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A FOREST FLORA

FOR

PILIBHIT, OUDH, GORAKHPUR AND BUNDELKHAND

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FOREST FLORA

FOR

PILIBHIT, OUDH, GORAKHPUR AND BUNDELKHAND

BY

P. C. KANJILAL, B.Sc.

Deputy Conservator of Forests



Allahabad

Superintendent, Printing and Stationery, United Provinces

1933

Price, Rs. 10.]

First Published, 1933

Printed by the Superintendent, Printing and Stationery,
United Provinces, Allahabad, India

INTRODUCTION

The area dealt with consists of forests administered by the Eastern Circle of the Forest Department of the United Provinces. These are distributed in the Civil Districts of Pilibhit, Kheri, Bahraich, Gonda, and Gorakhpur along the northern boundary of the Province and in Jhansi and Banda districts on the south, forming respectively, a northern and southern belt of forests separated by an extensive tract of cultivated land. In the north these forests form a more or less continuous tract from Pilibhit to Gonda, while in Gorakhpur and Bundelkhand they are scattered units surrounded by cultivation.

The book is primarily intended for the use of Foresters for whom a Forest Flora for this portion of the Province has not been so far available. Mainly, therefore, woody plants—trees, shrubs, and undershrubs—have been described. A special class of savannah land plants with woody rootstocks and more or less annual stems like *Careya herbacea Erythrina resupinata, Indigofera Hamiltonii, Combretum nanum Ochna pumila*, etc., have been included. These appear above ground after the annual savannah fires and die down nearly to the base in winter. Some of these, like *Indigofera Hamiltonii*, if protected, would, in all probability, grow to the size of shrubs in favourable situations, but with the majority the annual dying back is a hereditary habit which persists even under garden conditions. The herbaceous families Dioscoreaceæ and Nymphaceæ have been included on account of their great economic importance.

Brief descriptions of a few herbs of Forest interest have also been added in small type. They have been left out of the keys to avoid unnecessary crowding. Several common garden plants have been similarly included. These are often well known by sight and it is hoped that their names and very brief descriptions would prove useful.

The distribution records have been based on specimens collected within the area, either by my collectors or by myself or seen by me at the herbarium of the Forest Research Institute at Dehra Dun.

Vernacular names, if checked with descriptions in the Flora would be often found to be fairly useful in confirming identifications. They have, however, obvious limitations and are not by any means to be relied on as "short cuts" to scientific names of plants. They often vary from district to district; and sometimes several plants share a name. For the name to have any utility care must be taken to see that it is sufficiently reliable and, when possible, should be independently verified. An intelligent villager would sometimes invent a name on the spot rather than confess ignorance to an inquisitive outsider, specially if he has any local reputation as a *shikari*! Plants of economic value are usually fairly well known to castes and tribes like *musahars* who largely depend upon forests for their livelihood. Many of them collect medicinal plants and other minor forest produce for local bazars, and although often unable to discriminate between closely allied species, can be usually depended on for local names. Every attempt has been made to collect vernacular names known in each district, but I am afraid many may have escaped. When the name is not common to the whole

Province, districts, or tracts where they are current have been indicated by the following abbreviations :

P. Pil.	for Pilibhit.	*Gor.*	for *Gorakhpur.*
K.	,, Kheri.	*Ban.*	,, *Banda.*
Bah.	,, *Bahraich.*	*J.*	,, *Jhansi.*
Gon.	,, *Gonda.*	*Bund.*	,, *Bundelkhand.*

Common Sanskrit names have been given when possible, but for obvious reasons lesser known synonyms, in which a rich language like Sanskrit is prolific, or names about which there is any uncertainty, have not been included. Till English supplanted it, Sanskrit was the *lingua franca* of Hindu scholars all over India and many names have in consequence crept into literary usage in Indian vernaculars. Those who have some knowledge of Sanskrit, or of the languages derived from it, will find in many of these names, e.g. *agni-shikha* for Gloriosa superba ; *gridhranakhi* for Capparis sepiara ; little word pictures which aptly describe some outstanding features of the plant to which they belong. From their use in Ayurvedic medicine Sanskrit names of commoner medicinal plants are more widely known than vernacular names, and certainly have greater fixity. It is interesting to note that many local vernacular names can be directly traced to these ancient origins.

A few familiar Persian and Arabic names have also been included.

The brief description of the blaze in small type refers to the colour and texture of the bark when a slanting cut is made. It will be observed that several layers would be visible on such a cut, the outermost of which will be towards the periphery and innermost towards the centre.

The figures against the blaze indicate the normal thickness of the bark in inches. Blaze is often a useful character for identification and sometimes the only one, except the bark, available in the field for a deciduous tree that has shed its leaves. It may, however, be mentioned that blaze is a variable character, young plants usually having different blazes to those of old trees. The descriptions refer to the blaze of normal specimens of middle aged to mature stems.

I have had only limited opportunities for touring in the area and I am afraid several distribution records, field observations, etc., may have escaped me. If those who may use this book in the field will kindly point out to me such omissions, they will lay me under a great obligation.

A detailed Bibliography would be too lengthy for inclusion here, but the following works which I have freely consulted, among others, may be mentioned :

Brandis—Indian Trees ; Forest Flora of North-Western and Central India.

Basu and Kirtikar—Indian Medicinal Plants.

Blatter—Palms of British India and Ceylon.

Cooke—Flora of the Bombay Presidency.

Duthie—Flora of the Upper Gangetic Plain and of the adjacent Siwalik and Sub-Himalayan Tracts.

Engler—Das Pflanzenreich.

Engler and Prantl—Die Naturlichen Pflanzenfamilien.

Gamble—Flora of the Presidency of Madras ; Manual of Indian Timbers.

Haines—Botany of Bihar and Orissa; Flora of Chota Nagpur.

Hienig—Glossary of Botanic Terms.

Hole—On some Indian Forest Grasses and their Oecology.

Hooker—Flora of British India.

Hutchinson—Families of Flowering Plants.

Kanjilal—Forest Flora of Siwalik and Jaunsar Divisions of the United Provinces.

Kurz—Forest Flora of British Burma.

Osmaston—Forest Flora of Kumaun.

Parker—Forest Flora for the Punjab, Hazara, and Delhi.

Roxburgh—Flora Indica.

Troupe—Silviculture of Indian Trees.

Watt—Dictionary of Economic Products.

My thanks are due to Mr. R. S. Hole, C.I.E., for permitting me the free use of the library and herbarium of the Forest Research Institute when he was the Forest Botanist, to his successor, Mr. R. N. Parker, for the same hospitality, and to Mr. B. L. Gupta, the Curator of the herbarium, for frequent assistance. I am also indebted to Forest Officers of the Eastern Circle, United Provinces, for helping me to collect materials for the Flora.

January, 1933. P. C. KANJILAL.

BRIEF ACCOUNT OF CLIMATE AND FOREST VEGETATION

CLIMATE.

The climate is characterized by a warm wet season from the end of June or beginning of July to the end of September and a dry season during the rest of the year, of which middle of October to end of February or middle of March may be regarded as the cold season and April to end of June as the hot season. During the wet or monsoon period, rainfall is general and ranges from about 55 inches in the northern submontane tracts to about 30 inches in Bundelkhand. Both the Bay of Bengal and Arabian Sea branches of the S. W. monsoon current contribute to the rainfall of the area. The former is deflected from the Himalayan barrier into the submontane tract and the Gangetic Plain, while the western districts mainly owe their rainfall to the Arabian Sea current. Generally speaking, the total rainfall during the year decreases southwards from the submontane tract, while in the submontane tract itself there is a gradual increase eastwards. During the dry cold season immediately following the rains there are great differences between the temperatures and relative humidity of day and night and generally heavy dews occur. Towards the end of December or in January there is usually some rainfall. During April and May there are often local thunderstorms or sometimes dust-storms specially in the southern portion of the area. The maximum recorded temperature is 118·5°F. in June in Bundelkhand, but in the submontane tract higher temperatures than 110°F. are rarely reached. Hot winds known as *loo* are common in May and June in Bundelkhand and in the adjoining plains. These dessicating winds, where they are at all frequent, make only the survival of dry and xerophytic types of forests possible.

In parts of Pilibhit and South Kheri winter frosts are often severe, in North Kheri and Bahraich they are not generally serious, while in Gorakhpur, Gonda and Bundelkhand they are ordinarily negligible.

FOREST VEGETATION.

The area dealt with forms part of the Floristic sub-division of India known as the Upper Gangetic Plain. As has been mentioned, the forests are distributed over a northern tract in the Sub-Himalayan districts from Pilibhit to Gorakhpur and over a southern tract in

Bundelkhand extending to the southern-most extremity of the Province in Lalitpur. The bulk of the central plain has been under cultivation since remote antiquity. The vegetation of this central tract has been vastly modified by the action of man and almost nowhere can the original Forest Flora be seen. The extent of forests has been much reduced even within recent times, specially in the submontane tracts, due to the pressure of an agricultural population with a constantly increasing demand for land for cultivation.

In forests which have not been brought under protection the composition has been considerably influenced by mutilation and heavy fellings, grazing and fire. The cumulative effect of this has been a regression in type, ultimately resulting in an open scrubby jungle of scattered low trees like *Butea frondosa, Streblus asper, Casearia tomentosa, Holarrhena antidysenterica, Mallotus phillipinensis,* and thorny species like *Flacourtia Ramontchi, Zizyphus sp. Carissa opaca, Acacias, Mimosa sp, Gardenia turgida,* etc. In this type of forest independently of the dryness of the locality, there is general tendency to an increase in the proportion of thorny or prickly species, as, other factors being equal, the unarmed species are in greater danger of elimination. Some species like *Streblus asper* which are ordinarily unarmed become spinescent when growing under these conditions.

The forest vegetation in our area is generally of the deciduous type; most of the trees shedding their leaves in the beginning or middle of hot weather and coming to leaf again by the beginning of monsoon. After the jungle fires many plants with perennial rootstocks shoot up and produce flowers. The monsoon period is characterized by the rapid growth of shoots and production of leaves and by the phenomenal growth of numerous annuals which complete their life cycle by early winter. Generally speaking, the best time for the flowering of woody species is during the hot season, while a large number of grasses and suffruticose perennials flower at the close of rains or in early winter. Many deciduous species like *sal* are able to withstand jungle fires and even to spread where fires are early and periodic, as these fires reduce the severe competition of fast growing evergreen species, which, with few exceptions, are not fire resistant. Before fires were so prevalent, it is probable that evergreen species formed a larger proportion of the growing stock, at any rate in the submontane forests, than they do now. In fact effective fire protection for a number of years soon give them an upper hand in forests where they occur in mixture. Judicious controlled burnings are, therefore, destined to play an important role in the scientific management of these forests in the future.

Dwarfed shrubs like *Phoenix acaulis, Grewia sapida Erythrina resupinata, Careya herbacea. Combretum nanum,* etc., seem to have evolved in response to annual burning. The underground

portion of the stem in these species remains uninjured and often attains considerable thickness. Even when the shoots do not die back annually, as in *Phoenix acaulis*, there is no appreciable development of the stem above the ground which mainly develops underground and is held there by the pulling action of the roots. Many rhizomatous and bulbous herbs which produce annual shoots after the jungle fires may also have been similarly evolved. Seedlings of many species like *sal, Terminalia, tomentosa, Zizyphus Jujuba*, etc., when repeatedly cut back by fire produce a woody rootstock similar to those of species enumerated above, which ultimately produces a vigorous shoot and grows into a tree when fire protected.

The following Indian families of flowering plants which contain woody species are totally unrepresented in our area:—

Magnoliaceæ, Tenstroemiaceæ, Guttiferæ, Hypericaceæ, Berberidaceæ, Chailleticaceæ, Aquifoliaceæ, Coriraceæ, Connaraceæ, Hamamelidaceæ, Caprifoliaceæ, Goodeniaceæ, Ericaceæ, Vaccinaceæ, Myristicaceæ, Hernandiaceæ, Proteaceæ, Thymelaceæ, Platanaceæ, Juglandaceæ, Myricaceæ, Casurinaceæ, Betulaceæ, Fagaceæ, Pinaceæ.

The dominant families as regards woody species are :—

Leguminosæ, Euphorbiaceæ, Rubiaceæ, Urticaceæ (in the larger sense), *Malvaceæ, Acanthaceæ, Apocynaceæ, Asclepiadaceæ, Tiliaceæ, Vitaceæ*, while the ten most prevalent families according to the number of species are :—

Leguminosæ, Gramineæ, Cyperaceæ, Compositæ, Euphorbiaceæ, Acanthaceæ, Rubiaceæ, Labiatæ, Scrophulariaceæ, Convolvulaceæ.

The forests of the northern tract.—These forests are the remnants of the great sub-himalayan *sal* belt which extended right across the province to Eastern Punjab on the west, and through Bengal to Assam on the east, and into the Gangetic Plain along the south. A tract of swamps, springs and streams known as the *tarai* separates the plains from the broken ground and deposits of boulders, gravel and silt along the base of the outer hills which is called the *bhabar*. These *bhabar* deposits are porous and deep, and all but the largest streams disappear into them after emergence from the hills to reappear again in the swamps of *tarai*. Our area mainly extends into the *tarai* and plains beyond and only in few districts the northern boundary crosses into the *bhabar* tract. The area is drained by various streams and rivers running through the forest which ultimately reach one of the bigger rivers like the Sarda, Kauriala, Rapti,

or Gandak all of which are tributaries of the Ganges. The permanent subsoil water level is usually never at a very great depth and ranges from 10 to 45 feet.

The soil is alluvial and consists largely of sandy or clayey loam, but its actual composition changes considerably even within short distances and varies from pure sand to clay. Deposits of concretionary limestone mixed with clay known as *kankar*, sometimes occur near the surface, these form a hard mass which impedes the free development of roots and where present the forest vegetation is of an open stunted xerophytic character.*

The forests are often interrupted by savannah or grassy lands, sometimes of considerable extent, often dotted with trees like *Bombax malabaricum*, *Randia uliginosa*, *Butea, frondosa*, *Zizyphus xylopyrus*, etc. The dominant grass varies with each type of grass-land and is often a good indicator of locality. Thus where drainage is good the dominant grass is usually *Saccharum Narenga*. This denotes a soil condition suited to *sal* and where it occurs in association, *sal* is gradually extending into the grass-land. *Imperata arundinacea*, on the other hand, indicates clayey soil unsuited for *sal*. It is often the dominant grass in the type of grass-lands known as *majhars* in Gorakhpur and is frequently associated with the *khaskhas—Vetiveria zizanoides*. *Anthistiria gigantea* often occurs in association with *Saccharum Narenga*, but it is also found on badly drained situations. In hollows and water-logged low lying lands, *nar—Arundo Donax* and *Phragmites karka*—and *retwa—Saccharum fuscum*—are the characteristic grasses which indicate a condition unsuited for the growth of tree forest.

The forests may be roughly sub-divided into the following four types :—

(i) *Sal forests.*

(ii) *Mixed forests of miscellaneous species.*

(iii) *Swamp forests.*

(iv) *Alluvial forests.*

(i) *Sal forests.*—This is the prevailing type of forest in the northern belt. The principal species—*Sal—Shorea robusta*—is gregarious in habit and has a tendency to grow in pure crops of which it may constitute over 90 per cent. of the crop. The forests vary considerably in quality and composition with locality. It grows best in well-drained loamy soils, as on slopes of old river banks. The best quality

* Troup—Silviculture of Indian Trees.

sal forests in our area occur in north Kheri. The commonest associates are :—

Terminalia tomentosa, Terminalia Belerica, Lagerstroemia parviflora, Stereospermum suaveolens, Miliusa velutina, Saccopetalum tomentosum, Holarrhena antidysenterica, Cassia Fistula, Semercarpus Anacardium, Buchanania latifolia, Kydia calycina, Grewia Hainesiana, Diospyros tomentosa, Emblica officinalis, Dillenia pentagyna, Bauhinia sp., etc.

The commonest climbers are :—

Bauhinia Vahlii, Milletia auriculata, Acacia pennata, Porana paniculata, species of *Smilax*, etc.

The following shrubs and low trees are common in the underwood :—

Clerodendron infortunatum, Randia dumetorum, Mallotus philippinensis, Croton oblongifolius, Pogostemon plectranthoides, Flemingia Chappar, F. semialata, species of *Desmodium, Murraya Kœnigi, Ardisia solanacea* (humid localities) and many others.

(ii) *Mixed forests of miscellaneous species.*—These forests are characterized by an assemblage of large number of species—the composition varying from place to place and depending upon local factors. They pass imperceptibly into the drier types of swamp forests on the one hand and into *sal* forests on the other. The following species are commonly found :—

Bombax malabaricum, Lagerstroemia parviflora, Stereospermum suaveolens, Emblica officinalis Adina cordifolia, Mitragyna parvifolia, Lannea grandis, Garuga pinnata Butea frondosa, Bauhinia sp., Hymenodictyon excelsum, Pterocarpus Marsupium, Cassia Fistula, Casearia tomentosa, Sterculia sp., *Kydia calycina, Mallotus phillipinensis, Holarrhena antidysenterica, Eugenia Jambolana, Anogeisus latifolia* (absent in Gorakhpur), *Alanguim Lamarcki*, etc.

In dry situations the forests are of an open character in which thorny species like *Zizyphus Jujuba, Z. xylopyrus. Acacia Catechu, Flacourtia Ramontchi*, etc., form a large proportion of the crop.

In Domakhand—at the north-east boundary of Gorakhpur, several eastern and sub-himalayan species like *Premna scandens, Mallotus repandus, Uvaria Hamiltoni, Clematis Cadmia, Alangium begoncefolia*, etc., occur. This tract mainly lies in *tarai* country and being close to the foot hills of Nepal, probably has a higher rainfall than the rest of the area, which factors are probably largly responsible for the distribution of these species in this area.

(iii) *Swamp forests.*—These forests occur in water-logged swampy areas. The composition varies with the degree of water-logging but the types imperceptibly pass into one another and it is difficult to separate them except in a broad way. The following are some of the characteristic trees :—

Eugenia Jambolana, Trewia nudiflora, Putranjiva Roxburghii, Ficus glomerata, Bischoffia javanica, Terminalia Arjuna, Celtis tetrandra, Glochidion assamicum, Litsœa polyantha, Trema orientalis, Albizzia procera, etc.

Calamus sometimes occurs in association but is nowhere abundant and does not form dense brakes. *Eugenia Jambolana* often forms pure patches.

Along the edge of the water the characteristic trees are *Barringtonia acutangula,* and *Salix tetrasperma,* while *Phlogacanthus thyrsiflorus, Dœdalacanthus nervosus, Hyptianthera stricta, Ficus heterophylla, Ardisia solanacea* are some of the more characteristic shrubs. In the eastern districts the bush *Cephalanthus naucleoides* often occurs in compact groups in the shallower portions of *jhils.* In Gorakhpur the eastern swamp rose, *Rosa involucrata* is sometimes found in open grassy swamps which marks the present western range of this interesting species. Along sluggish nalas within the forest in Gorakhpur, *Lagerstroemia Flos-Reginae* has been recorded which is interesting as it is probably a comparatively recent escape from cultivation.

(iv) *Alluvial forests.*—This type of forest occurs on the recent soil along the banks of rivers and is consequently liable to be frequently washed off. Mostly the recent alluvium consists of fine mud. On these formations the most characteristic species is *Tamarix dioica* which occurs gregariously and comes up simultaneously with or follows *Saccharum spontaneum—kans.* As the *Tamarix* closes up, *kans* is eliminated. When the soil ceases to be new alluvium due to the river changing its course or becomes otherwise elevated above its original level by silt deposits, trees like khair—*Acaçia Catechu,* sisham—*Dalbergia Sissoo, Bombax malabaricum, Zizyphus Jujuba, Ehrœtia lœvis, Lannea Grandis, Garuga pinnata,* etc., gradually appear and a savannah land with dotted trees often results, which may finally lead to miscellaneous forests as described above. Along bigger rivers, sand and gravel are sometimes carried some distance into the plains. Recent alluvium of this nature is uncommon in our area but in the few places that it occurs, gregarious patches of *sissoo* and *khair* appear along with *Tamarix.* This dense *sissoo-khair* crop thins out considerably with age and as this goes on miscellaneous trees appear in gradually larger proportions and ultimately predominate, forming open grassy forests.

Forests of Bundelkhand.—These forests occur on the broken country on the south of the Ganges forming the slopes of the Vindhya Hills. These hills run across the Province in this tract and rise in a series of sloping plateus to a height of about 2,000 feet in the Jhansi district. The rocks are prominently sand stones with subordinate beds of shale and limestone overlying quartz and gneiss which sometimes appear on the surface.

The forest vegetation is of a dry type and is mainly Central Indian in character. The great bulk of the forests may be broadly divided into the two following types :—

(i) Mixed deciduous forests.

(ii) Dry thorn forests.

(i) *Mixed deciduous forests.*—Except in favourable situations like moist ravines or on deep fresh soils, the forests are of an open type and trees of large dimensions are uncommon. The composition varies from place to place but the prevailing species are :—

Terminalia tomentosa, T. Belerica, Anogeisus latifolia, Cordia Myxa, Lagerstræmia parviflora, Dalbergia latifolia, Ougenia dalbergioides, Cassia Fistula, Lannea Grandis, Acacia Catechu, Butea frondosa, Schliechera trijuga, Diospyros tomentosa, Bassia latifolia, Bridelia retusa, Ficus tomentosa, Schrebera swietenoides, Albizzia Lebbek, Flacourtia Ramontchi, Grewia sp., etc.

Dendrocalamus strictus is the common bamboo and often occurs in patches. *Teak—Tectona grandis*–occurs on quartzites and gneiss in the Jhansi district usually not far from large rivers and in places forms the predominant crop over small areas, *e.g.*, at Talbehat. The tree attains only small dimensions within our area.

Anogeisus pendula often occurs gregariously on quartzites and gneiss, either forming almost pure crops or associated with *A. latifolia, Acacia Catechu, Diospyros tomentosa, Zizyphus xylopyrus*, etc.

In more level country the mixed deciduous forest often imperceptibly passes into thorn forest.

On dry ridges species like *Nyctanthes Arbor-tristis Boswellia serrata, Sterculia urens, Cochlospermum Gossypium, Euphorbia Nivulia*, etc., often form a characteristic very open xerophytic forest. Many trees growing in such exposed situations have thin papery bark, and underneath this thin bark there is a layer of chlorophyll. The plants are thus adapted for remaining without leaves for extraordinarily long periods.*

* Haines—Botany of Bihar and Orissa.

Moisture loving species like *Diospyros Embryopteris, Terminalia Arjuna, Eugenia Jambolana, Ficus glomerata, Ficus retusa,* etc., occur along prennial streams and moist ravines. Eastwards the forests are gradually less dry and in Banda stunted *sal* of dry type appears in association with miscellaneous trees.

Alluvial *tamarisk* forests similar to those in the northern tract appears on recent alluvium. The southern tamarisk—*Tamarix ericioides*—sometimes occurs in rocky river beds.

(ii) *Thorn forests.*—These forests occur in dry parts of the area and generally on level ground. They form an open scrub consisting largely, but not exclusively, of thorny species; the characteristic species being *Balanites aegyptica, Zizyphus xylopyrus, Z. Jujuba, Z. nummularia, Grewia sp., Acacia leucophlœa, Z. Œnoplia, Butea frondosa, Calotropis gigantea, Prosopis spicigera, Capparis aphylla, Dichrostachys cinerea,* etc.

To the north-west as the Jalaun district is approached natural vegetation becomes scanty, and in the driest localities only xerophillous species like *Dichrostachys cinerea, Prosopis, specigera, Capparis, aphylla,* etc., survive. In the neighbourhood of village lands, however, there is considerable accession due to the occurrence of a number of escapes and self-sown species like *Azadirachta indica, Albizzia Lebbek, Acacia arabica, Cordia Myxa, Dalbergia Sissoo,* etc.

SYNOPSIS OF THE FAMILIES.

The distinguishing characters of the families have been selected with special reference to woody plants described in this work. Flowering plants or Phanerogams alone have been dealt with, in the classification of which the system of Bentham and Hooker has been mainly followed, which has been hitherto almost universally adopted in this country.

The Phanerogams are sub-divided as follows :—

I. Flowers uni-or bi-sexual; ovules enclosed in an ovary, fertilized through the tissue of the stigma and style. .. .. — ANGIOSPERMS.

A. Leaves reticulately veined. Perianth usually in whorls of 4 or 5. Embryo with two cotyledons. Stem capable of secondary growth in thickness consisting of pith, wood, bast and bark which form separate concentric layers. .. — **Dicotyledons.** (Families I—LXXII.)

1. Flowers in the majority of species bi-sexual, as a rule both calyx and corolla present, the corolla consisting of distinct petals. .. .. — **Polypetalæ.** (Families I—XL.)

a. Sepals usually distinct; petals and stamens hypogynous; disk usually absent. Ovary free. .. .. — **Thalamifloræ.** (Families I—XIII.)

b. Sepals distinct or connate. Petals distinct or sometimes more or less coherent; torus generally expanded into a fleshy disk between the petals and the ovary. .. .. — **Discifloræ.** (Families XIV—XXVIII.)

c. Calyx gamosepalous, often adnate to the ovary. Petals usually inserted on calyx-tube or on disk lining the calyx-tube; disk thin or wanting. Stamens perigynous or epigynous. .. .. — **Calycifloræ.** (Families XXIX—XL.)

2. Flowers usually bi-sexual: as a rule calyx and corolla both present. Corolla gamopetalous. .. .. — **Gamopetalæ.** (Families XLI—LIX.)

3. Flowers usually uni-sexual; perianth usually 1-seriate, usually both calycine. .. .. .. — **Monochlamydæ.** (Families LX—LXXII.)

B. Leaves on sheaths or broad-based petioles the blade usually parallel veined. Perianth usually in threes or multiples of three. Embryo with 1 cotyledon, small, usually in copious endosperm. Stem with scattered fibrovascular bundles, surrounded by cellular tissue, secondary growth, usually absent. Pith, wood, and bark not distinct .. — **Monocotyledons.** (Families LXXIII—LXXX).

I. Flowers uni-sexual, perianth none or incomplete. Ovules not enclosed in an ovary, fertilized directly by the pollen tube entering the micropyle or a tube formed by the integuments.. .. .. — **GYMNOSPERMS.**

A. DICOTYLEDONS.

1. Polypetalæ.

a. THALAMIFLORÆ.

I. **Ranunculaceæ.** Fruit dry. Climbers with opposite leaves or herbs with alternate leaves. Sepals deciduous, often petaloid. Petals sometimes wanting. Stamens numerous, anthers adnate, longitudinally dehiscent. Carpels numerous, free, 1-celled, 1-ovuled.

II. **Dilleniaceæ.** Trees. L. alternate, simple. penninerved, petioles sheathing. Fl. large, white or yellow. Sepals 5, imbricate, persistent, petals 5, caducous. Carpels one or many, more or less cohering on the axis, styles free. Fruiting carpels enclosed in the thickened sepals.

III. **Anonaceæ.** Trees or shrubs. L. alternate, simple, stipules none. Sepals 3, petals in one or two trimerous whorls. Stamens usually numerous, filaments short or none, anther-cells adnate to a broad connective. Carpels distinct in fruit (confluent in *Anona*). Seeds large, embryo small, endosperm ruminated.

IV. **Menispermaceæ.** Usually climbers. L. alternate, simple, entire or lobed, mostly palminerved, often peltate, stipules 0. Fl. small, uni-sexual, trimerous, sepals usually free. Petals usually 6 or 0. Stamens opposite to petals or anthers sessile on a column. Carpels free, as a rule 3. Fruit a drupe. Seed curved, horse-shoe shaped or reniform with or without endosperm.

V. **Nymphaceæ.** Aquatic-herbs, leaves usually peltate. Sepals 4-5. Petals and stamens usually numerous. Carpels many in pits of the torus or confluent with it. Ovary 1 or more ovuled. Fruit a spongy berry or of nuts sunk in pits of the torus.

VI. **Capparidaceæ.** Trees or shrubs. L. as a rule alternate, stipules often present and spinescent. Fl. usually bi-sexual, often zygomorphic. Sepals usually 4, petals 4. Stamens 4 5 or numerous, filaments filiform. Carpels connate into a 1-celled ovary with 2-4 parietal placentas, often on an enlongated gynophore. Fruit baccate or capsular.

VII. **Bixaceæ.** Trees or shrubs often armed. L. alternate, simple, mostly toothed, stipules small or 0. Fl. regular, 1-2 sexual, 4-or 5-merous, stamens usually numerous, free. Ovary 1-celled. Fruit baccate or capsular, seeds few, frequently arillate or with pulpy testa.

VIII. **Pittosporaceæ.** Evergreen trees or shrubs. L. alternate, simple, entire, stipules 0. Fl. regular, pentamerous, sepals and petals free, stamens 5. Anthers versatile. Ovary 1-celled with 2-5 parietal placentas. Fruit a leathery or woody capsule.

IX. **Tamaricaceæ.** Shrubs or trees. L. alternate small, generally scale-like. Fl. regular, in spikes, racemes or panicles; sepals and petals usually free, pentamerous, sometimes tetramerous.

Stamens as many as petals or twice their number. Ovary 1-celled, placentas 3-5, basal. Capsule 3-5-valved, seeds tufted or winged.

X. **Dipterocarpaceæ.** Resinous trees. L. alternate, usually coriaceous, simple, penninerved, stipules large, enclosing the bud. Fls. panicled, bi-sexual, regular, calyx-segments 5, some or all as a rule much enlarged in fr. Petals 5, contorted, stamens usually many, anthers adnate to filaments, connectives subulate. Ovary usually 3-celled. Fruit indehiscent, 1-seeded.

XI. **Malvaceæ.** Herbs, shrubs or trees. L. alternate, mostly stipulate, generally palminerved, hairs usually stellate. Fl. as a rule bi-sexual, regular, usually supported by 3 or more bracteoles. Sepals 5, valvate, more or less connate, petals 5, base adnate to staminal-column, contorted in bud. Stamens numerous, filaments monadelphous or variously connate, anthers 1-celled. Ovary syncarpous of 2-many carpels. Fruit of distinct dry carpels, or capsular.

XII. **Sterculiaceæ.** Herbs, shrubs or trees. L. alternate, mostly stipulate, hairs often stellate. Sepals 5, valvate, more or less connate, petals 5 or none. Stamens usually monadelphous, anthers 2-celled. Ovary usually of 2-5, nearly free or connate, carpels. Fruit capsular or of distinct follicles.

XIII. **Tiliaceæ.** Herbs, shrubs or trees. L. alternate, simple, stipules deciduous. Fl. regular, almost always bi-sexual, sepals 5-4, free or connate, petals 5-4, valvate in bud, often glandular at the base. Stamens 5, numerous, anthers 2-celled. Ovary usually 2-5-celled. Fruit drupaceous or capsular or of cocci.

b. Discifloræ.

XIV. **Linaceæ.** Herbs or shrubs. L. alternate, simple, entire. Fl. bi-sexual, regular, sepals and petals pentamerous, sometimes tetramerous. Stamens 10 or 8, half the number often sterile, filaments united at base, anthers versatile. Ovary 3-5-celled. Fruit capsular.

XV. **Malpighiaceæ.** Trees or shrubs often climbing. L. usually opposite, simple, entire, stipules small or 0. Fl. often zygomorphic, calyx 5-lobed, one or more segments often glandula outside; petals 5, often fimbriate. Stamens 10, sometimes unequal. Ovary 3-celled; styled 3 or 1. Fruit usually of one or more winged samaras.

XVI. **Zygophyllaceæ.** Undershrubs. Leaves usually opposite, 1-3-foliolate, stipules spinescent. Flowers regular, 2-sexual. Sepals 4-5; petals 4-5, imbricate. Stamens 10 or more. Ovary 4-5-lobed or winged, 4-5-celled. Fr. separating into cocci or capsular.

XVII. **Rutaceæ.** Trees or shrubs often armed. Leaves, simple, or compound, aromatic, dotted with translucent glands,

stipules 0. Fl. regular, sepals and petals 4 or 5, stamens 4-5 or 8-10 or many; ovary usually of 4-5 connate or free carpels. Fruit berry or drupe.

XVIII. **Simarubaceæ.** Trees or shrubs with bitter bark. Leaves alternate, stipules deciduous or 0. Fl. regular, small, often uni-sexual, sepals 3-5, usually connate, petals 3-5. Stamens as many as petals or double their number, inserted outside the disk. Ovary 2-5-partite or entire, and as many celled. Fruit of samaras or drupaceous.

XIX. **Ochnaceæ.** Shrubs or trees. L. alternate, simple, glabrous, stipulate. Fl. regular, bi-sexual. Sepals 4 or 5, free, imbricate, persistent: petals 5 or more, deciduous, stamens 10 or many, anthers basifixed. Disk thick, often enlarged after flowering. Ovary 3-10-celled, sometimes deeply lobed. Fr. of 3-10, one- or few-seeded drupes.

XX. **Burseraceæ.** Resinous trees or shrubs. L. alternate, imparipinnate, sometimes 1-foliolate. Fl. small, regular; calyx 3-5-lobed, petals 3-5. Stamens as many as petals or twice their number, inserted on the disk or outside at its base. Ovary 3-5-celled. Fruit drupaceous or pseudo-capsular.

XXI. **Meliaceæ.** Trees. L. alternate, generally pinate or 2-3-pinnate; stipules 0. Fl. regular, in cymose panicles; calyx small, 4-5-cleft, petals 4-5. Stamens twice the number of petals, filaments generally united into a tube. Disk usually between stamens and ovary, often tubular. Ovary 3-6-celled. Fruit a drupe or a capsule.

XXII. **Olacaceæ.** Shrubs, sometimes scandent, less often undershrubs. L. alternate, stipules 0. Fl. small, as a rule bi-sexual, calyx small or wanting. Petals 3-6, valvate. Fertile stamens usually 3 or 4, opposite the petals. Ovary 1-celled or at the base 2-5-celled, ovules pendulous from the apex of a free central placenta. Drupe 1-seeded.

XXIII. **Celastraceæ.** Trees or erect or climbing, sometimes armed, shrubs. L. simple, often opposite, stipules minute or none. Fl. regular, small, bi-sexual or polygamous; calyx small, 4- or 5-lobed, persistent. Petals 4-5. Disk large, surrounding the base of the 3-5-celled ovary or partially enclosing it, stamens usually 3-5 inserted on the disk or beneath its margin. Fruit a capsule or a drupe.

XXIV. **Rhamnaceæ.** Trees or shrubs, erect or climbing. Branchlets or stipules often spinescent; l. simple. Fl. small, regular. Calyx 4-5-cleft, lobes triangular, valvate in bud, disk lining or filling the calyx-tube, petals 4-5 rarely 0, inserted at the mouth of calyx-tube on the margin of the disk. Stamens opposite to petals, often hooded by them. Ovary free or immersed in the disk, usually 3-celled. Fruit drupaceous or capsular, sometimes winged.

XXV. **Vitaceæ.** Climbing or erect shrubs, or herbs; tendrils when present leaf-opposed. Leaves alternate, simple or compound. Fl. regular, calyx small, entire or 4-5-dentate. Petals 4-5, valvate in bud, free or connate at the apex or at the base. Stamens opposite to petals, free or connate into a tube and then adnate to the petals. Disk usually conspicuous. Ovary 2-6-celled. Fruit baccate.

XXVI. **Sapindaceæ.** Trees or shrubs. L. usually alternate generally compound, stipules 0. Fl. sometimes zygomorphic, mostly polygamous. Sepals 4-5, free and imbricate, or connate. Petals 4-5, free or 0. Disk usually conspicuous, various. Stamens 5-10, free, usually inserted between disk and ovary, filaments often hairy. Ovary usually 3-, sometimes 1-4-celled, entire or more or less divided. Fruit various; seed often with a conspicuous hilum.

XXVII. **Anacardiaceæ.** Trees or shrubs. L. usually alternate, simple or 1-pinnate, stipules 0. Fl. regular, calyx 3-5-cleft; petals 3-5, rarely 0. Stamens as many or twice as many as petals, sometimes not all perfect, inserted under, rarely on the disk. Ovary 2-6-celled, or of 5 free carpels. Fruit drupaceous.

XXVIII. **Moringaceæ.** Soft wooded deciduous trees. Leaves alternate, bi- or tri-pinnate, pinnæ and leaflets oppcsite, often with glands at base of petiolules and pinnae. Fl. large, irregular, bi-sexual. Calyx 5-cleft, segments petaloid. Petals 5. Disk lining the calyx-tube. Fertile stamens 5, opposite to petals, alternating with staminodes. Ovary 1-celled with 3-parietal placentas; ovules many. Fr. an elongated 3-valved capsule.

c. Calycifloræ.

XXIX. **Leguminosæ.** Herbs, shrubs or trees. L. stipulate, as a rule alternate and compound. Fl. bi-sexual, sepals 5, petals 5, in the majority of genera zygomorphic, rarely 0. Stamens 10 or numerous, free or connate. Carpel one, free; ovules usually numerous, attached to the inner suture. Fr. a 1-celled pod.

XXX. **Rosaceæ.** Herbs, shrubs or trees. L. stipulate, usually alternate. Fl. pentamerous, as a rule regular and bi-sexual. Stamens usually numerous. Carpels mostly distinct, often adnate to and enclosed in the calyx-tube.

XXXI. **Rhizophoraceæ.** Trees. L. opposite, usually coriaceous and entire, scars of petioles mostly prominent, stipules interpetiolar, deciduous. Fl. regular, generally bi-sexual; calyx more or less adnate to ovary, limb 4-14 lobed, lobes as a rule persistent, petals as many as sepals, stamens usually twice the number of petals. Ovary 4-celled (*Carallia.*) Fr. coriaceous, indehiscent usually 1-seeded.

XXXII. **Combretaceæ.** Trees or shrubs. L. simple, entire, stipules 0. Fl. usually bi-sexual and regular, calyx-tube adnate to ovary and produced beyond it, segments 4-5, valvate, petals 4-5

often wanting. Stamens as many as calyx-segments or twice their number, perigynous. Ovary 1-celled, inferior. Fr. dry, indehiscent, generally angled or winged.

XXXIII. **Myrtaceæ**. Trees or shrubs. L. simple, usually opposite sometimes alternate, generally quite entire, usually with translucent glands. Stipules 0. Fl. regular, generally bi-sexual. Calyx superior, limb short, 4-5-lobed. Petals 4-5, free or united in a cup. Stamens numerous; filaments often incurved in bud, free or connate in bundles. Ovary usually 2, less often 1- or more-celled. Fruit baccate, drupaceous or capsular.

XXXIV. **Lecythidaceæ**. Usually trees. Leaves alternate not gland dotted, entire or toothed. Flowers regular, 2-sexual. Calyx-tube adnate to the ovary; lobes usually 4-6, valvate or imbricate. Petals usually 4-6. Stamens numerous, in many series, few sometimes sterile. Ovary inferior, 2-6, rarely more celled. Fruit indehiscent usually a woody, fleshy, or fibrous, berry.

XXXV. **Lythraceæ**. Trees, shrubs or herbs. L. generally opposite, simple, entire. Flowers 2-sexual, regular, or oblique. Calyx inferior, persistent, segments 3-6, valvate, often with intermediate teeth. Petals as many as calyx-lobes or 0, imbricate and crumpled in bud. Stamens as many as or twice as many as calyx-lobes, or many. Ovary usually free and 2-6-celled. Fruit capsular or indehiscent.

XXXVI. **Onagraceæ**. Herbs or undershrubs sometimes aquatic. Flowers usually regular, 2-sexual. Calyx adnate or ½-adnate to the ovary (*Trapa*); lobes 2-5, usually 4, valvate. Petals alternating with sepals, rarely 0. Stamens as many or twice as many as the sepals. Ovary usually 2-4-celled. Fruit capsular and many seeded or indehiscent and 1-seeded (*Trapa*).

XXXVII. **Samydaceæ**. (*Casearia*.) Trees or shrubs. Leaves alternate, simple, often pellucid-punctate, stipules minute, deciduous. Flowers small, regular. Calyx persistent, 4-5-lobed, inferior. Petals 0. Stamens usually 6-10, alternating with staminodes usually united at the base into a hypogynous tube. Ovary free, ovoid, 1-celled, placentas usually 3-4, parietal. Fruit a succulent 3-4 valved capsule. Seeds usually arillate.

XXXVIII. **Cactaceæ**. (*Opuntia*.) Shrubs. Stems and branches succulent, prickly. Leaves minute or 0. Fl. regular, bi-sexual, solitary, usually showy, calyx-tube adnate to ovary. Sepals and petals alike, numerous, imbricate, stamens numerous. Ovary 1-celled. Fruit a fleshy berry. Seeds numerous.

XXXIX. **Araliaceæ**. (*Heteropanax*.) Small trees. Leaves alternate, pinnately decompound. Common petiole with a sheathing base. Flowers polygamous, in umbels, arranged in panicles. Calyx-tube adnate to the ovary; limb almost entire. Petals and stamens 5. Ovary 2-celled; styles 2. Fruit indehiscent, laterally compressed, 2-seeded.

XL. **Cornaceæ.** Usually small trees. Leaves (in local species) alternate. Stipules 0. Flowers regular. Calyx-tube adnate to the ovary, limb persistent, 4-10-toothed or truncate. Petals usually 4-10, usually valvate. Stamens as many as the calyx-teeth or sometimes twice or three times as many. Disk epigynous. Ovary 1-2-celled. Fruit drupaceous.

2. Gamopetalæ.

XLI. **Rubiaceæ.** Herbs, shrubs or trees. L. opposite, sometimes whorled, stipules inter- or intra-petiolar. Fl. as a rule bi-sexual and regular, usually 4-5-merous. Calyx-tube adnate to ovary. Corolla gamopetalous. Stamens inserted on the corolla-tube, as many as, and alternating with, its lobes. Ovary as a rule 2, sometimes more-celled. Fruit a berry, drupe or capsule.

XLII. **Compositæ.** Herbs or shrubs. L. as a rule alternate, stipules 0. Inflorescence a dense head of many small flrs., sessile on a broad receptacle and enclosed in an involucre of whorled of imbricate bracts. Calyx-tube adnate to the ovary; limb usually of hairs (pappus) or scales on the top of the ovary. Corolla tubular or ligulate, of 4-5 lobes. Stamens as many as cor. lobes, inserted on the corolla-tube; anthers usually connate, connective produced upwards. Ovary 1-celled with 1 erect ovule. Fruit dry, indehiscent, naked or crowned by the hairy or scaly calyx limb.

XLIII. **Plumbaginaceæ.** (*Plumbago.*) Shrubs or undershrubs. L. alternate, exstipulate. Fl. regular, bi-sexual, pentamerous. Calyx persistent, gamosepalous. Corolla salver-shaped. Stamens as many as and opposite the corolla lobes, usually free. Ovary 1-celled, 1-ovuled. Fruit capsular, circumciss at the base.

XLIV. **Myrsinaceæ.** Trees or shrubs. L. alternate, simple, usually gland-dotted, stipules 0. Flowers small, regular, sometimes 1-sexual, 4-5-merous. Calyx persistent, often enlarged in fr. Corolla-tube short or petals free. Stamens as many as, and opposite the corolla-segments, epipetalous. Ovary superior or ½-inferior, 1-celled, ovules on a free central placenta. Fruit indehiscent, dry or succulent.

XLV. **Sapotaceæ.** Trees, often with milky juice. L. entire, usually alternate and coriaceous. Fl. bi-sexual. Calyx persistent, segments 4-8, almost distinct. Corolla-tube short, lobes 4-24. Stamens as many as and opposite the corolla-lobes, or 2-3 times as many, sometimes alternating with staminodes. Ovary usually 4-12-celled. Fruit a 1-8-seeded berry, seeds with a crustaceous testa.

XLVI. **Ebenaceæ.** (*Diospyros.*) Trees or shrubs. L. entire, as a rule alternate, stipules 0. Fl. regular, usually dioecious, 4-5-merous. Calyx gamosepalous, persistent and generally enlarged in fr. Corolla-lobes twisted. Stamens usually 4-many, usually 16, filaments variously connate at base, often in pairs, anthers basifixed.

Staminodes in female flowers usually fewer than stamens in male flowers. Ovary 4-10-celled, superior. Fruit a berry, rind of fr. coriaceous, seeds embedded in soft or viscid pulp.

XLVII. **Styraceæ.** (*Symplocos.*) Small tree. L. alternate, stip. 0. Fl. bi-sexual, regular, 4-5-merous. Calyx superior, limb small, persistent. Petals free or connate at the base. Stamens many, in several series, adnate to the base of the petals. Ovary usually 2-3-celled. Fruit drupaceous.

XLVIII. **Oleaceæ.** Trees or shrubs. L. as a rule opposite, simple or compound, stip. 0. Fl. regular, as a rule bi-sexual, calyx small, 4-9-toothed or truncate. Corolla-lobes 4-9. Stamens 2, filaments usually short. Ovary free, 2-celled. Fruit a berry, capsule or drupe.

XLIX. **Salvadoraceæ.** (*Salvadora.*) Evergreen trees or shrubs. L. opposite, entire, stipules minute. Fl. small, tetramerous. Calyx small. Petals slightly connate below. Stamens 4, epipetalous alternating with the petals. Ovary free, 1-2-celled. Fruit a globose drupe.

L. **Apocynaceæ.** Trees, shrubs or herbs usually with milky juice. L. entire, as a rule opposite or whorled, stipules 0 or small, sometimes intrapetiolar. Fl. regular, bi-sexual, usually pentamerous. Calyx free; corolla-lobes spreading, mostly contorted in bud. Stamens 5, inserted on the corolla-tube. Anthers free or adhering to the stigma; pollen granular. Carpels 2, connate or distinct. Fruit a berry, drupe or of free or connate follicles. Seeds often with tufts of hairs on one, or both, ends.

LI. **Asclepiadaceæ.** Shrubs or herbs, often twining, usually with milky juice. L. entire, as a rule opposite, sometimes wanting, stipules 0. Fl. regular, bi-sexual, pentamerous. Calyx inferior, lobes imbricate in bud. Corolla-tube or throat often with scales, processes or hairs. Stamens 5, inserted at the base of the corolla, filaments free or connate, often with scales or processes on the back: anthers free or adnate to the stigma; pollen as a rule united into waxy masses. Carpels 2, distinct. Fruit of 1 or 2 follicles. Seeds usually surmounted by a dense brush of hairs.

LII. **Loganiaceæ.** Trees or shrubs. L. opposite, simple, generally connected by interpetiolar stipules or by a raised line. Fl. regular, usually bi-sexual, 4-5-merous. Calyx inferior. Stamens epipetalous as many as corolla-lobes, and alternating with them. Ovary usually 2-celled; ovules many in each cell. Fruit capsular or baccate.

LIII. **Boraginaceæ.** Herbs, shrubs or trees. L. as a rule alternate and simple, stipules 0. Fl. bi-sexual, as a rule regular and pentamerous. Calyx free, persistent. Stamens inserted on the corolla-tube, as many as, and alternating with the corolla-lobes. Ovary superior, cells 2, each with 2 ovules; or 4, each with one ovule. Fr. a drupe or consisting of nutlets.

LIV. **Convolvulaceæ.** Herbs or shrubs often twining. L. alternate, stipules 0. Fl. often showy, bi-sexual, regular, pentamerous. Calyx with distinct—or shortly connate sepals, persistent. Corolla often plicate in bud. Stamens 5, epipetalous. Ovary superior, 1-4, usually 2-celled; ovules 4. Fruit capsular, dry and indehiscent or baccate.

LV. **Solanaceæ.** Herbs or shrubs. L. as a rule alternate, stipules 0. Fl. pentamerous, regular. Calyx persistent and sometimes enlarged in fruit. Corolla often plicate in bud. Stamens epipetalous. Ovary usually obliquely 2-celled. Fruit baccate or capsular. Seeds usually many.

LVI. **Bignoniaceæ.** Trees or shrubs sometimes climbing. L. usually opposite, compound, rarely simple, leaflets opposite, stipules 0. Fl. usually showy, bi-sexual, generally zygomorphic, 5-merous. Calyx gamosepalous, truncate, split or toothed. Corolla somewhat two-lipped. Stamens 4, didynamous, or fifth rudimentary rarely all perfect. Ovary free, 2-celled, supported by an annular disk. Fr. often elongated, generally dehiscent, the two valves separating from the dissepiment, to which numerous seeds are attached; seeds winged.

LVII. **Acanthaceæ.** Shrubs, undershrubs or herbs. L. simple, opposite, stip. 0. Fl. bi-sexual, mostly irregular, 4-5-merous. Calyx 4-5-partite. Corolla subequally 5-lobed or 2-lipped. Stamens 4, sometimes didynamous or 2. Ovary free, 2-celled, style filiform, bifid, one branch often obsolete. Capsule loculicidal, seeds compressed usually seated on hard curved acute supports.

LVIII. **Verbenaceæ.** Trees, shrubs or herbs. L. usually opposite or whorled, simple or digitate (*Vitex*), stip. 0. Fl. usually zygomorphic, and 4-5-merous. Calyx as a rule gamosepalous and persistent, lobes imbricate. Corolla 2-lipped or subequally lobed. Stamens usually 4, didynamous or equal. Ovary free, 2-4-celled. Fruit drupaceous, succulent or dry, less often capsular.

LIX. **Labiatæ.** Mostly aromatic herbs or shrubs, branches often 4-sided, l. opposite or whorled, stip. 0. Fl. zygomorphic. Calyx persistent, sometimes 2-lipped, 5-sometimes up to 10-cleft. Corolla 2-lipped or subequally 4-5-lobed, lobes imbricate in bud. Stamens didynamous or only 2 perfect. Ovary free, usually 4-lobed or-partite, supported by an annular disk; style gynobasic; ovules 4. Fr. of 4 one-seeded nutlets.

3. Monochlamydeæ.

LX. **Amarantaceæ.** Herbs less often shrubs or undershrubs. Leaves alternate or opposite. Stip. 0. Fl. usually bi-sexual, perianth of 5 persistent scarious or hyaline segments, imbricate in bud. Stamens opposite the perianth segments, usually connate below, sometimes with intervening staminodes. Ovary free, 1-celled. Fruit usually an utricle, or baccate, embryo curved, surrounding a floury endosperm.

LXI. **Chenopodiaceæ.** Herbs or shrubs usually more or less fleshy. L. alternate, rarely opposite, simple. Stip. 0. Fl. small, sometimes 1-sexual, perianth of 3-5, more or less connate sepaloid segments. Stamens opposite the sepals, usually 5. Ovary 1-celled, free, ovule 1. Fr. dry, generally enclosed in the perianth, seed one.

LXII. **Aristolochiaceæ.** (*Aristolochia.*) Usually twining shrubs. L. alternate, stip. 0. Fl. bi-sexual, perianth gamophyllous usually petaloid, upcurved, limb broad, 3-lobed or 2-lipped, anthers sessile, in a ring round the style. Ovary inferior, 6-celled, with parietal placentas. Stigmas 3.

LXIII. **Piperaceæ.** Aromatic shrubs or herbs. L. alternate, entire, basal nerves 3 or more, stipules membranous, enclosing the buds. Fl. usually dicecious or polygamous, in catkin-like spikes. Perianth 0. Stamens usually 2-3, hypogynous, anther cells distinct or confluent. Ovary 1-celled, stigmas 3. Berry globose 1-seeded.

LXIV. **Lauraceæ.** Aromatic trees or shrubs, rarely a leafless parasite (*Cassytha*). L. as a rule alternate and entire, stip. 0. Flrs. 1 or 2-sexual. Perianth regular, deeply 6-cleft, segments sepaloid, biseriate. Stamens perigynous or hypogynous, in 2-4 whorls of 3 each, those of the innermost series often reduced to staminodes, those of the two outer-most series opposite to perianth-segments, anther cells 2 or 4, opening by valves. Ovary free, 1-celled, ovule 1. Fr. a berry, or drupe, seed one, exalbuminous cotyledons thick.

LXV. **Elæagnaceæ.** (*Elæagnus.*) Trees or shrubs, often spinescent, with silvery or brown stellate scales or hairs. L. alternate, quite entire, stip. 0. Flowers small, regular. Perianth with a short tube, limb 4-fid. Stamens usually 4, inserted on the perianth. Ovary 1-celled, ovule 1. Fruit indehiscent, enclosed within the lower fleshy part of the perianth.

LXVI. **Loranthaceæ.** Usually shrubs, parasitic on stems and branches. L. usually opposite, sometimes wanting, entire, usually thick. Fl. regular, perianth simple or double. Stamens equal to and opposite the perianth-lobes. Ovary inferior, 1-celled, ovule 1, adnate all round to the ovary walls. Fr. a drupe or a berry usually viscid.

LXVII. **Santalaceæ.** (*Santalum.*) Trees, mostly root-parasites. L. entire, stip. 0. Perianth usually adnate to the base of the ovary, 4-lobed. Stamens opposite to lobes. Ovary 1-celled, ovules several, pendulous from a central column. Fruit a drupe, crowned by the free margin of the perianth tube.

LXVIII. **Euphorbiaceæ.** Herbs, shrubs or trees, sometimes with milky juice. L. in most genera alternate, sometimes opposite, stipulate. Fl. as a rule unisexual. Perianth calycine or sub-petaloid, sometimes both calyx and corolla present, or 0. Stamens 1-many. Ovary superior, as a rule of 3 carpels, more or less united, styles 3, ovules 1 or 2 in each cell, pendulous from the inner angle. Fruit usually capsular, sometimes more or less succulent.

LXIX. **Ulmaceæ.** Trees or shrubs. L. alternate, distichous, often unequal-sided, stipulate. Flowers unisexual or polygamous. Perianth sepaloid, 4-8-lobed or of 4-5 sepals. Stamens opposite to perianth-segments, rarely twice their number. Ovary of 2 connate carpels, usually 1-celled, ovule 1, pendulous. Fruit indehiscent, a nut, often winged, or a drupe.

LXX. **Urticaceæ.** Herbs, undershrubs, or shrubs, rarely trees. Leaves alternate or opposite usually with 3 strong basal nerves, often dentate, stipulate. Flowers unisexual, small, usually in compact clusters. Perianth lobes 4-5, sometimes 2-3-lobes more or less free in male flowers. Stamens as many as perianth segments, filaments, inflexed in bud. Ovary free, 1-celled, ovule 1, erect. Fruit an achene, often invested by the perianth which is sometimes accrescent and fleshy.

LXXI. **Moraceæ.** Trees or shrubs with milky juice. Leaves usually alternate, rarely opposite, stipules often sheathing the buds. Flowers usually very small, diœcious or monœcious, crowded in receptacles which are globose cylindric or hollow, rarely females, solitary or 2 or 3 together. Perianth-segments usually 4, rarely 2, 3, 5 or 6, free or connate, female perianth often accrescent in fruit. Ovary free, 1-celled, ovule solitary, pendulous. Fruit often aggregated into fleshy pseudocarps composed of confluent perianths.

LXXII. **Salicaceæ.** Trees or shrubs. L. deciduous, alternate simple, stipulate. Fl. diœcious, in catkins similar in both sexes, 1 fl. in the axil of each bract, perianth 0; a disk at the base of stamens and ovary. Ovary 1-celled, ovules many on 2-4-parietal placentas. Fruit capsular. Seeds numerous minute, enclosed by long silky, deciduous hairs.

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LXXIII. **Amaryllidaceæ.** Herbs or shrubs with short stems which are sometimes produced into an erect or procumbent woody trunk. Leaves usually radical. Flowers 2-sexual, often on terminal scapes. Perianth petaloid, 6-lobed in two whorls. Stamens 6, filaments free or connate. Ovary inferior, 3-celled, ovules many. Fruit usually capsular, less often indehiscent.

LXXIV. **Dioscoreaceæ.** Twining herbs. Leaves alternate or opposite, simple or digitate. Flowers 1-sexual, small. Perianth 6-cleft, in two series. *Male Fl.*—Stamens 6 or 3 reduced to staminodes in male flrs. *Female Fl.* Staminodes 3 or 6; ovary inferior 3-gonous, 3-celled, cells 2-ovuled. Fruit a 3-winged capsule.

LXXV. **Liliaceæ.** Herbs or shrubs, sometimes climbing. Leaves alternate, sometimes reduced to cladodes. Perianth in 2-series. Stamens 6 or 3 reduced to staminodes. Ovary superior, 3-celled, style 1, ovules attached to the inner angle of cells Fruit baccate or capsular.

LXXVI. **Palmaceæ.** Shrubs or trees, sometimes climbing. L. alternate. Stem solid, usually unbranched, often crowded at the apex of the stem, pinnate or palmate, pinnæ or segments usually folded longitudinally. Petiole sheathing, often armed. Inflorescence of spikes or panicles with large sheathing bracts, fl. unisexual or polygamous. Perianth in two whorls of 3-segments each. Stamens 6 sometimes 3, rarely more. Ovary of 3 free carpels or 1-3-celled. Fruit indehiscent often a drupe. Endosperm horny or oily.

LXXVII. **Pandanaceæ.** Trees or shrubs, sometimes climbing. Stem solid, 2-3-chotomously branched, each branch with a tuft of linear sheathing leaves in tristichous spirals, edges and midrib of leaves usually spinous. Inflorescence of simple or branched spadices, covered with leafy spathes. Fl. dicœcious, small, crowded, perianth 0. Stamens many, filaments connate or free. Ovary of free or connate carpels. Fr. a syncarpium of numerous more or less obconical woody or fleshy drupes.

LXXVIII. **Typhaceæ.** (*Typha*) Marsh or aquatic herbs with creeping rhizomes. Leaves linear in two rows. Flowers monœcious, naked, minute, often mixed with hair like bracteoles with clavate tips, on cylindric spikes, the lower portion of which is female. *Male Fl.*—Stamens 2-3, sometimes up to 5, rarely 1; filaments connate. *Female Fl.*—Ovary with a minute stalk, 1-celled, ovule 1, pendulous. Fruit very minute, pericarp membranous.

LXXIX. **Araceæ.** Herbs with tubers or rhizomes, less often scandant shrubs. Leaves alternate (species with aerial stems); simple or palmately or pedately lobed, rarely pinnatifid, glabrous; petiole usually with a membranous sheath at the base. Flowers small, usually crowded on a fleshy spadix with green or coloured spathe; 2-sexual or 1-sexual and usually monœcious. Perianth 0, or of 4-8 segments. Stamens 4-8, or 1-many, often united. Ovary sessile, 1-many celled; ovules 1-many in each cell. Fruit of distinct or confluent berries.

LXXX. **Gramineæ.** Stems more or less tufted, woody or herbaceous, jointed. Leaves linear or oblong, on long split sheaths often with a distinct ligule. Flowers 2- or 1-sexual, small, in spikelets in the axils of bracts (glumes), usually also subtended by an inner membranous, usually transparent bract (palea) opposite the glume. Perianth much reduced or inconspicuous. Stamens 3 or 6, rarely 1 or 2. Ovary free, 1-celled with 2 or 3 feathery stigmas. Fruit a caryopsis; seed usually with copious mealy endosperm.

GLOSSARY

OF

BOTANIC TERMS.

A.

A, an, (prefix) without.

Ab (prefix), away.

Abortion, imperfect development or non-development of an organ, **abortive,** obsolete; imperfectly developed.

Accrescent, increasing in size with age; usually said of parts of the calyx or corolla that persist and enlarge after flowering.

Achene, a small dry indehiscent 1-celled 1-seeded fruit or a 1-seeded indehiscent carpel of an apocarpous fruit.

Acicular, needle-shaped; long and slender.

Acorn, fruit of the oak, i.e., a nut enclosed within a cup formed of an involucre of thickened bracts.

Actinomorphic, divisible into similar halves by two or more planes; said of flowers.

Aculeate, abounding with prickles.

Acumen, a sharp tapering point more or less prolonged. **Acuminate,** terminating in an acumen.

Acute, evenly tapering and ending in a narrow angle, but without a prolongation.

Adnate, said of dissimilar organs when congenitally united.

Adpressed, lying close throughout the entire length against the surface.

Adventitious, occurring in an unusual position; usually applied to buds and roots.

Aestivation, the mode in which the parts of a flower are folded in the bud, also their relative position.

Albumen, the nutritive substance found within the seed coats of some seeds outside the embyro.

Amplexicaul, said of a sessile leaf or the base of a petiole when clasping the stem.

Anastomosing, reticulately united.

Anatropous, said of an inverted ovule, i.e. one with the micropyle close to the hilum, and the chalaza at the opposite end, the axis of the ovule itself remaining straight.

Androphore, the tube or column on which some stamens are supported.

Androecium, the male organs of a flower collectively.

Androgynous, said of an inflorescence bearing both male and female flowers.

Angiosperm, a sub-phylum (which includes the two classes Monocotyledons and Dicotyledons) in which the ovules are enclosed in the ovary and are fertilized through the stigma.
Annulate, marked transversely by rings.
Anterior, said of that part of a flower which faces outwards from the axis of inflorescence; inferior.
Anther, the part of a stamen that bears the pollen.
Antipetalous, inserted opposite the petals.
Apetalous, without petals.
Apiculate, with a short pointed tip.
Arborescent, tree-like, growing to the size of a tree.
Apocarpous, with the carpels free and distinct.
Arcuate, shaped like a bow, i.e., moderately curved.
Areola, a small space with clearly defined outline e.g., the spaces between the reticulating veinlets of a leaf.
Aril, arillus, an accessory seed-covering or an appendage growing from or about the hilum of a seed. **Arillate,** having an aril. **Arillode,** a false aril growing from the micropyle or raphe.
Aristate, bearing an awn, or bristle e.g. glumes of some grasses.
Articulate, jointed in such a manner as to separate at maturity.
Ascending, directed obliquely upward.
Attenuate, narrow and gradually tapering.
Auricle, an appendage like the lobe of an ear. **Auriculate, auricled,** having an auricle.
Awn, a bristle-like appendage, especially of the glumes of grasses.
Axil, the upper angle formed by a leaf or a similar organ and the supporting stem or axis. **Axillary,** relating to the axil.
Axile, relating to the axis; generally said of a kind of placentation in which the ovules are borne on the axis at the inner angles of the cells of a syncarpous ovary.
Axis, the central line or support round or on which parts of an organ are arranged.

B.

Baccate, berry-like, pulpy.
Basifixed, fixed by the base, especially said of an anther attached at its lower end to the top of the filament. **Basal, basilar,** attached to the base.
Bast, fibrous inner bark.
Beak, a sharp tip like the bill of a bird.
Berry, a simple fruit succulent throughout, without a stone, and generally with more than one seed
Bi, (prefix), two, twice, doubly.
Bifarious, in two opposite vertical rows.
Bifid, divided into two segments with a narrow sinus.
Bifurcate, two-forked, having two prongs or branches.

Bilabiate, having two lips, a term usually applied to gamosepalous calyces and gamopetalous carollas.
Bipinnate, twice pinnate.
Biseriate, in two series or rows, generally one above or within the other.
Bisexual, having both stamens and pistil in the same flower; hermaphrodite.
Biternate, twice ternate.
Blade, the expanded portion of a leaf or a clawed petal.
Bole, the main axis or trunk of a tree.
Brachiate, widely spreading, a term applied to branches.
Bract, a rudimentary or modified leaf subtending a flower or an inflorescence. **Bracteate,** having bracts.
Bracteole, a secondary bract or one of the ultimate grade subtending each flower of an inflorescence. **Bracteolate,** having bracteoles.
Bulb, a short, usually underground stem, consisting of a short axis, bearing a bud or buds enclosed in fleshy scales or coats. **Bulbiform,** formed like a bulb. **Bulbous,** of the nature of bulbs. **Bulbil** small axillary bulbs.
Buttressed, said of stems with vertical ridges or projections.

C.

Caducous, falling off very early.
Cæspitose, tufted or growing in tufts, *e.g.*, many species of bamboos.
Callus, the new tissue which forms over the wounds of plants: a hard projection, sometimes applied to an extension of the flowering glume below its point of insertion, on the axis of the spikelet.
Calyx, the outer whorl of floral leaves, immediately below or outside the corolla. **Calycine** relating to the calyx.
Calyptra, a cap or hood. **Calyptrate,** hooded.
Cambium layer, a zone of tender thin-walled cells separating the wood from the bark in Dicotyledons and Gymnosperms, by the division and growth of which new wood and bark are formed.
Campanulate, bell-shaped deeper than cupshaped.
Canescent, with very short grey hairs or pubescence giving the epidermis a greyish white hue.
Capillary, slender, hairy or thread-like.
Capitate, having a globose head.
Capitulum, a globose head or cluster of sessile or shortly pedicellate flowers.
Capsule, a dry syncarpous fruit which opens at maturity to discharge the seed.
Carpel, one of the component parts of a syncarpous or apocarpous pistil.
Carpellary, relating to a carpel.
Caruncle, a wart-like appendage, produced at the base of a seed.
Cartilaginous, firm and tough, like parchment.
Caryopsis, a grain; the seed-like fruit of Graminaceae with thin pericarp, which is usually adnate to the contained seed.

Catkin, a scaly spike or raceme of unisexual flowers, pendulous or drooping, and generally deciduous.

Caudate, furnished with a tail, or with a slender tail-like terminal appendage.

Cauline, pertaining to the stem.

Cell, the living vegetable unit: the structural unit in the formation of a plant. Also, one of the cavities of an ovary or of an anther.

Chalaza, that part of the ovule where the base of the nucellus is confluent with the coats of the ovule.

Chartaceous, having the texture of writing paper, thin and flexible.

Cilia, marginal hairs forming a fringe like eye-lashes.

Ciliate, having cilia; *dim.* **ciliolate.**

Circinate, coiled inwards from the tip.

Cirrhose, cirrose, bearing tendrils.

Circumscissa, dividing or opening circularly or transversally.

Cladode, a branch more or less flattened which assumes the form and functions of a leaf.

Clavate. club-shaped, slender below and gradually thickened upwards.

Claw, the narrowed base of certain petals.

Cocci, pl. of coccus, the seed-like dehiscent or indehiscent segments of a dry fruit which separate at maturity.

Cogener. one of the same genus.

Coherent. similar parts united together but separable without rupture.

Collateral, side by side.

Coma, a tuft of soft hairs or cotton borne on a seed. **Comose,** having a coma.

Concolor, of the same colour throughout.

Confluent, blending together.

Conduplicate, folded once upon itself lengthwise.

Cone, the multiple fruit of Conifers formed mostly of imbricated scales by which the seeds are subtended.

Connate, said of similar organs or parts of the same organ when congenitally united.

Connective, the portion of a stamen that connects the two lobes or cells of an anther.

Connivent, conniving, said of sepals, petals or anthers having the apex arching over or converging in the centre of the flower.

Contorted. convolute. twisted in one direction upon itself; said of leaves or petals in a bud with one margin within and the other outside the whorl.

Convergent, said of lateral nerves of leaves curved from base to apex.

Cordate, heart-shaped; when applied to the base of a leaf or other organs, with two broad rounded lobes on either side of the axis.

Coriaceous, leathery, tough and thick.

Corm, a solid fleshy underground stem more or less jointed and naked or with thin scales, such as is characteristic of certain families, *e.g.*, Araceæ.

Corolla, the inner whorl of floral leaves.
Corona, a whorl of process from the corolla, or from stamens in some families like Asclepiadaceæ.
Cortical, relating to the cortex or bark.
Corymb, an inflorescence of the indefinite or centripetal kind in which the lower branches or pedicels, are longer than the upper, and thus although starting from different points, all attain almost the same level.
Costate, furnished with one or more primary ribs or veins.
Cotyledons, the seed lobes or first leaves of an embryo.
Crateriform, shaped like a shallow cup.
Crenate, with rounded teeth.
Crustaceous, hard and brittle; said of a covering which splits and breaks off easily.
Culm, the hollow and jointed stem of grasses, especially of bamboos.
Cuneate, wedge shaped, acute angled at the base.
Cupular, cup-shaped.
Cusp, a long and tapering rigid point. **Cuspidate**, furnished with a cusp.
Cuticle, the outermost layer of the epidermis.
Cyathiform, wine-cup shaped.
Cyme, an inflorescence of the definite or centrifugal type in which the main axis and all the lateral axes are each terminated by a flower so that flowering proceeds from the centre outwards.
Cypsela, a dry inferior achene invested with the adnate calyx, *e.g.* the fruit of Compositæ.
Cystolith, a crystalline concretion usually of calcium carbonate in the cells of some plants.

D.

Decandrous, with ten stamens.
Deciduous, said of trees or shrubs which are leafless for a part of the year; also of leaf or parts of a flower which fall off normally.
Declinate, bent to one side.
Decompound, compound or divided more than once.
Decumbent, inclined downwards but with the tip ascending.
Decurrent, produced down, as a sessile leaf when the blade is prolonged below the insertion along the stem forming a winged appendage.
Decurved, bent or directed outwards.
Decussate, in pairs alternately crossing at right angles.
Deflexed, bent downward.
Dehiscence, the mode of opening of a capsule or of an anther.
Deltoid, triangular in outline or in section.
Dentate, with margins cut into triangular salient teeth directed outward.
Denticulate, minutely toothed.

Dextrorse, turning or twining from left to right, *i.e.*, in the anti-clockwise direction.

Di, Dis, (prefix), two, twice, double.

Diadelphous, said of stamens united by their filaments into two sets of bundles.

Dichasium, a falsely dichotomous cyme of which the main axis ends in a flower and branches below the latter into two lateral axes of almost equal strength.

Dichotomous, forked in pairs.

Didymous, slightly 2 lobed or occurring in pairs.

Didynamous, said of a flower with two long and two short stamens, and also of stamens when they are such.

Diffuse, widely spreading;—**stems,** procumbent and also very much loosely branched.

Digitate, finger-like; said of a compound leaf with the leaflets all borne on the apex of the common petiole.

Dimorphic, dimorphous, having two forms, generally said of hermaphrodite flowers having one form with long styles and short stamens, and another with short styles and long stamens.

Dicœcious, unisexual with the male and female flowers on separate individuals.

Disk, Disc, an enlargement of the receptacle of a flower in the form of a cup or of a cushion, ring or glands. **Discoid, disciform,** disk-like; circular and flat. **Disc-florets,** those borne on the central portion of a capitulum.

Dissepiment, a partition in an ovary or pericarp, in the direction of its length.

Distal, furthest from the base.

Distichous, arranged in two opposite vertical rows.

Divaricate, spreading widely apart.

Dorsal, relating to, or inserted on, the back.

Dorsifixed, said of an anther attached to the top of the filament by a part not the whole of the back.

Drupe, a stone fruit, *i.e.*, one with a fleshy or pulpy pericarp and a bony or crustaceous endocarp. **Drupaceous,** like a drupe. **Drupel, Drupelet,** a diminutive drupe.

E.

E, Ex, (prefix), without or out of.

Ebracteate, without bracts. **Ebracteolate,** without bracteoles.

Echinate, set all round with sharp bristles like a hedgehog.

Effuse, very widely spreading.

Elliptic, elliptical, oblong with rounded ends. **Ellipsoid,** a solid with an elliptical outline.

Emarginate, with a notch at the apex.

Embryo, the rudimentary plantlet formed in a seed.
Endocarp, the inner layer of the pericarp.
Endosperm, the albumen of a seed.
Ensiform, sword-shaped.
Epi, (prefix), upon.
Epicalyx, a whorl of bracts below the calyx proper and somewhat resembling it in shape and colour.
Epicarp, the outer layer of a pericarp.
Epidermis, the outermost layer of tissue or skin of a plant.
Epigynous, inserted on the top of the ovary.
Epipetalous, said of stamens which are borne on, or adnate to the petals or corolla.
Epiphyllous, growing on leaves or perianths.
Epiphyte, a plant growing on, but not nourished by another plant. **Epiphytic,** having the habit of an epiphyte.
Equitant, said of two ranked leaves, or leaves in bud, when folded lengthwise, the outer ones at their base folding over the inner.
Erose, with an irregularly toothed margin.
Exalbuminous, without albumen.
Excavate, hollowed into broad deep pits.
Exocarp, the external layer of the pericarp when an endocarp is present.
Exserted, projecting outwards as anthers beyond the corolla.
Exstipulate, without stipules.
Extra-axillary, growing outside the axil, *i.e.*, above, below or one side of it.
Extrorse, applied to anthers that dehisce outwards, *i.e.* away from the axis of the flower.

F.

Falcate, curved like the blade of a sickle or scythe.
Family, a group of co-related genera.
Farina, starch or anything resembling it or analogous to it.
Farinaceous consisting of or resembling starch.
Fascicled, fasciculate, in dense clusters.
Fastigate, said of branches which are nearly parallel and point upwards.
Ferruginous, coloured like iron rust.
Filament the stalk of an anther.
Filiform, thread-like.
Fimbriate, having a fringe or border of fine thread-like processes.
Fistular, hollow tubular.
Flabellate, fan-shaped.
Flaccid, soft, flabby, wanting in stiffness.
Floccose, woolly with locks of dense soft hairs that are easily detached.
Foliaceous, of the form or texture of a leaf.

Follicle, a dry fruit resulting from a single carpel opening by only one usually the inner suture. **Follicular,** pertaining to or resembling a follicle.

Foramen, the minute aperture in the coats of an ovule corresponding to the micropyle of a seed.

Free, distinct, not adnate to any other organ. **Free central,** said of the placenta of a one-celled ovary when it forms a central ovule-bearing column arising from the base.

Fugacious, falling off or fading very early.

Fulvous, tawny.

Funicle, the stalk of an ovule or seed.

Furcate, forked.

Fuscous, brown or greyish brown.

Fusiform, spindle-shaped; solid and tapering at both ends.

G.

Gamopetalous, having combined petals.

Gamophyllous, said of a flower having a perianth of united leaves or segments; also applied to such a perianth.

Gamosepalous, having combined sepals.

Geminate, growing in pairs.

Geniculate, bent abruptly.

Genus, pl. genera, a group of closely related species indicated by the first name of a plant.

Gibbous, having a pouch-like swelling or protuberance on one side.

Glabrous, without hairs of any kind. **Glabrate,** somewhat glabrous. **Glabrescent,** becoming glabrous.

Glands, small wart-like bodies or round excrescences of any kind found on stems, petioles, etc., or inside flowers. Small raised superficial dots, or minute vesicles imbedded in the substance of leaves, etc., usually filled with oil. **Glandular,** having glands or relating to glands.

Glaucous, of a bluish-grey colour, often covered with a fine bloom. **Glaucescent,** somewhat glaucous.

Globose, nearly spherical.

Glochidia, barbed bristles.

Glomerate, compactly clustered.

Glumes, the chaffy bract-like scales of the inflorescence of grasses and their allies. **Glumaceous,** resembling or relating to glumes.

Glutinous, sticky.

Gonophore, a stipe or stalk supporting both stamens and ovary in a flower.

Gynobase, a short and broad elongation of the torus on which the pistil rests. **Gynobasic,** resting on a gynobase.

Gynophore, the stipe or stalk supporting an ovary.

H.

Hastate, spear-head shaped, usually said of leaves with a pointed apex, and basal lobes directed outwards.

Haustorium, pl. haustoria, a sucker at the end of a parasitic root; a root like sucker.

Head, a form of inflorescence consisting of a more or less dense cluster of sessile flowers which are centripetal in evolution.

Helicoid, coiled in a spiral.

Hermaphrodite, bisexual; having both stamens and pistil in the same flower.

Heter, hetero, (prefix), different.

Heterogamous, said of flower heads when male, female, bisexual and neuter florets, or any two or three of these, are borne on the same head.

Hilum, the place of attachment of an ovule or seed to the placenta or funicle.

Hirsute, thickly covered with long and rather coarse hairs.

Hispid, beset with rigid or bristly hairs.

Homogamous, said of a flower head with the florets all of the same sex.

Hyaline, transparent or translucent and colourless.

Hypanthium, an enlargement of the torus of the flower under the calyx or perianth.

Hypocrateriform, salver-shaped; said of a corolla with a slender tube abruptly expanded into a flat horizontal limb.

Hypogynous, inserted below the ovary.

I.

Imbricate, overlapping.

Imparipinnate, unequally pinnate; pinnate with a terminal leaflet or pinna.

Impressed, marked with small depressions; **nerves,** those slightly below the surface of the leaf.

Incised, cut sharply and irregularly.

Included, not protruding beyond the surrounding organs, usually said of stamens of styles that are not produced beyond the corolla.

Incomplete, said of a flower wanting calyx or corolla or both.

Incumbent, leaning upon.

Indehiscent, said of fruits the pericarp of which does not open to discharge the seeds.

Indumentum, a general term for any kind of hairy covering or coating.

Induplicate, with the margins folded inwards.

Induplicate valvate, said of members of a whorl when they touch one another with margins of each folded inward.

Indurated, hardened.

Inferior, inserted below the ovary and free from it, if said of the calyx; adnate to, or situated below the calyx, if said of the ovary, also anterior, when said of the relative position of the parts of a flower in an inflorescence.

Inflorescence, the mode in which flowers are arranged on the stem. Also used as a collective term for the whole flowering portion of the stem of a plant with its branches, bracts, bracteoles and flowers.

Infundibuliform, funnel-shaped.

Innate, said of an anther borne on the apex of the filament and with usually, marginal dehiscence.

Innovation, a newly formed shoot.

Integuments, the coats of an ovule or seed.

Inter, (prefix), between.

Interpetiolar, said of stipules of opposite leaves when they are inserted between the petioles, *i.e.,* across the stem.

Intra, (prefix), within.

Intrapetiolar, said of stipules of single leaves when they are connate by their margins so as to form apparently one stipule.

Introrse, applied to anthers that dehisce or are turned towards the axis of the flower.

Intruded, projecting inward.

Involucre, a circle of bracts subtending a flower cluster.

Involute, rolled inward.

Irregular, wanting in symmetry of form, said of flowers with the petals of perianth segments unequal in size and shape.

Isomerous, having an equal number of members.

K.

Keel, the central dorsal ridge, like the prow of a boat, formed by the two anterior and innermost petals of a Papilionaceous corolla.

Kernel, the contents of the putamen of a drupe.

L.

Labiate, two-lipped.

Lacerate, irregularly cleft as if torn.

Laciniate, irregularly cut or fringed into narrow lobes or segments with narrow sinuses.

Lacunose, marked with minute pits or depressions.

Lamina, the blade of a leaf; the expanded portion of a clawed petal.

Lanate, woolly.

Lanceolate, shaped like a lance-head, *i.e.,* 2-4 times as long as broad, narrowed at both ends towards the apex, and broadest below the middle.

Latex, milky sap.

Lax, diffuse, said of an inflorescence when the flowers or fruits are not closely arranged on it.

Legume, a fruit of a single carpel usually opening by both sutures when ripe. *Cf.* pod.

Lenticel, a corky dot or protuberance on the bark. **Lenticellate,** having lenticels.

Lenticular, lentil shaped, *i.e.*, like a double convex lens.

Lepidote, scurfy with minute scales.

Ligule, anything shaped like a strap, such as the limb of the ray-corolla in some Compositæ; a thin and scarious projection from the summit of the sheath of the leaf of grasses; an outgrowth from the inner face of the base of some petals.

Ligulate, strap-shaped usually applied to the ray-florets of Compositæ.

Limb, the expanded part of gamosepalous calyx or a gamopetalous corolla as distinguished from the tube; the blade of a clawed petal.

Linear, narrower than lanceolate, at least five times as long as broad.

Lineolate, marked with fine lines.

Lip, one of the two divisions of a bilabiate calyx or corolla.

Lobulate, divided into small lobes.

Loculicidal, applied to a kind of dehiscene of a capsular fruit in which splitting takes place through the cells.

Loculus, the cell of an ovary; the sac or cell of an anther.

Lodicule, one of the small scales which represent the perianth in the flower of grasses, occurring usually in pairs.

Lomentum, a form of legume which breaks up at maturity into one seeded indehiscent segments.

Lyrate, pinnately lobed with a large terminal lobe and one or more pairs of small basal lobes, so as to resemble a lyre.

M.

Macro, (prefix), large or long.

Mammillate, having nipple-like prominences.

Marcescenet, withering without falling off like the petals of some flowers.

Marginate, having a border, with a distinctive texture.

Median, relating to the middle, in a plane radial to the axis of a plant.

Medullary rays, vertical or longitudinal plates of cellular tissue which radiate from the pith towards the cambium.

Membranous, thin, pliable like a membrane.

Meristem tissue of cells capable of reproducing themselves by division.

Mesocarp, the middle layer of the pericarp.

Micro, (prefix), small.

Micropyle, the minute orifice in the coats of a seed represented by a scar, the opening through the coats of an ovule at the apex of the nucellus.

Mon, mono, (prefix), single, alone.

Monadelphous, said of stamens united by their filaments into one bundle forming a tube or column or sheath.
Moniliform, cylindrical and constricted at regular intervals so as to resemble a necklace of beads.
Monœcious, unisexual with the male and female flowers on the same plant.
Monopodial, pertaining to or of the nature of a monopodium, *i.e.*, a simple axis prolonged by means of a terminal bud.
Mucro, a short, straight, stiff, and sharp point.
Mucronate, abruptly terminating in a mucro.
Multi, (prefix), many.
Multifarious, in many vertical rows.
Multifid, cleft into many lobes or segments.
Multiseriate, in many series or rows.
Muricate, rough with sharp, straight points.
Muticous, blunt.

N.

Needles, the acicular leaves of conifers.
Nerves, the principal lateral ribs of a leaf.
Nervose, with strongly developed nerves.
Nodose, with swollen joints; knotty, chiefly said of roots.
Nucellus, the central part of an ovule containing the embryo sac.
Nucleus, the solid portion of a winged seed or fruit; a clearly defined and comparatively dense portion of the cytoplasm which controls all activities of the cell.
Nut, a hard indehiscent 1-seeded fruit resulting from a syncarpous ovary.

O.

Ob, (prefix), reversed or inverted.
Obconic, inversely conical, *i.e.*, with the attachment at the pointed end.
Obcordate, inversely cordate, *i.e.*, broadly two-lobed with a notch at the apex.
Obdiplostemonous, having twice as many stamens as petals in two series, the outer being opposite the petals.
Oblanceolate, inversely lanceolate, *i.e.*, long, narrow and tapering at both ends, but broadest above the middle.
Oblique, one-half larger than the other, unequal sided; **nerves,** those making acute angles with the midrib.
Oblong, much longer than broad with the sides nearly parallel.
Obovate, inversely ovate, *i.e.*, egg-shaped in outline with the broad end towards the apex.
Obovoid, said of a solid which is inversely egg-shaped in outline.

Obsolete, rudimentary, imperfectly developed.
Obtuse, blunt or rounded at the apex.
Ochrea, Ocrea, a membranous tabular stipule or a pair of membranous stiplues forming a sheath round the stem.
Oid, (suffix), resembling.
Operclum, a lid.
Orbicular, orbiculate, flat with the outline circular or nearly so.
Order, a group of closely related families of plants.
Osseous, of bony texture.
Ovary, that portion of the pistil which includes one or more cavities or cells containing one or more ovules.
Ovate, egg-shaped in outline with the broad end towards the base.
Ovoid, said of a solid with an ovate or oval longitudinal section.
Ovule, the embryonic seed in the ovary.

P.

Palea, or **pale,** a chaffy scale; the inner glume of the flower of a grass; the chaffy scales on the receptacles of many Compositæ.
Paleaceous, chaff-like.
Palmate, with the midribs of the leaf-lobes or leaflets all radiating from the apex of the petiole, the segments, like the spread fingers of the hand.
Palmatifid, palmate with the sinuses reaching half way down.
Palmatiloted, palmately lobed.
Palmatisect, deeply cut in a palmate manner.
Palmatipartite, with the segments palmately cut almost to the base.
Palminerved, with nerves radiating like the ribs of a palmate leaf.
Pandurate, Panduriform, fiddle-shaped.
Panicle, a compound inflorescence in which the main axis is racemose and the secondary and tertiary ramifications are racemose or not.
Papilionaceous, butterfly-like; applied to the kind of corolla characteristic of Papilionatæ (the Pea Tribe) of Leguminosæ. *See* Keel Wings and Standard.
Papillose, bearing minute nipple-shaped projections.
Pappus, the hairy tufts on the fruit of the Compositæ, and similar dry indehiscent fruits.
Parasite, a plant that grows on or in another plant, and draws nourishment from it.
Parietal, said of placentas attached to the wall of a more than 1-carpelled ovary.
Paripinnate, Syn. **abruptly pinnate,** evenly pinnate; pinnate without a terminal leaflet or pinna.
Patent, widely spreading.
Pedate, palmately divided with the lateral segments 2-cleft.
Pedicel, the ultimate stalk supporting a single flower in an inflorescence. **Pedicellate,** having a pedicel.

Peduncle, the stalk supporting a solitary flower or fruit or a cluster of flowers or fruits.
Pedunculate, having a peduncle.
Pellucid, transparent or translucent.
Peltate, shield-shaped; said of a flat body, (*e. g.*, a leaf) attached to the stalk by the lower surface and not by the margin or base.
Penicillate, bordered or tipped with brush-like hairs.
Penninerved, pinnately nerved; with nerves spreading laterally from various points on the midrib.
Penta, (prefix), five.
Pentadelphous, said of stamens arranged in five bundles.
Pentamerous, having the members in each whorl of the flower in fives.
Penultimate, next to the ultimate.
Perianth, a floral envelope; a term especially used when the calyx and corolla are similar in form and texture, or are represented by a single whorl.
Pericarp, the portion of the fruit formed of the walls of the ovary and whatever adheres to it, exclusive of, and outside, the seeds.
Perigynous, inserted around but away from the ovary; said of the sepals, petals and stamens of a flower when these are inserted on a tube formed by the torus (the calyx-tube) above the level of the base of the ovary.
Persistent, remaining attached; generally said of a calyx or a corolla which remains attached until the fruit is mature.
Perisperm, the outer endosperm of some seeds derived from the nucellus, *e.g.*, Piperaceæ.
Petal, one of the divisions of the corolla.
Petiole, the stalk of a leaf.
Petiolate, having a petiole.
Petiolule, the stalk of a leaflet.
Phloem, the soft tissue of the inner bark.
Phyllocladе, Phyllocladium, a modified branch that resembles a leaf in form and function. *Cf.* **Cladode.**
Phyllodium, a petiole having the form and function of leaves.
Pilose, thinly sprinkled with long soft simple hairs.
Pinna, pl. Pinnæ, the primary division of a bipinnate or tripinnate leaf. **Pinnule,** the secondary division of a tripinnate leaf.
Pinnate, a compound leaf is so called when the leaflets are arranged on either side of a common axis.
Pinnatifid, deeply pinnately lobed to about half way down.
Pinnatisect, pinnately cut nearly to the common axis.
Pisiform, pea-shaped.
Pistil, the female organ of a flower consisting normally of ovary, style and stigma.
Pistillode, a rudimentary or barren pistil.

Placenta, that portion of the interior of an ovary on which the ovules are borne; **Placentation,** position of the placenta.
Plaited, plicate, folded in longitudinal plates.
Plumose, feathered branched on either side like the plume or webs on the shaft of a feather.
Pod, the same as legume, but has a wider application, being used to denote any dry dehiscent many-seeded fruit, especially when it is much longer than broad.
Pollen, minute powder-like grains contained in the anther cells, the fertilizing agent of a plant.
Poly, (prefix), many.
Polyadelphous, having the stamens united by the filaments into many sets or bundles.
Polygamous, with hermaphrodite and unisexual flowers on one or different plants.
Polyphyllous, said of perianth having distinct leaves or segments.
Pome, a succulent fruit with seeds in many cartilaginous dry cells, *e.g.,* the apple and the pear.
Pore, a minute passage or orifice.
Posterior, said of that part of a flower which is nearest to the axis of inflorescence; superior.
Prickle, a sharply pointed stiff outgrowth of the epidermis.
Procumbent, Prostrate, lying flat or close to the ground.
Proximal, nearest the base or starting point.
Pruinose, covered with a whitish waxy bloom or powder.
Pseud, pseudo, (prefix), false.
Pseudocarp, a false fruit; one which has some portion other than the ovary so developed as to resemble a fruit.
Pubescent, covered with short, soft, straight, simple hairs.
Puberulous, puberulent, minutely pubescent.
Pulvinate, cushion-shaped.
Pulvinus, the swollen base of petioles or petiolules.
Punctate, dotted with small punctures or glands. **Puncticulate,** minutely punctate.
Pungent, terminating in, or tapering gradually to, a hard, sharp point.
Pustular, with small blister-like elevations.
Putamen, the shell of a nut; the hard endocarp of a drupe.
Pyrene, one of the small stones of a drupaceous fruit having more than one stone.
Pyriform, pear-shaped, obovoid with a tapering base.

Q.

Quadrangular, four-cornered.
Quadrate, square.
Quinquefoliolate, with five leaflets.

R.

Raceme, an inflorescence of the indefinite kind in which the flowers are borne on pedicels of more or less the same length along a single undivided axis or rachis, the oldest flowers being lowermost.

Rachis, the principal axis of a pinnate leaf or of an inflorescence.

Rachillum, pl. rachilla, the secondary rachis of a compound spike; the rachis of a spikelet of grass.

Radical, relating to or springing from the root.

Radicle, the axis of an embryo below the cotyledons.

Raphe, the cord or ridge formed by the funicle along the side of some ovules.

Raphides, needle shaped crystals found in the cells of some plants.

Ray, one of the radiating branches of an umbel. **Ray florets,** the flowers borne on the rim or circumference of the heads in Compositæ usually differing in structure from those on the disk.

Receptacle, the torus of a flower; hence also what is commonly known as the fruit of figs.

Reflexed, bent abruptly backward or downward.

Regular, symmetrical, generally said of flowers with the petals or perianth segments alike in size and shape.

Reniform, kidney-shaped; *i.e.*, broader than long, broadly cordate at the base, and with the auricles rounded.

Repand, having a wavy margin.

Resupinate, turned or twisted so that parts are eventually turned to the opposite direction from their normal position, generally spoken of flowers.

Reticulate, having the veins connected together like the meshes of a net.

Retinaculum, a persistent hook-like upcurved and subsequently hardened process from the placenta in most Acanthaceæ on which the ovules and seeds are borne.

Retrorse, directed backwards or downwards.

Retuse, with a small shallow notch in a rounded or truncate apex.

Revolute, having the margins or apex rolled backward upon the under-surface.

Rhizome, an underground or prostrate stem of root like appearance which sends off roots at the nodes and bears, like a true stem, buds, leaves or scales.

Rhomboid, rhomboidal, with four sides more or less equal, and the lateral angles obtuse.

Rostrate, beaked, narrowed into a slender tip or process.

Rotate, wheel-shaped; said of a regular gamo-petalous corolla with a short tube and a flat spreading limb.

Rotundate, circular or nearly so in outline.

Rufous, reddish brown.

Rugose, full of wrinkles. **Rugulose,** minutely wrinkled.
Ruminate, marked by transverse lines of divisions, said of albumen of some seeds, *e.g.*, Anonaceæ.
Runcinate, toothed or incised with the teeth or segments pointed backwards.
Runner, a very slender, prostrate branch arising from the base of a stem, rooting at the nodes or tip and sending up shoots which form new plants.

S.

Saccate, bulged into a small bag or cavity.
Sacciform, in the form of a bag.
Sagittate, shaped like an arrow-head; tapering towards the apex, two lobed at the base with the lobes pointed and directed downward.
Salver-shaped, with a long tube and horizontally spreading limb. *Cf.* **Hypocrateriform.**
Samara, an indehiscent dry fruit with a wing developed from the pericarp.
Saprophyte, a plant that is nourished by dead organic matter.
Sarmentose, producing long straggling woody branches.
Scabrous, very rough to the touch owing to short stiff hairs.
Scabrid, scaberulous, somewhat scabrous.
Scalariform, joined by transverse bars or with transverse markings, like the rungs of a ladder.
Scandent, climbing.
Scape, a leafless and generally unbranched flowering stem rising from the ground.
Scarious, scariose, thin, dry, membranous, somewhat stiff and not green.
Schizocarp, a general name for a dry fruit which on maturity splits into one-seeded portions.
Sclerotic, hardened or stony in texture.
Scurf, loosely adherent epidermal scales.
Secund, said of parts of organs all of which are turned in the same direction.
Sect, (suffix), deeply cut nearly to the axis.
Sepal, one of the segments of the calyx, especially when not combined.
Sepaloid, green and resembling a sepal in structure.
Septicidal, a form of dehiscence of a ripe carpel when it opens through the dissepiments or lines of junction of the carpels.
Septifragal, a form of dehiscence of a ripe carpel when the valves break away from the dissepiments and leave the latter attached to the axis.
Septum, pl. septa. *See* dissepiment.

Septate, divided by one or more partitions.
Serlate, in rows transverse or lengthwise.
Sericeous, covered with silky straight hairs.
Serrate, toothed like a saw with the teeth directed forward.
Serrulate, minutely serrate.
Sessile, without a stalk.
Seta, a bristle. **Setaceous,** bristle-like.
Setose, bristly.
Setulose, bearing minute bristles.
Sheath, a close fitting tabular or enrolled case, *e.g.*, the lower portion of the leaf of grasses.
Simple, undivided; consisting of one blade when said of a leaf; resulting from a single pistil when said of a fruit; unbranched when said of a stem, tendril, or style.
Sinistrorse, turning or twining from right to left, *i.e.*, clockwise.
Sinus, the space between the divisions or lobes of a leaf.
Sinuate, with an irregular deeply wavy margin.
Spadix, a spike with a thickened or fleshy axis bearing 1-sexual flowers generally sheathed in a spathe.
Sparse, arranged at some distance from each other.
Spathe, a large sheath-like bract enclosing an inflorescence or part of it.
Spathaceous, spathe-like.
Spatulate, Spathulate, shaped like a spatula, *i.e.*, oblong with a gradually narrowed base.
Species, a group of individuals alike in all essential particulars; the sub-divisions of a genus.
Spike, a racemose inflorescence bearing sessile flowers, on an undivided axis.
Spicate, in the form of or resembling a spike, or disposed in spikes.
Spikelet, a secondary spike; an ultimate branchlet of the inflorescence of grasses and Cyperaceae generally consisting of one or more flowers subtended by glumes.
Spine, a strongly pointed woody process consisting of a modified branch but sometimes of a modified leaf.
Spinescent, terminating in or resembling a spine-like sharp point; also becoming spinous.
Sporadic, occurring scattered here and there.
Spore, a minute unicellular body which detaches itself at maturity and is instrumental in the process of sexual reproduction in Cryptogams.
Squamose, beset with scales.
Stamen, the male organ of a flower, consisting of a filament and an anther.
Staminode, an abortive or antherless stamen.
Standard, the posterior or odd petal of a Papilionaceous corolla.
Stellate, star-shaped; with radiating rays like points of a star.

Stigma, that part of the pistil which is specially adapted for the reception of the pollen for the fertilization of the ovules.
Stigmatic, relating to the stigma.
Stipe, any stalk-like support; the stalk of an ovary above the floral whorls. Syn. **gynophore.** **Stipitate,** having a stipe.
Stipule, an appendage of a leaf, usually one on either side of the petiole.
Stipulate, having stipules.
Stipel, a secondary stipule, the appendage of a leaflet.
Stipellate, having stipels.
Stolon, a prostrate or reclined branch rooting at intervals or only at the tip, and giving off shoots which become independent plants.
Stone, the hard endocarp of a drupe. Syn. **Putamen.**
Striate, marked with thin longitudinal lines or minute furrows.
Strigose, covered with sharp-pointed, straight, stiff hairs of unequal length lying close along the surface and forming minute ridges.
Strophiole, a crest-like appendage about the hilum or the base of a seed. *Cf.* **Caruncle.**
Style, a stalk-like outgrowth from the summit of the ovary supporting the stigma.
Subulate, shaped like a cobbler's awl, narrow, tapering and somewhat stiff.
Succulent, with abundant cellular tissue full of juice.
Suffruticose, said of undershrubs when low, woody and branching from near the base.
Sulcate, grooved or furrowed with the depressions more or less parallel
Superior, inserted on the ovary or adnate to it, if said of the calyx; above the calyx and free from it, if said of the ovary; also posterio in position.
Superposed, placed one above the other.
Suture, a seam indicating the line of union of two parts; a line of opening.
Syncarpous, composed of two or more combined carpels.
Syncarpium, Syncarp, a fruit formed by the union of several carpels which have become compacted and fleshy.
Syngenesious, said of stamens united by their anthers, as in Compositæ.

T.

Tap-root, primary root resulting from the direct prolongation of the radicle.
Tendril, a slender process usually belonging to the axis and serving as a support in climbing.
Terete, cylindrical, rounded in cross-section.
Ternate, arranged in threes in a cluster or whorl.
Tesselated, divided up into small squares.

Testa, the outermost coat of a seed.
Tetra, (prefix), four.
Tetramerous, said of a flower having the parts or members in each whorl in fours.
Tetrandrous, with four stamens.
Thalamus, that part of the axis of a flower which supports the floral whorls and the pistil; Syn. **torus.**
Thyrsus, a contracted panicle, ovate or lanceolate in outline, usually with cymose branches. **Thyrsiform,** of the shape of a thyrsus. **Thyrsoid,** somewhat like a thyrsus.
Tissue, an aggregation of cells differentiated from surrounding aggregations.
Tomentose, covered with short, soft, rather dense and more or less tangled hairs.
Tortuous, bent irregularly in different directions.
Torulose, cylindrical with contractions at regular intervals.
Torus, same as **thalamus.**
Tri, (prefix), three.
Tribe, a division of a family, comprising a number of closely related genera.
Trichotomous, with the divisions always in threes and of more or less the same length.
Tricuspidate, with three cusps or sharp points.
Trimerous, said of a flower having the parts or members in each whorl in threes.
Triplinerved, with a strong secondary nerve on either side of the midrib proceeding from near the base.
Triquetrous, sharply 3-cornered.
Tristichous, in three vertical rows.
Truncate, ending abruptly, as if with the end cut off.
Tuber, a thickened underground stem bearing buds or 'eyes.' **Tuberous,** swollen like a tuber.
Tumid, swollen.
Turbinate, top-shaped; like an inverted cone.
Turgid, swollen and more or less firm.

U.

Umbel, a form of racemose inflorescence in which several branches or pedicels radiate from the top of a common peduncle and are of nearly the same length.
Umbonate, bearing a boss, or conical or rounded protuberance.
Undulate, with a wavy margin.
Uni, (prefix), one.
Unicellular, formed of, or consisting of, only one cell.
Unilateral, arranged on one side of the axis.

Unisexual, of one sex; having the stamens and the pistil in separate flowers.
Urceolate, urn-shaped.
Utricle, a 1-celled, 1-seeded fruit with a thin and more or less loose pericarp.

V.

Valvate, with the margins of the members of a whorl only meeting without overlapping.
Varicose, irregularly swollen at intervals.
Variety, a group of individuals differing from others of the same species in certain striking particulars which, however, are not of a nature to justify specific rank; sub-division of a species.
Venation, the mode in which the veins are disposed in a leaf.
Ventral, relating to, attached to the, or opening by the, inner angle or anterior face of a carpel.
Venulose, closely and finely veined.
Ventricle, a lateral swelling or bulging out. **Ventricose,** having a ventricle; unequally swollen.
Verrucose, covered with wart-like excrescences.
Versatile, swinging to and fro; said of an anther attached by the back to the attenuated top of the filament on which it swings.
Verticellate, arranged in whorls.
Villous, Villose, more or less thickly covered with long, soft simple hairs.
Virgate, with slender erect rod-like stems or branches.
Viviparous, said of plants, the seeds of which germinate before falling; also sometimes of such seeds.

W.

Whorl, a collective name for all similar members that are arranged in a circle, round an axis.
Wing, any thin membranous appendage. **Wings,** the side petals of a papilionaceous corolla.

X.

Xerophyte, said of plants that grow naturally in dry, hot places
Xylem, woody tissue.

Z.

Zygomorphic, capable of being bisected into similar halves by the median plane only; said usually of irregular flowers.

A FOREST FLORA

FOR

PILIBHIT, OUDH, GORAKHPUR, AND BUNDELKHAND.

I.—RANUNCULACEAE.

HERBS, or shrubs. Leaves usually alternate or radical, rarely opposite (*Clematis*); stipules 0, or adnate to the petiole, rarely free. Flowers bisexual or unisexual, regular or irregular. Sepals usually 5, less often fewer, frequently petaloid, generally deciduous, imbricate or rarely (*Clematis*) valvate. Petals absent, or 5, rarely fewer, often reduced or modified. Stamens usually numerous, in many rows; anthers adnate opening laterally. Carpels free, rarely combined, usually many, 1-celled; ovules 1, or more on the ventral suture. Fruit of numerous achenes or follicles, rarely baccate or capsular. Seeds small, albuminous.

CLEMATIS, *Linn.*

Shrubs, usually climbing by twining petioles. Leaves opposite exstipulate usually compound. Flowers solitary fascicled or in panicles axillary or terminal. Sepals 4, petaloid, valvate. Petals 0; stamens many. Carpels many, each with a pendulous ovule. Fruit a head of achenes with beaked or feathery styles.

A slender climber. Flowers in fascicles; styles beaked in fruit.	1. *C. Cadmia.*
An extensive climber. Flowers in panicles; styles feathery in fruit.	2. *C. gouriana.*

1. Clematis Cadmia, *Ham.*

A slender climber with furrowed stem. Leaves ternately decompound, usually 3-5 in. long. Leaflets shortly stalked, terminal largest, ·75-1.7 in. long, ovate or rhomboid to oblong-lanceolate, sub-acute, often entire or crenulate, angled or variously lobed, oblique rounded or cordate at the base, membranous, more or less ciliate along the margin otherwise glabrous. Flowers solitary, or in fascicles from leaf axils, bluish white or light blue. 1-1.5 in. across, woolly outside in bud, long peduncled, peduncles usually 1.5-3.2 in.

long, deciduous hairy, each with two leafly bracts. Sepals 5-6, .7-1 in. long, oblong, acute, spreading. Stamens small, less than half as long as the sepals; filaments dilated, shorter than the anthers. Carpels silky in flower; styles short. Achenes many .5-.6 in. long, glabrescent with age, compressed, rhomboid, with a short, more or less hairy beak, which is up to .2 in. long.

Rare; Gorakhpur—Sakhui, Kusamhawa (Chowk)—in grass lands near water.

Fl. Feb. -March. Fr. March-April.

The leaflets are sometimes small. Stem soft.

2. Clematis gouriana, *Roxb.* Vern. *Tisli baur, kanjuli.*

An extensive woody climber with thick, grooved stem and pale brown rough bark exfoliating in flakes. Branchlets furrowed; young parts and inflorescence adpressed pubescent. Leaves bipinnate, or biternate, 5.5-10in. in length. Leaflets 1.5-3.5 in. long, ovate or lanceolate-acuminate, base obliquely rounded or cordate, entire or distantly toothed or lobed, subcoriaceous, glabrous or slightly pubescent along the nerves beneath, base 3-5 (sometimes 7) nerved, nerves raised; petioles deciduous pubescent, often jointed. Flowers .5-.7 in. across, cream or white, scented, in copious axillary and terminal panicles of trichotomous cymes, woolly in bud; bracts leafy. Sepals .2-.3 in. long, oblong or obovate, revolute, margins tomentose. Stamens slightly exceeding the carpels; filaments glabrous. Carpels covered with long silky hairs. Achenes .15-.2 in. long, hairy with long slender feathery styles up to 2 in. long.

Oudh forests, Gorakhpur; rare.

Conspicuous when in fruit on account of the feathery styles. Bark peeling off in flakes from old stems.

Fl. end rainy season. Fr. cold season.

Nigella sativa, *L.* Vern. *Kalazira, mangrail*—is a small herb with pinnatisect leaves; solitary, long peduncled, pale blue flowers and sub-capsular fruits. Seeds pungent used as spice in Indian cookery. It is sometimes cultivated within our area.

II.—DILLENIACEAE.

Trees or shrubs, rarely herbs. Leaves alternate, usually simple, with numerous prominent sub-parallel nerves, exstipulate; petioles sheathed at the base. Flowers often showy yellow or white. Sepals usually 5, imbricate, persistent. Petals 5, rarely fewer, often crumpled in bud. Stamens many, hypogynous united at the base; anthers innate, opening laterally or by terminal pores. Carpels 1 to many, free or cohering in the axis, with free styles. Ovules 1 to many. Fruit dehiscent and dry, or indehiscent and baccate; seeds usually arillate, endosperm copious, fleshy; embryo minute.

1. DILLENIA, *Linn.*

Trees. Leaves large, with conspicuous sub-parallel venation. Flowers solitary or fascicled. Sepals 5, spreading. Petals 5, broad. Stamens nearly free; anthers linear, inner introrse, outer extrorse. Carpels 5-20, cohering on the axis, ovules indefinite. Fruit globose, composed of enlarged imbricate fleshy sepals enclosing the ripe carpels. Seeds immersed in pulp or naked, aril none.

Flowers solitary :—

Flrs. white, 6-8 in. across.	.. 1. *D. indica.*
Flrs. yellow, 2-4 in. across... ..	.. 2. *D. aurea.*
Flowers in fascicles, yellow, 1-1.5 in. across.	.. 3. *D. pentagyna.*

1. Dillenia indica, *Linn.* Vern. *Chalta.*

A handsome, dense-crowned tree with reddish brown or grey bark, peeling off in papery flakes. Leaves 8-10 in. long, oblanceolate or oblong-lanceolate, acute or short acuminate, sharply serrate, glabrous above, pubescent beneath; petiole 1-2 in. long. Flowers solitary, terminating branchlets, white, 6-8 in. across. Sepals fleshy, concave. Petals obovate, delicate. Fruit globose, 3-5 in. across.

Cultivated within the area, does not thrive in dry districts. In its natural habitat—Sub-Himalayan tract from Nepal to Assam, Bengal and S. India, etc.—it is found near water.

Fl. May-July. Fr. cold season. Evergreen in its habitat, leafless only for a short time when cultivated.

2. Dillenia aurea, *Smith.* Vern. *Aggai, chamaggai.*

A small deciduous tree with crooked trunk and nearly smooth, brown or grey bark; young parts shaggy. Leaves usually 8-12 by 3-6 in., sometimes larger, obovate, oblong or elliptic, acute or rounded at the apex, silky above and woolly beneath when young, upper surface ultimately glabrescent, lateral nerves 25-50 pairs, ending in sharp teeth, petiole about 1.5 in. long, deeply channelled. Flowers solitary, 2-4 in. across, on stout pilose peduncles 1-3 in. long, terminating branches, golden yellow; bracts several, recurved, silky pubescent. Sepals .9-1.3 in. long, fleshy, obovate or oblong, pubescent outside, margins thin. Petals 1-2 in. long, broadly obovate. Stamens numerous, inner longer. Styles radiating and recurved. Fruit globose, about the size of a small apple (i.e. about 1.5 in. across) encased by the accrescent sepals. Seeds glabrous, immersed in viscid pulp.

From Pilibhit to Gorakhpur.

Blaze red with lighter coloured edges.

Leafless cold season. Fl. end of March-April. Fr. May-June. New leaves April-May. When not in flower is apt to be mistaken for *D. pentagyna*, from which it differs in habit and its smaller petiolate leaves.

3. Dillenia pentagyna, *Roxb.* Vern. *Aggai.*

A moderate-sized deciduous tree. Bark somewhat rough, grey or pale-brown on older trees. Leaves usually 12 to 24 in. by 10 in., oblanceolate or elliptic, acute or obtuse, narrowed to the short and margined petiole, glabrous above glabrescent beneath, young leaves villous at first, then silky pubescent, lateral nerves many, up to 60 pairs in larger leaves; ending in sharp points, leaf margin between the teeth repand or crenulate. Flowers yellow, up to 1.5 in. across fragrant appearing before the leaves, in fascicles from tuberosities on old wood which are hairy at the top; pedicels 1-1.7 in. long ebracteate. Sepals 5, broadly obovate. Petals delicate, oblong, tapering at the apex; inner series of stamens longest; ovary of 5 carpels, ovules in more than 1 series, many, superposed, styles 5, radiating, reflexed. Fruit pendulous sub-globose, about .7 in. long consisting of the accrescent calyx and of a sharply 5-angled thin walled fruit of 5 dehiscent carpels, filled with transparent glutinuous substance.

Pilibhit, Oudh forests and Gorakhpur. The flower buds and fruits are acid and are eaten by local people.

In young plants the leaves sometimes attain a length of 4 ft. Blaze crimson or streaked light crimson and white.

Leafless from end of February-May.

Fl. March-April. Fr. ripens May.

III.—ANONACEÆ.

Trees, or erect or climbing shrubs. Leaves alternate, exstipulate, simple, entire, often pellucid dotted. Flowers usually 2-sexual and pendulous; sepals 3, free or connate, usually valvate; petals 6, in two whorls, or the inner whorl absent; stamens numerous, spirally arranged; anthers adnate, connective often enlarged or dilated. Carpels few to many, free, rarely connate (Anona), usually stalked in fruit and indehiscent, 1 or more seeded. Seeds large, with dense ruminate endosperm, and minute embryo.

Small leaves usually occur on the twigs below the normal sized ones.

I. Carpels free in fruit :—

A. Scandent shrub. Petals imbricate in bud. .. 1. *Uvaria.*

B. Erect shrubs. Petals valvate or free in bud :—

Petals uniform; connective concealing the anther cells. .. .. .. 2 .*Polyal hia.*

Outer petals small, similar to sepals; connective not covering the anther cells :—

Base of petals not saccate ovules usually 1-2. 3. *Miliusa.*

Base of petals saccate ovules 6-many. .. 4. *Saccopetalum.*

II. Carpels united and fleshy in fruit. .. .. 5. *Anona.*

1. UVARIA, *Linn.*

Uvaria Hamiltoni, *Hk.f., and T.* Vern. *Pahari-gohar* (?).

An evergreen scandent shrub; young parts rusty tomentose. Leaves 4-10 by 2-5 in., oblong-elliptic, broad lanceolate, or obovate, acuminate or acute, base narrowed or cordate, more or less pubescent above, stellate tomentose beneath, rather membranous, lateral nerves 15 to 18 pairs, slender almost straight; petiole up to 2 in. long, rusty pubescent. Flowers brick red, about 2 in. across, 1-2 together, usually on lateral, often leaf opposed abbreviated branches; pedicles up to 1.2 in. in flower, elongating in fruit, densely hairy; bracts and bracteoles ovate, woolly; sepals 3, connate below, obtuse; petals 6, imbricate in bud, about 1 in. long, oblong-obovate, spreading, much exceeding the sepals, sub-equal, fleshy, densely tomentose. Stamens indefinite; carpels numerous, linear; ovules many, 2-seriate. Ripe carpels baccate up to 1 in. across, oblong or roundish, rufous tomentose, many-seeded, borne on stalks ·75 to 1.3 in. long.

So far collected only in Domakhand forest, Gorakhpur.
Fl. April-May. Fr. rainy season.

2. POLYALTHIA, *Blume.*

Polyalthia suberosa, *Benth & Hook.f.* Vern. *Cham-khirni, kharia (Bah.) khirni, (Bah.).*

A small tree or a shrub usually with very corky bark; young parts rusty villous; branchlets ultimately thickly covered with corky lenticels. Leaves alternate, distichous, 2-5 in. by .75-2 in., oblong, oval or oblong-obovate; rounded or acute at both ends, lateral nerves faint, silky when young, glabrous above and slightly pubescent beneath later; petioles very short, hairy. Flowers usually solitary on short, woody, extra-axillary tubercles, greenish and red brown, on slender pubescent pedicels which have linear bracts about the middle. Sepals 3, triangular, acute, silky; petals 6, valvate, in two series, covered with bulb based adpressed hairs, 3 outer small about .2 in. long, ovate, acuminate, inner about twice the size, red brown, oblong; stamens numerous; filaments hardly any, anthers adnate tapering towards the base; connective produced into an enlarged truncated cap covering the cells. Carpels with short, hairy, oblong styles, ovules 1-2; torus convex hairy. Ripe carpels several, the size of a pea, black when ripe, borne on stalks about ·4 in. long, which are covered with raised dots with stiff deciduous hairs.

Pilibhit to Gorakhpur.

Wood " close, hard, tough and durable "—Brandis.

Blaze brown and red.

Fl. almost throughout the year; but mainly in the hot season. Evergreen.

Polyalthia longifolia, *Benth.* Vern. *Ashok.* A handsome evergreen tree with dark grey smoothish bark, straight trunk and pyramidal crown. Leaves 5-8 in. long, lanceolate, acuminate, undulate, glossy green, glabrous with short petioles. Flowers yellowish green, pubescent, .5 in. across, with long slender pubescent pedicels up to about 1.5 in. long, which are usually umbellately fascicled on tubercles, or short pubescent peduncles. Sepals broadly ovate, acuminate, with reflexed tips; petals spreading, narrow lanceolate, acuminate; anthers numerous, subsessile, cells capped by the dilated and truncated connectives. Ripe carpels ovoid ellipsoid, .8- 1 in. long, smooth, obscurely verrucose, on stout stalks, about .5 in. long.

Usually planted as an avenue tree in our area and also near temples. A native of Ceylon and Bengal

Fl. April-May. Fr. July.

3. MILIUSA, *Lesch.*

Miliusa velutina, *Hk.f. & Thom.* Vern. *Bari kari, kalan, gua sal kari.*

A moderate sized, deciduous, low branched, usually crooked, tree with dark-grey, rough bark. Young parts and inflorescence densely fulvous tomentose. Leaves 4-10 by 2.2-6 in., ovate elliptic or oblong, acuminate, sometimes acute, usually narrowed towards the base, which is obtuse or cordate, softly tomentose on both surfaces, with a strong and rather fetid smell (resembling somewhat that of Murraya Koenigii), lateral nerves somewhat distant, 8-12 pairs stopping short of the margin; petiole .1-.2 in. long. Flowers bracteate, drooping, .5-.7 in. across, greenish yellow, dark purple inside, on long pedicels up to 4 in. long, solitary or borne on 2-6 flowered short, extra-axillary peduncles. Sepals 3, densely villous outsid , glabrous within, ovate, acute, about .1 in. long. Petals 6, in two series, outer similar to sepals, slightly longer, inner much longer, broad ovate or suborbicular, tomentose outside, glabrous and dark purple inside. Stamens indefinite, filaments very short, connective not produced: torus elongated, hairy; carpels indefinite, inserted towards the top of the torus, villous, 2-ovuled with long silky hairs. Fruits of a number of rounded, stalked, succulent carpels up to .6 in. across, sparsely hairy outside each 1-2 seeded; stalks .3-.5 in. long.

Pilibhit, Oudh forests and Gorakhpur.

he wood is hardly used within our area, but is, according to Gamble, easily worked and durable, and has also a pretty grain. It stands a good deal of shade and is a frequent associate of sal. Leafless early part of hot season.

Fl. March-May. Fr. June-July.

The stem is often buttressed. Blaze dirty yellow turning brown, presenting a brittle sharp cut.

4. SACCOPETALUM, *Benn.*

Saccopetalum tomentosum, *Hk. f. & T.* Vern. *Kari, choti kari, kajrauta.*

A moderate sized deciduous tree with dark greyish brown, rather rough and fissured bark; young parts softly fulvous pubescent or tomentose. Leaves 3-8 by 1.7-4.5 in., oblong or elliptic-lanceolate, acute or acuminate usually with rounded or obtuse base, softly hairy when young, upper surface glabrescent with age; midrib often with small tubercles, lateral nerves 6-10 pairs, stopping short of the margin and forming loops as in the last species; petiole short up to .2 in. long, tomentose. Flowers brownish-green outside, pubescent on both sides, up to .8 in. across, lateral from previous year's wood, or sub-terminal, 1-2 together, pedicels slender usually from a very short peduncle; pedicels up to 3 in. long, bracteate at the base. Sepals 3, triangular-ovate, villous outside, less hairy inside; petals 6, hairy on both surfaces, outer linear, slightly longer than the sepals; inner about .5 in. long, saccate at the base and tapering towards the apex. inner face usually with a median dark-purple line; torus elongated, covered with tufts of long hairs. Stamens indefinite, subsessile, connective broad continued into a short crest at the top of the anthers; carpels silky at the base, 6-8 ovuled, stigma globose. Fruit of round succulent stalked carpels usually yellow pubescent up to 1 in. across, seeds 3-4 in. each carpel; stalks ·5-1 in. long.

Throughout the area.

Sometimes a fairly big tree. The leaves are used as fodder. The wood is yellow and cracks in seasoning. It is not used for timber within the area. The tree closely resembles *Miliusa velutina* with which it is apt to be confused. It has usually smaller leaves which become glabrescent with age with a faint aromatic cinnamon-like smell when bruised—very different to the smell of the leaves of the latter. The flower buds when fully formed are conical and not roundish or ovoid as in *M. velutina.*

Leafless towards the end of March. New leaves and flowers April to June.

Blaze yellow and brown.

ANONA, *L.*

Anona squamosa, *Linn.* The Custard apple. Vern. *Sitaphal, Sharifa.*

A shrub or a small tree. Leaves 2-5 by 1.2-2in., oblong-lanceolate or elliptic, apex subacute or rounded, sometimes tapering, faintly scented, pellucid dotted, glabrous above, glaucous beneath. Flowers greenish-yellow, up to 1 in. long, pubescent, drooping, solitary, or 2-4

on pedicels .5-.75 in. long from short extra-axillary branches. Sepals 3, minute; outer petals tapering, with a purple blotch at the base, inner minute or wanting. Carpels ultimately confluent into a round tubercled fleshy fruit which is glaucous when young, and yellowish-green when ripe. Seeds black enclosed in sweet, pulpy cells. The fruit varies in size in cultivation, it is usually 2-4 in. across. The tubercles become black on handling.

Cultivated and naturalized in many places—Pilibhit, Gonda, Jhansi, etc. The powered roots and leaves are said to be insecticides. The root is also a drastic purgative.

Fl. March-May. Fr. July-November.

A. reticulata, *Linn.* The Bullock's Heart. Vern. *Ramphal*—is a small tree. Leaves glabrous, 5-8 by 1-2 in., oblong-lanceolate, base acute Flowers 2-4 on lateral peduncles, yellowish green, tomentose, very similar to those of the preceding species. Fruit 3-5 in. across, globose, tapering towards the apex, yellowish or yellowish-red when ripe, surface divided into rhomboidal to hexagonal smooth cells by shallow fissures, pulp granular, sweetish, closely adhering to the seeds.

Occasionally cultivated.

Artabotrys odoratissimus, *R. Br.* Vern. *Champa*—A large very branchy glabrous shrub, leaves 2·8 in. long, oblong-lanceolate, shining above, coriaceous. Flowers very fragrant up to 1.75 in. long, solitary or paired, yellowish green; sepals 3; petals 6, bases concave and arching over the torus. Ripe carpels stalked. It is cultivated for the sake of its heavy-scented flowers. A native of Tenasserim, China, and Ceylon.

IV.—MENISPERMACEÆ.

Usually climbing or twining shrubs or rarely erect shrubs or small trees. Leaves alternate, exstipulate, usually simple, sometimes palmately lobed, or peltate. Flowers dioecious or polygamous, small, in cymes or racemes, 3-5-merous, sometimes bracteate, occasionally 3-bracteolate. Sepals usually in two series, outer often minute. Petals usually 6, rarely fewer, free or connate or 0. *Male flowers.*—Stamens usually the same number as, and opposite to the petals, often embraced by them, filaments free, or variously united; anthers free or united in a ring; pistillodes very small or 0. *Female flowers.*—Carpels 3 or more, or 1 only; styles terminal, but often becoming basilar by the curvature of the ovary; ovules usually solitary (by abortion). Fruit drupaceous, endocarp often tubercled, rugose or ribbed, containing the seed curved round a solid depressed centre; seed usually horseshoe-shaped or reniform, endosperm uniform or ruminate or 0.

I. Sepals 6. Carpels 3 or more :—

A. Endocarp ovoid or oblong :—

Stems often with unbranched aerial roots. Filaments free; style scar sub-terminal.	1. *Tinospora.*
Stems without aerial roots. Filaments united style scar subbasal.	2. *Anamirta.*

B. Endocarp horseshoe-shaped :—

1. Styles subulate :—

Carpels 3-12; petals minute; dry fruit not tubercled; endosperm ruminate. .. .. 3. *Tiliacora.*

Carpels 3-6; petals auricled; dry fruit tubercled; endosperm not ruminate. .. .. 4. *Cocculus.*

2. Styles forked, carpels 3. .. .. .. 5. *Pericampylus.*

II. Sepals 4, free; petals of male flowers 4, connate, carpel 1. 6. *Cissampelos*

1. TINOSPORA, *Miers.*

Deciduous climbing shrubs with succulent corky stems often with filiform aerial roots. Flowers in axillary or terminal racemes, or panicles or from the old wood, sepals 6, in two series, inner larger. Petals 6, smaller than the inner sepals. *Male flowers.*—Stamens 6, free, filaments thickened at the apex; anther cells dehiscing obliquely. *Female flowers.*—Staminodes 6, clavate. Carpels 3; stigmas forked. Drupels 1-3. Style scar subterminal; endocarp rugose, dorsally keeled, ventrally concave. Seed grooved ventrally, or curved round an intrusion of the endocarp; endosperm ventrally ruminate.

Leaves 2-4 in. in diam. glabrous .. .. 1. *T. cordifolia.*

Leaves 3·5-8 in. in diam. tomentose, or woolly beneath. 2. *T. malabarica.*

1. Tinospora cordifolia, *Miers.* Vern. *gúlóh, gúrich, gúlól.* Sans. *Gúdúchi, amrita ballari* (immortal creeper), *jwara nashini,* (the fever destroyer).

A deciduous soft-wooded and rather succulent climber, stems striate, pale brown or greyish-green with thin corky bark which becomes loose with age; often sending down long unbranched, slender, adventitious roots. Young parts and leaves glabrous. Leaves usually 2-4 in. long, rarely larger, broadly cordate, acuminate, base usually with broad sinuses; 5-7 nerved, membranous, under-surface glaucescent; petioles 1-3 in. long swollen at the base. Flowers small greenish-yellow, in slender racemes which are axillary, terminal or from old wood, and up to 5.2 in. long. *Male flowers.*—Clustered in the axils of minute subulate bracts, pedicels filiform about .2 in. long, 3 outer sepals minute, ovate, acute, 3 inner much longer, about .1 in. long, concave, obovate to suborbicular: petals 6, smaller than the inner sepals, sub-equal, broadly cuneate, lateral margins usually inflexed when young. Stamens 6, longer than filaments, dilated towards the top, connective broad; anther cells oblique. *Female flowers.*—Usually solitary on the racemes which elongate in fruit. Petals flat; staminodes 6, fleshy; carpels 3, on fleshy receptacles; stigmas divided. Drupes red, succulent, of the size of a pea; style-scar sub-terminal; endocarp broadly ovoid, slightly muricate.

Gonda, Kheri, Etawah; probably throughout the circle. It is often confused with the next species which appears to be the commoner form in our area.

The entire plant is prized in Indian medicine. The powder of the stem is said to be an alterative tonic and also an aphrodisiac. Its efficacy as a medicinal plant is ascribed to the presence of traces of Berberine. A starch is obtained from the stem by grinding in water and then allowing the strained mixture to stand for some time. This is used in chronic bowel troubles and is a specially valuable nutrient where no other food can be digested. The fresh juice a ts as a powerful diuretic.

Leafless March-June.

Fl. rainy season. Fr. cold season.

2. **Tinospora malabarica,** *Miers*. Vern. *Giloh, nimkathia bour* (*Bah.*); *nimkarui* (*Gon.*), *gurich*.

A large soft-wooded deciduous climber. Stems smooth, greyish green and shining when young, pale-brown with thin papery bark later, covered with large warty lenticels. Branchlets and young parts hairy. Leaves 3.5-8 in. long, broadly cordate, acuminate, base usually 7-nerved, sinus often deep, membranous, somewhat rough above with short adpressed hairs, grey tomentose beneath, sometimes 3-angled or lobed; petioles with swollen and twisted base, hairy, 2-5.5 in. long. Flowers greenish yellow, about .25 in. across, in racemes 1.5-4 in. long, usually from the old wood; pedicels about .25 in. long slender. *Male flowers.*—In fascicles of 1-4 from the axils of subulate bracts; 3 outer sepals oblong to ovate-lanceolate, 3 inner concave, suborbicular, much larger about .1 in. long. Petals shorter than the stamens, subequal, shortly clawed, limb broadly sub-rhomboid. Stamens 6, dilated towards the top. *Female flowers.*—Solitary in the bracts, resembling the males; staminodes shorter than the petals, clavate Carpels 3, divergent, on a short fleshy gynophore, stigmas 2-fid Drupels round or broadly ovoid, about .5 in. long, scarlet or orange when ripe. Endocarp obscurely hexagonal, dorsally tuberculate convex and having a keel which forms a blunt beak at either end ventrally pitted.

Pilibhit, Oudh Divisions, Gorakhpur, Bundelkhand, usually climbing tall trees in cool situations

Economic uses as of the last species. Elephants are very ond of the succulent stems.

Leafless December-March(?). Fl. February-March. Fr. May-June.

Like the last species it usually sends down serial shoots, usually from the proximity of the severed surface of a stem.

2. ANAMIRTA, *Colebr.*

Anamirta paniculata, *Colebr.* Vern. *Kákmári.* Sans. *Kákmári.*

A large woody evergreen climber with pale-brown striate cork bark. Leaves 4-10 in. long, broadly ovate to suborbicular, coriaceous glabrous and shining above, pale beneath with tufts of hairs in th

axils of nerve branches below, base truncate or broad cordate, usually 5-(rarely 3-) nerved; petioles up to 8 in. long, thickened both at base and apex. Flowers about .25 in. diam.; in large panicles from old wood attaining 14 in. Sepals 6, sub-equal, ovate oblong, petals 0. *Male flowers.*— Filaments united into a column on which the anthers form a globose head. *Female flowers.*—Carpels 3, surrounded by 9 minute, fleshy staminodes. Drupels globose .5 in. across, usually 2-3 together; black when ripe, style scar near the base endocarp spherical with a globose hollow intrusion from the base.

N. Oudh—*R. Thompson.* There are no specimens from our area at Dehra-Dun or Calcutta.

The bitter and poisonous fruits are used in the form of an ointment for obstinate skin diseases and for destroying lice. These contain picrotoxin which is a poison with similar action as strychnine.

Fl. April-May Fr. June.

3. TILIACORA, *Colebr.*

Tiliacora racemosa, *Colebr.* Syn. **T. acuminata,** *Miers.* Vern. *Karwanth, rangoi, ramsarobel.*

An evergreen, extensive woody climber with striate grey bark; branches glabrous. Leaves usually 2-6 by 1.4-3.5 in., ovate-lanceolate, acute or acuminate, coriaceous, glabrous, dark-green and shining above, base rounded or truncate, sometimes cuneate, lateral nerves 4-5 pairs, lowest pairs from near the base, all decurrent on the midrib; petiole .5-1.3 in., jointed near insertion, chanelled. Flowers about .2 in. across, yellow, supported by small bracts, in lax axillary panicles or racemes up to 12 in. long, which are at first pubescent or tomentose and ultimately glabrescent; male panicles usually longer. *Male flowers.*—3-7, together in cymes from ultimate branches. Sepals 6, outer 3, broadly triangular, ciliate, inner broad ovate, elliptic or suborbicular, concave, about double the size of the outer sepals; petals 6, smaller than the stamens, suborbicular, apex notched; stamens 6, free. *Female flowers.*—Usually solitary or sometimes in twos; sepals and petals similar to those of the males; carpels several (3-12) on a short gynophore with terminal recurved subulate styles. Drupes about .4 in. long somewhat compressed; reddish when ripe, stone bent double with an intervening woody plate.

Pilibhit to Gorakhpur, and Bundelkhand.

Fl. principally hot season. Fr. June-December.

4. COCCULUS. *DC.*

Climbing, straggling or erect shrubs or small trees. Flowers panicled, or rarely fascicled in the axils of the leaves. Sepals 6, in two whorls, outer smaller. Petals 6, smaller than the inner sepals, usually auricled at the base. *Male flowers.*—Stamens free, embraced by the petals; anthers-cells opening transversally. *Female flowers.*—Saminodes 6 or 0; carpels 3-6, styles subulate. Drupels laterally compressed, style scar sub-basal; endocarp horsesho -shaped, dorsally keeled and tubercled, excavate at the sides. Seeds curved; endosperm fleshy.

Leaves tomentose or hairy; leaves dull green; male flowers in axillary panicles. .. .. .. *C. villosus.*
Leaves glabrous when mature; leaves glaucous; male flowers in sessile axillary clusters. .. .. *C. Læba.*

Coeculus villosus, *DC.* Syn. **C. hirsutus,** *Diels.* Vern. *Charenti, Sarenta.* Sans. *Patalgarudi, vatsadani, vanatiktika.*

A branchy and rather slender climber; twigs, young parts and inflorescence densely villous; bark of old stems grey, rough, peeling in scales. Leaves 1-3 in. long, triangular to oblong-ovate, apex obtuse, rounded or emarginate, usually mu ronate, pilose, ultimately glabrescent above, under surface densely villous, base 3-5 nerved, truncate rounded or cordate; petiole up to .5 in. long. Flowers minute, yellowish green. *Male flowers.*—In short peduncled compound compact cymes, much shorter than the leaves, bracts subulate; sepals 6, villous externally. 3 outer small, linear, narrow obovate; petals 6, emarginate, shorter than and embracing the stamens; stamens 6; free, anthers opening transversally. *Female flowers.*—1-3 from short peduncles; sepals as in the males; petals larger, apical lobes pointed, base hairy; carpels 3; styles reflexed. Drupes purple when ripe, compressed, sub-reniform, .15 in. across, endocarp perforated in the centre keeled on the back and symmetrically marked with sub-parallel ridges radiating from the tuberculate rim of the central pit.

Hedges and waste lands in Kheri and Bundelkhand, probably also in Pilibhit and Gonda.

The root and leaves are medicinal. The former is said to be a good substitute for sarsaparilla. The juice of the leaves mixed with water has the property of coagulating into a green jelly. The juice of the fruits yields bluish purple ink.

The leaves are variable in size and shape and are sometimes lobed, they are usually smaller upwards and on the flowering branches, on the latter they are also comparatively narrower

Blaze yellowish white or pale yellow.

Fl. November-April, also at other times of the year. F. December-May.

In Bundelkhand it becomes quite extensive climber and climbs tallest trees, the stem attaining a diameter of 2-3 in.

2. Cocculus Læba, *DC.*

A glabrate climber; branches striate; young parts pilose. Leaves .6-1.7 in. long, very variable linear-lanceolate to oblong-ovate or elliptic-ovate, rounded or obtuse and usually mucronate at the apex, base usually 3-nerved, cuneate, truncate or rounded, adpressed pubescent when young, glabrate with age, coriaceous; petiole up to .3 in. long. Flowers minute. *Male flowers.*—In dense clusters on leaf axils. Sepals 6, outer smaller; petals emarginate, embracing the stamens. *Female flowers.*—Solitary or in twos from leaf axils. Drupes purple, roundish, about .15 in. long, keeled on the back laterally ridged and perforated at the centre.

Rohilkhand—*Duthie*; I have seen no specimens from our area. Likely to be found in the Afforestation Division and Bundelkhand.

The plant is said to be sometimes used medicinally in the N.-W. Frontier in the treatment of intermittent fevers.

Fl. and Fr. throughout the year. The leaves are sometimes lobed and usually small towards the ends of the branches.

5. PERICAMPYLUS, *Miers.*

Pericampylus incanus, *Miers.*

A climbing shrub with striate stem and softly tomentose branchlets. Leaves 1.5-4 in. across, subpeltate suborbicular or broad ovate, broadly acute, obtuse or emarginate, usually mucronate, base usually 5-7 nerved truncate or broadly cordate, upper surface at first pilose glabrescent later, undersurface tomentose; petiole jointed near the base, up to 3 in. long, inserted close to the base of the lamina. Flowers minute, yellowish-green, in compound, usually divaricate, densely hairy, corymbose cymes fascicled on leaf axils or on abbreviated branches. *Male flowers.*—With an outer whorl of 3 villous bracts;* sepals 6, concave broadly obovate, pilose outside; petals 6, yellow, infolded on the sides and embracing the stamens, much smaller than the sepals, spatulate; stamens 6, divergent towards the apex, anthers dehiscing transversally. *Female flowers.*—Sepals and petals as in the males; staminodes 6; carpels 3 with 2-fid stigmas. Drupes red, about .2 in. long, compressed, obovoid; endocarp horseshoe-shaped, style scar near the base, dorsally and laterally echinate; sides excavate.

Recorded by Duthie from Rohilkhand and Oudh. There are no specimens from our area at Dehra.

The roots are reputed to be antidote against snake-bite. It is interesting to note that a fluid extract of the roots has been proved to possess decided remedial powers when injected into the bitten place.

* According to some authorities these are the outermost whorl of sepals.

6. CISSAMPELOS ,L.

Cissampelos Pareira, *Linn.* Vern. *Harjuri, purainpairhi, puraina, pariabel,* Sans. *Vrihat tikta, vrihat karnika, etc.*

A climber which throws out slender, softly grey hairy, striate shoots from a woody root-stock. Leaves 1.5 6 in. across, broadly ovate, sometimes reniform, usually peltate, apex subacute, rounded, or sometimes emarginate, usually mucronate, base usually broadly cordate or truncate, 7-11-nerved, softly hairy on both surfaces, sometimes glabrescent above, glaucous beneath; petiole up to 4 in. long, inserted close to the base, or sometimes at the base. Inflorescence softly hirsute. *Male flowers.*—Minute, in corymbose or divaricate compound cymes on slender peduncles, which are fascicled on the axils of leaves or panicled on a short leafy rachis; bracts small, subulate. Sepals 4, hairy outside, obovate, inflexed; petals broadly cupular, obscurely 4-lobed; stamens combined to form a columnar synand ium; anthers encircling the disk-like termination of the column, dehiscing horizontally. *Female flowers.*—In clusters from the axils of imbricating foliaceous, accrescent bracts on axillary racemes; raceme elongating in fruit, sepal 1, obovate; petal 1, shorter, suborbicular or reniform, both yellowish and externally hairy; carpel 1, densely hispid; stigma 3-lobed. Drupe about .15 in. long broadly obovate, or subglobose and compressed, style scar sub-basal, more or less hispid, red when ripe. Endocarp horseshoe-shaped, transversally ridged and tuberculate, pitted about the centre.

Throughout the circle in hedges and open forests.

"The rhizome is used in the formation of rice beer of the kols"—*Haines.* The leaves are used for bandaging in cases of fracture (whence the vernacular name) and also for unhealthy sores and sinuses. As a medicinal plant it is officinal in the Pharmacopœia of India and is said to be a mild tonic and diuretic.

V.—NYMPHÆACÆ.

Aquatics, usually with peltate leaves which are involuto in bud. Flowers handsome, solitary from the roots, usually on long naked stalks. Sepals and petals both free and 3-5-nerved, the latter usually in several whorls; hypogynous or adnate to a fleshy enlarged torus. Carpels 3 or more, free, combined or irregularly sunk in pits of a fleshy disk; stigmas peltate or decurrent; ovules few to many, scattered over the walls of the carpels. Fruits of indehiscent dry carpels, or of connate carpels, or of a spongy turbinate syncarp with nut-like carpels immersed in it; seed naked or arillate; albumen floury or 0.

A family of little forest interest. The following plants are commonly found in jhils in our area and are important chiefly on account of their yielding farinaceous foods for which there is commercial demand.

1. **Nymphæa Lotus,** *Linn.* The Indian lotus. Vern. *Chota kanwal.* Sans. *Kumud, raktotpala, hallaka, raktasandhika, bhadra.*

Rhizome tuberous. Leaves 6-12 in. across, floating, sub-sagittate when young, peltate later, suborbicular or reniform, deeply cordate, sinuate toothed, usually velvety pubescent and with prominent nerves beneath; petiole inserted close to basal sinus, usually submerged. Flowers 2.5-8 in. across, white or pink to deep red. Sepals 4, ribbed, oblong-lanceolate; petals many, oblong, both adnate to disk and persistent in fruit passing into the anthers which are numerous and without appendages. Carpels many sunk in the disk and forming a syncarpous ovary, stigmas radiating, connate, furrowed. Fruit ripening under water, 1.5 in. across breaking up irregularly; seeds numerous.

Jhils and ponds all over the circle.

The rhizomes and seeds are eaten. The powdered rhizomes are used for diarrhœa, dyspepsia, etc. The flowers open after sunset and are faintly scented There are several varieties varying in size, colour of flower, tuber, pubescence, etc.

2. **Nymphæa stellata,** *Willd.* Vern. *Bambher,* Sans. *Indiwara, nilotpal.*

A more slender plant than the last. Leaves 3-8 in. long, elliptic or orbicular, peltate, entire or broadly sinuate, often blotched with purple beneath, glabrous, with an acute narrow sinus near the base. Flowers 2-5 in. across, blue or purplish, sometimes white or pink. Sepals linear, lanceolate, 4, not ribbed; petals narrow, tapering; anthers tipped with long appendages. Fruit roundish.

In shallow water in jhils, water-logged places in open forests; etc. Economic uses as of the last species.

3. **Euryale ferox,** *Salisb.* Vern. *Tal makhana, makhana,* Sans. *Mukhauna.*

A prickly aquatic. Leaves large orbicular, peltate 1-4 ft. across, spinescent on the nerves on both surfaces; corrugated above; purple beneath, nerves prominent, dichotomously ramifying from the centre. Flowers violet-blue, 1-2 in. across. Sepals 4, spinescent, inserted above the carpels on the torus, persisting in fruit and crowning it; petals smaller than sepals, in several series gradually passing to the stamens, ovate oblong; ovary syncarpous sunk in the torus. Berry round 2-4 in. across, spongy; seeds about 20, ovoid, with pulpy aril.

Gorakhpur and Oudh Divisions.

The seeds have a black hard testa and the endosperm is mealy. They constitute an excellent, light easily assimilable food and are much used throughout the province. They are also considered to be invigorating to the system.

Fl. June to end of rainy season.

4. Nelumbium speciosum, *Willd.* The sacred lotus of India. Vern. *Kanwal.* Sans. *Padma, kamala; ambuja, saroia, pankaja, shatapatra, pundarika, aravinda, kokanada, etc.*

A large aquatic with milky juice and horizontal creeping rhizome. Leaves orbicular more or less cup-shaped, up to 2 ft. across, peltate, floating or raised above the surface of water, glabrous, glaucous below. Petioles stout, usually ultimately tuberculate. Flowers very handsome, delicately scented 4-10 in. across, on long peduncles white or pink. Sepals and petals in whorls of 4-5, both caducous, narrow elliptic, tapering at both ends 3.5-5 in. long, at first concave, then spreading, passing gradually into the stamens; anthers with a pale yellow club-shaped appendage at the top; carpels numerous sunk on the large fleshy obconic torus. Fruit consisting of the dry enlarged torus in the cavities of which the carpels are inserted.

The plant is considered sacred both by Hindus and Budhists. In certain rituals of the former its use is essential. The flowers open during the day and close at night. The large leaves are used as plates and "as cool bedsheets in high fever with much heat and burning of the skin." (Dutt's *Materia Medica of the Hindus.*) The large rhizomes are known as *bhainsra*, and are largely eaten. The fruits are known as *kanwal-gatta*; the seeds are eaten. Various parts of the plant are medicinal, *e.g.*, a sherbet of the plant is said to be a useful refrigerant in small-pox and other eruptive fevers; the roots are used as paste in skin diseases; the flowers are used as astringent in diarrhœa, in fever and diseases of the liver; the seeds are used as refrigerant in skin diseases, etc.

VI.—CAPPARIDACEÆ.

Herbs, shrubs or trees, erect or climbing, sometimes by means of stipulary spines. Leaves alternate, simple or digitate. Flowers usually tetramerous, bisexual, solitary umbelled, racemed or in extra axillary rows, often irregular. Sepals free or connate; petals free, imbricate in bud; stamens 4, sometimes on an androphore or perigynous. Ovary sometimes on a gynophore or an gynandrophore, 1-celled; ovules numerous on 2-4 parietal placentas. Fruit capsular, baccate, or dry and indehiscent; seeds exalbuminous.

I Leaves simple :—

A. Petioles unarmed; fruit moniliform; sepals combined. .. .. 1. *Mærua.*

B. Petioles armed with stipular spines; sepals free; fruit a berry. .. .. .. 2. *Capparis.*

II. Leaves digitately trifoliolate... .. .. 3. *Crataeva.*

1. MÆRUA, *Forsk.*

Mærua ovalifolia, *Cambers.* Syn. **M. arenaria,** *Hk. f. & Thoms.* Vern. *Tameran.*

A large woody climber, with pale grey smooth bark. Leaves 1-3.3 by .4-1.5 in. oblong-lanceolate or elliptic-oblong, entire, sub-acute or rounded, mucronate, greyish green, lateral nerves distant, indistinct, up to about 7 pairs; petiole about .25 in. long; stipules minute. Flowers 1-1.5 in. across, white, fragrant, in terminal or lateral, long peduncled corymbs, sometimes solitary; pedicels up to .5 in. long; bracts minute, acute. Calyx-tube funnel-shaped, lined with a disk, and containing the stout gonophore, which slightly exceeds the tube; lobes 4, up to .6 in. long, obovate, oblong-acute, with an incurved horn on the back near the apex, margin villous, much exceeding the petals. Petals 4, lanceolate acute, inserted on the margin of the disk. Stamens numerous, inserted on the gynophore, exserted; filaments subulate. Ovary cylindric, truncate, on a long gynophore up to about 1.2 in. long, which becomes woody in fruit; stigma sessile. Fruit up to 3 in. long, consisting of an elongated, often twisted and 'knotted' berry, deeply constricted between the 'knots' each of which is 1-seeded; seeds round, tuberculate.

Etawah, Jhansi, Banda.

Two varieties are found within our area.

1. Var. scabra, leaves and shoots rough young parts and inflorescence downy, calyx softly pubescent. This is the common variety within our area.

2 Var. glabra, leaves and shoots glabrous, according to Duthie found in Bundelkhand.

The root has some resemblance to liquorice root in taste.

Fl. November-March.

2. CAPPARIS, *Linn.*

Climbing shrubs or small trees. Leaves simple, rarely 0, petiole usually with a pair of stipular spines. Flowers bracteate, often handsome and showy. Sepals 4, in two series; petals 4, imbricate; torus short. Stamens usually many inserted on the base of the gynophore. Ovary long stipitate, 1-celled with 2-6 parietal placentas; stigma sessile. Fruit a fleshy berry on a woody stalk. Seeds with hard testa, imbedded in pulp.

A. Nearly aflless shrub with grey-green branches... 1. *C. aphylla.*

B. Leafy shrubs: —

Flowers small, umbellate, .3-.5 in. across, leaves .6-2 in. long. .. .. 2. *C. sepiaria.*

Flowers large showy, supra-axillary in vertical rows, 1-2 in. across; leaves 1.7-4.5 in. long. 3. *C. horrida.*

1. Capparis aphylla, *Roth.* Vern. *Karil.* Sans. *Karira.*

A nearly leafless shrub or a small tree, with corky, longitudinally furrowed bark and grey-green often matted-branches covered with waxy bloom when young. Leaves ·3-·5 in. long, caducous, minute, on young branches only, linear with spinescent apex, sessile or subsessile. stipular spines about .2 in. long, stiff nearly straight, reddish-brown, persisting after the fall of leaves. Flowers ·8 in. across, brownish-red, in umbellate corymbs, on short lateral branches, or solitary between the spines; buds pubescent; pedicels ·2-·5 in. long. Sepals unequal; lower saccate; upper concave and smaller, inner elliptic or oblong acute. Petals narrow-oblong, stamens many about .7 in. long; gynophore almost the some length as the stamens, not woody in fruit style, subulate persisting in fruit. Berry roundish red when ripe, about .5 in. across.

Bundelkhand, *Brandis*; E'awah and Afforestation Divisions, in dry scrub jungles.

The flower buds and fruits are pickled. The top shoots and young leaves are said to be efficacious in allaying toothache if chewed. The wood is whitish or light yellow, hard, close-grained and tough, but is attacked by white-ants and is not obtainable in our area in sufficient size to be used as timber.

New leaves November-March. Fl. March-May.

2. Capparis sepiaria, *Linn.* Vern. *Aundi.* Sans. *Kakadani, gridhranakhi.*

A scandent or straggling shrub, with greenish sulcate stems, shoots zig-zag and tomentose. Leaves .6-2 in. long, variable in size, elliptic or obovate, obtuse or emarginate, glabrescent above, tomentose or downy beneath, coriaceous, lateral nerves distant about 5 pairs; petioles short up to .15 in. long pubescent; stipular spines recurved, upper portion dark-brown and shining, tomentose and slightly enlarged at the base. Flowers in subsessile or sessile umbels or umbellate corymbs terminating shoots, white, .3-.5 in. across, pedicels .5-.8 in. long, filiform, hairy. Sepals concave, suborbicular, ciliate. Petals obovate-oblong. Stamens about .3 in. long; gynophore about .2-.3 in. long. Berry on a slender stalk, .3 in. across, 1-seeded, black when ripe.

Jhansi and Afforestation Divisions.

Fl. June-November.

3. Capparis horrida, *Linn. f.* Vern. *Karálwá, Harsúr, kharbiswa, Harúá,* (J). Sans. *Húnkara.*

A scandent shrub often climbing the tallest trees, with grey or pale brown somewhat rough and corky bark; twigs green; young parts covered with dense scurfy tomentum which is usually rusty and caducous. Leaves 1.7-4.5 in. by 1-2.5 in., lanceolate, ovate or

elliptic, acute with a stout mucro at the apex, shining above when mature, main lateral nerves up to 8 pairs, distant; petiole up to .4 in., stipular spines hooked, with a broad base and yellowish brown tip. Flowers usually subsolitary in superposed extra-axillary rows; sometimes solitary, white, turning pink, 1-2 in. across; pedicels up to 1 in. long. Sepals concave, scurfy tomentose. Petals about .4-.6 in. oblong-obovate, exceeding the sepals, villous inside. Stamens purple up to 1.5 in. long. Ovary globose: gynophore up to 1.7 in. long, enlarging and becoming woody in fruit. Berry 1-1.5 in. across, broadly ellipsoid or ovoid, orange red when ripe.

All over the area, and also in Etawah. Frequently on shady banks.

The leaves and root bark are medicinal, both are said to improve appetite and the latter is believed to be useful for gastric irritation. The leaves are good fodder.

The tomentum is sometimes grey on the shoots and inflorescence. Sometimes the flowers at the ends of shoots look panicled on account of the imperfectly formed leaves at the time of flowering. Blaze yellowish brown.

Fl. February-April. Fr. August-September.

3. CRATÆVA, *Linn.*

Trees. Leaves digitately 3-foliolate. Flowers large, white, yellowish or purplish, polygamous. Sepals 4, cohering below with the large, lobed, hemispheric disk. Petals 4, long-clawed open in bud. Stamens many, inserted at the base of the gynophore. Ovary 1-celled on a slender gynophore. Stigma sessile, depressed; ovules many on two parietal placentas. Fruit baccate, sometimes, 2-celled by the formation of a spurious dissepiment, often with a hard exocarp; seeds imbedded in pulp.

Secondary nerves 6-8 pairs; berry 1-celled; seeds smooth. .. .. 1. *C. religiosa.*
Secondary nerves usually 9-15 pairs; berry 2-celled; seeds spinulose-tuberculate on the back. .. 2. *C. lophosperma*

1. Cratæva religiosa, *Forst. f.* Vern. *Barna, banno (J), baruna.* Sans. *Varuna; asmarighna.*

A moderate sized deciduous unarmed tree, bark grey with horizontal wrinkles; branches closely lenticellate. Leaves clustered at the ends of the branches; petioles 2-4 in. long, leaflets 2-5 by 1-3 in., ovate or ovate-lanceolate-acuminate, lateral oblique, all entire, subcoriaceous, glabrous above, glaucous and closely reticulate beneath, main lateral nerves 6-8 pairs, base cuneate; petiolules .2-.3 in. long. Flowers 2-3in. across, somewhat zygomorphic, white and cream to yellow and pink with purple stamens; usually in lax terminal corymbs, which are sometimes leafy. Pedicels 1-2 in. long; bracts linear-spatulate, acuminate, caducous; sepals 4, deciduous, petaloid, oblong or ovate, acute. Petals 4, slightly unequal, long clawed, ovate, or oblong-elliptic, 1-1.5 in. long, stamens

numerous, much exceeding the petals; filaments slender. Ovary globose on a long gynophore 1.2-2 in. long, which becomes woody in fruit. Berry about 1.2 in. across round, or ovoid, with a hard brown rind, usually marked with white specks. Seeds imbedded in yellow pulp, smooth, somewhat compressed, perforate in the centre.

Throughout the area, nowhere common.

Regenerates freely from root suckers. Very handsome in flower for which it is frequently cultivated. The wood is yellowish-white even grained; suitable for combs, turnery, etc. The fresh leaves and root-bark bruised with water, vinegar or lime juice have been found to be an excellent substitute for mustard poultice. The bark of the stem is said to be useful in gastric irritation and urinary complaints.

Blaze pale-yellow with patches of orange, .5-1 in.

F.l April May. Fr. July August.

2. **Cratæva lophosperma**, *Kurz*. Vern. *Parna*.

Middle-sized or small tree with ashy grey, nearly smooth bark and closely lenticellate branches. Petioles 1.5-3 in. long Leaflets ovate-lanceolate, acuminate, glabrous above glaucous beneath subcoriaceous, secondary nerves prominent, 9-15 pairs or more; petiolule .1-.25 in. Flowers white, turning yellow, up to 2 in. across in terminal corymbs; pedicels 1.5-2.5 in. long. Sepals ovate or spatulate, acute, greenish white (?). Petals about 1 in. long, obovate, clawed. Filaments purple, extruded. Gynophore 2-2.5 in. long, ovary oblong, or cylindric, 1-celled with 2 intrusive placentas. Fruit 2-celled; about 2.2 by 1.5 in.; pale brown or nearly white; obovoid or ellipsoid, seeds reniform, compressed, spinulose tuberculate on the back; perforate in the centre.

Gorakhpur—Tilkonia; rare.

The leaves are said to be very bitter. Closely resembling the last species.

Flowers hot season.

VII.—BIXACEÆ.

Trees or shrubs. Leaves alternate, mostly simple; stipules minute or 0. Flowers regular, 1-2 sexual, sepals usually 4-5 imbricate, free or connate, usually deciduous. Stamens usually hypogynous, anthers 2-celled, opening by pores or slits. Disk often glandular, thickened. Ovary usually 1-celled, with many ovules on parietal placentas, or several celled by intrusion of walls. Styles and stigmas free or united. Fruit various. Seeds frequently arillate or with pulpy testa, albuminous.

I. Leaves digitate; flowers large showy; petals contorted in bud; fruit capsular. .. .. 1. *Cochlospermum*.

II. Leaves not lobed; flowers small, petals 0; fruit indehiscent:—

Ovary more than 2-celled; styles free. .. 2. *Flacourtia*.

Ovary 1-celled; styles connate. .. .. 3. *Xylosma*.

1. COCHLOSPERMUM, *Kunth.*

1. Cochlospermum Gossypium, *DC.* Vern. *Gabdi, ganyóri.*

A middle-sized deciduous tree, with diagonally furrowed thick ashy grey bark. Young parts and inflorescence brownish tomentose. Leaves 4-7 in. across, collected towards the ends of the branches, palmately 5-7 lobed, lobes acuminate, entire, membranous, glabrous, above when mature, softly tomentose beneath; petioles 3.5-9 in. long; stipules caducous. Flowers yellow 3-4.5 in. across, very handsome; appearing before the leaves, in short, few flowered, terminal panicles; pedicels up to 1.25 in. long, stout thickening in fruit. Sepals 5, silky outside, unequal, imbricate, oblong or elliptic, concave. Petals 5, up to 2 in. long, deeply notched, broadly obovate. Stamens numerous, shorter than the petals; inserted on the glandular disk; filaments subulate, anthers opening by short slits near the apex. Ovary with 5 deeply intruding parietal placentas, which meet in the centre; style 1, longer than the stamens, often persisting in fruit. Fruit a 5-celled, striate, leathery capsule, oblong ovoid, abruptly narrowed at the base, 2-4 in. by 1-2 in.; the chartaceous epicarp and endocarp splitting on different lines; seeds up to .3 in. long, kidney-shaped, brown, pitted and rugose, covered with silky wool.

Gonda (Tulsipur range), Jhansi, Banda.

The wood is light and spongy. A gum known as *katira* exudes from the bark. It is supposed to be cooling and is used medicinally on that account. The silk cotton from the tree is one of the *kapoks* of commerce.

Very handsome in flower. Blaze yellowish and light pink, with deep brown streaks, .5 in. An orange-coloured juice exudes from near the cambium. Sepals, and often petals and stamens, marcescent in fruit.

Fl. March-April. Fr. June-July. Leafless December-April.

2. FLACOURTIA, *L'Herit.*

Trees or shrubs often spinous. Leaves usually toothed or crenate. Flowers usually dioecious, small. Sepals 4-5, imbricate. Petals 0. Stamens numerous, anthers versatile. Ovary on a glandular disk styles 2 or more. Fruit usually a berry with several seeds, seeds obovoid, testa hard.

Evergreen; leaves long, acuminate, leaves and inflorescence glabrous; fruit about ·7 in. across. ..	1. *F. Cataphracta*
Deciduous; leaves not acuminate; leaves and inflorescence usually pubescent; fruit ·3-·5 in. across.	2. *F. Ramontchi.*

1. Flacourtia Cataphracta, *Roxb.* Vern. *Panyálá.* Sans. *Prachin-amalaka.*

A small or moderate-sized tree: often armed with compound spines up to 5 in. long, bark pale brown to dark grey, not rough. Leaves 2-4.5 in. by 1-1.7 in., ovate or oblong-lanceolate, long acuminate, crenate, shining above, dark-green, thin and tough, lateral nerves up to 7 pairs, distant; petiole short, .1-.3 in. long. Flowers inconspicuous, very small in short irregular, axillary, and terminal racemes; pedicels up to .25 in. long, slender, joined near or at the base; bracts minute. Sepals rounded with ciliate margin. Stamens numerous. Ovary flask-shaped, stigmas 4-6, persistent in fruit. Fruit dark purple when ripe, globose; pleasantly acid and astringent with 8-12 flattened seeds.

Pilibhit, Gorakhpur, probably also Oudh; usually in shady places: rare as an indigenous tree, often cultivated for the fruits which attain larger size under cultivation. The wood is hard and compact.

Young plants have simple axillary spines. According to Haines the seeds take a year to germinate.

Blaze yellowish and pale-brown with green edges.

Fl. July-August. Fr. October-December.

2. Flacourtia Ramontchi, *L. Herit.*, Syn. **F. sapida,** *Roxb.* Vern. *katia*; *kanker*; Sans. *Swádu kantaka.*

A small deciduous tree with light grey bark often peeling off in flakes; armed with axillary spines; young parts hairy or tomentose. Leaves very variable, 1.5-3 by .8-2.5 in., broadly ovate, obovate elliptic or suborbicular, crenate, glabrescent above, more or less pubescent specially along the nerves beneath; petiole tomentose .2-.4 in. long. Flowers greenish-yellow, about .15 in. across in short few flowered hairy racemes; pedicels usually jointed below the middle. Sepals broadly elliptic or ovate or more or less hispid and ciliate. Stigmas 5-11. Fruit .3-.5 in. across, globose, dull scarlet red or brown when ripe, edible, seeds 8-16.

Fairly common throughout the area, in scrub or open forests. The wood is hard. The leaves are used as fodder. The fruit is fairly good eating and is much sought after by village boys. It is medicinal and is said to be useful for enlarged spleen.

Blaze yellowish brown with green edges, ·15-·3 in.
Leafless Feb.-March. Fl. March-April. Fr. May-June.
Several varieties of this plant have been mentioned in F. B. I. of which the following are found within our area.

1. sapida *F. B. I.* Leaves glabrous, or puberulous on the nerves beneath, and petiole, elliptic to suborbicular; branchlets pubescent. Kheri, Gorakhpur, etc.

2. occidentalis *F. B. I.* Leaves broadly oblong, to orbicular usually pubescent beneath, sometimes above; branchlets and petioles tomentose. This is the commonest variety within our area.

Typical *F. Ramontchi* has glabrous leaves and nearly or quite glabrous inflorescence, occasionally found in Bundelkhand, e.g. Banda

3. XYLOSMA, *Forster.*

Xylosma longifolium, *Clos.* Vern. *Kantawa* (*Bah.*).

A moderate-sized evergreen tree, armed with axillary spines when young; bark dark grey, almost black. Leaves 3-6 in. long, lanceolate or oblong-lanceolate, usually long or short acuminate, tip sometimes obtuse, bluntly serrate, coriaceous, dark-green, smooth and shining above when young; petiole .2-.4 in. long. Flowers small, diœcious, greenish-yellow, .15 in. across, in short dense axillary panicles; pedicels about .15 in. long, jointed below the middle from the axils of minute bracts. Sepals 4-5, broadly ovate or suborbicular, somewhat erose, glabrous. Petals 0. Stamens many, within the 10-glandular, red disk. Ovary 1-celled, seated on the disk; style short; stigma sometimes 2-lobed; ovules few, parietal. Fruit about 2 in. across, red when ripe, indehiscent, few seeded more or less dry, seated on the persistent calyx.

Pilibhit, Oudh forests, usually in shady and rather moist localities Regenerates usually by root-suckers. Wood fairly hard, pinkish. Bark with raised lenticels and paler in young stems.

Blaze pinkish, then yellowish deeper down, hard spines up to 2 in. long.

Fl. November-Jan. Fr. March-May.

VIII.—PITTOSPORACEÆ.

PITTOSPORUM, *Banks.*

Trees or shrubs, sometimes epiphytic. Leaves alternate, sometimes crowded, and subopposite or subverticillate at the ends of branches, entire or sinuate, exstipulate. Flowers hermaphrodite, inflorescence terminal or axillary. Sepals 5, imbricate, free or connate below. Petals 5, hypogynous, erect with connivent or connate claws, torus small; stamens 5, alternating with the petals, filaments subulate, anthers versatile, 2-celled, opening inwards by slits. Ovary incompletely 2-3 celled, by the intrusion of placentæ. Style simple, short; stigma terminal, 2-3 lobed. Ovules 2 or more on each placenta. Fruit a 1-celled 2-3 valved capsule; valves separating between the placentæ. Seeds covered with a viscous or oily resinous pulp; albumen copious, tough.

Pittosporum floribundum, *W. & A.*

A small evergreen tree with a short trunk and spreading branches; bark yellowish-brown or grey with short rows of raised lenticels; branchlets glabrous. Leaves crowded at the ends of branches, often subverticillate, 2·75-6 by .9-1.7 in., lanceolate or oblong to elliptic-lanceolate, acute or acuminate, margins often sinuate, thinly coriaceous, shining above, pale beneath, secondary nerves rather faint, fine, tertiaries finely reticulated, base tapering to a channelled petiole, which

is .2-.7 in. long. Flowers yellowish .3 in. across, crowded on the ends of subcorymbosely branched, thinly pubescent or glabrescent terminal panicles, shorter than the leaves; pedicels minute, articulate, elongating in fruit to .15 in.; bracts caducous. about .25 in. long, oblong-lanceolate or subspatulate, acute; bracteoles minute, narrow to ovate lanceolate, often in whorls at the bases of pedicels; sepals .1 in. long, oblong or ovate, obtuse or subacute, puberulous outside. Petals .2-.3 in. long, narrow oblong. Ovary with about 12 ovules, style persistent. Capsule .2-.3 in. across, greenish-yellow when ripe, rugose 2-valved, transversally striate within; seeds 6, in a scarlet pulp, which persists as an outer coat when dry, obtusely trigonous, somewhat concave on the two faces, rounded on the back.

Bahraich (Sohelwa forests); rare in our area. The bark and the oil are reputed to be medicinal and are recommended for pulmonary affections and as an antiseptic in some cutaneous diseases.

Blaze white, softly fibrous. Upper surface of mature leaves somewhat rugulose on account of impressed nervules; panicle branches articulate.

Fl. June-July. Fr. cold season.

IX.—TAMARICACEÆ.

Trees or shrubs. Leaves, alternate minute scale-like, exstipulate. Flowers regular, in spikes or panicled racemes, or rarely solitary. Sepals and petals, each 5, rarely 4, free or connate below. Stamens 5-10 or many, inserted on a glandular or lobed hypogynous or subperigynous disk. Ovary free, 1-celled or imperfectly septate, styles 2-5, free or connate, or sessile with 3-5 stigmas. Ovules on basal placentas. Capsule 3-valved, seeds plumed or winged.

TAMARIX, *Linn.*

Shrubs or small trees. Leaves minute. scale-like, sheathing or amplexicaul. Flowers white or pink in terminal or lateral spikes or dense racemes. Stamens 5-10, sometimes 4; ovary tapering towards the apex; styles 3-4 short, dilated into the stigmas. Ovules many, seeds plumose at the apex; exalbuminous.

Flowers scarcely ever exceeding ·12 in. in diameter, usually unisexual, in dense spikes, stamens 5, capsule up to ·25 in. long. .. .. 1. *T. dioica.*

Flowers up to ·3 in. across, bisexual, in racemes; stamens 10; capsule up to ·5 in. long. .. .. 2. *T. ericoides.*

1. Tamarix dioica, *Roxb.* Vern. *Jhau,* Sans. *Pichoola.*

A very branchy glaucous shrub, branches drooping; bark dark-brown. Leaves sheathing with acuminate tips and white margins. Flowers .12 in. across, dioecious, pink, rather pretty, in dense pedunculed spikes, 1-2 in. long, often forming drooping terminal panicles at the ends of branches; bracts persistent, nearly as long as the

flowers, ovate or lanceolate-acuminate, with thin white margins. Sepals half as long as petals, elliptic. Petals pink, oblong. Stamens inserted between the notches of a 5-lobed disk, exceeding the petals in male flowers, reduced to staminodes with broad sagitate anthers in female flowers, filaments ligulate; capsules elongate, usually surrounded by withered floral organs and exceeding them.

Gregarious in river banks all over the area. Leaf scars concentric.

Fl. May-July. Fr. cold season.

2. Tamarix ericoides, *Rottl.* Vern. *Laljhau.*

A handsome shrub with fastigate branches and dark —almost black— cracked bark. Leaves glaucous, sheathing acuminate. Flowers handsome, pink, .25-.3 in. across, in terminal racemes which are up to 6 in. long. Bracts membranous, with white edges, acuminate from a broad base, about .15 in. long; pedicels very short. Sepals ovate, elliptic with thin whitish edges. Petals broadly obovate or suborbicular, minutely denticulate somewhat unequal, much exceeding the sepals. Stamens 10, shorter than the petals, alternating with the glands of the disk and connate with them; styles 3 clavate at the ends. Capsule about .4 in. long, tapering surrounded by the marcescent floral leaves; coma of the seeds dirty white.

Bundelkhand (Jhansi Division).

Fl. October-April.

Tamarix gallica, *Linn.* The Tamarisk. Vern. *Jhau.* Sans. *Jhavuka, shavaka.* A gregarious shrub or small tree with rough bark. Leave amplexicaul. Flowers ·08 in. long, white or pink, bisexual in panicled spike-like racemes; bracts shorter than the flowers. Sepals triangular, obtuse, persistent; petals much exceeding the sepals: stamens 5, exserted, filaments about twice the length of the petals; disk 10-lobed. Capsule ·25 in.

According to Duthie fairly abundant in the Gangetic plain near rivers and in low-lying saline ground. I have not seen any in our area, nor are there any specimens at Dehra from our area. The galls and the manna are medicinal.

Fl. July-August.

X.—DIPTEROCARPACEÆ.

Usually resinous trees. Leaves alternate, simple, entire, with subparallel secondary nerves, stipulate. Stipules usually early deciduous. Flowers 2-sexual, in axillary or terminal panicles or racemes. Sepals 5, connate below, free or adnate to the base of the ovary, 2 or more of the sepals enlarging into wings in fruit. Petals 5, contorted, sometimes connate at the base. Stamens 5-15 or indefinite, and 1-many seriate, hypo-or sub-perigynous, free, connate, or adnate to the petals, filaments short, often dilated at the base,

anthers often aristate, basifixed. Ovary slightly sunk in the torus, usually 3-celled, style solitary; ovules usually 2 in each cell. Fruit usually nut-like, sometimes capsular, usually accompanied by the variously enlarged lobes of the calyx. Seeds usually exalbuminous, cotyledons fleshy.

SHOREA, *Roxb.*

Shorea robusta, *Gaertn.* The Sal tree. Vern. *Sál, sakhu, sakhui, sakhwa* Sans. *Sal, aswakarni.*

A large deciduous tree, usually gregarious with cylindrical crown up to middle age. Bark in young stems, dark-brown smooth or with a few cracks, dotted with minute specks, in older trees dark-grey or brown, thick, fibrous, longitudinally fissured. Tips of branchlets and stipules pubescent. Leaves 4-10 in. by 2-5 in., oblong or ovate-acuminate, usually with obtuse tip, base rounded or cordate secondary nerves 12-15 pairs, tough, subcoriaceous, shining and smooth; petiole .5-.8 in. long, terete; stipules .25-.8 in. long, caducous, falcate or somewhat obliquely linear-oblong usually with a central ciliate ridge on the inner face, covering the young buds. Flowers cream-coloured, about .5 in. long, short pedicelled, and usually unilateral on the branches of lax, terminal and axillary panicles. Inflorescence tomentose, usually with grey stellate tufts of hairs. Bracts fugacious, small, usually oblong. Sepals combined at the base and forming a short calyx tube which is adnate to the torus, all accrescent in fruit, ovate, tomentose outside. Petals exceeding the sepals in flower, lanceolate, tapering to a blunt tip which is twisted in bud, silky outside. Stamens many, in several series, much shorter than the petals, filaments abrupty dilated towards the base, connective produced into a setose awn. Ovary 3-celled, style subulate, persistent in fruit and forming a beak. Fruit .5-.7 in. long, ovoid, densely pubescent, with a thin outer shell; wings 5, subequal spatulate, oblong, minutely stellate pubescent, brown when dry, with 10-15 sub-parallel nerves. Cotyledons unequal, fleshy, long stalked on germination.

Pilibhit eastwards to Gorakhpur, also Banda, remarkably gregarious wherever found.

The most important timber tree of our area. It attains its best dimensions in Nepal. The wood varies when freshly cut from reddish-brown to nearly white. The latter is called *sakhui* in the eastern districts and is considered to be superior to the red variety. The timber is cross-grained, does not take a good polish and is liable to split and warp in drying. It is, however, our strongest and most durable timber for structural work. It yields a clear resin which is burnt as incense, and is used for caulking and in medicine. A large number of trees, specially in the more densely populated districts, have been ruined in the past by the practice of tapping for this resin. The seed is collected in large quantities for expressing an oil which is used for cooking and burning. The bark is used for tanning.

Blaze red or reddish-brown, fibrous, thick.
Fl. March-April. Fr. June-July.

XI.—MALVACEÆ.

Herbs, shrubs or rarely soft-wooded trees with mucilaginous juice and tenacious inner bark, herbaceous portions generally covered with stellate hairs. Leaves alternate, stipulate, simple, lobed or digitately compound, usually with strong basal nerves. Flowers usually 2-sexual, regular, axillary or terminal, solitary, fascicled, or cymosely panicled. Bracteoles 3 or more, free or combined often forming an epicalyx. Sepals 5, valvate in bud, free or connate. Petals 5, twisted, imbricate. Stamens many or indefinite, adnate to the base of the petals, usually monadelphous, forming a tube, less often pentadelphous, or free; adnate to the base of the petals. Anthers variously shaped, ultimately 1-celled. Ovary 2-many celled, of 2-3 or many carpels round a central axis. Ovules 1 or more in each cell, attached to inner angle of carpels, curved. Styles distinct or connate, stigmas usually linear or capitate. Fruit of dry indehiscent or dehiscent cocci, or a loculicidal capsule, sometimes large and woody. Seeds sometimes with woolly or silky hairs; endocarp scanty or 0; cotyledons folded or crumpled, leafy.

I. Stamens united in a tube; filaments free for a very short length or united all the way up. Herbs or shrubs (within our area):—

A. Fruit of many cocci separating from the axis:—

1. Styles as many as carpels; carpels 5 or more:—

a. Carpels with one ovule in each, cocci 1-seeded:—

Bracteoles below the calyx, 3. .. 1. *Malvastrum*.

Bracteoles 0. .. .. 2. *Sida*.

b. Carpels with more than one ovule; cocci usually more than 1-seeded; bracteoles 0. 3. *Abutilon*.

2. Styles twice as many as the carpels, carpels 5:—

Carpels opposite the petals; bracteoles 5. 4. *Urena*.

Carpels opposite the sepals; bracteoles 10. 5. *Pavonia*.

B. Fruits capsular:—

Stigmas spreading, distinct; bracteoles usually 5, or more, usually prominent. .. .. 6. *Hibiscus*.

Stigmas connate; bracteoles 5, minute, deciduous. .. .. .. 7. *Thespesia*.

I. Stamens united at the base only, dividing into 5 bundles, sepals coriaceous; fruit capsular. Trees:—

L. simple; bracteoles 4-6; capsule 3-valved... 8. *Kydia*.

L. digitate; bracteoles 0; capsules 5-valved... 9. *Bombax*.

1. MALVASTRUM, *A. Gray*.

Malvastrum coromandelianum, *Garcke*. Syn. **M. tricuspidatum**, *A. Gray*.

An erect undershrub or a perennial herb up to 3 ft. high, covered with stellate hairs, the free arms of which are adpressed, on the under surface of leaves, petiole and calyx. Leaves .7-3 in. long, ovate or

ovate-lanceolate, irregularly serrate, 5-nerved at the base, strigose with simple hairs above; petiole up to 1.2 in. long, stipules linear. Flowers yellow, solitary; .5-.7 in. across; bracteoles 3, half the length of the calyx. Calyx-lobes triangular, cleft nearly halfway down. Petals exceeding the calyx. Carpels 8-10; reniform, strigose 3-cuspidate, indehiscent when ripe.

Originally introduced, but now a common weed of waste lands, specially on fresh soils. A good fibre can be obtained from the stems. Closely resembles a Sida from which it can be easily distinguished by the presence of bracteoles.

2. SIDA, *Linn.*

Herbs or undershrubs. Leaves simple or lobed. Flowers rather small, usually yellow to nearly white; axillary, solitary or clustered, bracteoles 0. Peduncles often jointed. Sepals united below the middle. Staminal-tube dividing at the top into many anther bearing filaments. Carpels 5 or more, styles as many as the carpels, stigmas terminal. Ripe carpels 2-awned separating from the axis, dehiscing on the inner face; seeds solitary, pendulous.

The flowers of Sidas open towards midday. They usually flower and fruit throughout the year.

The following species which are usually woody may be mentioned:—

1. **S. veronicæfolia**, *Lamk.* Syn. **S. humilis**, *Willd.* Sans. *Bhumi-bala.*

An erect or procumbent undershrub or perennial herb; covered with stellate and also with simple spreading hairs. Leaves very variable, .4-3.5 in. long, ovate or suborbicular, cordate, acute, or acuminate, crenate-serrate, membranous, usually dark green, base 5-9 nerved. Flowers axillary, solitary, or in pairs, sometimes racemose by suppression of leaves. Peduncle jointed just above the middle, slender. Flowers pale yellow. Carpels 5, smooth, shortly cuspidate or mucronate.

The leaves are usually larger in forest forms. All over the circle in waste lands, open forests and clearings. The leaves are medicinal.

2. **S. spinosa**, *Linn.* Vern. *Bariara, gulsakari.* Sans. *Nagabala.*

A small undershrub up to 3 ft. high, rough with minute stellate pubescence. Leaves .4-2 in. long, ovate, obovate or rhomboid, crenate-serrate, rounded or subacute at the apex, base truncate, narrowed or subcordate, 3-7 nerved, glabrescent above, softly stellate tomentose beneath; petiole up to 1 in long sometimes with 1-3 tuberculate spines at the base. Flowers pale-yellow about 1.5 in across usually solitary on axillary, slender, peduncles .5-.7 in. long, which are jointed above the middle often near the calyx. Calyx ribbed longitudinally, lobes triangular, hairy outside. Carpels 5, thin walled, almost equalling the calyx, with 2 stiff, divergent, subulate, pubescent awns, half the length of carpels (or longer).

Common in waste lands, and clearings in forests throughout. Very variable in size and shape of leaves, length of podicels and habit. The leaves and roots are medicinal. The leaves are said to be demulcent and refrigerant.

3. S. grewioides, *Guill. Perr and A. Rich.*

A stellate tomentose undershrub attaining 3 ft. Leaves .3.-1 in. elliptic or obovate, coarsely crenate-serrate, tomentose on both surfaces, petiole shorter than the blade. Flowers white about .5 in. across, 1-2 on peduncles which are usually shorter than the petioles and indistinctly jointed below the tomentose calyx. Carpels 7-8, exceeding the calyx when ripe, reticulate on the back, awns short.

Etawah (Duthie).

4. S. carpinifolia, *L.* Syn. **S. acuta,** *Burm. f.* Vern. *Kharenta,* Sans. *Balaphanijvika.*

An erect undershrub, sometimes almost shrubby, with tough stem and sparsely stellate hairy branchlets. Leaves .7-2.7 in. lanceolate-oblong to linear-lanceolate towards the top of shoots, coarsely serrate, glabrescent with age, acute or subacute; petiole up to .25 in. long, shorter than the linear acuminate stipules. Flowers yellow, peduncles solitary, jointed about the middle. Calyx nearly glabrous. Carpels 5-10 not hairy; prominently reticulate on the back, toothed on the sides; awns short, about a third of the length of the carpels.

A common waste land weed. An excellent fibre is obtained from the plant. The roots, juice, and leaves are medicinal.

5. S. rhombifolia, *Linn.* Vern. *Lal barıala.* Sans. *Atibala, pita pushpa.*

An erect pubescent undershrub. Leaves variable .7-2 in. long, sometimes larger; lower rhomboid-lanceolate or broadly obovate, coarsely serrate, entire towards the 3-5 nerved base, glabrescent above, grey pubescent beneath; petiole short, about .2 in. long; stipules setaceous exceeding or equalling the petioles. Peduncles axillary or corymbosely clustered towards the ends of branches; jointed usually above the middle. Sepals hairy; lobes triangular, acute, petals yellow, streaked with darker coloured veins. Carpels 5-10, usually pubescent, awns short.

Common in clearings, etc. The following varieties are found within ou area :—

Var. 1. rhomboidea, *Roxb. L.* rhomboid-lanceolate peduncles reaching half the length of the blade or longer; jointed at the base; awns very short inflected.

Var. 2. obovata *Wall.* L. broadly obovate, base cuneate, peduncle longer than the petiole but shorter than the leaf blade; joined about the middle.

A form with long peduncles exceeding the leaves and smooth carpels without awns has been collected by Duthie from Kheri.

The fibre is excellent and could be used commercially.

6. S. cordifolia, *Linn.* Vern. *Lal-kharenti.* Sans. *Balyalaka.*

An erect undershrub covered with long spreading hairs and also with stellate pubescence. Leaves 1-2 in. long, ovate-cordate, obtuse, crenate, softly grey tomentose on both surfaces, base more or less cordate, 5-7-nerved. Petiole slightly longer than the blade. Peduncle solitary or few together, often crowded at the ends of branches, jointed near the flower. Calyx densely covered with spreading hairs. Petals yellow. Carpels 9-10; strongly reticulate on the back, awns extruded from the calyx, divergent, covered with stiff reflexed hairs.

Common in clearings, open forests, and waste lands. It yields a strong fibre. The seeds, leaves, and roots are medicinal.

3. ABUTILON, *Tournef.*

Herbs and shrubs more or less pubescent. Leaves angled or palmately lobed. Inflorescence axillary or terminal. Flowers usually solitary on peduncles. Bracteoles 0. Sepals, petals, and stamens as in Sida. Carpels 5-indefinite; styles as many as the carpels; ripe carpels separating from the axis, awned or not, 1-more seeded; seed reniform.

Very closely allied to Sida; the flowers are usually larger and generally open (in Indian spp.) in the evening. They are in flower and fruit like the Sidas throughout the year. The following more or less woody species may be mentioned:

1. A. asiaticum, *G. Don.*

Tomentose with spreading hairs and dense shorter pubescence. Leaves 2-4 in. long ovate or suborbicular-cordate, acute, irregularly toothed, softly tomentose on both surfaces; petioles up to 2.5 in. long. Peduncles stout, longer than the petioles, jointed near the calyx. Flowers yellow, "2 in. across" —*Duthie.* Calyx velvety, lobes broad acute. Ripe carpels 20, densely hispid outside, seeds smooth.

Bundelkhand (*Edgeworth*), Gonda. I have seen no Bundelkhand specimens in the herbarium of the Forest Research Institute.

2. A. indicum, *Sweet.* Vern. *Bara-bariari, kangai, kakai,* (Et.)

An undershrub sometimes woody and tall or an annual, hoary-felted. Leaves small about 3 in. long, suborbicular-cordate, irregularly toothed, acute or short acuminate greyish-green, minutely pubescent on both surfaces, undersurface paler and softer, petiole usually longer than the blade; stipules linear, deflexed. Flowers orange yellow about 1 in. across, usually solitary, on stout peduncles which are generally longer than petioles and jointed near the top. Calyx downy. Carpels 15-20, exceeding the calyx; awns short, spreading, at first tomentose, glabrescent later; seeds minutely stellate hairy.

A common weed in open forests and waste lands. The stem yields an excellent fibre. Various parts of the plant, e.g. leaves fruits, seeds, roots, are medicinal.

3. A. graveolens, *W. & A.*

Erect undershrub, rather woody. Stems covered with long spreading hairs and shorter sticky pubescence. Leaves 2-3.5in. long, orbicular-cordate abruptly short acuminate, softly tomentose on both sides; petioles equaling the blades or sometimes slightly longer. Peduncle jointed above the middle. Flowers orange, turning pink. Carpels 20 or more, without awns; seeds with minute stellate hairs.

Gonda, Etawah—*Duthie.*

4. A. ramosum, *Guill.*

Shrubby, stem downy, with a few spreading hairs intermixed. Leaves 2 in. or more long, covered on both surfaces with minute pubescence, cordate, subtrilobate; or 3-angled; petiole often shorter than the blade. Peduncles often branched from above the middle and bearing 2-3 flowers. Pedicels jointed close to the flower. Calyx lobed to the middle. Flowers about .5 in. across, yellow. Carpels 8-10, exceeding the sepals, with spreading beaks, seeds dotted.

Bundelkhand (*Edgeworth*). I have seen no specimens from our area

4. URENA, *Linn.*

Urena lobata, *Linn.* Vern. *Lapetua, pithia, bachita.*

An erect undershrub, 2-4 ft. high, stem densely tomentose. Leaves 2-4 in. long, broader than long, 3-7 lobed, lobes pointed, base cordate or rounded 5-7-nerved, softly hairy on both surfaces, mid-rib and sometimes a nerve on either side with a glandular pore. Petiole ·5-·6 in. long. Flowers up to 1 in. across, pink with a dark centre, clustered in leaf axils; pedicels short. Bracteoles 5, united at the base, adnate to the calyx, stellate pubescent. Calyx lobes lanceolate. Petals connate below and adnate to the staminal tube, anthers nearly sessile on the staminal tube. Carpels 5, ovule 1 in each. Style 10-branched, stigmas capitate. Ripe carpels densely tomentose, covered with spines, bearing 2-5 recurved bristles on the top.

A common weed throughout the area; usually an annual. The stem yields good fibre.

U. repanda. *Roxb.*—An erect much branched herb or undershrub, covered with stiff stellate hairs all over. Leaves variable, up to 3 in. across, upper lanceolate; the lower roundish, acute, irregularly toothed, obscurely lobed, base cordate, 5-7-nerved. Flowers axillary, solitary, or in short racemes about 1 in. across, pink. Bracteoles subulate, exceeding the calyx, connate at the base. Carpels smooth.

Pilibhit, Bahraich, (probably also other divisions in Oudh) and Gorakhpur.

Fl. rainy season.

5. PAVONIA, *Cav.*

Pavonia zeylanica, *Cav.*

An undershrub, branches, petioles and peduncles covered with spreading hairs intermixed with short glandular pubescence. Leaves small up to 1 in. in diameter, roundish in outline, usually 3-lobed, middle largest, coarsely toothed; less often entire, covered on both surfaces with stellate hairs; petioles often longer than the blade up to 1.25 in. long; stipules filiform. Peduncles 1-flowered, up to 1·3 in. long, jointed near the top. Flowers pink, about .4 in. long. Bracteoles usually 8-9, setose, covered with stiff, long hairs, about twice the length of calyx, free, up to .3 in. long. Calyx lobes lanceolate, ciliate. Petals exceeding the bracteoles. Ovary 5-celled, styles 10; carpels separating from the axis on maturity, glabrous (when ripe), narrowly winged, enclosed in the persistent involucre of bracteoles.

Etawah, Banda.

Fl. end of rainy season.

P. odorata, *Willd.* Vern. *Sugandha bala.* Sans. *Bala heivara.*

An erect herb 1-3 ft. high; stem petioles and peduncles covered with viscid pubescence and few spreading hairs. Leaves .5-2 5 in. long, orbicular or roundish ovate, slightly lobed or angled, lobes acute, distantly toothed, both surfaces stellate hairy, grey beneath, base broadly cordate or truncate; petioles longer than the blades up to 3.5 in. long; stipules linear. Flowers pink or white, ·75 in. across peduncles jointed near the top, up to 2 in. long. Involucral bracteoles 10-12. Carpels 5, smooth, not winged.

Bundelkhand—*Duthie.* There are no specimens from our area at Dehra. An excellent fibre is obtained from the stem. The root is aromatic and is used medicinally.

6. HIBISCUS, *Medik.*

Herbs, shrubs or rarely trees. Leaves more or less palmately lobed. Inflorescence axillary or in terminal racemes by suppression of upper leaves. Bracteoles 5 or more, rarely 0, free or connate at the base. Calyx 5-toothed, sometimes spathaceous, lobes valvate. Petals adnate to the staminal tube at the base. Staminal-tube truncate or 5-toothed at the apex; filaments numerous. Ovary usually 5-celled, with 3 or more ovules in each cell. Styles 5, connate below. Capsule loculicidally 5-valved, sometimes with false dissepiments, forming spuriously 10-celled fruit. Seeds glabrous; tomentose or woolly.

A genus of no forest importance. The following species may be mentioned :—

1. H. hirtus, *Linn.* Shrubby, branches rough with stellate pubescence. Leaves up to 3 in. long, ovate-acuminate, cordate, irregularly serrate, covered on both surfaces with stellate pubescence, mid-rib with a linear gland beneath; lower leaves angled or lobed; petioles shorter than the blade, up to 2 in. long, covered with spreading hairs and stellate pubescence; stipules subulate up to ·4 in. long. Flowers white or pink about ·1 in. across solitary, on peduncles which are equal to or longer than the leaves, jointed below the flower and covered with spreading hairs. Involucral bracteoles 6-9, shorter than the calyx lobes, subulate; calyx deeply divided, lobes linear-lanceolate, both hirtellous, staminal tube toothed at the apex, anthers in tufts. Capsule hairy; seeds covered with white wool.

"Etawah, Bundelkhand"—*Duthie.* There are no specimens from our area in Dehra herbarium.

2. H. micranthus, *Linn.* An undershrub, rough all over with stiff stellate hairs. Leaves up to 1.25 in. long, ovate-elliptic, oblong or lanceolate, coarsely serrate; petiole usually very short, sometimes up to 1 in. long, stipules subulate about ·25 in. long. Flowers about ·5 in. across, white or pink, solitary, on peduncles which usually exceed the leaves and are jointed near the top. Bracteoles 7-8, subulate, shorter than the calyx lobes. Calyx deeply divided, lobes lanceolate. Anthers in tufts on the staminal tube. Capsule globose, abou t·25 in. long, seeds reniform, cottony.

Jhansi, Agra district, and Etawah in ravine lands, probably also Banda.

Fl. February-June. Fr. October-November (?).

3. H. Gibsoni, *Stocks.* An erect undershrub, stems more or less bristly. Leaves 1-3 in. across, deeply palmately divided; lobes up to 2·7 in. long, usually lanceolate, serrate, covered with stellate hairs when young, glabrescent later; petiole up to 2·5 in. long. Peduncles 1-flowered exceeding the leaves, jointed near the top. Involucral bracteoles 9-12; 1-1·5 in. long, slightly connate at the base, linear-subulate somewhat stiff, covered with scattered stiff hairs, exceeding the calyx and bending over them. Flowers yellow with purple centre usually 2 in. long. Sepals thin, lanceolate, acuminate, with three or more prominent ascending nerves. Corolla exceeding the bracteoles Capsule pointed, covered with spreading bristles, about as long as the sepals. Seeds pilose.

Jhansi Banda, Etawah.

Fl. August-January (?)

4. H. ficulneus, *Linn.* A tall annual. Branches prickly with sharp bristle-tipped tubercles. Leaves up to 7 in. long, orbicular-cordate, 3-5, angled or lobed, coarsely crenate, rough hairy; petiole up to 8 in. long. Flowers 1-1·5 in. across, white with pink centre; peduncles up to 1 in. long, upper racemed on leafless branches. Bracteoles caducous villous. Calyx spathaceous, villous. Capsules 1·5 in long, pointed, gland pubescent when young, hispid later.

Bundelkhand—*Duthie.* The stem yields an excellent silky fibre.

The following species are commonly cultivated in our area :—

5. H. cannabinus, *Linn.* Vern. *Patsan.* An annual or perennial. Leaves deeply palmately lobed, lower cordate this; lobes lanceolate, serrate, midrib with a linear gland; petioles bristly; lower longer than leaf blades. Peduncles very short. Flowers 2 in. long, yellow with crimson centre. Capsule bristly, pointed. Cultivated for its fibres as a rainy season crop.

6. H. sadariffa, *Linn.* The roselle or red sorrel. Vern. *Patwa, Lal ambari.* Stem and petioles often red. Leaves mostly deeply 3-lobed, sometimes lower leaves simple. Flowers yellow. Calyx accrescent and fleshy in fruit; usually red.

Fl. rainy season. Fr. cold season. The acid calyces are put much to the same use as tamarind. It is also made into jelly.

7. H. esculentus, *Linn.* Lady's fingers, okra. Vern, *Bhindi, ramturai.* Sans *Tindisa.* A stout bristly annual, with 5-7 lobed, coarsely toothed hirsute leaves; yellow flowers with purple centre and ribbed tapering capsules up to 10 in. long. Largely cultivated for the green fruits during the rainy season which are used as vegetables.

8. H. mutabils, *Linn.* A large shrub or a small tree, with broad 3-5-lobed, stellate-pubescent, coarsely toothed leaves, 4-9 in. across and handsome usually double, white or pink flowers, 3-5 in. across which change to red in the evening.

A native of China, but has been long cultivated in India.

9. H. rosa-sinensis, *Linn.* The common garden Hibiscus, the chinese shoe flower. Sans. *Japa.* Vern *Gurhal.* A well-known ornamental shrub. It has numerous single and double varieties varying in colour from brilliant crimson to yellow. Staminal tubes exserted beyond the petals. The leaves are 2.5-3·5 in. long nearly glabrous or with a few stellate hairs on the nerves beneath, ovate-acuminate, coarsely [illegible] sometimes lobed.

10. H. syriacus, *L.* Vern. *Gurhal.* Sans. *Japa.*—Branches usually erect. Leaves up to 2 in. long, ovate or rhomboid-ovate upper more or less lobed, coarsely toothed, calyx scurfy, corolla usually lilac-blue with dark-purple centre or white. Common in gardens. Frequently made into hedges.

Fl. rainy season. Native country unknown.

11. H. schizopetalus *Hook. f.* L. narrow, ovate, coarsely toothed, usually 1·5-3 in. long. Calyx spathaceous. Corolla red or orange, petals deeply lanciniate and reflexed; staminal column long, slender, pendulous.

Flowers hot and rainy season. A native of Africa.

7. THESPESIA, *Soland.*

Thespesia macrophylla, *Blume.* Syn. **T. Lampas,** *Dalz. & Gibs.* Vern. *Bankapasi.*

A stout undershrub up to 5 ft. high, young parts rusty pubescent. Leaves 4-7 by 3-6 in. across, usually palmately 3-lobed; lobes usually acuminate, middle largest; upper leaves undivided ovate-acuminate, base broadly cordate, usually 5-nerved, midrib with a pore near the base, rather rough above and softly stellate-tomentose beneath, both surfaces with raised dots; petiole up to 4 in. long; stipules subulate, caducous. Flowers 3-4 in. across yellow, with crimson centre. 1-3, on axillary peduncles up to 5 in. long which branch near the top; pedicels, 2-5 in. long. Bracteoles setaceous, caducous; calyx cupular with subulate teeth up to ·3 in. long from a truncate margin; corolla lobes convolute. Staminal-tube 5-toothed at the apex. Capsule ovoid, pointed 1 in. long somewhat woody, seeds smooth.

Pillibhit, Oudh forests, and Gorakhpur.

Frequently occurs as undergrowth in sal forests. The bark yields strong and useful fibre.

T. populnea, *Soland.*—a small tree with long petioled, roundish, cordate, acuminate, entire glabrous leaves, 3-5 in. long; yellow flowers which fade to pink or purplish and globose capsules. An inhabitant of sea coasts of India, occasionally cultivated in gardens within our area.

8. KYDIA, *Roxb.*

Kydia calycina, *Roxb.* Vern. *Pula, pataeh, patuli.*

A moderate-sized deciduous tree with pale-grey bark, exfoliating in narrow long strips. Young parts inflorescence, petioles and under-surface of leaves stellate tomentose. Leaves 3-6 in. across,

suborbicular-cordate, palmately 5-7-nerved beneath, with a glandular slit on the midrib and sometimes on the lateral nerves on either side, more or less lobed or angled, somewhat rough with stellate hairs or glabrate above, under-surface paler. Petioles 1-2 in. long; stipules caducous, spatulate. Flowers ·5-·7 in. across white or slightly pink, in many-flowered much branched panicles, polygamous, usually dicœcious; pedicels up to .4 in. long. Bracteoles 4-6, connate below, ovate in flower; accrescent, spreading, brown, oblong-spathulate, and strongly veined in fruit. Calyx rusty tomentose, not deeply divided, lobes ovate, incurved over the capsule; persistent in fruit. Petals obovate exceeding the sepals, adnate to the staminal tube, ciliate when young, clawed, densely shaggy on either side near the base. Staminal-tube divided into 5 branches from near the middle each bearing 3-5 anthers. Ovary 3-celled; 3-styled. Capsule subglobose the size of a pea, mealy with very dense stellate hairs. Seeds 3, oblique, finely reniform, striate.

Common throughout.

The inner bark is used for clarifying *gur*. The fibres could be made into rough cordage. The wood is soft and is as yet used mainly for fuel.

Blaze pinkish white. Conspicuous when leafless on account of the persistent bracteoles. Leafless January-April. Fl. rainy season.

9. BOMBAX, *Linn.*

Bombax malabaricum, *DC.* Vern. *Semal.* Sans. *Shalmali, Panchaparni.*

A tall deciduous tree, with whorled branches usually with buttressed trunk. Bark ashy grey, smooth when young, fissured with age; branches and young stems with pointed conical prickles with woody bases. Leaves digitately compound, with 5-7 leaflets; common petiole 4-12 in. long; stipules short, triangular, caducous. Leaflets 3-8 in. long, lanceolate, oblong or elliptic-lanceolate or oblanceolate, acuminate usually cuneate at the base, entire smooth, coriaceous; petiolules up to 1 in long. Flowers 3-4 in. across, crimson or orange, fleshy, crowded at the ends of the branches on short fleshy pedicels. Calyx cup-shaped, fleshy, silky inside, shortly lobed; lobes rounded. Petals oblong, 3-6 in. long, stellate pubescent outside, recurved, closely parallel veined. Stamens numerous, adnate to the base of the petals and much shorter than them, arranged in an outer series of 5 bundles of several stamens each, and an inner series of 15 stamens, of which the innermost 5 are longest and forked, deep pink, sparingly covered with spreading hairs; filaments flattened at the base. Ovary 5-celled

style exceeding the stamens; stigmas spreading. Capsule 5-7 in. long, woody, 5-angled, oblong-ovoid. Seeds smooth, surrounded by long white silk cotton.

Common throughout the area.

The wood is used for well curbs, packing cases and manufacture of matches and has a fair demand. The young calyces of the buds are eaten as vegetable. The cotton is particularly suitable for stuffing pillows, cushions, etc. The seeds form nutritious cattle food. The tap root of the young plant is valued as a tonic. The gum (known as *mocharas*) contains a large quantity of tannin and is on this account used medicinally. The dry young fruits, flowers, and bark are also medicinal.

Blaze pink streaked with white and paler pink, fibrous, thick.

Fl. January-March. Fr. April-May.

Adansonia digitata, *Linn.*Eng. The Baobab or monkey bread tree. Arab. *Hujid.* A moderate-sized tree, with spreading branches. Leaves digitate, with 5 sub-sessile, obovate-oblong leaflets. Flowers large, white, pendulous, on long peduncles. Fruits large gourd-like, woody.

The trunk attains an enormous diameter and becomes barrel-shaped with age. Occasionally cultivated, e.g. Cawnpore; Allahabad, etc., not common. Native of Africa. The subacid pulp of the fruit is edible.

XII.—STERCULIACEÆ.

Herbs, shrubs (rarely climbing) or trees, often with mucilaginous bark and strong bast, herbaceous portions usually more or less (often stellate) pubescent. Leaves alternate, stipulate, simple, palmately lobed or digitate. Inflorescence axillary and terminal, usually cymose. Flowers usually regular, uni-or bi-sexual. Sepals 5, usually connate. Petals 5 or 0. Stamens usually many, more or less monadelphous. Anthers 2-celled, cells parallel or divergent. Ovary sessile, or stipitate, of 2-5 connate or more or less free carpels, rarely of 1 carpel; ovules on the inner angles of the carpels. Fruit various, often dry and dehiscent, on a woody stipe.

I. Flowers unisexual or polygamous; petals 0:—
Fruit of radiating follicles .. .. .. 1. *Sterculia.*

II. Flowers bisexual; petals present:—

A. Flowers irregular; fruit of spirally twisted follicles. .. .. .. 2. *Helicteres.*

B. Flowers regular; fruit capsular:—

1. Petals deciduous; staminal column long; seeds winged:—
Staminal column with staminodes. 3. *Pterospermum.*
Staminal column antheriferous throughout. .. .. 4. *Eriolæna.*

2. Petals persistent; staminal column short; seeds not winged:—
Fertile stamens 15; bracteoles caducous. .. .. 5. *Pentapetes.*
Fertile stamens 5; bracteoles persistent. .. .. 6. *Melhania*

1. STERCULIA, *Linn.*

Trees. Leaves digitate or palmately lobed, sometimes undivided. Flowers usually in panicles. Calyx 4-5-fid or-partite. Anthers sessile in a head or ring on the staminal column. Ovary of 5, nearly distinct carpels, stigmas radiating. Ripe carpels distinct, usually on a long gynophore, opening before ripening; seeds one or more in each carpel, often winged, sometimes arillate; endocarp adhering to cotyledons.

I.	Follicles leathery and stiff; leaves tomentose beneath :—		
	Outer bark papery; leaf lobes usually entire; follicles bristly; inflorescence usually viscid-pubescent, erect.	1.	*S. urens.*
	Bark not papery; leaf lobes often lobed or toothed; follicles downy; inflorescence tomentose, drooping.	2.	*S. villosa.*
II.	Follicles papery; leaves glabrescent.	3.	*S. colorata.*

1. Sterculia urens, *Roxb.* Vern. *Katila, katira, karar.*

A middle-sized deciduous tree with white and pinkish smooth bark, the outer layer of which peels off in papery flakes and leave irregular depressions on the bark. Young parts rusty tomentose. Leaves 8-12 in. across, crowded at the ends of the branches, usually palmately 5-lobed; lobes short, caudate-acuminate, entire sinuses usually broad, sparsely pubescent and somewhat rough above, softly grey tomentose beneath, membranous, base cordate, 5-7-nerved. Petioles 6-9 in. long. Flowers small about ·25 across, greenish-brown, polygamous, in erect, densely viscid pubescent panicles, up to 10 in. long, which are crowded at the ends of the branches. Bracts lanceolate-acuminate; bracteoles narrower and smaller; both caducous. Calyx campanulate; lobes acute, hairy, with glandular tufts of hairs at the base; stamens in bisexual flowers in a ring round the carpels, in males united in a column. Follicles 3-6, up to 2 in. long, leathery, tip acuminate, densely beset with reddish-brown stinging hairs; seeds .25 in. long, reddish-brown, oblong, more or less terete.

Jhansi, Banda, in dry hilly country.

A gum (*katira*) exudes from the bark and is used medicinally as a substitute for gum tragacanth to which however it is inferior. The seeds are eaten and the bark yields a coarse fibre.

Blaze brown, deeper layers pink-edges green, 1-1·5 in.

Fl. December to February. Fr. hot season. Leafless from November and December to May.

2. Sterculia villosa, *Roxb.* Vern. *Udal, udala, udar, gudal.*

A middle-sized deciduous tree, with smooth grey bark. Young parts and inflorescence rusty or tawny tomentose. Leaves 9-18 in. across, crowded at the ends of branches, usually 5-7-lobed; lobes abruptly acuminate, entire, toothed or cleft, sinuses deep and narrow, glabrescent or sparsely stellate pubescent above, softly tomentose with matted stellate pubescence intermixed with spreading hairs beneath; base usually 7-nerved, cordate; petiole 9-24 in. long, at first tomentose, becoming smoother with age; stipules up to 1 in. long, obliquely lanceolate-acuminate, caducous. Flowers yellowish, about .5 in. long, in drooping panicles. Panicles fascicled at the ends of branches and up to 14 in. long, male and female flowers mixed; males more numerous. Bracts linear. Calyx membranous, campanulate, lobed half way down, pubescent outside, pinkish inside. *Male flowers.*—Anthers on a pink staminal column. *Female flowers.*—Staminodes in a membranous ring below the ovary on the gynophore; ovary of 5 carpels, villous; styles often deflexed. Follicles up to 5, 1-2 in. long, tapering at both ends, rusty villous, red inside, gynophore woody. Seeds dark-brown with a small black shining aril at the base.

Throughout the area.

A coarse fibre is obtained from the bark which is used for cordage. A clear gum exudes from the tree which is sometimes put to the same use as the gum of *S. urens.*

Blaze pink or pinkish brown.

Fl. March-April. Fr. May-June. Leafless December-May. Leaf scars prominent.

3. Sterculia colorata, *Roxb.* Vern. *Samari.*

A moderate-sized deciduous tree, with spreading crown and dark grey bark. Leaves 4·5-10 in. across, crowded at the ends of the branches, broader than long, variable in shape; 3-5-angled or variously lobed, lobes acuminate, entire, pubescent when young, glabrous on both surfaces with age, thin but tough, base cordate or truncate, 5-7 nerved. Petiole up to 8 in. long; stipules caducous, subulate. Flowers up to .8 in. long, in dense panicles at the ends of branches, which are up to 4 in. long, both densely clothed with orange-red stellate tomentum. Calyx funnel-shaped. ultimately purplish; lobes very short, acute; tube long, stellate-pubescent within, with a ring of tufted hairs below the middle, persistent in fruit. Anthers up to 30, on a membranous ring, at the end of a sparingly pubescent gynophore, which is ultimately extruded beyond the calyx, closely surrounding the 5 minute carpels. Follicles 2-3 in. long, on a long stipe, foliaceous, prominently veined, oblong, obtuse, pinkish, bearing a wrinkled seed on either margin opening before maturity.

Pilibhit, Gonda. A handsome tree in foliage; sometimes buttressed at the base.

Blaze soft, white with yellowish bands.

Leafless January-May. Fl. before the leaves March-April. Fr. April-May. Sometimes attains a fairly large size.

2. HELICTRES, *Linn.*

Helictres Isora, *Linn.* Vern. *Maror-phal, murra.* Sans. *Avartani.*

A shrub with tenacious bark; young parts densely stellate tomentose. Leaves distichous, 3-6 by 2-5·5 in., broad oblong, suborbicular, or obovate, acute, irregularly crenate-serrate, often rough above, densely pubescent beneath, usually oblique and 5-7-nerved at the base; petiole ·2-·4 in. long, pubescent; stipules subulate, deciduous. Flowers zygomorphic, about 1·5 in. long, brick-red, solitary or in few flowered axillary or extra-axillary clusters, bractetate; pedicels ·2-·5 in. long. Calyx ·6-·8 in. long, curved, laterally compressed, gibbous, stellate brown, pubescent outside, teeth unequal. Petals 5, very unequal, reflexed much exceeding the calyx, lower two largest, long clawed, claws margined. Staminal column adnate to the exserted gynophore, which is sparingly covered with deciduous blackish glands towards the bent, and somewhat dilated, apex. Anthers 10, on short stalks alternating with 5 minute staminodes, and arranged in a ring round the ovary; ovary 5-celled, conical, carpels more or less spirally twisted, styles connate, reflexed. Fruit 1·5-2 in. long, of 5 spirally twisted carpels on a long gynophore.

Throughout the area, very common in glades and open forests.

The bark yields a strong fibre. The seeds roots and bark are medicinal.

Bark nearly smooth. Blaze yellowish darkening on exposure, fibrous.

Leafles March. Fl. rainy season. Fr. cold season.

3. PTEROSPERMUM, *Schrib.*

Pterospermum acerifolium, *Willd.* Vern. *Muchkand, kath champo.* Sans. *Karnikara.*

A large evergreen handsome tree with smooth grey bark. Young parts and inflorescence covered with floccose, rusty, stellate tomentum. Leaves 4-12 in. long, roundish or oblong, often lobed or distantly and irregularly toothed palmately 8-10-nerved and cordate or peltate at the base, coriaceous, dark-green and ultimately smooth above, ashy or brownish tomentose beneath, petioles up to 6 in. long; stipules multifid, caducous. Flowers white, fragrant 5-6 in. across, solitary or in few flowered short cymes. Bracteoles multifid, deciduous. Calyx fleshy, deeply divided, lobes up to 4·5 in. long, linear-oblong, rusty floccose outside, with a villous band along the middle and downy on the edges within. Petals white, shorter than the sepals, linear, tapering towards the base. Stamens 15, in 3 groups, each alternating with much longer staminodes, both inserted below the ovary on a staminal column which is fused with the gynophore. Ovary oblong, densely villous, 5-celled, 5-angled, style 1, stellate, tomentose towards the base, glabrescent and clavate

above. Capsule 5-angled, up to 6 in. long, woody, oblong, narrowed towards the base, dark-brown, scurfy, seeds obliquely oval, compressed, winged.

Gonda, Kheri, doubtfully wild. The tree is frequently cultivated in gardens within our area.

The calyx is medicinal. It is used for glandular swellings on the neck and ears

Fl. March-June. Fr. cold season.

4. ERIOLOÆNA, *DC.*

Trees or shrubs. Leaves simple, palmately nerved, downy or stellate tomentose beneath. Flowers large, yellow on 1-many-flowered peduncles. Bracteoles 3-5, usually laciniate, sometimes small and caducous. Calyx at first spathaceous, later on 5-partite. Petals deciduous, staminal tube short bearing many antheriferous filaments. Staminodes 0. Ovary sessile, 5-10 celled, enclosed by the staminal tube, styles connate, stigmas 5-10; ovules many in each cell. Capsules woody, villous at the inner angles of the valves on stout peduncles, which are often sharply bent near the top. Seeds winged above, albumen thin.

Young parts villous with stellate hairs; flowers 2-4 in. across; peduncle 1-flowered; capsules not tubercled.	1. *E. Wallichii.*
Young parts scurfy stellate; flowers up to 2 in. across; peduncle 1-few flowered; capsules tubercled.	2. *E. Hookeriana.*

1. Eriolæna Wallichii, *DC.* A tall deciduous shrub or small tree, with reddish-brown bark, young parts shaggy. Leaves 3-8 in. across, roundish or broadly ovate-cordate, shortly acuminate or acute, irregularly crenate, upper surface somewhat rough and stellate pilose, under-surface softly tomentose, base 7-9-nerved, petiole up to 2 in. long, tomentose; stipules up to 1 in. long, deciduous, linear-lanceolate, irregularly lobed or laciniate. Flowers showy bright yellow about 4 in. across usually solitary on stout shaggy peduncles which are shorter than the leaves, jointed below the flower, and bent at the joint in fruit. Bracts scarious small; bracteoles larger up to ·8 in. long, shaggy enclosing the buds, both laciniate—the latter more closely. Calyx 5-partite, densely tomentose outside, villous within; sepals up to 1·2 in. long, linear-lanceolate, acuminate. Petals orbicular with a short dilated hairy claw. Staminal-tube glabrous; ovary villous. Capsule ovoid about 1·5 in. long, 8-valved, rough with brown stellate scurf, surface slightly rugose.

Gorakhpur (Ramgarh), Gonda, Jhansi.

Flowers with new leaves in April-May and also probably the rainy season (second flush?) Fruits cold season. Leafless end of cold season.

2. Eriolæna Hookeriana, *W. & A. Prodr.* Vern. *Barbainda (J), kapasi.*

A deciduous shrub or a small tree, young shoots and inflorescence stellate scurfy. Leaves 3-6 in. across, round cordate, short acuminate, more or less rough with stellate pubescence, or glabrescent above, usually grey tomentose or pubescent beneath, irregularly crenate-serrate, usually 5-7 nerved at the base; petiole 1-3·5 in. long, stout, stellate hairy, ultimately glabrescent. Flowers up to 2 in. across, yellow, 1—few on peduncles which are usually longer than the petioles; bracteoles shorter than the calyx, laciniate, pinnatisect, grey tomentose. Sepals linear-lanceolate, acuminate, tomentose outside, adpressed pubescent within; glandular at the base, smaller than in the last species. Petals obovate, claw dilated and pubescent within. Ovary villous; style stellate pubescent. Capsules about 1 in. long, ovoid, tapering and somewhat apiculate, 8-10 valved, valves scurfy when mature, tubercled.

Banda, Jhansi, Mirzapur.

Fl. April-July with new leaves. Fr. Cold season.

Eriolæna Candollei, *Wall.* A small tree with grey bark and stellate pubescent young parts. Leaves up to 5 in. long, broadly ovate, acuminate or acute, glabrescent or stellate hairy above, grey tomentose beneath, crenate-dentate, petioles up to 3 in. long. Flowers 1·5 in across, yellow in many-flowered peduncles. Capsules 2 in. long, woody, ovoid, apiculate 10-valved.

Recorded from Gorakhpur by Brandis. There are no specimens from our area at Dehra.

5. PENTAPETES *L.*

Pentapetes phœnicia, *L.* Vern. *Dupairhiya.* Sans. *Arka vallabha (friend of the sun); raktaka.*

A small shrubby annual or undershrub with stellate pubescent shoots. Leaves 2-5 in. long linear-lanceolate coarsely serrate, glabrescent and dark-green above, pale and rough pubescent along the nerves beneath; petiole up to 1·5 in. long; stipules subulate. Flowers scarlet, up to 1 in. across, solitary or in pairs, on very short axile peduncles which are jointed near the top. Bracts and bracteoles linear-lanceolate, acuminate, calyx deeply divided covered with scattered bristly hairs. Petals obovate. Fertile stamens in five groups of 3 each, alternating with 5 longer petaloid staminodes. Capsule ·75 in. across, globose, covered with rough stellate, and spreading longer hairs mixed.

In moist ground near cultivation; Gorakhpur and probably throughout Oudh. The flowers open during noon whence the vernacular and Sanskrit names.

6. MELHANIA, *Forsk.*

Undershrubs or shrubs. Leaves simple, toothed, downy. Flowers yellow, in 1-4-flowered, axillary peduncles; bracteate. Sepals 5, connate below. Petals 5, marcescent. Stamens 5, alternating with 5 ligulate staminodes, connate at the base; anther cells parallel. Ovary sessile, 5-celled, cells 1-many ovuled, styles 5, connate below, stigmatose on their inner faces. Capsule 5-valved dehiscing loculicidally.

Leaves broadly ovate, bracteoles exceeding the calyx, petiole up to 1·5 in. long. .. .. *M. Hamiltoniana.*

Leaves lanceolate or oblong-lanceolate, bracteoles usually equalling the calyx, petiole short never exceeding 1 in. in length. .. .. .. *M. futteyporensis.*

Melhania Hamiltoniana, *Wall.* Var. abutiloides, Syn. **M. abutiloides** *Arn.*

A small shrub, young parts, branchlets and inflorescence hoary. Leaves 1·5-4 by ·8-2·2 in. sometimes up to 5·5 in. long, ovate-lanceolate acute or acuminate, sometimes subacute, 3-5 nerved and cordate at the base, unequally toothed, softly stellate pubescent above, hoary tomentose beneath; petiole up to 1·5 in. long, dilated at the top; stipules subulate, caducous. Flowers up to 1·2 in. across, 2-3 on long peduncles about twice the length of petioles. Bracteoles 3, persistent as epicalyx, ovate or cordate-ovate, acuminate with recurved edges. Sepals 5, persistent, shorter than the bracteoles, or equalling them; lanceolate, tomentose outside. Petals yellow with darker veins, obovate exceeding the sepals. Capsules .5 in. across, ovoid, villous.

Etawah, Bundelkhand—*Edgeworth.*

Fl. June—close of rainy season. Fr. cold season.

Melhania futteyporensis, *Munro.*

An undershrub 2-3 ft. high, young parts and branchlets white pubescent. Leaves 2-3 in. long, oblong or oblong-lanceolate, cordate softly tomentose on both surfaces, petiole up to 1 in. long; stipules setaceous. Peduncles twice the petioles 2-4 flowered; bracteoles ovate-cordate to lanceolate, margins recurved or not, equalling the sepals or shorter. Sepals lanceolate, villous outside both sepals and bracteoles persistent. Capsule ·5 in. oblong, villous.

Bundelkhand—*Edgeworth*; Agra district—*Duthie.* Fl. close of rains Fr. rainy season. Very closely allied to the preceding species.

Waltheria indica, *Linn.* A small undershrub with pubescent shoots. Leaves 1-2·5 in. long oblong-lanceolate or ovate, apex rounded or acute, unequally serrate pubescent above, grey tomentose beneath, more or less plicate, base narrowed rounded or subcordate, petiole up to .75 in. long pubescent. Flowers yellow, .25 in. across, in dense axillary and terminal capitate clusters, bracts ciliate lanceolate. Calyx villous, teeth lanceolate, persistent. Petals exceeding the calyx, clawed. Capsule membranous included within the calyx.

Bundelkhand in open forests. Fl. January-March.

Melochia corchorifolia, *Linn.* A small undershrub with hollow stems and thinly stellate pubescent shoots. Leaves ·75-3 in. long, ovate or ovate-lanceolate, glaberscent above, sparsely stellate hairy and rough below, irregularly crenate-serrate, base rounded, truncate or narrowed, 5-nerved; petiole up to 1 in. long. Flowers pink or white, about ·25 in. across, in dense axillary and terminal clusters; bracteoles subulate, setose. Capsule globose ·25 in. across hispid.

Bahraich, Jhansi, probably throughout the area in open places. The stem yields a fibre. Fl. rainy season.

Abroma angusta, *L.* Vern. *Ulat-kambal.* A shrub or a small tree with downy branchlets, cordate, ovate-oblong leaves up to 6 in. long; large purplish flowers 2 in. across and capsules 1·5-2 in. across, exceeding the calyx. Sometimes cultivated; the bark yields an excellent fibre. The roots are used medicinally for uterine complaints.

XIII.—TILIACEÆ.

Trees, shrubs or herbs with bast and hairs as in Malvaceæ. Leaves stipulate, alternate, rarely opposite, simple or lobed. Flowers regular, uni-or bi-sexual usually in cymes. Sepals 3-5, valvate, free or connate. Petals as many as the sepals, usually imbricate. Stamens usually numerous, less often definite, free or 5-adelphous, often on a prolongation of the torus (gonophore); anthers 2-celled. Ovary superior, 2-10-celled. Styles connate or divided into as many segments as there are cells in the ovary. Stigmas free, rarely connate. Ovules attached to the inner angles of the cells. Fruit various, drupaceous, capsular, or of cocci or of ultimately free carpels. Seeds usually albuminous, 1 to many.

I.	Trees or shrubs; fruit drupaceous.	1. *Grewia.*
II.	Herbs or undershrubs, fruit spiny.	2. *Triumfetta.*
III.	Herbs; fruit capsular, not spiny.	3. *Corchorus.*

1. GREWIA, *Linn.*

Trees or shrubs, more or less stellate pubescent. Leaves usually distichous, more or less toothed, often inequilateral, with 3-7 basal nerves. Flowers white or yellow, usually in cymes; peduncles solitary or fascicled, usually axillary, panicled. Sepals 5, free, often coloured within, deciduous. Petals 5, shorter than the sepals, usually glandular at the base; glands usually with hairy rims. Stamens numerous, usually free, inserted on a gonophore*. Ovary 2-4-celled, with 1 style and lobed stigma; ovules 2 or more in each cell. Fruit a fibrous or fleshy, often lobed-drupe with 1-4 stones, each of which is 1 or more seeded.

* The gonophore is short or absent when the petals are eglandular.

I. Peduncles often leaf-opposed; inflorescence terminal and axillary :—
Leaves small, suborbicular, somewhat coarsely toothed; petiole slender; flowers white, peduncle exceeding the petiole. .. .. .. 1. *G. populifolia.*

II. Peduncles never leaf-opposed; inflorescence axillary:—

A. Leaves softly tomentose, pubescent or glabrescent not rough :—

1. Leaves 3-nerved at the base, (sometimes 5-nerved in G. Rothii, or 4-nerved in G. hirsuta), lanceolate to ovate-lanceolate :—

a. Trees; leaves green on both surfaces. Flowers white. .. .. 2. *G. disperma.*

b. Shrubs; leaves hoary beneath.

i. Flowers bisexual :—
Leaves ovate-acuminate; peduncles slender, several times the petiole. .. 3. *G. Rothii.*
Leaves usually oblong, rounded, or blunt, acute at the apex; peduncles stout. .. 4. *G. salvifolia.*

ii. Flowers polygamous :—
Leaves linear to oblong-ovate; peduncles stout. .. 5. *hirsuta.*

2. Leaves 5 or more nerved at the base, broad-suborbicular-or oblique-ovate :—

a. Trees or tall shrubs :—

i. Leaves ovate or oblong, very oblique, auricled or cordate at the base, glabrescent, thin and chartaceous, nerves, arching; petioles over ·5 in. long, thickened at the top, often exceeding the peduncles; stipules transversally auricled; fruit didymous. .. 6. *G. tiliæfolia.*

ii. Leaves broadly ovate or suborbicular, more or less softly tomentose, coriaceous, green on both surfaces when mature, nerves arching; petioles stout, .5'-1 in. long; stipules lanceolate falcate; peduncle usually more or less exceeding the petiole .. .. 7. *G. Hainesiana.*

iii. Leaves broad-ovate to suborbicular, grey-green, often tomentose on both surfaces; petioles up to ·5 in. long; peduncle slender, considerably exceeding the petioles. .. 8. *G. elastica.*

iv. Leaves usually ovate-oblong, persistently tomentose beneath; nerves straight; petiole short up to ·3in. long; peduncle usually exceeding the petiole. .. 9. *G. orbiculata.*

b. Undershrub, with a thick underground, rootstock and annual shoots. 10. *G. sapida.*

B. Leaves rough on one side or both surfaces :—

1. Drupe with crustaceous rind :—

a. Erect shrubs :—

Leaves 3-6 in. long ovate, oblong or obovate, base 3-5 nerved; drupe large, shortly stalked. .. 11. *G. sclerophylla.*

Leaves 1-3 in. long orbicular, base 3-5-nerved ; drupes usually sessile. 12. *G. villosa.*

b. Straggling or subscandent shrub, leaf 3-nerved at the base. Stem quadrangular fluted in old stems. 13. *G. flavescens.*

2. Drupe fleshy, rind not crustaceous :—

Small tree. Leaves broad ovate, rough on both surfaces ; petiole short. .. 14. *G. abutifolia.*

1. G. populifolia, *Vahl.* Syn. **Grewia betulifolia,** *Juss.*

A much branched shrub, young parts and inflorescence stellate pubescent. Leaves ·5-1·5 in. long, obovate, suborbicular or broad ovate, acute or obtuse, base rounded or cuneate, coarsely toothed, ultimately glabrous on both surfaces ; petiole up to .5 in. long, slender. Flowers white, up to 1 in. across, 1, rarely 2, on leaf-opposed peduncles which exceed the petioles and are jointed towards the top. Buds tomentose, elliptic-oblong. Sepals up to ·75 in. long, linear-oblong. Petals little shorter than the sepals, narrow-oblong usually notched at the apex, basal gland broad, suborbicular, villous. Ovary glabrous or pillose. Drupe orange-yellow, deeply 2-lobed, smooth, stones 1-4.

Etawah.

The acid fruits are eaten. Fl. July-Aug.

2. Grewia disperma, *Rottl.* Syn. **G. lævigata,** *Vahl.* Vern. *Kalai, banharia* (*Gon.*), *haria* (*Pil.*).

A small, almost evergreen tree with brownish bark, young parts and inflorescence hairy. Leaves 3-7 by 1-2·5 in. lanceolate, acuminate, serrate, lower teeth often reduced to cup-like glands, membranous, sparsely hairy when young, glabrous later on, equally green on both surfaces ; petioles ·2-·4 in. long, dilated at the top ; stipules subulate, usually shorter than the petioles. Flowers white ; ·5-1 in. across, 2-6 together on axillary peduncles which are up to 1 in. long. Peduncles 1-3 together; pedicels up to ·7 in. long. Buds ovoid, tomentose. Sepals linear-oblong up to ·6 in. long, white inside.

Petals much shorter, about ¼-th as long as the sepals, tapering towards the apex, claw dilated gland exceeding half the length of the petal. Ovary villous, style glabrous, stigma laciniate. Gynophore rather elongated, upper portion villous. Drupe 1-4 lobed, ·3 in. across, black when ripe, glabrescent.

Pilibhit, Oudh Divisions, and Gorakhpur.

The leaves are lopped for fodder. The bark yields a good fibre which could be used for cordage, but the tree is not sufficiently abundant to be commercially utilizable.

Blaze—yellowish-white with brown bands.

Fl. rainy season. Fr. cold season.

3. Grewia Rothii, *DC.* Syn. **Grewia excelsa,** *F. B. I.* Vern. *Ghatiari.*

A shrub; young parts and inflorescence hoary. Leaves 2-4·5 in. long, lanceolate or ovate-oblong, acuminate, glabrescent or tomentose above, softly hoary-tomentose beneath; base 3-5-nerved, closely serrulate or crenulate, petiole very short, downy; stipules obliquely oblong-lanceolate or falcate, usually exceeding the petioles. Flowers up to ·3 in. across, in slender, solitary or fascicled, axillary peduncles, which are up to 1 in. long; pedicels usually umbelled on the peduncle, up to ·3 in. long, buds obovoid. Sepals linear-oblong, ·2 in. long, tomentose outside, pubescent within. Petals shorter than the sepals, yellow, oblong, entire, basal glands not broad, villous. Ovary villous; style exceeding the stamens. Drupe .25 in. across more or less pubescent, obscurely lobed; stones usually 2.

Jhansi Division, probably also Banda; fragmentary specimen, incomplete for satisfactory identification also from Bahraich.

Fl. April-September. Fr. rainy season.

4. Grewia salvifolia, *Heyne.*

A shrub; young parts and inflorescence tawny. Leaves variable, 1-3 in. long, oblong or lanceolate, apex rounded or bluntly acuminate, base 3-nerved, usually rounded, finely serrulate, coriaceous, upper surface glabrescent, under-surface tawny or grey tomentose; petiole up to ·3 in. long, tomentose. Flowers yellow inside, ·5 in. across, 2-3 on axillary and somewhat stout peduncles, which are solitary, or 2-3 together and longer than the petioles. Buds oblong, ribbed, ·4 in. long. Sepals ·3-·4 in. long, linear-oblong. Petals about half as long as the sepals, obovate or oblong, notched at the apex, basal gland roundish, not as wide as the base of the petal. Ovary villous, style exceeding the stamens. Drupe 2-lobed, ·25 in. across, glabrescent.

Oudh forests—*Duthie.* I have seen no specimens from our area. It may be looked for in Bundelkhand.

Fl. April-September.

5. Grewia hirsuta, *Vanb.* var. **helicterifolia,** (*Wall. sp.*,) Syn. **G. polygama,** *F. B. I.*; **G. pilosa,** *Roxb.* (*vide* Journal of Botany, vol. XLIX, 1911, page 350 *et seq.*)

Vern. *Sitachabaini, gurshakri, kakai,* (*Bah.*), *gurawa,* (*J*).

A small spreading shrub, with annual or periodic shoots from the root. Young parts and inflorescence pubscent. Leaves 2-4·5 by ·3-1 in., narrow lanceolate or oblong, acute or acuminate, closely serrate, stellate pubescent or glabrate above, grey or tawny tomentose beneath, base usually 3-nerved; petioles up to .15 in. long; stipules subulate. Fowers yellow, polygamous; peduncles axillary, 1 to 5 together, 2-6 flowered, usually exceeding the petioles, up to ·5 in. long; pedicels shorter, bracts subulate; buds obovoid, ribbed, tomentose. Sepals linear-oblong, up to ·4 in. long, usually with a tuft of hairs inside; petals obovate-oblong, much shorter. Stamens many, usually exceeding 20; gonophore with a villous ring round the top. Ovary villous; drupe ·2-·4 in across, reddish-brown and shining when ripe, rind crustaceous, covered with a few scattered hairs, usually 1-4 lobed, lobes not deep; stones up to 4, 1-seeded.

In grass lands throughout the area.

The fruits are eaten. The leaves and the roots are medicinal. A decoction of the former is said to be a very good remedy for dysentery.

Fl. May-September. Fr. ripen cold season.

6. Grewia tiliæfolia, *Vahl.* Vern. *Phalsa, dhamin.* Sans. *Dhanubriksha, dharmana.*

A moderate-sized or rather small tree with light grey bark. Young parts and inflorescence sparingly stellate pubescent. Leaves 2·5-6 in. by 2-3·7 in., broadly ovate, broad acute or obtuse, often obscurely three-angled towards the apex, tough, irregularly crenate, base oblique and often unequally cordate, the larger lobe being more or less auricled, 5-7 nerved, glabrescent on both surfaces on maturity, secondary nerves up to 6 pairs excluding the basal, lowest pair from about the middle of the blade; petiole ·5-1 in. long, swollen at the top; stipules falcate-acuminate, foliaceous and auricled at the base, often somewhat recurved. Peduncles usually several in each axil, shorter than the petioles, 3-flowered, slender. Pedicels about the same length as the peduncles, or shorter. Flowers yellow about ·7 in. across; bracteoles caducous; buds ovoid-oblong or oblong, pubescent. Sepals oblong, acute and slightly hooded, about ·3 in. long. Petals oblong, usually notched at the apex, about half the length of sepals, gland not as broad as the base of the petals, sometimes

absent. Ovary hairy; style a little exceeding the stamens; stigma usually of five rounded spreading lobes. Drupe globose, two-lobed; about ·25 in. across with 2 stones.

Kheri, Gorakhpur, probably also in other Oudh Divisions, Jhansi; not common. Often cultivated for the edible fruits. The mucilaginous bark is medicinal. The elastic timber is prized for *bahangi* poles, etc.

Fl. April—June. Fr. rainy season.

A very variable species, in some forms young parts and the under-surface of the leaves are hoary. The foliaceous falcate stipules are very characteristic of the species.

7. Grewia Hainesiana, Hole. Syn. **G. asiatica,** *Roxb.* not of Linneus. *Vern. Phalsa.*

A small moderate-sized tree, with rather smooth light grey or greenish bark. Young parts, petioles and inflorescence grey or fulvous tomentose. Leaves 2-6 in. by 1·5-4·5 in., elliptic or suborbicular, apex acute or acuminate, both surfaces pubescent when young, upper-surface becoming smoother with age, base usually oblique more or less cordate or truncate, 5-7 nerved, secondary nerves somewhat arcuate; petiole ·5-1 in. long dilated at the top; stipules linear-lanceolate or subulate, up to ·4 in. long, sometimes auricled at the base. Peduncles 2-4, axillary and terminal, usually 3-flowered, shorter than the petioles or equalling them, less often slightly exceeding them; pedicels longer or shorter than the peduncles. Flowers yellow about ·7 in. across; buds ·2 in. long, clavate or cylindric, ribbed. Sepals narrow-oblong, orange or yellow inside. Petals ovate-oblong, or oblong, sometimes emarginate at the apex, yellow or reddish. Ovary villous, styles exceeding the stamens 4-lobed. Drupe globose about ·4 in. across and almost black when ripe, pilose, often 2-lobed, with 1-2 stones. Stones 1-2-seeded.

Throughout the area; sometimes cultivated.

The fruits are edible. The mucilaginous bark is used for clarifying sugar, the timber is similar to that of G. elastica.

Fl. April-May. Fr. earlier part of the rainy season.

Grewia asiatica, *Linn.* Vern. *Phalsa.*—A shrub with grey tomentose shoots. Leaves 2-4 in. long, broadly elliptic or suborbicular, more or less cordate, oblique, acute or acuminate, irregularly crenate-serrate, permanently hoary beneath; petioles ·25-5 in., rather thickened towards the top; stipules variable as in the previous species. Peduncles several, usually much exceeding the petioles. Buds cylindric or broadly clavate. Drupes with 1-2 stones each of which is one-seeded. Known only in cultivation.

8. Grewia elastica, *Royle. Inc.* G. vestita *Wall.*

A medium-sized or small tree; bark light grey, smooth with white blotches on branches. Young parts, inflorescence and petiole

tomentose. Leaves 2-6 by 1·2-3 in., obliquely ovate-elliptic or oblong-ovate, abruptly short acuminate, sometimes sub-lobate, serrulate, upper-surface stellate pubescent when young, usually glabrescent later, under-surface softly grey pubescent or persistently grey tomentose when mature; base usually narrowed, sometimes rounded, 5-7-nerved, nerves nearly straight, innermost pair reaching to more than two-third the length of the blade, secondary nerves (ex luding basal nerves) up to 4 pairs; petiole short up to ·5 in. long; stipules linear-acute or subulate up to ·3 in. long. Flowers yellow, about ·7 in. across, 2-3 together on axillary peduncles which exceed the petioles or are equal to them; pedicels shorter than or equalling peduncles; bracteoles caducous; buds about ·2 in. long, often slightly constricted, woolly, globose to oblong. Sepals linear-oblong, about ·4 in. long. Petals oblong, sometimes eglandular. Ovary villous; style equalling the stamens. Drupe the size of a pea, black when ripe, slightly hairy.

From Pilibhit eastwards to Gorakhpur.

Fruits are edible. The timber is put to the same use as that of G. asiatica to which it is, however, inferior.

Blaze reddish-brown with white streaks in older trees.

Fl. April-May. Fr. rainy season.

1. Var. vestita, *Wall.* (sp.) Leaves oblong acuminate, under-surface finely pubescent when mature, buds clavate before opening. The common tree in our area.

2. Var. elastica proper, shoots shaggy when young, with rusty or white tomentum. Leaves more tomentose than in var. vestita, permanently white or tawny beneath, sometimes obscurely angled or lobed. Buds globose. Petals sometimes without glands. Drupe very small.
Not common, Gorakhpur, Oudh forests—*Duthie.* The hill form of the species.

9. Grewia rotundifolia, *Juss.* Syn. **G. orbiculata,** *Rottl.*

A small twiggy tree or shrub; young parts, petioles and inflorescence tomentose. Leaves 1-3 in. long, broadly elliptic, oblong or roundish, usually acute, softly pubescent or glabrescent above, grey tomentose beneath unequally toothed, base usually 5-nerved and oblique; petiole up to 3 in. long, stipules ·25 in. long, subulate. Flowers yellow, about in. across, umbellate, peduncles axillary, 1-3-flowered, longer than the petioles, slender, pedicels shorter than the peduncles; buds obovoid. Sepals oblong. Petals sometimes without basal glands, shorter than the sepals. Ovary villous; style exceeding the stamens. Drupe ·3 in. across, tomentose, slightly lobed.

Bundelkhand—*Duthie.* There are no specimens from our area in Dehra Dun herbarium.

Fl. April-May with new leaves. Fr. cold season. The leaves look grey green on the under-surface.

10. Grewia sapida, *Roxb.* Vern. *Phalsa, pharsa.*

An undershrub or shrub, with a woody underground root-stock from which switchy shoots are sent out every year. Young parts pubescent. Leaves 2-5·5 in. by 1·5-3·5 in., broad oblong-elliptic or obovate, apex rounded, abruptly acute or acuminate, irregularly serrate or doubly serrate, rough above, usually grey pubescent beneath, base cuneate, usually 5, sometimes up to 7-nerved, rounded or subcordate, often oblique; petiole short, ·1-·3 in. long; stipules subulate or tapering from a broad or auricled base, up to ·35 in. long. Peduncles slender, usually much longer than the petioles, ·5-1·45 in. long, several from each axil, usually 3, sometimes up to 5-flowered; pedicels up to ·5 in. long; buds tomentose, oblong-obovoid; sepals about .3 in. oblong or oblanceolate. Petals often emarginate at the apex. Drupes of the size of a pea, subacid, black when ripe, stellate hairy.

Throughout the area in grass lands and fire-traces, etc. The dying back of the shoots, at least of the upper portions, appears to be a permanent feature of the species and does not alter even under favourable garden condition. The fruits are edible and resemble those of G. Hainesiana.

Fl. March-June. Fr. May-November.

11. Grewia sclerophylla, *Roxb.* Syn. **G. scabrophylla,** *Roxb.* Vern. *Dapher, bendu.*

A shrub or an undershrub, young parts and inflorescence densely covered with brown, rough, stellate tomentum. Leaves 3-6·5 in. by 2·5-6 in. elliptic, ovate or obovate to suborbicular, irregularly toothed, larger teeth glandular at the top, rather thick, rough above, stellate tomentose beneath, base 3-nerved, usually narrowed; petiole ·3-·7 in. long, usually with several pairs of glands towards the top; stipules subulate. Peduncles up to ·8 in. long, stout, 1 to few in leaf axils, each 2-3-flowered. Flowers white, about 1 in. across on stout pedicels, which often exceed the peduncles; buds about ·5 in. long, ribbed, densely hairy, club-shaped. Sepals oblong-lanceolate, yellow inside. Petals white, half the length of sepals, obovate, notched at the apex. Ovary villous; style not exceeding the stamens, pilose at the base. Drupe globose, depressed at the top, ·8 in. across, rough stellate pubescent, with a crustaceous rind and sweetish viscid pulp; stones usually 4.

Common in grass lands, all over the area.
The fruit is edible, the stem yields good fibre.
Fl. May-September. Fr. end of rainy season. Most of the shoots die back every year.

12. Grewia villosa, *Willd.*

A small shrub. Young parts and inflorescence villous with deciduous soft hairs and shorter stellate pubescence. Leaves 1·5-3 in. long, suborbicular, apex acute, short acuminate or rounded, unequally

serrate, teeth tufted with hairs, rough, more or less stellate hairy and often wrinkled above, softly tomentose beneath, base 5-nerved, cordate or rounded, often oblique; petiole ·5-1 in. long, pilose; stipules foliaceous, tapering to a pointed tip from a broad base, silky pubescent. Peduncles very short, usually solitary, often leaf-opposed or extra-axillary, 2-4-flowered; pedicels ·2-·3 in. long; buds elliptic, villous, bracts oblong, acute or linear lanceolate. Petals yellowish, much shorter, emarginate at the apex, obovate-oblong. Ovary, villous. Drupe about ·4 in. across, coppery red, when ripe, crustaceous covered with minute ciliate tubercles and deciduous stellate hairs.

Bundelkhand—*Duthie* probably also in the Afforestation Division. I have seen no specimens from our area at Dehra. The fruits are edible.

Fl. June-September.

13. Grewia flavescens, *Juss.* Syn. **G. pilosa,** *Lamk.* Vern. *Gurgawa* (*J*), *gangerwa.*

A large straggling shrub; branches quadrangular and fluted. Young parts, inflorescence and leaves rough with stiff stellate hairs. Leaves 1·5-4 in. long oblong-lanceolate, apex usually abruptly-narrowed, acuminate, unequally serrate, 3-nerved at the base, under-surface paler. more densely and softer pubescent; petiole short, up to ·15 in. long, pubescent; stipules subulate, exceeding the petioles. Peduncles short, slightly exceeding the petioles, rather stout, usually 3-flowered; pedicels usually exceeding the peduncles; bracts ovate; buds ·4 in. long, pilose constricted in the middle. Sepals oblong; petals linear, a little shorter than the sepals, bifid at the top, yellow, claw dilated, villose on both sides. Anthers with simple hairs on the back. Ovary villous; style pilose at the base; stigma with 4 linear arms. Drupe crustaceous, about ·5 in. across, 2-lobed, light brown, scabrid, with stiff stellate hairs, mesocarp fibrous; stones 4.

Bundelkhand, Etawah.
Fl. June-October. Fr. October-December, persisting long.

14. Grewia abutifolia, *Vent.* Syn. **G. aspera** *Roxb.* Vern. *Dhaman* (*B*).

A bushy shrub; young parts and inflorescence rough stellate pubescent. Leaves 3-6 in. long, broad-ovate or suborbicular, often more or less lobed, irregularly serrate, usually short acuminate, rough on both surfaces with stellate hairs, base subcordate or rounded, 3-nerved; petiole up to ·7 in. long; stipules short, adpressed hairy, subulate. Peduncles much shorter than the pedicels, clustered on leaf axils, 3-4-flowered; buds ellipsoid, tomentose. Sepals ·3 in. long, oblong. Petals much shorter than the sepals, glands about half the length of the petals. Ovary villous; style exceeding the stamens. Drupe minutely stellate pubescent, about ·5 in. across (·8-1 in—Haines.). Stones up to 4.

Bundelkhand, (Rajghat)—*Duthie.*
Fl. July-August. Fr. cold season.

2. TRIUMFETTA, *Linn.*

Herbs or shrubs. Leaves often lobed and serrate. Flowers small, yellow in dense cymes, which are axillary or terminal. Sepals 5, free. Petals 5; stamens 8-25 on a fleshy glandular torus. Ovary 2-5-celled with 2 ovules in each cell; style filiform; stigma 5-toothed. Fruit globose or oblong, spiny, indehiscent or separating into cocci; seeds albuminous, 1-2 in each cell.

Fr. large, spines on fr. hispid towards the base. Leaves ovate lanceolate.	1. *T. pilosa.*
Fr. small, spines glabrous, leaves 3-5-lobed, pubescent beneath.	2. *T. rhomboidea.*
Fr. small, spines pubescent, dilated at the base; leaves orbicular, grey tomentose beneath.	3. *T. rotundifolia.*

1. Triumfetta pilosa, *Roth.*

A small shrub or undershrub with woody base; 2-6 ft. in height; branches hispid with bulb based, stellate hairs; young parts rusty villous. Leaves 2·5-5 by 1-2·5 in.; upper leaves usually smaller, ovate-lanceolate, acuminate, base rounded or subcordate, 5-nerved, inequally serrate, membranous, stellate hairy on both surfaces; petiole up to 1·8 in. long; stipules about ·3 in. long, obliquely linear-lanceolate to subulate, hispid. Flowers yellow, about ·3 in. long, in congested, short-peduncled, lateral cymes, much shorter than the leaves; pedicels minute, hairy; bracts subulate, very hairy. Flowers yellow, up to about ·4 in. long; buds linear-oblong with swollen base. Sepals 5, apiculate, stellate-hairy outside, linear-oblong. Petals 5, yellow, linear-spatulate or linear-oblong, with densely ciliate thickened bases. Stamens 10; torus densely ciliate on the margin. Ovary covered with short scales, style slender. Fruit 4-celled, 8-seeded, densely covered with bristles, about ·6-·7 in. across, including the bristles. Bristles ·2-·25 in. long, recurved, hispid on their lower edges; seeds compressed, reddish-brown, polished.

Kheri, probably in all Oudh Divisions; also Pilibhit and Gorakhpur.

Fl. August-September. Fr. cold season.

2. Triumfetta rhomboidea, *Jacq.* Vern. *Bhora.* Sans. *Jhinjharita.*

An erect switchy herb or undershrub, up to 4 ft. high with simple hairs on the herbaceous parts. Leaves polymorphous; lower, 2-3 in. across, often 3-lobed, orbicular-ovate, acuminate, irregularly serrate,

membranous, covered on both sides with stellate and simple hairs; base cordate, rounded or cuneate, 3-7-nerved; upper leaves not lobed. Petiole of the lower leaves up to 2·7 in. long, hairy and swollen at the junction with the blade; stipules up to ·25 in. long, lanceolate, acuminate. Flowers yellow, about ·3 in. long, in dense lateral and terminal cymes. Peduncles and pedicels very short. Sepals oblong, apiculate. Petals 5, obovate, shorter than the sepals; base ciliate, Stamens 8-15. Fruits ·25 in. across, globose, covered with spines, grey tomentose, between the spines; spines ·05 in. long, hooked, glabrous.

Pilibhit, Bahraich, Gonda, probably also Kheri, and Gorakhpur.

An excellent silky fibre is extracted from the stems. The flowers, fruits, and leaves are used in medicine on account of the mucilage they contain.

Flowers and fruits rainy season.

3. Triumfetta rotundiolia, *Lamk.*

A twiggy undershrub. Young parts fulvous, branches rough, stellate, hairy. Leaves ·5-1·5 in. long suborbicular, irregularly serrate, acute, sometimes obscurely lobed, rather thick, upper surface rough, covered with deciduous stellate hairs, under-surface grey velvety, petiole up to about 1 in. long. Flowers yellow, ·15 in. long, in cymes on an interrupted terminal raceme, buds clavate. Sepals oblong, stellate hairy, petals a little shorter, ciliate at the base; stamens 15-25. Fruits globose, covered with hooked spines about ·25 in. across, including the spines. Spines usually pubescent towards the base.

Bundelkhand, Etawah.

Fl. rainy season. Fr. cold season.

Corchorus Antichorus, *Raeusch.*—A small more or less woody, prostrate perennial with tortuous branches. Leaves ·25-·7 in. long, roundish, plicate, crenate-serrate; petioles ·5 in. long, slender. Flowers ·15 in. across, yellow, in small cymes with stout short pedunc1es. Sepals 4-5. Petals exceeding the sepals. Stamens 8-10. Capsule ·5-1·25 in. long, cylindric, slender, beaked.

Etawah, Jumna and Chambal ravines.

Corchorus capsularies *Linn.* Vern. *Harrawa.* The Jute.—An erect glabrous annual. Leaves 2-4 in. long, lanceolate-acuminate, serrate, lowest teeth produced into threadlike appendages; petiole in large leaves up to 1·5 in long. Flowers small, yellow. Capsules turbinate, depressed at the top, ridged and muricate.

Bundelkhand, apparently naturalized; may occur also in Oudh.

Corchorus olitorius, *Linn.* The Jute.—Differs from the above mainly by the elongated glabrous capsule.

Gorakhpur, Bahraich, Bundelkhand.

XIV.—LINACEÆ.

Herbs or shrubs, rarely trees. Leaves usually alternate, simple entire, rarely crenate. Flowers regular, bisexual. Sepals 5, rarely 4, free or connate below, imbricate. Petals as many as the sepals, hypogynous or slightly perigynous, often contorted in bud, usually fugacious. Stamens 4-5, alternating with staminodes or twice as many, rarely more, connate at the base into a tube or ring; anthers versatile. Disk of 5 gland , adnate to the staminal ring. Ovary superior 3-5-celled; styles 3-5, more or less free. Fruit usually a septicidal capsule, often splitting into cocci, rarely a drupe.

REINWARDTIA, *Dumort.*

Reinwardtia trigyna, *Planch.* • Vern. *Basant.*

A small glabrous shrub 2-4 ft. high, branches often rooting. Leaves 1-4 in. by ·5-1·3 in., oblanceolate or oblong-lanceolate, usually mucornate, narrowed at the base into a slender short petiole, membranous, usually entire. Stipules minute, caducous. Flowers about 1 in. long and 1·5 in. across, bright yellow, solitary or in axillary or terminal cymes. Sepals 5, persistent, lanceolate. Petals 5, obovate, stamens 5, alternating with as many staminodes, longer than the styles in some flowers and shorter than them in others. Disk glands 2-3; styles usually 3, more o less connate at the base. Capsule globose with thin walls about 25 in. across.

Pilibhit, Gonda, probably also Bahraich; on the banks of shady nalahs; not common. It is well worth cultivating on account of its handsome flowers.

Fl. January-April.

XV.—MALPIGHIACEÆ.

Trees or shrubs often climbing. Leaves opposite, entire usually extipulate. Flowers regular or irregular, white or yellowish, bisexual, pedicles jointed, 2 bracteolate. Calyx 5-partite, one or more usually provided with a large gland outside (except in *Aspidopterys*). Petals 5, free. Disk obscure. Stamens 10, hypogynous or sub-perigynous, equal or unequal. Filaments free or connate below. Ovary 3-celled; cells 1-ovuled; styles 1-3. Fruit of 1 or more samaras. Seeds exalbuminous.

Calyx glandular; style 1; samaras winged at the apex in fruit.	1. *Hiptage.*
Calyx eglandular; styles 3; samaras winged all round.	2. *Aspidopterys.*

1. HIPTAGE, *Goertn.*

Hiptage Madablota, *Goertn.* Vern. *Madh-málati,* Sans. *Mádhavi.*

A large evergreen climbing shrub. Young branchlets and inflorescence silky pubescent. Leaves 4-8 by 1·5-3·5 in., oblong, ovate or elliptic-lanceolate, acuminate, entire, coriacious, glabrous, main lateral nerves 5-7 pairs; petiole stout, ·2-·5 in. long. Flowers showy, about 1 in. across, fragrant, in large terminal, or small r axillary racemes which are usually shorter than the leaves. Pedicels up to 1·25 in. long, jointed above the middle. Calyx persistent, 5-partite, silky pubescent, with one large gland near the base, partly adnate to the pedicel; segments imbricate, obtuse-oblong. Petals 5, much larger than the sepals, unequal, ·5-·7 in. long, 4 white, 1 yellow, adpressed silky pubescent, clawed, fimbriate. Stamens 10, lowest much longer than the rest, connate at the base. Ovary 3-lobed. Fruit of 1-3 samaras, each with 3 oblanceolate, oblong or obovate wings, 1 large up to 2 in. by ·5 in.; and two smaller, spreading, up to 1 by ·2 in.

In moist shady localities throughout the area. The leaves and bark are medicinal.

Fl. February-April. Fr. May-June. The blade at its junction with the petiole has often a pair of glands.

2. ASPIDOPTERYS, *A. Juss.*

Climbing shrubs. Leaves entire; exstipulate. Flowers white or yellow, small, in axillary or terminal panicles. Sepals 5, eglandular. Petals 5, entire. Stamens 10. Ovary 3-locular, 3-lobed, lobes flattened at the back and winged laterally which are accrescent in fruit. Fruit of 1-3 samaras, winged all round.

Leaves ovate-acute or acuminate. .. .. 1. *A. Wallichii.*

Leaves more or less orbicular with a broad acumen. .. 2. *A. cordifolia.*

1. Aspidopterys Wallichii, *Hook. f.*

A dextrorse woody climber, young parts and inflorescence white pubescent. Leaves 2-5 in. long, lanceolate, ovate or elliptic, acuminate, main lateral nerves 4-6, arcuate, shallow cordate or rounded at the base, subcoriaceous, glabrescent above, white tomentose beneath. Petiole ·5-·7 in. long, channelled. Flowers white, ·3 in. across, in lax, terminal and axillary panicles. Pedicels up to ·17 in. long, slender, jointed above the middle. Calyx short, glabrescent, segments oblong. Petals 5, entire, sessile, much longer than the sepals, equal. Ovary villous; styles 3, glabrous; samaras 1-3; wing usually orbicular or ovate-oblong, rather variable, thin, up to 1·2 in. long, nerves prominent radiating from the central portion; nucleus not crested or winged.

Gonda, Bahraich, North Kheri; probably also in other districts.

Fl. August-September. Fr. cold season.

2. Aspidopterys cordata, *A. Juss.*

A slender climber, young parts, inflorescence and under-surface of leaves white or grey adpressed tomentose. Leaves 3-7 in. long, roundish or orbicular-cordate, abruptly terminated by a broad acuminate tip, upper-surface glabrescent with age; petiole 1-1·5 in. long, channelled, pubescent. Flowers ·25 in. across in lax panicles. Calyx segments ovate, acute; petals much longer. Samaras 1-3 winged, wing orbicular or broadly obovate, reticulate as in the previous species; up to 1·5 in. long, nucleus not winged or keeled.

Gonda, Bahraich.

Fl. rainy season. Fr. cold season.

XVI.—ZYGOPHYLLACEÆ.

Herbs or shrubs rarely trees, branches usually articulate. Leaves usually opposite, stipulate 2-3-foliate, pinnate, stipules sometimes spiny. Peduncles usually 1-2 in the axils of the stipules. Flowers bisexual, usually regular. Sepals 4-5. Petals 4-5, usually imbricate, rarely 0. Disk convex or depressed, rarely absent. Stamens as many as the petals or twice as many, rarely more, inserted at the base of the disk. Ovary sessile on a short gynophore, lobed or winged, usually 4-5 celled. Ovules 2 or more in each cell; style angled or furrowed. Fruit coriaceous or crustaceous sometimes dividing into 2-10 cocci (sometimes spiny), or capsular and septicidally dehiscent. Seeds usually solitary in each cell.

FAGONIA, *Linn.*

Fagonia cretica, *Linn.* Syn. **F. arabica,** *Linn.* Vern. *Jowasa,* Sans. *Dusparsha.*

A small spiny undershrub, covered with scattered glands, branchlets striate, green. Leaves deciduous, opposite, 1-3-foliolate up to ·5 in. long. Leaflets linear, acute, mucronate, almost sessile or petiolate. Petiole variable, up to 1·2 in. long; stipules of sharp spines up to ·5 in. long, persistent, and enlarging even after fall of leaves. Flowers small, rose-coloured, solitary on peduncles ·25-·5 in. long. Sepals ovate, silky, ending in a sharp point, imbricate; petals about ·25 in. long, spatulate. Ovary hairy, 5-angled, style subulate, 5-angled at the base. Fruit ·2 in. across, pubescent, separating into 5 cocci, roundish, deeply 5-lobed almost to the axis and terminated by the style.

Etawah, in ravine lands. The plant is medicinal.

Flowers and fruits almost all the year round.

Tribulus terrestris, *Linn.* Vern. *Gokhura.* Sans. *Gokshuru.*—A prostrate herb with hairy branches, abruptly pinnate, stipulate leaves, with 5-7 pairs of adpressed hairy, subequal, oblong leaflets, up to ·5 in. long; solitary axillary flowers; and globose fruit which separates into 5, muricate cocci, each with 2 divergent spines.

Kheri, Bahraich, Gonda, Bundelkhand probably all over the area. The entire plant, specially the fruits and leaves are valued in Hindu medicine. It is used in various kidney diseases with success.

XVII.—RUTACEÆ.

Trees or shrubs rarely herbs, usually aromatic, dotted with pellucid glands. Leaves usually alternate, compound, less often opposite or simple. Flowers regular, in cymes or panicles. Calyx of 4-5 small lobes. Petals 4-5, valvate or imbricate, hypogynous. Stamens as many or twice as many as petals, rarely more (*Citrus*, *Ægle*). Disk within the stamens, crenate or lobed, sometimes elongated and large. Ovary of 4-5 free, or connate carpels; styles 1-5, free or variously united. Fruit a berry, capsule, or drupe or of 1-4 capsular cocci. Seeds usually solitary in the cells.

I. Unarmed :—

A. Leaves pinnately 1-5 foliolate; style persistent... 1. *Glycosmis.*

B. Leaves imparipinnate; style deciduous :—

Flowers solitary or corymbose; filaments not dilated at the base; ovary usually 2-celled; style long. .. .. .. 2. *Murraya.*

Flowers panicled; filaments dilated at the base; ovary usually 4-5-celled; style short. 3. *Clausena.*

II. Armed :—

A. Pericarp not woody :—

Leaves imparipinnate; rachis winged; stamens 8; ovary with 1 ovule in each cell; pericarp fleshy. .. .. .. 4. *Limonia.*

Leaves 1-foliolate; stamens many; ovules many in each cell of ovary; pericarp leathery. 5. *Citrus.*

B. Pericarp woody :—

Leaves imparipinnate; stamen 10-12. .. 6. *Feronia.*

Leaves 3-foliolate; stamens many. .. 7 *Ægle.*

1. GLYCOSMIS, *Correa.*

Glycosmis pentaphylla, *Correa.* Vern. *Makranda* (*Pil.*), *ban-nibu*, *ghutrua* (*Bah.*).

An evergreen shrub, attaining up to 5 ft. Leaves alternate, 1-5-foliolate, rachis and petiole rather stout. Leaflets variable in size and

shape, usually 3-6·5 in. by 1-2 in. oblong, lanceolate, obovate or oblanceolate, entire or obscurely crenulate, apex obtuse, acute, or acuminate, coriaceous, glabrous, under-surface paler; base acute; petiolule usually ·05-·2 in. Flowers small, white, in clusters on axillary and terminal erect panicles, 1-4 in. long. Calyx 4-5-fid; lobes ovate-orbicular, ciliolate, with a gland outside near the apex. Petals 4-5, obovate or suborbicular, imbricate. Stamens 8-10, free; filaments dilated below; anthers with a gland at the apex. Ovary 2-5-celled on a short thick disk covered with minute tubercular glands. Berry about ·4 in. across, globose, pink or bluish when ripe, with a sweetish pulp.

All over the area.

Flowers and fruits almost throughout the year. Frequently gregarious in shady places.

The twigs are used as tooth cleaners (*dataun*).

2. MURRAYA, *Linn.*

Unarmed shrubs or small trees. Leaves alternate, imparipinnate, leaflets alternate, petioluled. Flowers bisexual, solitary, in axillary cymes or terminal corymbs. Calyx 5-fid. Petals 5, imbricate. Stamens 10, alternately, shorter; filaments subulate. Disk elongated. Ovary usually 2-5-celled, with 1-2 ovules in each cell. Style articulated, deciduous; stigma capitate. Fruit 1-2-seeded berry.

Evergreen; leaflets 3-9, dark, glossy green; flowers usually few on inflorescence fruits red when ripe. ..	1. *M. exotica.*
Deciduous; leaflets 9-25, light green; flowers usually many on inflorescence; fruits black when ripe. ..	2. *M. Koenigii.*

1. Murraya exotica, *Linn.* Vern. *Haril, girgitti.*

A handsome evergreen shrub or a small tree, fluted at the base when old; bark yellowish-brown or grey, rough. Young parts and rachis pubescent. Leaves 3-7 in. long; leaflets 1·2-3 in. by ·5-1·3 in., ovate, rhomboid or elliptic-lanceolate, more or less acuminate, tip acute or obtuse, usually notched, base usually acute and oblique, dark-green, glabrous and coriaceous when mature; petiolule short up to ·15 in. long. Flowers white, fragrant, about 1 in. across, solitary, or in short terminal and axillary corymbs of cymes. Sepals pubescent, minute, obtuse, glandular. Petals oblong-lanceolate, subobtuse, upper portion spreading. Ovary linear, 2-celled. Berries up to ·7 in. long, ovoid, pointed at the apex, rugose, red when ripe.

In cool shady localities all over the area.

It is frequently cultivated as an ornamental shrub. The twigs are made into tooth cleaners.

Blaze yellow or pale brown, brittle. Bark peeling off in flakes.

Fl. March-September. Fr. cold season.

Murraya Koenigii, *Spreng.* Vern. *Nimkathia, kathnim.*

A deciduous shrub with smooth dark-brown bark; young parts downy. Leaves 6-12 in. long; rachis pubescent. Leaflets with a peculiar fœtid smell when bruised, 1-3 by ·5-1·3 in., ovate-lanceolate, acuminate, tip blunt or acute, more or less crenulate, base, oblique glabrescent above, puberulous along the nerves beneath; petiolules about ·1 in. long. Flowers ·3-·5 in. long, white, on short axillary and terminal, corymbose panicles. Sepals small, acute. Petals oblong, obtuse. Ovary 2-celled; fruit ovoid ·4 in. long rugose with glands, black when ripe.

Throughout the area. The leaves are used for flavouring curries and soups in Southern India. Leafless for a short time in hot season.

The lower leaflets on the rachis are often very small; bark leniticellate lenticels often coalescing.

Fl. February-May. Fr. cold season.

3. CLAUSENA, *Burm.*

Clausena pentaphylla, *DC.* Vern. *Ratanjot, ban nimboo* (*Bah.*); *teyrur, suraj mukha.*

A highly aromatic undershrub with woody root-stock from which annual shoots are thrown out. Young parts and inflorescence tomentose. Leaves with 3-7, usually subopposite leaflets; rachis pubescent, 2-7 in. long. Leaflets 2·5-6 by 1-2·7 in., lanceolate or ovate, acuminate, entire or sometimes slightly sinuate or obscurely toothed; base oblique, usually narrowed often acute, under-surface softly tomentose, main lateral nerves 10-15 pairs, forming loops near the margin. Flowers ·25 in. across, yellowish-white, usually in terminal panicled cymes, up to 10 in. long. Sepals 4, ovate, acute, pubescent, minute. Petals imbricate, concave, oblong, obtuse, with a few scattered hairs outside. Stamens 10; filaments short, abruptly tapering towards the top; anthers often with a rather dilated, obscure gland on the back near the apex. Ovary villous, on a raised torus 2-5-celled; each with 2 ovules, style short, articulate, glabrous. Berry about ·4 in. long ovoid, orange when ripe; verrucose with raised glands.

Common in Pilibhit, Gorakhpur and Oudh forests in grass lands and fire traces. The plant is valued in Indian veterinary practice.

Fl. March-May; and occasionally at other times of the year. The gland dots are large and prominent on the leaves.

C. Wampi, *Oliv.* Vern. *Ampich.*—A small tree with prominently glandular young parts, glabrous leaves with 5-9 leaflets; round berries, yellowish-green when ripe filled with acid pulp. It is cultivated in gardens within our area.

4. LIMMONIA, *Linn.*

Limmonia acidissima, *Linn.* Vern. *Bilashin, beli.*

A small spinous tree or a tall shrub with brown or ash-coloured furrowed corky bark; spines ·5-1 in. long, sharp, with brown tips. Leaves imparipinnate 2·5-6 in. long : rachis and common petiole jointed and winged, wings broad obovate, crenulate usually narrowed on the rachis. Leaflets 5-9, sessile, ·5-1·5 in. long, lanceolate, obovate or subrhomboid, usually obtuse and notched at the apex, base acute oblique in lateral leaflets, glabrous, irregularly crenulate, somewhat stiff. Flowers white, few, about ·3 in. across in short umbellate sometimes leaf-bearing racemes. Racemes up to ·8 in. long, 1-3 together, pubescent; pedicels ·2-·3 in. long. Calyx small 4-lobed; lobes ovate, acute. Petals 4, elliptic or oblong. Stamens 8, inserted round the disk, filaments subulate ; ovary 4-celled, cells 1-ovuled; style short, stout. Berry black when ripe ·3-·4 in. across; seeds 1-4 immersed in bitter pulp.

Bundelkhand

The wood is yellowish-white hard and close-grained, it merits attention. The leaves, roots and fruit are medicinal The dried fruits are considered to be an antidote to poisons. They are also said to have tonic properties and power of resisting contagion from small-pox and other fevers.

Fl. April-June. Fr. cold season

The genus *Limmonia* as pointed out by Dr. Trimen (Journal of Botany, Vol. XXVII, page 162) is strictly speaking untenable. According to him this plant should be called *Hesperethusa crenulata Roem.*

5. CITRUS, *Linn.*

Citrus medica, *Linn.* Vern. *Nibu, nibua.*

A small armed tree or a shrub with smooth bark; young shoots glabrous; purple, spines axillary. Leaves 1-foliolate, 3-6 in. long, elliptic, oblong-lanceolate or obovate, usually obtuse, sometimes blunt acuminate, entire or crenate-serrate, glabrous, coriaceous; petiole ·3-·4 in. long, naked or winged; articulated at its junction with the blade. Flowers fragrant, white, tinged with pink, ·5-1 in. long, few, in axillary racemes or solitary, often unisexual; pedicels stout, very short. Calyx cupshaped, with 3-5 short, distant teeth, persistent. Petals 4-8, imbricate, oblong with large glandular dots. Stamens 20-40, polyadelphous; disk large. Ovary many-celled ; ovules more than 4 in each cell ; style deciduous. Berry globose, or oblong, fleshy, often mammillate at the apex, rind in wild forms usually thick, and rather verrucose, golden yellow when ripe, many celled, septa membranous.

Swampy localities in Pilibhit, Oudh Divisions and Gorakhpur.

The fruit is eaten and is valued medicinally.

Fl. April-May. Fr. cold season

The following varieties are ordinarily cultivated :—

a. medica proper. Sans. *Vijapura.* Vern. *Nibua.* The Citron. Ar. *Utrej, Otroj.*—Leaves oblong. Petiole naked or marginate. Flowers several. Fruit mammillate; rind verrucose, thick.

b. Limonum. *W. & A.* Vern.—*Galgal.* The lemon. Petiole margined; fruit ovoid middle-sized, mammillate, rind thin, pulp abundant. Largely cultivated in the submontane tracts, less frequently in our area. The juice is largely used as a pickling medium and in medicine.

c. acida, *Roxb.* Vern. *Kaghzi nimbu* (*form with ovoid fruit*), *nimbu.* Sans. *Jambira.*—The sour lime of India. Leaflet elliptic, oblong; petiole more or less winged. Flowers small. Petals 4, fruit usually small, globose or oblong ovoid, rind thin or thick. Several forms are known in cultivation, the one with ovoid fruit and thin rind is valued.

d. Limetta, *W. & A.* ? Vern. *Mitha nibu.* Sans. *Madhu karaktika.*—The sweet lime of India. Petiole winged. Flowers small, white. Fruit globose mammillate, rind thin, pulp sweet, abundant, not aromatic.

e. Lumia, *W. & A.* ? The sweet lemon.—Petiole margined. Flowers tinged with red. Fruit ovoid-oblong, rind with convex vesicles, with long curved mammilla. Pulp sweet, without aroma. Not common.

The following are also cultivated :—

1. **C. aurantium,** *Linn.* The Orange. Vern. *Narangi.* Sans. *Nagaranga.*—Petiole winged or naked; wing often large. Flowers 2-sexual. Stamens 20-30. Fruit globose, usually depressed or flattened; rind loose or adherent, pulp sweet, or sub-acid, yellow or red.

2. **C. decumana,** *Murr.* Vern. *Chakotra.* The Pumello or the Shaddock.—A small spreading tree. Leaves large up to 9 in. long, petioles broadly winged. Flowers large, white. Fruit large, roundish, or narrowed towards the base. Rind thick, pulp pale yellow to red. Cultivated with fair success in the northern portions of our area.

6. FERONIA, *Correa.*

Feronia elephantum, *Correa.* Vern. *Kaitha,* Sans. *Kapitha.* The wood apple.

A medium-sized, armed, deciduous tree, with grey, longitudinally furrowed bark. Spines axillary, polished at the tip, rather stout, 1-2 in. long. Leaves imparipinnate, 2·5-4 in. long, rachis jointed, margined. Leaflets 5-7, sessile or short petiolate, ·8-2 in. long, cuneate or obovate, apex rounded or emarginate, glabrous, coriaceous and stiff, entire. Flowers ·3 in. across, polygamous, pale-green, tinged with red, in loose pubescent panicles, male and female flowers often in the same panicle. Calyx deciduous, lobes 5-6, very small. Petals 5-6 imbricate, elliptic-oblong. Stamens 10-12, inserted round a thin disk; filaments dilated and villous at the base, anthers red.

Ovary ultimately glabrous, at first 5-6, ultimately 1-celled; ovules in many series; style 0; stigma fusiform. Fruit globose, with a woody, rough, brownish pericarp, about the size of a tennis ball or a little larger.

Pilibhit, N. and S. Kheri, Gonda, Jhansi, Etawah. Usually cultivated or an escape. Doubtfully indigenous.

The acid pulp is largely eaten. The gum resembles gum-arabic and is valuable. The fruit, gum, leaves and bark are medicinal.

Blaze white.

Fl. April-June. Fr. November-January.

7. ÆGLE, *Correa*.

Ægle Marmelos, *Correa*. Vern. *Bel, bael.* Sans. *Bilwa.* Eng. The bael tree.

A medium-sized armed, deciduous tree, with yellowish-grey, shallowly furrowed and corky bark. Spines large, sometimes leaf-bearing, about 1 in. long; young parts and inflorescence downy. Leaves usually 3-foliolate, common petiole 1-2·5 in. long. Leaflets 1·5-4 by ·75-2 in., terminal largest, ovate, lanceolate or rhomboidal, base cuneate or rounded, acuminate, often obtusely crenate, glabrous subcoriaceous, lateral leaflets one or both sometimes aborted, very short petioluled; terminal petiolule ·5-1 in. long. Flowers greenish-white, about 1 in. across, in short lateral and axillary panicles; buds globose. Calyx small, pubescent, 4-5-lobed; lobes broad or obscure, deciduous. Petals 4-5, elliptic-oblong, imbricate, gland dotted, about ·4 in. long. Stamens numerous, free or sometimes in fascicles of 2-3; anthers long. Ovary up to 20-celled; ovules many in each cell, on a stout axis; style short, deciduous, stigma capitate. Fruit 2-2·7 in. across in wild trees (much larger in cultivation) with a smooth greenish grey or yellow, woody shell, and orange-coloured sweet aromatic pulp with many seeds.

Throughout the area; often cultivated.

The pulp is largely eaten and is often made into a cooling sherbet. It (specially the pulp of the unripe fruit roasted in the shell) is a good remedy for diarrhœa and dysentery, and is also used for strengthening mortar and is extracted in large quantites for this purpose. The mucilage in which the seeds are imbedded is an excellent adhesive. The leaves and wood are used in Hindu rituals.

Flowers and new foliage April-May. Leaves shed March-April.

Fruit ripens in hot season a year after flowering.

XVIII.—SIMARUBACEÆ.

Trees or shrubs, usually with bitter bark. Leaves alternate, usually pinnate; stipules 0 or deciduous. Flowers regular, usually unisexual, small. Inflorescence axillary or terminal, paniculate or racemose. Calyx 3-5-lobed. Petals 3-5, rarely 0. Disk annular, cupular or elongated, entire or lobed, rarely 0. Stamens as many, or twice as many as the petals, inserted at the base of the disk; filaments free, often with scales at the base. Ovary free, or 1-6-celled, usually deeply lobed; styles 2-5 free, or variously united; ovules usually one in each cell. Fruit drupaceous or samaroid, often of free carpels or capsular. Seeds albuminous.

A tall tree with large pinnate leaves; ovary deeply divided; fruit samaroid. .. .. .. 1. *Ailanthus.*

A small spiny tree with grey-green, rather small leaves; ovary not lobed; fruit drupaceous. .. 2. *Balanites.*

AILANTHUS, *Desf.*

Ailanthus excelsa, *Roxb.* Vern. *Ajan, asu* (*Et.*). Sans. *Madala.*

A large deciduous tree, with dark-grey shallowly fissured bark; young parts rusty or grey villous. Branchlets stout with large pith. Leaves attaining up to 4 ft. in vigorous trees, but usually 1-2 ft. long, paripinnate, crowded at the ends of branches. Rachis often expanded towards the base, at first downy, glabrescent with age. Leaflets 16-28, variable in shape and size, fœtid when bruised, 2-4 in.—sometimes up to 6·5 in.—long, obliquely ovate, acuminate, coarsely toothed, at first pubescent, ultimately glabrous and dark-green above, softly pubescent beneath, lateral nerves 12-16 pairs; petiolule up to 1 in. long. Flowers in much-branched, usually lax, pubescent panicles, polygamous, small, greenish-yellow, about ·25 in. across; bracts minute, deciduous, hairy. Calyx hairy at the base, teeth short. Petals much exceeding the calyx-lobes, about ·15 in. long, oblong lanceolate, induplicate valvate, scattered hairy inside, reflexed after opening. Stamens 10 in the male, 2-3 in the bisexual flowers, without scales; filaments shorter than the anthers. Disk thin, 10-lobed. Ovary 2-5 partite; styles connate; rudimentary in the male. Fruit of 1-5 samaras, 1·5-2 in. long, narrowed at both ends, with prominent veins, which are nearly parallel, except over the seed; twisted at the base; seed one at the centre, compressed.

Jhansi, Etawah.

The bark and leaves are medicinal; both are reputed to be good tonics. Branches with large leaf scars.

Deciduous, May-June. Fl. January-March. Fr. May-June

2. BALANITES, *Delile.*

Balanites Roxburghi, *Planch.* Vern. *Hingot, engua,* Sans. *Ingudi briksha.*

A grey-green, scraggy, spinous shrub or a small tree; spines up to 1·7 in. long stout, axillary often leaf and flower-bearing: young parts pubescent, branchlets glabrescent. Leaves 2-foliolate; common petiole very short ·1-·2 in. long; leaflets 1-2 by ·5-1 in. obovate or elliptic, rounded or mucronate at the apex, base cuneate or acute, pubescent or puberulous; petiolules minute. Flowers up to ·4 in. across, fragrant, greenish-white, 2-10 in axillary fascicles or short peduncled cymes. Inflorescence grey tomentose; buds roundish. Sepals about ·15 in. long, tomentose outside, silky within. Petals imbricate, slightly exceeding the sepals, oblong, villous within. Stamens 10, inserted between the lobes of the disk at its base; disk expanded and cupular at the top and lobed on the margin. Ovary villous or floccose, 5-celled, half-seated in the disk; style conical short. Drupe ovoid up to 2·5 in. long, 5-grooved, sometimes indistinctly, on a short thick stalk, rind woody, pale yellow when ripe, pulp offensive smelling; enclosing a hard one-seeded fibrous stone.

Gonda (Bankatwa range), Bundelkhand, Etawah.

From the seeds an oil is expressed. The pulp contains a fair percentage of saponin and is used in cleaning silk. The shell of the hard fruit is used for encasing crackers. The fruit, bark and leaves are medicinal. The seeds are said to be useful for colic.

The branches frequently end in spines. This species has been united with *B. ægyptica*, Delile, by Engler and Prantl which is a native of tropical Africa and differs in having glabrous petals.

Fl. April-May. Fr. cold season.

XIX.—OCHNACEÆ.

Trees or shrubs usually glabrous. Leaves alternate, usually simple, stipulate. Flowers usually large, regular, bisexual, in panicles or umbels, rarely solitary, bracteate. Sepals 4-5, or more, imbricate, persistent, sometimes coloured. Petals 5-10, imbricate. Disk thick, enlarged after flowering. Stamens definite or numerous inserted at the base of the disk, anthers dehiscing by terminal pores or longitudinally. Ovary usually 2-10-celled, with axile or parietal placentas, sometimes deeply lobed. Styles connate or free towards the apex; ovules 1-2 in each cell, or indefinite. Fruit usually breaking up into a number of drupes or pyrenes, sometimes capsular.

OCHNA, *Linn.*

Ochna pumila, *Ham.*

A small handsome undershrub, throwing out a number of annual shoots from a perennial woody root-stock. Leaves 4-6 by 1-5·2 in., oblanceolate or obovate, spinous-serrulate, apex obtuse or subacute,

narrowed to a short stalk at the base, glabrous, coriaceous, veins raised, tertiaries irregularly reticulate; stipules lanceolate 2·5-3 in. long. Flowers bright yellow 1·5-2 in. across, fragrant; 3-6 in umbels, at the ends of elongate axillary and terminal peduncles 2-3 in. long; bracts lanceolate, inserted at the base of the peduncle; bracteoles smaller below the pedicels. Pedicels 1-1·5 in. long, jointed below the middle. Sepals elliptic-oblong, up to ·5 in. long, accrescent and red in fruit. Petals delicate obovate much exceeding the sepals. Stamens indefinite with short filaments and longer anthers. Ovary deeply 3-10-lobed; style inserted between the lobes, solitary, with 4 short, linear segments near the top. Fruit of 3-10, reticulately rugose, ellipsoid, greenish drupels up to ·5 in. long, seated on the enlarged disk.

In grass lands and fire lines in Pilibhit, Gorakhpur and Oudh Divisions.

Fl. March-June.

XX.—BURSERACEÆ.

Trees and shrubs often resinous. Leaves alternate, imparipinnate, exstipulate. Flowers regular, small, polygamous or bisexual, usually in racemes or panicles. Calyx often minute, 3-5-lobed. Petals 3-6, free or rarely connate. Disk cupular or annular, free or adnate to the calyx tube. Stamens as many or twice as many as the petals, inserted on the margin or at the base of the disk. Ovary superior, 3-5-celled. Ovules 2 in each cell, axile. Fruit drupaceous, with 1-5 pyrenes or pseudo-capsular and dehiscent, seeds exalbuminous.

Bark papery, leaflets subsessile or sessile; calyx small, open; fruit 3-gonous, dehiscent.	1. *Boswellia.*
Bark not papery; leaflets short stalked; calyx urceolate; fruit globose, indehiscent.	2. *Garuga.*

1. BOSWELLIA, *Roxb.*

Boswellia serrata, *Roxb.* Vern. *Salai* or *salaia, salar.*

A middle sized handsome tree, with greyish-green, ashy or reddish bark, peeling off in thin papery flakes; young parts and inflorescence pubescent. Leaves imparipinnate, 12-18 in. in length, crowded at the ends of the branches, leaflets 17-31, opposite 1-2·5 in. long, basal pair often the smallest, lanceolate or ovate-lanceolate, subacute or obtuse, more or less oblique at the base. Coarsely crenate, subcoriaceous, sparsely pubescent on the nerves above, glaucous beneath. Flowers white, in stout racemes shorter than the leaves, crowded towards the ends of branches but not terminal. Calyx persistent, pubescent outside, 5-7-toothed, teeth small, ciliolate, broad at the base; distant. Petals 5-7, ovate, pubescent outside, ·2 in. long.

Stamens 10; somewhat unequal, alternately long and short, inserted at the base of the scarlet, annular, crenate disk; anthers puberulous. Ovary 3-celled, style short, grooved. Fruit ·5 in. long, trigonous, with three valves and 3 heart-shaped 1-seeded stones, winged on the margins.

Bundelkhand; frequently gregarious.

From wounds in the bark a fragrant and transparent golden yellow gum resin (the Indian Olibanum) exudes which is burnt as an incense. The resin yields turpentine of good quality on distillation

Fl January-March. Fr. May-June.

GARUGA, *Roxb.*

Garuga pinnata, *Roxb.* Vern. *Kikar, bania, kharpat.*

A moderate-sized deciduous tree with grey bark exfoliating in dark coloured scales or plates. Young parts and inflorescence pubescent. Leaves 9-18 in. long, exstipulate; leaflets 11-19, opposite 2-4 by ·75-1·75 in., short petioluled, oblong or ovate lanceolate, crenate, somewhat abrupt acuminate, softly pubescent at first, usually ultimately glabrescent. Flowers polygamous, greenish-yellow, about ·25 in. across, in spreading panicles from leaf scars at the ends of the branches, panicles up to 10 in. long. Calyx campanulate, ·25 in. long, pubescent outside, lobes 5, tapering to the apex. Petals 5, twice as long as the calyx lobes, linear, acute, pubescent outside, inserted with the stamens on the edge of the thin crenate disk which lines the calyx-tube. Stamens 10, filaments hairy. Ovary 4-5 celled, flask-shaped, narrowed into the style, hairy; stigma capitate 4-5-lobed. Drupe ·5-·7 in. across, globose, yellowish-green when ripe with 2 stones.

Throughout the area.

The tree can be readily propagated from cuttings The wood is not used within our area except for fuel.

Bark brittle; blaze pink or red streaked with white.

Leafless January-April. Fl. March-April. Fr. June-August.

XXI.—MELIACEÆ.

Trees or shrubs, usually with bitter bark and leaves. Leaves alternate, exstipulate usually pinnate, sometimes bipinnate, rarely simple; leaflets more or less oblique at the base. Flowers bisexual or polygamous usually in axillary panicles. Calyx 3-6-lobed. Petals 3-6, usually free. Stamens 4-12, usually twice as many, sometimes as many as, the petals, filaments usually combined into a tube outside the disk, rarely (*Cedrela*) free. Anthers usually sessile on the tube. Disk hypogynous or tubular and forming a second tube or annular, rarely absent. Ovary free, usually 2-5-celled. Style simple; stigma

disciform or capitate; ovules 2 or more in each cell. Fruit drupaceous, capsular or baccate. Seeds sometimes arillate or winged, albuminous or exalbuminous.

I. Leaflets usually toothed; fruit drupaceous :—

Leaves 1-pinnate.	..	..	1. *Azadirachta*
Leaves 2-3-pinnate.	..	..	2. *Melia*

II. Leaflets usually entire; fruit dehiscent :—

A. Seeds not winged :—

Leaflets many.	..	..	3. *Amoora.*
Leaflets 5-11.	..	..	4. *Heynea.*

B. Seeds winged :—

Stamens united into a tube; capsule woody, large.	5. *Soymida.*
Stamens free; capsule not woody small. ..	6. *Cedrela.*

1. AZADIRACHTA, *A. Juss.*

1. **Azadirachta indica,** *Juss.* Syn. **Melia Azadirachta,** *Linn.* **M. indica,** *Brandis.* Vern. *Neem.* Sans. *Nimba.* Eng. The nim or margossa tree.

A moderate sized to large evergreen tree; bark dark-brown with shallow vertical furrows. Leaves imparipinnate, 9-15 in. long, rachis glabrous. Leaflets 9-15, terminal often aborted, minutely petioluled, 1·5-3 in. by ·5-1 in., falcately lanceolate, acuminate, coarsely toothed, glabrous, dark-green above, paler beneath subcoriaceous, base very inequal. Flowers white, about ·4 in. across, scented, in numerous lax panicles which are shorter than, or as long as, the leaves. Calyx deeply 5-lobed, segments broad, rounded, minutely denticulate. Petals spreading about ·2 in. long, oblong-spatulate, ciliolate, pubescent inside along the centre. Staminal tube dilated at the base and apex, 10-12 toothed; usually pubescent inside towards the top, anthers opposite the teeth and included within the tube. Ovary glabrous, 3-celled, flask-shaped; style as long as the staminal tube, expanded into a 3-lobed fleshy stigma. Drupe ·5-·7 in. long, ovoid oblong, smooth, with a single stone, greenish-yellow when ripe.

Throughout the area; often planted.

All parts of the tree are medicinal. A medicinal oil is extracted from the seeds which is valued as an antiseptic. The gum is used as a demulcent tonic. The wood is durable, and "much resembles mahogany"—*Gamble.* It could be used for furniture, agricultural implements, carts, etc.

Blaze deep pink or reddish, about ·5 in.

Fl. March-May. Fr. May-July.

2. MELIA, *Linn.*

2. Melia Azedarach, *Linn.* Vern. *Bakain.* The Persian lilac, West Indian bead tree or Bastard cedar.

A middle-sized deciduous tree with short trunk and spreading crown. Bark smooth, greenish-brown and lenticellate at first, dark-grey and longitudinally shallow fissured, and exfoliating in rectangular plates and about ·5 in. thick on mature trees. Young parts covered with scurfy, stellate hairs. Leaves 9-18 in. long, usually 2- sometimes 3-pinnate, base of rachis flattened; pinnæ 5-9; leaflets 3-7 pairs on each pinna, ·5-2·5 by ·3-1·2 in., ovate or lanceolate, acuminate, glabrous, base of lower leaves unequal, unequally serrate or lobed, lateral nerves 8-12 pairs, petiolule of terminal leaflet longest up to ·5 in. long, margined. Flowers lilac and purple up to ·4 in. long, fragrant, in lax panicles of cymes shorter than the leaves; bracts and bracteoles minute, pedicels small. Calyx deeply 5-6 cleft, pubescent outside, lobes elliptic-oblong. Petals 5-6, ·2-·3 in. long, spatulate; staminal tube dilated at the top, deep purple with 20-30 teeth, hairy inside; anthers 10-12 inserted at the mouth of the tube between the teeth, apiculate. Ovary 5-celled, with 2 ovules in each cell; stigma capitate, with a purple ring at the base. Drupe about ·7 in. long globose, yellow when ripe, at first smooth ultimately wrinkled; stone 5-celled with a seed in each cell.

Usually planted, sometimes found as an escape.
The seeds and root bark are medicinal. The tree is an extremely fast grower and coppices well.
Blaze dark-brown or yellow and white.
Leafless December-March. Fl. March-April. Fr. November-December, but long persisting on the tree.

3. AMOORA, *Roxb.*

Amoora Rohituka *W. & A.* Vern. *Sohaga.* Sans. *Rohitaka.*

A middle-sized evergreen tree with dense spreading crown and dark-grey or greyish-brown bark, exfoliating in circular pieces, young parts tawny pubescent. Leaves crowded at the ends of the branches, dark-green, imparipinnate, 1-2 ft. in length. Leaflets 9-15; 3-9 by 1·5-4 in., decreasing in size towards the base of the rachis, oblong-lanceolate, oblong, or elliptic-oblong, usually abruptly acuminate, very oblique at the base, entire, subcoriaceous, ultimately glabrous, lateral nerves 10-16 pairs; petiolules up to ·3 in. long. Flowers polygamo-dioecious, white, buds globular. *Males.*—In axillary panicles, shorter than the leaves but usually exceeding half their lengths; bracts at the base of the flowers minute, scale-like; pedicels very short, stout. Calyx short, 5-partite, lobes imbricate, round, ciliate. Petals 3, exceeding the sepals, about ·1 in. long, concave, orbicular, puberulous outside, rather fleshy; staminal-tube

urceolate, glabrous, anthers 6-9, inserted near the base of the tube, slightly extruded, apiculate. Disk obsolete. *Female and hermaphrodite flowers.*—Subsessile, or sessile, larger than the males, in supra-axillary or axillary spikes which are much shorter than the leaves, calyx and petals as in the males; anthers narrower. Ovary fleshy, hairy, 3-celled, with 2 superposed ovules in each cell. Capsule globose 1-1·5 in. across, obovate, pale yellow when ripe, with leathery pericarp, 3 valved; seeds with scarlet aril.

Pilibhit, Gonda, Gorakhpur, in shady damp places.
An oil is extracted from the seeds which is used for burning. It is also used medicinally for rheumatism.
Leaf scars large, forming prominent depressions on the branches. Bark fibrous, blaze bright red with broad white streaks, generally exuding milky resin from the inner layers.
Fl. July-September. Fr. May-June.

4. HEYNEA, *Roxb.*

Heynea trijuga, *Roxb.*

A small, handsome, practically evergreen tree attaining 40 ft. in height. Bark grey or dark-brown, vertically furrowed. Leaves 9-18 in. long, rachis jointed at the nodes, glabrous; leaflets 5-11, stalked, terminal largest, 3-6 by 1·25-3 in., ovate or oblong-lanceolate, acuminate, oblique at the base, entire, dark-green and glabrous above, paler and sometimes puberulous beneath, lateral nerves 10-14 pairs, nervules elegantly reticulate; petiolule up to ·75 in. long. Flowers dull white about ·2 in. long, in corymbose panicles of cymes, with small subulate bracteoles at the base of the ramifications; panicles up to 12 in. long including the 5-7 in. long peduncle. Calyx 5-partite, lobes, hairy outside, ovate, obtuse. Petals erect, oblong, with finely ciliolate margins; staminal-tube deeply divided into 8-10 segments, each of which is 2-cleft with anthers in the clefts, lobes hairy inside; anthers apiculate. Disk fleshy, annular. Ovary sunk in the disk, 2-3-celled with 2 ovules in each cell; style obconical; stigma bluntly 2-fid with a discoid ring at the base. Capsule ·5 in. long, ellipsoid, 1-celled, 2-valved; seed usually one, exalbuminous.

Pilibhit, N. Kheri, Gonda, Bahraich.
Blaze cheesy, bright red in concentric layers.
Fl. February-May. Fr. later end of rainy season.

5. SOYMIDA, *A. Juss.*

Soymida febrifuga, *A. Juss.* Vern. *Rohna, rohina.*

A middle-sized deciduous tree with rough, dark-brown bark, exfoliating in oblong plates, and wrinkled branchlets. Leaves 9-18 in. long, crowded at the ends of the branches, red when young, paripinnate.

Leaflets 3-6 pairs covered with subpeltate scales when young, ultimately glabrous, opposite or subopposite, 2-4·5 by 1-2·5 in., lower pairs small, elliptic or oblong, obtuse, entire or sinuate, unequal at the base, upper half usually smaller, coriaceous; petiolules very small up to ·25 in. long. Flowers white, about ·2 in. across; in large terminal panicles; bracts ovate, acute; pedicels usually bracteolate and jointed a little below the middle. Calyx 5-partite, sepals imbricate, round, minutely denticulate. Petals spreading about ·1 in. long, obovate, clawed; staminal-tube urceolate, about half as long as the petals, deeply 10-lobed; lobes 2-fid, anthers inserted between the forks, shortly stalked. Disk flat. Ovary 5-celled, with a large 5-angled, discoid stigma with 5 triangular lobes radiating from the centre; ovules many in each cell, pendulous bi-seriate. Capsules up to 2·5 in. long, woody, obovoid or ellipsoid, 5-valved, with many, thin, compressed, pendulous seeds, about 1·7 in. long, winged at either end; central axis 5-gonous woody.

Banda—not common.

The heart wood when seasoned is durable and is suitable for furniture-making. The bark is medicinal and is used for treating intermittent fevers, dysentery, diarrhœa, etc.

Rachis is sometimes permanently red.

Fl. with new foliage April-May. Leafless February-March. Fr. May-June.

6. CEDRELA, *Roxb.*

Cedrela Toona, *Roxb.* Syn. **Toona ciliate,** *Roem.* Vern. *Tun.* The Toon tree.

A large, handsome, deciduous tree. Bark grey, exfoliating in irregular flakes. Young parts puberulous, leaves generally paripinnate, usually 1-2·5 ft. long, sometimes larger, somewhat crowded at the ends of the branches. Leaflets, opposite or alternate, 4-12 pairs, 2-5 by ·7-2 in., lanceolate or ovate-lanceolate, acuminate, entire, margins often slightly wavy, glabrous and shining above, often with a tuft of hairs at the axils of secondary nerves beneath, subcoriaceous, lateral nerves 10-15 pairs on either side of the midrib, base oblique; petiolule ·2-·5 in. long. Flowers white, faintly fragrant, in drooping pyramidal panicles, which do not exceed the leaves. Calyx small, 4-6-cleft, divided nearly to the base, lobes suborbicular, obtuse, ciliate. Petals 5, ·15-·2 in. long, oblong, obtuse or subacute, ciliate. Stamens 5, free, inserted on the hairy, 5-lobed, orange disk. Ovary 5-celled, hairy with several ovules in each cell; stigma peltate. Capsule ·75-1 in. long, oblong-ovoid, light or dark-brown, sometimes sparsely lenticellate. Seeds reddish-brown, winged at both ends ·5-·6 in. long including the wings.

Throughout the area; sometimes planted in avenues.

The wood is valued for cabinet-making and for door and window panels.

Blaze pinkish-red, mottled with white, turns brown on exposure; bark fibrous.

Fl. with new leaves March-April. Fr. June-July. Leafless cold season.

XXII.—OLACACEÆ.

Trees or shrubs, sometimes scandent, rarely undershrubs, often root parasites. Leaves usually alternate, simple, exstipulate. Inflorescence cymose or racemose. Flowers regular, small, bisexual, polygamous or unisexual. Calyx, 4-5-toothed or reduced to a rim, sometimes accrescent, free, or adherent to the fruit, lobes valvate or imbricate. Petals 3-6, usually valvate, free or more or less coherent. Stamens 3-15, free or monadelphous, all fertile or some reduced to staminodes. Anthers dehiscing longitudinally. Disk usually hypogynous, less often perigynous, cup-shaped, rarely 0. Ovary free or half-inferior; 1-celled above, and imperfectly 2-5-celled below. Ovules pendulous from the apex of a free central placenta. Style simple or 0. Fruit drupaceous, or dry and indehiscent. Seeds pendulous, usually albuminous.

Calyx accrescent in fruit, stamens 3.	1. *Olax.*
Calyx not accrescent in fruit; stamens 4-5. ..	2. *Cansjera.*

1. OLAX, *Linn.*

Undershrubs or shrubs, sometimes climbing and spinescent. Leaves alternate, often distichous. Flowers in axillary, short, simple or branched racemes. Calyx truncate enlarging in fruit. Petals 3-6, more or less coherent or free, valvate. Fertile stamens usually 3, adnate to the base of the petals; staminodes usually 5-6, bifid. Ovary free, seated in a cup shaped disk, 1-celled above, 3-celled below. Ovules 3, pendulous from the apex of a free central placenta. Style simple, stigmas 3-lobed. Fruit drupaceous, surrounded by the accrescent calyx, crustaceous. Seed albuminous, embryo minute.

Climbing shrub; flowers in short racemes. ..	1. *O. scandens.*
Undershrub with annual shoots; firs. 1-2, on slender peduncles.	2. *O. nana.*

1. Olax scandens, *Roxb.* Vern. *Gumech* (*Bah.*).

An evergreen scandent shrub; older branches often distantly armed with stout spines; young parts and inflorescence pubescent. Leaves 1-3 by ·75-1·3 in., ovate, elliptic-oblong or suborbicular, usually obtuse, glabrescent above, more or less pubescent beneath, margins often slightly recurved; petiole up to ·3 in. long, pubescent. Flowers white ·2-·3 in. long, in short, axillary, usually simple racemes which are ordinarily shorter than the leaves. Buds oblong, pedicels short; bracts pubescent, minute, caducous. Calyx cup-shaped, truncate, ciliate. Petals linear-oblong, acute, more or less connate. Stamens 3-4,

shorter than the petals and adnate to them at the base. Ovary glabrous, style subulate. Stigma, 3-lobed, clavate. Drupe about ·4 in. across, globose, yellow when ripe, crowned by the persistent style and nearly ¾-ths encased in the accrescent, cup-like, calyx.

Bahraich, Gorakhpur; rare.

The fruit is edible.

Fl. April-June. Fr. October-December.

Olax nana, *Wall.*

A switchy undershrub about 2 ft. high. Stems striate, Leaves subsessile, 1-2·5 in. long, ovate-lanceolate or oblong-lanceolate, apex obtuse, entire, margins recurved, glabrous and light-green above, glaucous beneath, rather thick, lateral nerves indistinct. Flowers white, about ·25 in. long, solitary, on slender axillary peduncles up to ·5 in. long; buds clavate, oblong. Calyx minute, sometimes lobed. Petals 3, oblong-obovate, obtuse at the apex, cohering towards the base. Fertile stamens 3, opposite the petals, about half their length; staminodes 6, one on each edge of the petals, longer than the fertile stamens. Drupe, subglobose, ·25 in. long, nearly covered by the accrescent, scarlet, calyx.

Grass lands in Pilibhit, Oudh and Gorakhpur. The rather insipid fruits are sometimes eaten.

Fl. April-May. The shoots are annual from a woody root-stock.

2. CANSJERA, *Juss.*

Cansjera Rheedii, *Gmel.* Vern. *Karil.*

A scandent shrub, often with distant, rather blunt spines. Branchlets pubescent, greenish; older branches prominently lenticellate. Leaves alternate, 1·5-3·5 by ·75-1·5 in.—sometimes up to 4·5 by 2·7 in.—ovate-lanceolate acuminate, entire, glabrescent on both surfaces, subcoriacous, somewhat rugose, base rounded, more or less oblique, lateral nerves prominent beneath, arcuate 3-6—sometimes up to 8 pairs, tertiaries indistinct; petioles minute, up to ·1 in. long. Flowers minute, about ·1 in. long, oblong-urceolate, yellowish, marcescent in fruit, bisexual, in axillary and terminal, pubescent spikes up to 1 in. long; spikes usually 1-2 together, bracts smaller than the flowers, lanceolate. Perianth usually 4, sometimes 5-lobed; lobes short recurved at the apices. Stamens usually 4, alternating with the linear oblong, lobes of the disk. Ovary superior; stigmas capitate, 4-lobed; ovule 1. Drupe red when ripe, subglobose with crustaceous pericarp and crowned with the remains of the style, ·3-·5 in. long.

Gonda and Bahraich, not common.

Fl. July-October.

XXIII.—CELASTRACEÆ.

Trees or erect or climbing, sometimes spinous shrubs. Leaves opposite or alternate, usually coriaceous, simple, stipules minute, caducous or 0. Flowers 2-sexual or polygamous, usually cymose, rarely clustered, or racemose. Calyx 4-5-lobed, imbricate, persistent. Petals 4-5 imbricate in bud. Disk usually conspicuous, flattened or cushion-like, sometimes lobed, rarely 0. Stamens usually 3-5 inserted on the edges of the disk or under it, alternating with the petals. filaments subulate; anthers dorsifixed. Ovary 3-5-celled, superior or rarely half inferior and sunk in the disk. Ovules 1-2 in each cell, erect, rarely 1 and pendulous. Fruit various; seeds usually arillate, sometimes winged, usually albuminous; cotyledous foliaceous; embryo large.

I. Leaves alternate :—

A. Climbing shrubs, unarmed; flowers in panicles; ovary free. .. .. . 1. *Celastrus.*

B. Erect shrubs or trees, usually armed; flowers in dichotomous cymes; ovary sunk in the disk and confluen tat the base with it. .. 2. *Gymnosporia.*

II. Leaves opposite or sub-opposite :—

A. Ovary free :—

Tree; stamens 4-5; seeds not winged, albuminous. .. .. .. 3. *Elæodendron.*

Climber (in our area); stamens 3, with capsular fruit; seeds winged; exalbuminous. .. .. .. 4. *Hippocratea.*

B. Ovary immersed in the disk and confluent with it at the base :—

Climbers; stamens 3; fruit baccate; seed exalbuminous. .. .. .. 5. *Salacia.*

1. CELASTRUS, *Linn.*

Celastrus paniculata. *Willd.* Vern. *Malkakni, mal kangni, kankun* (*Bah*; *Gon.*) *Kangni* (*Gor.*). Sans. *Kanguni, jyotishmati.*

A large woody climber with rough pale-brown bark, young shoots dotted with numerous lenticels. Leaves 2-5 in. by 1·25-3 in., elliptic, obovate, or orbicular, abruptly short-acuminate, crenate-serrate, base usually entire and acute, sometimes rounded, glabrous, rather coriaceous, secondary nerves 4-7 pairs, arched and branched before reaching the margin, basal pairs close; petiole ·4-·8 in. long; stipules minute diciduous. Flowers whitish-green, about ·1 in. across, unisexual, in large, terminal, panicled, pubescent cymes. Calyx pubescent outside, 5-lobed; lobes orbicular, minutely toothed towards the apex. Petals 5, oblong. *Male flowers.*—Stamens 5, inserted on the edge of the concave disk; pistillode rudimentary. *Female flowers.*—Disk larger; stamens with small anthers, without pollen; ovary free:

seated on the disk, narrowed into the style, 3-celled; stigma 3-lobed. Capsule globose, ·3-·5 in. across, 3-angled, 3-celled, orange-yellow when ripe, 3-6-seeded, valves remaining attached by the bases after dehiscence. Seeds black, in red aril.

Throughout the area; usually in open forests. An oil is obtained from the seeds, known as "Oleum nigrum" which is used for rheumatism and is a reputed remedy for beri-beri. The crude oil is sometimes used for burning.
Blaze pink with deeper coloured streaks.
Fl. and new leaves April-June. Fr. October-January.

2. GYMNOSPORIA, *W. & A.*

Shrubs or small trees usually spinous. Leaves alternate, exstipulate. Flowers small, bisexual, in axillary, solitary or fascicled cymes. Calyx 4-5-lobed. Petals 4-5, spreading. Stamens 4-5, inserted on the margin of the disk or below it; anthers broadly didymous Disk broad sinuate or lobed. Ovary usually sunk in the disk and more or less confluent with it, 2-3-celled; ovules 2 in each cell; style short; stigmas 3. Capsule usually obovoid 2-3-celled; seeds partially or entirely covered by an aril.

Spines rather slender, not leaf-and flower-bearing; cymes compact; capsules 3-gonous, usually more than ·3 in. across.	1. *G. Royleana.*
Spines stout, often leaf-and flower-bearing; cymes dichotomous, lax; capsule rounded, usually up to ·2 in. across.	2. *G. montana.*

1. Gymnosporia Royleana, *Wall.* Syn. **Celastrus spinosa,** *Royle.* Vern. *Karil.*

A stiff thorny shrub, often with pubescent or puberulous branchlets, armed with few short weak spines. Leaves 2-4 by 1·7 in., lanceolate, elliptic-lanceolate or obovate, crenate-serrulate, coriaceous, glabrous, subacute or acute, secondary nerves somewhat obscure, base cuneate, narrowed into a short, pubescent, channelled petiole; stipules with a broad base. Flowers in axillary cymes, shorter than the leaves, up to ·7 in. long, usually fascicled; pedicels up to ·2 in. long. Floral parts as in the next species. Capsule ·3-·4 in. across, turbinate, 3-angled, 3-celled, aril divided into linear segments at the top, covering about a th rd of the seed.

Gonda, Bahraich, Bundelkhand—*Brandis.*
Bark-brown somewhat rough; blaze pink.
Flowers and fruit greater part of the year. Fl. mostly end of cold season. Fr. mostly September-December.

2. Gymnosporia montana, *Benth.* Syn. **Celastrus senegalensis,** *Lamk.* Vern. *Bhekal, baikal.*

A shrub or small tree, usually armed with stout spines up to 1·5 in. long, which often bear leaves and flowers. Leaves variable, 1-2·5 by ·75-1·25 in., spatulate, oblanceolate or sometimes suborbicular,

base narrowed into a very short petiole, serrulate, glabrous, grey-green, coriaceous; stipules setaceous, minute, caducous. Flowers greenish-white, about ·15 in. across, in lax compound and forked often dichotomous cymes, pedicels very slender, about ·1 in. long; bracts acute, minute. Calyx 5-fid, ovate, obtuse; petals oblong. Stamens 5; disk obscurely 10-lobed. Ovary glabrous. Capsule ·2 in. across, of the size of a pepper-corn, roundish, purple when ripe.

Bundelkhand.

Flowers and fruits more or less throughout the year.

3. ELÆODENDRON, *Jacq.*

Elæodendron glaucum, *Pers.* Vern. *Mutmur, jamrasi, chaulai* ? (*Gon*).

A large deciduous tree with grey scraggy bark, exfoliating in woody plates, branchlets smooth, reddish-brown or purplish. Leaves usually opposite 2-6 by 1·25-3·5 in., variable in shape, elliptic, ovate, orbicular or oblong, short acuminate, coriaceous, glabrous, dark glossy green above, paler beneath, crenate-serrate or subentire; petiole ·4-1 in. long, channelled. Stipules minute, caducous. Flowers greenish-white, ·2 in. across, in axillary, dichotomous lax cymes, on slender peduncles up to 2·5 in. long. Calyx 4-5 partite, lobes imbricate, round, with rather thin margins. Petals 4-5, oblong. Stamens 4-5, inserted under the edge of the fleshy disk, anthers globose, 2-fid at the top. Ovary sunk in the disk and adnate to it at the base, 2-5-celled, narrowed into the very short style. Drupe about ·5 in. long, ovoid, tapering at both ends, dry, tipped with the remains of the style, stone usually 1-seeded.

Throughout the area.

The root is believed to be an antidote to snake venom. The wood is suitable for cabinet work. It has some resemblance to sal in colour and is sometimes substituted for that species by forest contractors.

The bark when freshly cut exudes a watery-fluid, often copiously.

Blaze red to reddish-brown, brittle. Pedicels slender, ·3-·4 in. long. Leafless April. Fl. February-August. Fr. cold season. The seeds are said to be largely sterile.

4. HIPPOCRATEA. *Linn.*

Hippocratea arborea, *Roxb.* Vern. *Ait bel.*

A large evergreen woody climber. Leaves opposite 2·5-6 in. by 1·5-3·5 in., elliptic-ovate or lanceolate, usually short and rather abruptly acuminate, coriaceous, glabrous, entire or obscurely crenate-serrate, serratures often with deciduous black or brown tips; petiole up to ·5 in. long, channelled. Flowers minute, yellow, in axillary and terminal, long peduncled, often dichasial or trichotomous cymes; peduncles usually shorter than the leaves; bracts acute, opposite.

Calyx 5-partite, externally puberulous. Petals 5, linear-oblong, exceeding the calyx, inserted below the disk. Stamens 3, inserted on the disk close to the ovary; filaments dilated. Ovary sunk in the disk, 3-celled, narrowed to the short style, ovules 2 in each cell. Fruit capsular of 1-3 compressed, dehiscent lobes connate at the base; carpels 2-3 in. long, oblong, tapering at both ends, pericarp, leathery, parellel-veined, separating into two equal halves, seeds 2 in each carpel; corky, winged towards the base; wings darker in colour than the seed, ovate, about 1·5 in. long.

Gonda, Bahraich—not common.

Fl. May-July. Fr. April-September.

5. SALACIA. *Linn.*

Salacia prinoides, *DC.*

A large evergreen woody climber with dull grey bark, and concentric bands of bast in the wood. Branchlets more or less 4-angled at the nodes; older branches minutely tubercular. Leaves opposite, 2-3 in. long, oblong, or elliptic, short, obtuse-acuminate, coriaceous, serrulate, base usually cuneate; petiole about ·2 in. long. Flowers pale yellow, about ·25 in. across, 2-6 clustered together on axillary tubercles; pedicels ·3 in. long. Calyx persistent, 5-partite, lobes ovate, glabrate. Petals 5, much exceeding the calyx, obovate or suborbicular, clawed, inserted under the prominent and fleshy disk. Stamens 3, reflexed, inserted on the inner edge of the disk; filaments flattened; anthers transverse, cells oblique. Ovary conical, 3-celled, with 2 ovules each, base confluent with the disk. Style 0, stigma minute. Fruit baccate, scarlet when ripe, globose minutely apiculate, up to ·5 in. across, usually 1-seeded.

Banki forests, Gorakhpur; rare. I have not yet come across the erect form of the plant in our area.

Fl. December-January, also hot season—a second flush? Fr. cold season.

XXIV.—RHAMNACEÆ.

Trees, or erect or scandent shrubs, sometimes bearing tendrils; often armed. Leaves simple, alternate, rarely subopposite, often with strong basal nerves; stipules small, sometimes changed into prickles. Flowers small, usually bisexual, less often 1-sexual, green or yellow, usually in axillary cymes, sometimes forming panicles. Calyx 4-5-fid, lobes triangular, valvate, usually keeled within. Petals 4-5, rarely 0, inserted on the calyx tube on the margin of the disk, usually shorter than the calyx segments. Disk thin and lining the calyx tube, or thick and filling it. Stamens opposite the petals and often

hooded by them. Ovary free or sometimes immersed in the disk usually 3-celled with 1 ovule in each cell. Fruits usually indehiscent, less often capsular, sometimes winged. Seeds usually albuminous.

I. Ovary superior or half inferior. Fruit girt by the calyx tube in the middle or the base :—
Unarmed and scandent ; fruit dry, winged. .. 1. *Ventilago.*
Usually armed ; fruit drupaceous. .. .. 2. *Zizyphus.*
. Ovary inferior. Fruit crowned by the calyx tube :—
Tendril-bearing climbers :—
Flowers racemed ; fruit winged. .. .. 3. *Gouania.*
Flowers in umbels ; fruit not winged. .. 4. *Helinus.*

1. VENTILAGO, *Gaertn.*

Ventilago calyculata, *Tulsane.* Vern. *Karia bouri, Keoti (Bund.).*

A large woody climber with grey or dark-brown fissured bark usually red in the fissures, and zig-zag green branchlets, which often end in woody tendrils ; young parts softly hairy. Leaves 2-5 in. by 1-2·5 in., variable in shape, ovate, oblong or elliptic, acute, abruptly short acuminate or obtuse, subcoriaceous, upper portion entire or crenulate, base often unequal, secondary nerves 6-8 pairs, arcuate, tertiaries numerous, fine, sub-parallel ; petiole ·2-·4 in. long, pubescent. Flowers numerous, minute, greenish, with an offensive odour, in densely pubescent, terminal panicles up to 9 in. long. Calyx 5-fid, with spreading teeth, keeled inside. Petals 5, shorter than the calyx lobes, obcordate, edges inflexed and enclosing the stamens. Disk filling the calyx tube. Stamens 5, adnate to the base of the petals. Ovary pubescent, immersed in the disk, 2-celled ; style very short, elongating into wing in the fruit ; stigmas 2, short. Fruit a roundish nut, deeply seated in the cup-like calyx tube, terminated by a linear-oblong, more or less pubescent reticulate wing up to 2 in. long, with a prominent mid-rib and tapering apex, crowned by the remains of the stigma.

Throughout the area.

Fl. December-March. Fr. hot season.

2. ZIZYPHUS, *Juss.*

Trees or shrubs, sometimes scandent usually with stipular prickles. Leaves alternate, sub-distichous with 3-5 basal nerves. Flowers small, in fascicles, in sessile or peduncled cymes. Calyx usually 5-fid, lobes spreading, keeled within. Petals 5 or 0, very small, deflexed, hooded.

Disk 5-10 lobed, lining the calyx tube, edges free. Stamens 5, enclosed by petals. Ovary confluent with it at the base. 2-4-celled; styles 2-3, free or partly connate, divergent. Fruit a dry or fle hv drupe, usually with 1-4-seeded stone. Seeds with scanty albumen or exalbuminous.

I. Flowers in fascicles, or in sessile or short peduncled cymes; petals 5 :—

A. Fruit fleshy when ripe; cymes sessile or subsessile, and exceeding the peduncles, or flowers in fascicles :—

1. Erect trees or shrubs drupe over ·3 in. long, orange or red when ripe :—

Leaves ·75-2 in. long, glabrous above. .. 1. *Z. Jujuba.*

Leaves ·5-·75 in. long, pubescent above; a low bush with zig-zag branchlets. .. .. 2. *Z. nummularia*

2. Scandent shrub; leaves silky pubescent beneath, drupe about ·25 in. long, black when ripe. .. 3. *Z. Œnoplia.*

B. Fruit dry when ripe; cyme peduncles much exceeding the pedicels. .. .. 4. *Z. xylopyra.*

II. Flowers in panicle l cymes; peduncles long; petals 0; subscandent. .. .. 5. *Z. rugosa.*

1. Zizyphus Jujuba, *Lamk.* Vern. *Ber.* Sans. *Badri.* Ar. *Sidr.* Per. *Kunar.*

A small to middle-sized tree, bark dark-grey with deep vertical furrows, red and fibrous inside. Branches drooping. Young parts, inflorescence and under-surface of leaves densely rusty or grey tomentose. Leaves ·75-2 by ·5-1 in., ovate to broadly elliptic, apex subacute or rounded, dark-green and glabrous above; base oblique, strongly 3-nerved, nerves impressed above, prominent beneath, petiole ·1-·6 in. long. Stipular prickle either solitary or in pairs and one curved and the other straight. Flowers about ·2 in. across, in subsessile, axillary cymes or in fascicles, pedicels exceeding the peduncles. Calyx glabrous within. Petals spatulate. Disk 10-lobed, lobes grooved. Ovary 2-celled, style 2-fid. Drupe ·5-1 in. long, globose or ovoid, in cultivated forms ellipsoid or obovoid, with tapering apex, red or orange when ripe. Stone tubercled, 2-celled.

A common tree throughout the area, often cultivated.

The wood is hard and close-grained. It is used for saddle trees. It makes excellent charcoal. The fruit is largely eaten. The bark is said to be useful for diarrhœa. A variety of lac is often produced on the branches.

Fl. May-September. Fr. cold season.

VAR. fruticosa, *Haines.*

A shrub about 4 ft. high. L. ovate-suborbicular, stipular prickles l u pairs, one straight and the other curved; both strong. Fruit globose. It often forms gregarious patches in scrub forest and grass lands in Bundelkhand. In some of its forms it closely resembles *Z. nummularia.*

2. Zizyphus nummularia, *W. & A.* Syn. **Z. rotundifolia,** *Lamk.* Vern. *Jhar-ber, kanta ber. Sans. Ajapriya, bhukantaka.*

A small bushy shrub, with widely-forked branches and zig-zag grey pubescent or tomentose branchlets. Leaves ·5-·75 in., elliptic or orbicular-serrate or entire, sometimes mucronate, usually pubescent above, grey tomentose beneath, petiole up to ·2 in. long. stipular prickles in twos, one slender and long and the other short and curved. Flowers ·14 in. across, greenish, in short compact cymes. Petals obovate, with inflexed margins. Disk 10-lobed, with a pit opposite each lobe. Drupe ·3 in. diameter globose, red when ripe.

Etawah, Bundelkhand.

The leaves are used for fodder for camels and goats. The acid fruits are eaten.

Fl. rainy season. Fr. cold season.

3. Zizyphus Œnoplia, *Mill.* Vern. *Mokoh, makor.*

A straggling shrub, climbing to the tallest trees. Bark grey, more or less rough. Young parts softly rusty tomentose. Leaves 1·2·5 in. long, obliquely ovate-lanceolate or ovate, acute or short acuminate usually entire, sometimes obscurely toothed, more or less pubescent above, adpressed brown silky beneath, base 3-5 nerved; petiole ·1-·3 in. long, pubescent; stipular prickles often solitary by the suppression of the straight prickle, the curved one often developing a pyramidal woody base in old stems. Flowers minute ·1 in. across, in dense, axillary, small, subsessile cymes. Sepals broad, ovate. Petals obovate and clawed, longer than the stamens. Disk with 10 grooved lobes. Ovary 2-celled; style united to above the middle, 2-4-fid. Drupe black when ripe, ovoid, ·25 in. long, stone 1-2-seeded, tubercled.

Throughout the area; common in scrub forests. The fruits are acid, and edible.

Blaze, reddish with paler streaks.

Fl. March-May. Fr. cold season.

4. Zizyphus Xylopyrus, *Willd.* Vern. *Ghont* (*J., Gor.*), *banbera* (*K.*), *chittaina, sitaha* (*Gor., Gon., Bah.*).

A large deciduous shrub or a small tree often with straggling branches. Young parts and inflorescence grey tomentose; bark greyish or brown, smooth or with exfoliating plates. Leaves 1-3·5 by 1-2·3 in., broadly elliptic or obovate, serrulate, acute or rounded at the apex, base unequal, 3-5-nerved, pubescent on the nerves above and on the under-surface; petiole ·1-·4 in.—exceptionally up to ·6 in.—long, spines in pairs, one straight, the other curved, rather small, sometimes absent. Flowers about ·25 in. across, greenish, 5-, rarely 4-merous, on peduncled, axillary, divaricate compound cymes; peduncles up to ·5 in. long, stout. Calyx lobes shortly

keeled near the apex. Petals hooded, spatulate, with a long claw. Disk thin, 5-angled. Ovary 3-celled; styles 3, nearly free up to the base. Drupe globose, about 1 in. across, depressed at the top, sometimes grey pubescent; rind dry when ripe; stone 3-celled, rough.

Throughout the area, sometimes over extensive areas in open forests. The bark and the fruit are excellent tanning materials. The latter if gathered at the right time may contain as much as 20 per cent. tannin.

Blaze pink or red and white.

Fl. April-June. Fr. cold season. Leafless March-April, new leaves April-May.

5. **Zizyphus rugosa,** *Lamk.* Vern. *Daurai* (*Bah.*, *Gon.*, *Gor.*)., *ainwa*: *banbera* (*Pil.*, *K*), *shagerah.* (*J*).

A large evergreen scandent shrub, or a small straggling tree. Young parts and inflorescence rusty tomentose. Leaves 2·5-6 in. by 1·7-3·5 in., broadly ovate or elliptic, subacute, rounded or acute, less often subacuminate at the apex, inequally cordate and 3-5-nerved at the base, serrulate; glabrous above when mature, glabrescent to brown tomentose beneath, subcoriaceous: petiole stout, pubescent up to 4 in. long, stipular spines often solitary, with a laterally compressed, broad, and often pubescent base, and recurved smooth tip. Flowers small, about ·2 in. across, yellowish-green in terminal and axillary panicled cymes which attain 1 ft. in length, lower cymes sometimes axillary; peduncles up to 2 in. long. Calyx lobes obscurely keeled inside, or not keeled at all. Petals 0. Ovary 2-celled, villous above the disk, style united to above the middle, 2-fid. Drupe ·3 in. long, globose or pyriform; stone 1-celled, 1-seeded, thin-shelled.

Throughout the area but not as common as the last species. The fruit is edible.

Fl. February-May. Fr. May-July.

3. GOUANIA, *Linn.*

Gouania leptostachya, *DC.*

A climbing shrub with grey or brown bark, branchlets glabrous, often terminating in tendrils. Young parts and inflorescence pubescent. Leaves alternate, 2-4 in. long, short acuminate, arcuate, minutely glandular at the crenatures, more or less pubescent along the nerves beneath, subcoriaceous, base rounded or subcordate and 3-nerved, or 5-nerved by the branching of the outer pair, lateral nerves (excluding the basal pair), up to 5 pairs, arcuate; petiole ·5-1 in. long, channelled; stipules with persistent base and caducous apex. Flowers white, ·15 in. across, in clusters on axillary and terminal racemes 6-10 in. long, often branched. Calyx 5-(rarely 6-)-fid; teeth acute, keeled at the apex. Petals inserted under the margin of the disk,

infolded round the stamens. Disk lining the calyx tube, 5-angled, angles ending in processes opposite the sepals. Ovary inferior, sunk in the disk, 3-celled, style 3-fid. Fruit 3-winged, capsular, yellowish-brown, about ·5 in. across, broader than long, separating into 3, 1-seeded carpels, outer wall reticulate specially over the seeds, crowned by the calyx-tube. Seeds 3, somewhat laterally compressed, polished.

Pilibhit, Kheri.
Blaze pink or red.
Fl. August-September. Fr. cold season, long persisting.

4. HELINUS, *E. Meyer.*

Helinus lanceolatus, *Brandis.*

An unarmed climbing shrub, branchlets striate; tendrils simple, terminal. Leaves 1-3 by ·5-1 in., lanceolate, often mucronate at the apex, shallow cordate or rounded and 3-nerved at the base, glabrous and dark-green above, paler and sometimes slightly pubescent beneath, lateral nerves 3-4 pairs excluding the basal pair, petiole up to ·3 in. long; stipules minute, dark-brown subulate, pubescent. Flowers about ·15 in. across greenish-yellow, in axillary umbellate cymes, borne usually at the ends of the branches. Peduncles ·5-1 in. long, slender, pedicels minute, filiform elongating in fruit. Calyx with spreading lobes, lobes 5, about half the length of the calyx tube, acute. Petals inserted under the disk at the margin, infolding the stamens, and shorter than them. Disk filling the calyx tube, obscurely 5-angled. Ovary sunk in the disk, 3-celled, styles 3, recurved. Fruit capsular, tardily dehiscent, globose, about ·3 in. across, 3-celled, 3-seeded; seeds black.

Bahraich, (Sohelwa)—prefers shady banks.
Fl. and fruits most part of the year.

XXV.—VITACEÆ.

Climbers with leaf opposed tendrils, erect shrubs, or herbs, or rarely small trees; joints often swollen. Leaves alternate; petiole often thickened at the base. Flowers small, regular, hermaphrodite or polygamous, sometimes dicœcious, in variously compound, cymose inflorescences. Calyx 4-5 toothed or entire. Petals 4-5, valvate, free or connate at the apex or base, sometimes perigynous. Stamens 4-5, opposite the petals, inserted on the disk or outside it. Ovary sunk in the disk, 2-6 celled with 1-2 ascending ovules in each; style short or none; stigma simple or lobed. Fruit a berry: seeds often rugulose, albuminous, albumen sometimes ruminate.

Climbers; stamens free. Ovary 2-celled.	1 *Vitis.*
Erect shrubs or herbs. Stamens connate at the base ovary 3-6-celled.	2. *Leea.*

1. VITIS, *Linn.*

Usually climbing shrubs, ascending clockwise if twining; tendrils usually leaf opposed, sometimes inflorescence-bearing. Leaves simple, or 3-9 foliolate, stipules usually scarious. Flowers small 4-5-merous, petals sometimes cohering at the tips and lifted off as a cap when falling. Disk of glands or lobed or annular. Stamens free. Ovary usually 2-celled. Berry 1-4-seeded. Seeds variable in shape and markings.

Planchon in his monograph on the genus divided it into a number of genera. As the entire group can be easily made out in the field it has been kept intact for the convenience of Foresters and these genera have been indicated against each species.

I. Leaves simple :—

A. Flrs. tetramerous ; infl. not tendrillate :—

Stem woolly ; bark not corky ; leaves pubescent or tomentose on the under surface ; seeds with irregular, angled pits on either side. ..	1. *V. adnata.*
Stem soft, bark corky, deeply furrowed ; leaves sparingly pubescent ; seed, smooth except for a continuous ridge on both faces.	2. *V. repanda.*

B. Fls. pentamerous ; infl. tendrillate :—

Leaves broader than long, usually 3-7-lobed, glabrescent or sparingly pubescent. ..	3. *V. latifolia.*
Leaves ovate, never broader than long, not lobed, tomentose on the nerves beneath. ..	4. *V. indica.*

II. Leaves digitate :—

A. Leaves trifoliolate :—

Young parts densely grey or woolly tomentose ; flrs. pentamerous ; infl tendrillate. ..	5. *V. divaricata.*
Young parts covered with few rough hairs; flrs. tetramerous ; infl. not tendrillate... ..	6. *V. trifolia.*

B. Leaves 3-6 foliolate or pedate :—

1. Leaves glabrous ; flrs. dioecious—

Bark not corky, leaves pedate fruit globose.	7. *V. lanceolaria*
Bark corky ; leaves digitate ; fruit oblong.	8. *V. Parkeri.*

2. Leaves softly pubescent, flrs. 2 sexual. .. 9. *V. auriculata*

1. Vitis adnata, *W. & A.* Syn. **Cissus adnata,** *Roxb.* Vern. *Gurwari, gurbanwaria.*

A large deciduous woody climber with reddish-brown bark ; branchlets striate, brittle. Young leaves, branches and inflorescence covered with dense rusty wool, tendrils branched, often ending in disks. Leaves simple, 2·5-6 in. long, usually longer than broad, broadly ovate, suborbicular, somewhat abruptly acuminate, or cuspidate broadly cordate, margin bristle toothed, more or less rusty pubescent

or tomentose, usually 5-nerved at the base, secondary nerves (excluding basal nerves) up to 7 pairs, excurrent, petiole up to 4·5 in. long, pubescent; stipules 3 in. long, oblong, rounded. Inflorescence on new shoots, leaf opposed, up to 2·5 in. long, cymes peduncled, subumbellate, persistently tomentose on the nodes. Flowers ·12 in. across, minute, 4-merous, bisexual. Petals hooded, greenish, oblong ovate; style subulate, persistent. Berry ·4 in. long, purple, nearly black when ripe, pyriform, usually apiculate, seed 1, obliquely pyriform, with a continuous ridge on both faces, with angled pits on the surface.

From Pilibhit to Gorakhpur, and Bundelkhand.

Fl. April-June. Fr. June-July.

Vitis Sp.—Branches obscurely 4-angled; young parts densely rusty woolly. Leaves simple about 3 in. long, ovate cordate, bristle serrate, shortly caudate acuminate; petiole up to about 1 in., stipules oblong. Cymes compound umbellate, peduncled; peduncle 1 in., usually 5-rayed. Flowers 4-merous. Berry round-ovate, about 2 in., long shortly tipped with the style, seed 1, almost smooth. (My sheet no. 474.)

Allied to the above; possibly *V. assamica, Laws*, more material needed for satisfactory identification.

Gorakhpur. Fr. April.

2. Vitis repanda, *W. & A.* Syn. **Cissus repanda,** *Vahl.* Vern. *Pani bel.*

A stout soft-wooded climber with deeply furrowed corky bark, young parts rusty villous; tendrils bifid. Leaves simple 2·5-8 in. long, broadly orbicular-cordate, usually slightly broader than long, often palmately 3-7-lobed or angled, lobes short, triangular, acute or acuminate, membranous, floccose-tomentose when young, glabrous, except on the nerves beneath with age, repand toothed, basal sinus deep or broad, base 5-nerved, outermost pair branched from near the origin, secondary nerves 3-7 pairs above the basal, straight; petiole usually 2·5-5 in. long, sometimes longer. Stipules ·2-·3 in. long, oblong, rounded, sometimes falcate; tendrils forked or dichotomous. Cymes on new shoots, decompound, leaf-opposed, subumbellate, pedunculate: peduncles 2-5 in. long, 3-5-rayed. Bracts ·15 in. long, concave, ovate. Flowers about ·1 in. long, reddish-brown, 4-merous bisexual, petals ovate-oblong hooded; hairy at the apex; disk 4-lobed; style persistent. Berry pyriform ·3-·4 in. long, black when ripe, beaked with the enlarged style. Seeds ·3 in. long, pyriform nearly smooth with a continuous ridge on both faces.

Throughout the area.

Leafless in cold season. Fl. April-June. Fr. ripens.

3. Vitis latifolia *Roxb.* Syn. **Ampelocisus latifolia,** *Planch.*

A climber with fairly extensive weak annual stems from a perennial root-stock, new stems hollow, glaucous or blue, often purplish at

the nodes. Leaves simple 5-10 in. across, suborbicular, palmately 3-7-lobed or angled, lower sometimes lobed halfway down, cordate to retuse at the base, crenate, serrulate or dentate, mealy when young, glabrous or pubescent on the nerves beneath when mature, base 5-7-nerved; petiole up to 8 in. in length, channelled. Flowers ·1 in. across, reddish-brown, 5-merous, polygamous, in compact, pyramidal, pubescent, panicles of cymes, 1-4 in. long and on a long stout peduncle bearing a bifid tendril close to the cymes. Calyx truncate. Petals, free; ·1 in. long, oblong, recurved, glabrous; disk 5-furrowed, often adnate to the fruit; style 0. Berry black when ripe, globose up to ·35 in. across, usually 2-seeded, seeds ellipsoid, roughly plano-convex, polished, transversely rugose on the back and sides with a strong ridge on the face.

Oudh and Pilibhit also probably, Gorakhpur in scrub jungles, hedges and in secondary growth in clearings.
New shoots in May and June. Fl. May-July. Fr. August-October.
The fruits are sweet and edible.

4. Vitis indica, *Linn.* Syn. **Ampelocissus Arnottiana,** *Planch.* Vern. *Jangli angur.*

A large climber; branches floccose tomentose, striate; tendrils woolly. Leaves 3-6 in. long, broad ovate, deeply cordate with narrow sinus, gland toothed, hard, floccose when young, glabrescent with age above, rusty tomentose on the nerves beneath, secondary nerves 6-8 pairs; petioles about 3 in. long, densely floccose tomentose. Flowers 5-merous, minute, greenish-purple, subsessile, in dense clusters on the thick branches of a peduncled panicle of cymes, covered with dense wool, peduncle 2-3 in. long, usually bearing a strong tendril at the base of the cymes. Petals free, fruit globose, 1-2-seeded. Berry ·75 in. long, purple globose.

Banda (Edgeworth). There are no specimens at Dehra from our area.

Vitis vinifera, *Linn.* The grape vine. Vern. *Angur.*—A large woody climber with suborbicular, 5-lobed leaves, and 5-merous green flowers in pyramidal panicles of cymes; petals cohering at the top. It is cultivated within the area but the fruits do not come to perfection as the rainy season starts before they ripen properly.

5. Vitis divaricata, *Wall.* Syn. **Ampelocissus divaricata,** *Planch.*

A somewhat extensive climber with cottony tomentose, glabrescent branches. Young parts densely woolly or grey tomentose. Tendrils branched, long-stalked. Leaves usually trifoliolate, rarely simple or more or less deeply lobed: petiole 1-5 in. long, often reddish. Leaflets membranous, covered when young with lax, pale-brown hairs above and with felted tomentum beneath, glabrescent with age, variable, terminal, 2·5-8 in. long, oblong to elliptic-lanceolate or

ovate, lateral smaller in length, tip acute or acuminate; base unequal, broader half semicordate on the broader side; margin bristle serrate, serratures often unequal. Inflorescence of long peduncled, leaf opposed, compound, pubescent, 2-3-chotomous, dense cymes. Peduncles up to 5 in. long, forked near the top into a long tendril. Cyme branches usually divaricate with linear bracts at the forks. Flowers very small, reddish-brown or purple-red, pentamerous. Petals hooded and beaked; disk cupular, 10-pleated or lobed. Berry ·4 in. long, ovate to globose, 3-4-seeded; seeds oblong or obovate, shortly beaked, with a pit on the back from which depressed lines radiate on all sides, face with a ridge which broadens upwards.

Tulsipur—Gonda Division.

Fl. June-September. Fr. October. Stems annual from a perennial root-stock.

6. Vitis trifolia, *Linn.* Syn. **V. carnosa,** *Wall.*; **Cissus carnosa,** *Lamk.* Vern. *Amarti-bour.*

A climber with a woody root-stock, and annual, somewhat thin, compressed stems: bark rough with numerous lenticels. Young parts densely rough-hairy. Tendrils wiry, branched, often ending in adhesive disks. Leaves trifoliolate; stipules about ·4 in. long, scarious; petiole ·7-3 in. long, hairy. Leaflets variable 1-3·5 in. by ·7-2·5 in., terminal largest, lateral oblique and sometimes lobed on the broader side, lanceolate to broadly elliptic, or obovate, sharply or broadly acute, coarsely toothed or broadly crenate, somewhat fleshy, rough pubescent on both surfaces; petiolule of the terminal leaflet up to 1 in. long. Inflorescence axillary or leaf-opposed, of compound cymes on a long peduncle, which exceeds the leaves, initial branches 3-5-rayed from the peduncle, then divaricate. Flowers small, bisexual, greenish, 4-merous. Petals saccate at the tip; disk 4-lobed, white, crenate; style subulate. Berry ·3 in. across roundish, apex depressed, crowned with the remains of the style; black when ripe; seeds 3-4, sharply angled on the face and grooved and tubercled on the back.

Throughout the area in open localities. The leaves are used for poulticing indolent boils and swellings.

Fl. May-June. Fr. cold season (early part).

7. Vitis lanceolaria, *Wall.* Syn. **Tetrastigma lanceolarium,** *Planch.*

A large evergreen woody climber with flattened stem and pale-brown, rough and tubercled bark. All parts glabrous except the stipules, inflorescence and flowers; branches green, often muricate with corky warts; tendrils woody unbranched leaf-opposed. Leaves pedately 5-foliolate, or 4-3-foliolate, common petiole 1-4 in. long, stout, sometimes pubescent; leaflets variable, 2·5-7 in. by 1-3·5 in.,

terminal largest, lateral oblique, oblong or ovate, to elliptic lanceolate or oblanceolate, usually abruptly acuminate, margins distantly cuspidate serrate, base entire, fleshy, secondary nerves impressed below, 6-10 pairs, not prominent, nearly meeting at the edges; petiolules sometimes pubescent, up to 1 in. in terminal leaflet. Flowers polygamo-dicecious, green, tetramerous, in compound corymbose cymes, with umbellate branches not exceeding the leaves, covered with minute weak hairs. Female cymes fewer flowered and usually shorter than the male cymes. Petals ovate-oblong, corniculate at the apex; staminodes present in the female flowers; style none; stigma 4-lobed. Berry globose, about ·3 in. across yellowish when ripe, usually 1-seeded; seeds shortly beaked, 1-2, obovate, rounded or inner face concave if berry more than 1-seeded, back with a deep groove and face with a forked depressed line.

Pilibhit and Gorakhpur; probably also in Oudh Divisions in the vicinity of swamps.

Fl. March. Fr. January-February.

8. Vitis Parkeri, *Gagnepain.* Syn. **Tetrastigma Parkeri,** *Gagnepain.*

A fairly large soft-wooded climber with terete stem, bark longitudinally furrowed, rough, corky. All parts glabrous with the exception of the inflorescence. Twigs smooth, tendrils leaf-opposed, long, undivided. Leaves digitately 3-6-foliolate, petiole up to 8 in. long. Leaflets 2-7 by 1·2-4 in. long, terminal largest, outermost more or less oblique, elliptic or oblanceolate, caudate acuminate, lateral nerves ending in 3-5 cuspidate teeth, base cuneate or acute, subcoriaceous; petiolule of the terminal leaflet up to 1·2 in. long. Flowers minute, dicecious, tetramerous, in axillary, divaricate, subcorymbose compound cymes, up to 3 in. long, common peduncle branched near the base. *Male flowers.*—Not seen. *Female flowers.*—Stigma 4-lobed; style none. Berry oblong, 1-2-seeded, about ·75 in. long. Seeds oblong or plano-convex if more than one, bluntly beaked marked with parallel horizontal furrows laterally, and with a groove on the face and another almost continuous one on the back the latter with a low ridge.

Gorakhpur, Pilibhit.

Blaze fibrous white streaked with pink, turning orange.

Fl. January-February. Fr. cold season.

Probably the same as V. campylocarpa, Kurz. In the absence of more complete materials, the more recent name has been tentatively retained.

9. Vitis auriculata, *Laws.* Syn. **Caryratia auriculata,** *Gamble.*

A soft-wooded climber with corky bark when old. Branches succulent; young parts and inflorescence pubescent; tendrils usually 2-fid. Leaves digitately 3-5-foliolate; petiole 3-5 in. long, stipules prominent.

·75-1·5 in. long, very thin, broadly falcate. Leaflets 2-6 in. long, terminal largest, lateral oblique and obscurely lobed, broadly ovate to elliptic or rhomboidal, inequally and somewhat coarsely serrate, membranous, acuminate, base rounded or subacute; glabrescent above, pubescent beneath; petiolule of terminal leaflet up to 1·5 in. long. Inflorescence axillary, on long peduncled divaricating compound cymes; peduncles succulent, longer than the petioles. Flowers small, tetramerous, greenish, bisexual; petals oblong, narrowed and hooded above, disk 4-lobed; style subulate. Berry ·7 in. across, round, 1-seeded. Seed obovate-oblong.

Jhansi—Rora forest, Banda—Kalyanpur: rare. The fruit is said to be edible.

Fl. rainy season. Fr. October.

Record based on somewhat incomplete material.

2. LEEA, *Linn.*

Erect herbs or shrubs sometimes small trees. Branches usually furrowed. Leaves alternate, simple, pinnate or decompound, secondary nerves usually parallel; petiole with sheathing base. Flowers small in leaf-opposed compound cymes, pentamerous. Petals 5, connate at the base and adnate to the staminal tube, hooded at the apex. Disk tubular, 5-lobed above; stamens alternating with the lobes of the disk and forming with the latter a staminal tube; filaments inflexed; anthers connate or free, opening into the tube. Ovary adnate to the stamineal tube, 3-6-celled, with 1 ovule in each cell. Fruit a 3-6-seeded berry; seed wedge-shaped.

A.	Flrs. brick-red, leaves usually 1-pinnate.	1. *L. alata.*
B.	Flrs. greenish-white :—	
I.	Leaves simple; stem herbaceous.	2. *L. macrophylla.*
II.	Leaves 1-3-pinnate, stem not herbaceous :—	
	Upper leaves simply pinnate, lower bipinnate, leaflets scabrid.	3 *L. aspera.*
	Leaves 2-3-pinnate, leaflets glabrous.	4. *L. sambucina.*
	Leaves 2-pinnate, leaflets hairy beneath. ..	5 *L. bracteata.*

1. Leea alata, *Edgew.*

A stiff perennial herb up to 5 ft. high, with a woody root-stock; hairless but somewhat rough with elevated dots. Leaves simply imparipinnate; petiole 1-2·5 in. long, grooved and winged; stipules falling off early. Leaflets 5-9 sessile, 3·5-11 in. by 1-3 in., narrowly oblong-lanceolate or oblanceolate, acute or rounded. Cymes hairy; peduncles 2-7 in. long, deeply grooved. Flowers small, brick-red, crowded. Berries ·3 in. across, reddish-purple, with 4-6 seeds.

From Pilibhit eastwards to Gorakhpur.

Fl. April-July. Fr. September-October.

2. Leea macrophylla, *Roxb.* Vern. *Hathikana, hathikanwa.*

An annual herb with a perennial root-stock 1-3 ft. high. Young parts hoary pubescent. Leaves simple; upper 5-9 in. long, lower much larger, attaining 2 ft., broadly ovate or suborbicular, unequally toothed, sometimes obscurely lobed, acute, base cordate glabrescent above, pubescent beneath with ashy-grey branched hairs, coriaceous; petiole up to 3 in. long, with large adnate stipules. Flowers greenish-white, sessile in cymes, which are arranged on short corymbs. Berries ·3 in. across, black when ripe.

Pilibhit to Gorakhpur, in glades and grass lands.

The roots yield a dye and are medicinal The plant dies back in the cold season.

Fl. May-June. Fr. cold season.

3. Leea aspera, *Edgew.* Vern. *Gidar-phalsa* (*Pil.*) *Rumalu* (*Gor.*).

A perennial herb or shrub attaining up to 12 ft. in height. Leaves attaining 20 in. in length. Upper leaves usually simply imparipinnate, lower pinnæ sometimes 3-foliolate; lower leaves bipinnate; common petiole not winged, usually short. Leaflets 5-7 in the upper leaves; 2.5-7.5 by 1.3-3 in., elliptic, oblong or ovate, abruptly acuminate, sometimes acute, somewhat coarsely serrate, base cordate or rounded, 5-7-nerved, secondary nerves parallel and close, forked near the margin, tertiary nerves close and parallel, usually rough, coriaceous, the space between the main nerves on upper surface sparsely covered by lines of adpressed and more or less deciduous rough hairs, under-surface puberulous along the nerves; terminal petiolule up to 1·8 in. long. Inflorescence of compound trichotomous cymes; peduncle up to 3 in. long, often forked from near the base, usually 3-rayed. Berry greenish-black to black when ripe, up to ·4 in. across, depressed globose, sometimes obscurely lobed, glaucous.

All over the area, quite common.

The stem breaks off close to the ground at the nodes every year, leaving a woody base. Leaves turn red before falling. The berries have some resemblance to the fruit of some Grewias, hence probably the vernacular name.

Fl. March-June. Fr. cold season.

4. Leea sambucina, *Willd.*

A large shrub. Leaves 2-3 pinnate. Leaflets usually 3-5 on each pinna, very variable in size and shape usually 3-5·5 in. long, oblong-lanceolate to elliptic-acuminate, or caudate, somewhat thin, subcoriaceous, almost glabrous, irregularly serrate; teeth 2-3 times the number of secondary nerves, secondary nerves bent near the margin; tertiary nerves fine, not prominent. Flowers greenish, subsessile in compact cymes, on much branched corymbs. Berries black covered with bloom when ripe.

Pilibhit, Gonda, Kheri, Banda; probably throughout the area.
Fl. rainy season. Fr. cold season

L. bracteata, *Clarke.* A large shrub with 1-2 pinnate leaves, with large ovate-lanceolate, acuminate, irregularly serrate, roughly pubescent, leaflets in which secondary nerves are somewhat distant with several serratures between each pair. There is only a fragmentary specimen of this species in Dehra Dun herbarium from Kheri.

XXVI.—SAPINDACEÆ.

Trees or shrubs or rarely climbing herbs. Leaves usually alternate, pinnate or rarely palmately trifoliolate or unifoliolate. Flowers small, regular or zygomorphic, generally polygamo-dicecious. Calyx 4-5-lobed or of 4-5 sepals, often unequal, usually imbricate. Petals 4-5, or fewer, or 0 generally with scales or tufts of hair within. Disk annular or unilateral, rarely in male flowers 0, usually lobed. Stamens 5-10, usually 8, filaments free, often villous; anthers 2-celled basifixed or versatile. Ovary usually 3-celled, sometimes 1-4-celled, style simple or divided, usually terminal; stigma usually simple; ovules generally 1-2 in each cell. Fruit capsular or indehiscent, entire or lobed, sometimes winged. Seeds with or without aril, exalbuminous, often with a large hilum.

I. Climbing annual. .. . . 1. *Cardiospermum.*

II. Erect trees or shrubs :—

A. Leaves odd pinnate, or even pinnate by abortion; flrs. irregular .. .. 2. *Erioglossum.*

B. Leaves paripinnate or simple, flrs. regular :—

1. Fruit indehiscent :—

Petals 0; pericarp not saponaceous; seeds arillate. .. .. .. 3. *Schleichera.*

Petals 4-5; pericarp saponaceous; seeds not arillate. .. .. .. 4. *Sapindus.*

2. Fruit capsular .. .. .. 5. *Dodonea*

1. CARDIOSPERMUM. *Linn.*

Cardiospermum Halicacabum, *Linn.* The heart-pea or the balloon vine, Vern. *Kali gugchi.*

An elegant wiry, annual climber puberulous or almost glabrous, with striate stems. Leaves alternate, ex-stipulate, bi-ternate; petiole up to 2 in. long. Leaflets deeply incised, membraneous, ovate in general outline, acuminate, base narrowed, or decurrent into the petiolule, terminal largest up to 2·5 in. long. Flowers small, white, polygamous, in axillary peduncled cymes. Cymes with 2-coiled tendrils at the base, few-flowered. Peduncle up to 3 in. long. Sepals 4, outer 2 smaller. Petals 4 in unequal pairs with scales at the base.

Stamens 8 ex-centric. Capsule about ·75 in. across, inflated, tubinate and depressed the top, three-angled, winged at the angles, 3-celled, valves thin, papery, seeds black, round with a large white aril at the base.

All over the area and also in Etawah in open places; common. The roots are medicinal and are said to be laxative.

Fl. rainy season. Fr. early cold season.

2. ERIOGLOSSUM, *Blume.*

Erioglossum edule, *Bl.* Syn. **E. rubiginosum,** *Bl.*; **Sapindus rubiginosa,** *Roxb.*

A small evergreen tree. Young parts inflorescence and rachis softly golden or rusty pubescent. Leaves imparipinnate (usually paripinnate by abortion), rachis and common petiole up to about 11 in. long. Leaflets 8-13, opposite or sub-opposite, short stalked, lower gradually smaller than the upper, 2-6 by 1-2·2 in., oblong-lanceolate to elliptic, acuminate, entire, base often unequal, coriaceous, glabrescent above, softly pubescent—at least on the nerves—beneath, lateral nerves usually not paired, 8-12 on each half. Inflorescence up to 13 in. long, of cymose 3-5-flowered clusters borne on lax, panicled racemes. Flowers fragrant, brownish white, irregular, about ·25 in. long; bracts woolly, linear. Sepals 5, 2 outermost smaller. Petals 4, obovate-oblong, stalked and lobed at the base, each having on its inner face a scale which is lobed at the top and shaggy on the inner face. Stamens 8; disk unilateral. Ovary 3-lobed, villous. Fruit of 1-3 oblong diverging cocci, black when ripe.

Pilibhit, North and South Kheri, Bahraich; rare.

The fruit is said to be edible. The wood is light. "Bark usually discoloured; blaze thin, dark red."—*Haines.*

Fl. April-May. Fr. May.

3. SCHLEICHERA, *Willd.*

Schleichera trijuga. *Willd.* Vern. *Kusam, gosam.*

A fairly large or medium sized deciduous tree with a spreading umbrageous crown attaining up to 9 ft. girth but a comparatively low height. Bark light-grey, exfoliating in irregular plates; young parts rusty tomentose. Leaves alternate, even pinnate, rachis up to 6 in. long. Leaflets 4-8, opposite, short-stalked, terminal pair largest, then gradually smaller to the lowest pair, 2-9 by 1-3·5 in., oblong or elliptic, entire usually rounded, subacute or short acuminate at the tip, base usually unequal, glabrescent, dark-green and coriaceous when mature, crimson or fresh green and pubescent along the nerves when young, nerves prominent beneath, reticulated. Flowers small, yellowish-green, polygamous, in pedicellate clusters, on interrupted slender drooping racemes, simple, or often branched in male flowers,

which are 3-6 in. long, crowded at the ends of branches and axillary, extra-axillary or borne on abbreviated branches; pedicels slender. Petals 0. Disk annular, wavy; stamens 5-8, longer than the calyx; ovary hairy outside, flask shaped, narrowed to a rigid style, 3-celled, stigma lobed. Fruit indehiscent, about ·8-1 in. long, smooth, ovoid and short pointed with dry and crustaceous rind. Seed enclosed in fleshy aril, smooth, brown.

Throughout the area fairly common.
The best lac is reared on this tree. The seeds yield an oil which is used for burning; the fleshy aril is acid and edible. The wood is hard, heavy, and durable.
Blaze hard, pink, slightly mottled with orange; seedlings trifoliolate.
Leafless for a short time in March. Fl. March-April with new leaves. Fr. latter end of rainy season.

4. SAPINDUS, *Linn.*

Trees or shrubs. Leaves alternate, paripinate or subverticillate and 1-foliolate. Leaflets coriaceous, entire. Flowers regular, polygamous, in terminal or axillary panicles. Sepals 4-5 imbricate. Petals 4 5. Disk annular, fleshy. Stamens 8-10 inserted within the disk; filaments usually pilose; anthers versatile. Ovary usually 2-4 lobed, 2-4-celled, style terminal; stigma 2-4 lobed; ovules solitary in each cell. Fruit of 1-3 indehiscent, dry or fleshy cocci, pericarp often saponaceous; seed globose, often with hard tests.

Leaflets 4-6, 2 5-6 in. long; disk and ovary hairy. .. 1. *S. emarginatus.*
Leaves 1-foliolate 6-12 in. long; disk and ovary glabrous. 2. *S. Danura.*

1. Sapindus emarginatus, *Vahl.* Syn. **S. trifoliatus,** *Hiern* (in part) Vern. *Ritha.* Sans. *Phenil, arishta.*

A medium-sized evergreen tree with rough grey bark; peeling off in oblong plates. Young parts, inflorescence and rachis fulvous tomentose. Leaves alternate, even pinnate, rachis up to 2·5 in. long. Leaflets 2-3 pairs, shortly-stalked, 2·5-6 in. long, terminal pairs usually largest, elliptic-oblong or ovate, entire, apex emarginate or rounded, sometimes acute, narrowed at the base, lateral nerves 6-10 pairs, coriaceous, upper surface glabrescent, lower softly tomentose. Flowers white, in terminal panicles, about ·3 in. across bracts, bracteoles and sepals, rusty tomentose. Sepals 5; petals 4-5, imbricate, orbicular, densely hairy outside, fringed on the margin, with long white hairs, clawed; claw with two tufts of hairs near the top. Stamens usually 8; anthers crested. Ovary 3-lobed, rusty tomentose; style persistent. Fruit glabrescent on maturity, ultimately separating into 1-3 roundish drupels each about ·4-·7 in. in diameter; pericarp saponaceous; stone with a hard outer shell and a thin inner membrane.

Cultivated. The saponaceous pericarp is used as soap. Blaze yellowish-brown.
Fl. cold season. Fr. hot season.

2. Sapindus Danura, *Voigt.* Syn. **Scytalia Danura,** *Roxb.*; **Scytalia verticellata,** *Roxb.*; **Aphania Danura,** *Radlk.* Vern. and Sans. same as for the last species.

A large shrub about 10 ft. high. Leaves simple, subsessile, alternate or subopposite, usually crowded at the ends of branches 6-12 by 2-3·5 in. obovate, elliptic or oblong, apex acuminate or acute, narrowed towards the base which is rounded or subcordate, entire, coriaceous, glabrous on both surfaces, lateral nerves somewhat distant and bent; petiole short stout, about ·15-·2 in. long. Inflorescence of a terminal (rarely axillary), pubescent panicle up to 14 in. long, the ramifications of which are remote and divergent. Flowers pale pink about ·3 in. across, pedicellate; usually several crowded together; bracts minute; sepals 5, unequal, roundish concave, imbricate; petals 5, broad ovate with ciliate margin, each with a scale at the base which is hairy on the top; disk crenulate. Stamens 6-8 (sometimes 9); filaments short, ovary glabrous or sparsely hairy, 2-3 lobed. Fruit usually of 2 ellipsoid drupels united only at the base, each about ·4 in. long with the persistent style at the apex, "orange through bright scarlet to black when ripe"—*Haines.*

Kheri (Masankhamb), rare.

Frs. March. Fr. hot season.

Nephelium Longana, *Camb.* A middle-sized branchy evergreen tree. Leaves alternate even pinnate, rachis up to 7 in. long. Leaflets 2-5 pairs, opposite or sub-opposites, up to 9 in. long, oblong, elliptic or lanceolate, obtuse, acute or acuminate, entire with wavy margin, coriaceous, smooth above, glaucous beneath; petiolules small, stout. Flowers small, in a large axillary or terminal rusty pubescent panicles which are about 16 in. long. Calyx 5-6-lobed; petals 5-6, clawed; filament hairy; fruit a globose slightly tubercled berry, ·75 in. across, red or purple when ripe; seed entirely enclosed by an edible aril.

Kheri, Jhansi, cultivated. "The young leaves are red and conspicuous".—*J. S. Gamble.*

Fl. March-April. Fr. end of hot season.

Nephelium Litchi, *Camb.* The Litchi. Vern. *Leechi.* A spreading evergreen tree. Leaves alternate; leaflets 2-5 pairs, 2-6 in. long, oblong-elliptic lanceolate, acute or acuminate, coriaceous, smooth and shining above, glaucous beneath. Flowers small, in spreading, rusty pubescent panicles, polygamous, petals absent. Fruit globose covered with pointed tubercles red when ripe; seed covered by a translucent delicious aril.

Cultivated.

5. DODONEA, *Linn.*

Dodonea viscosa, *Jacq.* Vern. *Vilayati mehendi.*

A stiff evergreen, resinous shrub. Leaves alternate, extipulate, subsessile, 1·5-3 by ·2-1 in. oblanceolate, coriaceous, glabrous, shining

above. Flowers polygamous, inconspicuous, yellowish-green, ·2 in. across, in short terminal panicles of cymes. Sepals usually 5, about ·1 in. long. Petals 0 ; stamens 8 ; disk inconspicuous. Ovary 3-4-celled. Fruit a compressed capsule, ·5 in. long, membranous, 2-4 winged and septicidally 2-4-valved.

Often grown in hedges, and occasionally an escape in Bundelkhand.

XXVII.—ANACARDIACEÆ.

Trees or shrubs usually with acrid, resinous, sometimes milky juice. Leaves alternate, rarely opposite, simple, trifoliolate or imparipinnate ; extipulate. Flowers regular, small, bisexual, or unisexual, generally in a paniculate inflorescence. Calyx 3-5-cleft, sometimes accrescent. Petals 3-5, free, alternating with the sepals, rarely 0. Disk usually annular, cupular, or flat rarely obsolete. Stamens as many or twice as many as the petals, sometimes not all perfect, usually inserted under the disk, rarely on it. Ovary superior, rarely half-inferior 1, or 2-6-celled or of 4-6 free carpels ; in the male flowers rudimentary or 2-4-fid. Styles usually combined ; stigmas subsessile or capitate ; ovules solitary, pendulous. Fruit drupaceous, 1-5-celled, with 1-5 seeds ; endocarp sometimes dehiscent, seeds exalbuminous or very nearly so.

I. Leaves simple:—

A. Drupe usually exceeding 2 in. in length :—

Perfect stamen 1 ; style 1.	1. *Mangifera.*

B. Drupe under 2 in. in length :—

Stamens 5 ; carpels combined ; styles 3 ; drupe on a fleshy receptacle.	2. *Semecarpus.*
Stamens 10 ; carpels 4-6 free, 1 perfect ; receptacle not fleshy.	3. *Buchanania.*

II. Leaves imparipinnate :—

Leaflets without an intramarginal vein ; drupe small about ·5 in. long, compressed : stone 1-celled.	4. *Lannea.* (*Odina*).
Leaflets with an intramarginal vein ; drupe large, usually 1·5-2 in. long, ellipsoid ; stone 2-6-celled...	5. *Spondias.*

1. MANGIFERA, *Linn.*

Mangifera indica, *Linn.* Vern. *Am, amiya.* Sans. *Amra, rasala, madhuduta.* The mango.

A large evergreen tree with spreading crown and rough, dark grey almost black bark, often with raised lenticels, abounding in a resin with turpentine-like smell. Leaves usually crowded at the ends of the branches, 4·5-12 by 1·25-4 in., oblong-lanceolate, acuminate, entire with wavy margin, glabrous, dark-green, shining, coriaceous, secondary nerves subparallel, 20-30 pairs; petiole ·5-1·5 in. long, swollen at the base. Flowers yellowish-green, polygamous, fragrant, about ·15 in. across, in terminal pubescent panicles exceeding the leaves. Calyx 4-5 partite, hairy, petals 4-5, reflexed, oblong, subacute with 3 orange-coloured ridges on the inner face. Disk fleshy, 5-lobed; stamens 4-5, one only perfect; anthers purple. Ovary sessile, 1-celled, style subulate. Drupe 2-6 in. long, very variable, somewhat laterally compressed often with a short beak or protuberance on the ventral face at the apex; stone compressed, fibrous.

Frequently an escape from cultivation. Extensively cultivated throughout the area for the fruit.

The timber is much used for planking and cheap furniture. The kernel is roasted and pounded into a meal and used as a substitute for wheat flour during seasons of scarcity. The gum is medicinal.

Blaze yellow to orange or reddish-brown, fibrous. New leaves delicate purple and pink.

Fl. February-March. Fr. June-July.

2. SEMECARPUS, *Linn. f.*

Semecarpus Anacardium, *Linn. f.* The marking nut-tree. *Vern. Bhilawa, bhela.* Sans. *Bhallataka, arushkara.* Arab. *Habbul-fahm.* Pers. *Biladur.*

A moderate-sized deciduous tree with rough dark-brown bark, exfoliating in irregular scales; and abounding in a very acrid juice. Young parts, inflorescence and petiole softly grey tomentose. Leaves crowded at the ends of branches, alternate 6-18 by 4-8 in., obovate-oblong or pandurate, apex rounded or short-pointed, base narrowed, often auricled, or cordate, entire, subcoriaceous, somewhat rough and glabrescent above, pubescent along the nerves beneath, space between the nerves ashy grey, secondary nerves 15-25 pairs, subparallel slightly arched, prominent below; petiole semicircular in section, about ·5-2 in. long, rather dilated below. Flowers ·2-·3 in. across, greenish-yellow, polygamous, pentamerous, subsessile in fascicles arranged on simple terminal pubescent panicles, the lower branches of which are leafy,

5-15 in. long, female panicles shorter than the males. Calyx 5-cleft, pilose outside, base enlarged in fruit. Petals ·2 in. long, oblong or ovate, glabrous, greenish-yellow, much larger than the sepals. Stamens 5, inserted at the base of the broad annular disk. Ovary 1-celled; styles 3, densely hairy, rudimentary in male flowers; ovule solitary, pendulous. Drupe 1-1·5 in. long, compressed oblong, black and shining when ripe, seated on an orange coloured fleshy cup.

Throughout the area.

The orange coloured fleshy cup of the fruit is eaten when perfectly ripe. The fruit contains a corrosive juice which, mixed with lime, is used by dhobies for marking ink. It is medicinal.

Blaze red, exuding resin, which blackens on exposure. Leaves turn bright yellow before falling.

Fl May-September. Fr. February-March.

3. BUCHANANIA, *Roxb.*

Buchanania latifolia, *Roxb.* Vern. *Piyal, piyar, paira, piyarua* (Oudh, *Pilibhit* and *Gorakhpur*), *achar* (*Jhansi*). Sans. *Piyala, chara, chirika.*

A small to moderate-sized deciduous tree with a small crown attaining 60 ft. in height. Bark dark-grey, tubercled, tesselated into small quadrangular plates divided by fissures. Young parts rusty tomentose. Leaves 4-10 by 1·5-4.5 in., crowded at the ends of branches, alternate, ovate or elliptic-oblong, obtuse or subacute at the apex narrowed or rounded at the base, lateral nerves 15-20 pairs, subparallel diverging broadly from the midrib, entire, coriaceous, glabrous above, matted pubescent when young and glabrescent with age beneath; petiole up to ·5 in. long, stout, pubescent. Flowers small, ·25 in. across, yellowish-white, bisexual, pentamerous, clustered on the branches of terminal and subterminal panicles with stoutish branches which are up to 7 in. long. Calyx hairy outside; petals obovate-oblong; stamens 10; filaments flattened. Ovary usually of 5 free, hairy carpels only one of which is functional. Drupe ·5 in. across, globose, black when ripe, stone hard shelled; seeds biconvex.

Throughout the area usually associated with poor quality sal and scrub forests.

The fruit and the oily kernel are edible, the latter—chironji—is in considerable demand in Indian confectionery. The heart wood is valued for bullock yokes in ploughs.

Blaze deep red, fibrous.

Fl. January-April. Fr. May-June.

4. LANNEA, *A. Rich.*

Lannea grandis, *Engl.* Syn.. **Odina Wodier,** *Roxb.* Vern. *Jingan, jigna.* Sans. *Jingni.*

A middle-sized to large tree, bark grey, smooth when young, rough and exfoliating in plates later. Young parts densely stellate pubescent. Leaves alternate, crowded at the ends of branches, imparipinnate; rachis up to 18 in. long. Leaflets 5-11, opposite, shortly stalked, 2·5-6 in. by 1·3·5 in., ovate or lanceolate, entire, acuminate, base often unequal, lateral nerves 6-10 pairs, subcoriaceous, glabrous with age; petiolules of lateral leaflets about ·1 in. long. Flowers small, ·15-·2 in. across, greenish-yellow, dicœcious, 4-5 merous, fascicled on the branches of racemes which are crowded at the ends of branches in upper leaf axils; bracts, numerous. *Male flowers.*—Racemes up to 6 in. long. Sepals ovate, ciliate; petals oblong, acute; stamens 8, inserted on the margin of the annular disk; pistillode 4-lobed. *Female flowers.*—Racemes elongating in fruit to 8 in.; sepals persistent and slightly enlarged in fruit; petals oblong, obtuse, larger than in male flowers; staminodes 8, ovary oblong, 4-6 lobed, 1-celled; styles 6 short; stigma papillose; ovules solitary, pendulous. Drupe up to ·5 in. long curved on the ventral face, oblong, laterally somewhat compressed. Stone irregularly pitted, large.

Throughout the area; thrives in most soils.

It yields an useful gum which is used in cloth printing and in medicine. The leaves and branches are used for elephant fodder. Easily grown from cuttings.

Blaze deep-red, streaked with white or pale pink, fibrous, thick.

Leafless cold season. Fl. March-April. Fr. April-June.

5. SPONDIAS, *Linn.*

Spondias mangifera, *Willd.* Vern. *Ambara.* Sans. *Amrataka.* The Hog plum.

A medium-sized deciduous tree, with smooth, pale-brown or light-grey bark, and abounding in a resin with mango-like smell. Leaves alternate up to 18 in. in length. Leaflets 7-11, opposite, short-stalked, 2-7 by 1·5-3 in., ovate-elliptic, oblong or elliptic, abruptly short acuminate, secondary nerves 10-30 pairs, joined by a prominent intra-marginal nerve, glabrous, membranous; petiolules ·2 in. long. Flowers sessile, greenish-white, ·25 in. across; polygamous; in clusters on the branches of fleshy sub-terminal panicles 10-18 in. long. Calyx deciduous, 5-toothed; petals 5, ·1 in. long, oblong, acute spreading; stamens 10; disk 10-lobed. Ovary sessile, deeply 5-partite, 4-5-celled; styles 4-5, conniving above. Drupe 1·5-2 in. long, ovoid; skin rather fleshy yellow when ripe; stone large, fibrous, rough with cavities, 1-5 celled, 2-5-seeded, of which 1 is fertile.

Throughout the area.

It can be easily propagated by cuttings. The young acid fruits are pickled. A white resin exudes from the tree when the bark is wounded, which is medicinal. The pulp of the fruits is said to be useful in certain type of dysentry

Blaze pink streaked with white, cheesy.

Fl. March-April while still leafless. Fr Cold season. Leafless December-April. One of the first trees in the forest to shed leaves, which turn yellow before falling.

XXVIII.—MORINGACEÆ.

Soft-wooded deciduous trees. Leaves alternate, 2-3 pinnate, pinnae imparipinnate, leaflets opposite, often glandular at the base; stipules 0. Flowers large, irregular, hermaphrodite, in axillary panicles. Calyx cup-shaped, 5-cleft; segments unequal, petaloid, imbricate. Petals 5, unequal, the 2 upper small, lateral ascending, anterior largest. Disk lining the calyx tube and with a short free margin. Stamens inserted on the margin of the disk, declinate, 5 perfect and opposite the petals, alternating with 5-7 staminodes; filaments free, thickened at the base; anthers 1-celled, dorsifixed. Ovary terete, stipitate, villous, 1-celled, with 3 parietal placentæ; style slender, tubular; stigma truncate; ovules many, in two series on each placenta. Fruit an elongate, 1-celled, 3-6-angled, torulose, loculicidally 3-valved, beaked capsule, corky and pitted within. Seeds many in the pits of the valves, testa corky, winged or not, endosperm 0.

MORINGA, *Lamk.*

Moringa pterygosperma, *Gærtn*; Syn. **M. oleifera,** *Lamk.* Vern. *Sanjna.* Sans. *Sigru, shobhanjan.* The Horse-radish tree, the drumstick tree.

A medium-sized deciduous tree with deeply-fissured, thick, corky bark exuding a red gum when wounded. Young parts pubescent or tomentose. Leaves usually 3-pinnate, 1-2·5 ft. long; pinnæ 6-10 pairs, pinnae and pinnules often glandular at the joints. Leaflets usually 5-7, ·5-·75 in. long, lateral elliptic, terminal obovate and a little larger, entire, rounded at the apex, slightly rough above, paler beneath, lateral nerve obscure; petiolule of lateral leaves about ·1 in. long of terminal leaflets ·2-·3 in. long. Panicles spreading, 1-2 ft. long, lower branches leafy. Flowers showy, fragrant, about 1 in. across, irregular. Calyx lobes ·5 in. long, linear lanceolate, reflexed, puberulous outside. Petals ·7-·9 in. linear-spatulate or oblanceolate, white or pale pink with yellow dots, the two lateral strongly reflexed. Filaments villous at the base. Ovary villous. Capsule 9-20 in. by

·6-·8 in., 9-ribbed, constricted between the seeds. Seeds about 1 in. long trigonous; winged at the angles.

Throughout th area; also cultivated.

The fruits, young leaves and flowers of the sweet variety are eaten as vegetable; they are often bitter in wild plants. The young root bark is a good substitute for horse-radish The leaves are excellent camel fodder. The bark and gum are med cinal. An oil is extracted from the seeds known a Ben oil which is valued by watchmakers for lubricating delicate machinery and b/ perfumers. Easily propagated from cuttings.

Blaze light-yellow or cream, mottled with orange-brown towards the exterior, up to 2 in. deep.

Fl January-April. Fr May-June

XXIX.—LEGUMINOSÆ.

Herbs, shrubs or trees. Leaves alternate, rarely opposite or whorled, usually stipulate, compound or 1-foliolate, rarely simple, sometimes reduced to phyllodes. Leaflets often stipellate. Flowers usually irregular and bisexual, in racemes or panicles, rarely solitary, bracteate, usually 2-bracteolate. Sepals 5, often unequal, combined, sometimes 2-lipped or free. Petals 5, rarely fewer, imbricate (Papilionatæ and Cæsalpinioideæ), or valvate (Mimosoidæ). Stamens normally 10, less often fewer, or indefinite, perigynous or subhypogynous; filaments free or variously combined; anthers 2-celled, dorsifixed. Ovary usually free, 1-carpelled, with 1 or more ovules on the inner suture; style simple cylindric, often declinate. Fruit a legume (pod), less often follicular or indehiscent or breaking up into 1-seeded joints, rarely fleshy and drupaceous. Seed usually exalbuminous.

Flowers zygomorphic.—

Corolla papilonaceous, descending imbricate, *i.e.*, the outermost petal uppermost (standard), the 4 others in opposite pairs, the lowermost pair innermost, usually connate; stamens usually combined, definite. .. I. *Papilionatæ.*

Corolla not papilonaceous, ascending imbricate, *i.e.*, the uppermost petal innermost and the lowermost petal outermost, petals subequal; stamens free, definite .. .. II. *Cæsalpinioideæ.*

Flowers regular:—

Petals valvate, usually united above the base; stamens definite or indefinite... .. III *Mimosoideæ.*

Sub-family 1.—PAPILIONATÆ.

Herbs, shrubs, or trees sometimes climbing. Leaves alternate simple, digitate, or pinnate, stipulate. Flowers mostly zygomorphic, bisexual. Calyx gamosepalous, more or less distinctly 5-lobed or toothed, the two upper often connate and opposite to the three lower. Corolla papilonaceous, petals 5 unequal; the upper petal (*standard*) outermost, the two lateral (*wings*) overlying the next pair which frequently cohere by their inner edges and form the keel. Stamens normally 10, rarely fewer, monadelphous or diadelphous rarely free.

Tribe I. **Genisteæ.**—

Herbs or shrubs leaves simple or digitately trifoliolate; stamens monadelphous; pod dehiscent not jointed :—

Keel beaked, pod turgid. .. 1. *Crotalaria.*

Tribe II. **Galegeæ.**—

Herbs or shrubs sometimes climbing (*Milletia*); leaves imparipinnate; stamens usually diadelphous; pod dehiscent, not jointed; stipellae usually absent :—

I. Hairs fixed by the centre; anthers apiculate :—

Flowers usually pink or purple; pods cylindric, firm. .. .. 2. *Indigofera.*

II. Hairs basifixed, anthers obtuse :—

A. Pods distinctly septate; inflorescence axillary :—

Flowers yellow or white; pod slender .. .. 3. *Sesbania.*

B. Pods not septate; inflorescence terminal or leaf-opposed :—

Erect herbs or undershrubs; leaflets with almost parallel nerves; pods many-seeded early dehiscent. .. 4. *Tephrosia.*

Large woody climber (*U. P. Species*); leaflets reticulate nerved, pods few-seeded, woody, tardily dehiscent .. 5. *Milletia.*

Tribe III. **Hedysareæ.**—

Herbs or shrubs sometimes climbing; leaves usually imparipinnate; stamens usually diadelphous, pods jointed or 1-seeded :—

Leaflets ex-stipellate :—

Stamens in bundles of 9 + 1 :—

Unarmed; ovules solitary. .. .. 6. *Lespedeza*
Armed; ovules 2 or more. .. 7. *Alhagi.*
Stamens in bundles of 5 + 5. .. *Eschynomene*

II. Leaflets stipellate :—

A. Pods twisted inside the calyx. .. 8. *Uraria.*

B. Pods not twisted inside the calyx:—

1. Joints of pod turgid; calyx glumaceous. .. .. 9. *Alysicarpus.*

2. Joints of pod flattened :—

A tree ; racemes in fascicles from old wood. .. .. 10. *Ougenia.*

Shrubs ; racemes simple or panicled from the current year's shoots. .. 11. *Desmodium.*

Tribe IV. **Viceæ**—

Climbers or low herbs ; leaves paripinnate, ending in a bristle or tendril ; stamens diadelphous or monadelphous by abortion; pod not jointed, dehiscent :—
Stamens 9, the posterior stamen absent. .. 12. *Abrus.*

Tribe V. **Phaseoleæ**—

Climbers (exceptions, *Erythrina*, *Flemingia*, *Butea frondosa*); leaves pinnately trifoliolate (exception *Flemingia*); stamens 1-2-adelphous ; pods not jointed, dehiscent ; stipels present, sometimes absent and then leaves gland-dotted :—

I. Leaves not gland-dotted :—

A. Racemes swollen at the nodes :—

1. Petals very unequal :—

Climbers ; keel exceeding the wings and the standard. .. .. 13. *Mucuna.*

Tree or under-shrub, standard exceeding the wings and the keel. 14. *Erythrina.*

2 Petals about equal :—

a. Pods 1-seeded dehiscent at the seed-bearing tip only stamens diadelphous :—

Flowers large showy in racemes; erect trees or dextrorse climbers. 15. *Butea.*

Flowers small, in panicles sinistrorse, climbers. .. .. 16. *Spatholobus.*

b. Pods dehiscent throughout; stamens monadelphous :—

Upper lip of calyx exserted, lower minute ; flowers not fascicled on the racemes. .. .. 17. *Canavalia.*

Calyx teeth subequal, upper two connate ; flowers fascicled on the racemes. .. .. 18. *Pueraria.*

B. Racemes not swollen at the nodes :—

Style bearded; petals very unequal; stamens diadelphous; anthers uniform, stipules and bracts persistent. .. 19. *Clitoria.*

Style not bearded; petals nearly equal; stamens 1-adelphous, alternate anthers sterile; stipules and bracts minute, caducous. .. .. .. 20. *Teramnus.*

II.—Leaves dotted with glands specially on the under-surface :—

A. Ovules 3-many: pods with depressed lines between the seeds .. .. 21. *Atylosia.*

B. Ovules 1-2; pods not depressed between the seeds :—

1. Calyx lobes not accrescent :—

Leaves digitately 3-foliolate. .. 22 *Flemingia.*

Leaves pinnately 3-foliolate. .. 23. *Rhynchosia.*

Calyx lobes accrescent. .. .. 24. *Cylista.*

Tribe VI. **Dalbergiæ.**—

Trees or shrubs sometimes scandent, leaves imparipinnate, stamens 1- or 2-adelphous; pods indehiscent.

I. Leaflets alternate :—

Pod longer than broad. .. .. 25. *Dalbergia.*

Pod nearly circular. .. .. 26. *Pterocarpus*

II. Leaflets opposite.—

Pods thick almost woody, not winged... 27. *Pongamia.*

Pod thin winged. .. .. 28. *Derris.*

1. CROTALARIA, *Linn.*

Herbs or shrubs with simple or digitately 3-foliolate leaves. Flowers in terminal or leaf opposed racemes, often showy. Calyx tube short; teeth linear or lanceolate, free, or shortly connate and more or less 2-lipped. Corolla equalling or exceeding the calyx; standard orbicular, short clawed, with a callus, above the claw; keel broad, equaling the standards, the petals united, much incurved, and beaked. Stamens 1-adelphous, connate in a tube, slit above, anthers, alternately short, and versatile with slender filaments, and long and basifixed with flattened filaments. Ovary 2-many ovuled; style long, abruptly incurved at the base, bearded above; stigma small, oblique. Pod straight linear or oblong, turgid or inflated. Seed with a filiform stalk.

Leaves simple :—

Branches not winged :—

Pods hairy :—

a. Pods scarcely extruded 3-4-seeded, less than ·5 in. long :—

Deciduous rigid undershrub; leaves distant or few. .. .. 1. C. *Burhia.*

c. Pods extruded more than 10-seeded, exceeding 1 in. in length :—	
Branches 4-angled pods densely velvety...	2. *C. tetragona.*
Branches terete ; pods silky.	3. *C. juncea.*
2. Pods glabrous :—	
a. Robust erect plants ; corolla exserted ; pod exceeding 1 in. in length :—	
Stipules and bracts leafy leaves usually acute at the apex.	4. *C. sericea*
Stipules and bracts setaceous, leaves usually rounded or emarginate. ..	5. *C. retusa.*
b. Switchy undershrubs ; corolla scarcely exserted.	6. *C. albidia.*
B. Branches winged.	*C. alata.*
II. Leaves trifoliolate.	*C. medicaginea.*

1. Crotalaria Burhia, *Ham.*

An erect stiff deciduous undershrub, about 2 ft. high, branches often leafless or nearly so, striate, hairy, sometimes spinescent. Leaves few, rigid, extipulate, subsessile, ·25-1 in. long, narrow, oblong, hairy on both surfaces, pale green. Racemes terminal, usually 2-6 flowered, bracteate. Flowers about ·4 in. long, pale-yellow, pedicels 2-bracteolate. Calyx hairy, teeth lanceolate. Corolla pale-yellow, scarcely exceeding the calyx ; pod densely hairy, hardly longer than the calyx, 3-4-seeded.

Afforestation Division, Agra, and Meerut districts.
The fibres are said to be used for cordage.
Fl. cold season.

2 Crotalaria tetragona, *Roxb.*

A weak-stemmed shrub up to 6 ft. in. height with quadrangular hairy branchlets, young parts rusty pubescent. Leaves subsessile 4-12 in. long, linear-lanceolate, acute or acuminate, mucronate more or less hairy on both surfaces ; petiole about ·1 in. long, rusty pubescent, stipules minute, setaceous. Racemes lateral and terminal 6-9 in. long, laxly 6-12-flowered ; bracts setaceous. Flowers handsome, about 1 in. long, lemon-yellow ; pedicels ·5 in. long. Calyx densely brown tomentose externally ; lobes linear, the lower often cohering at the apices ; corolla shortly exserted. Pod 1·5-2 in. long, closely 15-20-seeded.

Gonda, Bahraich ; usually on broken ground in cool situations. A handsome plant in flower.
Flowers September-December. Fr. March-June.

3. Crotalaria juncea, *Linn.* Vern. *Arjha san, sanai.* The false san hemp.

Closely allied to the last species. It is a smaller and stiffer shrub, with pubescent whippy branches distant, short petioled, linear

oblong, pubescent leaves up to 3 in. long with obtuse, mucronate apex; yellow flowers about 1 in. long on lax racemes, with deeply partite hairy calyx and exserted corolla; and 10-15-seeded pod, covered persistently with short spreading hairs.

Cultivated all over the area for its fibres.

Fl. August-January. Fr. December-February

4. **Crotalaria sericea,** *Retz.* Vern. *Ban sani, jangli san, Sunni* (*Oudh and Gor.*), *chunmuni* (*Bundelkhand*).

An erect, bright-green undershrub up to 6 ft., in. height with stout and somewhat fleshy, glabrous grooved branches. Leaves 2·5 to 7 in. by 2-3·5 in., subsessile, obovate or oblanceolate, rounded or acute, mucronate, entire, base tapering to the short petiole, subcoriaceous, glabrous above, finely silky beneath; stipules persistent broadly falcate, about ·4 in. long. Racemes terminal, sometimes branched, usually 8-12 in. long, sometimes attaining 18 in. with persistent leafy, ovate acuminate, bracts. Flowers showy, about 1 in. long, yellow; pedicles about ·7 in. long with 2 bracteoles near the base. Calyx glabrous; corolla much exserted. Pod distinctly stipitate, exserted, smooth, 1-2 in. long, inflated, with many reniform seeds in two rows.

Fairly common in grass-lands and in moist situations all over the area; sometimes cultivated for the sake of the flowers. The stem yields a fairly strong fibre

Fl. and fr. cold season.

5. **Crotalaria retusa,** *Linn.*

An erect low-branched undershrub 3-4 ft. high with striate more or less pubescent branches. Leaves 1·5-3·5 in. by ·5-1·2 in., oblanceolate, retuse or rounded at the apex, base cuneate, dotted with pellucid dots, silky pubescent when young, glabrous above with age; petiole short; stipules setaceous. Flowers many, ·7 in. long, lax in terminal racemes 6-12 in. long; bracts setaceous not prominent, deflexed, pedicles short up to ·3 in. long. Calyx sparsely hairy, lobes longer than the tube; corolla yellow with purple stripes, exserted. Pod smooth, oblong about 1·6 in. long, narrowed into a short stipe, seeds 15-20.

Gonda (Balrampur).
Somewhat resembling the last species.
Fl. and fr. October-late cold season.

6. **Crotalaria albidia,** *Heyne.*

A switchy undershrub up to 3 ft. in. height, much branched from the base, branchlets slender, striate, pubescent. Leaves 1-3 in. by ·25-·7 in., linear-oblong to oblanceolate, apex rounded or obtuse, mucronate, entire, dotted with pellucid dots base narrowed, with an

extremely short petiole, which is ·1 in. in length ; stipules 0. Flowers ·25-·4 in. long, in lax terminal 10-25-flowered racemes. Calyx silky, upper lobes broader than the three lower; corolla yellow, scarcely exserted. Pod smooth, oblong, cylindric about ·5 in. long, exserted, 6-12-seeded.

Throughout the area.
Fl. and fr. September-April.

Crotalaria alata, *Buch-Ham.* Vern. *Ban san, sanai* (*Pil.*) *ban sani, choti sanni* (*Kheri*), *jangli sanni* (*Bah, Gonda*).

A small hairy suberect undershrub or herb attaining 2 ft., with woody root-stock and annual stems, winged along the internodes by decurrent stipules which end as stiff, pointed, triangular flaps below the leaves, and are clothed with silky hairs. Leaves subsessile up to 3 in. long, oblong, obovate or oblanceolate, apex rounded or acute, mucronate, entire, base often unequal. Racemes few flowered up to 4·5 in. long, bracteate. Flowers yellow, about ·5 in. long. Calyx hairy ; corolla scarcely exserted. Pod 1-1·5 in. long, hairy, far exserted ; smooth, beaked narrowed into a stipe, 30-40-seeded.

From Pilibhit to Gorakhpur.
Fl. hot season.

Crotalaria medicaginea, *Lamk.*

A small branchy perennial procumbent or erect herb, very variable in size and habit ; branches slender, silky. Leaves digitately 3-foliolate, petiolate. Leaflets variable in size and shape, usually small, attaining 1 in. in length, oblanceolate or obovate, apex truncate, emarginate or obtuse, glabrescent above, silky beneath. Racemes much exceeding the leaves up to 12-flowered. Flowers yellow, about ·3 in. long. Calyx hairy outside ; corolla extruded. Pod roundish grooved, beaked, hairy outside ; 2-seeded.

Throughout the area in waste-lands ; also in the Jamuna ravines, Agra district and Meerut. Used medicinally and sold in bazars under the name of "gulabi."

2. INDIGOFERA, *Linn.*

Herbs or shrubs, clothed with adpressed hairs attached by the centres, sometimes mixed with basifixed hairs, often silvery cinnescent. Leaves usually imparipinnate, rarely 1 or 3-foliolate. Flowers usually pink or purple, in axillary racemes or spikes ; bracts caducous ; bracteoles 0. Calyx minute, campanulate, teeth subequal or lowest longest. Corolla more or less caducous ; standard obovate ; keel straight, obtuse, spurred on either side near the base. Stamens 2-adelphous, posterior free, others united in a tube, anthers uniform, apiculate. Ovary sessile, usually many-ovuled ; style short incurved ; stigma capitate, usually penicellate. Pod usually linear, cylindric, oblong, rarely flat or armed, often torulose and septate between the seeds.

extremely short petiole, which is ·1 in. in length ; stipules 0. Flowers ·25-·4 in. long, in lax terminal 10-25-flowered racemes. Calyx silky, upper lobes broader than the three lower; corolla yellow, scarcely exserted. Pod smooth, oblong, cylindric about ·5 in. long, exserted, 6-12-seeded.

Throughout the area.
Fl. and fr. September-April.

Crotalaria alata, *Buch-Ham.* Vern. *Ban san, sanai* (*Pil.*) *ban sani, choti sanni* (*Kheri*), *jangli sanni* (*Bah, Gonda*).

A small hairy suberect undershrub or herb attaining 2 ft., with woody root-stock and annual stems, winged along the internodes by decurrent stipules which end as stiff, pointed, triangular flaps below the leaves, and are clothed with silky hairs. Leaves subsessile up to 3 in. long, oblong, obovate or oblanceolate, apex rounded or acute, mucronate, entire, base often unequal. Racemes few flowered up to 4·5 in. long, bracteate. Flowers yellow, about ·5 in. long. Calyx hairy ; corolla scarcely exserted. Pod 1-1·5 in. long, hairy, far exserted ; smooth, beaked narrowed into a stipe. 30-40-seeded.

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Throughout the area in waste-lands ; also in the Jamuna ravines, Agra district and Meerut. Used medicinally and sold in bazars under the name of "gulabi."

2. INDIGOFERA, *Linn.*

Herbs or shrubs, clothed with adpressed hairs attached by the centres, sometimes mixed with basifixed hairs, often silvery crescent. Leaves usually imparipinnate, rarely 1 or 3-foliolate. Flowers usually pink or purple, in axillary racemes or spikes ; bracts caducous ; bracteoles 0. Calyx minute, campanulate, teeth subequal or lowest longest. Corolla more or less caducous ; standard obovate ; keel straight, obtuse, spurred on either side near the base. Stamens 2-adelphous, posterior free, others united in a tube, anthers uniform, apiculate. Ovary sessile, usually many-ovuled ; style short incurved ; stigma capitate, usually penicellate. Pod usually linear, cylindric, oblong, rarely flat or armed, often torulose and septate between the seeds.

3. Indigofera argentea, *Linn.* Var. cœrulea, *F. B. I.* Syn. **I. articulata,** *Gouan*; **I. Houer,** *Forsk*; **I. cœrulea,** *Roxb.* Vern. *Nil.*

A small shrub attaining 5-6 ft. in cultivation with more or less angled branches covered with adpressed silvery hairs. Leaves 7-9 (sometimes 11)-foliolate, rachis and common petiole up to 3 in. long; stipules minute subulate. Leaflets ·5-1 in. long, obovate, mucronate. Racemes shorter than the leaves; flowers reddish-yellow; corolla hairy outside. Pods ·3-·7 in. long at first thinly pubescent, hairy, sausage-shaped, bristle tipped, 2-4-seeded, slightly torulose.

Gorakhpur; probably an escape from cultivation—the eastern form of the Surat or Egyptian Indigo. Also Banda according to Hooker
Fl. and fr. cold season.

4. Indigofera tinctoria, *Linn.* Vern. *Nil.*

An erect shrub about 4 ft. in height with canescent, furrowed branchlets, young parts dark-brown, ultimately grey. Rachis of leaves up to 3.5 in. long in the more vigorous plants, but usually shorter; stipules minute, subulate. Leaflets 7-13, ·4-1 in. long, obovate, oblanceolate or oblong-obovate to elliptic, membranous, mucronate, covered with adpressed hairs on both surfaces; stipels setaceous. Racemes shorter than the leaves elongating in fruit; flowers nearly sessile. Calyx hairy; teeth more than twice as long as the tube. Standard greenish; wings pink. Pods brown, linear, slender, straight or slightly curved, beaked, 1-1·5 in. long, 6-12-seeded, seeds cylindric truncated at either end.

Etawah, also "Jamuna ravines near Agra and Muttra—*Duthie*. The form indigenous in our area is cultivated in the Madras Presidency but scarcely ever in North India. The cultivated indigo of North India is I. sumatrana, *Gærtn*, and is distinguished chiefly by its narrower leaves and stouter obtuse pods.
Fl. September. Fr. December.

5. Indigofera Hamiltonii, *Grah.* Syn. **I. juncea,** *Ham.*

An undershrub with woody root-stock and numerous grey canescent, ultimately glabrescent, whippy branchlets; young parts at first fulvous, then grey. Leaf rachis ·5-3·5 in. long; stipules small, caducous. Leaflets usually 3-8, ·3-1·2in. long, oblong, elliptic or obovate, round or truncate—sometimes emarginate—at the apex, mucronate, adpressed hairy on both surfaces, paler beneath. Racemes usually from the woody base, long peduncled, much exceeding the leaves, varying in length from 8-15 in.; bracts minute ·1 in. long, concave, lanceolate shorter than the pedicels. Flowers up to ·4 in. long, rose or purple with darker lines. Calyx hairy, lower teeth longer than the upper. Standard not clawed; wings slightly constricted in the middle, clawed; keel petals clawed. Pod 1-1·5 in. by. 15 in. smooth, compressed, pointed at the tip, sutures prominent; seeds 9-12.

Pilibhit to Gorakhpur in grass-lands

A more robust shrubby plant has been collected within the area which does not seem to be specifically different. It has usually 5-11 leaflets, and larger concave acuminate bracts, about the size of the buds. This probably represents the unburnt condition of the plant. The dwarf form has the habit of plants like Grewia sapida, Careya herbacea, Erythrina resupinata, Combretum nanum, etc, which produce annual switchy shoots from a woody root stock. Shoots produced early in the season are usually 3-5-foliolate ·ate shoots have more leaflets.

Fl. April-May. Fr. June-July.

6. Indigofera paucifolia, *Delile.* Syn. **I. oblongifolia,** *Forsk.*

A shrub 3-6 ft. in. long in height with stout, woody, silvery canescent branches. Leaves 3-5-foliolate, stipules lanceolate acuminate. Leaflets alternate, ·5-1 in. long, shortly stalked, oblanceolate, or narrow elliptic, slightly pubescent above, densely dotted with white hairs on the under-surface. Flowers small, brick-red, 20-50, in dense spike-like racemes, which exceed the leaves; pedicels small, curved. Calyx ·1 in. long, silvery outside, teeth equalling the tube. Corolla extruded, about thrice the calyx; standard hairy outside. Pods ·5-·7 in. long, crowded on the rachis, deflexed, torulose, pointed, hoary pubescent when young; seeds 6-8.

Bundelkhand—*Edgeworth*; Agra district—*Monro.*

There are no specimens at Dehra from our area.

7. Indigofera pulchella, *Roxb.* Syn. **I. purpurascens,** *Roxb.* Vern. *Basant, sakina* (*Pil.*).

A tall deciduous shrub with fairly smooth, brown bark, branchlets angled or furrowed adpressed hairy and ultimately glabrescent. Leaves up to 6 in. long, strigose; stipules subulate, caducous; leaflets usually 11-19, sometimes fewer and subopposite, elliptic to obovate-oblong, obtuse, apiculate, clothed on both surfaces with adpressed hairs, ·7-1·3 in. long, light-green above, paler beneath, subcoriaceous; petiolules short. Racemes axillary and terminal, dense 1·5-4 in. long, elongating in fruit; bracts deciduous, covering the buds, concave, with pointed tips, hairy outside. Flowers pink or rose ·5 in. long, crowded towards the upper end of the racemes; pedicels slender; calyx oblique, broad campanulate, pubescent. Pod glabrous linear 1 to 1·7 in. long, usually reflexed, 8-12-seeded.

All over the area.

Fl. November-March. Fr February-June.

Indigofera linifolia, *Retz.*—A perennial much-branched procumbent persistently silvery pubescent herb 12-18 in. long. Leaves simple. 2-1 in. long, linear, or linear-oblong, mucronate; stipules setaceous Flowers red, subsessile, congested on short axillary racemes; coroll extruded. Pod globose, densely hairy 1-seeded

A common weed in open grassy places and blanks. The seeds are collected in times of scarcity and made into *chapaties*.

Fl. and fr. August-January.

Indigofera cordifolia, *Heyne.*—A profusely-branched hoary annual. Leaves simple ·2-·5 in. long, ovate, cordate, densely tomentose below, less so above. Flowers red, minute in axillary clusters. Pod ·15 in. long, oblong, round, beaked, 2-seeded, often brown spotted inside; seeds truncated at one end.

Etawah, Agra.

The seeds are eaten as famine food in the same way as those of I. linifolia.

Fl. and fr. September-December.

Indigofera hirsuta, *Linn.*—An erect herb attaining 4 ft., branches inflorescence and pods covered with spreading hairs. Leaves imparipinnate, rachis up to 4 in. long; stipules setaceous, plumose; leaflets 5-11, terminal largest, up to 2 in. long, obovate or elliptic-oblong, mucronate, covered on both surfaces with adpressed hairs, under-surface glaucous. Flowers pink, crowded in racemes 2-5 in. long. Calyx deeply cleft; lobes setaceous, plumose. Pods deflexed, densely pubescent 4-gonous, beaked, up to ·7 in. long.

A common weed in waste-lands all over the area conspicuous when in fruit.

Fl. rainy season. Fr. October-December.

Indigofera enneaphylla, *Linn.* A herb sometimes with a woody root-stock and numerous trailing pubescent branches attaining 2 ft. Leaves ·5-1·5 in. long, subsessile, pinnate, 5-9-foliolate; stipules scariose, ovate, cuspidate. Leaflets ·2-·8 in. long, linear, oblanceolate, firm, adpressed-pubescent, sometimes silvery beneath. Flowers red, subsessile, in dense spike-like heads which are shorter than the leaf rachis; bracts scariose. Pod ·12-·25 in. long oblong, thinly silky, 2-seeded.

Throughout the area: a valuable fodder plant.

3. SESBANIA, *Pers.*

Soft-wooded shrubs or herbs, with abruptly pinnate leaves. Leaflets numerous, deciduous, linear-oblong, obtuse, mucronate. Flowers in lax racemes, yellow, white or pink. Calyx campanulate, teeth short, subequal. Corolla much exserted; all petals with long claws; standards broad. Stamens 2-adelphous, 9+1; anthers uniform. Ovary stalked, linear, many-ovuled. Style filiform incurved, glabrous, stigma capitate. Pod long, flexible, septate between the seeds.

Flowers yellow or spotted with purple, les than 1 in. long:—

Shrub or small tree unarmed	1. *S. ægyptiaca.*
Prickly annual.	2. *S. aculeata.*

Flowers large, white or pink, more than 1 in long:—

Soft wooded tree.	3. *S. grandiflora.*

1. S. ægyptiaca, *Pers.* Vern. *Jait.* Sans. *Jayanti.*

A short-lived soft-wooded tree or shrub attaining 15 ft. Leaves 3·6 in. long, glabrous ending in a point, leaflets 12-20 pairs, close-set, ·75-1 in. long, linear-oblong, membranous, pale-green; petiolules minute. Flowers 6-10 in lax racemes, pale-yellow, or standard dotted or variegated with purple, maroon or red. Pod 6-9 in. long, torulose, flexible and twisted.

Commonly cultivated as a hedge plant all over the area; sometimes occurs as an escape. Its growth is fast, but it lives only about three years. Three forms may be recognized by the colour of the flowers:—

1. typica, *Prain.* Standards yellow.
2. picta, *Prain.* Standards dotted with purple.
3. bicolor, *W. and A.* Standards maroon or deep purple.

"The root well bruised and made into a paste is an excellent application for scorpion stings." *N. C. Dutt* in *Watt's Dictionary of Economic Products.* The leaves and seeds are also used medicinally in various parts of the country.

Fl. and fr. cold season.

2. Sesbania aculeata, *Pers.* Vern. *jayanti.*

An erect shrub-like annual somewhat resembling the last species and attaining about 5 ft. in height, covered with small, weak, hooked prickles on the branches and leaf rachis. Leaves 6-12 in. long; leaflets 20-40 pairs, ·2·6 in. long, linear, obtuse, apiculate, glabrous. Flowers yellow ·3-·5 in. long. Pods 6-9 in. long, slender, not twisted, beaked.

A common weed of water-logged and wet places in the rains.

Fl. and fr. rainy season.

3. Sesbania grandiflora, *Pers.* Vern. *Basna, agusth.* Sans. *Vaka.*

A soft-wooded small tree with a short stem and spreading branches, attaining 30 ft. in height. Leaves 6-12 in. long. Leaflets 10-30 pairs, about 1 in long, narrow, oblong, obtuse and emarginate at the apex. Flowers showy 3-4 in. long, white, or sometimes pink, in lax 2-4 flrd. racemes. Pods 12-20 in. long by ·3 in. broad, slender, straight or falcate, constricted between the seeds, sutures thick.

Cultivated chiefly for the ornamental flowers. The young leaves, flowers and pods are eaten. The juice of the flowers is squeezed into the eyes to relieve dimness of vision. This and the juice of the leaves are also popular remedies for catarrh and headache. The root of the pink flowered variety rubbed into a paste with water is applied in rheumatism. The leaves are also said to be aperient.

Fl. and fr. cold season.

4. TEPHROSIA, *Pers.*

Herbs or shrubs usually undershrubs, with odd pinnate rarely simple leaves; leaflets opposite, with obliquely parallel nerves. Flowers in terminal and leaf-opposed racemes or sometimes solitary, or in pairs on the leaf axils; bracteate. Calyx campanulate, with subequal teeth. Petals clawed; standard suborbicular; keel incurved, slightly adherent to the wing petals. Stamens 2-adelphous, posterior filament ultimately free; anthers uniform. Ovary sessile, linear, many-ovuled; style much incurved; stigma capitate, often penicillate. Pod linear, flattened, many-seeded, sometimes obscurely septate between the seeds.

Pods thinly adpressed pubescent, or glabrescent:—	
Stem suberect, glabrescent, flowers less than ·3 in. long.	1. *T. purpurea.*
Stem erect, branches silky; flow more than ·3 in. long.	2. *T Hamiltonii.*
Pods densely velvety, tomentose.	3. *T. villosa.*

1. Tephrosia purpurea, *Pers.* Vern. *Sarphonk, ban-nil* (*Pil.*), *basant* (*Et., Jh.*). Sans. *Sarapunkha.*

A spreading undershrub with hairy branches which become smooth with age; young parts silky. Leaves imparipinnate, 2-5 in. long; rachis hairy; stipules linear or subulate often reflexed. Leaflets 9-21, ·6 to 1·2 in. long, oblanceolate apex obtuse to retuse, mucronate, base cuneate, glabrous or adpressed-pubescent, lateral nerves prominent beneath, close and parallel. Racemes usually 1-6 in. long, lax, hairy. Flowers ·25-·3 in. long, purple, 1-3 together on the racemes; pedicels slender up to ·25 in. long; bracts in threes, equalling the pedicels. Calyx silky outside; teeth linear-lanceolate. Standard silky outside; style flattened, glabrous above. Pod 1-1·6 in. long at first, slightly hairy, then glabrescent, compressed, slightly recurved, 6-10 seeded.

All over the area and also in Etawah.

A common waste-land weed.

Fl. mainly rainy season. Fr. cold season.

2. Tephrosia Hamiltonii, *Drummond.*—Is closely allied and differs mainly by its more erect habit, angled, silky or villous branches, and larger flowers, which are about ·35 in. long.

It is found in similar localities.

3. Tephrosia villosa, *Pers.*

A diffuse shrub, or woody spreading undershrub, with flexuose branchlets covered with white, grey or fulvous adpressed silky hairs.

Leaves 2-3 in. long; rachis leafy nearly to the base; stipules lanceolate acuminate, silky outside. Leaflets usually 11-17; ·4-·8 in. long, oblanceolate, mucronate and obtuse to retuse at the apex, silky beneath; petiolules minute, shaggy. Racemes up to 6 in. long, lower portion leafy. Flowers about ·4 in. long pale-red, lowermost in fascicles, subsessile. Bracts in threes, plumose. Calyx deeply cleft, densely silky tomentose outside, lobes two to three times the tube, linear subulate. Standard silky outside. Pods about 1·2 in. long, grey or fuscous velvety, compressed.

Jhansi; Etawah.

Fl. and fr. greater portion of the year.

5. MILLETTIA, *W. & A.*

Millettia auriculata, *Baker.* Vern. *Gurari, gauj.*

A deciduous, robust, woody, dextrorse climber or a semi-erect shrub, with furrowed, light yellowish brown bark; young parts silky; bud scales, concave, hairy outside. Leaves imparipinnate, crowded at the ends of the branches; rachis 6-15 in. long, swollen at the base; stipules large, silky outside, basal portion persistent and prominent on the branches. Leaflets 7-9, sometimes 5, opposite, 2·5-6 by 2-3·5 in., oblong, ovate, elliptic or obovate, abruptly short acuminate, entire, thinly coriaceous, grey silky when young, glabrescent above, and paler and pubescent at least along the nerves beneath with age, secondary nerves prominent beneath, straight, 8-12 pairs; petiolules about ·2 in. long, each with a pair of short setaceous stipellæ. Flowers ·4-·5 in. long, cream-coloured, clustered on numerous, densely silky, racemes 4-12 in. long, which are crowded at the ends of the branches, bracts minute, densely hairy; pedicels ·1 in. long. Calyx densely silky, short-toothed. Corolla extruded, hairy outside; standard auricled at the base, wings falcate, keel incurved. Stamens monadelphous. Ovary hairy; disk thin, cupular. Style filiform, incurved, glabrous; stigma capitate. Pod 3-6 in. by ·5-1 in., woody, flattened, strap-shaped densely brown velvety, sutures thick, tardily dehiscent. Seeds 4-6, compressed.

Throughout the area often forming a dense undergrowth in sal forests in the semi-erect state.

The root is used for poisoning fish. Bands of bast and wood alternate in the stem.

Blaze, pale orange or yellowish, white and fibrous inside. Terminal leaflet sometimes attains 9 in. or more in length.

Fl. April-July. Fr. cold season.

6. LESPEDEZA, *Mich.*

Lespedeza stenocarpa, *Maxim.* Syn. **L. macrostyla,** *Baker.*

A twiggy shrub 3-5 ft. high; branchlets often drooping; young parts hoary with adpressed silky pubescence. Leaves digitately trifoliolate; petioles up to 1 in. long; stipules up to ·2 in. long, dry, lanceolate-acuminate, striate. Leaflets ·3-1·1 in. long, terminal largest, obovate-cuneate, apex emarginate or round, mucronate, entire, coriaceous, nerves prominent, glabrous above, under-surface grey or silvery silky, sometimes glabrescent with age. Flowers rose-purple, ·4 in. long, in very short, dense, hairy racemes in the axils of leaves or leafy bracts, less than 1·5 in. long; pedicels short, elongating in fruit, hairy, longer than the bracts. Calyx covered with long spreading hairs, deeply cleft, teeth longer than the tube, linear lanceolate. Standard obovate; ·3 in. long; wings slightly adherent to the keel; stamens diadelphous, 9+1. Ovary covered with long silky hairs; style hairy, breaking up above the base and then persisting in the pod as an awn. Pod up to ·6 in. long, thin, oblong, flattened, narrowed to the long-awned apex, veined, covered with scattered hairs.

Bhambar Range (outer Nepal hills)—Gonda; rare. Sometimes the rachis of the raceme is very short and the flowers appear to be fascicled.

Fl. November to June.

7. ALHAGI, *Desv.*

Alhagi camelorum, *Fisch.* Syn. **A maurorum,** *Baker.* Vern. *Jawasa.* The camel thorn.

A low spreading spiny shrub with longitudinally furrowed corky bark; branches puberulous, ultimately glabrous; spines axillary ·5-1·5 in. long, sharp, stout on the older branches. Leaves usually drooping, simple, variable, ·3-·8 in. long, obovate-oblong, obtuse, mucronate, rigid, glabrous; petiole small; stipules minute, subulate. Flowers 1-8, on spine-tipped branches, red, about ·3 in. long thin; pedicels short. Calyx teeth much shorter than the tube, triangular. Corolla much exserted, petals all clawed; standard almost equalling the other petals, obovate-oblong, auricled at the base; keel obtuse. Ovary glabrous. Pod up to 1·3 in. long, falcate, inequally constricted between the seeds on the lower (inner face).

Etawah and Afforestation Divisions, Bundelkhand, on dry sandy oil.

The plant puts forth new leafy shoots in the hot weather; the herbaceous portions die off after rains. It is valued as fodder for camels. The branches are said to be made into tatties.

F April-May Fr August-September.

Æschynomene aspera, *Linn.* Vern. *Sola* The sola-pith plant.—A tall, stout aquatic, perennial, stem and branches spongy glabrous. Leaves imparipinnate 3-6 in. long, rachis often minutely spiny; stipules 3 in. long, lanceolate, with a basal auricle. Leaflets numerous alternate, reaching down almost to the base of the rachis, linear-oblong, ·25- 45 in. long, glabrous. Flowers yellow ·4-·7 in. long, 2-4 on short lax, axillary, bristly racemes shorter than the leaves; pedicels bristly. Calyx 2-lipped, hispid; corolla exserted, fugacious; pod 2-3 in. long, echinate when mature with a prominent line of tubercles on both sutures, apiculate, somewhat indented along the sutures of joints; joints 3-8, ·4 in. by 3 in., lowest stipitate.

Said to occur in swamps within our area, but there are no specimens at Dehra.

The sort pith is used in the manufacture of pith hats.

Fl. rainy season. Fr. cold season.

8. URARIA, *Desv.*

Herbs with perennial root-stocks or undershrubs. Leaves pinnately 1-9 foliolate, leaflets stipellate. Flowers in racemes; pedicels bristly or plumose; calyx-tube very short, 2 upper teeth short, 3 lower setaceous, often plumose. Standard broad, wings adhering to the obtuse keel. Stamens 2-adelphous (9+1) often exserted. Ovary few ovuled; style filiform, inflexed; stigma terminal. Pod of 2-6, small, turgid, 1-seeded, indehiscent joints usually bent on one another so as to become more or less face to face when ripe.

I.	Upper caves 5-9-foliolate.	1. *U. picta.*
II.	Upper leaves 1-foliolate, lower often 3-foliolate :—	
	A. Racemes dense under 4 in. long, very hairy: lower teeth of calyx very long, the upper very small.	2. *U. alopecuroides.*
	B. Racemes over 4 in. long, elongate, calyx teeth subequal :—	
	Pod glabrous.	3. *U. neglecta.*
	Pod hairy.	4. *U. hamosa.*
III.	Leaves all 1-foliolate.	5. *U. prunellæfolia.*

1. Uraria picta, *Desv.*

A finely pubescent undershrub up to 3 ft. high. Leaves very variable, lower simple, grading to the 5-9-foliolate upper leaves 6-14 in. long; stipules up to ·85 in. long, obliquely ovate, acuminate, dry, parallel veined. Leaflets 2·5-8·5 in. long, upper linear oblong, or lanceolate, apex usually obtuse, mucronate; lower elliptic-oblong, all glabrescent and clouded with whitish blotch along the mid-rib above and somewhat rough, minutely pubescent, prominently veined and paler beneath; stipels setaceous, longer than the petiolules. Racemes terminal 6-12 in. long, hispid, dense. Lower bracts

stipule-like and more or less persistent; upper lanceolate, acuminate early deciduous. Flowers in twos, ·25 in. long, purple; pedicels incurved at the tip, covered with hooked bristles. Calyx deeply divided; lobes subulate, feathery with long bulb-based hairs, 2 upper shortest. Pod 3-6-jointed, lead-coloured and smooth, pressed against the rachis of the raceme.

Throughout the circle. Easily distinguished in the field by the white blotched oliage.

Fl. May August. Fr. cold season.

2. Uraria alopecuroides, *Wight.* Syn. **U. repanda,** *Wall.*

An erect undershrub about 3 ft. in height with a woody root-stock. Branches, inflorescence and petiole covered with stiff, often hooked, hairs. Leaves 1-3-foliolate; petiole 1-1·4 in. long; stipules tapering to a fine point from an oblique and broad base, parallel veined, up to ·5 in. long. Leaflets 1·7-3 in. long, terminal largest, lateral much smaller, ovate or elliptic, sometimes oblong, apex mucronate, obtuse to rounded, base usually cordate, lateral nerves 6-8 pairs, prominent beneath, distant, both surfaces rough, often clouded; stipels setaceous. Racemes terminal and axillary 2·5-3·5 in. long, very dense, conspicuous at first from the long awned imbricating bracts, then with the feathery calyx lobes and pedicels; bracts ·35 in. long, suborbicular-ovate, acuminate, ending abruptly in a sharp point, ciliate, striate; pedicels ·3 in. long densely bristly, incurved at the top. Flowers ·25 in. long, pink. Calyx teeth 2 upper short, 3 lower subulate, feathery with long bulb-based hairs. Pod 2-jointed, smooth.

Pilibhit, Gorakhpur.

3. Uraria neglecta, *Prain.*

A deciduous weak shrub or an undershrub; young parts and petiole covered with bristly pubescence. Leaves 1-3-foliolate, common petiole up to 1 in. long; stipules ·3 in. long, drawn out to a long point from a broad base. Leaflets 1·2-3 in. long, terminal largest, oblong-elliptic or ovate, apex mucronate, subacute or rounded, somewhat rough, undersurface pubescent, lateral nerves usually 10-13 pairs on terminal leaflets, closer than in the last species, subparallel, impressed beneath; stipels setaceous. Racemes terminal 4-12 in. long, dense, sometimes branched. Flowers ·2 in. long, purple, in twos; bracts ovate, lanceolate, acuminate, caducous, sometimes attaining ·6 in. usually smaller, silky outside; pedicels incurved at the tip up to ·4 in. long, densely covered with bulb-based bristles. Calyx bristly outside, lobes subequal. Pod smooth, 2-6-jointed, folded about the joints.

Pilibhit, but probably also in Oudh and Gorakhpur

Fl. September-October Fr. cold season.

4. Uraria hamosa, *Wall.*

A diffuse undershrub, young parts covered with hooked bristles and spreading pubescence. Leaves simple and 3-foliolate, leaflets up to 4·5 in. long, terminal largest, usually elliptic-ovate or oblong, obtuse or emarginate, base rounded, glabrescent above, pubescent beneath, lateral nerves up to 16 pairs, stipels minute, setaceous. Racemes terminal and axillary, lax, attaining 20 in., often panicled when terminal; bracts ovate, acuminate, ·45 in. long, closely ciliate, adpressed silky outside, imbricating before flowers open, caducous. Flowers purple, somewhat distant, in twos; pedicels up to ·25 in. long, incurved at the top; calyx tube covered with scattered hairs, lobes subequal. Pods hairy, 2-6-jointed.

Pilibhit to Gorakhpur.

Resembles closely U. neglecta from which it can be distinguished by its laxer, more slender and less bristly inflorescence and hairy pods.

5. Uraria prunellæfolia, *R. Grah.*

A small undershrub with strict herbaceous shoots from a woody root-stock. Young parts and petiole rough with bristly pubescence. Leaves 1-foliolate; petiole short up to ·35 in. long; stipules, striate, triangular acuminate up to ·5 in. long. Leaflet 2·5-6 in. by ·7-3·2 in., oblong or lanceolate, obtuse or subacute, mucronate, rough on both surfaces, nerves prominent, about 8-12 pairs somewhat distant. Racemes terminal up to 5·5 in. long, bracts ovate-oblong, acuminate, hairy outside, early deciduous, up to ·35 in. long. Flowers in fascicles of two to three, up to ·15 in. long, bluish-purple; pedicels up to ·35 in. long, covered with bulb-based bristles and hooked hairs, incurved at the tips. Calyx lobes covered with long rough hairs, lower lobes longer than the upper. Pod 2-6-jointed, sparsely hairy, coiled spirally, joints attenuated, black.

Pilibhit eastward to Gorakhpur. In fire lines and grass-lands The species has the habit of plants dwarfed by forest fires like rythrina resupinata, etc.

Fl. April-May. Fr. rainy season.

9. ALYSICARPUS, *Neck.*

Diffuse herbs or undershrubs. Leaves 1-foliolate, sometimes 3-foliolate, stipellate; stipules scarious. Flowers small in termina or leaf-opposed, rarely axillary racemes or spikes; pedicels usually in pairs; bracts scarious. Calyx glumaceous deeply lobed; upper segments often connate. Corolla not exserted; standard obovate or orbicular, narrowed to a claw; keel obtuse, usually with lateral appendages to each petal, adnate to the wings. Stamens diadelphous, 9+1;

anthers uniform. Ovary many-ovuled; style filiform, incurved at the apex; stigma capitate. Pod terete or turgid, consisting of several 1-seeded joints.

Calyx much longer than the first joint of pod :—

Joints of pod not transversally ribbed.	1. *A. longifolius.*
Joints of pod transversally ribbed.	2. *A. rugosus.*
Calyx shorter or scarcely longer than the first joint of the pod.	3. *A. vaginalis.*

1. Alysicarpus longifolius, *W. & A.*

An erect undershrub 4 ft. high, branches glabrous. Leaves usually 1-foliolate, sometimes with 1-2 rudimentary lateral leaflets; petiole short up to ·7 in. long; stipules erect, linear-lanceolate, acuminate up to ·8 in. long. Leaflet 2-6 in. long, linear-oblong or lanceolate, mucronate, glabrous above, sparsely hairy beneath, subcoriaceous; stipels setaceous. Racemes elongate up to 13 in. long, sometimes branched, dense and spike-like on account of the pedicels being closely pressed on the rachis. Flowers reddish; pedicels jointed at the top, about ·15 in. long. Bracts conspicuous, about ·45 in. long, concealing the buds, ovate-lanceolate, soon falling off. Calyx ·3-·5 in. long, exceeding the lowest joint of the pod; teeth lanceolate acute, ciliate, longer than the plicate tube. Pod 4-6-jointed, indistinctly recticulate, ·3-·5 in. long, slightly moniliform, apiculate, glabrous.

Kheri, in phantas, probably also in other Oudh Divisions; Bundelkhand—*Duthie.*

2. Alysicarpus rugosus, *DC. Var.* Heyneanus, *Baker.*

A robust undershrub attaining 4 ft.; branchlets pubescent. Leaves 1-foliolate; petiole short, hairy up to ·3 in. long; stipules equalling or just longer than the petioles, tapering from a broad base, ciliate. Leaflets ·6-2·3 in. by ·3-1·3 in., oblong or obovate-oblong, glabrous above, hairy beneath. Racemes dense, 1·5-7 in. long, adpressed hairy. Flowers ·25 in. long, pink-purple; pedicels short, slender jointed at the top, about ·1 in. long. Bracts ovate-cuspidate, often tinged with purple. Calyx about ·2 in. long in flower, enlarging and much exceeding the first joint of the pod later, divided nearly to the base, teeth lanceolate, ciliate on the edges. Pod 2-5-jointed, moniliform, apiculate, slightly turgid, prominently marked with transverse ribs.

Bundelkhand, in waste lands.

Fl. and fr. rainy season.

VAR 1. typica, *DC.* Stem diffuse and herbaceous, nearly glabrous. Leaves elliptic or oblong, racemes dense. Rohilkhand and Bundelkhand—*Duthie.*

VAR. 2. ludens, *Baker*. Branches glabrous. Leaves 2-4·5 by 1-3 in. linear or linear-lanceolate, glabrous above, hairy beneath. Racemes attaining 9 in. glabrescent. Clayx lobes with few or no hairs on the margin. Etawah.

VAR. 3. styracifolius, *Baker*. Diffuse and much-branched, young branches pubescent. Leaves ·5-1-in. long, elliptic-oblong, obtuse. Racemes hairy, dense, ·5-1·5 in long. Calyx teeth densely ciliate. Pod hardly exserted at all. Bundelkhand, Afforestation Division.

3. Alysicarpus vaginalis, *DC.*

A much branched and variable undershrub, attaining 4-ft. Branchlets slender, glabrous. Leaves 1-foliolate; petioles glabrous, up to ·4 in. long; stipules lanceolate, acuminate up to ·3 in. long. Leaflet very variable in size and shape, usually ·4-2 in. long, linear, or broad oblong-lanceolate to elliptic, glabrous above, sparsely hairy beneath, mucronate, base cordate. Racemes lax, 1-3 in. long, distantly 8-12-flowered, glabrous. Flowers very small, ·15 in. long; pedicels close to the rachis; jointed. Bracts lanceolate, acuminate, ciliate in fruit, just shorter than the first joint of the pod. Corolla yellowish, tinged with pink or purple. Pod nearly terete up to 1 in. long, prominently veined, septate, but not constricted between the septa.

Banda, probably all over the area.

Fl. rainy season. Fr. cold season.

Some forms of the plant are diffuse and herbaceous

10. OUGENIA, *Benth.*

Ougenia dalbergioides, *Benth.* Vern. *Sanan, panan, chajan, tinsa* (*J.*). Sans. *Tinsia, sejandana.*

A medium-sized, short-stemmed, deciduous tree, attaining about 30 ft. in height, with grey or light-brown bark, peeling off in short shreds; branchlets angular or striate. Leaves pinnately trifoliolate, common petiole 2-6 in. long, channelled above, swollen and pulvinate at the base; stipules caducous, lanceolate up to ·2 in. long. Terminal leaflets largest, 3-6 in. by 2·3·5 in., broadly ovate, elliptic or rhomboid; lateral smaller 2·5-4·5 by 1·5-3 in., oblique, ovate or elliptic; all entire, subcoriaceous, glabrous above, paler, slightly pubescent or glabrescent beneath; petiolules ·1-·2 in. long; stipels subulate ·1 in. long. Flowers light-pink or rosy, in short, fascicled racemes, usually from old wood; pedicels ·5-·8 in. long, very slender, clustered on the short racemes; bracts small scaly, ovate, acuminate, villous; bracteoles minute. Calyx ·1-·15 in. long, pubescent, teeth obtuse, shorter than the tube, upper two cuneate. Corolla ·3-·4 in. long; standard nearly orbicular, shortly clawed; wings oblong; keel obtuse. Stamens

diadelphous, 9 + 1. Ovary sessile, many ovuled; style incurved subulate, stigma capitate. Pod 2-4 by ·3 in., distinctly jointed, flat; joints ·6-·8 in. long, reticulately veined. Seeds about ·2 in. long, smooth, brown when ripe.

Throughout the area.

alued for its timber which is used for agricultural implements legs of *charpoys*, buildings, etc. The bark is a fish poison. The gum is sometimes used medicinally. The leaves are good fodder for which the tree is often lopped.

Blaze white, streaked with red due to exudation of beads of red gum; fibrous. Produces root-suckers in abundance.

Fl. when almost leafless in February-March. Fr. May-June. Leafless February-April.

11. DESMODIUM, *Desv.*

Herbs or shrubs. Leaves pinnately 1-3-foliolate, stipellate. Flowers small, usually in copious, often dense racemes, rarely in umbellate heads. Calyx campanulate; teeth longer or shorter than the tube, the two upper often sub-connate. Corolla exserted; standard broad, keel usually obtuse more or less adherent to the wings. Upper stamen partially or entirely free, the other 9 united. Ovary sessile or stipitate, few or many-ovuled; style incurved; stigma minute, capitate. Pods very compressed, indented along one or both sutures; joints 1-seeded, generally indehiscent, rarely dehiscent along one suture, usually separating; pod rarely continuous, indistinctly jointed and dehiscent.

I. Pod distinctly jointed, not continuous :—

A. Leaves 3-foliolate —

1. Flowers in umbels :—

Umbels axillary, naked.	1. *D. Cephalotes.*
Umbels arranged in plicate racemes, hidden by a pair of persistent foliaceous bracts. ..	2. *D. pulchellum.*

2. Flowers in elongate, axillary and terminal simple or panicled racemes ;—

a. Joints of pod indehiscent :—

Pods 6-10-jointed; joints longer than broad; stipules subulate.	3. *D. laxiflorum.*
Pods 4-6-jointed : joints scarcely longer than broad; stipules auricled.	4. *D. diffusum.*

b. Joints of pod dehiscing along the lower suture :—

Pods 6-8-jointed.	5 *D. polycarpum.*

B. Leaves 1-foliolate :—

1. Petiole winged. .. .. .. 6. *D. triquetrum*.
2. Petiole not winged :—

Leaflet entire, glabrescent on the upper surface ; stems angular. .. .. 7. *D. gangeticum*

Leaflet repand, hispid above stems round. .. 8. *D. latifolium*.

II. Pod indistinctly jointed, dehiscing in a continuous line along the ventral suture ; joints not separating ; leaflets 1-3 :—

Undershrub ; side leaflets if present, minute. .. 9. *D. gyrans*.

Shrub, side leaflets well developed. .. .. 10. *D. gyroides*.

1. Desmodium Cephalotes, *Wall.*

A shrub up to 6 ft. in height with striate three-angled zig-zag branchlets and grey bark. Young parts, rachis and pod covered with hoary or grey silky pubescence. Leaves pinnately 3-foliolate, common petiole channelled, ·8-1·2 in. long ; stipules caducous, about ·8 in. long, linear-lanceolate, and long pointed, striate veined, covering the buds. Leaflets about 2-6 by 1-3 in., terminal largest, elliptic or lanceolate, acute or acuminate, bristle tipped, subcoriaceous, glabrescent above, pubescent along the nerves beneath, margin recurved, lateral nerves 10-17 pairs, straight, close, prominent, joined by numerous sub-parallel tertiaries ; stipels setaceous. Flowers red, ·3-·4 in. long, usually in dense, short peduncled, axillary umbels which are much shorter than the leaves; umbels usually solitary, but sometimes on short leafless branches; peduncles up to ·3 in. long ; pedicels ·1 in. long, jointed at the apex hairy ; bracts caducous. hairy outside, dry, linear-oblong, acuminate; bracteoles setaceous or linear. Calyx 4-toothed, teeth linear, lower-most longest, hairy. Pod 2-5-jointed, somewhat curved, up to 5 in. long, joints as long as broad, grey silky.

Throughout the area, usually in sal forests.

Fl. July-August Fr. November-December.

2. Desmodium pulchellum, *Benth.* Vern. *Gheopatti* (*Bah.*).

An erect shrub up to 6 ft. in height with reddish-brown bark and zig-zag, striate and grey pubescent branchlets. Leaves pinnately 3-foliolate ; common petiole up to ·5 in. long, channelled ; stipules up to ·4 in. long, dry, subulate ; stipels setaceous. Terminal leaflet 2·5-5 by 1·2-2·25 in., ovate-elliptic or oblong, lanceolate, tip subacute or obtuse, cuspidate, margin undulate, lateral leaflets 1·5-3 in. long, oblique, all coriaceous, somewhat rough and subglabrous above, finely downy and paler beneath, main lateral nerves 6-9 pairs, prominent beneath, usually slightly bent near the base. Flowers ·25 in. long white or cream, in clusters of 2-6, in two rows, on axillary and terminal racemes 2-10 in. long, each cluster enclosed between a pair of leaflike, persistent, obliquely orbicular bracts. Bracts ·5 in. across,

coriaceous, strongly nerved, glabrous above, finely downy beneath, with a short densely villous peduncle which ends in a long fine point; bracteoles setaceous. Calyx hairy; corolla extruded. Pod ·3 in. long, entirely covered by the bracts usually 2-jointed, joints constricted at both sutures, reticulate, glabrate or downy.

All over the area.
The inflorescence elongates considerably in fruit.
Fl. July-September. Fr. cold season.

3. Desmodium laxiflorum, *DC.*

A suberect deciduous shrub 3-5 ft. in height with angled branchlets and reddish brown bark. Young branchlets and inflorescence pubescent. Leaves pinnately 3-foliolate, rarely simple; common petiole channelled, 1-3 in. long; stipules ·3-·5 in. long, persistent, erect, scarious, lanceolate, drawn out to a sharp point, striate. Leaflets elliptic, ovate or lanceolate, apex acute, cuspidate, base rounded, entire, membranous, glabrescent and somewhat rough above, paler and covered with adpressed hairs beneath, lateral nerves 9-13 pairs slightly arched near the margin and running along it. Terminal leaflet largest 3-8·5 by 1·5-4 in., lateral 2·5-6 in. long and somewhat oblique; stipels bristly about ·25 in. long; petiolule of terminal leaflet ·5-1·25 in. long of lateral leaflets up to ·1 in. long. Flowers about ·25 in. long, in fascicles, on lax, drooping, axillary and terminal racemes or terminal panicles 5-15 in. long; pedicels slender, up to ·3 in. long. Bracts scarious, resembling the stipules but smaller; bracteoles setaceous, deciduous. Calyx deeply lobed, hairy. Standard white, 2 in. long, wings and keel deep purple. Pod slender up to 2 in. by ·05-·1 in., 6-8-jointed, not deeply constricted between the joints; joints longer than broad, breaking off easily, covered with bulb-based hooked hairs, by means of which they cling to passing objects.

Oudh Divisions, but probably also in all sal forests in our area.
Fl. rainy season. Fr. cold season.

4. Desmodium diffusum, *DC.*

A stout perennial herb with sulcate stems; young parts silky. Leaves 3-foliolate; petiole 1-1·2 in. long, densely hairy, with prominently auricled, scarious, and conspicuously striate stipules. Leaflets 1·5-3 in. long, ovate, oblong or elliptic, obtuse, rounded at both ends, finely pubescent and prominently nerved beneath, subcoriaceous; stipels ovate, acute. Flowers purple or blue, minute in fascicles of 2-3, on the hairy rachis of axillary or terminal racemes or leafy panicles. Lower bracts auricled; bracteoles lanceolate. Calyx teeth linear. Corolla twice as long as the calyx. Pod up to ·7 in. long, 5-6-jointed; joints as broad as, or broader than long.

Banda, Rohilkhand (Duthie's collector).
The leaves are much eaten by cattle

5. Desmodium polycarpum, *DC.* Vern. *Kabra.*

A suberect undershrub with slender, striate branches. Young parts, petioles and rachis of inflorescence covered with adpressed silky hairs. Leaves pinnately 3-foliolate; common petiole channelled, ·4-1 in. long; stipules up to ·7 in. long, deltoid acuminate with a long point, erect, striate. Leaflets elliptic, oblong or obovate, rounded or slightly notched at the apex, subcoriaceous, light-green, glabrescent and often clouded on the upper surface, under-surface paler and glaucescent, covered with long silky hairs specially along the midrib, secondary nerves 6-9 pairs, arched near the margin, upper ones meeting in loops; terminal leaflet 1·3-3 by 1-1·5 in., the lateral smaller; petiolules minute. Flowers bluish-purple, ·2-·3 in. long, in pairs, or fascicled in dense terminal and axillary racemes which are 2-4 in. long and sometimes branched. Bracts caducous, concave, lanceolate-cuspidate, ciliate, about ·2 in. long, striate, conspicuous and imbricatei n bud; pedicels filiform, ·15 in. long. Calyx ·1 in. long, glabrate, teeth triangular, corolla ·2 in. long. Pod ·5-·7 in. long and ·15 in. broad, 6-8-jointed; slightly curved and covered specially on the sutures with brown hooked bristles, straight on the upper suture, indented on the lower; joints opening by lower suture, reticulate, length equalling breadth.

All over the area.

The branches sometimes produce adventitious roots at the nodes. The pods stick together and often persist long after ripening.

Fl. rainy season. Fr. cold season.

6. Desmodium triquetrum, *DC.*

An erect undershrub with a weak stem about 3-4 ft. long; branchlets trigonous and shaggy along the angles, young parts and inflorescence covered with somewhat stiff hairs. Leaflet single, 2-5 by 1-2 in., narrow oblong-lanceolate, acute, subcordate at the base, entire, subcoriaceous, glabrescent above, sparsely villous along the nerves beneath, lateral nerves 12-17 pairs; petiole up to 1·5 in. long, jointed, with leafy wings ·4 in. across, which end on either side of the base of the leaf blade in stiff points; stipules ·5 in. long, scarious, ovate, striate, erect. Flowers purple or blue, ·3 in. long, solitary or clustered in the axils of stipule-like linear-lanceolate scarious bracts, with smaller but similar ones at their bases, on lax terminal and axillary racemes 6-10 in. long. Calyx 4-lobed. Pods usually 6-8-jointed, up to 1.5 in. long, densely covered with silky hairs, not deeply indented at the joints; joints a little broader than long.

Pilibhit to Gorakhpur.

Fl. rainy season. Fr. cold season.

D. **pseudo-triquetrum,** *DC.*—A prostrate undershrub closely resembling the last, but all parts smaller. Pod glabrous or pubescent on the valves densely hispid along the edges. May be found in Oudh.

7. Desmodium gangeticum, *DC.*

A shrub or slender undershrub of variable habit, 2-5 ft. high, with striate, pubescent branches. Leaflet single, 2·4-6 in. long, ovate-lanceolate to elliptic-oblong, acute, base rounded or subcordate, entire, scabrid and subglabrous above, glaucescent and pubescent beneath, lateral nerves more or less straight, 8-10 pairs, subcoriaceous; petiole ·5-1·2 in., channelled. Stipules persistent; ·2-·5 in. long, erect, scarious triangular, awned, striate; stipels setaceous. Racemes terminal and branched or axillary, lax, 6-12 in. long, pubescent usually with reflexed hairs pointing upwards. Bracts minute, setaceous, pedicels slender. Flowers in twos, white, tinged with purple ·15 in. long. Calyx teeth, deltoid, longer than the tube. Pod ·5-1·2 in. by ·1 in., subfalcate or straight, 6-10-jointed, deeply indented along the lower suture, slightly along the upper; joints indehiscent, longer than broad; usually covered with minute hooked hairs.

Throughout the area.
Fl. May-August, Fr. October to January.

VAR. maculatum, *Baker.*—A dwarfed form which has much smaller leaflets than the type—4-1 in. long. It occurs along fire traces and has to all appearances the habit of plants like Grewia sapida, Combretum nanum, etc.

8. Desmodium latifolium, *DC.*

A small deciduous shrub 3-6 ft. high, covered with rusty or grey hairs, branches terete. Leaflet single, 2·5-6 by 2-4·5 in. broadly ovate, obtuse and mucronate at the apex, base truncate, lateral nerves 7-8 pairs including the basal, arched and running along the margin, margin somewhat repand, thinly subcoriaceous, rough pubescent above with stiff hairs, softly rusty tomentose beneath; petiole up to 1·2 in. long; stipules ·15 in. long, broadly subulate; stipels subulate. Flowers purple ·2 in. long, in clusters, on axillary or terminal, densely brown, pubescent racemes—which are sometimes branched,—4-12 in. long; pedicels very short, hairy. Calyx teeth linear. Pods ·5-·7 in. long, 3-6-jointed, lower suture deeply indented between the joints, covered with stiff hooked hairs; joints slightly longer than broad.

Throughout the area in sal forests.
Fl. rainy season. Fr. cold season.

9. Desmodium gyrans, *DC.* The Telegraph Plant.

A shrub 3-8 ft. high with scarcely woody stem, branches glabrescent, striate. Leaves usually 3-, sometimes 1-foliolate by abortion, rachis ·7-2 in. long, channelled; stipules scarious ·3-·7 in. long, lanceolate long-acuminate, striate, erect. Leaflets narrow oblong-lanceolate or oblong, obtuse at both ends, glabrous and often clouded above, glaucous and more or less pubescent beneath, lateral nerves 6-10 pairs. Terminal leaflet largest, 1·5-4 by ·6-1·6 in., lateral much smaller, absent or deciduous, inconspicuous ·2-·8 by ·1-·15 in. Petiolule of

lateral leaflets up to ·15 in long; stipels setaceous. Flowers pink or pale mauve and blue in pairs, about ·4 in. long, somewhat distant on the racemes. Racemes axillary or terminal, lax, downy, 3·5-6 in. long, at the ends of branches sometimes forming extensive leafy panicles. Bracts concave, broadly ovate or elliptic, acute, ·25 in. long, closely imbricate in bud; pedicels hairy, ·3 in. long. Calyx glabrescent, teeth short, pod 1-1·5 by ·2 in., sparsely hairy or glabrescent, dehiscing continuously along the upper suture and appearing falcate after dehiscence; joints 5-10, rather obscure, broader than long.

All over the area in shady localities.

The lateral leaflets move in circles by jerks in moist warm weather when exposed to the sun, whence the English name.

Fl. rainy season. Fr. early cold season.

10. Desmodium gyroides, *DC.*

A shrub similar in many respects to the last species with reddish-brown smooth bark. Young branches adpressed silky hairy, sometimes shaggy. Leaves 3, sometimes 1-foliolate by abortion; rachis up to 1·5 in. long channelled, hairy; stipules as in the last species, silky outside. Leaflets obovate-oblong, apex rounded, sometimes emarginate, base rounded, subcordate, subcoriaceous, glabrescent above, glaucous, and pubescent or tomentose beneath, lateral nerves 6-9 pairs; terminal leaflets largest 1·4-3 by ·75-2 in., lateral leaflets often absent up to 1·5 in. long. Flowers deep-purple, ·5 in. long, in short axillary and terminal racemes 1-2 in. long, the latter sometimes panicled. Bracts ·35 in. long, similar to those of the last species. Pods 1-1·5 in. by ·15-·2 in., persistently covered all over with stiff brown hairs, dehiscing and subsequently curling up as in the last species.

Gonda, Gorakhpur ; probably also in other sal forests

Fl. August-September. Fr. November-December.

12. ABRUS, *Linn.*

Abrus precatorius, *Linn.* Eng. Crab's-eyes (the seeds), Indian Liquorice. Vern. *Ghonghchi, rati,* Sans. *Gunja.*

A dextrorse deciduous climber with woody base and many tough slender branches. Leaves 2-4 in. long, paripinnate, rachis ending in a soft bristle, stipules ·15 in. long, subulate. Leaflets 10-20 pairs, deciduous, ·3-1 by ·15-·3 in., increasing slightly in size from the base, oblong-ligulate, rounded at both ends, minutely apiculate, glabrous above when mature, thinly adpressed, silky or glabrescent when mature, petiolules and stipels minute. Flowers up to ·4 in. long, white with a tinge of pink or pink clustered on tubercles on dense pedunculate pubescent racemes shorter than, or as long as, the leaves; peduncles often leaf-bearing, thickened in fruit, pedicels very short. Calyx ·1-15 in. long, campanulate, truncate, thinly silky; standard

ovate, narrowed towards the base, adnate to the staminal tube; wings oblong-falcate shorter than the keel. Stamens 9, cohering in a tube, slit above. Ovary subsessile; style short, incurved. Stigma small capitate. Pod 1-1·5 in. by ·5 in., oblong with a sharp deflexed beak rather inflated, thinly pubescent, thinly septate between the seeds. Seeds 3-5, polished, ·2-·3 in. long, ovoid, generally two-thirds, scarlet and the rest black with a large hilum in the black part, rarely wholly black or white.

Common throughout the area, usually in scrub forests or hedges, very pretty when the pods open and disclose the scarlet seeds.

The root is used as a substitute for liquorice. The seeds are said to constantly weigh 1·75 grains and form the unit of Indian weight measurement (*rati*), and are used by jewellers as weight. They contain a poisonous principle —abrin. The powdered seeds are sometimes said to be used by *chamars* for poisoning cattle by hypodermic injection with a needle. The root, leaves, and the seeds are used in Indian medicine.

Fl. rainy season. Fr. cold season.

13. MUCUNA, *Adans.*

Mucuna prurita, *Hook.* Syn. **M. pruriens,** *F. B. I.* (*non DC.*) Eng. Cowage, Vern. *Kaunch.*

A slender much-branched climber with annual branches and woody base. Leaves pinnately trifoliolate, common petiole 2-4.5 in. long, swollen at the base; stipules ·2 in. long, linear, hairy outside. Leaflets 2-5 by 1·3-3·4 in., ovate, elliptic, or rhomboid-ovate, mucronate, glabrescent above, covered with grey silky hairs beneath, lateral nerves 6-8 pairs; terminal leaflet smallest; base of lateral leaflets oblique, semicordate; petiolule of lateral leaflets ·1 in. long; stipels setaceous, ·1 in. long. Racemes axillary, up to 12 in. long, sometimes reduced to a solitary flower, silky; bracts 1-3-flowered, caducous, lanceolate, ·2-·5 in. long, silky; pedicels ·1 in. long. Flowers up to 1·5 in. long, dark-purple. Calyx covered with grey, irritating bristles; teeth unequal, upper connate. Standard ·6 in. by ·5 in.; wings nearly as long as the slightly incurved keel, both about twice as long as the standard; stamens diadelphous. Pod 2-3 in. long; ends curved in opposite directions like an S, turgid, densely clothed with brown or rusty, irritating bristles; seeds 6.

All over the area in open scrubs and hedges.

The roots and pods are used in Indian medicine. The pods are used as an anthelmintic. The seed is believed to absorb scorpion poison when applied to the part stung.

Fl. rainy season. Fr. November-January.

14. ERYTHRINA, *Linn.*

Trees, shrubs or undershrubs often prickly. Leaves pinnately 3-foliolate; stipules small; stipels gland-like. Flowers large, usually coral-red, in dense peduncled terminal or axillary racemes; pedicels in pairs or in fascicles on the rachis. Calyx oblique at the mouth, spathaceous and finally splitting to the base, or campanulate and

bi-labiate. Corolla long exserted; petals very unequal; the standard much exceeding the keel and the wings. Stamens 10, upper stamen free to the base or connate with the others up to about halfway up. Ovary stipitate; many-ovuled; style incurved beardless; stigma capitate. Pod narrowed at both ends, turgid; torulose, dehiscent.

Undershrub with herbaceous annual shoots from a perennial root-stock. .. .. 1. *E. resupina a.*
A medium sized tree. .. .. .. 2. *E. suberosa.*

1. Erythrina resupinata, *Roxb.*

A dwarfed undershrub with herbaceous and more or less prickly shoots produced annually from a perennial root-stock, young parts densely tomentose. Leaves 3-foliolate; rachis 2-6 in. long, glabrescent; stipules ·25 in. long, ovate, oblong. Terminal leaflet largest, 2-4·5 in. long, broad elliptic or rhomboid, apex rounded or acute, narrowed towards the cordate or obtuse, 3-5-nerved base, lateral leaflets 1·5-3·3 in. long, oblique ovate, all glabrescent when mature, coriaceous, nerves sometimes prickly on the under-surface; petiolules of lateral leaflets ·15-·2 in. long. Racemes several, stout, 2-7·5 in. long, appearing before the leaves, usually densely flowered from the base; bracts oblong-lanceolate, caducous, about ·15 in. long, pedicels ·3-·5 in. long, jointed and expanded at the top. Flowers bright scarlet, in fascicles of three from short excrescences, very showy up to 1·2 in. long. Calyx campanulate, 2-lipped; standard bright scarlet resupinate and lowermost, oblong, 3-4 times the calyx, and about twice the keel; wings shorter than the keel, greenish-red. Ovary stipitate, hairy. Pod 2·5-3 in. by ·4-·8 in., flat, curved, 3-seeded, torulose.

Grass-lands from Pilibhit to Gorakhpur. A remarkably handsome plan when in flower for which it deserves a place in the garden.

The herbaceous portions die off at the end of the rains.

Fl. March. Fr. hot season.

2. Erythrina suberosa, *Roxb.* Vern. *Pharai* (*Gor.*), *garausa* (*J.*), *pangra.* Sans. *Mandala.*

A medium-sized deciduous tree up to 60 ft. high, with prickly branches and deeply furrowed, thick, corky, bark. Prickles about ·2 in. long. conical light-brown, in twos or threes, straight. Young parts and inflorescence tomentose. Rachis sometimes prickly, 4·5-13·5 in. long; stipules linear-lanceolate, acute. Leaflets 3-9 in. across, often broader than long, terminal rhomboid or ovate, lateral, oblique, all coriaceous, base 3-nerved usually narrowed, midrib sometimes prickly, glabrescent above, densely matted tomentose beneath, margins often sinuate; stipels glanduliform; petiolules of lateral leaflets 2-·5 in. long. Racemes several at the ends of the branches,

pedunculate, 4·5-9 in. long, dense. Flowers coral-red, in fascicles of 2-3; bracts caducous; pedicels ·3-·5 in. long, jointed at the top. Calyx ·25-·35 in. long, campanulate, soon becoming 2-lipped; standard 1·5-2 in. long, clawed; keel petals connate, ·5-·7 in. long, much exceeding the very small falcate wings, base clawed, apex ending in a long fine point. Pod 4·5-6 in. by ·5 in. tapering both ways, subterete, stipitate, faintly constricted between the seeds; seeds 4-5 black.

Throughout the area, usually in open forests, often gregarious in hilly forests.

The light white wood is used for sieve frames, sword scabbards, etc. The bark, juice and leaves are used medicinally.

Blaze pale-yellow outside, inner substance fibrous and orange-brown.

Leafless cold season. Flowers and young foliage in March. Fr. ripen in June.

E. indica, *Lamk.* The Indian Coral Tree. A moderate-sized tree with yellowish or greenish-grey bark, often planted in gardens. It flowers in March when it is conspicuous on account of its brilliant scarlet blossoms. It is a native of the sea coasts of India.

15. BUTEA, *Roxb.*

Erect trees or extensive woody climbers with large 3-foliolate stipellate and prominently nerved leaves. Flowers large showy, usually bright orange or red, densely fascicled in racemes or panicles. Calyx broadly campanulate; teeth short, deltoid. Corolla much exserted; petals nearly equal in length; standard recurved; keel much curved, subobtuse or acute. Stamens 2-adelphous, upper free; anthers uniform. Ovary sessile or stalked, 2-ovuled; style filiform, curved, beardless, capitate. Pod coriaceous, ligulate, lower portion indehiscent, compressed, upper dehiscent round the apical seed.

A tree.	1.	*B. frondosa.*
A large climber.	2.	*B. superba.*

1. Butea frondosa, *Roxb.* Vern. *Palas, dhak, paras.*

A moderate-sized low-branched crooked deciduous tree, with brown or slate-grey fibrous bark, exfoliating in thin stripes. Young parts softly silky. Leaves 3-foliolate; common petiole 2·5-6 in. long; stipules triangluar, acute, short. Leaflets usually 3-9 in. long; terminal rhomboid or obovate from a narrowed base; lateral leaflets slightly smaller, obliquely ovate or elliptic, obtuse or emarginate at the apex, all coriaceous, glabrous above with age, tomentose and reticulate beneath; petiolules ·2-·3 in. long, stout; stipels subulate. Flowers 1·5-2 in. long, bright orange in fascicles from swellings on stout axillary and terminal racemes often borne on leafless branches 4-7 in. long; rachis, pedicels, bracts, bracteoles and calyx outside covered with dark-brown, velvety tomentum; bracts small, oblong-lanceolate, deciduous; pedicels ·5-1 in. long. Calyx ·5 in. long, persistent,

broadly campanulate, upper teeth combined, lower short, triangular, softly grey tomentose inside. Corolla much exserted, covered outside with silky hairs; standard ovate acute; wings falcate, keel acute or subacute. Ovary short-stalked. Pod light to reddish-brown, softly downy, 4-6 in. by 1·2-2 in., compressed, narrowed abruptly into a short stalk.

Common all over the area.

The leaves are used for plates and for wrapping up parcels. Lac is often reared on it. The flower yields an orange dye, and the ruby-coloured gum is used as a substitute for kino and is known as Bengal kino.

Blaze white, streaked with red, exuding a red gum, fibrous. "Stands more salt in the soil than most plants."—*Parker.*

Leafless March. Fl. March-April. Fr. May-June.

2. Butea superba, *Roxb.* Vern. *Badrasin.*

An extensive dextrorse climber with pale-brown rough bark, closely resembling the last species in foliage and flowers. Leaflets 5-9 in. long, sometimes attaining 18 in. in young plants, rhomboid-ovate or obovate, coriaceous, glabrous above, pubescent or tomentose along the nerves beneath. Flowers gorgeous orange-scarlet, 1·2-2·5 in. long, fascicled on thickened nodes of racemes which are up to 12 in. long, and are borne on leafless branches. Rachis, calyx and pedicels, brown velvety. Pedicels up to ·12 in. long. Calyx broad campanulate, teeth unequal, shorter than the tube, upper combined, lower linear lanceolate. Corolla softly silky tomentose outside on exposed surface, much exserted; standard oblong-lanceolate, recurved; keel much curved. Ovary densely tomentose. Pod 4·5-6 in. by 1·6 in. leathery, oblique strap-shaped, adpressed silky tomentose; seeds 1, rarely 2.

Banda, Kheri (Bhira)—*Duthie's collector*, but it has never been collected since from the last locality.

Blaze fibrous, dirty-pink and white exuding red gum. There are no concentric rings of deep red bast bands in the wood. Roxburgh in his Flora Indica remarks "When in flower I do not think the vegetable world offers a more gaudy show."

Deciduous February-May. Fl. March-April.

16. SPATHOLOBUS, *Hassk.*

Spatholobus Roxburghii, *Benth.* Syn. **Butea parviflora,** *Roxb.* Vern. *Maurain, mendra* (*Gor.*), *maudibel* (*P.*), *modhbaur* (*K.*), *patabel* (*Bah. Gon.*).

A robust deciduous climber, twining clockwise with reddish brown lenticellate bark, often with horizontal wrinkles. Young parts pubescent; wood with sub-concentric layers of fibres inside, which exude red gum when cut. Leaves pinnately 3-foliolate; common petiole 2-5 in. long, base thickened, stipules ·3 in. long, deciduous, triangular

acute. Leaflets 4-9 in. by 1·7-5 in., stipellate, terminal obovate to rhomboidal, lateral rather smaller, ovate-elliptic, oblique—the lower side longer—all obtuse, acute or shortly acuminate at the apex, subcoriaceous, silky when young, ultimately glabrous, paler beneath, lateral nerves 7-10 pairs, prominent, uppermost meeting near the margin in loops; petiolules ·25-·4 in. long. Flowers ·3-·4 in. long in threes on the tumid nodes of terminal, pubescent, panicles sometimes up to 3 ft. long, the lower portions of which are leafy; pedicels up to .15 in. long, bracts minute, linear, caducous. Calyx silky tomentose outside, 2-lipped, campanulate; 2 upper lobes only free near the top, 3 lower free, lanceolate. Corolla white or cream coloured, exserted, petals subequal; standard emarginate; wings free keel straight, obtuse. Stamens diadelphous. Ovary 2-ovuled, shortly stipitate; style incurved beardless, stigma capitate. Pod 3-6 in. by ·6-1.6 in., densely brown velvety, one-seeded near the apex, dehiscent round the seed, base indehiscent, flat reticulate, abruptly narrowed into a short stalk, ·4-·6 in. long.

Throughout the area. One of the most injurious climbers in the forest easily recognised by the clockwise climbing habit of the stem and the concentric rings of bast in the wood.

Blaze fibrous, dirty-pink, exuding red gum.
Fl. September-December. Fr. February-April.

17. CANAVALIA, *DC.*

Canavalia ensiformis, *DC.* Vern. *Sem, bansema* (*J.*) Eng. Sword bean.

A large, weak-stemmed dextrorse climber with smooth green stems. Leaves pinnately 3-foliolate; common petiole 1·7-3·5 in. long, channelled, base swollen; stipules minute. Leaflets 3-6·5 in. long, glabrescent, terminal largest, rhomboidal elliptic, lateral oblique, ovate-elliptic; all shortly acuminate, cuspidate, broadly cuneate at the base, subcoriaceous, lateral nerves distant 5-7 pairs, rather prominent; petiolule ·25 in. long, pubescent; stipels setaceous. Flowers lilac or white, 1-1·5 in. long, loosely solitary or in pairs on fleshy tumerous swellings on the rachis of a long peduncled, axillary, puberulous raceme 6-12 in. long; pedicels short, reflexed, woody in fruit. Calyx ·5-·6 in. long, 2-lipped, upper lip notched, lower shortly 3-lobed, sparsely adpressed pubescent to glabrescent outside, silky-specially at the throat, and often mottled with purple inside; lobes imbricate, much shorter than the tube, upper largest. Corolla exserted, petals all clawed and auricled; standard slightly exceeding the wings and the keel, obovate, often with two short ridge-like callosities above the auricles, reflexed; keel incurved; stamens monadelphous. Ovary silky, abruptly narrowed to the incurved style; ovules 10 or more. Pod 6-12 by 1-1·5 in., beaked, prominently

3-ridged on the back, slightly curved at either end, base abruptly narrowed to a stalk, smooth; seeds 8-10, red or pink rather compressed.

Bundelkhand, often cultivated within our area. The young pods are eaten. The seeds of the wild plant are often bitter. In cultivation the pods attain 12-18 in.

Fl. May-September. Fr. cold season.

VAR. virosa *F. B. I.* Syn. C. virosa, *W. & A.* is a perennial with tough, reddish branchlets and differs from the last species by its smaller leaflets which are usually 1·5-4 in. long and rounded at the base and more persistently hairy on the under-surface; hairy petiole; smaller lilac-purple flowers borne on denser and shorter racemes; smaller pods (3 5 in. long) and less compressed, marbled, brown seeds. The seeds are said to be poisonous.

Bundelkhand.

18. PUERARIA, *DC.*

Twining shrubs or herbs, sometimes with tuberous roots with pinnately 3-foliolate leaves; leaflets stipellate, sometimes palmately lobed. Flowers densely fascicled in long, often compound racemes; rachis swollen at the nodes; bracts small deciduous. Calyx campanulate, the two upper teeth often connate. Corolla exserted; standard obovate or orbicular usually spurred at the base, equalling in length the obtuse wings and the keel. Stamens usually 1-adelphous; anthers uniform. Ovary subsessile, many ovuled; style filiform, much incurved, beardless; stigma capitate. Pod linear, flattish; sometimes constricted between the seeds; seeds orbicular or transversely oblong.

Flowers appearing before the leaves. Large woody climber.	1. *P. tuberosa.*
Flowers appearing with the leaves. Slender climber...	2. *P. phaseoloides.*

1. Pueraria tuberosa, *DC.* Vern. *Bilaikand, bilarakand.*

A large soft-wooded dextrorse climber, with pale-brown or dark-grey stringy bark and large tuberous roots. Young parts adpressed grey silky. Common petiole 4-8 in. long, stipules peltate, broadly oblong, ·2 in. long. Leaflets 4-12 in. long, acute, or acuminate, margins often sinuate, base usually 3-nerved, sometimes 4-nerved, cuneate or truncate, membranous, silky pubescent when young, glabrescent above and adpressed hairy beneath when mature, lateral nerves 6-8 pairs including the basal ones; terminal leaflets rhomboid or broadly ovate, lateral oblique, ovate, petiolules ·2-·3 in. long; stipels ·1 in. long, lanceolate, subulate. Racemes 4-12 in. long, dense, simple or panicled from old wood, grey or brown pubescent. Flowers purplish blue, ·5-·75 in. long, usually in fascicles of three; bracts very small, caduc ous, densely hairy. Calyx densely silky.

teeth shorter than the tube, ciliate on the margins. Petals clawed, standard orbicular, often lighter in colour, with pale yellow central spot; wings oblong-falcate minutely spurred above the base; keel nearly straight. Ovary sessile, hairy. Pod 1·7-3 by ·45 in., slightly constricted between the seeds and clothed with bulb-based brown bristles; seeds 3-6.

All over the area.

The tissue round the pith exudes red juice when cut. The young tuber are sometimes eaten, but are usually used medicinally. These sometimes attain enormous size.

Blaze pinkish or yellowish, fibrous.

Fl. February-April. Fr. May-June. New leaves May. Leafless towards the end of the cold season.

2. **Pueraria phaseoloides,** *Benth.*

A slender climber with a woody base, stems herbaceous; young branches and petiole covered with stiff hairs. Leaves pinnately 3-foliolate, common petiole 1·5-4 in. long; stipules lanceolate, acute, ·2 in. long. Leaflets 1·7-4 in. long, terminal rhomboid, lateral oblique ovate, in all apex obtuse but mucronate, lateral nerves 5-7 pairs, including basal pair, membranous, silky when young sparsely pubescent above, grey silky beneath when mature; stipels setaceous. Racemes axillary, 3-9 in. long, adpressed hairy, long peduncled. Flowers pale-blue and white, ·4 in. long in fascicles from swollen nodes of the racemes; pedicels short. Calyx covered with adpressed silky hairs; lower teeth longest and equal to the tube. Petals spurred above the claws. Ovary hairy. Pods 2-3 by ·15 in., several, slender, sparsely hairy with adpressed hairs; seeds 10-16.

Kheri—*Duthie.*
Fl. September. Fr. October-December

19. CLITORIA, *Linn.*

Clitoria Ternatea, *Linn.* Sans. *Aparajita.*

An extensive wiry climber with glabrescent stem. Leaves usually pinnately 5-7 foliolate, sometimes 3-foliolate, rachis up to 3 in. long, slightly pubescent; stipules ·2 in. long, erect, scarious, subulate, striate. Leaflets short petioluled, ·9-2 in. long, oblong or elliptic, apex usually rounded and bristle tipped, base narrowed, pubescent when young, glabrescent later, subcoriaceous, lateral nerves 5-6 pairs, joining in loops. Flowers showy, 1·5-2 in. long, deep blue with yellowish or orange centre, solitary in leaf axils; pedunole about ·5 in. long; bracts resembling the stipules but smaller; bracteoles a pair at the base of the calyx, broadly or suborbicular ovate, up to ·4 in. long, prominently veined. Calyx up to ·75 in. long; lobes oblong-lanceolate, sharp-pointed, reticulate nerved. Standard spoon-shaped with prominent veins, much exceeding and entirely covering the keel

and wings which are incurved. Stamens diadelphous. Ovary stipitate; style incurved, flattened, bearded along the inner side. Pod 2-4 in. long, flattened, recurved somewhat hairy outside, 6-10; seeded. Seeds flattened.

Etawah, Kheri, usually as an escape in hedges.

Cultivated in gardens. The flowers are used in Hindu ritual. In some cultivated varieties the flowers are white and sometimes double. The root and seeds are purgative.

20. TERAMNUS, *SW.*

Teramnus labialis, *Spreng.*

A spreading wiry climber, branches covered with few adpressed silky hairs. Leaves pinnately 3-foliolate, rachis up to 2·5 in. long petiole channelled ·8-2 in. long, puberulous; stipules deciduous, minute up to ·1 in. long, lanceolate-cuspidate, pubescent. Leaflets very variable, terminal largest 1·2-2·5 in., elliptic, ovate or oblong, lateral oblique, smaller, up to 2 in. long, in all apex acute or subacute, base narrowed and cordate or rounded, upper surface dark-green glabrescent, under-surface paler, sparsely adpressed hairy, coriaceous, lateral nerves about 6 pairs; stipels subulate. Racemes axillary, 1·2-4·5 in. long, slender, lax, hairy. Bracts caducous, narrow lanceolate. Flowers in fascicles or solitary on the raceme, ·15 in. long. Calyx campanulate, silky pubescent, equalling the tube. Corolla slightly extruded, pink, purple or white, petals subequal. Stamens monadelphous, alternately sterile and short. Ovary hairy; style beardless. Pod 6-10-seeded, linear, up to 2 in. long slightly curved at the ends, constricted inside between the seeds; seeds cylindric-truncate.

Etawah and Bundelkhand.

Fl. July-September. Fr. cold season.

21. ATYLOSIA, *W. & A.*

Herbs or shrubs, usually twining, sometimes erect. Leaves pinnately or subdigitately 3-foliolate, gland-dotted beneath. Flowers usually yellow, axillary in pairs or racemes. Calyx tube campanulate; teeth distinct, lowest longest. Corolla more or less exserted, sometimes marcescent; standard orbicular, often auricled, keel obtuse. Stamens 2-adelphous, anthers uniform. Ovary sessile; style filiform incurved, glabrous; stigma capitate; ovules 3 or more. Pod linear or oblong, septate within, more or less transversally depressed between the seeds. Seeds conspicuously strophiolate.

Leaflets stipellate; petal marcescent. ..	.. 1. *A. rugosa*
Leaflets exstipellate; petals deciduous.	.. 2. *A. scarabæoides*

1. A crassa, *Prain.*

A slender spreading twiner with striate branches; young parts, under-surface of leaves, petiole and inflorescence softly brown tomentose. Leaves pinnately 3-foliolate, common petiole 1-3 in. long; stipules minute, caducous, lanceolate acuminate, brown tomentose. Leaflets ·7-3 in. long, terminal rhomboid, tapering below the middle to an obtuse subcordate base, lateral oblique, broadly ovate, all acute, slightly rough and minutely pubescent above, nerves prominently reticulated beneath, base 3-5-nerved; petiolules minute; stipels setaceous. Racemes axillary, 1·5-6·5 in. long when fully formed, laxly flowered, sometimes panicled; flowers yellow, about ·7 in. long; bracts up to ·5 in. long, caducous, concealing the buds, broad-ovate, obtuse, striate, gland-dotted; pedicels paired up to ·25 in. long. Calyx persistent; brown pubescent, gland-dotted. Corolla marcescent. Pod ·1-1·5 in. by ·4-·6 in., straight, beaked, grooved between the seeds, furrows somewhat oblique, brown velvety outside, covered usually with orange glands.

Throughout the area. Fl. and fr. all the year round.

2. Atylosia scarabæoides, *Benth.*

A slender climber with a woody base and wiry branches; young parts, racemes and petioles densely grey or brown tomentose. Leaves subdigitately 3-foliolate, common petiole up to 1·6 in. long; stipules shaggy, minute; terminal leaflet ·8-1·9 in. long, elliptic, obovate or lanceolate, narrowed to a subacute usually 3-nerved base, lateral smaller, obliquely ovate, all acute to rounded at the apex which is often minutely cuspidate, entire, rather thick, both surfaces softly grey tomentose, under-surface more densely, prominently reticulate above when young, nerves and glands rather obscure on the under-surface; petiolules minute, densely tomentose; stipels 0. Flowers yellow, about ·4 in. long, on 2-6-flowered, short, axillary, peduncled racemes, up to ·6 in. long, bracts foliaceous, densely hairy; pedicels up to ·2 in. long. Calyx deeply-lobed, lobes lanceolate, lowest almost as long as the tube. Corolla deciduous, exserted, wings auricled; keel petals falcate. Pod ·7-1 in. by ·25-·3 in., straight 3-6-seeded, covered with short dense pubescence and long, brown, spreading, silky hairs, deeply furrowed between the seeds, furrows oblique.

All over the area. Fl. and fr. throughout the year.

Atylosia albicans, *Benth.*—A twining shrub. Leaves subdigitately 3-foliolate; leaflets 1-2 in. long, terminal obovate, narrowed at the base, lateral oblique, all canescent beneath, coriaceous. Flowers yellow, much exserted, in 4-12 flowered, racemes shorter than the leaves; bracts caducous. Pod 1-1·5 in. long, distinctly constricted between the seeds, thinly canescent, 5-6-seeded. Recorded from Bundelkhand by Edgeworth. I have seen no specimens from our area at Dehra Dun.

22. FLEMINGIA, *Roxb.*

Shrubs, undershrubs or herbs, with perennial root-stocks. Leaves gland-dotted below, digitately 3-foliolate or 1-foliolate, stipules striate, often deciduous; stipels 0. Inflorescence various; pedicels short; bracts foliaceous or scarious. Calyx-tube short; teeth narrow subequal or lowest the longest. Corolla little or not exserted, petals clawed, subequal; standard obovate, or suborbicular, auricled at the base, wings obliquely oblong or obovate, adnate to the obtuse or slightly beaked keel. Stamens 2-adelphous, anthers uniform. Ovary subsessile, 2-ovuled; style filiform, beardless; stigma capitate. Pod obliquely oblong, small, turgid, usually 2-seeded. Seeds not strophiolate.

I. Leaves 1-foliolate:—
  A. Bracts large, persistent, conduplicate, each enfolding a small cluster of flowers:—
    1. Leaflets oblong, or ovate-lanceolate:—
      Shrub 4-10 ft. high; lateral nerves close, usually more than 8 pairs, subequal. .. 1. *F. strobilifera.*
      Undershrub 1-2 ft high; lateral nerves distant usually less than 8 pairs basal pair longest. .. .. 2. *F. bracteata.*
    2. Leaflet suborbicular-cordate. .. .. 3. *F. Chappar.*
  B. Bracts small, caducous. .. .. .. 4. *F. paniculata.*

II. Leaves 3-foliolate:—
  A. Flowers very small, in lax panicles exceeding the leaves. .. .. 5. *F. lineata.*
  B. Flowers fair-sized, in spike-like racemes:—
    1. Branches sharply angled; bracts scariose, rigid, exceeding the buds. .. .. .. 6. *F. stricta.*
    2. Branches not sharply angled; bracts neither rigid, nor exceeding the buds:—
      a. Erect or prostrate undershrubs or shrubs:—
        i. Racemes condensed shorter than the petioles:—
          Erect shrub 4-6 ft. high; leaves broad lanceolate. .. .. .. 7. *F. congesta.*
          Prostrate undershrub, stem 3 ft. or less; leaves linear-lanceolate. .. 8. *F. prostrata.*
        ii. Racemes elongated exceeding the petioles. 9. *F. semialata*
      b Low dwarfed undershrubs, with subteranean root-stock:—
        Root-stock, calyx and pod beset with ruby coloured glands:—
          Branches erect: petioles more than 2 in. long; terminal leaflets 4-6·5 in. long. .. .. 10. *F. nana.*
          Branches trailing; petioles under 1 in. long; leaflets usually ·5-1·4 in. long. .. .. 11. *procumbens.*

1. Flemingia strobilifera, *R. Br.* Vern. *Pithawan* (Gor.), *sudarsanpatti* (*Gor.*).

An erect evergreen shrub 5-8 ft. high, branchlets striate, pubescent. Leaflet 2-6 by 1-3 in., oblong or obovate-lanceolate, acute, base rounded, glabrescent above, usually softly pubescent and more or less covered with minute red glands beneath, subcoriaceous, lateral nerves usually 8-10 pairs; petiole ·3-·8 in. long, hairy, swollen at the junction with the blade; stipules scarious ·5 in. long, linear-lanceolate, acuminate. Flowers white, ·25-·3 in. long, in short cymes on zig-zag terminal and axillary, often branched and hairy racemes, 2-6 in. long, each cyme infolded by a conduplicate, membranous bract. Bracts about 1 in. across broader than long, deeply cordate, usually cuspidate at the apex, prominently veined, puberulous, bracteoles minute, linear, caducous. Calyx deeply cleft, gland-dotted, hairy; teeth linear-lanceolate, lowermost longest. Pod downy, up to about ·4 in. long covered with deciduous glands.

In all sal forests in the area.
Fl. February-March. Fr. cold season.

2. Flemingia bracteata, *Wight.* Syn. **F. strobilifera.** var. bracteata, ***F. B. I.***

Similar in many respects to the foregoing. It is an erect undershrub up to about 2 ft. high with 3-angled pubescent twigs. Leaflet 3-6·5 by 1-2·5 in., lanceolate or oblong-lnaceolate, base cordate or rounded, 3-nerved, main lateral nerves including the basal pair—which is longest—4-7 pairs, glabrescent above and pubescent on the nerves beneath, glands often obscure; petioles up to ·3 in. long, stout; stipules ·5-·7 in. long, subpersistent; scarious, linear-lanceolate. Flowers pinkish, ·25 in. long, clustered and completely hidden by bracts as in the last species. Racemes zig-zag, often panicled 2-5 in. long; bracts ·7-·8 in. across, often emarginate, softly hairy, densely ciliate on the edges. Pod pubescent.

Oudh forests.

3. Flemingia Chappar, *Ham.* Vern. *Kasrau'.*

A gregarious deciduous shrub up to 8 ft. high, young parts and petiole rusty pubescent. Leaflet solitary 2·5-5·5 in. across, orbicular-or ovate-cordate, acuminate, cuspidate, 3-nerved at the base, glabrescent above, rusty pubescent along the nerves beneath, lateral nerves 4-6 pairs above the basal; petiole ·8-1·5 in. long, swollen at the top and the base. Flowers ·3-·4 in. long, yellowish-white, in congested cymes which are infolded by large bracts and are borne on the rachis of terminal and axillary, often panicled racemes 2·5-7 in. long, rachis straight, pubescent; bracts secund, in two series, 1 by 1·5 in., membranous, strongly veined, reddish-brown when mature, deeply emarginate, cuspidate at the apex, base cordate. Calyx hairy and dotted

with a few scattered glands, lowermost longest, teeth linear, acuminate. Corolla half exserted. Pod downy ·3-·4 in. long.

Common undergrowth in sal forests in the area.
The twigs are used for basket-making in Gorakhpur. The roots are used in Hindu medicine.
New bracts August-October Fl. February-April. Fr. April-May. Deciduous April; new leaves May-June.

4. Flemingia paniculata, *Wall.*

An erect shrub 3-6 ft. high, twigs terete, thinly pubescent. Young parts covered with spreading hairs. Leaflet 3·5-6 in. by 1·3-3·5 in., ovate or lanceolate, short-acuminate, cuspidate, base cordate, usually 5-nerved, lateral nerves 5-8 pairs, excluding the basal pairs, membranous, glabrous except along the nerves beneath, which are covered with adpressed scattered hairs, glands inconspicuous; petiole ·6-1·25 in. long, swollen at the base and apex; stipules caducous, ·3-·5 in. long, linear-lanceolate, striate, scarious. Flowers pink, ·3 in. long, fascicled in lax, axillary and terminal, grey pubescent racemes 1-3 in. long which are often clustered and panicled or sometimes subsolitary in leaf axils. Bracts dry, caducous, resembling the stipules; bracteoles very small, ovate-lanceolate, acuminate, hairy outside, ciliate on the margins. Calyx gland-dotted covered with spreading hairs; teeth linear, acuminate. Pod about ·5 in. long, thinly pubescent with spreading hairs and covered with deciduous glands.

In shady and somewhat damp situations throughout the area.
The leaves are coppery red when dry.
Fl. December-April.

5. Flemingia lineata, *Roxb.*

An erect shrub with terete glabrous stem and angular, grey pubescent, switchy branchlets. Leaves digitately 3-foliolate; petiole ·5-1·2 in. long, channelled, adpressed pubescent; stipules dry, scarious, lanceolate, acuminate, striate up to ·4 in. long. Leaflets 1-3 in. long, obovate to oblanceolate-oblong, apex often cuspidate, base cuneate, strongly 3-rarely 5-nerved which run up to more than half the length, plicate between the nerves when young, subcoriaceous, glabrescent or slightly hairy above, pubescent along the nerves beneath; petiolules very small, densely hairy. Flowers ·2 in. long, red, on axillary, panicles 1·2-3·5 in. long, usually exceeding the leaves when fully formed. Bracts caducous, dry, resembling the stipules; bracteoles minute, linear, hairy; pedicels minute. Calyx lobes linear, subequal, adpressed hairy; corolla not exserted. Pod up to ·45 by ·35 in., glandular-pubescent.

Gonda, Gorakhpur, "N Oudh"—*Duthie.*

Fl January-March.

6. Flemingia stricta, *Roxb.*

A tall shrub with woody base and herbaceous shoots, branches acutely 3-angled, pubescent. Young shoots, undersurface of leaves, petiole and stipules usually dotted with scattered black glands. Leaves digitately 3-foliolate, petioles 4-6 in. long, channelled and often slightly winged, pubescent; stipules 2-3 in. long, caducous lanceolate, acuminate, striate, rigid and dry, adpressed hairy. Leaflets usually 6-12 by 2-4 in. long, lanceolate or oblong, narrowed at both ends, acuminate, coriaceous, rough above when young with short stiff bristles, glabrescent later, pubescent on the nerves beneath, lateral nerves 12-20 pairs; petiolules very short, stout, tomentose. Racemes 3-4 in. long, axillary, often branched, dense, silky with adpressed hairs. Bracts imbricating and conspicuous in bud which give the inflorescence a cone-like appearance at this stage; basal bracts ovate-lanceolate, large,—1 in. or more in length—upper ·4 in. long, exceeding the buds, linear-lanceolate, caducous. Flowers ·4-·5 in. long, purplish veined; petiole ·1 in. long. Calyx silky, upper teeth lanceolate, lowermost equalling the corolla, linear-lanceolate. Pod ·5 in. long, glabrescent.

Gonda (Tulsipur), Kheri (Sonaripur) and probably in shady moist situations in sal forests elsewhere

Fl. February-March. Fr. August-September.

7. Flemingia congesta, *Roxb.* Var. *villis, Prain.*

An erect shrub 4-6 ft. high. Young branches subterete or obtusely triangular, adpressed silky pubescent. Leaves digitately trifoliolate; petiole 1·7-3 in. long, channelled and slightly winged near the top, stipules ·4-·5 in. long, scarious, linear-lanceolate, caducous, softly hairy outside. Leaflets very variable in size, 3-6 in. by 1·3-3 in., lanceolate or oblanceolate, acuminate or acute, terminal cuneate, lateral oblique and usually obtuse or rounded at the base, all subcoriaceous, puberulous and somewhat rough above, silky pubescent along the nerves and abundantly dotted with black glands beneath, basal nerves 3-5 extending to more than three-quarters the length of the blade, lateral nerves excluding the basal, up to 7 pairs Racemes axillary, shorter than the petioles, dense, generally fascicled in the lower axils, sometimes branched, densely silky with adpressed spreading hairs. Flowers pink, up to ·4 in. long; pedicels minute bracts deciduous, dry, ovate, acute, about ·25 in. long, silky outside Calyx densely silky, gland-dotted, upper teeth lanceolate, lowest linear, acuminate, longest and equalling the corolla Standard

greenish-white, striped with pink. Pod ·5 in. long, brown, hairy, gland dotted when young.

Pilibhit to Gorakhpur in all sal forests.

There are no specimens of forma typica at Dehra. In this form the petioles are hardly winged and the leaves are thicker and darker-green. It probably occurs in all sal forests, but on account of its close similarity to *var. viridis* may have been overlooked by collectors.

8. Flemingia prostrata, *Roxb.* Syn. **Flemingia congesta** var. semialata, *F. B. I.* in part.

A suberect or trailing weak undershrub, up to 2·5 ft. long, from a woody root-stock. Branches grooved, angled, covered with brown hairs when young. Petiole three-angled, expanded at the top, not or very slightly winged ·9-2 in. long, hairy, stipules up to ·5 in. long, linear to ovate lanceolate hairy outside, scarious. Leaflets 1·5-4 by ·5 1·5 in, narrow or linear-lanceolate, cuspidate acute, the terminal leaflet largest, cuneate, lateral leaflets oblique and round at the base; all glabrescent or somewhat rough with bulb-based hairs above, softly brown tomentose beneath, basal nerves 3-5, rather short, lateral up to 8 pairs, prominently raised beneath. Racemes shorter than the petiole up to 1·7 in. long, very dense: bracts densely pubescent outside, about ·3 in. long lanceolate acuminate. Flowers up to ·25 in. long, pink and yellowish-green. Calyx densely shaggy, lobes linear acuminate, lowest exceeding or equalling the corolla. Pod hairy, gland-dotted when young up to ·4 in. long.

Pilibhit to Gorakhpur common. Dwarfed in grass-lands.

Fl. May-September. Fr. cold season. The stems are usually annual.

9. Flemingia semialata, *Roxb.* Syn. **Flemingia congesta,** var. semialata, *Baker.* in *F. B. I.*

Resembles F. congesta, but is more robust and taller attaining sometimes 10 ft. in height. Petiole 1-4 in. long, winged, 3-angled. Leaflet 3·7 in. long broadly lanceolate or elliptic, acute or acuminate, glabrescent except on the nerves beneath, rather thin. Flowers ·4-·5 in. long, pinkish, in lax, often branched elongate racemes up to 5 in. long which always exceed the petioles. Standard greenish, marked with pink lines. Pod ·4-5 in. long downy.

Common in all sal forests of the circle, sometimes gregarious.

Subdeciduous. Fl. August-December. Fr. December-February.

10. Flemingia nana, *Roxb.* Syn. F. congesta, var. nana *F. B. I.*

A small undershrub, usually not attaining more than 18 in. in height, with a thick woody underground root-stock, branches triquetrous, sulcate, at first pubescent, ultimately glabrescent, under-surface of leaves, pedicels, inflorescence and calyx dotted with garnet-coloured

glands. Leaves digitately trifoliolate, petioles variable in length up to 9·5 in. long, slightly winged, three-angled; stipules linear-lanceolate, ·5-·9 in. long, scarious. Leaflets 4-6·5 in. long, terminal elliptic-lanceolate, obovate, or rhomboid, acute, or short acuminate, with a cuneate base, lateral oblique, oblong to broad ovate; all subcoriaceous, glabrescent and somewhat rough above, brown pubescent on the nerves beneath, basal nerves 3-5 reaching to more than three-fourths the length of the blade, lateral nerves 4-6 pairs. Flowers ·25 in. long, greenish with deep-purple veins, crowded in axillary, fascicled racemes 2-5 in. long, which are densely covered with brown silky hairs; pedicels ·25 in. long; bracts lanceolate-acuminate, striate, scarious, adpressed silky outside. Calyx hairy outside, lowermost tooth longest. Pod up to ·4 in. long, downy, covered with garnet-coloured glands which often turn almost black with age.

Kheri, probably in other sal forests in heavy soil. It has acquired a permanently dwarfed habit like Grewia sapida, Ochna pumila, etc. In exceptional cases small leaflets may be produced, but ordinarily—considering the size of the plant—the leaves are disproportionately large.

Fl. February-April. Fr. April-May. The new leaves are produced after the flowers.

11. Flemingia procumbens, *Roxb.*

A dwarfed undershrub, with short trailing weak shoots up to 24 in. long which are produced annually from a woody base, branches slender, angled, softly grey, hairy when young. Leaves small; petiole hairy, slightly winged, ·2-·7 in. long; stipules oblong, acuminate, grey silky outside, up to ·2 in. long. Leaflets ·7-1·4 in. long, terminal obovate, lateral oblique ovate or oblong; all usually apiculate, softly grey hairy on both surfaces, more densely on the under-surface which is persistently dotted with orange-red glands, base 3-nerved, nerves prominent beneath. Racemes axillary, long peduncled, densely hairy up to 2 in. long. Flowers ·2 in. long, purple. Bracts boat-shaped, hairy, minute. Calyx hairy, gland-dotted, lowermost lobe equalling the corolla. Pod ·35 in. long, downy, densely beset with orange or garnet-coloured glands when young.

Pilibhit to Gorakhpur in grass-lands, permanently dwarfed like the foregoing species.

Fl. and fr. April-May.

23. RHYNCOSIA, *Lour.*

Twining or erect herbs, undershrubs or shrubs. Leaves pinnately 3-foliolate, stipules caducous; leaflets gland-dotted beneath, stipels usually absent. Flowers in axillary racemes or rarely solitary in the leaf axils; bracts caducous. Calyx usually not accrescent; tube short; teeth equalling or much exceeding it, the upper more or less connate. Corolla included or exserted; standard with

inflexed auricles at the base; keel incurved not distinctly beaked. Stamens 2-adelphous, 9+1: anthers uniform. Ovary subsessile; ovules usually 2, rarely 1; style long, filiform much incurved, stigma small capitate. Pod round or oblong, flattish or turgid. Seeds 2, rarely 1, strophiole present or absent.

Stipules ·3-·5 in. long, subpersistent; flowers reddish purple. .. .. 1. *R. sericea.*
Stipules minute deciduous, flowers yellow. .. 2. *R. bracteata.*

1. Rhyncosia sericea, *Spanoghe.*

A slender, woody climber, stems covered with soft glandular hairs; young parts silky. Leaves pinnately 3-foliolate, common petiole 1·6-in. long, pubescent; stipules subpersistent up to ·4 in. long, lanceolate, oblong or ovate, acuminate, hairy, striate. Leaflets 2-4 in. long softly hairy on both surfaces, gland-dotted beneath; terminal rhomboid often broader than long; lateral oblique, broad ovate, short acuminate; in all margins usually sinuate, base 3-nerved; petiolule ·1 in. long, stipels minute, setaceous. Racemes long-peduncled, hairy, axillary, sometimes branched, 7-12 in. long. Flowers red-purple, about ·7 in. long; bracts linear, exceeding the short pedicels. Calyx hairy and glandular, lower lobe acuminate, upper two connate, tips free. Corolla exserted, petals clawed; standard hairy and gland-dotted on the back, wings auricled above the claw. Pod 1-1·3 in. long, undulate on the sutures between the seeds; oblong-obovoid, compressed covered with scattered brown hairs and deciduous glands, beaked, 2-seeded.

Gonda—*Duthie.*

Fl. July-September. Fr. September-February.

2. Rhyncosia bracteata, *Benth.*

A slender but distinctly woody climber with pubescent, striate branches. Leaves pinnately 3-foliolate, gland-dotted; petiole pubescent; stipules minute up to ·15 in. long, narrow-lanceolate, caducous. Leaflets 1·7-3 in. long, rhomboid, acuminate; terminal often broader than long; lateral usually oblique; all scattered hairy above, tomentose beneath when mature, lateral nerves distinct 4-5 pairs including the basal; petiolules short, hairy. Racemes axillary, long peduncled, up to 6·5 in. long, usually exceeding the leaves, often branched, laxly flowered, glandular pubescent. Bracts ovate, acuminate, pubescent, concealing the buds. Flowers yellow, ·5-·6-in. long. Calyx hairy and glandular, tube campanulate, lower lobe acuminate, exceeding the tube, upper two connate, tips free. Standard ·3 in. across; wings auricled. Pod ·75-1·3 in. long, pubescent, obovoid, with a reflexed beak, not septate.

Gorakhpur (Tilkonia).

Fl. January-March. Fr. March-April.

24. CYLISTA, *Ait.*

Cylista scariosa, *Ait.* Vern. *Bansem.*

A slender climber, young parts, undersurface of leaves and petioles softly brownish hairy. Leaves pinnately trifoliolate; petiole 1·5-2·7 in. long; stipules ·15 in. long, lanceolate, acuminate, scarious, silky outside. Leaflets 2-4 in. by 1·4-2·8 in., dotted below, with orange coloured glands; terminal rhomboid; lateral oblique, ovate, base rounded or narrowed; all acute or acuminate, softly tomentose above, densely beneath, lateral nerves 5-7 pairs including the basal pair; petiolule shaggy, ·1 in. long; stipels setaceous. Racemes 2-5·5 in. long, axillary, simple or branched, lax. Bracts thin, caducous, ovate, acuminate, strongly veined, covering the buds. Flowers 1 in. long, yellowish and red. Calyx lobes unequal, imbricate, subpetaloid, strongly nerved, scarious and accrescent in fruit to 1-1·4 in., lowermost largest, boat-shapped, about 1 in. across in fruit, lateral pair smallest, upper connate to more than half way up. Corolla concealed in the calyx, petals clawed; standard spurred at the base on either side; wings oblong, spurred on one side, stamens 2- adelphous. Ovary hairy, gland-dotted, 1-3 ovuled; style hairy at the base, filiform; stigma capitate. Pod enclosed in the persistent calyx, ·4 in. long, pubescent and gland-dotted, 1-seeded.

Gonda.
Easily recognised when in fruit from the scarious enlarged sepals.
Fl. December-April.

Cajanus indicus, *Spreng.* Vern. *Arhar, tor.* Eng. *Pigeon pea.*

An erect shrub 5-10 ft. high, with many, sulcate silky branches. Leaves trifoliolate, leaflets ·5-2·5 in. long, oblong-lanceolate, densely silky pubescent and indistinctly gland-dotted beneath. Flowers yellow, or the standard veined with red, in lax racemes, or terminal panicles. Pod 2-3 in. long, finely silky, often marked with dark-purple spots, torulose with oblique depressions between the seeds, apiculate. Seeds somewhat compressed about the size of a small pea, yellow and red or dark-brown.

Seeds much valued for *dal* for which it is extensively grown as a winter crop. Perennial but usually grown as an annual.

25. DALBERGIA, *Linn. f.*

Trees or shrubs, sometimes climbers. Leaves imparipinnate, leaflets alternate, exstipellate. Flowers small, in terminal or axillary panicles. Calyx campanulate, teeth 5, distinct, usually short. Corolla exserted; standard broad; wings oblong, as long as the standard; keel obtuse, shorter than the standard, the petals connate at the tip; stamens 9-10, monadelphous or diadelphous; anthers minute, basifixed, slit mostly short, apical. Ovary stipitate, few-ovuled; style short, incurved, glabrous; stigma, capitate. Pod thin and flat, usually oblong or strap-shaped, indehiscent not thickened or winged at the sutures, 1-4-seeded, veined above the seeds.

I. Stamens 9 in one bundle :—
Leaflets 5-7, obtuse or emarginate at the apex; flowers white appearing after the leaves. .. 1. *D. latifolia.*
Leaflets 3-7, acuminate, flowers yellowish, appearing with the new shoots. .. .. 2. *D. Sissoo.*
II. Stamens diadelphous in two bundles of 5 each :—
A. Trees :—
Wood continuous, standards broad-obovate, or suborbicular, with a hardened and thickened claw; panicles, lax. .. .. .. 3. *D. lanceolaria.*
Wood with concentric rings of bast; standard narrow-oblong or oblong-obovate, claw not thickened and hardened; panicles compact. .. .. 4. *D. paniculata.*
B. Climbing shrub. .. .. .. 5. *D. volubilis.*

1. Dalbergia latifolia, *Roxb.* Vern. *Sitsal, siasa.* The rose wood or black wood.

A large deciduous tree (usually a small tree in our area) with light-grey bark and glabrous branches. Leaves imparipinnate, 4-10 in. long, common petiole 1·5 in. long, glabrous. Leaflets 1-3 in. across, terminal slightly longest, firm, suborbicular, or elliptic-obovate, and usually rounded or emarginate at the apex, coriaceous, glabrous, shining above, pale beneath, base cuneate, nerves somewhat raised and reticulate; petiolules up to ·3 in. long, channelled. Flowers white, ·25 in. long, in numerous much-branched lax panicles up to 5 in. long, shorter than the leaves, axillary and from leaf-scars; pedicels ·12-·15 in. long; bracts minute; bracteoles membranous, very caducous. Calyx glabrous; teeth oblong, obtuse or sub-acute shorter than the tube. Corolla shortly exserted, petals clawed. Stamens usually monadelphous. Ovary glabrous. Ovules 3-5. Pod 1·5-3·5 in. by ·5-·75 in., abruptly narrowed to a stipe, glabrous, sometimes constricted between the seeds. flat, 1-3 seeded.

Gonda, Bahraich, Bundelkhand.

Heartwood handsome, dark-purple with black streaks. The timber is valuable and is even preferred to sissoo for cabinet-making.

Blaze yellowish-white, with green edges, fibrous.
Leafless February-March. Fl. September Fr. cold season.

2. Dalbergia Sissoo, *Roxb.* Vern. *Shisham, sissoo.*

A fairly large, deciduous tree, with rather rough, longitudinally furrowed pale-grey or light-brown bark, peeling off in narrow strips; young parts downy or tomentose. Leaves imparipinnate, 3-5 foliolate; rachis 1·5-3 in. long, zig-zag; stipules ·2 in. long, caducous. Leaflets alternate 3-5, 1-2·5 in. across, rhomboid, suborbicular or broad ovate, abruptly acuminate, base rounded, truncate or cuneate, glabrous, shining and tough when mature, nerves somewhat raised, closely reticulate; petiolules ·1-·2 in. long, stout. Flowers pale-yellow, ·2-·3 in. long, secund on the branches of axillary, pubescent panicles, shorter than the leaves; pedicels minute; bracts minute, ciliate, caducous. Calyx teeth shorter than the tube, lowest subacute

and longest, the rest obtuse. Corolla twice the length of the calyx. Standard orbicular, long clawed; stamens 9 combined in a slit tube. Ovary pubescent; style shorter than the ovary, ovules 2-4. Pod 1·5-4 by ·3-·5 in. strap-shaped, base narrowed into a stipe, 1-3 seeded.

Gregarious in riparian tracts throughout the area. In recent years it has been extensively planted.

One of the best timbers for furniture and indoor work generally, takes a fine polish and is very beautiful in appearance.

Blaze very fibrous, pale-yellow turning reddish-brown.

Leafless January-February. New leaves with flowers in March. Fr. cold season.

3. Dalbergia lanceolaria, *Linn. f.* Vern. *Sirsa.*

A large deciduous tree with, nearly smooth pale-brown or grey bark, sometimes buttressed at the base, young parts densely covered with rusty hairs. Leaves 5-10 in. long; stipules ·3 in. long, caducous, linear-oblong. Leaflets 7-17, 1-2·5 by ·5-1·2 in., oblong or obovate-oblong, usually notched and rounded at the apex, base broadly cuneate; glabrous above, pale and obscurely hairy beneath, suboriaceous, sec. nerves raised, forming loops close to the margin; petiolules up to ·2 in. long. Flowers pinkish-white or purplish about ·4 in. long, often secund on the branches of lax, axillary and terminal, rusty pubescent panicles 2-5 in. long; bracts minute, caducous. Calyx adpressed hairy; teeth shorter than the tube, ciliate, 2 upper obtuse, 2 lateral subacute, the lowest longest, linear-lanceolate, acute. Corolla much exserted; standard suborbicular or broadly obovate, and somewhat abruptly bent from the thickened and hardened claw; stamens in two bundles of 5 each. Ovary 3-ovuled. Pod 1·8-4·5 in. long, 1-3-seeded narrowed at both ends, base with a stipe ·3-·5 in. long, sometimes sinuate between the seeds.

Kheri, Bahraich, Gonda, Gorakhpur, Bundelkhand, not common.

The vernacular name is shared by this plant with the Albizzias, with some of which it has a superficial resemblance.

Blaze soft, pale-yellow, turning to reddish-brown on exposure.

Fl. April-May before or with the young leaves. Fr. September-January. Leafless March-April.

4. Dalbergia paniculata, *Roxb.* Vern. *Dhobien.*

A medium-sized or tall deciduous tree, with ashy-grey bark; young parts covered with greyish-brown pubescence. Leaves 4-6 in. long with 9-13 leaflets; leaflets usually ·5-1·5 in. long, obovate, oblong or elliptic, obtuse, emarginate, glabrescent, under-surface pale; petiolules minute. Flowers up to ·3 in. long, bluish or purplish-white, usually in terminal, less often axillary, somewhat dense panicles up to 3 in. long; rachis ferruginous pubescent; bracts hairy, caducous. Calyx silky pubescent; teeth subdeltoid, shorter than the tube. Corolla exserted; standard oblong, emarginate, claw not thickened at the base. Stamens in two bundles of 5 each. Pod 1·5-3 in. by ·5-·6 in.

gradually narrowed from the middle to the base and apex, apex more sharply tapering than in D. lanceolaria, stipitate at the base, seeds 1-3.

" N. Oudh and Bundelkhand—*Duthie.* There are no specimens at Dehra from our area. The tree is difficult to distinguish in leaf from D. lanceolaria. The wood has bands of bast alternating with xylem which is an important distinguishing character. The leaves often dry black.

Leafless hot season. Fl. July. Fr. November-January—*Haines.*

5. Dalbergia volubilis, *Roxb.* Vern. *Bankharra.*

A large deciduous climber or sub-scandent shrub, attaining 8-12 in. in diameter, branchlets glabrous, green, often twisted into spiral hooks; bark rough, pale-brown. Leaves 4-10 in. long, rachis slightly adpressed hairy, stipules caducous. Leaflets 7-15, glabrescent, ·75-2 by ·75-1 in. oblong or obovate, apex obtuse, truncate or emarginate, cuspidate, under-surface paler and finely reticulate; petiolules ·15 in. long. Flowers pale-purple or blue, ·25 in. long, in ample terminal and axillary rusty pubescent or tomentose panicles, with horizontal branches, which are 3-5 in. long. Bracts minute, ovate, hairy outside. Calyx hairy outside, upper 2 lobes obtuse, lower 3-pointed. Corolla exserted; keel petals slightly connate; stamens diadelphous in bundles of 5. Pod 2-3·4 in. by ·7-·9 in., somewhat abruptly narrowed into a stalk. 1-2-seeded.

All over the area, nowhere common. The stem is often fluted.
Blaze white, turning reddish-brown. Fl. January-March. Fr. hot season.

26. PTEROCARPUS, *Linn.*

Pterocarpus Marsupium, *Roxb.* Vern. *Bija, bijasar, bijia.*

A lofty, nearly evergreen tree with longitudinally fissured, dark-grey, rough bark; young parts rusty pubescent. Leaves 6-12 in. long; rachis glabrous; stipules ·2 in. long, lanceolate, hairy outside, caducous. Leaflets 5-7; 2-5 by ·9-2·2 in., sometimes larger, oblong or ovate lanceolate to elliptic, usually shortly blunt acuminate, and often cuspidate, coriaceous, lateral nerves 13-18 pairs, more prominent than the intermediate ones, forming loops near the margin, glabrous above, under-surface slightly rusty hairy, ultimately glabrescent. Flowers yellow about ·4 in. long, in copious terminal panicles up to 9 in. long, with rusty pubescent branches; bracts minute; pedicels ·1 in. long. Calyx campanulate, densely ferruginous hairy, teeth short. Corolla exserted, petals long clawed; standard and wings crisped on the margins; keel petals smaller, slightly connate. Stamens monadelphous, ultimately equally diadelphous by the sheath splitting on the underside; anthers versatile. Ovary stipitate, 2-ovuled; style incurved; stigma terminal. Pod 1·3-2·2 in. across, orbicular, indehiscent, prominently veined with a wing-like rim round the solitary seed, the apex displaced to near the base, the latter being abruptly narrowed into a stalk ·2 in. in length.

Throughout the area.

The scarlet gum is commercially known as the East Indian Kino. It is valued in medicine for diarrhœa The timber is particularly suited for planking and is locally in demand for making drums. It takes a fine polish and seasons well, could be used for furniture, posts and beams, door and window frames, boat building, etc.

Blaze grey and pink striated, exuding bright-red gum.

Fl. October, but also at other times of the year. Fr. cold season (December-January.) New leaves April-May.

In our area var. acuminata, *Prain*, is the common plant.

P santalinus, *Linn. f.*—Vern. *Lal chandan* Sans. *Rakta chandana.* The red sanders. A small tree. Leaves with 3 leaflets which are 1 3-3 in. long, terminal largest, broadly ovate to suborbicular, usually retuse at the apex, glabrous above, silky beneath, coriaceous, sec. nerves somewhat prominent. Flowers ·3 in. long, yellow, in simple axillary and terminal, adpressed hairy racemes not exceeding the leaves. Pod orbicular, at first downy, glabrescent later, centre turgid, margin winged, base narrowed to a stalk about ·35 in. long.

A native of the Madras Presidency, attempts have been made to plant it in the Jhansi Division.

Fl. June. Fr. December.

27. PONGAMIA, *Vent.*

Pongamia glabra, *Vent.* Vern. *Kainja.* Sans. *Karanja, naktamla.*

A medium-sized handsome evergreen tree, with grey-green soft bark, branches and leaves glabrous. Leaves 4-10 in. long imparipinnate; stipules small, oblong, obtuse, caducous; leaflets green, opposite, 2-4 in. by 1·25-2·5 in., ovate-oblong or elliptic, shortly acuminate, or less often acute, base rounded or acute, subcoriaceous; petiolules ·25 in. long. Flowers light-pink or white, in fascicles of 2-4 on axillary peduncled racemes, which are shorter than the leaves, pedicels ·2-·3 in. long; bracts caducous. Calyx ·15 in. long, purplish, pubescent, truncate or obscurely toothed. Corolla ·5 in. long; standard suborbicular, ·3-·4 in. across, emarginate, claw very short; wings obliquely oblong, slightly adhering to the keel; keel obtuse, petals connate at the tip. Stamens monadelphous, the upper stamen connate with the others in the middle; anthers versatile. Ovary subsessile, ovules 2; style filiform, incurved; stigma small, terminal. Pod woody, 1·5-2 in. by ·7-1 in. with a short bent beak, narrowed at the base, somewhat inflated, usually 1, rarely 2-seeded. Seeds reniform, white streaked with brown.

Throughout the area about the banks of stream, often planted in avenues.

In Hindu medicine, the oil from the seeds is used for skin diseases and rheumatism. The leaves and roots are also used medicinally. The oil could also be used for burning.

Blaze soft, pale-yellow, edged with green, fœtid smelling.

Fl. April-May. Fr. cold season Subdeciduous for a short time in the hot season.

28. DERRIS, *Lour.*

Derris scandens, *Benth.*

A large woody climber, with lenticellate branches; young parts rustypubescent. Leaves imparipinnate, 7-11 foliolate; rachis 2·5-6 in.

long, channelled, glabrescent when mature ; stipules minute, caducous. Leaflets opposite, ·9-3 in. by ·5-1·4 in., narrow or obovate-oblong, apex often tapering, obtuse, subcoriaceous, glabrous above, puberulous beneath, secondary nerves somewhat distant and obscure, 6-8 pairs ; petiolules ·1-·15 in. long, slender, pubescent. Flowers white or pink ·25-·3 in. long. in fascicles on long, axillary and terminal rusty pubescent racemes, which usually exceed the leaves—3-12 in. long—and are often branched ; bracts minute hairy ; pedicels up to ·2 in. long. Calyx ·1 in. long, entire, silky pubescent ; corolla exserted ; standard suborbicular, and slightly cordate near the claw ; wings shaggy on the margins at the base above the claw, and adnate to the keel ; keel obtuse, its petals slightly cohering. Stamens usually monadelphous ; upper stamen half or more free ; anthers versatile. Ovary hairy ; style incurved ; stigma capitate. Pod thin 2-3 by ·4-·5 in., 1-3 seeded, sinuate between the seeds, reticulate, with a narrow wing on the upper suture.

Gonda.

Fl. rainy season. Fr. cold season.

Derris Sp. near D. cuneifolia, *Benth.* Vern. *Basandi bour.*

A climber with imparipinnate leaves, 4-6 in. long, at first downy, glabrescent with age ; stipules, caducous. Leaflets 7-9 ; 2·2-4·5 in. by 1-1·6 in., oblanceolate or oblong-elliptic, abruptly short acuminate, base rounded or cuneate, subcoriaceous, at first thinly puberulous, ultimately glabrescent ; petiolules ·25 in. long. Racemes 2-6 in. long, usually shorter than the leaves. Flowers ·3-·4 in. long, in fascicles of 2-3 on short pedicels from the nodes of the racemes, pedicels ·2-·3 in. long. Bracts minute, hairy. Calyx more or less truncate, glabrous. Wings auricled at the base ; stamens monadelphous. Ovary hairy. Pod 2-5 in. by ·5-1 in., 1-3-seeded, compressed and thin, sinuate between the seeds, narrowly winged on the upper suture, scarcely on the lower suture.

Pilibhit, Bahraich—rare. Specimens rather incomplete for determination

SUB-FAMILY CÆSALPINIOIDEÆ.

Trees or shrubs, sometimes climbing, rarely herbs. Leaves pinnate or 2-pinnate, leaflets sometimes reduced to one pair, sometimes these combining to form a single 2-lobed palminerved leaflet. Flowers irregular, very rarely regular, usually 2-sexual, usually in racemes which are axillary, lateral or panicled. Calyx enclosing the disk, sometimes spathaceous with a short or long tube ; sepals 5 or 4 by the fusion of the upper two, imbricate, rarely valvate. Petals 5 or fewer, by abortion, ascending imbricate, the upper one being innermost and often different. Stamens 10, or fewer by abortion, usually

free, rarely combined or numerous. Ovary free or adnate by its stipe to the calyx. Pod often septate; seeds various, endosperm usually 0.

I. Leaves simply pinnate, or 1-foliolate :—

Petals 5; stamens free :—	
Leaflets 2 or more; anthers basifixed. ..	1. *Cassia.*
Leaflet 1; anthers versatile. ..	2. *Bauhinia.*
Petals 3: stamens mon-adelphous; anthers versatile.	3. *Tamarindus.*

II. Leaves 2 pinnate :—

Pod not winged :—	
Sepals imbricate; pod not moniliform. ..	4. *Cæsalpinia.*
Sepals valvate; pod moniliform. ..	5. *Parkinsonia.*
Pod winged along the upper suture. ..	6. *Mezoneurum.*

1. CASSIA, *Linn.*

Erect shrubs or trees, rarely herbs. Leaves paripinnate. Flowers usually showy, in axillary racemes and terminal panicles, rarely in axillary pairs. Calyx-tube very short; sepals broad or narrow. Petals subequal. Stamens rarely all 10 perfect, usually 3-5 reduced to staminodes, or absent; anthers basifixed, usually opening by apical pores or short slits. Ovary sessile or stalked, many-ovuled; style incurved; stigma terminal. Pod variable in shape, terete or flat, usually septate, dehiscent or indehiscent; seeds usually albuminous.

I. Stamens 10, all anther bearing :—

Lower 2 or 3 stamens, longer and with larger anthers; rachis of leaves without glands; pod terete, indehiscent. A tree.	1. *C. fistula.*
Stamens nearly all equal; rachis of leaves with several glands between the leaflets; pod flat, dehiscent. A tall shrub or small tree. ..	2. *C. glauca.*

II. Stamens 10, 6-7 only anther-bearing :—

A. Leaf rachis with glands between each pair of leaflets; large shrub.	3. *C. auriculata.*
B. Leaf rachis with a single gland at the base; undershrubs or small shrubs :—	
Leaflets 3-5 pairs.	4. *C. occidentalis.*
Leaflets 6-12 pairs.	5. *C. Sophera.*

1. Cassia fistula, *Linn.* Sans. *Suvarnaka, rajataru,* Vern. *Amaltas, warga, kirwara* (*J.*). Eng. The Indian Laburnum, the purging fistula.

A moderate-sized deciduous tree, with pale or ashy-grey almost smooth bark, young parts ferruginous silky. Leaves 9-18 in. long; stipules minute, pubescent, caducous. Leaflets 4-8 pairs, 2-6 in. by

1·5-3 in., ovate, ovate-lanceolate or elliptic-oblong, acuminate or acute, sometimes obtuse, coriaceous, dark-green above, paler beneath; lateral nerves close, numerous, somewhat raised; petiolules ·2-·3 in. long. Flowers bright-yellow, 1·5-2·5 in. across, in axillary, lax drooping racemes, 1-2 ft. in length. Bracts caducous, linear, acuminate, silky, about ·2 in. long; bractcoles smaller, ovate, acute. Pedicels 1-2·5 in. long, slender, jointed at the top, sparsely pubescent. Calyx hairy outside, deeply-lobed; sepals obtuse, oblong. Petals ·7-1·2 in. long with prominent purple veins, oblong or obovate, clawed. Stamens 10, all anther-bearing; lowermost 3, longest and curved, anthers opening by slits; lateral 4-6, filaments straight, anthers opening by pores; uppermost 1-3, smallest, anthers indehiscent. Pod about 2 ft. long and 1 in. across, dark-brown or black when ripe, terete, woody, with numerous 1-seeded partitions; seeds 40-100, about ·4 in. across, compressed, imbedded in dark-brown sweetish pulp.

All over the area; often cultivated as an ornamental tree in gardens.

The heartwood is hard and durable, and is often used for posts. The sweetish pulp round the seeds is the Cassia pulpa of British pharmacopœia. "Decoctions of the leaves and fruits are used as laxatives.—*Haines.* The bark is an excellent tanning material. The wood makes excellent charcoal.

Bark of old trees rather rough and dark-grey; blaze reddish, ·5-·7 in.

Fl. April-June, when nearly leafless. Fr. April, sometimes long persisting on the tree. The tree is scarcely wholly leafless at any time of the year.

2. Cassia glauca, *Lamk.*

A large shrub or small tree, with terete branches; young parts golden silky. Leaves 6-9 in. long; rachis with obconic glands between the lower 2 or 3 pairs of leaflets; stipules linear-falcate, up to ·8 in. long, silky, deciduous. Leaflets 4-6 pairs, 1·4-4 in. long, ovate to oblong-lanceolate, apex broadly acute, pale-green above, glaucous and sparsely pubescent, ultimately glabrescent beneath; petiolule ·1 in. long, hairy. Flowers about 2·5 in. across, bright-yellow, in axillary pedunculed corymbs, which are up to 8 in. long. Bracts caducous, elliptic, puberulous; pedicels up to 1·5 in. long. Calyx pubescent outside, cleft nearly to the base, greenish-yellow; segments unequal, suborbicular or broadly elliptic-oblong, obtuse. Petals subequal, about 1 in. long, broadly obovate, clawed. Stamens 10, subequal. Pod 4·8 in. by about ·5 in., base narrowed to a stalk, many-seeded, flat, thin, sinuate along the sutures, partitioned, seeds flattened.

Often planted within the area of the circle. Bundelkhand—*Mrs. Bell.* Etawah.

Fl. cold season.

Var. suffruticosa, *Baker.* Syn. C. suffruticosa, *Kœn.*—Has 6-9 pairs of leaflets which are smaller, being usually ·7-1·5 in. long, oblong and obtuse, often retuse at the apex. Flowers are about 1 in across, and the pods 3-4 in. long.

Gorakhpur (*Harsukh—Duthie's collector*); Bundelkhand—*Mrs. Bs*

3. Cassia auriculata, *Linn.*

An erect shrub up to 8 ft. high, with grey-brown lenticellate, more or less smooth bark; branchlets, rachis and inflorescence hairy. Leaves 2·5-4 in. long. Rachis grooved, with one long, setaceous gland between each pair of leaflets; stipules up to ·8 in. across, persistent, foliaceous, semicircular or kidney-shaped, broadly cordate, inner margin abruptly sharp acuminate. Leaflets 6-12 pairs, ·5-1 in. long, obovate-oblong or oblong, usually obtuse, mucronate, subcoriaceous, glabrous above, adpressed hairy beneath. Flowers yellow, about 1·2 in. across, in axillary peduncled corymbs or corymbose racemes, 2-4 in. long at the ends of the branches. Bracts foliaceous, ovate, acute or acuminate, often slightly cordate; pedicels pubescent, up to 1·5 in. long. Calyx yellow, deeply cleft; segments unequal, obtuse sparsely hairy towards the base. Petals about 1 in. long, obovate, clawed, veins reddish; uppermost 3 stamens reduced to staminodes, 3 lowermost longest. Pod 2-4·5 in. long, straight, thin, flexible, sparsely hairy, often undulate along the sutures, beaked with the remains of the style, base abruptly narrowed into a stalk, seeds 6-12, compressed, tapering towards the base.

Etawah, Jhansi.

"The bark constitutes one of the best materials for tanning in India. Branches are valued for tooth-sticks. The seed, bark, and leaves are medicinal; the leaves are eaten as vegetable in times of scarcity"—*Duthie.*

Blaze stringy, dirty-yellow.

Fl. mostly cold season. Fr. December-March. I have seen this plant in flower and fruit at the end of April in Jhansi district.

4. Cassia occidentalis, *Linn.* Eng. The Negro Coffee or Coffee Senna. Vern. *Kasaundi* (*Pil.*, *K.*); *chakuna*, *chakund* (*Pil.*), *kasoja* (*K.*, *Bah.*), *chakunda* (*Gor.*), *bara pawar* (*Et.*). Sans. *Kasanara.*

A fœtid undershrub, often annual, 2-5 ft. high, the basal portion sometimes persisting and becoming quite woody. Leaves 5-8 in. long, with a single conical black gland at the base of the petiole. Rachis grooved; stipules ·3-·4 in long, tapering from a broad and auricled base, caducous. Leaflets 3-5 pairs, 1·5-3·5 by ·7-1·3 in., upper pair longest, ovate-oblong or elliptic-lanceolate, acute or acuminate, rounded and often unequal at the base, glabrous and dull-green on both surfaces, somewhat rough and paler on the undersurface, membranous; petiolules hairy, ·1 in. long. Flowers yellow about ·75 in. across, on axillary short-peduncled corymbose racemes at the ends of the branches, which together ultimately form a panicle. Bracts white tinged with pink, oblong to elliptic-acuminate, exceeding the buds, caducous; pedicels pubescent up to ·3 in. long. Calyx white and pink divided nearly to the base; sepals oblong-obtuse; petals obovate, yellow with orange veins. Upper three stamens reduced to staminodes, lowermost fertile, but smaller than the lateral stamens,

anthers opening by terminal slits. Pod compressed 4-5 in. long, brown, slightly bent, depressed between the seeds. Seeds 20-30, compressed, with two oval spots on either face, narrowed at the base, hard, shining.

An abundant weed in waste-lands and forest blanks. The seeds are said to be used as substitute for coffee after being roasted and ground. The leaves roots and seeds are medicinal. The whole plant is purgative.

Fl. and fr. July-November.

5. Cassia Sophera, *Linn.* Vern. *Chakunda.* Sans. *Kasamarda.*

A shrub 4-7 ft. high, annual or perennial, closely allied to C. occidentalis. Leaves 5-10 in. long, with a single stalked gland, more attenuated than in the last spp, at the base of the petiole; stipules ovate acuminate, with auricled base, caducous about ·35 in. long. Leaflets 6-12 pairs, 1-3 in. long, narrow lanceolate, sharply acute or acuminate, glabrous, membranous, petiolules short. Flowers orange-yellow, about 1 in. across, in axillary peduncled, corymbose, racemes which are up to 2 in. long and often branched, or in terminal panicles. Bracts shorter than the buds, deciduous, greenish, concave, obtuse, hairy outside. Petals with orange-red veins. Stamens as in the last species. Pods straight or slightly curved, lighter-coloured along sutures, somewhat inflated, 2-5 in. long. partitioned, but not depressed between seeds; seeds many, compressed, polished, hard, with oval spots as in the last species.

Gonda Division (Janakpur); Banda—*Edgeworth.*

"The plant is supposed to have expectorant properties."—*Indian Medicina Plants.* It contains chrysophanic acid to which it owes its efficacy for curing skin diseases.

Fl. December-August. Fr. November-December.

The following may also be mentioned:—

1. Cassia obtusifolia, *Linn.* Vern. *Chakunda, rasanji, pawar,* Sans. *Eadmaka.*—A gregarious undershrub, usually 1-5 ft. high, sometimes higher. Leaves 2·5-5 in. long with one linear gland between the lowest pairs of leaves; stipules linear, caducous. Leaflets 3 pairs, 1-2 in. by 75.-1·5 in, obovate, sometimes mucronate, glabrous or puberulous on both surfaces. Flowers bright-yellow about ·75 in. across, usually in pairs on very short axillary peduncles; pedicels up to 1·25 in. long. Petals about ·5 in. long, subequal, oblong, obtuse. Fertile stamens 7; staminodes 3. Pod 5-10 in. long, slender, sub-terete often falcate, incompletely septate. Seeds truncately cylindric, length parallel to the sutures.

A very common weed in waste-lands. The tender leaves are said to be eaten as a vegetable. Leaves and seeds are valuable remedies for ringworm and itch, whence the Sanskrit name.

2. Cassia Tora, *Linn.*, is very similar. It is a smaller plant and has two glands between the lower pairs of leaflets. The leaflets are glaucous on the undersurface and often small, not exceeding ·5 in. length. The flowers are smaller about ·5 in. across, and the pedicels are much shorter. The plant

is fœtid. It is very doubtful if the above separating characters should entitle it to a specific rank, as plants intermediate in character are often found.

3. Cassia Absus. *Linn.* Vern. *Bhatwas.*—An erect viscous hairy herb with two pairs of rhombic-ovate leaflets up to 1·5 in. long and terminal racemes of few, small, red or yellow flowers with only 4 stamens; and flat hairy pod 1-1·5 in. long.

A waste-land weed over most of the area. The seeds are said to be a remedy for ophthalmia. Fl. rainy season.

4. Cassia pumila, *Lamk.*—A diffuse undershrub or herb, with many stems. Leaves variable in length from ·5-2·5 in., base of petiole with a single stalked gland. Stipules tipped with sharp point, lanceolate. Leaflets 16-40, ·25-·5 in. long, linear-oblong oblique, midrib near the upper margin ending in a sharp point, rigid. Flowers small, about ·15 in. across, yellow, usually solitary on short extra-axillary bracteate peduncles. Calyx segments tipped with sharp point; stamens 5. Pod 1-1·5 in long, flat, puberulous or glabrescent, septate, 6-12-seeded.

Waste-lands within the area.

Fl. September-October.

5. Cassia mimosoides, *Linn.*—A diffuse undershrub or perrennial herb with many stems. Leaves 1·2-3 in. long with a small sessile gland near the base; stipules stiff, tapering to a sharp point. Leaflets numerous, 40-60 pairs, about ·15 in. long, linear-oblong, midrib close to upper margin and continued to a sharp point at the apex, glabrous. Flowers ·3 in. long, yellow, in 2-3 flowered peduncles, which arise from 2 extra-axillary bracts. Stamens 10, 4-5 anthers larger than others. Pod flat 1·5 to 2 in. long. 15-25-seeded.

Fairly common—*Duthie.*

Fl. rainy season.

6. C. Leschenaultiana, *DC* —Is a more erect plant with larger and fewer leaflets ·25-·5 in. long which are glaucous on the undersurface. Flowers about ·5 in. across, stamens all perfect or 1-3 uppermost reduced to staminodes. Pod 1-2 in. long, 8-16-seeded. It has the same distribution as the type.

7. Cassia siamea, *Lamk.*—A moderate-sized tree. Leaves 6-12 in. long; leaflets 6-14 pairs, 1·5-2·5 in. long, oblong, emarginate, midrib ending in a bristle. Flowers bright-yellow ·5-·7 in. across in numerous large panicles. Stamens 7. Pod flat 6-9 in. long, many-seeded.

Often cultivated in gardens within our area. A rapid grower.

2. BAUHINIA, *Linn.*

Unarmed erect trees, or climbers with circinate tendrils. Leaves unifoliolate, more or less cleft from the tip, rarely entire or divided into two leaflets, midrib ending in a bristle. Flowers usually showy, in copious, simple or panicled sometimes corymbose racemes. Calyx with long and cylindric or short and turbinate tube, 5-lobed or spathaceous; disk lining the tube and produced beyond the rim. Petals 5, subequal, usually clawed. Stamens 10, often reduced; anthers versatile. Ovary stalked, many ovuled; style long or short; stigma

small or large, peltate, subterminal or oblique. Pod flat, continuous within, dehiscent or indehiscent. Seeds albuminous.

I. Fertile stamens 10 :—

A. Shrub with large yellow flowers ; pods dehiscent. 1. *B. tomentosa.*

B. Trees with small whitish flowers ; pods indehiscent :—

Leaves not acid ; racemes simple with short pedicels ; calyx spathaceous ; pod falcate, prominently reticulate. .. .. 2. *B. racemosa.*

Leaves acid ; racemes subcorymbose, with long pedicels far exceeding the bracts; pods straight marked with diagonal veins. 3. *B. malabarica.*

II. Fertile stamens 3-5 :—

A. Leaves deeply-lobed :—

Extensive climber. .. .. .. 4. *B. Vahlii.*

B. Trees :—

Flowers before the leaves ; flower buds not angled ; calyx spathaceous ; stamens 5. .. 5. *B. variegata.*

Flowers after the leaves ; flower buds sharply-angled ; calyx 2-cleft ; stamens 3-4. .. 6. *B. purpurea.*

Leaves scarcely cleft at all ; flowers small, white ; stamens 3. .. .. 7. *B. retusa.*

1. Bauhinia tomentosa, *Linn.* Vern. *Champa, champo.*

A large shrub or small tree with grey bark ; young parts ferruginous tomentose. Leaves 2-3 in. each way, cleft less than half-way down, with a bristle at the cleft, lobes obtuse at the apex, base truncate and 7-9-nerved, glabrous above, softly pubescent beneath ; petiolule ·5-1 in. long, thickened at both ends. Flowers usually in pairs, yellow, in axillary or leaf-opposed peduncles which are up to 1·5 in. long. Bracts and bracteoles linear. Calyx ·5-·75 in. long, brown pubescent outside, spathaceous, splitting down to the tube. Petals sub-equal, about 1·3-2 in. long, obovate, clawed, uppermost with a purple blotch at the base. Stamens 10, all perfect ; ovary densely hairy, stipitate. Pod 4-5 in. by ·5-·7 in. light-brown, stalked, compressed, at first downy, glabrescent with age, 8-12-seeded.

Jhansi. The buds are medicinal.

Fl. July-August. Fr. January-February.

Bauhinia acuminata, *L.*—A large shrub, leaves 1·5-2·5 in. long, sometimes longer, lobed one-third to half-way down, lobes acute or acuminate ; petiole 1·5 in. long. Flowers white in short racemes, up to 3 in. long, buds long-beaked. Calyx spathaceous. Pod 4-5 in. by ·7 in. tapering below.

Often cultivated in gardens. Fl. January-April.

2. Bauhinia racemosa, *Lamk.* Vern. *Makuna, mahuli.* Sans. *Sveta kanchan.*

A small, much-branched, deciduous tree with short bole and dark-grey or almost black, rough bark which has numerous longitudinal cracks. Young parts rusty tomentose. Leaves ·8-2 in. by 1·5-3 in. cleft to less than half the length, broadly cordate and 7-9-nerved at the base, coriaceous, glabrous above, and paler and sparsely pubescent (sometimes at first softly tomentose), specially along the nerves beneath; petiole ·4-1 in. long; stipules minute, caducous. Flowers white, about ·5 in. long, on short pedicels, in simple, terminal and leaf-opposed racemes 2-7 in. long (sometimes longer) which are at first downy, and later on glabrescent. Pedicels ·2-·4 in. long with hairy articulations about the middle. Bracts minute, subulate; buds somewhat curved, and pointed at the tip. Calyx spathaceous; limb at length reflexed, hairy inside and out towards the apex, more than twice the tube. Petals linear-oblanceolate often hairy along midrib towards the tip, ultimately reflexed. Stamens 10, all perfect; filaments shaggy at the base, more or less, densely hairy with long weak hairs upwards to the anthers. Stigma sessile. Pod 5-10 in. by ·7-1 in., slightly falcate, rigid, turgid, smooth, beak very small or absent, 12-20 seeded. Seeds dark reddish-brown, compressed.

Throughout the area in scrub jungles. The bark yields a rough fibre, which could be used for cordage. The gum and the leaves are said to be used medicinally.

Blaze dark-pink or deep-red, fibrous, ·5-·75 in.

Fl. March-June. Fr. cold season.

3. Bauhinia malabarica, *Roxb.* Vern. *Sahoul* (*Ban*), *amlosa* (*Pil. Gon. K.*), *mohli* (*J.*), *mauli* (*Bah.*).

A small branchy tree; bark dark-brown fibrous with shallow fissures exfoliating in thin strips, shoots rusty tomentose. Leaves acid, 1·3-4·5 by 1·5-5·5 in., cleft to less than a third of its length, 7-9 (sometimes 11)—nerved and cordate at the base, coriaceous, glabrescent above, paler and glaucous beneath; petiole ·7-1·7 in. long puberulous, thickened at both ends. Racemes 1·5-3 in. long, terminal, axillary or leaf-opposed, corymbose, often several together or panicled, densely flowered; buds obovoid, not pointed at the apex. Bracts minute, acute, rusty pubescent. Flowers dull white, ·5 in. long, on slender, pubescent pedicels which are ·5-1 in. long and jointed near the top. Calyx 5-cleft, rusty tomentose outside; segments acute, longer than the tube. Petals oblong-spatulate. Stamens 10, alternately long and short; filaments hairy at the base; style produced. Pod flat,

flexible, 7-12 in. by · 7-1 in. tapering to a blunt beak, prominently reticulate when dry, veins diagonal and meeting in the middle, 20-30-seeded.

Throughout the area.

Fl. August-October. Fr. January-May. The tree, if deciduous at all, is leafless for a short time.

Blaze pink or deep-red turning brown, fibrous, ·5-1 in.

4. Bauhinia Vahlii, *W. & A.* Vern. *Maurain, pator* (*Gor.*).

An enormous evergreen climber, climbing by means of branchlets ending in a pair of circinate tendrils. Bark dark, reddish-brown, young parts, inflorescence, petioles and undersurface of leaves specially along the nerves, rusty tomentose. Leaves very variable, 4-18 in. in diameter, cleft through about a third of the length, lobes obtuse, deeply cordate and 11-15-nerved at the base rigid, subcoriaceous, upper surface smooth; petioles 3-6 in. long; stipules about ·35 in. long, oblong, obtuse, caducous velvety outside. Flowers white or cream, up to 2·2 in. across, sometimes larger, in dense corymbose racemes; pedicels 1-2·5 in. long, with 1 linear bract and 2 bracteoles. Calyx up to ·4 in. long, brown tomentose, cleft into two concave lobes, exceeding the cylindric tube; teeth minute. Petals about 1 in. long, obovate, clawed, brown or grey silky outside on the backs, margins crisped. Stamens 3; staminodes 2-7; filaments shaggy at the base. Ovary rusty tomentose; style long, red, glabrescent; stigma capitate. Pod 6-12 by 2-2·5 in. densely brown, velvety, flat, woody, narrowed towards the base, with a very short thick stipe; seeds 8-12, round, compressed about 1 in. across.

Throughout the area.

The most destructive forest climber. The bark yields a strong fibre which is used for cordage. The green seeds are eaten after roasting in the pod. The leaves are used for making umbrellas, plates and wrapper for packing. The seed is said to possess tonic and aphrodisiac properties.

The stem on transverse section shows connected islands of woody tissues lying in a matrix of pholem. This curious structure which results from eccentric development well adapts the plant to a climbing habit and also gives it great vitality, which makes its eradication so difficult. The stem sometimes attains enormous dimensions. Blaze fibrous, pink or red with white fibres, turning brown.

5. Bauhinia variegata, *Linn.* Sans. *Kanchanar.* Vern. *Kachnar, koilar.*

A small or medium-sized tree attaining up to 50 ft. in height, with nearly smooth, grey, longitudinally cracked bark. Leaves 3-6 in. long, usually broader than long, cleft to about a fourth way down, with broadly cordate, 11-15-nerved base, coriaceous, glabrous above, glaucous and pubescent along the nerves beneath; petiole 1-1·7 in. long, thickened at both ends. Flowers large, sessile or shortly pedicelled, fragrant, showy, in short axillary corymbs.

Bracts and bracteoles minute, deltoid. Calyx spathaceous, softly downy; tube up to 1 in. long; limb nearly equal to the tube, whitish inside. Petals 1·5-2 in. long, obovate, narrowed to a broad claw, usually lower 4 white, sometimes pink or purplish, upper pink with purple centre, less often deep purple with red centre, all with strong midrib and purple or pink veins radiating from the base, claw somewhat channelled at the centre. Stamens usually 5. Pod 6-10 in. by ·75-·9 in. hard, flat, glabrous, beaked, slightly curved with a long stipe about 1 in. long; seeds 10-15.

All over the area.

The leaf buds are eaten as vegetable. The bark is medicinal. The dry buds are used in diarrhœa and worms.

Blaze red, fibrous.

Fl. February-April. Fr. April-May.

6. Bauhinia purpurea, *Linn.* Vern. *Kwiller, koelra.*

A medium-sized deciduous tree, attaining up to 50 ft. in. height, with grey or dark-brown, sometimes almost black, fibrous bark, exfoliating in woody scales. Young parts and inflorescence brown pubescent. Leaves 3-6 in. long, slightly longer than broad, cleft nearly half-way down, lobes sometimes overlapping, tapering and usually broadly acute, subcoriaceous, somewhat rigid, smooth above, undersurface puberulous when young, glabrescent later; cordate or sometimes truncate at the base, 9-11-nerved, nerves prominent; petiole 1-2 in. long. Flowers deep rose in short terminal panicles, or simple corymbose racemes, 2·5-4 in. long, lower racemes from the axils of small leaves. Bracts and bracteoles minute, deltoid; pedicels stout, ·2-·5 in. long, brown pubescent; buds obovoid-oblong, acutely 5-angled. Calyx brown pubescent, tube ·3 to ·4 in. long; limb spathaceous 5-toothed at the apex, usually split into two lobes, often pinkish inside, more than twice the tube. Petals 1 to 2 in. long, oblanceolate, clawed, veined, with distinct midrib. Stamens 3 fertile; staminodes smaller, filiform. Ovary long-stalked, hairy, style long; stigma oblique. Pod 6-10 by ·-·75 in., slightly curved, beaked, smooth, greenish-purple till ripe, flat, stalked. Seeds 12-15, suborbicular-oblong up to ·6 in. across, compressed.

Throughout the area.

The flower buds of this species are eaten like those of B. variegata. The bark could be used for tanning as it contains a fair quantity of tannin. The leaf is good fodder.

Blaze fibrous, pink, then pale-yellow or orange and white further on, turning orange-brown.

Fl. September-November. Fr. January-April.

7. Bauhinia retusa, *Ham.*

A moderate-sized tree, with dark-grey or brown rough bark, with few longitudinal fissures. Leaves 4-6 in. across, usually broader than long, broadly notched or entire at the apex, broadly cordate or truncate and 9-11-nerved at the base, coriaceous, dark-green and smooth above, and glaucous beneath; petioles 1·5-3·5 in. long. Flowers yellowish-white ·5 in. across, in lax terminal panicles of corymbose racemes; lower branches from axils of abbreviated leaves. Rachis and peduncles more or less pubescent. Racemes up to 2·5 in. long; pedicels pubescent up to ·8 in. long; bracts minute, linear, hairy; bracteoles smaller. Buds globose. Calyx hairy outside, 3-cleft almost to the base. Petals suborbicular, clawed, upper mottled with purple. Stamens 3; rest reduced to stamonodes with swollen bases. Ovary densely hairy on the stipe and on both sutures, the stipe adnate to the calyx tube which is woolly at the throat. Pod red before drying, oblanceolate, obovate or oblong with a short stout stipe, 4-7 by 1·2 to 2 in., seeds flat 6-8, suborbicular, smooth dark-brown, about ·5 in. across.

Bahraich (Sohelwa), Gonda.

A clear gum is collected by making incisions on the bark, which is used in the manufacture of Indian sweetmeats and for medicinal purposes.

Blaze pink turning brown on exposure, fibrous.

Fl. September-November. Fr. March-April.

3. TAMARINDUS, *Linn.*

Tamarindus indica, *L.* The Tamarind Tree. Vern. *Imli.* Sans. *Tintiri, amlika.* Ar. *Tamar-i-hindi* (whence the English name).

A large handsome evergreen tree with shallow fissured, dark-grey, rough bark. Leaves 2-5 in. long, even pinnate; stipules persistent in young plants, linear-lanceolate. Leaflets 10-20 pairs, ·4-·7 in. by ·15-·2 in., linear-oblong, slightly notched at the apex, coriaceous, glabrescent lateral nerves meeting in a more or less continuous, often undulating intramarginal nerve; petiolules minute. Racemes lax, terminal, few-flowered, up to 4 in. long. Flowers pale-yellow or yellowish white, ·5 in. long. Calyx segments lanceolate, lowest connate. Petals streaked with red, 3 only developed, lowermost reduced to scales. Stamens monadelphous, only 3 perfect, rest reduced to setaceous staminodes. Ovary stipitate, stalk adnate to calyx tube. Pod 3-8 in. by 1 in., usually curved, somewhat compressed, pericarp brittle, brown and scurfy; seeds dark-brown, smooth, ·5 in. in diameter, with hard testa embedded in reddish brown, acid pulp which is traversed by fibres.

Planted throughout the area for the sake of the fruit, and as an ornamental tree. The wood is heavy and is used for the rice pounders, mallets, sugar mills, turnery, etc.

An adhesive is made from the seeds, which yield considerable quantities of mucilage when steeped in water. The fruit is largely eaten. The pulp of the ripe fruit is regarded as refrigerent, digestive, carminative and laxative. The bark, seeds, leaves and the flowers are also used medicinally. There is widespread belief that sleeping under this tree is injurious to health.

Blaze fibrous, pink or purplish-brown, ·5-1 in.

Fl. April-June. Fr. cold season.

Saraca indica, *Linn.* Syn. Jonesia Asoca, *Roxb.* Sans. *Ashoka.* A very handsome unbrageous evergreen tree branching low, with dark grey somewhat rough bark. Leaves dark-green, paripinnate, stipules combined, erect; rachis leafy almost to the base, red when young. Leaflets 6-12, oblong-lanceolate, dark-green above, 3-9 in. long, drooping and pink when young. Flowers orange-red about 1·2 in. long, in compact panicles of corymbs, pedicels red, stout. Calyx red; tube solid below widening above; lobes 4, stamens 7, exserted, some of which are transformed to purple-pink petals in cultivation, filaments red. Pod 4-8 in. long, tapering to either end valves coriaceous.

An inhabitant of Eastern India. Sometimes cultivated. Petals ordinarily absent.

Fl. hot season.

4. CÆSALPINIA, *Linn.*

Trees or shrubs, sometimes climbing; armed or unarmed. Leaves abruptly bipinnate, stipules various, stipels 0, or reduced to thorns. Flowers often showy, yellow or red, in axillary or terminal racemes or panicles; bracts caducous, bracteoles 0. Calyx of 5 sepals, connate at the base into a short tube lined by the disk; the lowest sepal, outermost and largest, cucullate. Petals 5, orbicular or oblong, clawed, the uppermost smallest. Stamens free, declinate; filaments often woolly; anthers uniform. Ovary sessile; ovules few; style filiform; stigma terminal. Pod various in form, dehiscent or not, thin, flattened or turgid, sometimes spiny, rarely torulose. Seeds ovate or orbicular.

Pod densely covered with prickles.	..	1. *C. crista.*
Pod unarmed, glabrous :—		
Leaflets over ·5 in.; pod dry.	..	2. *C. sepiaria.*
Leaflets under ·5 in.; pod fleshy.	..	3. *C. digyna.*

1. Cæsalpinia crista, *Linn.* Syn. **C. Bonducella,** *Flem.* Vern. *Kainju bel, kat karanj.* Sans. *Karanja.* Eng. The Fever Nut.

An extensive evergreen rambling climber; branchlets, rachis inflorescence, and young parts fulvous hairy, branches lenticellate and armed with nearly straight prickles, with broad woody bases; bark pale-brown to dark-brown. Leaves up to 15 in. long; stipules foliaceous, deeply lobed or divided into several segments; rachis armed with curved prickles a pair of which are usually present at the base of each pinna. Pinnae 6-8 pairs up to 8 in. long. Leaflets 12-20 on each pinna, decreasing in size from top downwards, ·5-1·5 in. long, oblong, obtuse, mucronate, pubescent beneath; petiolule

minute, armed at the base with small curved prickles. Racemes pedunculate, supra-axillary and terminal up to 12 in. long, often branched; bracts linear, acuminate, exceeding the buds and reflexed over them, up to ·45 in. long, rusty tomentose; pedicels about ·25 in. long. Flowers yellow, about ·75 in., across. Calyx brown hairy on both sides, lobes oblong, obtuse. Petals ·4-·5 in. long, oblanceolate, the smallest often spotted with red. Stamens declinate, filaments villous. Pod 2-3 in. by 1·5-2 in., dehiscent, coriaceous, densely covered with wiry prickles, 1-2-seeded. Seeds ·5-·7 in. long, ovoid, lead grey, marked with fine horizontal and parallel lines when dry.

Throughout the area, specially near villages.
The seeds and the root bark are used in the treatment of fevers. The seeds are also said to be tonic.
Fl. August-October. Fr. cold season.
Blaze fibrous, reddish.

2. Cæsalpinia sepiaria, *Roxb.* Vern. *Aila.* Eng. Mysore-thorn.

An extensive deciduous prickly climber, bark dark-brown or grey, rough with lenticels, and bases of old prickles. Prickles up to ·75 in. long on spreading woody bases, usually paired, branchlets downy; inflorescence and young parts rusty pubescent. Leaf rachis up to 15 in. long, covered with paired curved prickles at the junction of the pinnæ. Pinnæ 5-10 pairs, 3-5 in. long; stipules caducous, semi-sagittate. Leaflets 16-24, ·5-·7 in. by ·2-·3 in. narrow oblong or obovate, usually rounded at both ends, hairy at first on both surfaces, usually glabrescent with age above. Racemes 9-12 in. long, terminal or supra-axillary, in the latter case often several in a series one above the other, youngest lowermost. Flowers bright yellow about 1 in. across; pedicels up to 1·2 in. long, jointed near the top. Bracts rusty-tomentose, lanceolate, smaller than the buds. Calyx about ·5 in. long, pale-yellow, pubescent; sepals concave, lowermost longest. Petals obovate, suborbicular, lowermost broadest. Filaments shaggy on the lower half. Pod 2-3·5 in. by about 1 in. smooth, slightly winged on the lower suture, beaked with the remains of the style, late in dehiscing, 1-2-seeded. Seeds ·4 in. long, ovoid, compressed, mottled brown and black.

Pilibhit, Gorakhpur, Kheri.
Blaze reddish-brown or pale-orange about ·3 in. deep.
Fl. December-May. Fr. rainy season.

3. Cæsalpinia digyna, *Rottl.*

A large scandent shrub, copiously armed with hooked prickles. Leaves bipinnate; rachis 6-10 in. long, armed with paired prickles, specially at the insertion of the pinnæ, sparsely fulvous hairy or glabrescent; pinnæ 8-12 pairs, usually ·8-2 in. long, pubescent; leaflets 7-10 pairs, ·25-·35 in. long, oblong or obovate, obtuse

at the apex, base usually unequal and oblique, dark-green and glabrescent above, lighter and adpressed pubescent beneath. Petiolules minute. Flowers pale-yellow, ·7 in. across, in glabrescent, supra-axillary racemes, 3-8 in. long. Calyx glabrous, tube persistent, obliquely truncate in fruit; sepals and petals both dotted with pellucid glands, sepals soon deciduous, yellowish-green, lowest largest; petals suborbicular or obovate, shortly clawed; uppermost smallest, reflexed, slightly ciliate near the claw. Filaments densely shaggy. Ovary glabrous. Pod 1·2-2 in. long, fleshy, oblong, with short beak, shortly stalked, 1-4-seeded.

Gorakhpur (Domakhand) rare. The pods are rich in tanin and are said to have about the same yield as the American Sumach.

Fl. rainy season. Fr. February-April.

C. Sappan, *Linn.* A small tree armed with a few scattered prickles; branches lenticellate. Leaf rachis about 15 in. long; pinnae 8-12 pairs. Leaflets 10-20 pairs, ·45-·85 in. long, oblique-oblong, retuse at the apex, obliquely truncate at the base, glabrescent. Flowers yellow, ·5 in. long, in axillary and terminal racemes about 12 in. long, pedicels jointed. Pod 3-4 in. by 1·2-1·5 in., reddish-brown, polished, apex obliquely truncate, which is narrowed to a rounded base, upper suture continued into a beak. Seeds 3-4.

A native of Burma, Bombay and Madras Presidencies. Planted sometimes in gardens. The wood yields a red dye.

Fl. later half of rainy season.

C. pulcherrima. *Swartz.* Vern. *Gul torah,* Eng. The Peacock Flower, Brabadoes Pride.—A shrub armed with few conical prickles. Leaf rachis 6-11 in. long, glabrous; pinnae 6-9 pairs, with a recurved prickle at the junction with the rachis. Leaflets 6-11 pairs, oblong, mucronate, glabrous. Flowers yellow or scarlet, about 1·5 in. across, in axillary terminal racemes up to 12 in. long, filaments 2 in. long, bright-red, 5 longer than the others. Pod 2-3 in. long, glabrous, compressed upper suture continued into a beak, narrowed towards the base and continued into a short stalk.

Commonly cultivated in gardens. Fl. hot season.

Poinciana regia, *Bojer.* Vern. *Gul mohar.* The Gold Mohur. A fast growing soft-wooded tree, with beautiful feathery leaves and gorgeous scarlet and orange flowers.

A native of Madagascar, often cultivated within our area.

5. PARKINSONIA, *Linn.*

Parkinsonia aculeata, *Linn.* Vern. *Vilayati babul.* (*Bah., Pil., Kh.*), *vilayati cheonkar* (*Etawah*).

A struggling evergreen tree or shrub, with thin smooth bark and green branches, often armed with stout spines ·3-·5 in. long which terminate primary rachis of the leaves. Leaves bipinnate, with a very short main rachis bearing towards the base, 1-2 pairs of relatively very long pinnae; stipular spines curved or 0. Pinnae 6-12 in. long, grey-green, flattened and margined. Leaflets deciduous,

numerous, up to ·15 in. long, shortly petioluled, oblong or obovate, pubescent. Flowers yellow ·5-·7 in. across, in axillary racemes, which are 2-4 in. long. Calyx divided nearly to the base; lobes 5, oblong, deciduous. Petals 5, about ·4 in. long, suborbicular; claw densely hairy; stamens free, shaggy near the base; ovary hairy. Pod slender 1·5-4 in. long, pointed at the apex and the base, monoliform, marked with converging parallel lines, 1-6-seeded. Seeds elongated, nearly, terete, brown, usually mottled.

Cultivated throughout the area as a hedge plant, apparently sometimes naturalised.

6. MEZONEURUM, *Desf.*

Mezoneurum cucullatum, *W. & A.*

A large, armed, scandent shrub; stem prickles thick, recurved, dark-brown, often on conical or oblong protuberances. Leaves bipinnate; rachis 6-12 in. long; pinnae 3-5 pairs, up to 8 in. long; stipules minute, caducous. Leaflets 4-5 pairs, 1-3·2 in. long, lowermost usually smallest, often somewhat oblique, ovate or lanceolate-acuminate, subcoriaceous, smooth and dark-green above, paler beneath, secondary nerves somewhat raised but similar to tertiaries and forming loops; petiolules about ·13 in. long. Flowers yellow or orange up to ·9 in. long, in copious panicles; rachis often greenish-yellow; bracts and bracteoles absent or obscure; pedicels about ·15 in. long, yellow, articulated. Calyx yellow, obliquely campanulate; sepals 5, obtuse, concave, 2 lowermost longest, ·35 in. long and hooding over the others in bud. Petals 5, suborbicular; anterior petal purple, deeply two-lobed and folded. Stamens 10, free unequal, filaments hairy at the base, declinate; anthers red. Ovary 1-2-ovuled; style filiform. Pod 2-4 in. long, thin, indehiscent, winged on the back and abruptly narrowed to a short stalk. Seeds usually solitary.

Pilibhit to Gorakhpur often on nala banks.

Fl. December-March. Fr. March-April.

SUB-FAMILY III.—MIMOSOIDAE.

Trees or shrubs, sometimes climbing, rarely undershrubs or herbs. Leaves usually bipinnate, less commonly simply pinnate, sometimes pinnae or leaflets reduced to one pair. Flowers small, regular, usually 5-merous and hermaphrodite, sometimes polygamous, generally in heads or spikes; bracts small, bracteoles 0, or very small and deciduous. Calyx more or less campanulate, truncate, valvately toothed or lobed, sometimes minute. Petals valvate, free or more or less connate into a tubular or funnel-shaped corolla, hypogynous or perigynous. Stamens as many or twice as many as the petals, or indefinite, free or mon-adelphous, sometimes adnate to the base of

the corolla. Ovary free, 2-many ovuled. Pod dehiscent or indehiscent, sometimes jointed. Seeds exalbuminous or albuminous, sometimes arillate.

I. Stamens definite :—

A. Flowers in racemes or spikes; anthers tipped with deciduous glands :—

1. Unarmed tree; leaflets alternate. .. .. 1. *Adenanthera.*

2. Armed trees; leaflets opposite :—

Pinnae 1-2 pairs; leaflets 1 pair, over 1 in. long. Flowers similar. .. 2. *Piptadenia.*

Pinnae 2 pairs; leaflets 7-12 pairs, under 1 in. in length. Flowers similar. .. 3. *Prosopis.*

Pinnae 6-10 pairs, leaflets 8-15 pairs. 1 in. long. Flowers dissimilar. .. 4. *Dichrostachys.*

B. Flowers in heads, anthers without glands :—

Pod continuous, opening through the sutures. *Leucæna.*

Pod jointed, joints separating, suture persistent. 5. *Mimosa.*

II. Stamens indefinite :—

A. Stamens mon-adelphous ;—

Thorny trees, shrubs or climbers* .. 6. *Acacia.*

B. Stamens free :—

Pod straight, unarmed. .. .. 7. *Albizzia.*

Pod twisted or circinate, armed. .. .. 8. *colobium.*

1. ADENANTHERA, *Linn.*

1. Adenanthera pavonia, *Linn.* Vern. *Rakt chundan.* Sans. *Kuchandana.*

An unarmed tree with dark-brown or greyish brown bark, which becomes rough on older trees. Leaves up to 3 feet long, bipinnate, but usually smaller, with 3-6 pairs of pinnae, which are 4-12 in. long. Leaflets 4-8 pairs alternate, ·75-2 in. long, oblong to ovate-oblong or elliptic-oblong, glaucous beneath ; base unequal ; petiolules short. Flowers minute, greenish-yellow, about ·1 in. long, pentamerous in axillary recemes, 2-6 in. long, or in terminal panicles. Bracts minute, caducous ; pedicels minute, about equalling the flowers in length. Calyx teeth minute, slightly pubescent outside. Corolla pale-yellow ; segments united at the base, linear-oblong or lanceolate-acute, touching each other in bud. Stamens 10, free ; anthers crested with deciduous glands. Ovary sessile, many ovuled ; style filiform. Pod 6-9 in. long, flat, curved ; valves

* Some exotic Acacias are unarmed.

spirally twisted during dehiscence; seeds 8-15, bright, scarlet about ·3 in. across, bi-convex on either face.

Tilkoniya-Gorakhpur (*Duthie's collector*), not collected since from the district. Often planted.

The seeds are used as weight and also strung into heads. The heart-wood is coral-red when freshly cut and turns purple later on exposure. It is hard and durable. It is sometimes used as a substitute for Red Sanders in Hindu rituals.

Fl. March-May. Seeds ripen August-October.

2. PIPTADENIA, *Benth.*

Piptadenia oudhensis, *Brandis.* Syn. **Adenanthera oudhensis,** *Stewart.* Vern. *Genti* (Oudh).

A small to middle-sized branchy tree, with short trunk and drooping branchlets and rough greyish or reddish-brown bark, which exfoliates in woody scales; armed with large, compressed conical prickles. Leaves bipinnate, with a circular gland between each pair of pinnae. Rachis 2·5-5 in. long; pinnae 2 pairs ·75-3 in. long; each bearing two nearly sessile leaflets, which are 1·25-3·5 by 1-3 in. long, obliquely broad ovate or kidney-shaped, obtuse at apex, secondary nerves distant, running into loops near the margin, coriaceous, smooth above, glaucous beneath, petiolule ·1 in. long. Flowers greenish-yellow, subsessile or sessile about ·15 in. long, in dense terminal and axillary panicles of spikes; panicles up to 6 in. long, spikes up to 3 in. long; rachis hairy. Calyx cup-shaped with minute teeth; petals nearly free, oblong, acute, much larger than the calyx. Stamens 10; anthers with globose glands. Ovary stalked; ovules many; style filiform. Pod 9-12 in. long, flat reddish-brown, glabrous, narrowed to a stalk. Seeds 15-20, compressed, broad oval.

Gonda, Bahraich, also Gorakhpur on the banks of Gandak near Nepa Frontier.

The wood is said to be durable and hard. It is close-grained.

Blaze red, fibrous.

Fl. April-May.

3. PROSOPIS, *Linn.*

Prosopis spicigera, *Linn.* Vern. *Jhand, chaunkra, chinkur.*

A small thorny deep-rooted tree, armed with somewhat compressed prickles. Bark grey, rather rough. Leaves exstipulate, bipinnate with 2-3 pairs of pinnae 1-2 in. long, often with glands between the pinnae; main rachis up to 2 in. long. Leaflets 7-12 pairs, small, up to ·4 by ·15 in., obliquely oblong, cuspidate, subsessile, somewhat rigid, glabrous, greyish-green. Flowers minute, ·1-·15 in. long.

pale-yellow, in slender spikes, 2-5 in. long, which when terminal are panicled. Calyx cup-shaped, faintly toothed or truncate. Petals oblong, acute, incurved at the apex. Stamens 10, free, shortly exserted, each anther tipped with a deciduous gland. Ovary stalked, many ovuled; style filiform; stigma minute. Pod 4-8 in. by ·2-·3 in. straight, cylindric, glabrous, swollen round the seeds; seeds 10-15, immersed in sweetish mealy pulp, oblong, compressed, brown.

Afforestation Division, Bundelkhand.

The sweetish pulp in which the seeds are imbedded are eaten in times of scarcity. The bark is also said to be eaten during famines. The leaf rachis have often round galls caused by insect attack. The bigger trees are evergreen.

Fl hot season.

Prosopis julifolia, *DC* The mesquite A small almost unarmed tree. Rachis up to 2·5 in. long, bearing a gland between each pair of pinnae Pinnae 2-4 pairs. Leaflets 10-14 pairs 2·5-4· in long; oblong, mucronate. Flowers creamy in spikes. Pod compressed 5-8 by ·3 in. straight or curved, mesocarp, pulpy.

Indigenous in Southern United States; Mexico, etc. Sometimes grown in drier parts of the Province.

4. DICHROSTACHYS, *DC.*

Dichrostachys cinerea, *Willd.* Vern. *Kairi* (*Etawah*).

A rigid branchy shrub or a small tree, with light-grey or whitish, longitudinally furrowed bark, and armed with spines, which either terminate branches or are axillary. Young parts grey pubescent. Leaves feathery, bipinnate, 1-2·5 in. long; rachis hairy, ending in a bristle; pinnae 5-9 pairs, ·25 -·7 in. long, with a stalked gland between each pair; stipules subulate with a broad base. Leaflets sessile, 8-15 pairs, dark-green, about ·1 in. long, oblique-oblong, mucronate, coriaceous, distantly ciliate. Flowers minute, dense, in axillary pedunculate spikes, upper flowers yellow, lower pink, solitary or 2-3 together; spikes up to 2 in. long, peduncles hairy; bracts minute membranous. Upper flowers in the spike fertile with yellow stamens; lower sterile, with pink exserted staminodes. Calyx membranous, hairy outside with short teeth; petals valvate; stamens 10, filaments filiform, exserted; anthers yellow, tipped with reddish glands: staminodes longer than the filaments of fertile flowers—about ·5 in. long. Ovary sessile, many ovuled; style filiform; stigma capitate. Pod 2-3 in. by ·25 in., irregularly twisted, and articulated between the seeds. Seeds about 10, brown; polished, somewhat compressed.

Etawah, Bundelkhand.

Fl. May-October. Fr. cold season.

Leucæna glauca, *Benth.* The Lead tree. A large shrub or a small tree, with smooth greyish-brown bark. Leaves bipinnate, pinnae 4-8 pairs, 2-3·5 in. long; rachis ending in a bristle, up to 6 in. long. Leaflets 10-15 pairs, glaucous, oblique, linear oblong, acute. Flowers white in peduncled globose heads, ·5-·8 in. across; peduncles pubescent, 1-2 in. long. Calyx tubular with somewhat dilated apex; petals free. Stamens 10, free, much exserted. Pods several together on the heads, flat, 5-6 in. long.

Indigenous in tropical America, sometimes cultivated within the area. The leaves are used as green manure in rubber and coffee estates. It is capable of standing considerable shade and its growth is fast. Reported to have been used in the Philippines for keeping down coarser grasses. The wood is good fuel and the leaves are excellent fodder.

Fl. May-August.

5. MIMOSA, *Linn.*

More or less prickly shrubs or undershrubs. Leaves usually bipinnate, leaflets small, ligulate; stipules and stipellae small. Flowers very small, in dense globose heads, polygamous, mostly 4-merous. Calyx campanulate, shortly toothed, petals connate towards the base. Stamens as many or twice as many as the petals; filaments filiform, free, much exserted; anthers not gland-tipped. Ovary stalked, many ovuled; style filiform; stigma minute, terminal. Pod flat, dry, breaking up into 1-seeded joints, which separate from the continuous sutures.

Pinnæ digitately arranged; stamens 4.	1. *M. pudica.*
Pinnæ pinnately arranged; stamens 8-10 :—	
Pinnæ 5-12 pairs; sutures of pods not prickly. ..	2. *M. himalayana.*
Pinnæ 3-5 pairs; sutures of pods prickly. ..	3. *M. hamata.*

1. Mimosa pudica, *Linn.* Vern. *Lajwanti.* Sans. *Varah kranta, lajjalu.* Eng. The Sensitive Plant.

A spreading deciduous undershrub, stem and branches prickly and clothed with bristles. Leaves sensitive; common petiole beset with ascending bristles; stipules linear lanceolate with bristly edges; pinnae 4, digitately arranged, 1-3·5 in. long; leaflets 12-20 pairs, ·3-·4 in. long, obliquely narrow oblong, acute, undersurface adpressed bristly. Heads ·4-·5 in. across, pink, on slender axillary peduncles, ·7-1 in. long, covered with spreading bristles. Flowers with the stamens about ·1 in. long; stamens 4, much exserted. Pod with weak prickles on the sutures, ·6-1 in. long, joints 3-5.

Waste-lands; sometimes cultivated. Said to have been introduced from tropical America; if so, this must have happened several centuries ago, as the fact that it possesses Sanskrit names goes to prove.

The root and leaves are used medicinally.

Fl. August-November. Fr. November-December.

2. Mimosa, himalayana, *Gamble.** M. rubicaulis, F.B.I. in part. Vern. *Alai, aila* (*Bah., Pil. K.*), *hinsa* (Gon.).

A large straggling or erect shrub; bark smooth and reddish-brown on young stems, and pale-brown and rough on older stems; branchlets grooved, thickly beset with curved or straight prickles; young parts brown tomentose. Leaves 4-9 in. long, rachis prickly, at first downy, glabrescent with age, ending in a stiff bristle; stipules subulate, pinnae 8-12 pairs, 1-2, in. long, often with a short stiff bristle between each pair, usually unarmed, terminating in a short bristle. Leaflets 10-20 pairs on each pinna, lowest pair often reduced to minute bristles, ·25-·3 in. long, oblique, oblong, midrib terminating in a stiff point, glabrous, dark-green above, paler and sparingly hairy beneath. Heads ·4-·6 in. across on downy peduncles, 1-2 in. long, which are either fascicled on leaf axils towards the ends of branches or arranged on terminal panicles. Flowers pink or white, tetramerous; bracts minute, linear-spatulate, hairy outside; corolla ·12 in. long, stamens 8. Ovary glabrous. Pod 3-5 in. by ·4 in., slightly curved, smooth, 6-10, jointed, joints broader than long; sutures smooth, rarely with a few prickles; persisting after fall of the joints.

Common in grass-lands and waste-lands and also along ravines.

Fl. June to September. Fr. cold season.

In a local form the leaves have fewer pinnæ—sometimes only 5 pairs—than in the plant here described.

3. Mimosa hamata. *Willd.*

A much-branched thorny shrub, with grey pubescent branches, which are beset with straight or slightly curved prickles up to ·2 in. long. Leaves ·75-1·75 in. long, rachis hairy usually having weak prickles; stipules subulate. Pinnae 3-5 pairs, ·3-·7 in. long; leaflets 6-8 pairs, up to ·15 in. long, oblong, semicordate, acute, somewhat oblique, undersurface hairy. Heads ·5-·6 in. across, pedunculate. Peduncles ·6-1·2 in. long, downy, solitary or in pairs on the axils towards the ends of the branches. Flowers pink, tetramerous; bracts minute; ciliate. Corolla ·12 in. long, cleft half-way down; stamens 8. Ovary pubescent, stalked. Pods grey puberulous, curved, 2-3 by ·4 in., joints 4-8, sutures prickly indented between the joints and persistent.

Afforestation Division.

M. Prainiana, *Gamble*, is very similar, it has longer leaves—2-3 in. long; 5-7 pairs of pinnae and glabrescent pods. It may be found in the drier parts of the area.

*Vide Gamble, revision of Indian species of Mimosa in Kew Bulletin no. 1, 1920.

6. ACACIA, *Willd.*

Trees or shrubs, sometimes climbing, usually spinose or prickly. Leaves* bipinnate, usually with a large basal gland and often several between the pinnæ; stipules sometimes transformed into spines. Flowers in globose pedunculate heads or cylindrical spikes, bisexual or sometimes hermaphrodite, usually 5-merous. Calyx campanulate or funnel-shaped, shortly toothed. Petals exserted, united in the lower half. Stamens indefinite, free or almost free, much exserted, anthers minute, not gland-tipped. Ovary stalked or sessile, many ovuled, style filiform, stigma minute, capitate. Pod variable, usually compressed and dry, rarely turgid or sub-cylindric, never breaking up into joints; sutures not thickened.

I. Trees or large shrubs with stipular spines or prickles :—

A. Flowers in globose heads; spines straight :—

1. Heads axillary, fascicled :—

a. Pod cylindric, turgid, pulpy within. .. 1. *A. Farnesiana.*

b. Pod moniliform, flat, grey downy. .. 2. *A. arabica.*

c. Pod flat, not moniliform :—

Leaflets 6-8 pairs, glabrous or nearly so :—

Pod with undulate sutures. .. 3. *A pseudeburnea.*

Pod with straight sutures. .. .. 4. *A. Jacquemontii.*

Leaflets 15-30 pairs, tomentose on both surfaces. .. .. .. 5. *A. tomentosa.*

2. Heads in terminal panicles. .. .. 6. *A. leucophlœa.*

B. Flowers in peduncled spikes; prickles curved :—

Leaflets under ·5 in. long :—

Pinnæ 7-24 pairs. .. .. 7. *A. Catechu.*

Pinnæ 3-5 pairs. .. .. .. 8. *A. ferruginea.*

Leaflets ·5-1·25 in. long. .. .. 9. *A. lenticularis.*

II. Climbers with scattered prickles; flowers in panicled heads :—

A. Pods thick; indehiscent; pinnæ 3-6 pairs, leaflets acid. .. .. .. 10. *A concinna.*

B. Pods thin, dry, dehiscent :—

Old stems terete; leaflets closely set, sometimes overlapping, with the petiolule near the upper margin of the blade. .. 11. *A. pennata.*

Old stems fluted; leaflets more or less distant, not overlapping, with the petiolule on the centre of the blade. .. .. 12. *A. Gageana.*

1. Acacia Farnesiana, *Willd.* Ver. *Vilayati babul, gandhela; vilayati kikkar.* Sans. *Urimeda, vitkhira.*

A thorny shrub, or a small tree, with smooth dark-brown bark. Branches lenticellate, downy when young; spines stipular, straight, ·25-·6 in. long, usually ashy-grey. Leaf rachis 1-3 in. long, pubescent, with a small gland at about the middle of the petiole and ending in a bristle. Pinnæ 2-8 pairs up to 1 in. long terminated by a minute

*In many Australian Acacias the leaves are transformed into phyllodes.

bristle. Leaflets 10-20 pairs, minute up to ·25 in. long, oblong, acute, glabrescent. Flowers yellow, pentamerous, very fragrant, in pedunculate heads, which are ·4-·6 in. across. Peduncles up to 1·2 in. long, pubescent, fascicled on leaf axils on minute excrescences, with a ring of minute, ciliate bracts at or near the top. Ovary glabrous. Pod 1·5-3 in. long, brown, slightly curved, somewhat inflated and subcylindric, marked with diagonal striæ, which meet half-way; seeds in a double row, immersed in pulp.

Frequently cultivated. Naturalized and now wild in many places on sandy soils from Pilibhit eastwards to Gorakhpur.

The flowers are used in Europe for perfumery. It yields a superior gum, and the pods and roots are said to be rich in tanin. The leaves and bark are used medicinally.

Fl. December-March. Fr. April-July.

Blaze pale-yellow, with reddish bands.

2. Acacia arabica, *Willd.* Vern. *Babur, babul.* Sans. *Vabhula, barbara.* Pers. *Kare-mughilan.* Arab. *Am-mughilan.*

A moderate sized evergreen tree with dark-grey, almost black or dark-brown, longitudinally fissured bark. Spines stipular, ·3-2 in. long, straight, white, with brown tips, large in young, smaller or absent in old trees; branchlets pubescent. Rachis 1-3 in. long, ending in a bristle, generally pubescent, with 3-6 pairs (sometimes up to 9 pairs) of pinnæ up to 1·5 in. long, with a broad gland between the lowest pair, and usually several between the others. Leaflets minute, 10-20 pairs, ·1-·2 in. long, linear-oblong, glabrescent. Flowers yellow, fragrant, in pedunculate heads about 5 in. in diameter. Peduncles up to ·75 in. long, in fascicles of 2-6, on leaf axils, grey downy, with a whorl of 2, broadly triangular, pubescent, concave bracts about the middle. Pod generally solitary 3-7·5 in. long, densely grey downy, fleshy, deeply constricted between the seeds; convex on either side; bluntly beaked, 8-13-seeded, tardily dehiscent.

Throughout the area in village lands, spoil banks, embankments, etc.;—planted and self-sown.

The gum which is similar to gum arabic is used medicinally and also for calico printing. The green pods and branches are in much demand for cattle feeding. The pods and bark are rich in tanin. The timber is hard and durable and is used for wheels, rice pounders, agricultural implements, etc.

Fl. rainy season. Fr. January-April.

Blaze brown, deeper layers pink, hard.

Var. cupressiformis, is a fastigate form with a broom like appearance This variety is sometimes found in the western portions of the Afforestation Division in village lands.

3. Acacia pseudeburnea, Drummond. Syn. A. eburnea, *Willd.* (in part).

A small deciduous armed tree or large shrub, with ashy-grey and nearly smooth bark; striate branches and reddish-brown villous branchlets. Spines straight, stipular, ·25-·7 in. long, pubescent when young, pale-yellow to reddish-brown. Leaf rachis and pinnæ villous—the former ·5-1·5 in. long, having usually one gland just below the lowest pinnae and two glands between the two uppermost pinnae. Pinnae ·3-·5 in. long, usually 3-5 pairs. Leaflets 6-12 pairs, about ·1 in. long, linear-oblong, apex mucronate, hairy when young, glaucous beneath. Flowers pink or yellowish-white, in pedunculate heads ·4-·6 in. across. Peduncles usually solitary or paired on leaf axils, villous, ·7-1·2 in. long, having two connate bracts about the middle; bracteoles minute, narrowed from a broad apex. Calyx campanulate about ·06 in. long, with a few bristly hairs near the base. Filaments free nearly to the base; anthers red. Ovary glabrous; pods 2-4 together on the same peduncle; 2-4·5 by ·25 in., flat, glabrescent, stipitate, walls reticulate, sutures undulate, or indented between the seeds; seeds 2-11, about ·2 in. long, oblong, greyish.

Gonda Division, on sandy soils on banks of streams.

Fl. November-February. Fr. April-May.

Blaze fibrous, pink or white with reddish bands.

4. Acacia Jacquemontii, *Benth.* Vern. *Baonli.*

A deciduous shrub, with reddish or greyish-brown smooth bark, and slender somewhat zig-zag glabrescent branchlets. Spines stipular, connate below, white, straight, ·3-1·7 in. long, Rachis ·3-2 in. long, glabrous; pinnæ ·25-·65 in. long, 2-4 pairs, with a gland between upper pairs. Leaflets 5-10 pairs, ·1-·15 in. long, linear oblong-obtuse, usually mucronate, stiff, glabrous. Heads yellow about ·3 in. across, pedunculate; peduncles up to ·6 in. long with a ring of 2 bracts about the middle, in fascicles of 2-8 on leaf axils. Bracts spatulate with a widely acute tip; glabrous. Flowers minute, fragrant, corolla exserted; lobes ovate, acute; ovary glabrous. Pod 2-3 in. by ·5-·6 in., straight, stipitate, reticulate on the walls, flat, glabrous; seeds 5-6.

Jumna ravines—Afforestation Division.

"The bark yields a gum, and it is also used in tanning. The leaves are stored as fodder."—*Duthie.*

Fl. February-May.

5. Acacia tomentosa, *Willd.*

A small tree, branchlets and leaf rachis covered with grey tomentum. Spines straight up to 3·5 in. long, pubescent when young, ultimately glabrescent. Leaves 2-3·5 in. long, rachis with an oblong

gland between the lowest pair of pinnae and one or two between the uppermost pairs; pinnæ 6-12 pairs, ·5-1·5 in. long; leaflets 15-30 pairs, ·1 to ·15 in. long, broadly oblong, tomentose on both surfaces. Heads ·5 in. across in terminal panicles; peduncles, stout, pubescent, with bracts about the middle. Flowers white. Pod 4-6 in. long, grey downy, falcate, 6-10 seeded.

Bundelkhand—*Mrs. Bell.* There are no specimens from our area at Dehra.

Flowers beginning of cold season (*Duthie*).

6. Acacia leucophlaea, *Willd.* Vern. *Reonj, reonja.*

A moderate-sized deciduous tree, often crooked, with rough, dark-brown or grey, sometimes almost black bark; branches and young stems usually with yellowish-white and smooth bark. Young shoots and inflorescence densely grey tomentose; spines in pairs stipular, grey puberulous, up to 1 in. long, sometimes minute and weak, or absent. Rachis 1 5-4 in. long, downy, grooved, usually with one gland between the lowest, and two between the upper pinnae. Pinnæ 5-12 pairs, ·6-1·5 in. long, downy. Leaflets 12-35 pairs, ·15-·35 in. long, oblique, linear oblong, stiff, hairy when young, glabrescent later. Flowers pale-yellow or white, in pedunculate heads ·25 in. across; peduncles up to ·5 in. long, paired, pubescent, with a whorl of connate bracts, about the middle, in terminal panicles or on axillary leafless branches much exceeding the leaves; bracteoles minute, spatulate, concave, shaggy. Calyx villous towards the top; corolla extruded; lobes hairy outside. Ovary shaggy near the apex. Pod 4-6 in. by ·3 in, sessile or slightly stipitate, flat, brown velvety when young, tardily dehiscent, seeds 10-20.

Jhansi, Banda Afforestation Division.

The wood is excellent fuel. The bark yields a fibre which may be used for cordage. The young pods and seeds mixed with flour are said to be eaten in times of scarcity.

The spines are red when young. Leaves on young plants are glaucous green.

Blaze reddish-brown, white streaked, fibrous, hard ·7-1 in.

Fl. August-November. Fr. February-March.

7. Acacia Catechu, *Willd.* Vern. *Khair.* Sans. *Khadir.* Eng. The Cutch Tree.

A middle-sized often gregarious deciduous tree, often attaining 40-50 ft. with rough, dark-brown or grey, sometimes partly blackish, furrowed bark, exfoliating in narrow strips, which remain attached for a long time. Young stems ashy; young parts downy; spines stipular, in pairs near the base of the leaf, up to ·2 in. long, curved, flattened, dark-brown, sometimes absent, in old plants. Rachis 2·5-7 in. long, pubescent, with one large cup-like gland towards the base

and 2-5 between the upper pinnæ; pinnæ 10-30 pairs, up to 1·7 in. long. Leaflets ligulate, about 15 in. long, ciliate, when young, usually 30-50 pairs, sometimes fewer or more; petiolules minute. Flowers creamy-white, ·15 in. long, in axillary pubescent spikes 2-4 in. long; peduncles ·5- 7 in. long. Bracts exceeding the buds, boat-shaped caducous, ciliate. Calyx hairy outside, teeth deltoid; corolla two to three times the calyx; lobes pubescent. Pod 2-3 5 in. by ·5-·6 in. stipitate, flat, dark-brown, shining, sometimes constricted between seeds, apex narrowed, acute or sub-acute, 3-8-seeded; seeds flat, orbicular, ·2 in. across.

All over the area; gregarious on recent alluvium.

The wood is hard, polishes well and is very durable. The well-known commercial products Cutch and Katha are obtained by boiling chips o heartwood. Kersal or catechuic acid is found in cavities of the wood. It is valued in Indian medicine as a remedy in chest affections. The wood yields a very superior charcoal.

Blaze deep red with fine white lines; deeper layers pale-yellow, fibrous.

Fl. April-June. Fr. November-February.

Var. **Sundra**, *Duthie*. Syn. A. Sundra, *DC.* differs from typical ***A. Catechu***, in having glabrous rachis, calyx and petals. It has 20 to 40 pairs of leaflets. Banda, rare.

8. Acacia ferruginea, *DC.* Vern. *Kali-kikkar.* Ar. and Pers. *Samaghe-arabi.* Eng. The Indian gum arabic (the gum).

A moderate-sized tree with rough grey bark; young parts puberulous, ultimately glabrescent. Spines stipular, curved, with a broad base, dark-brown or absent. Rachis 1·5-3 in. long, with one gland towards the base and one between the uppermost pinnae, glabrous, not bristle-tipped; pinnæ 2-5 pairs; 1-2 5 in. long. Leaflets 10-20 pairs; ·25-·35 in. long, oblique, linear-oblong, glaucous, more or less obtuse, glabrous, rigid, minutely petioluled. Flowers yellow, about ·1 in. long, in dense peduncled spikes which are 2·5-4 in. long. Spikes axillary, glabrescent, often appearing panicled on account of the branches being leafless at the time of flowering. Calyx-teeth deltoid, glabrous or slightly puberulous. Corolla lobes oblong-lanceolate, acute. Ovary glabrous, stipitate. Pod 4-5 in. by ·75-1·2 in. stipitate, glabrous, margins sometimes constricted between seeds. Seeds 4-6.

Banda (Donda forest)—rare.

Fl. March-April. Fr. November-January.

The gum is an excellent adhesive. The watery extract from the young pods (Aqaqiya) is astringent and demulcent. The bark is an astringent and the gum is a demulcent and a nutrient emollient; all the three are valued in Indian medicine.

Blaze red with fine lines.

9. Acacia lenticularis, *Ham.*

A medium-sized evergreen tree, attaining up to 60 ft. in height with rough brown, grey or dark-grey bark and lenticellate twigs. Spines stipular, dilated and compressed at the base, more or less hooked, polished brown, ·15-·3 in. long, old trees nearly unarmed. Rachis 2·5-8 in. long, glabrous, usually with one gland each below the lowest pair and between the uppermost pinnæ. Pinnæ usually 2-4 pairs, 2-5·5 in. long. Leaflets larger than that of any other Acacia in our area, 5-12 pairs, with a pitted gland at the insertion of each pair, ·5-1·25 in. by ·25-·5 in., oblong or obovate, oblique, midrib close to upper margin, apex rounded, obtuse or truncate, usually cuspidate, coriaceous, glabrous, veins prominent; petiolules minute. Flowers about ·2 in. long, white, in short pedunculed puberulous or glabrous spikes, which are 4-5 in. long, and solitary or fascicled on leaf axils, bracts minute, caducous. Calyx campanulate, glabrous, or slightly downy, teeth deltoid. Corolla greenish, twice the calyx, deeply-lobed, lobes oblanceolate. Ovary long stipitate, glabrous. Pod 4-9 in. long, flat, sutures thickened; seeds 3-8.

Pilibhit (Tarai Range).

Blaze red.

The tree looks like an Albizzia at first; from which it can be readily distinguished by its spines.

"Frost hardy and ornamental; but the timber is said to be attacked by white-ants though very hard and strong."—*Haines.*

Fl. April-June. Fr. cold season.

10. Acacia concinna, *DC.* Vern. *Rasaul baur.*

An extensive woody climber, stem round, greyish-brown with 5 vertical lines of conical and more or less hooked prickles, twigs often grey; young parts grey or ferruginous tomentose. Rachis 2·5-5·5 in. long, prickly or more or less downy, usually ending in a subulate awn, with a prominent gland near the base and another below the uppermost pair of pinnæ; stipules about ·3 in. long, hairy, obliquely ovate, acute, auricled at the base; pinnæ 3-6 pairs, middle ones 2-3·2 in. long. Leaflets acid, from 5-6 pairs on the lower pinnæ to 10-14 pairs on the middle pinnæ, ·4-·6 in. by ·15 in., oblong, apex usually cuspidate, rounded, base truncate, and oblique, midrib closer to upper margin, membranous, pale-green and glabrescent above, glaucous beneath. Flowers brick-red in bud, white after opening, on pedunculed heads which are ·4-·5 in. across and arranged in terminal, leafy panicles. Peduncles ·6-1·5 in. long, downy, in fascicles of 2-4 at the ends of branches from leaf axils, or axils of bracts. Bracts deciduous, resembling the stipules. Calyx red, funnel-shaped, deeply-lobed. Corolla slightly exserted; lobes white, with red median lines. Ovary glabrous except for a few hairs near the top, stipitate. Pod 3-4 in.

by ·7-1 in. often indented between the seeds, stipitate, thick and fleshy, saponaceous, 6-10 seeded.

Khorl to Gorakhpur.
The saponaceous pods are used for washing.
Fl. March-May. Fr. cold season.

11. Acacia pennata, *Willd.*

A large prickly climber, bark dark-brown with horizontal cracks. Stem with about 5 lines of small prickles. Young parts, inflorescence, and leaf rachis hairy. Leaf rachis, 4·2-9 in. long, with a large cup-like gland near the base and 2-4 smaller glands between the upper pinnæ, usually prickly. Pinnæ 7-16 pairs, 1·5-4 in. long. Leaflets from 16 pairs on lower pinnæ to 30-50 pairs on the middle pinnæ, closely set, often overlapping, ·2-·3 in. by ·03-·05 in., linear-oblong, inequally broad, sharp, acute, midrib starting from near upper margin at the base, nearly median at the apex, glabrous or nearly so. Flowers pale-white, in pedunculate heads which are ·3-·4 in. across; peduncles 1-4 together, ·4-·7 in. long, downy, on large terminal leafy panicles. Calyx glabrous. Pod 4-6 by ·6-2 in. strap-shaped, reddish-brown and shining when mature, sutures thickened, base usually narrowed to a short stalk; apex usually shortly beaked; seeds 8-14.

Very common throughout the area.
A variable plant. The largest and most invasive of the climbing Acacias in our area. Young pods purple.

Blaze pink to red, fibrous.
Fl. rainy season. Fr. cold season.

12. Acacia Gageana, *Craib.* A. cæsia. *Willd.* (in part).

A large prickly climber; young shoots, inflorescence and rachis pubescent; prickles hooked, small. Rachis prickly 3·5-8 in. with a circular gland near the base and 1-3 glands between the upper pinnae; glands more or less pubescent. Pinnæ 7-14 pairs, 1-3·5 in. long, sometimes with 1-3 glands between the uppermost leaflets. Leaflets ·2-·4 in. long, from six pairs in lower pinnæ, to 30 pairs (sometimes up to 40 pairs) in the middle pinnae; close, subfalcately oblong, acute, tip directed forwards, uppersurface dark-green, shining glabrescent, undersurface pubescent and paler, margins ciliate, base truncate; petiolules minute and inserted at about the middle of the base. Flowers pale-yellow in terminal panicled heads, the lower branches of which arise in leaf axils. Heads nearly glabrous in bud, ·4-·5 in. across, on pubescent peduncles 4-·7 in. long; peduncles 1-4 together. Bracts minute, linear, acute; bracteoles hairy outside, concave, somewhat boat shaped. Calyx campanulate, teeth triangular, short. Corolla glabrous, divided to less than half the length. Ovary glabrous stipitate. Young pods softly tomentose; glabrous

when mature, thin, variable in shape and size, stipitate, sometimes slightly constricted between sutures, 4-6 in by ·8-1 in.

Pilibhit—not common. The young branches are striate and have about five lines of prickles; the older stems are deeply fluted along these lines.
Fl. August-September.
Very similar is, *A. torta*, *Craib*, which may also be found in Pilibhit and in Oudh. It differs from the last species by its much more pubescent twigs, rachis, peduncles and flower heads and conical petiolar glands and villous ovary, and more densely tomentose young pods.

7. ALBIZZIA, *Durazz.*

Unarmed trees, rarely climbers. Leaves bipinnate; stipules usually small, sometimes large and foliaceous; leaflets opposite. Flowers 2-sexual, in large globose heads, sessile or pedicelled, usually pentamerous. Calyx campanulate or funnel-shaped, distinctly toothed. Petals valvate, united below the middle. Stamens indefinite, many times the length of the corolla; filaments united at the base, often forming a sheath; anthers minute, not gland-crested. Ovary sessile or shortly stalked; style filiform; stigma minute, capitate. Pod large, thin, flat, strap-shaped, straight, dehiscent or sub-indehiscent, continuous within; seeds compressed, ovate or orbicular, exalbuminous.

I.	Stipules not foliaceous, small; leaflets 12-20 pairs, broadly oblong :—	
	A. Leaflets over ·5 in. across :—	
	Midrib of leaflets closer to the upper edge; flowers stalked; heads not panicled; pod straw coloured.	1. *A. Lebbek.*
	Midrib of the leaflets closer to the lower edge; flowers sessile; heads panicled; pods brown...	2. *A. procera.*
	B. Leaflets under ·5 in. across :—	
	Midrib of leaflets closer to the upper edge; flowers sessile; heads panicled. ..	3. *A. odoratissima.*
II.	Stipules foliaceous, large; leaflets 20-40 pairs; falcate.	4. *A. stipulata.*

1. Albizzia Lebbek, *Benth.* Vern. *Siris.* Sans. *Shirisha.*

A large deciduous tree with a spreading crown. Bark rough, dark-brown, almost blackish in patches, irregularly cracked, young shoots and inflorescence pubescent. Leaf rachis 5-9 in. long with a large basal gland and often one or more between the upper pinnae: stipules ·15 in. long, linear, tomentose, caducous. Pinnae 2-5 pairs, 4-8 in. long, often glandular. Leaflets 4-9 pairs, 1-2 by ·6-1 in., obliquely oblong, terminal obovate, apex retuse or obtuse, glabrescent or glabrous, midrib closer to the upper edge, lateral nerves indistinct; petiolules very short. Heads 2-4 together from the axils of the upper leaves; peduncles 2-4 in. long, downy; bracts ·2 in. long, caducous. Flowers greenish-white, fragrant, about 1·5 in. long, including the stamens; pedicels

·1 in. long, slender, pubescent. Calyx ·15 in. long, pubescent, teeth short, deltoid. Corolla ·3-·4 in. long, lobes ovate, acute. Stamens 1·1-5 in. long, green at the ends, staminal tube shorter than the corolla tube. Pod 6-12 in. by 1-2·25 in. thin, flat, firm, straw-coloured, with brown spots; seeds 6-10.

Throughout the area, often cultivated.

The heartwood seasons and polishes well and is an excellent timber for furniture, locally used for wheels, well curbs, sugarcane crushers, etc. The seeds, bark, leaves and flowers are used medicinally.

Conspicuous when in fruit which remain long on the tree after the ripening of the fruit.

Blaze red or deep crimson, fibrous.
Fl. April-June. Fr. January-February.

2. Albizzia procera, *Benth.* Vern. *Sirsa.*

A tall handsome sub-deciduous tree, bark nearly smooth yellowish or greenish-white, peeling off in plates. Leaf rachis 10-18 in. long, basal gland large, oblong or oval. Pinnæ 2-6 pairs, 5-9 in. long, often with glands between upper 2 pairs of leaflets; leaflets 6-16 pairs, 1-2·2 by ·6-·9 in., oblique, oblong-ovate, or rhomboid-oblong, obtuse, glabrescent, or adpressed pubescent on the paler undersurface, midrib diagonal, nearer the lower edge except at the apex, petiolules very short. Heads ·5 in. across in fascicles of 2-5, in large terminal panicles; bracts caducous; peduncles ·5-1 in. long. Flowers sessile, yellowish-white. Calyx about ·1 in. long, glabrous, teeth unequal, acute. Corolla up to ·2 in. long, lobes oblong-lanceolate, pubescent on the back. Stamens ·4-·5 in. long; filaments yellowish; staminal tube as long as the corolla tube. Pods 4-8 by ·6-·9 in., glabrous, reddish brown, flexible; seeds 6-12.

All over the area, often in damp situations.

The heartwood is used to some extent for the same purposes as that of siris. Some of the younger branches of this tree are deciduous and fall irregularly throughout the year. I have seen sometimes large three-year old branches eliminated in this way.

Blaze red with white streaks, fibrous.
Fl. June-August. Fr. December-May.

3. Albizzia odoratissima, *Benth.* Vern. *Kala siris.*

A large, nearly evergreen tree, bark rough, dark-grey with almost black patches, young shoots and inflorescence pubescent or tomentose. Leaf rachis 4-8 in. long, with a large gland at the base and 1-2 between the upper pinnæ, grey downy. Pinnæ 3-8 pairs, 3-6 in. long. Leaflets 7-20 pairs, ·6-1·2 by ·2-·4 in., sub-sessile, oblique, oblong, sometimes sub-falcate, obtuse, sometimes acute, often mucronate glabrescent above, paler and pubescent or tomentose beneath, midrib closer to the upper edge. Heads few flowered, solitary or in fascicles of 2-4, arranged in leafy panicles; peduncles, ·5-1·2 in. long, bracts ·1 in. long, ovate, brown-tomentose. Flowers sessile, ·75-1 in. long, yellowish-white, fragrant. Calyx very small, hairy,

scarcely toothed. Corolla ·3 in. long, hairy; lobes ·1 in. long; staminal tube about half the corolla tube. Pod 4-12 in. by ·7-1 2 in., thin, flexible, tomentose when young, reddish-brown or dusky greenish-brown: seeds 8-12.

Throughout the area.

The heartwood is fairly durable, takes a good polish and seasons well; used for much the same purposes as A. Lebbek.

Blaze crimson with white streaks.

New leaves with the flrs. hot season. Fr. cold season.

4. Albizzia stipulata, *Boiv.* Vern. *Sirsa, shamsundra.*

A large handsome fast-growing flat-topped tree, bark smooth, dark-grey, horizontally wrinkled, occasionally with vertical furrows, and with scattered lenticels. Young parts and inflorescence pubescent. Leaf rachis 6-12 in. long, bearing a large gland near the base and often one or more between the pinnæ; stipules large, deciduous, about 1 in. long, obliquely semi-cordate, membranous, acute, pinnæ 6-20 pairs, 2-6 in. long. Leaflets sub-sessile, 20-40 pairs, ·3-·5 in. by ·1 in., falcate-oblong, tapering to a sharp point, midrib very close to the upper edge, glabrous above, downy beneath. Heads pedunculate in axillary and terminal panicles; peduncles, ·7-1·2 in. long; bracts about ·5 in. long, resembling the stipules, deciduous. Flowers sessile, yellowish white. Calyx ·1 in. long, short-toothed, pubescent. Corolla ·2-·25 in. long, pubescent outside, segments ovate-lanceolate, pubescent. Stamens 1-1·3 in. long; staminal tube up to ·7 in. long. Pod 4-7 by ·5-·7 in., thin, glabrous, light-brown, late in dehiscing; seeds 8-10.

Throughout the area, not common, often on clayey soil, sub-deciduous.

Blaze deep-red streaked with white, fibrous, about 1 in.

Fl. March-July. Fr. October-April.

VAR. Smithiana, *Prain.* Syn. Mimosa Smithiana, *Roxb.*—Is a distinct variety with small stipules.

Albizzia lucida, *Benth.* Syn. Mimosa lucida, *Roxb.*

A handsome tree, having a glabrous rachis, with 1, rarely 2 pairs of pinnæ, each bearing 2-3 pairs of dark-green and shining elliptic-oblong acuminate leaflets, 2-5 in. long. Flowers sub-sessile in small heads. Pods brown, 5-9 in. by about ·1 in.

A native of Bihar, Nepal, E. Bengal and Burma; sometimes cultivated as an ornamental tree in gardens in our area; easily recognised from its large leaflets.

Pithecolobium dulce, *Benth.* Vern. *Vilayati babul.* Eng. The Manilla tamarind.

A moderate-sized tree with short horizontal ridges on the stem, bark longitudinally striated; branchlets closely lenticellate. Leaves up to 3 in. long, bipinnate, with short rachis and a pair of stipular thorns. Pinnæ short 1 pair, both rachis and pinnæ ending usually in short broad-based bristles. Leaflets 1 pair, 1-2 in. long, oblique, elliptic-oblong, obtuse, coriaceous, glabrescent. Flowers white in pedunculed heads which are arranged in pubescent, axillary and terminal panicles shortly exceeding the leaves. Calyx downy; petals connate below; stamens monadelphous, exserted. Pods twisted. Seeds 6-8, black, immersed in sweet edible pulp.

Cultivated as a hedge plant throughout the area.

Fl. cold season. Fr. April-June.

XXX.—ROSACEÆ.

Herbs, shrubs or trees. Leaves stipulate, usually alternate, simple or compound. Flowers regular, usually 2-sexual and pentamerous. Calyx gamosepalous; calyx tube (hypanthium) free or adnate to the ovary, often lined above or throughout by the disk, limbs imbricate in bud. Petals imbricate, rarely 0. Stamens perigynous, often indefinite in one or many series, incurved in bud; anthers small. Ovary of 1 or more, free or connate carpels; styles as many as the carpels free or connate; ovules 1-2 in each carpel. Fruit various, a pome drupe or an aggregate of achenes, follicles or drupes, sometimes of nutlets sunk in a fleshy receptacle, rarely capsular. Seeds exalbuminous.

I. Ripe carpels not enclosed within the calyx tube :—
Armed rambling shrub; fruit an aggregate of drupes — 1. *Rubus.*
II. Ripe carpels enclosed within the calyx tube :—
Prickly shrub, leaves imparipinnate; carpels free, many. — 2. *Rosa.*
Unarmed tree, leaves simple, carpels more or less connate, definite. .. .. .. — 3. *Pyrus.*

1. RUBUS, *Linn.*

Rubus lasiocarpus, *Smith.* Vern. *Kala hisalu.*

A prickly straggling shrub up to 10 ft. high, with long smooth purplish, often arched branches covered when young with white bloom; prickles hooked in young shoots, straighter in older stems. Leaves imparipinnate, 3-10 in. long; rachis weakly prickly; stipules adnate on the lower half, free end linear and about ·25 in. long. Leaflets usually 5-9, but sometimes 11; 1-3 in. long, lateral sessile or sub-sessile, terminal largest, ovate or elliptic-lanceolate to lanceolate simply or doubly, acutely serrate, or sometimes imperfectly lobed, acuminate or acute at apex, glabrescent above, hoary tomentose beneath, lateral nerves straight, prominent, usually 7-10 pairs. Flowers ·3-·7 in. across, pink, in axillary or terminal, simple or panicled corymbs, shorter than the leaves; pedicels hairy of various lengths, usually ·25-·5 in. long. Calyx densely woolly, deeply divided; lobes lanceolate or ovate-lanceolate, exceeding the petals, persistent; petals obovate or sub-orbicular, carpels numerous. Fruit ·3-·5 in. across, black when ripe; drupels densely hairy, receptacle elongated, villous.

Pilibhit, N. Kheri, in sheltered localities.
Fl. January-March. Fr. hot season.

2. ROSA, *Linn.*

Rosa involucrata, *Roxb.* Vern. *Kucheta, kaunta.*

A compact, armed, shrub; young parts and inflorescence grey or brownish tomentose. Leaves imparipinnate, 2-4 in. long; rachis usually pubescent, ultimately glabrescent, usually with a pair of compressed prickles at the base; stipules short, laciniate, persistent, adnate to the

common petiole. Leaflets 7-9, shortly stalked ·7-1·5 in. by ·3-·6 in., oblong to elliptic-lanceolate, somewhat broadly acute or obtuse at the apex, finely serrate, coriaceous, glabrous, dark-green and shining above, slightly pubescent along the midrib beneath. Flowers white 1·5-2 in. across, in short, terminal few-flowered, corymbs, or solitary; peduncles stout, much shorter than the leaves; pedicels short; bracts densely tomentose up to ·7 in. long, irregularly incised into setose teeth or segments. Calyx tube globose, ·2-·3 in. across, brown or greyish-velvety, lobes 5, ·5-·7 in. long, lanceolate or ovate, acuminate, pubescent within, deciduous in fruit. ·5-·7 in. long. Petals 5, obovate, retuse at the apex, ·7-1·2 in. long. Stamens many inserted on the thickened, annular disk at the mouth of the calyx tube; carpels many; styles free ending in a cushion-like mass of stigmas immediately above the tube; fruit globose, tomentose.

Gorakhpur in swampy ground where it is often gregarious. Stipules, peduncles and bracts sometimes have glandular hairs.
Fl. February-May. Fr. rainy season.

Rosa damascena, *Mill.* Vern. *Gulab.* Damask rose.

Largely grown all over the area for its fragrant flowers, which are used in manufacture of rose water and attar.
The numerous imported cultivated roses thrive remarkably well in gardens within the area.

3. PYRUS, *Linn.*

Pyrus Pashia, *Ham.*

A medium-sized deciduous tree; bark rough dark-grey, almost black, furrowed on old stems, dark-brown and smooth on branches; young parts and inflorescence covered with dense white wool. Leaves usually 1·7-4 in. by 1-1·7 in., ovate-lanceolate, acuminate, sometimes acute, closely serrate or crenate, glabrous or nearly so when mature; lateral nerves 7-10 pairs, raised above, sub-coriaceous, petioles ·5-1·5 in. long; stipules up to ·5 in. long, caducous, setaceous. Flowers white, about 1 in. across, in corymbs, umbels or fascicles, usually terminating short branches. Pedicels ·5-2 in. long, bracts resembling the stipules. Calyx tube urceolate; usually woolly when young; lobes ovate, acute, woolly inside; petals obovate or suborbicular. Stamens 25-30; carpels 3-5, connate, adnate to the calyx tube; styles free, woolly towards the base. Fruit a globose pome, ·5-1 in. in diameter, somewhat rough with whitish dots, dark-brown when ripe, depressed at the top.

N. Kheri, extremely rare.
The fruits are edible when over-ripe. Young plants are spinescent and their leaves are often lobed. The leaves dry black.
Blaze soft, pinkish, turning brown on exposure.
Deciduous cold season. Fl. February-March. Flowers appear shortly before the leaves. Fr. cold season.
Fragaria indica, *Andr.*, is a perennial silky pubescent herb, with slender prostrate runners; 3-foliolate leaves with obovate, toothed leaflets up to 1·5

in. long yellow flowers and globose bright red fruits. It is found in sheltered localities with more or less moist soil in Pilibhit, Gorakhpur, Kheri and probably also elsewhere in Oudh. The fruits though insipid are eaten by local people.

The following cultivated plants may be mentioned:—

Pyrus sinensis, *Lindl.*—A very gritty pear, sometimes cultivated in gardens within the area. The Chinese or sand pear.

Prunus Persica, *Stokes*. The Peach. Vern. *Aru*.—Sometimes cultivated, but the fruit is very inferior.

XXXI.—RHIZOPHORACEÆ.

Trees or shrubs, often littoral. Leaves opposite, entire, coriaceous, generally glabrous; stipules interpetiolar, caducous. Flowers regular, axillary, usually bisexual. Calyx more or less adnate to the ovary, or free, 4-14 lobed, persistent. Petals as many as the calyx lobes, entire, 2-fid or lacerate. Stamens usually twice the number of petals, perigynous or epigynous; filaments free. Disk lining the free portion of the calyx tube. Ovary 5-1-celled by the disappearance of the septa; ovules 2 in each cell, pendulous; style 1. Fruit 1-seeded, coriaceous, usually indehiscent. Seed ultimately exalbuminous by the quick absorption of the albumen by the developing embryo.

1. CARALLIA, *Roxb.*

Carallia integerrima, *DC.*

An evergreen tree, with dark-grey, smooth bark on old stems, often having bunches of adventitious roots. Leaves 3-5·5 by 1·4-3 in., elliptic or oblong, abruptly short acuminate, tip sometimes obtuse, entire, base often cuneate, leathery, glabrous, shining and dark-green above, paler and often having dark red almost black dots beneath, margins usually recurved, lateral nerves alose meeting and forming loops within the margin; petiole ·2-·4 in. long, channelled and margined, stout; stipules ·4-6 in. long, interpetiolar, caducous, terminating shoots. Flowers green, sessile, about ·2 in. across, in short axillary, usually 3-chotomous cymes; peduncles ·3-·6 in. long, stout; bracts concave. Calyx superior; persistent, lobes 5-8, erect triangular. Sepals and petals inserted on an epigynous, 10-16 lobed disk. Petals 5-8 white, orbicular, clawed, apex lacerate. Stamens twice as many as petals; ovary ½-inferior, usually-4 celled, stigma 4-lobed. Fruit about ·3 in. long, globose or ovoid, 1-celled, red when ripe.

Pilibhit, Kheri, Bahraich, Gorakhpur in swamps.

The tree attains only small dimensions within our area. The heartwood is red, hard and durable. It has pretty silver grain and should prove an ornamental cabinet timber if it could be obtained in good sizes and sufficient quantities.

Blaze red, hard.

Fl. December-April. Fr. April-May.

XXXII.—COMBRETACEÆ.

Trees or shrubs, sometimes scandent, rarely undershrubs. Leaves usually simple, petiolate, opposite or alternate, exstipulate. Flowers usually bisexual, sometimes polygamous, usually bracteate, in heads, racemes or spikes. Calyx tube adnate to the ovary, often produced above it; lobes 4-5, valvate. Petals 4-5, inserted between the calyx lobes, or 8. Stamens 4-5, or twice as many, inserted on the calyx tube. Ovary inferior, 1-celled; style simple; ovules 1-7, pendulous from the apex of the cell. Fruit 1-seeded, usually coriaceous, indehiscent, sometimes 2-5-winged or angled. Seed exalbuminous; cotyledons, usually convolute.

Flowers in spikes or racemes :—	
Trees. Leaves sub-opposite or alternate; petals 0. ..	1. *Terminalia.*
Climbers or undershrubs. Leaves opposite; petals 4-5.	2. *Combretum.*
Flowers in globose heads. Petals 0.	3. *Anogeissus.*

1. TERMINALIA, *Linn.*

Large trees. Leaves sub-opposite or alternate, entire or crenulate, exstipulate, often with a pair of glands on the petiole or the base of the blade. Flowers small, greenish, in simple or panicled spikes, bisexual, or the upper flowers of the spikes male; bracts caducous. Calyx tube produced above the ovary; lobes 4-5, deciduous. Petals 0. Stamens 8-10, inserted on the calyx tube. Disk epigynous, within the stamens, densely hairy. Ovules 2-3. Fruit oblong, ovoid, ellipsoidal or globose, indehiscent, winged or angular, with a coriaceous or bony kernel.

I. Fruit drupaceous, ovoid, not winged :—	
Leaves crowded at the ends of branches; petioles long; fruit tomentose, not ribbed.	1. *T. belerica.*
Leaves scattered along the branches; petioles short; fruit glabrous, more or less ribbed.	2. *T. Chebula.*
II. Fruit coriaceous with 4-5 wings :—	
Leaves glabrous; bark smooth, pale.	3. *T. Arjuna.*
Leaves hairy or tomentose below; bark rough, dark grey.	4. *T. tomentosa.*

1. Terminalia belerica, *Roxb.* Vern. *Bahera.* Sans. *Baheruka, vibhitaki.*

A large deciduous tree, with ashy or dark-grey rough bark exfoliating in irregular small scales. Young parts and inflorescence rusty tomentose. Leaves alternate, clustered at the ends of branches, 3-8 by 2-5 in., broadly elliptic or obovate, obtuse, sub-acute or shortly acuminate at apex, base often unequal, lateral nerves 5-8 pairs, margin with a pellucid rim, coriaceous, puberulous when young, dark-green and glabrous when mature; petiole 1-3 in. long, glands absent or inconspicuous. Flowers small, about ·25 in. across, greenish-yellow, with an unpleasant smell, in slender, drooping, axillary and extra-axillary, interrupted spikes 3-6 in. long, from the new shoots, upper flowers often male; bracts minute,

villous, caducous. Calyx hairy outside, villous within; limb expanded teeth 5, triangular. Drupe about 1 in. long, pyriform or globose, grey velvety, obscurely ridged.

Common throughout.

The fruit is the "*belleric-myrobolan*" of commerce. There is but little demand for it from our area. It is locally used for preparing writing ink. It also forms one of the constituents of "triphala" (*lit.* three fruits—the other two being *harra* and *aonla*), which is used extensively in indigenous medical practice. The kernel is edible. The timber which is yellow, when freshly cut is not durable, but it is used for packing cases, posts for temporary buildings, etc. Old trees are often buttressed at the base.

Blaze fibrous, yellow, darkening on exposure.

Leafless February-March. New leaves—which are copper-coloured—in April. Fl. hot season, after new leaves. Fr. cold season.

2. Terminalia Chebula, *Retz.* Vern. *Harra.* Sans. *Haritaki.*

A medium-sized deciduous tree; bark dark-grey to black'sh, rough, and with shallow vertical furrows. Young parts rusty pubescent. Leaves 3-7 by 2-3·75 in., sub-opposite or alternate, elliptic or ovate-oblong, acute, or shortly acuminate, silky when young, glabrous on maturity, coriaceous, lateral nerves 6-12 pairs, arcuate, prominent, base sometimes unequal, rounded or narrowed; petiole ·5-1 in. long, usually with two or more glands near the top. Flowers dull white about ·1 in. across, all bisexual; spikes 2-4 in. long, often panicled, sometimes fascicled, terminal or from upper leaf axils; rachis at first downy; bracts subulate. Limb of calyx-tube cup-shaped, shaggy inside, teeth acute. Drupe 1-1·5 in. long, obovoid or ellipsoid, smooth, more or less 5 ribbed, stone bony obscurely angled, rough, having gum vessels on the walls.

Throughout the area.

The fruit is the best myrobolans for tanning, and has a ready sale. It is also largely used medicinally, principally as a laxative, alterative and tonic. The galls on young twigs and bark are also used in tanning. The heartwood is fairly durable, it is hard and close-grained and is used for house-building, agricultural implements, etc.

Blaze hard, brown, deeper layers yellow.

Leaflets February-March. New leaves April. Fl. hot season. Fr. ripens close of cold season next year.

A form with shorter leaves which are permanently tomentose beneath is found in Bundelkhand.

3. Terminalia Arjuna, *W. & A.* Vern. *Arjun, kawa* (J). Sans. *Arjun, Rakubha.*

A large tree with buttressed trunk and smooth, pale greenish or light grey bark peeling off in thin flakes and showing fresh green surface; young parts pubescent. Leaves opposite or sub-opposite, 3-8 by 1·4-3·2 in. oblong or spatulate-oblong, obtuse or sub-acute, base unequal, rounded, glabrescent, undersurface light brown, margin somewhat obscurely crenate-serrate, lateral nerves arcuate, 10-15 pairs, petiole about ·25 in. long, with somewhat elongate glands at the top. Flowers yellowish white about ·2 in. across, all bisexual, in terminal

and panicled or simple and axillary erect spikes; bracts linear-lanceolate. Calyx hairy at the throat; lobes acute; ovary glabrous. Fruit 1-1·7 in. long, reddish-brown, with 5-7 wings, which are marked with closely parallel, somewhat indistinct, ascending lines.

North and South Kheri, Bahraich (*Duthie*), Banda, Jhansi, Etawah, near streams; often planted.

The lowermost leaves in a branch are often very short. Evergreen or leafless for a short period before flowering. The timber is similar to that of T. tomentosa: the bark is valued in Hindu medicines.

Blaze deep-red.

Fl. hot season. Fr. March-April.

4. Terminalia tomentosa, *W. & A.* Vern. *Sain, asna, saj, asaina.*

A large deciduous tree, with dark-brown or grey, almost black, deeply furrowed bark, young parts rusty tomentose. Leaves sub-opposite. 4·5-9 by 2·5-4 in. oblong, elliptic or obovate-oblong, apex shortly acuminate, broadly acute or obtuse, base often inequally cordate, margins entire or sometimes serrulate, lateral nerves usually 10-20 pairs, slightly curved, coriaceous, upper surface silky when young, glabrescent later, undersurface softly grey tomentose (sometimes glabrescent); petiole ·3-·4 in. long, usually with 1-2 elongate, turbinate glands at the junction with the midrib. Flowers about ·15 in. across dull-yellow, bisexual; spikes erect, in large pubescent panicles, lower branches of which are axillary; bracts subulate. Calyx glabrous or hairy outside; lobes triangular acute, hairy inside. Fruit 1·5-2·5 in. long with 5 coriaceous wings ·6-1 in. wide, marked with parallel striations, margins indented.

Throughout the area, often associated with sal. It stands water-logging much better than the latter.

After sal it is one of the principal timbers in our area. The seedlings have bent "shoulders" over the primary roots from which character and characteristic rufous hairs of young parts; they can be readily identified in the field. Young ovaries are sometimes attacked by a *Cynips* resulting in galls. These are sometimes mistaken for fruit. The bark is used for tanning. The Tassar silk-worm is fed on the leaves in the Central Provinces, for which purpose the trees are pollarded.

Blaze fibrous, red, deeper layers paler.

Leafless March-May. Fl. April-June, sometimes also later. Fr. February-March.

Var. nepalensis. Leaves attaining up to 12 in. long, undersurface white or grey, sec. nerves more than 20 pairs, calyx thinly pubescent, less spreading, and longer than in the type; disk lobed, densely villous. The timber is said to have lighter colour and to be superior to that of ordinary *sain*.

Kheri (*Duthie's collection*), probably also elsewhere along the northern belt of sal.

2. COMBRETUM, *Linn.*

Large, often scandent, shrubs, rarely undershrubs (*C. nanum*). Leaves opposite, petiolate, entire, rarely alternate or ternate. Flowers polygamo-dicecious, often in panicled spikes or racemes; bracts sometimes large and showy. Calyx tube constricted above the ovary, limb deciduous, urceolate, funnel-shaped or tubular; lobes 4 to

5, small. Petals usually as many as the calyx lobes. Stamens twice as many as petals, in two series. Disk lining the calyx limb and ending in a hairy ring, or at its base. Ovary inferior, 1-celled; style subulate, simple; ovules 2 to 5, pendulous from the apex of the cell. Fruit dry, generally indehiscent, with 4 to 5 wings, or ridges.

Flowers 5-merous; fruits 5-winged; bracts conspicuous creamy white. .. .. .. 1. *C. decandrum.*
Flowers 4-merous; fruits 4-winged, bracts green :—
Undershrub. .. .. .. 2. *C. nanum.*
Climbing or rambling shrub. .. .. 3. *C. ovalifolium.*

1. Combretum, decandrum, *Roxb.* Vern. *Kali bel* (*Pil.*), *Ainth bour* (*Bah. Gor.*), *punk, Kali larah* (*Gor.*).

A large evergreen climbing shrub; young parts brown silky. Leaves opposite usually 3-6 by 1·3-2 in., oblong or elliptic-oblong, abruptly short acuminate, coriaceous, glabrous above when mature, adpressed pubescent on the midrib and sec. nerves, with tufts of hairs on the nerve axils beneath, lateral nerves 6-8 pairs, arcuate, joined by numerous sub-parallel tertiaries; petioles ·2-·4 in. long. Flowers 5-merous, greenish-white, about ·2-·25 in. across in densely villous, cylindric spikes up to 2 in. long (sometimes longer), forming large terminal and axillary panicles. Bracts opposite, leafy up to 2·5 in. long, gradually smaller towards the top of the inflorescence, creamy white, villous. Bracteoles villous, linear. Calyx hairy, limb cup-shaped, hairy inside at the base; lobes linear-spatulate, acuminate. Petals 5, oblong, acute or acuminate; stamens 10. Fruit about 1 in. long, oblong or elliptic oblong, with 4-5 papery wings.

Pilibhit, Gonda, Bahraich, Gorakhpur, probably in all Oudh districts. Bark on branches reddish-brown, peeling off when older in thin flakes. Very conspicuous when in flower on account of the creamy bracts. Sometimes forming a very tangled dense bush in the open.
Fl. cold season. Fr. April to June.

2. Combretum nanum, *Buch-Ham.*

An undershrub with woody root stock, from which several switchy stems are given out annually. Leaves 1·7-4 by 1-2·5 in., alternate or sub-opposite obovate or elliptic, apex often shortly pointed, truncate rounded or bluntly acute, red when young, coriaceous, glabrous, obscurely pellucid dotted; petioles short, up to ·3 in. long. Flowers white, ·25 in. across, in simple or branched racemes 1-4 in. long. Calyx tube ·15 in. long, covered with glandular scurf; limb ·1 in. long, obconic, hairy within; teeth 4, triangular. Petals 4, exserted, obovate, usually notched. Stamens 8, much exserted. Fruit about 1·5 in. long with 4 wings which are a beautiful pink before drying.

Grass-lands, and open burnt areas throughout the area.
New shoots and flowers March-May. Fr. June-August. The shoots become leafless in December, the leaves turning red before falling. Habit similar to that of Grewia sapida, Erythrina suberosa, etc., which suggests that it has been permanently dwarfed by similar agencies—presumably annual jungle fires.

3. Combretum ovalifolium, *Roxb.* Vern. *Ainth bour* (*J*).

A large deciduous woody climber; bark rough, grey or dark-brown peeling in narrow strips, sometimes with irregular shallow cracks; branchlets glabrous. Leaves opposite, 2-4·5 by 1-2·5 in., elliptic, elliptic-ovate or elliptic-lanceolate, apex rounded, obtusely acuminate or abruptly blunt apiculate, base rounded or broadly cuneate, entire, coriaceous, glabrous above, undersurface villous along the midrib, specially at the nerve axils and lower secondary nerves when young, ultimately glabrescent, main lateral nerves 4-6 pairs, lowest from near the base, abruptly curved near the margin; petiole ·3-·8 in. long, red when young. Flowers yellowish-green, ·15 in. across and about ·2 in. long, in dense, peduncled, pubescent and minutely scaly spikes 1-2·5 in. long, which are axillary towards the ends of branches and sometimes fascicled, or terminal, often forming leafy panicles; bracts opposite, leaf-like, reduced upwards. Calyx tube scaly outside, 4-angled, constricted into a short neck above the ovary; limb cupshaped, expanded, teeth 4, about ·05 in. long, triangular acute, ultimately reflexed. Petals 4, white, slightly shorter than the calyx teeth, oblong, obtuse. Stamens 8, in two series; disk densely hairy. Fruits brigh pink when young, pale golden-brown when ripe, ·75-1 in. long, 4-winged, finely striated.

Bundelkhand, fairly common in the southern part, e.g., Lalitpur.
Leaves and often the flowers covered with minute microscopic scales which are only visible under the lens. Leaves turn bright red before falling.
Blaze brown, deeper layers yellow, ·25-·5 in. thick.
Twigs are used for basket-making. Likely to be mistaken for C. decandrum which it much resembles, but the bracts are not creamy white like those of the latter species.
Fl. April. Fr May.

3. ANOGEISSUS, *Wall.*

Trees or shrubs. Leaves alternate or inconstantly opposite. Flowers small, greenish, in dense globose heads, on axillary peduncles. Calyx tube long, constricted above the ovary into a beak, limb campanulate; lobes 5. Petals 0. Stamens 10, in two series, inserted on the limb of the calyx tube; disk crenate, hairy. Ovary inferior, 1-celled; style filiform, simple; ovules 2, pendulous from the top of the cell. Fruit small, indehiscent, compressed, 2-winged, beaked, packed horizontally into dense heads; seed 1.

I.	Beak as long as, or longer than, the rest of the fruit; branches not pendulous :—	
	Flower heads usually in short racemes, or fascicles; wing of fruit with entire margin.	1. *A. latifolia*.
	Flower heads on long, usually unbranched peduncles; wing of fruit with jagged margin on the upper half.	2. *A. sericea*.
II.	Beak shorter than the rest of the fruit.	3. *A. pendula*.

1. Anogeissus latifolia, *Wall.* Vern. *Dhai (J.), banjhi.*

A medium-sized or tall tree, with smooth greenish-white bark, which peels off in round plates and leaves deep pits; young parts usually silky. Leaves 2-4 by 1-2·5 in., alternate or sub-opposite, elliptic-oblong or ovate, obtuse, emarginate or acute, sub-coriaceous, glabrescent, midrib often red, sec. nerves 8-12 pairs; petiole ·3-·5 in. long. Flowers small, in heads which are about ·5 in. across, peduncles usually shortly racemed or fascicled, or sometimes solitary, much shorter than the leaves. Calyx pubescent, teeth minute, about ·25 in. across; pedicels pubescent. Fruits ·2-·3 by ·2 in., compressed, winged laterally, yellowish-brown, glabrescent with age; beak as long as, or longer than, the fruit.

Gonda, Bahraich, Bundelkhand.

The twigs, bark and leaves are very important tanning materials, the young shoots being the best. The timber is tough and elastic, and is in demand for carriage shafts, agricultural implements, etc.

Pellucid dots are visible if the upper surface is examined with a lens. The foliage assumes a beautiful copper colour in winter before falling. Blaze brown pink, deeper layers yellowish, edges green.

Fl. April-May. Fr. December-February.

2. Anogeissus sericea, *Brandis.* Vern. *Dhaukra.*

A small to moderate-sized tree, branches stiff, bark on old trees rather rough; young parts, inflorescence and undersurface of leaves covered with long silky hairs. Leaves 1-3 in. long, elliptic, acute, or shortly acuminate, sometimes obtuse, often mucronate, lateral nerves 4-6 pairs; petiole short, about ·1 in. long. Heads ·75 in. across, on long, usually unbranched, peduncles; bracts leafy. Calyx pubescent, limb often persisting in fruit above the beak. Fruit about ·25 in. across, beak and upper portion of nucleus densely hairy; upper half of wing jagged.

Bundelkhand—*Edgeworth and Vicary*; but I have seen no specimens at Dehra from our area. A fragmentary specimen from Kheri in the herbarium of the Forest Research Institute has been referred to this species by Duthie. It is too incomplete for satisfactory determination.

Fl. hot season.

3. Anogeissus pendula, *Edgew.* Syn. **A myrtifolia,** *Wall.* Vern. *Kathdhai, dhao.*

A small, gregarious and deciduous tree, bark smooth, grey-brown—almost white, often with shallow fissures when old; branchlets drooping. Young parts adpressed pubescent. Leaves ·7-2 by ·5-·75 in., elliptic or obovate, acute or obtuse, often mucronate, narrowed at the base, silky when young on both surfaces, less hairy or glabrescent later, lateral nerves 5-7 pairs, often reddish; petiole more or less hairy, short, about ·1 in. long. Flower heads about ·2 in. across, on pubescent peduncles up to about

1 in. long, which are never racemed, but sometimes have a lateral branch with a few-flowered head, floral characters as in A. latifolia; fruit usually broad towards the base up to ·2 in. long (excluding the beak) by ·25 in. margined laterally, the upper portion of nucleus and beak usually adpressed pubescent, the latter being shorter than the rest of the fruit.

Bundelkhand.

Timber is similar to that of A. latifolia. The leaves assume a beautiful reddish-brown colour before falling in the beginning of hot weather. The leaves are pellucid dotted as in A. latifolia.

Blaze soft, reddish-brown with fine white lines, deeper layers yellow, about 25 in.

Fl. August.-September. Fr. cold season.

Quisqualis indica. *Linn.* The Rangoon Creeper. A handsome scandent shrub. Leaves opposite, elliptic-oblong, short acuminate, 2–4 in. long; petioles ·2-·4 in. long. Flowers showy, sweet-scented, in terminal lax racemes, white when they first appear and then turn pink and red later; calyx-tubes prolonged about 2 in. above the ovary.

Extensively grown within our area in gardens for the flowers.

XXXIII.—MYRTACEÆ.

Trees or shrubs. Leaves opposite, rarely alternate, simple, entire usually with an intramarginal nerve, petiolate, dotted with pellucid oil glands; stipules none or minute, deciduous. Flowers regular, usually 2-sexual, rarely polygamous, axillary or terminal, solitary or in cymes or corymbs; bracts 2 or 0. Calyx-tube adnate to the ovary and produced above it, or half-superior; limb of 4-5 lobes, often closed in bud. Petals as many as sepals and alternating with them, inserted on the margin of the disk, surrounding the cavity of the calyx-tube. Stamens many, inserted with the petals on the calyx-tube, in many rows; filaments often incurved in bud, free, or connate in bundles; anthers 2-celled, dehiscing longitudinally. Ovary inferior or half-inferior, usually 2-celled, less often fewer or more celled; ovules usually many, sometimes few. Fruit various, baccate or drupaceous or capsular, crowned with the calyx limb. Seeds many, or 1 by arrest, exalbuminous.

Fruits baccate; leaves opposite.	1. *Eugenia.*
Fruits capsular; longitudinally splitting at the top; leaves alternate (except in young plants and coppice shoots).	2. *Eucalyptus.*

1. EUGENIA, *Linn.*

Trees or shrubs. Leaves usually opposite, coriaceous, glabrous, often aromatic, gland-dotted. Flowers usually tetramerous, solitary and axillary, or in terminal or lateral, simple or panicled cymes; bracts small and deciduous. Calyx-tube often produced above the ovary; lobes, usually 4. Petals as many as calyx lobes, rarely 0, sometimes united in a calyptra. Stamens many; filaments filiform, free

or slightly united in 4 bundles; anthers versatile; ovary 2 rarely 3-celled, style simple. Ovules many in each cell, but only 1 or few developing. Berry drupe-like, rarely dry, crowned with the persistent calyx limb: Seeds few, variously compressed.

Leaves oblong or elliptic, ovate, over 1 in. broad :—
Leaves subcoriaceous, soft, lateral nerves distant. .. 1. *E. operculata.*
Leaves coriaceous, tough, lateral nerves close. .. 2. *E. Jambolana.*
Leaves narrow lanceolate, under 1 in. in breadth. .. 3. *E. Heyneana.*

1. **Eugenia operculata,** *Roxb.* Vern. *Madar jamua, madarua, dugdugia* (Bah.).

A moderate-sized evergreen tree, with somewhat rough, pale-brown or grey bark, which exfoliates in irregular plates. Leaves 3-6 by 2-3·5 in. elliptic or obovate, obtusely acuminate, apiculate or rounded at the apex, glabrous, dull-green, subcoriaceous, lateral nerves 8-12 pairs, the upper forming loops near the margin; petiole ·5-1 in. long. Flowers ·25 in. across, greenish-white, subsessile, in broad, lax, lateral panicles of trichotomous cymes from leafless nodes below the current year's shoots, 2-6 in. long. Calyx campanulate, gland-dotted, limb with short obtuse lobes. Petals suborbicular, white, falling off in one piece. Stamens folded; each anther with deciduous apical gland. Berry about 3-·5 in. long, globose or ovoid, with a truncated tip, juicy.

Pilibhit eastwards to Gorakhpur in sal forests, often in grassy blanks where it is a nurse to the seedling of the superior species.
The leaves turn red before falling. Blaze fibrous, reddish brown.
Fl. April-May. Fr. end of rainy season.

2. **Eugenia Jambolana,** *Lam.* Syn. **Syzigium Jambolanum** *DC.* Vern. *Jamun, jamua.* Sans. *Jambu.*

A large evergreen tree; bark smoothish, light-grey or brown, to rather rough with cracks and pits in old stems. Leaves very variable in size and shape, usually 3-6 by 1·5-3·5 in., elliptic, oblong-elliptic or ovate, acuminate, acute or subobtuse narrowed, often abruptly, at the base to the petiole, smooth, glossy when young, coriaceous, lateral nerves close, very fine and numerous, joined by an intramarginal nerve; petioles up to 1 in. long, channelled. Flowers greenish-white, subsessile ·25·5 in. across, usually in threes in panicles of broadly divergent, trichotomous cymes 1·5-4 in. long, which are lateral from old wood, or less often axillary or terminal. Calyx-tube turbinate; limb truncate or obscurely lobed; petals dirty-white, falling off in one piece, suborbicular, concave, dotted with large reddish pellucid glands; anthers gland-tipped. Berry variable in size and shape up to 1 in. long, oblong, obovate or sub-globose, often somewhat curved, black juicy and shining when thoroughly ripe, usually crowned with the cup-like limb of calyx-tube, purple inside; seed 1.

Throughout the area, both sporadic and gregarious along nullahs and swamps; often cultivated. In cultivation the leaves tend to become wider and the fruits are larger.

The timber is specially suitable for use under water. The heart-wood is used considerably for buildings, etc., and is often substituted for sal by forest contractors. The fruits are edible; and its juice is some times made into a kind of vinegar, which is used for enlarged spleen, dyspepsia, etc. The seeds are used in Indian medicine for treatment of diabetes. The bark is a possible tanning material.

Blaze red or reddish-brown, fibrous. Fl. May-June. Fr. June-July.

VAR. caryophyllifolia, *Duthie*. Syn. E. caryophyllifolia, *Lam*, Syzigium Jambolanum var. microcarpum, *Thwaites*. Vern. *Kathjamua, jamu*.

Leaves usually lanceolate-acuminate with cuneate base, usually smaller and narrower than the type; panicles shorter and sometimes irregularly branched. Berry roundish size of a pepper-corn or pea. It is usually more branchy and a small middle-sized tree. Fls. May-June.

3. **Eugenia Heyneana,** *Duthie*. Syn. **E. salicifolia,** *Grah*. Vern. *Kathjamua, jamnera.*

A shrub or a small branchy tree. Leaves narrowly lanceolate, acuminate 2·5-5 by ·35-1 in., intramarginal nerve close to the margins base narrowed to the short and channelled petiole which is ·1-·3 in. long. Panicles laxer, on account of the cymes having longer stalks than E. Jambolana, lateral from old wood. Calyx teeth minute acute, distant. Berry "oblong about ·5 in. long, crowned by the limb of the calyx-tube."—*Duthie.*

Jhansi (Rajghat)—*Duthie*; Banda (Ranipur), usually on river banks. Scarcely more than a variety of the last species.

E. Jambos, *Linn*. Vern. *Gulab jaman*. The rose apple. A moderate sized tree. Leaves lanceolate-acuminate, 5-8 in. long with distinct intramarginal nerve narrowed to short petiole. Flowers large, about 2-3 in. across, white, in short, terminal, racemose cymes. Petals not calyptrate. Berry globose 1-2 in. long, white, crowned with 4 rounded calyx lobes, inflated, having 1-2 grey seeds inside; pericarp somewhat leathery, sweet with delicate rose-flavour. Often cultivated in gardens within the circle.

Psidium guyava, *L*. The Guava. Vern. *Amrud*—A small tree with smooth bark. Leaves 2·5-6 in. oblong, or elliptic-oblong, faintly aromatic. Flowers 1-few, on axillary peduncles, white, up to 1·5 in. across. Berry varying in size and shape, usually containing numerous seeds, immersed in a pleasantly-flavoured sweet pulp. Extensively grown in gardens and has become, to some extent, naturalised.

2. EUCALYPTUS, *L, Héritier.*

Evergreen trees or shrubs, secreting aromatic gums or resins. Leaves in seedlings opposite, sessile, horizontal; in older plants alternate, petiolate, usually drooping and of different shape. Flowers in umbels or heads, rarely solitary. Calyx-tube often continued beyond the ovary. Petals fused into a lid or operculum over the calyx-tube. Stamens numerous; ovary inferior, 3-6 celled; ovules numerous. Fruit usually a hard or woody capsule opening by slits at the top. Seeds minute, numerous, a low percentage of which are fertile and slightly larger than others.

Several species of this Australian and Tasmanian genus have been introduced in our area, but their cultivation on a large scale has not been attended with success so far. The young plants are subject to white-ant attack, which is probably one of the factors responsible for this failure.

1. **Eucalyputs rostrata** *Schlecht.* The Red Gum.

A tall tree with smooth ashy-grey or whitish bark, which is sometimes rough towards the base. Leaves 4-6 in. long, lanceolate falcate, secondary nerves faint. Flowers in axillary 3-12 flowered, short peduncled umbels. Calyx-tube hemispheric; operculum a little longer than calyx-tube; suddenly attenuated to a beak from a hemispheric base. Fruit about ·25 in. across, rim, convex; valves at the top exerted, deltoid.

Indigenous almost all over Australia except in so ne coast tracts. Planted at Mailani. The plant is able to stand water-logging better than any other Eucalyptus. It can also stand a considerably high temperature as well as frost. One of the most important timber trees of Australia. The timber is heavy, extremely durable and strong, and takes a good polish.

Fl. May-June.

2. **Eucalyputs tereticornis,** *Smith.* Forest Red Gum.

A tall tree. Bark smooth, whitish or greyish. Leaves 4·5-8 in. long lanceolate falcate or sometimes ovate, sec. nerves more prominent than in the last species. Flowers pedicelled, on axillary short peduncled umbels, 4-8-flowered; pedicels stout. Calyx-tube more or less hemispheric or semi-elliptic; operculum 3-·5 in. long usually elongated, conical, much longer than the calyx-tube. Capsules about ·25 in. across, rim convex; valves much extended; deltoid or broad lanceolate.

Indigenous in Victoria, N. S. Wales, Queensland, never far from littoral regions. Closely allied to the last species. The timber is said to be good, but is mainly used as fuel or for fencing. Easily distinguished from the last species by its much longer and conical operculum which is not beaked.

Callistemon linearis, *DC.* The Bottle Brush.

A small evergreen tree. Leaves aromatic, alternate, 1 7-3·2 in. long, linear-lanceolate, narrowed at both ends, intramarginal vein conspicuous. Flowers crimson on leaf-bearing spikes. Fruit capsular dry. A native of Australia. Often grown in gardens within our area. Fl. March-October.

C. **salignus,** *Sweet,* is very similar and has white flowers. It is less frequently cultivated.

XXXIV.—LECYTHIDACEÆ.

Trees.* Leaves alternate, usually crowded at the ends of branchlets exstipulate, entire or shortly toothed, without oil glands. Flowers solitary, in racemes or spikes. Calyx-tube adnate to the ovary; lobes 4-6, rarely 2-3, valvate or imbricate. Petals 4-6, rarely 0, or more. Stamens many in several series; anthers sometimes wanting. Ovary inferior, 2-6, rarely more-celled; ovules usually many; style long, slender; stigma capitate. Fruit a woody, fleshy or fibrous berry with 1, to many seeds.

Flowers in pendulous racemes. Fruit angular, 1-seeded; stamens all perfect.	1. *Barringtonia.*
Flowers in short spikes. Fruit globose, many-seeded; stamens some imperfect.	2. *Careya.*

* Exception—Carcya herbacea which is an under shrub.

1. BARRINGTONIA, *Forst.*

1. Barringtonia acutangula, *Gaertn.* Vern. *Paniha, samudarphal*; *neora* (*K., B.*), *nailya* (*Pil.*), *Injarh* (*K., Gon., Gor.*). Sans. *Ijul.*

A small tree, with dark-grey, longitudinally furrowed bark. Leaves 3·6 by 1·3-3·3 in., crowded at the ends of the branches, obovate or oblanceolate, minutely denticulate, coriaceous, glabrous, apex rounded or subacute, lateral nerves 8-13 pairs, curved near the margin, base narrowed to the very short and narrowly margined petiole. Flowers about ·5 in. across, delicately fragrant, deep red, in slender drooping racemes, which are 6-18 in. long. Calyx-tube funnel-shaped, not produced beyond the ovary; lobes 4, rounded, equalling the tube, minutely denticulate. Petals 4, adnate to the base of the staminal tube, imbricate, early deciduous together with the stamens, Stamens in several series, connate below, red; filaments dilated at the base. Disk annular, within the staminal tube. Ovary 2-celled with 2 pendulous ovules in each cell. Fruit about 1·5 in. long, oblong, bluntly quadrangular, crowned by the persistent calyx lobes, somewhat narrowed and truncate at both ends; fibrous, 1-seeded; seed exalbuminous.

Pilibhit, Oudh forests, and Gorakhpur, and also Bundelkhand (Rajghat) gregarious on banks of streams.

The pounded bark is said to stupify fish.

Blaze pink, soft. Cotyledons rudimentary, the embryo and seedling have swollen hypocotyl.

Fl. hot season. Fr. end of rainy season.

2. CAREYA, *Roxb.*

Trees or an undershrub (*C. herbacea*). Leaves usually large and toothed. Flowers large, handsome, in few-flowered racemes or spikes. Calyx-tube campanulate, not produced beyond the ovary; limb, deeply 4-lobed. Petals 4, imbricate, large, white or pink. Stamens numerous, those of the outermost and innermost series often without anthers, all slightly connate at the base; filaments long. Ovary inferior. 4-5-celled, with an annular disk on the top; ovules numerous on axile placentas; style long. Fruit a large, globose berry with numerous seeds, crowned with the limb of the calyx-tube; albumen 0, cotyledons obsolete; embryo with large hypocotyl.

Tree, with sessile flowers.	1. *C. arborea.*
Undershrub, with stalked flowers..	2. *C. herbacea.*

1. Careya arborea, *Roxb.* Vern. *Kumbi, kumbha.* Sans. *Kumbhi.*

A moderate-sized deciduous tree, with dark-grey or brown, thick, fibrous bark, exfoliating in narrow flakes. Leaves alternate 6-12 by 3-7 in., obovate or oblanceolate, short acuminate or obtuse, crenate-denticulate, lateral nerves 10-15 pairs, forming loops near the margin, glabrous, rather thin, base narrowed to a short margined petiole.

Flowers 2·5-4 in. across, evil-smelling, white and pink; spikes stout, terminal; 2 lateral bracts unequal, central elliptic, linear. Calyx-lobes 4, shorter than the tube, rounded, erect stiff. Petals white, 1·5-2 in. long, elliptic, caducous, filaments red; style persistent, stiff. Berry globose or ovoid, glabrous 2·5—3 in. across, rather fibrous; seeds numerous, immersed in pulp, up to ·4 in. long.

Pilibhit to Gorakhpur, Banda, usually in shady places.

The heart-wood is scanty dull-red or reddish-brown. It takes a fine polish, seasons well and is durable. It is however hardly used in the province at present. The inner bark is used for slow fuzes and is also made into coarse cordage. The bark, flower and fruit are medicinal.

The hypocotyl of young seedlings are swollen and fleshy.

Blaze brownish-red, fibrous, about ·5-1 in.

Leafless February; leaves turn red or purple before falling. Fl. March-May. Fr. July.

2. **Caryea herbacea,** *Roxb.* Vern. *Chota kumbi.* Sans. *Bhumi darimba.*

A dwarfed undershrub, with a woody root-stock and annual shoots. Leaves 5-8 5 in. long, obovate or oblanceolate or finely serrate, shortly acuminate or rounded, glabrous, narrowed into a margined petiole. Racemes few-flowered; bracts oblong. Flowers bad-smelling, about 2·5 in. across, purple and pink. Sepals broadly oblong, ·5 in. long. Petals oblong, greenish-purple, filaments pink below. Fruit much as in C. arborea, but smaller.

This interesting plant at first sight looks like a dwarfed *kumbi*. It is found in open grass-lands from Pilibhit to Gorakhpur and has habits similar to plants like Combretum nanum, etc. Flowers appear with the new shoots in March-April. According to Haines the flowering is partly dependant on the time of firing the grass.

XXXV.—LYTHRACEÆ.

Trees, shrubs or herbs, often with 4-angled branches. Leaves entire, usually decussate, rarely alternate or whorled, sometimes dotted. Stipules usually 0. Flowers usually 2-sexual, regular or somewhat zygomorphic, usually in cymes or panicles, sometimes solitary. Calyx-tube usually free, rarely adnate to the ovary (*Punica*), persistent, lobes 3-6, often with accessory teeth, alternating with them. Petals 3-6, rarely 0, inserted near the mouth of the calyx-tube, often clawed and crumpled; stamens as many or twice as many as the calyx lobes, or indefinite, inserted on the calyx-tube. Ovary usually free and at the base of the calyx-tube usually 2-6-celled, style long; stigma capitate, ovules many, usually on axile, rarely parietal placentæ. Fruit dry, coriaceous or membranous, more or less adnate to the base of the calyx-tube, dehiscent or not; seeds usually many, sometimes winged, exalbuminous.

Stamens 12; calyx-tube tubular, curved; flowers zygomorphic; seeds not winged. A shrub. .. .. 1. *Woodfordia.*

Stamens indefinite; calyx-tube cupular or campanulate, not curved; flowers actinomorphic; seeds winged. Trees .. .. 2. *Lagerstræmia.*

1. WOODFORDIA, *Salisb.*

Woodfordia fruticosa, *Kurz.* Syn. **W. floribunda,** *Salisb.* Vern. *Dhaunti, adhauti,* (*K*) *dhawai.* Sans. *Agnijwala, dhatri.*

A large spreading shrub with reddish-brown bark, peeling off in thin flakes. Young parts hairy; leaves and branchlets covered with black dots. Leaves sessile, 2-5 by ·6-1·7 in., opposite, distichous (sometimes in whorls of three), lanceolate or ovate-lanceolate, acuminate from a rounded or cordate base, puberulous above, paler and pubescent beneath, glandular dots more numerous on the undersurface, lateral nerves 6-12 pairs, meeting to form the intramarginal nerve. Flowers shortly pedicellate, scarlet, ·4-·6 in. long, in short panicles of closely clustered cymes, usually from the axils of fallen leaves; peduncles and pedicels pubescent, usually glandular; lower bracts more or less leafy, upper smaller and brownish; bracteoles minute. Calyx scarlet, tubular, usually somewhat curved, oblique at the opening, lobes 6, oblong, acute, with an outer whorl of 6 rudimentary hairy teeth. Petals 6, white, acute, scarcely exceeding the calyx lobes. Stamens 12, inserted at the base of the calyx-tube, exserted, bent downwards; filaments red; anthers versatile. Ovary superior, 2-celled; ovules numerous. Capsule with very thin walls, ellipsoid, included within the persistent calyx-tube and irregularly breaking up.

Throughout the area, sometimes gregarious. The stem is often fluted and has bands of internal bast in the wood.

Blaze pink.

The flowers yield a red dye which is used for dyeing silk. The leaves and flowers contain a fair amount of tanin and could be used for tanning.

Fl. January-April. Nearly leafless February-March. Fr. April-May.

2. LAGERSTRŒMIA, *Linn.*

Trees or shrubs. Leaves opposite or subopposite, entire, distichous; petiole short. Flowers handsome, bracteate, in terminal and axillary panicles; bracts and bracteoles usually paired. Calyx-tube cupular, or campanulate, coriaceous, smooth or ribbed outside; lobes valvate, 6 or more. Petals 6 or more, long-clawed, wrinkled or crisped, alternating with the calyx lobes. Stamens numerous, inserted at the base of the calyx-tube; filaments often curled, filiform; anthers versatile. Ovary 3-6-celled, superior; style long, filiform; stigma capitate; ovules numerous on axile placentas. Fruit a more or less woody 3-6-celled loculicidal capsule seated on the persistent calyx; seeds numerous, winged at the apex, erect compressed.

Calyx not ribbed outside Flowers about ·5 in. across white; leaves usually grey beneath.	1. *L. parviflora.*
Calyx ribbed outside. Flowers large ·3 in. across, purple leaves green beneath.	2. *L. Flos-Reginæ.*

1. Lagerstrœmia parviflora *Roxb.* Vern. *Asidh, sainja* (*Bundel.*).

A large or medium-sized deciduous tree with ashy or light-brown smooth bark, peeling off in thin strips; young parts pubescent. Leaves 2-4 by 1-1 5 in. oblong, narrow elliptic, or ovate-lanceolate, acuminate or acute, glabrous above, undersurface grey and pubescent when young, usually glabrescent later, coriaceous, prominently reticulate; petioles very short. Flowers ·3-·5 in. across, white, fragrant in lax, axillary and terminal, downy, panicles of cymes. Cymes 2-5-flowered; peduncles and pedicels, slender, the latter up to 2 in. long, bracts leafy. Calyx at first hairy, glabrescent later. Calyx-tube broadly c pular, enlarging and woody in fruit; lobes 6, triangular, acute. Petals 6, membranous, about 25 in. long, ovate-oblong, margin undulate. Outer 6 stamens longer than the rest. Capsules 7-1 in. long, ovoid or ellipsoid, polished about a quarter immersed in the accrescent calyx; seeds with a terminal wing, thickened and somewhat curved on the back, about ·75 in. long (including the wing).

Throughout the area.

The timber is hard, greyish-brown, and polishes well. It is used for buggy shafts, agricultural implements, etc. The bark is a tanning material.

Blaze reddish-brown, ·5-1 in.

Leafless March. Fl. hot season. Fr. December-January.

VAR. benghalensis, *Clarke*, has leaves permanently pubescent beneath; and the fruit is small.

N. Oudh and Gorakhpur—*Duthie.*

2. Lagerstrœmia Flos-Reginæ, *Retz.*

A moderate-sized tree (in our area), with light-grey smooth bark, peeling off in flakes. Leaves usually 4-8 in. by 1·5-3 in., elliptic or oblong-lanceolate, acuminate, coriaceous, lateral nerves 10-12 pairs, prominent beneath, joining to form a more or less intramarginal nerve which becomes discontinuous towards the base; petiole ·2-·4 in. long. Flowers very handsome mauve-purple, 2-3 in. across, in terminal panicles up to 1 ft. long, rachis and peduncles downy; pedicles stout, pubescent, jointed below the middle. Calyx turbinate, covered with grey or brown tomentum; tube ribbed, ribs 12-14 alternately broad and narrow; teeth 6-7, spreading acute. Petals 6-7, 1-1·5 in. long, spreading suborbicular, much crumpled and wavy, with deep coloured veins, claw about ·3 in. long. Capsules oblong-ovoid or subglobose, smooth, seated on the persistent, somewhat woody and prominently ribbed, enlarged calyx-tube, 5-6-valved, ·75-1·25 in. long; seeds including the wing about ·5 in. long.

Very handsome when in flower. Along streams in the Gorakhpur Forest Division (Jagpur Surpar, etc.) Also cultivated within the area in gardens for the flowers.

The leaves turn a beautiful purple before falling. It is an important timber tree in Assam and Burma. In our area it is too limited in distribution to be of much value. Evergreen or subdeciduous.

Fl. usually rainy season. Fr. cold season—long persisting.

L. indica *L.* The crepe plaint or crepe myrtle. Vern. *Farash.*

A handsome shrub or a small tree, with smooth white or ashy bark, elliptic, subobtuse or acute leaves, 1-3 in. long, and numerous panicles of showy, white, rose or mauve flowers of several shades. Calyx-tube not ribbed.

Very commonly cultivated. A native of China.

Fl. rainy season.

Lawsonia inermis, *Linn.* Syn. **L. alba.** *Lamk.* The Henna. Vern. *Mehendi.*

A shrub with greyish bark; branchlets often ending in a spine. Leaves ·5-1·5 in. long, elliptic, oblanceolate or narrowly-lanceolate, obtuse or acute, often mucronate, base tapering, coriaceous. Flowers fragrant, about ·25 in. across, white in panicles. Calyx 4-lobed; petals 4, shortly clawed; stamens 8; capsule size of a pepper-corn, seated on the persistent calyx; irregularly breaking up.

Cultivated as a hedge plant throughout the area. The leaves are used for dyeing nails, hands and hairs, for which purpose the plant is often grown. They are also used for skin diseases. An otto is extracted from the flowers.

Punica Granatum, *Linn.* The Pomegranate. Vern. *Anar.* Sans. *Darimba.* Often cultivated within our area.

XXXVI.—ONAGRACEÆ.

Herbs, rarely undershrubs; sometimes aquatic. Leaves opposite or alternate. Flowers regular or sometimes irregular, bisexual. Calyx-tube wholly adnate to the ovary (half adnate in *Trapa*); lobes 2-5, usually 4; petals alternating with the calyx lobes, rarely 0. Stamens as many, or twice as many, as calyx lobes. Ovary inferior (half inferior in *Trapa*), 1-6—usually 2-4-celled; style simple with capitate stigma or 2-4-lobed; ovules 1-many in each cell; fruit various; seeds 1 (*Trapa*) to many.

Fruit indehiscent, seed 1.	1. *Trapa.*
Fruit capsular; seeds numerous.	2. *Jussiæa.*

TRAPA, *Linn.*

Trapa bispinosa, *Roxb.* The water chestnut. Vern. *Singara, singharah.* Sans. *Shringataka.*

An aquatic floating herb. Leaves dimorphic; submerged leaves, opposite, pinnately cut into thread-like segments looking like roots; floating leaves, in rosettes, green mottled with brown, broadly rhomboid, 1·3-2 by 1·5-3·2 in. dentate, entire towards the base, acute, glabrous above, densely hairy and reddish-purple beneath. Petioles up to 5 in. long, swollen near the top, the inflated portion forming a spongy float and about 1 in. long and hairy. Flowers few, usually axillary, about ·75 in. across, tetramerous, white, close to the surface of water; pedicels stout, short and incurved at first, afterwards elongating and submerged. Calyx hairy, half superior, segments lanceolate, two enlarging and becoming spinescent in fruit. Petals

about twice as long as the calyx lobes, obovate, crenulate on the margins; stamens 4; inserted like the petals on the margins of a perigynous disk. Ovary free and conical towards the apex, 2-celled with solitary pendulous ovule in each cell. Fruit single-seeded 1-1·5 in. long, hard, obovoid, with a short beak and two lateral sharp spines, dark-brown or black when ripe, surface uneven, ripening under water.

In jhils all over the area. The fruit is largely eaten and is an important economic product.

Fl. later portion of rainy season. Fr. cold season.

Var. incisa, *Wall.* The leaves are smaller, coarsely toothed on the upper half, and much less hairy. Gorakhpur.

2. JUSSIÆA. *LIN.*

Jussiæa erecta, *Linn.* Var. exaltata, *Roxb.*

An erect undershrub or a perennial herb up to 4 ft. high. Young parts pilose; stem with raised decurrent lines from leaf bases, usually more or less hairy. Leaves linear, narrow lanceolate, 1·5-3·7 in. long, acute or acuminate, base narrowed, thin pubescent or hairy, usually along the nerves, lateral nerves 12-20 pairs, meeting together to form an intramarginal nerve. Flowers yellow, ·6-·7 in. across, about ·9 in. long, solitary in leaf axils, usually tetramerous, shortly pedicelled. Calyx-tube linear, wholly adnate to the ovary; pubescent; lobes ovate-elliptic, acute. Petals up to ·4 in. long; stamens twice the number of calyx lobes, epigynous. Capsule narrow, cylindric, 1-1·5 in. long, more or less pubescent, thin-walled, irregularly breaking up between the ribs; seeds minute, reddish-brown grooved.

This is the plant which has been called J. suffruticosa, *L.* by Indian Botanists hitherto, which na ne really applies as has been shown by Ridley (Journal on Botany, p.259, Vol. LIX, 1921) to a different plant.

Fairly common in open water-logged soil.

Fl. cold season.

J. repens, *L.* is a smaller plant with creeping or floating stem; whitish flowers 1-1·5 in. across, having 5-6 petals. It is also fairly common in moist and water-logged situations.

XXXVII.—SAMYDACEÆ.

Trees or shrubs. Leaves simple, alternate, often distichous, usually petiolate, often with pellucid glands; stipules small, deciduous. Flowers regular, small, shortly pedicelled, in axillary or subterminal fascicles, racemes or panicles. Calyx coriaceous, persistent, tube short or long, sometimes adnate to the ovary: lobes 3-7. Petals as many as the calyx lobes, or 0, perigynous. Stamens definite or indefinite, often alternating with staminodes, or united into a tube with them. Ovary superior or half superior, 1-celled; style 1, or 2-5; ovules many, on 2-5 parietal placentæ. Fruit loculicidally 3-valved, the placentæ alternating with the valves. Seeds many or few, sometimes arillate, albuminous.

1. CASEARIA, *Jacq.*

Trees or shrubs. Leaves distichous, often with translucent dots or dashes; stipules caducous. Flowers small, greenish-yellow, clustered in the leaf axils; pedicels short, jointed above the base. Calyx inferior, deeply 4-5-lobed, persistent. Petals 0. Stamens 6-10, united towards the base into a hypogynous tube, alternating with staminodes. Ovary free, ovoid, 1-celled, style simple, stigma capitate or 3-fid; ovules many, parietal. Capsule succulent, ellipsoid. Seeds many, usually with fleshy scarlet aril.

Leaves and branchlets glabrescent, elliptic. .. .. 1. *C. graveolens.*
Leaves and branchlets softly tomentose, oblong. .. 2. *C. tomentosa.*

1. Casearia graveolens, *Dalz.* Syn. **C. glomerata,** *Roxb.* Vern. *Beri, narha.*

A deciduous shrub or a small tree; bark brown or grey with white specks. Leaves 3·5-8 by 2·3-4 in., elliptic or elliptic-oblong, short acuminate, acute or obtuse, margin entire to crenate-serrate, glabrous, lateral nerves 8-10 pairs; petiole ·2-·5 in. long; stipules lanceolate, acuminate up to ·3 in. long, early deciduous. Flowers ·15 in. across, green, numerous, clustered on the leaf axils, pedicel short, jointed below, pubescent below the joint, elongating in fruit. Bracts minute, hairy outside, dry. Calyx deeply 5-lobed, pubescent outside. Stamens 6-8 alternating with villous staminodes. Fruit up to 1 in. long, yellow when ripe, ellipsoid, smooth, 3-valved; seeds 12 with orange aril.

Throughout the area. The fruits are used for poisoning fish.

The leaves turn copper-red before falling. The lower leaves at the bottom of a branch are sometimes smaller in size than normal leaves. There are often clusters of buds in leaf axils, and the branches terminate in winter in falcate tapering buds.

Blaze yellowish-brown or pale-yellow, streaked with orange or reddish-brown.

Leafless March-April. Fl early hot season. Fr. beginning of rainy season.

2. Casearia tomentosa, *Roxb. Vern. Chilla, beri.*

A moderate-sized deciduous tree; bark dark-brown, rough, peeling off in square pieces; young parts and leaves softly tomentose. Leaves 2·7-7 by 1·3-3 in. oblong, lanceolate or elliptic-oblong, serrulate or entire, acute or short acuminate, somewhat fleshy, subcoriaceous, lateral nerves 8-10 pairs, petioles variable ·25-·5 in. long; stipules about ·1 in. long, caducous. Flowers yellowish-green, ·2 in. across, numerous, clustered on the axils of fallen leaves; pedicels ·2-·3 in. long, hairy. Calyx villous outside, deeply 4-5 cleft. Stamens usually 8, alternating with staminodes which are villous near the top; stigma

discoid, 3-lobed. Fruit ·7-·8 in. long, seated on the persistent calyx ellipsoid; seeds embedded in a scarlet pulp consisting of agglutined arils.

Common throughout the area, generally in scrub forests. The fruit pounded with mud is used for poisoning fish.

Leafless for short time about March. Leaves become spotted with brown and then turn red before falling. The bark of young trees and branches are ashy or light-grey.

Blaze reddish-brown, striated with pale-yellow, soft.

Fl. February-April. Fr. May-June.

XXXVIII.—CACTACEÆ.

Succulent plants. Stems of various shapes—columnar, club-shaped, spherical, compressed, angled, etc. Leaves rarely well-developed, usually reduced to scales in the axils of which are small cushions, known as "areoles", on which are borne tufts of hairs or spines. Flowers usually solitary and axillary on the areoles, or terminal between tubercles on the stem. Perianth usually regular, rarely somewhat zygomorphic, of many whorls which are usually united and tubular at the base, superior, rotate, funnel-shaped or salver-shaped; stamens, numerous, inserted on the perianth tube. Ovary inferior, 1-celled, with several intruded parietal placentæ; style 1; stigmas as many as the placentas. Fruit usually a 1-celled, fleshy berry, seeds many.

A large family of American plants. Several species are cultivated in gardens within our area. Several species of the genus Opuntia have been naturalized since a long time in various parts of India. The following are most frequently found in our area :—

1. Opuntia monacantha, *Haw.* Vern. *Nagphan.*

A large succulent shrub with bright green spiny joints, branched from the base; joints obovate to oblanceolate, much compressed; spines usually deciduous, with the exception of the largest which is up to 2 in. long. Flowers yellow up to 2 5 in. long and 3 in. across; perianth rotate. Berry pyriform, depressed at the apex, bearing areoles with tufts of barbed bristles reddish when ripe. This species often succumbs to the attack of a scale insect (Coccus indicus, *Green*) which prevents its spreading as rapidly as the other species.

2. Opuntia elatior, *Mill.*

A shrub of similar habit to the above. Joints glaucous or grey-green, obovate or elliptic, usually broader than in the last species. Spines straight, rather slender, 2-5 on each areole. Flowers yellow, changing to orange; perianth campanulate; tube with a few spines. Berry pyriform, angular or more or less warty, reddish-purple when ripe.

"Very general in the province "—*Burkill.*

3. Opuntia Dillenii, *Haw.*

A straggling shrub, with grey-green or bluish-green oblanceolate or obovate joints with undulate margins, lower joints often corky. Areoles with 4-6 horny sometimes stout spines and numerous barbed bristles. Flowers sulphur-yellow slightly tinged with orange. Perianth rotate. Berry pyriform, depressed at the apex, bearing tufts of barbed bristles, deep purple, when ripe.

All over the area and also in the Afforestation divisions.

All the above Opuntias have a common vernacular name—Nagphan. They flower usually in the hot season, the flowers opening during sunshine. The joints have been used as cattle fodder in times of scarcity after scorching, to rid them of the prickles and chopping. The usual method of propagation is by joints; they are often used in hedges.

Cereus pterogonus, *Lemaire* (?)* with tall, columnar and sharply 6-7 ridged stems bearing tufts of prickles on the areoles is sometimes found in hedges in Bundelkhand.

XXXIX.—ARALIACEÆ.

Trees or shrubs, rarely herbs. Leaves usually alternate, often compound or decompound, sometimes simple; petioles usually long, with a sheathing base, stipules adnate to the petiole rarely absent. Flowers regular, bisexual or polygamous, usually in umbels or heads, which are racemed or panicled. Calyx-tube adnate to the ovary, limb truncate, or obsoletely toothed. Petals usually 5, valvate, or subimbricate, sometimes falling off as a calyptra. Stamens, as many as, and alternating with the petals, inserted around an epigynous disk. Ovary inferior, 1-many celled. Ovules solitary in each cell, pendulous, styles as many as the cells of the ovary, free or united, erect or recurved. Fruit dry or baccate; seeds albuminous.

HETEROPANAX, *Seem.*

Heteropanax fragrans, *Seem.*

A small soft-wooded evergreen tree, with soft, dark-grey, rugose bark. Leaves enormous up to 4 ft. long, tripinnate; rachis dilated at the base; leaflets 3-5·5 by 1·5-3 in., elliptic-ovate, lanceolate or elliptic, usually short acuminate, entire, often oblique and narrowed towards the base, glabrous, lateral nerves distant, 5-9 pairs, arcuate, upper often meeting in intramarginal loops; petiolules 0-·5 in. long. Flowers polygamous, yellow ·2 in. across, subsessile or shortly pedicellate in dense umbels, up to ·7 in. across, usually borne on racemes, which attain 3 in. from the branches of an enormous panicle 1·5-3 ft. long. Flowers and inflorescence covered with more or less deciduous, stellate, rusty scurf. Bracts, small, concave, persistent. Calyx turbinate, nearly truncate; petals 5, valvate, acute; stamens 5, extruded, spreading. Ovary 2-celled; styles 2, distinct, persistent and recurved in fruit; disk scurfy, villous. Fruit compressed at right angles to the septum ·2-·3 by ·3-·4 in., glaucous, ultimately glabrescent; seeds 2, compressed, orbicular, with ruminated albumen.

Pilibhit rare.

At first sight the tree looks like *Oroxylum indicum*, but it can be at once distinguished by its alternate leaves. The bisexual flowers are generally pedicellate and borne towards the ends of the panicle branches; the male flowers are usually subsessile and borne lower in sub-capitate smaller umbels. Pedicels enlarge in fruit to ·25 in.

Fl. cold season. Fr. February.

* There is some doubt about the name of this plant. This is apparently the plant Haines calls C. hexagynous, Haw.

XL.—CORNACEÆ.

Shrubs or trees. Leaves petiolate, alternate or opposite, entire, sometimes lobed or serrate, frequently unequal at the base, exstipulate. Flowers regular, hermaphrodite or 1-sexual, in axillary or terminal cymes, heads or panicles. Calyx-tube adnate to the ovary; limb 4-5-toothed, or truncate, persistent. Petals usually 4-5 or 0, valvate or imbricate, inserted at the base of the limb. Stamens epigynous as many as calyx lobes, rarely twice or thrice the number. Ovary inferior, 1-4-celled crowned by the disk; style single, stigma capitate or branched; ovules usually solitary in each cell, pendulous from the apex of the ovary. Fruit generally succulent, 1-4-celled, less often with 2 distinct stones; seeds oblong, pendulous, albuminous.

ALANGIUM, *Lamk.*

Trees or shrubs, sometimes spinous. Leaves alternate. Flowers 2-sexual, in axillary cymes or fascicles; pedicels jointed. Calyx-tube adnate to the ovary; limb 5-10-toothed or truncate. Petals 5-10; stamens as many as the petals, or twice, or thrice as many. Ovary inferior, 1-2-celled, surmounted by a disk. Fruit drupaceous, crowned by the calyx-tube; seed oblong; cotyledons foliaceous.

Leaves oblong entire; flowers fascicled; stamens twice or thrice as many as petals. .. .. .. 1. *A. Lamarckii.*

Leaves broad ovate, often lobed; flowers in cymes, stamens as many as the petals. .. .. 2. *A. begonifolium.*

1. **Alangium Lamarckii,** *Thwaites. Vern. Akola, akora, akohar.*

A deciduous shrub or a small tree, bark pale-brown, greyish, or fissured and somewhat corky on branches and young trees, smoother on older stems; branchlets sometimes ending in spines; young parts ferruginous tomentose. Leaves 2·5-6 by ·7-2 in., alternate, simple, narrow-oblong or oblong to elliptic-lanceolate, acuminate, obtuse or acute, at first pubescent along the nerves above, glabrescent later, undersurface more or less pubescent, lateral nerves 5-8 pairs, distant, lowest pair close to the base, which is rounded or acute and sometimes unequal; petiole ·2-·5 in. long, hairy. Flowers ·6-·8 in. long, white, fragrant, solitary or fascicled from the axils of fallen leaves; pedicles stout, jointed near the apex, densely hairy. Calyx wooly, calyx-tube slightly ribbed; lobes 6-10, triangular, minute. Corolla externally wooly when young, ultimately adpressed pubescent; petals 5-10, reflexed, linear, up to ·8 in. long. Stamens up to 30; filaments plumose at the base, with white silky hairs; anthers very long; disk depressed; ovary 1-celled; style elongate, slender; stigma large. Drupe ·5-·75 in. long ellipsoidal or globose topped by the persistent calyx limb, purple to black when ripe, endocarp bony.

Throughout the area. The bark of the roots is medicinal. The acid fruit is sometimes eaten, and an oil is expressed from the seeds.

Blaze yellowish-white, soft, ·5-·75 in.

New leaves April. Fl. February-April. Fr. May-August.

2. Alangium begonifolium, *Bail.* Syn. **Marlea begoniæfolia,** *Roxb.*

A small deciduous tree with grey or brown, smooth bark; young parts silky, glabrous with age. Leaves simple, alternate, 3-6 in. long, variable, ovate-acuminate to sub-orbicular or broadly subquadrate, entire, angled or lobed, lobes often acuminate, glabrous above when mature, undersurface more or less pubescent along the nerves and with tufts of hairs on nerve axils, base usually oblique, truncate, cuneate or deeply cordate, basal nerves 3-5, lateral nerves (excluding the basal) up to 4 pairs, all joined by intramarginal loops and by subparallel somewhat distant tertiaries; petiole 1-1·5 in. long, grooved on the inner face. Flowers white or cream-coloured, ·6-·8 in. long, bracteate, in axillary, dichotomous, usually compound and pedunculate cymes, not exceeding the leaves; bracts linear; pedicels pubescent, jointed to the calyx-tube. Calyx minutely toothed, clothed with scattered hairs. Petals 6-8, strap-shaped, puberulous. Stamens as many as the petals, and alternating with them; filaments short, covered with long silky hairs; anthers much longer than the filaments; disk hemispheric, epigynous. Ovary 2-celled; style ·3-·4 in. long; stigma capitate. Drupe ovoid, dark-purple when ripe, ·3-·5 in. long crowned by the calyx limb; stone 2-celled, 2-seeded.

Gorakhpur-Kalnahi (Domakhand forest). Rare.
Fl. hot season. Fr. rainy season.

XLI.—RUBIACEÆ.

Trees, shrubs or herbs, rarely climbing. Leaves opposite or whorled, simple, entire, usually stipulate; stipules various, inter-or intra-petiolar, usually connate. Flowers bisexual, rarely 1-sexual, usually regular. Calyx-tube adnate to the ovary, limb various. Corolla gamopetalous, funnel-shaped, salver-shaped or rotate, lobes usually 4-5, valvate, imbricate or contorted to left. Stamens as many as the corolla lobes, inserted on the mouth or the throat of the corolla; filaments short or long; anthers 2-celled. Disk epigynous, usually annular or cushion-shaped, sometimes absent. Ovary inferior, usually 2-celled, sometimes up to 10-celled, rarely 1-celled; style simple, or 2-many branched; stigmas various. Ovules 1 to many in each cell. Fruit baccate, drupaceous, capsular or dehiscent or of indehiscent cocci. Seeds various, with fleshy or horny albumen; radicle superior or inferior.

I. Flowers and fruits in heads :—

A. Calyx-tubes not fused in fruit, fruits dry :—

a. Ovules solitary in each cell; seeds not winged. .. 1. *Cephalanthus.*

b. Ovules many in each cell; seeds winged: —

Calyx 5-lobed; bracts not leafy. .. .. 2. *Adina.*

Calyx truncate; bracts leafy. .. .. 3. *Mitragyna* (*Stephegyne*).

B. Calyx-tubes fused in fruits to form a syncarpium of drupes, ovule 1 in each cell .. .. 4. *Morinda.*

II. Flowers and fruits not collected together in heads:—

A. Ovules more than two, usually many in each cell :—

a. Fruit capsular :—

Corolla lobes valvate; capsule over ·5 in. long; seeds large winged. Inflorescence supported by leafy bracts. .. .. .. 5. *Hymenodictyon.*

Corolla lobes imbricate; capsule about ·1 in. long; seeds minute compressed. Bracts not leafy. .. .. 6. *Wendlandia.*

b. Fruit indehiscent :—

i. Flowers white, usually large :—

Ovary 2-celled; placentas on the septum. .. 7. *Randia.*

Ovary 1-celled; placentas parietal. .. .. 8. *Gardenia.*

ii. Flowers greenish, small, in axillary clusters .. 9. *Hyptianthera.*

B. Ovules solitary in each cell :—

a. Corolla lobes valvate :—

Fruit a drupe with several stones; flowers not fœtid smelling. .. .. .. 10. *Vangueria.*

Fruit capsular; flowers fœtid when bruised. .. 11. *Hamiltonia.*

b. Corolla lobes twisted in bud :—

i. Flowers in terminal corymbose panicles :—

Style shortly exserted, 2-fid. .. .. 12. *Ixora.*

Style twice as long as corolla tube, entire. .. 13. *Pavetta.*

ii Flowers in axillary fascicles, or 1-3 together. .. 14. *Coffea.*

1. CEPHALANTHUS, *Linn.*

Cephalanthus occidentalis, *Linn.* Syn. **Cephalanthus naucleoides,** *DC.* Vern. *Jal-kemba, jal-kaim.*

A large bushy shrub. Leaves opposite or in whorls of 3-4; usually 3-6 in. by 1-2·5 in. (sometimes over 7 by 3 in.), ovate, elliptic or lanceolate, acuminate, entire, rounded or narrowed at the base: lateral nerves 8-12 pairs, arcuate, prominent beneath; petioles up to 1 in. long; stipules acuminate. Flowers white, scented, about ·3 in. long, sessile, densely crowded and mixed with linear clavate bracteoles, on peduncled heads, up to ·8 in. across, when flowers open. Peduncles 1-3 in. long, with a ring of caducous bracts in the middle, several from the axils of upper leaves or terminal, sometimes branched, bracts minute, acute. Calyx campanulate, lobes 4-5 ciliate, rounded. Corolla trumpet-shaped; lobes short, 4-5, oblong, often with black glands between each, more or less pubescent inside. Stamens 4-5, inserted at the throat of the corolla; anthers subsessile elongate, base ending in a sharp point. Ovary 2-celled; ovule solitary in each cell; style filiform, much extruded; stigma clavate. Fruits numerous, 1-seeded, indehiscent, dry, 4-gonous-obpyramidal, crowned by the calyx. Seed with a spongy aril.

Pilibhit, Kheri, Gonda, Gorakhpur, probably also in Bahraich, in swamps and jhils, often gregarious.

Fl. March-June.

Anthocephalus Cadamba, *Miq.* Vern. *Kadam.* Sans. *Kadamba.*—Is a large handsome tree, with whorled branches and large glabrous elliptic-oblong or ovate, short acuminate leaves, 5-10 in. long, with long petioles; axillary and terminal heads of orange flowers 1·5-2 in. across, with white exserted stamens and orange-coloured round fleshy fruit (pseudocarp). It is often planted in avenues and temples. It requires plenty of moisture for satisfactory growth. The fruit is edible.

2. ADINA, *Salisb.*

Adina cordifolia, *Hook.f.* Vern. *Karma*; *haldu, tikui.*

A large tree, with a spreading crown and buttressed trunk; bark grey or brownish-grey, rather rough; young parts pubescent. Leaves 4-8 in. across (sometimes up to 10 in.), orbicular-cordate, abruptly short acuminate, ultimately glabrate above, pubescent beneath, lateral nerves 5-7 pairs, basal pair branching close to the midrib petiole up to 4 in. long more or less pubescent; stipules ·5-1 in. long, broadly oblong or elliptic-obovate, obtuse, usually reddish when young; concealing the leaf buds. Flowers yellow, in round, peduncul-ate heads, which are ·7-1 in. across. Peduncles 1-4 from each axil, 2-4 in. long, pubescent, usually unbranched with a pair of obtuse deciduous bracts near the top; bracteoles filiform, wider at the top; receptacle hairy. Calyx-tube 5-angled, pubescent; lobes 5, linear, acute. Corolla trumpet-shaped, pubescent outside; lobes 5, valvate. Stamens 5, inserted at the mouth of the corolla tube; filaments short. Ovary 2-celled, ovules many in each cell; style filiform, much ex-serted; stigma calvate. Fruit of numerous (200—300) tiny capsules splitting into 2 dehiscent cocci; seeds many in each, minute, winged.

Throughout the area.

The wood is yellow when freshly cut, afterwards changing into reddish-brown, even-grained. It takes good polish and seasons well. It is in much demand for planking, turnery and manufacture of coombs, etc.

Young regeneration is as a rule difficult to find, although after forest fires it frequently comes up abundantly. In recent soil, e.g., banks, cuttings, etc., it often succeeds in establishing itself, sometimes as a pure crop.

Leafless April-May.

Blaze red marked with white lines, deeper layers lighter.

Fl. June-July. Fr. cold season.

3. MITRAGYNA, *Korth.*

Mitragyna parvifolia, *Korth.* Syn. **Stephegyne parvifolia,** *Korth.* Vern. *Tikui, kaim.*

A large deciduous tree, sometimes with buttressed trunk, with smooth, brownish or grey bark, blotched with irregularly exfoliating scales, which leaves depressions after falling, young parts more or less pubescent. Leaves 2-6 in. long, rather variable, ovate-oblong, obovate,

or broadly elliptic, obtusely acuminate to acute or obtuse, cuneate to subcordate at the base, entire glabrescent above, more or less pubescent beneath, lateral nerves 6-8 pairs; petioles ·4-1 in. long, channelled; stipules about ·5 in. long, spatulate-oblong or oblong-obovate, membranous, often reddish, prominently veined. Flowers greenish-yellow or white, in globose heads, which are up to 1 in. across. Heads terminal on short peduncles, solitary or in trichotomous cymes with long lateral branches up to 2 in. long, subtended by a pair of large leaf-like bracts. Bracteoles numerous, minute, spatulate, upper portion hairy. Calyx funnel-shaped, truncate or minutely lobed, ciliate at the apex. Corolla up to ·3 in. long, trumpet-shaped, glabrous outside, lobes 5, valvate. Stamens 5; filaments short; anthers apiculate. Ovary 2-celled; ovules many, pendulous from several placentas, style filiform, much exserted; stigma cylindric-clavate, hollowed at the base. Fruit of numerous (100-150) obovoid capsules, ribbed at the top, each splitting into two cocci with many minute winged seeds.

Throughout the area.

Wood pinkish-brown, not much used. It could be utilized for several purposes for which *Haldu* is used.

Blaze pink, inner layers pale turning reddish-brown on exposure.

Leafless in April-May. Fl. June to July. Fr. cold season.

4. MORINDA, *Linn.*

Morinda tinctoria, *Roxb.* Vern. *Al, arlu.*

A small tree, with greyish corky bark and pubescent young parts; branchlets quadrangular, yellowish. Leaves 3-8 in. by 2-4 in., ovate-elliptic or oblong, shortly-usually abruptly-acuminate, pubescent on both surfaces, specially beneath, often somewhat rough, base tapering or cuneate, lateral nerves 10-15 pairs; petiole up to 1 in. long, pubescent; stipules sheathing, often bifid, lobes acute. Flowers white, in elongated peduncled heads, ·7-1 in. across. Peduncles usually solitary, leaf opposed or terminal or sometimes in the axil of a small linear reduced leaf, ·7-1·7 in. long, rarely branched, pubescent. Calyx limb truncate, persistent. Corolla densely pubescent outside, tube up to ·8 in. long; lobes usually 5, valvate about half as long as the tube. Stamens as many as corolla lobes; filaments short, anthers included in the corolla-tube. Ovaries confluent, each 2-celled, with one ovule in each cell; style arms linear. Fruit ·7-1 in. across, of coalescent drupes forming a syncarpium, boundaries of the drupes distinct.

Jhansi, Etawah.
The bark of the root is collected for dyeing
Blaze "grey-brown"—*Haines.*
Fl. May to September. Fr. January-February.

5. HYMENODICTYON, *Wall.*

Hymenodictyon excelsum, *Wall.* Vern. *Bhurkur.*

A medium-sized deciduous tree. Bark brownish-grey and smooth on branches and young trees, deeply furrowed and corky on old trees. Leaves 4-10 in. by 2-5 in., ovate, elliptic or obovate, acuminate (often abruptly), membranous, entire, usually cuneate or acute at the base, softly pubescent on both surfaces, undersurface grey; lateral nerves 7-10 pairs, petiole 1-3 in. long; stipules oblong or ovate, glandular serrate. Flowers white, fragrant ·2-·3 in. long, densely crowded on terminal, branched panicles. Bracts leafy, long petioled, veins much reticulated, persisting in fruit; bracteoles minute; pedicels very short, slender. Calyx minute, pubescent; lobes deciduous, acute. Corolla pubescent outside, tube slender, limb cup-like. Stamens 5, inserted below the throat; anthers linear. Ovary 2-celled, ovules many; style slender, stigma capitate. Fruit all ellipsoid, capsule ·5-·7 in. long, reddish-brown when ripe, on recurved pedicels, 2-valved; seeds many, winged all round; wing deeply slit at the base.

Throughout the area, conspicuous when leafless in the cold season by its numerous pendulous fruits and reddish-brown, dry bracts

The wood is used locally for drums.

Blaze pinkish-brown, with darker-brown or orange streaks, darkens on exposure, up to 1·5 in.

Leafless November-May. Fl. May-August. Fr. cold season.

6. WENDLANDIA, *Bartl.*

Small trees or shrubs. Leaves opposite or ternate; stipules persistent. Flowers small in dense, terminal, panicled cymes. Calyx-tube globose with 4-5 subequal persistent lobes. Corolla of 4-5 lobes, imbricate in bud. Stamens 4-5 exserted, with versatile anthers. Ovary usually 2-celled; ovules many on globose axile placentæ; style slender. Capsule small, globose, 2-valved, seeds many, minute, compressed.

Hoary. Stipules recurved; lateral nerves 12-20 pairs; corolla lobes equal to or exceeding the tube. .. 1. *W. exserta.*

Glabrate. Stipules erect, lateral nerves 10-12 pairs; corolla lobes shorter than the tube. .. .. 2. *W. tinctoria.*

1. Wendlandia exserta, *D.C.*

A small evergreen tree with rough, brown bark, exfoliating in strips; branchlets, under-surface of leaves and inflorescence grey pubescent. Leaves 4-8 by 1-3 in., ovate, lanceolate or narrow oblong, acute or acuminate, pubescent or glabrate above, more densely pubescent beneath, lateral nerves 12-20 pairs, sub-parallel; petiole ·5-1 in.

long; stipules ovate-acute, recurved. Flowers ·15 in. across, white sessile, scented; in pyramidal panicles of cymes up to 10 in. long; bracts lanceolate, villous; bracteoles smaller. Calyx grey tomentose, lobes subulate, corolla funnel-shaped; lobes 4-5, as long as or longer than the tube, oblong. Stamens alternating with the lobes; filaments equaling the anthers; Style 2-fid. Capsule white, tomentose, ·1 in. long.

River banks and broken ground in Pilibhit, Gorakhpur and Oudh divisions.

The wood is reddish-brown, hard, but is seldom used.

Blaze pale-yellowish, inner layers pale-pink.

Fl. March-April. Fr. rainy season.

2. **Wendlandia tinctoria,** *DC.* Vern. *Tilka.*

A small tree with rough, brown, stringy bark. Leaves 3·5-8 in. by 1 5-3 in., oblong, oblong-lanceolate or obovate, acuminate, glabrous when mature above, pubescent or glabrate beneath, lateral nerves 10-12 pairs, base narrowed to a petiole which is up to ·7 in. long; stipules up to ·3 in. long, erect, pointed with laterally expanded base. Flowers sessile, white, ·2-·3 in. long, in pubescent pyramidal panicles; bracts subulate. Calyx teeth oblong, ovate, hairy, persistent in fruit. Corolla slender, lobes shorter than the tube; anthers shortly exserted, filaments short. Capsule roundish about ·07 in. across; hairy; reddish-brown when ripe.

Bahraich, Gonda, not common.

Blaze light-pink.

Fl. January-March. Fr March-April.

7. RANDIA, *Linn.*

Shrubs or trees, spinous or unarmed. Leaves opposite or sometimes alternate by one being arrested; stipules short, intra-petiolar, free or connate. Flowers white, fading to yellowish, solitary, fascicled or in axillary or leaf opposed cymes, often dimorphic. Calyx-tube various, often tubular. Corolla tube long or short; lobes usually 5, twisted in bud. Stamens 5, anthers subsessile. Disk epigynous, annular or cushion-shaped. Ovary usually numerous; style short or slender; stigma fusiform, usually large. Fruit usually a 2-celled and many-seeded berry. Seeds angular, albuminous; cotyledons orbicular.

I.	Spines short at the ends of arrested branchlets; corolla glabrous outside.	1. *R. uliginosa.*
II.	Spines axillary, corolla hairy outside :—	
	Flowers usually solitary; berries about 1·5 in. long, yellow when ripe...	2. *R. dumetorum.*
	Flowers in cymes or fascicles, berries small, ·25-·3 in. long, purple when ripe.	3. *R. asciculata.*

1. Randia uliginosa, *DC.* Vern. *Pinwar, bhauer.*

A small rigid deciduous tree, bark reddish-brown with horizontal cracks, nearly smooth, branchlets quadrangular, pubescent when young; spines decussate, ·25-·5 in. long at the ends of arrested branchlets. Leaves often crowded at the ends of the branches, 3-8 by 1·3-3·5 in., obovate or obovate-oblong, cuneate and narrowed at the base to the petiole; glabrous above, sometimes with a few hairs along the nerves beneath, lateral nerves 6-8 pairs; stipules triangular. Flowers white solitary, 1-2 in. across, dimorphic, peduncled and small or subsessile and large. Calyx-tube ·5-1 in. long, lobes 5-7, rounded. Corolla spreading; tube usually short; lobes 5-7 rounded. Stamens 5-7, sessile. The large (subsessile) form with a ring of hairs at the throat of the corolla tube and 2-lobed stigma, the smaller (peduncled) form* with a very short corolla tube, glabrous within and undivided stigma. Fruit about 2 in. across and crowned with the persistent calyx lobes, 2-celled.

Throughout the area, usually in open water logged situations.

The fruit is an article of minor forest produce and is largely eaten as vegetable

"Blaze pale-yellow, finely speckled with pale, orange or pink"—A.E. *Osmaston.*

Leafless February-April. Fl. May-June. Fr. September-December

2. Randia dumetorm, *Lamk.* Vern. *Main, mainphali.* Sans. *Madana.*

A large deciduous shrub or sometimes a small tree, with stout axillary spines and dark-brown or grey, somewhat rough bark. Leaves 1-4 in. by ·75-2 in., obovate or oblanceolate, roundish or obtusely short acuminate or acute, narrowed at the base into the margined petiole, pubescent or rough, sometimes glabrous; stipules ovate with a sharp point. Flowers subsessile ·7-1 in. across, yellowish or greenish-white, fragrant solitary or paired, sometimes three together on short lateral branchlets. Calyx-tube ·2-·3 in. long, campanulate with few short rough hairs; lobes variable, foliaceous, unequal, usually ovate-lanceolate or spatulate, as long as the tube. Corolla covered with adpressed silky hairs; corolla-tube not exceeding the calyx; lobes, oval or oblong, spreading, up to ·75 in. long. Stigma fusiform. Berry 1-1·5 in. across, globose or ovoid, yellow when ripe, usually tipped with the persistent calyx-tube, pulp gelatinous; seeds compressed.

Common all over the area.

The fruit is considered to be one of the best and safest of emetics in Indian medicine. They are greedily eaten by deer and are used for poisoning fish.

Blaze red or pink, soft.

VAR. longispina, *DC.*, (sp.) is a form with obovate or oblong leaves. Flowers 1-3 together, terminating short shoots calyx lobes ovate. Fruits ovoid.

This form is quite as common as R. dumetorm proper.

*Functionally male?

3. Randia fasciculata, *DC.*

A large spreading shrub with short axillary spines; branchlets pubescent. Leaves 1-3 in. long, oblong-lanceolate, elliptic or ovate, acute or acuminate, usually rounded at the base; petiole up to ·25 in. long; stipules deciduous, tapering to a rigid point. Flowers white 1 in. in diameter, usually in 3-flowered cymes at the ends of branchlets, sometimes axillary and fasciculate. Calyx pubescent; teeth linear. Corolla with slender tube about ·9 in. long, lobes broad, oblong, often with pointed tips, hairy at the base. Stigma slightly exserted, fusiform. Berry size of a pea with 10-12 seeds.

Bundelkhand—*Mrs. Bell.*

There are no specimens from our area at Dehra.

Fl. December-May—*Haines.*

8. GARDENIA, *Linn.*

Trees or shrubs sometimes armed. Leaves opposite, sometimes in whorls of 3; stipules intrapetiolar, often connate. Flowers often large, usually white, turning yellow, terminal or axillary, solitary or fascicled; often dimorphic or polygamous. Calyx-tube variously cleft or lobed. Corolla 5-12-lobed, twisted in bud. Stamens as many as the corolla lobes; anthers subsessile or sessile. Ovary 1-celled; style stout; stigma clavate, fusiform or 2 cleft; placentæ 2-6, parietal with numerous ovules. Fruits a berry or drupe. Seeds many imbedded in the placentæ, compressed, with thin testa, albuminous; albumen horny.

I. Unarmed :—

Leaves 1·5-4 in. long; calyx lobes short, ovate-acute; a shrub. .. .. 1. *G. gummifera.*

Leaves 4-8 in. or more long; calyx lobes long, recurved. 2. *G. latifolia.*

II. Armed :—

Flowers dimorphic. .. .. 3. *G turgida.*

1. Gardenia gummifera, *Linn. f.*

An unarmed shrub with resinous buds and white bark. Leaves sessile or subsessile, 1·5-4 by ·7-1·7 in., obovate, broadly acute or obtuse, shining, sometimes puberulous on the nerves beneath, lateral nerves 12-18 pairs; stipules connate, truncate or mucronate. Flowers subsessile, 1-3 together. Calyx pubescent, lobes with linear acute apices. Corolla hypocrateriform, pubescent outside, 1-2 in. long, and about 2 in. across; tube slender; lobes 5, oblong. Fruit 1-1·5 in. long, ellipsoid with few irregular raised lines; placentas 4-5.

Bundelkhand—*Mrs. Bell.* I have seen no specimens at Dehra.

A clear gum exudes from the tree which is known in vernacular as *dikamali* and is used for cutaneous diseases to keep off flies and worms. The fruit is edible.

Fl. March-April. Fr. June-August

2. Gardenia latifolia, *Ait.* Vern. *Papra.*

A small unarmed deciduous tree; bark glaucous, smooth, peeling off in irregular, small, thin, round pieces; twigs stout. Buds gummiferous; young parts pubescent. Leaves subsessile, 4-8 in. long, broadly elliptic, or orbicular, less frequently obovate, rounded or obtusely acuminate, glabrescent or pubescent, lateral nerves 10-20 pairs, glandular hairy at the axils, bright green above, paler beneath; stipules up to ·7 in. long, connate, apex acuminate, cohering with the short petioles, and covering the young buds, the base forming a tube, which persists as a loose ring. Flowers 1-2 in. long and 2-3 in. across, sometimes larger, white, turning yellow, fragrant, solitary or in pairs. Calyx ·7-1 in. long, pubescent, tube stout, more or less tubular; lobes 5-9, obliquely obovate or oblong. Fruit round, 1-2 in. across, topped by the stout limb of the calyx—which attains ·5 in., pubescent when young, speckled with white lenticular dots with age; endocarp polished inside, seeds immersed in purplish pulp.

Jhansi, Banda on dry hillsides.

The wood is suitable for turnery. Gamble recommends its trial as a substitute for box-wood. Fruit is said to be edible. The leaves are sometimes very large.

Blaze white, with fine orange lines, edges green, ·5 in.

Fl. April. Fr. cold season.

Leafless March-April.

3. Gardenia turgida, *Roxb.* Vern. *Kharar, markharar, chamarkharar.*

A small deciduous tree, with smooth bluish or pale-grey bark. Branches mealy; young parts pubescent; spines axillary, often leaf-bearing. Leaves often crowded on dwarf shoots, very variable in size, 1-4 in. long, obovate, elliptic or suborbicular, obtuse or blunt acuminate, at first pubescent, ultimately shining above, pubescent or tomentose beneath, coriaceous, secondary nerves rather indistinct, about 5 pairs, base narrowed and decurrent into a very short petiole; stipules triangular, acute, caducous, ·15 in. long, connate. Flowers solitary or fascicled at the ends of branches or axillary, fragrant, polygamous. *Male flowers.*—Usually fascicled; calyx ·15-·2 in. long, pubescent, subtruncate with minute bristly teeth, limb of calyx-tube exceeding the adnate basal portion; corolla tube ·6-·7 in. long somewhat dilated above; lobes oblique, oblong up to ·6 in. long. *Hermaphrodite flowers.*—Usually solitary and terminal; calyx ·75-1 in. long; limb of calyx-tube much smaller than the base; teeth larger than in the male flowers, obtuse-oblong. Corolla as in the male flowers. Ovary ·3-·4 in. long. Fruit globose, 1-3 in. across, mealy outside, pericarp fleshy, thick, endocarp woody; placentæ usually 5; seeds up to ·15 in. long, pale-brown.

Throughout the area, common in dry situations.

The wood is dirty-white, close-grained. It is scarcely used except for fuel. The unripe fruit is said to be eaten cooked. It is also used medicinally.

Blaze yellowish-white with darker streaks, edges green.

Fl. March-May. Fr. cold season. Leafless April-May. In young plants, only small stiff leaves ·5-1 in. long are produced.

Gardenia jasminoides, *Ellis.* Syn. **G. florida,** *Linn.* Vern. *Gandharaja* Cape Jasmine.

A handsome evergreen compact shrub. Leaves 1·5-4 in. elliptic, obovate or oblanceolate, glabrous, shining above, narrowed to the short petiole at the base, nerves prominent; stipules forming an intrapetiolar, spathaceous cleft sheath. Flowers solitary and terminal, very fragrant, white, mostly double. Calyx-tube ridged or winged.

A native of China, often grown in gardens for the flowers. Fl. April-June.

9. HYPTIANTHERA, *W. & A.*

Hyptianthera stricta, *W. & A.*

An evergreen shrub or rarely a small tree, with rough brown bark and 4-angled or somewhat compressed, decussate branchlets. Leaves 3-7 by 1·2-2·2 in., lanceolate, oblong or linear-lanceolate, acuminate, coriaceous, dark-green, glabrous, entire, sometimes slightly undulate; lateral nerves 6-9 pairs; petiole ·15-·5 in. long; stipules triangular, acuminate, persistent. Flowers about ·15 in. long, sessile, greenish-white, in dense axillary fascicles; bracts minute, lanceolate, acute, ciliate. Calyx with a short limb, about ·1 in. long; lobes ovate acute, hairy inside. Corolla shorter than the calyx, tubular, with twisted lobes, hairy behind the anthers; anthers nearly sessile, inserted by their backs. Disk epigynous, annular, cushion-like. Ovary 2-celled with 6-10 pendulous ovules in each cell; style villous, stout; stigma deeply 2-cleft, included. Fruit globose-oblong berry about ·3 in. long, topped by the calyx limb, seed 4-6 in each cell compressed and angled with fibrous testa.

Kheri, Gonda, Bahraich, Gorakhpur, almost certainly also in Pilibhit in damp shady localities.

Fl. February to March. Fr. April to May.

10. VANGUERIA, *Juss.*

Vangueria spinosa, *Roxb.* Var. mollis *F. B. I.* Sans. *Pindu, pinditaka.*

A deciduous shrub with pubescent branchlets; spines up to ·7 in. long, usually somewhat supra-axillary. Leaves 2-5 in. by 1·25-2·75 in., ovate, elliptic or elliptic-oblong, acute or acuminate, pubescent on both surfaces, usually cuneate and running into the short petiole at the base, lateral nerves 6-9 pairs, curving upwards near the margin; petiole up to ·5 in. long; stipules connate, sharply acuminate from a broad base. Flowers ·2 in. long, globose, greenish, on short

peduncled cymes, which are axillary or supra-axillary, sometimes on small excrescences or from the axil of fallen leaves; peduncles pubescent up to ·4 in. long; pedicels filiform. Bracts minute, setaceous. Calyx pubescent; tube, cup-shaped; lobes 5 distant, linear, pointed. Corolla induplicate-valvate in bud; tube short, wooly with moniliform hairs at the throat, lobes ovate-lanceolate, acute or acuminate, equalling the tube, reflexed. Stamens subsessile, inserted on the throat of the corolla; anthers extruded. Disk epigynous cushion-shaped. Ovary 3-6-celled; ovules pendulous, solitary in each cell; style subulate; stigma reaching the throat of the corolla, capitate. Fruit a globose drupe ·7-1 in. in diameter with 3-6 stones.

Pilibhit, Gonda, Gorakhpur. Rare.

The fruit is edible.

Fl. April-May. Fr. rainy season. Deciduous March-April.

Our species appears to be intermediate between V. spinosa *Roxb* and V. pubescens, *Kurz.* I therefore follow the F. B. I. in uniting them and adopting its no nenclature.

11. HAMILTONIA, *Roxb.*

Hamiltonia suaveolens, *Roxb.*

A deciduous shrub with pale-brown bark peeling off in thin pieces. Leaves 4-9 by 1·7-4 in., opposite, ovate, oblong-elliptic or lanceolate, acute, pubescent when young, ultimately glabrescent or not, often somewhat rough, subcoriaceous, main lateral nerves 10-15 pairs, base usually acute; petiole ·5-1 in. long; stipules short, acute from a broad base, persistent, pubescent. Flowers purple or bluish ·5 in. long, dimorphic, fragrant, fœtid when bruised, subumbellate or sub-capitate on lax trichotomous terminal panicles, which are pubescent, specially towards the extremities; bracts subulate. Calyx lobes usually 5, sometimes 4, oblong-lanceolate, densely hairy. Corolla, trumpet-shaped, base slender, pubescent; lobes usually 5, valvate in bud, oblong, short. Stamens inserted on the throat of the corolla exserted or included. Ovary 1-celled by absorption of walls; ovules 5; styles exserted or included, 5-fid. Capsule ovoid; seeds 5, each enclosed by a delicate net, elongate, triquetrous.

Gonda (Tulsipur and Bhamber Ranges), Bahraich; usually on dry hillsides. Fl. September-January. Leafless hot season.

12. IXORA, *Linn.*

Shrubs or small trees. Leaves opposite or ternate; stipules usually connate. Inflorescence of terminal, trichotomous, often corymbose cymes, usually panicled. Calyx-tube small; limbs of 4 small persistent teeth. Corolla of a slender tube, and 4- rarely 5-spreading, often reflexed, lobes. Stamens usually 4, on the mouth of the corolla

tube, filaments very short or obsolete; anthers exserted, linear, with 2-fid bases. Ovary 2-celled, with 1 ovule in each, peltately attached to the septum; style filiform, exserted but never twice as long as corolla tube; stigma at first fusiform, afterwards usually 2-branched. Fruit usually a drupe, with two plano-convex or ventrally concave, coriaceous pyrenes. Seeds peltate.

Leaves 4-9 in. long, usually lanceolate, subcoriaceous, acuminate, petioles short; panicles usually 6-9 in. long, lax.	1. *I. undulata.*
Leaves 3-6 in. long, usually oblong or elliptic, obtuse, less often short acuminate, coriaceous, subsessile; panicles usually 2-4 in. long compact.	2. *I. parviflora.*

1. Ixora undulata, *Roxb.*

A small evergreen tree or shrub, with dark-brown, slightly rough bark. Leaves 4-9 by 1·7-4 in., oblong or elliptic, lanceolate, acuminate, acute or rounded at the base, dark-green, smooth, shining above, secondary nerves 12-16 pairs, margin often more or less undulate; petiole channelled, ·3-·5 in. long, stipules intra-petiolar, broadly triangular with a long cusp, connate. Flowers white, fragrant, in trichotomous cymes, which are corymbose on the branches of a pyramidal panicle, with long internodes, sometimes peduncled, usually 6-9 in. long. Lower bracts more or less leafy, upper linear; bracteoles minute. Buds slender, clavate about ·4 in. long. Calyx lobes persistent, acute, minute, corolla tube slender, about ·3 in. long; lobes reflexed, linear-oblong, valvate in bud, about half the length of the tube. Drupe globose, purplish or greyish when ripe; stones 2, plano-convex.

Gorakhpur (Domakhand). Rare.
"Blaze pink, then white".—*Haines.*
Fl. April-June, also in the rains. Fr. August-September.

2. Ixora parviflora, *Vahl.* Vern *Khujha, gucha* (*Ban.*), *tameran* (*Bah.*), The Torch Tree.

A small evergreen glabrous tree or a shrub, with dark, pale-grey, often pustulate bark. Leaves nearly sessile, 3-6 by 1·3-2·5 in., oblong or elliptic, apex subacute, or obtuse, less often short acuminate, base rounded or cordate, coriaceous, dark-green and shining, lateral nerves faint up to about 14 pairs; petioles up to ·2 in. long; stipules cuspidate with a broad base. Flowers white, fragrant, subsessile in compact, 3-5 branched panicles which are 2-6 in. long. Lower bracts similar to the stipules, upper minute. Flower buds about ·35 in. long, slender, clavate. Calyx lobes 4, minute, acute. Corolla lobes 4, sometimes 5, obtuse, oblong, reflexed, about ·15 in. long; anther bases tailed; style slightly hairy. Drupe ·2-·3 in. across, depressed globose, reddish or black when ripe.

Gonda, Bahraich, Gorakhpur, Banda, often near nalas. The branches are said to be used for torches in C. P.

Blaze pale-pink.

Fl. February-May. Fr. May-June.

I. coccinea, *Linn.* Sans. *Ruktaka, andhuka,* is a shurb with shining oblong leaves and scarlet flowers in compact corymbs. It is often cultivated in gardens within our area.

13. PAVETTA, *Linn.*

Pavetta indica, *Linn.* Vern. *Chitwa.* Sans. *Pappana.*

A large deciduous shrub up to about 12 feet high with pale-brown slightly rough bark. Leaves 3-9 by 1-3·5 in. rather variable, elliptic, obovate or lanceolate, acute or acuminate, base usually tapering, pubescent on both surfaces or glabrous, subcoriaceous to membranous, lateral nerves 10-15 pairs; petiole up to 1·5 in. long; stipules forming an intra-petiolar sheath, usually with acute tip. Flowers slender, white, ·5-·75 in. long, fragrant, on terminal and lateral, dense or lax, corymbose panicles of pubescent cymes; pedicels up to ·3 in. long; bracts similar to stipules, broad. Calyx more or less pubescent, teeth 4 acute. Corolla salver-shaped, tube ·5-·7 in. long, slender; lobes twisted in bud, ultimately recurved about half the length of the tube, oblong. Stamens 4, on the mouth of the corolla tube; filaments short; anthers exserted. Ovary 2-celled, with 1 ovule in each, peltately attached to a fleshy placenta, style filiform, about twice the length of the corolla; stigma not divided, fusiform. Drupe globose, smooth with 1-2 plano-convex seeds.

Throughout the area, in damp shady localities. The root possesses aperient qualities and is considered to be a remedy for visceral obstructions.

Blaze pale-yellow, green at the edge.

Fl. rainy season. Fr. cold season.

Of the varieties mentioned in F. B. I. the following are found in our area :—

Form 1. indica proper. Leaves glabrous beneath or nearly so; cymes glabrate; corolla glabrous. S. Lalitpur; Gorakhpur; probably also elsewhere.

Form 2. Var. tomentosa, F. B. I. Leaves pubescent or tomentose beneath; cymes pubescent, tomentose or villous. The common form.

14. COFFEA, *Linn.*

Coffea bengalensis, *Roxb.*

A small deciduous shrub up to about 4 feet high, with spreading branches, and pale or greyish-brown bark, which peels off in thin flakes. Leaves 2-4 by 1-2·5 in., elliptic or broadly ovate, acute or acuminate at the apex, membranous, glabrous, except on the nerves beneath, main lateral nerves about 4-6 pairs, base narrowed into a short petiole; stipules persistent, stiff, ·2-·3 in. long, subulate with a broad base. Flowers salver-shaped, white, fragrant, showy 1-1·8 in. across,

solitary or 1-3 together at the ends of small branches. Calyx truncate, teeth minute, setaceous. Corolla tube up to ·8 in. long, lobes twisted to the left in bud, elliptic or oblong-obovate, obtuse. Stamens 5, at the mouth of the corolla tube, sessile; anthers dorsifixed, apiculate. Ovary 2-celled, style bifid, ovule solitary in each cell, peltately, attached to the dissepiment. Drupe ·5 in. long, globose or ovoid, truncate at the top, with 1-2 grooved stones which are plano-convex, if more than 1; endosperm horny.

In shady damp situations in Gorakhpur (Domakhand), sometimes cultivated for the flowers.

Leafless February-April. Fl. April-May, also rainy season. Fr. cold season.

Hamelia patens, *Jac.* A large evergreen shrub. Leaves in whorls, 2·5-6 by 1·5-2·5 in., elliptic-oblong or lanceolate, short acuminate, narrowed at the base. Flowers about 1 in. long, orange and scarlet in panicled cymes. Corolla tubular, puberulous with short teeth.

A native of the West Indies and tropical America. Sometimes grown in gardens on our area.

Mussænda Roxburghii, *Hook f.* A large shrub. Leaves 3-8 in. long, elliptic-acuminate, prominently nerved, narrowed to the short petiole. Flowers yellow, in terminal cymes, conspicuous from one of the sepals, developing into a large white leaf ·2-3 in. long.

A native of Assam, often cultivated in gardens. Flowers rainy season.

Mussænda luteola, *Delile.* A shrub with smaller leaves than the last species and pale-yellow foliaceous sepal.

A native of tropical Africa—sometimes grown in gardens within our area.

XLII.—COMPOSITÆ.

Herbs or shrubs rarely trees. Leaves exstipulate, alternate or opposite, simple or compound, base of petiole sometimes sheathing. Flowers sessile, usually many in heads, surrounded by a calyx-like involucre of bracts; bracteoles 0, or of scales or bristles on the receptacles. Flowers 1-2 sexual, sometimes dœcious, all alike and tubular or ligulate, or outer (ray-florets) ligulate and inner tubular. Calyx superior, limb reduced to a ring of hairs or scales or 0. Corolla gamopetalous, tubular or campanulate with 2-5 lobes, or ligulate, or somewhat bilabiate. Disk epigynous. Stamens 4-5, inserted on the corolla tube; anthers basifixed, united into a tube. Ovary inferior, 1-celled, ovule solitary, erect; style slender 2-fid. Fruit dry, indehiscent (cypsela), naked or crowned by the hairy or scaly calyx (pappus), exalbuminous.

The family is of little forest importance within our area, most species belonging to it being herbaceous.

VERNONIA, *Schrub.*

Herbs, shrubs, rarely small trees or climbers. Leaves alternate, often toothed. Heads homogamous, terminal or axillary, solitary, or panicled. Florets purple, tubular, involucral bracts in many series, inner longest. Corollas all equal, lobes 5, narrow. Anther base usually obtuse; style arms subulate. Fruits truncate, usually angled, striate or ribbed. Pappus of many hairs, often with an outer ring of short hairs or bristles.

1. Vernonia Roxburghii, *Less.*

An erect undershrub or a herb, 3-4 ft. high, with striate hairy stem. Leaves 3-7 by 1-3 in., subsessile, obovate or oblanceolate apex, acute, or acuminate, sharply serrate, prominently nerved, base narrowed to the very short petiole. Heads purple ·5-·75 in. across, few and terminal, or in corymbose panicles; involucral bracts in several series; outer smallest, subulate, inner, linear-oblong, obtuse and mucronate or acuminate. Corolla tubular, all equal; anther bases obtuse. Achenes ribbed, pubescent. Pappus dirty-white.

In sal forests from Pilibhit to Gorakhpur, Bundelkhand—*Duthie.*

Fl. September—February.

2. Vernonia anthelmentica, *Willd.* Vern. *Kalazira.* Sans. *Somaraja, vakuchi.*

A coarse pubescent annual about 2-3 ft. high. Leaves 3-8 in. long, elliptic-lanceolate or obovate, coarsely serrate. Heads purple, ·6-·7 in. long, several together in each peduncle, often subcorymbose with long stalks. Bracts linear-oblong, apiculate, exposed portion green, scarious below. Achenes ·15 in. long, truncate, black hairy. Pappus of reddish, or dirty-white hairs with an outer row of short scales.

Generally found near villages.

Fl. September-December Fr. cold season.

Inula Cappa, *DC.*

An undershrub, sometimes shrubby and up to 8 ft. in height. Leaves 3-6 by ·7-2 in., alternate, oblong-lanceolate, distantly cuspidate, serrate, thick, upper-surface pubescent with adpressed bulb based hairs, under-surface woolly, lateral nerves 8-12 pairs or more, petiole up to 4 in. long. Heads about ·2 in. across, in much branched terminal and axillary, often corymbose, panicles. Involucral bracts linear, ending in a sharp point, stiff, in many series, outer smallest, pubescent outside. Receptacle pitted. Florets pale-yellow, mostly tubular, ray-florets obscure. Cypsela ·05 in. long, pubescent. Pappus of dirty-white feathery hairs. ·15-·25 in. long.

Gonda, Gorakhpur, in sal forests, probably in other Oudh Divisions and Pilibhit also.

Fl. October-December.

Echinops echinatus, *Roxb.* Globe thistle. Vern. *Gokhru.*

A much branched rigid annual up to 3 ft. high, stems branched woolly. Leaves up to 5 in. long, sessile, oblong, pinnatifid, lobes spinose, under-surface cottony. Heads 1-flowered, arranged in a globose ball, 1-2 in. across, with a common involucre of spinose bracts, one or two of the bracts of involucels produced into long sharp spines. Florets purplish-white. Cypsela ·15 in. long, obconic, silky villous, surrounded by the hardened inner involucel bracts.

A common waste-land weed. Fl. hot season.

Cnicus arvensis, *Hoffm.* Creeping thistle.

A cottony weed about 2 feet high with a perennial creeping rootstock. Leaves 3-5 in. long, sessile, obovate or oblong, spinous, sinuate or pinnatifid. Heads diœcious, pedunculed, numerous, homogamous, purple or lilac. Involucral bracts broad, lanceolate outer ending in spines. Cypsela smooth.

A very common weed in new clearances and cultivated ground all over the area.

Fl. February-May.

Ageratum conyzoides *Linn.*

A softly hairy annual weed often gregarious. Lower leaves opposite, ovate, crenate, petiolate, usually 1-3 in. sometimes up to 5 in. long. Heads light-blue, rarely white ·2 in across, in dense corymbs. Fruit black, angled with a pappus of 5-awned scales, connate below.

Introduced. It has now become a common weed of waste-lands and fields in moist situations.

Fl. mainly in the rainy season.

XLIII.—PLUMBAGINACEÆ.

Herbs, undershrubs or shrubs. Leaves alternate, sometimes radical and in rosettes. Stipules 0. Flowers 2-sexual, regular, pentamerous, bracts rigid, with scarious margins; bracteoles 2. Calyx inferior, gamosepalous, often tubular, 5-10-ribbed, usually scarious, persistent. Corolla hypogynous, gamopetalous, or petals almost free; salver-shaped. Stamens 5, opposite the corolla lobes or petals; filaments nearly free or adnate to the base of the corolla. Ovary free, 1-celled; ovule 1; pendulous from a long basal funicle, styles 5, free or more or less connate below. Capsule included within the calyx, membranous.

PLUMBAGO, *Linn.*

Plumbago zeylanica, *Linn.* Vern. *Chitri.* Sans. *Chitraka.*

A weak shrub, with glabrous, striate, herbaceous branchlets. Leaves 1·5-4.5 in. by ·8-2·2 in. ovate, acute, entire, lateral nerves rather obscure, tertiaries, finely reticulate, base abruptly cuneate and running into the margined petiole which is amplexicaul and sometimes auricled at the base. Flowers white ·5-1 in. long, subsessile in glandular pubescent, spicate racemes, which are 2-6 in. long, terminal or axillary, sometimes branched. Lower bracts leafy; bracteoles ovate-acuminate, shorter than the calyx. Calyx free, tubular covered with sticky stalked glands, persistent, 5-toothed. Corolla about twice the calyx, hypocrateriform, lobes oblong, apiculate. Stamens 5, hypogynous; filaments equalling the corolla-tube, dilated at the base; anthers purple. Ovary tapering at the apex; style slender; stigma divided into 5 slender branches. Capsule enclosed within the calyx and nearly equalling it in length, oblong, apiculate, with membranous walls, circumsciss at the base and splitting upwards into 5 valves.

Apparently naturalized if not truly wild in many parts of our area; e. g., Kheri, Bahraich, Jhansi also in the Afforestation Division.

The root is used in medicine; it is said to be useful for dyspepsia, piles, diarrhœa, skin diseases, etc. It is believed to be caustic and vesicant.

Fl. principally May-November.

Plumbago capensis, *Thunb.*, with blue flowers is often cultivated in gardens within our area.

XLIV.—MYRSINACEÆ.

Trees or shrubs, sometimes scandent. Leaves alternate, simple, usually gland-dotted, exstipulate. Flowers regular, 2-sexual or polygamous, dioecious. Calyx inferior, or more or less adnate to the ovary (Mæsa) 4-6-often 6-lobed, persistent and sometimes enlarging in fruit. Corolla tube short or none, segments 3-7 usually 5, contorted or imbricate. Stamens as many as corolla lobes and opposite them; filaments short, free, or more or less connate; anthers opening longitudinally or by terminal pores, sometimes connate. Ovary 1-celled, superior (½-inferior in Mæsa), stigma simple, rarely shortly-lobed, ovules few or many on a free central placenta. Fruit usually indehiscent, baccate. Seeds usually albuminous.

Leaves coarsely toothed, sec. nerves prominent. Flowers small, white; ovary ½-inferior; seeds many. Erect shrubs..	1.	*Mæsa.*
Leaves entire or serrulate, thin, sec. nerves distinct. Flowers minute, greenish; ovary superior; seed 1. Straggling or subscandent shrubs.	2.	*Embelia.*
Leaves always entire, fleshy, sec. nerves obscure. Flowers pink, middle sized; ovary superior; seed 1. Erect shrubs..	3.	*Ardisia.*

1. MÆSA, *Forsk.*

Mæsa indica, *Wall.*

A large shrub up to 15 ft. high, with pale-brown bark and straggling branches; twigs covered with lenticels with age; young parts glabrous. Leaves 3-5·5 by 1-2 in., lanceolate, ovate or oblong to elliptic-lanceolate, acuminate, distantly and coarsely toothed, thin but somewhat tough, glabrous, under-surface paler, lateral nerves 5-10 pairs, impressed above; petiole ·3-·5 in. long, channelled. Flowers white, scented, up to about ·2 in. across in simple or branched axillary racemes, 1-3 in. long; pedicels minute; bracts minute, acute. Calyx minute, tube more or less adnate to the ovary lobes 5, ovate, obtuse or subacute, pubescent, ciliolate. Corolla twice the length of calyx lobes—about ·15 in., tube very short lobes impricate, round. Stamens 5 on the corolla tube; filaments, short anthers broad, dorsifixed. Ovary half inferior; ovules many; style short, persistent in fruit, obscurely lobate. Fruit a round berry about ·15 in. across, crowned by the calyx lobes, pinkish and succulent when ripe.

Rare: Pilibhit (Nakhatal).

Flowers mainly December-March. The leaves are sometimes slightly pubescent beneath but this form has not been so far found in our area. Carl Metz in Das Pflanzenreich divides M. indica, *Wall* into several species and calls the form found in our area, M. Martiana, *Metz.*

2. EMBELIA, *Burm.*

Embelia robusta, *Roxb.* Vern. *Baibirang, bhabirung.*

A large scrambling shrub with rusty pubescent, rather stout, lenticellate branchlets. Leaves 2-5·7 in. by 1·2-3·2 in. obovate or elliptic, usually short acuminate, sometimes serrulate, membranous, more or less rusty, often stellately-pubescent beneath, specially along the nerves, lateral nerves 6-12 pairs, prominent, base narrowed; petiole up to ·7 in. long, channelled rusty pubescent and glandular. Flowers small, polygamous, ·2 in. across, greenish in axillary or terminal pubescent racemes, often fascicled, 1·3-5 in. long; pedicels about ·1 in. long, glandular, bracts minute, setaceous. Calyx persistent free, deeply 5-fid, lobes ovate, acute, gland ciliate, black-dotted. Petals 5, double the calyx in length, free or slightly connate, oblong, apex tapering and reflexed with black gland dots outside, minutely papillose inside. Stamens 5, adnate to the base of the petals, anthers broad-ovate minutely apiculate. Ovary superior, ovules few, embedded on a globose placenta; style short, persistent. Fruit about ·15 in. across, globose, dry, indebiscent red when ripe, with many longitudinal furrows, seed 1.

Throughout the area in open forests.
Bark fairly smooth brown Blaze pinkish-brown.

Fl. rainy season, but occasionally at other times also. Fr. Cold season. The fruits are said to be used for adulterating black pepper. The young leaves in combination with ginger are said to be used as gargle in cases of sore throat.

E. villosa, *Wall.* is a much more hairy plant; undersurface of the leaves are more pubescent; racemes are longer than the leaves and the flowers are tetramerous. There is a specimen from Kheri at Dehra Dun herbarium which has been included under this species with a query. It is doubtful if this specimen represents anything more than a form of E. robusta.

3. ARDISIA, *Swartz.*

Ardisia solanacea, *Roxb.* Syn. **Ardisia humilis,** *A. DC.* Vern. *Mujrawa bhakmal.*

A large glabrous evergreen shrub with tawny striate bark. Leaves collected at the ends of the branches, 3·5-8 in by 1·3-3·5 in., obovate or oblanceolate shortly acuminate or acute, entire coriaceous, rather fleshy, cuneate at the base and running into a short-margined and channelled petiole ·25-1 in. long. Flowers pink or pinkish-white, ·5-·8 in. across, waxy, in long peduncled contracted or corymbose racemes, 1-3·5 in. in length. Pedicels ·4-·8 in. long; bracts caducous, ovate; buds conical. Calyx 5-cleft nearly to the base; lobes round, obtuse, gland-dotted, margin thin, ciliate ·2 in. long. Corolla deeply 5-lobed, rotate, twisted to the right in bud; segments ovate-acute, gland-dotted. Stamens 5, yellow, adnate to the base of the corolla, filaments short, anthers acute. Ovary free, tapering at the apex; style free, persistent in fruit; stigma minute. Fruit about ·3-·5 in. across, succulent, black when ripe, depressed globose, pulp, pinkish. Seed 1, striate, excavate at the base.

Pilibhit to Gorakhpur usually in damp shady places.

Blaze reddish-brown, inner layers with darker, fine anastomosing lines.

Fl. almost throughout the year but principally March-April. Fr. cold season.

XLV.—SAPOTACEÆ.

Trees or shrubs, often with milky juice; young parts usually rusty tomentose. Leaves usually alternate, coriaceous, entire, petiolate, stipules 0, or caducous. Flowers 2-sexual, usually in axillary fascicles, or from old leaf scars, rarely panicled; bracts and bracteoles 0, or minute. Calyx lobes 4-8, much imbricated, or in two series, outer series valvate, persistent, Corolla tube shorter than the calyx, lobes as many or 2-4 times as many as those of the calyx. Stamens inserted on the corolla tube, 1-3 times as many as the corolla lobes, in as many series or some reduced to staminodes; filaments usually short; anthers oblong-lanceolate, connective often produced; staminodes alternating with the stamens. Ovary superior, 2-12-celled; style linear. Ovules solitary in each cell, usually attached to the inner angle. Berry 1-8-seeded. Seeds ellipsoid or compressed with crustaceous testa, albuminous or exalbuminous.

Calyx segments 4-5, petals less than 14	staminodes 0. .. .	*Bassia.*
Calyx segments 6-8, petals 18 or more	staminodes 6-8. .. 2.	*Mimusops.*

1. BASSIA, *Kœn.*

Trees with milky juice. Leaves crowded towards the ends of branches, coriaceous; stipules caducous. Flowers axillary, or from the axils of fallen leaves, in fascicles. Calyx segments usually 4, the two outer valvate and enclosing the inner pair, rarely 5. Corolla urceolate or campanulate; lobes usually 8-10, sometimes fewer or more, contorted in bud. Stamens more than twice the number of corolla lobes, usually 16-20, sometimes more; anthers acute, lanceolate, connective often produced. Ovary 4-12, usually 6-8-celled. Berry globose, or ovoid, fleshy; seeds 1-3, rarely more, albumen 0; cotyledons fleshy.

Corolla tube fleshy; anthers subsessile. .. .. 1. *B. latifolia.*
Corolla tube not fleshy; anthers short-stalked. .. 2. *B. butyracea.*

1. **Bassia latifolia,** *Roxb.* The Mahua tree. Vern. *Mahua.* Sans. *Madhuka.*

A large deciduous tree, bark dark-grey, nearly black with vertical cracks, and horizontal wrinkles. Young parts pubescent. Leaves clustered at the ends of the branches; 5-9 by 2·5-4 in., elliptic-obovate to-oblong, shortly acuminate, base rounded or acute, coriaceous, lateral nerves 10-14 pairs, glabrous above, pubescent when young, glabrescent with age beneath; petiole 1-1·5 in. long. Flowers densely clustered at the ends of the branches on rusty villous shoots; pedicels drooping 1-1·5 in. long, rusty pubescent. Calyx divided nearly to the base, lobes 4, the two outer enclosing the inner; all elliptic or oblong, rusty tomentose, about ·5 in. long. Corolla ·6-·8 in. long, cream-coloured, succulent, sweet; tube ovoid-urceolate; lobes usually 8-9, sometimes up to 14, elliptic or narrow-elliptic, erect. Stamens 20-30, usually 24-26. Anthers 3-seriate, subsessile, pointed at the apex, hairy on the back; style 1 in. or more in length, hairy at the base, persistent. Berry 1-2 in. long, ovoid, fleshy, green. Seeds 1-4 about ·5 in. long.

All over the area, also commonly cultivated.
The flowers are collected and eaten raw or cooked. A spirit is also manufactured from them. The fruit is eaten and an oil is extracted from the seeds which is used for cooking and adulterating *ghee.* The oil cake is employed as an emetic. The heart-wood yields timber suitable for constructional purposes. The timber is locally valued for planking in the Eastern Divisions.

Blaze pink or red and white, exuding latex, fibrous.
Fl. March-April. Fr. June-July. Leafless February-April.

2. **Bassia butyracea,** *Roxb.* Vern. *Cheola, phulwa.*

A large deciduous tree; bark dark-brown or greyish, more or less rough on old trees. Leaves 5·5-12 in. by 3-7 in. obovate or obovate-oblong, acute or obtuse, coriaceous, glabrous above usually tomentose beneath, lateral nerves 14-20 pairs; petiole up to 1·2 in. long.

Flowers with an offensive odour; pedicels drooping, tomentose, 1-1·5 in. long, crowded from below the terminal leaves. Calyx deeply 5-cleft, coriaceous, rusty tomentose, lobes ·3-·5 in. long, imbricate, elliptic, sub-acute. Corolla pale-yellow, caducous; tube about ·7 in, long, cylindric not fleshy; lobes 8-10, spreading, oblong. Stamens 30-46, inserted at the mouth of the corolla tube, filaments nearly as long as the anthers, glabrous; anthers not hairy. Ovary 7-9-celled. Berry ovoid, 1-3 in. long, 1-3-seeded.

Gonda, Bahraich—rare.

The seeds yield a vegetable butter which is eaten and also used medicinally. The flowers are boiled into a sweet *gur*-like substance which is prized in Kumaun. The oil-cake and the fruits are eaten.

Blaze pink, upper layers yellowish-brown, exuding milky juice, fibrous.

Fl. November-January Fr. Rainy season.

2. MIMUSOPS, *Linn.*

Mimusops hexandra, *Roxb.* Vern. *Khirni.*

A handsome evergreen, umbrageous tree, bark dark-grey, rough, irregularly fissured, peeling off in oblong plates. Leaves 2-6 by 1-2·5 in., oblong or obovate, obtuse and emarginate at the apex, coriaceous, glabrous, dark-green and shining above, paler beneath, midrib impressed, secondary nerves fine, subparallel up to about 20 pairs; petiole up to ·5 in. long, glabrous. Flowers white, about ·3 in. across axillary, solitary or fascicled. Pedicels stout about ·3 in. long. Calyx deeply partite; lobes 6, outer series of 3 valvate, enclosing the three imbricate lobes, rusty pubescent, ovate, subacute, tips reflexed. Corolla ·25 in. long; tube short; lobes 18 in two series, the outer 12 linear or oblong; inner 6, obovate. Stamens 6, inserted at the base of the corolla and opposite the inner petals; filaments short; anthers acute; staminodes 6, alternating with the stamens more or less toothed. Ovary hairy, 12-celled. Berry about ·5 in. long, orange when ripe, cylindrical.

Usually planted, often naturalized.

The bark is valued in Indian medicine. The fruits are eaten. The seeds yield an oil. The timber is durable, hard and tough and is used in turnery and house-building.

The outer petals are regarded by some authorities as ligules according to whom there is a single whorl of petals.

Blaze pink, exuding latex about 1-1.25 in.

Fl. November-December. Fr. April.

Mimusops Elengi, *Linn.* Vern. *Maulsari.* Sans. *Bakul.* A middle-sized ornamental tree with dark grey, almost black bark. Leaves 3-4 in. long oblong acuminate, smooth dark glossy green above; petiole adout 1 in. long. Flowers heavily scented, star-shapen axillary. Fruits orange when ripe, edible. It is often cultivated in gardens in our area. The flowers retain their perfume even a long time after drying and are used in Indian perfumery.

XLVI.—EBENACEÆ.

Trees or shrubs. Leaves alternate, rarely opposite, exstipulate, entire. Flowers axillary, usually diœcious, regular, solitary or in short bracteate cymes; pedicels often articulate under the flower. Calyx inferior, gamosepalous, often accrescent in fruit, lobes 3-7. Corolla gamopetalous, lobes 3-7, usually contorted. Stamens as many as, or 2-3 times as many as the corolla lobes: inserted at the base of the corolla, free or the filaments paired or variously united; anthers basifixed, connective often produced. Staminodes in the female flowers resembling stamens, or 0. Ovary superior; styles 2-8, cells 2-16, imperfectly septate; ovules 1-2 in each cell, attached to the inner angles by the cells, pendulous. Fruit usually a berry with coriaceous pericarp, 1-few-seeded. Seeds pendulous, compressed; testa thin, albumen copious, sometimes ruminate.

DIOSPYROS, *Linn.*

Trees, rarely shrubs. Flowers diœcious, very rarely polygamous; males mostly in 3 or more flowered cymes; females solitary, usually 4-5-merous. Calyx accrescent and often hardened in fruit, deeply 4-6-lobed. Corolla tubular, salver-shaped or campanulate, lobes twisted to the right. *Male flowers.*—Stamens 4-many, usually 16; filaments often in pairs: pistillode usually present. *Female flowers.*—Staminodes 0-16. Ovary 4-10-celled, ovule 1, rarely 2 in each cell; styles 1-4. Berry globose, ovoid or ovoid-conic; supported by the enlarged calyx, pulp often viscid. Seeds oblong.

Leaves always alternate; albumen uniform :—

A. Stamens 16; fruits not scurfy tomentose :—

1. Ovary glabrous; corolla puberulous or glabrescent outside :—

Leaves more or less membranous: bark dark, rough. A crooked spinescent tree or shrub .. 1. *D. cordifolia.*

Leaves coriaceous when mature. Bark smooth, a tall graceful tree, not spinescent.. .. 2. *D. montana.*

2. Ovary tomentose; corolla densely silky, tomentose outside. .. .. 3. *D. Holeana.*

B. Stamens usually more than 20, fruits scurfy, tomentose .. .. 4. *D. Embryopteris.*

II. Leaves alternate and opposite; albumen ruminate .. 5. *D. tomentosa.*

1. **Diospyros cordifolia,** *Roxb.* Vern. *Bistendu, kairkuha, bhaktendu.*

A small deciduous crooked tree or large shrub often spinescent; spines sometimes bearing leaves. Bark dark-grey, almost black, rough; young parts and inflorescence pubescent. Leaves alternate, 1-4 by ·4-1·5 in., oblong or ovate, apex acuminate to obtuse, base cordate or rounded thin, softly pubescent or glabrescent; petiole up to ·2 in. long. *Male flowers.*—About ·25 in. long, whitish, in axillary

bracteate, pedunculate cymes, which are ·2-·3 in. long and 3-flowered; pedicels minute. Calyx pubescent, deeply 4-lobed, lobes rounded; corolla conical and twisted in bud; tube campanulate, urceolate; lobes ovate, tapering. Stamens 16, in. 8 pairs, outer of each pair longer; anthers pubescent. *Female flowers.*—·35-45 in. across and about ·3 in. long, white, solitary, peduncles up to ·4 in. long with a pair of bracts below the flower. Calyx deeply divided, accrescent in fruit, pubescent ·5-·6 in. across; lobes about ·3 in. long, oblong-ovate with sub-acute tips. Corolla larger than in the male flowers; lobes 4; staminodes 8-13. Ovary glabrous 8-celled; styles 4. Fruit globose ·8-1 in. in diameter; yellow when ripe; seated on the leathery calyx; the enlarged sepals are acuminate and about ·4 in. long.

Gonda, Bahraich, Jhansi, Banda and also Etawah; not common.
Blaze yellowish-brown, darkening on exposure.
Fl. and Fr. March-May.

2. Diospyros montana, *Roxb.* Var. grandis. Syn. **D. Kanjilali,** *Duthie.*

A middle-sized to tall tree with an elongated trunk and a small open crown, and greenish or ashy-grey smooth bark exfoliating in large flakes; young parts pubescent. Leaves 1·5-6 by 1-3 in., elliptic-lanceolate to oblong, elliptic, or ovate, obtusely acuminate or acute at apex, rounded or obtuse at the base, softly pubescent when young, ultimately glabrescent and rigidly coriaceous, lateral nerves indistinct; petiole 1·5-4 in. long. *Male flowers.*—In short peduncled, usually 3-flowered, axillary cymes; peduncles up to ·4 in. long; bracts minute, ovate-oblong ciliate. Calyx up to ·25 in. long, deeply 4-cleft; lobes ovate-oblong, rounded, pubescent on both surfaces. Corolla greenish-white, ·2-·3 in. long, puberlous outside, conical in bud with twisted lobes, urceolate after expansion; lobes oblong, obtuse, shorter than the tube, margins often minutely ciliate. Stamens 16, in pairs, united below, apiculate. *Female flowers.*—Axillary, usually solitary, on short peduncles which are about ·25 in. long. Calyx pubescent on both the surfaces; lobes ·2-·3 in. long, spreading ciliate on the margin. Corolla ·3 in. long, greenish, otherwise as in the male flowers. Staminodes usually 8, in two series, alternately long and short, the longer toothed near the acuminate apex, shorter ones obtuse. Ovary 8-celled; styles 4, each lobed at the top. Fruit up to 1 in. long, sub-globose, often tapering to the top. Seeds usually 8, about ·5 in. long, curved, somewhat compressed, albumen uniform.

Throughout the area on fresh soil, nowhere common.
Blaze pale-yellow with green edges, turn darker on exposure, soft about ·3 in.
Fl. March-April. Fr. May.
Our tree differs from D. montana as defined by Roxburgh in being constantly spineless and having fewer-flowered cymes and larger number of staminodes. Duthie bases his record of D. montana *Roxb.* on Edgeworth and Mrs.

Bell's sheets from Bundelkhand. I have seen no specimen of D. montana proper from our area at Dehra. The plant here described seems to occupy an intermediate position between Roxburgh's D. cordifolia and D. montana. Further field observations are necessary for ascertaining if it deserves a specific rank. It is easily recognized in the field.

4. **Diospyros Holeana,** *Gupta and Kanjilal.*

A medium-sized tree with dark, rather rough bark which exfoliates in small plates, and silky pubescent buds. Leaves 4-7 by 1·5-3·5 in., oblong or oblong elliptic, acuminate, cuneate to obtuse at the base, coriaceous, glabrous, secondary nerves, obliquely ascending rather indistinct, nervules closely reticulating; petiole ·15-·3 in. long. *Male flowers.*—About ·5 in. long, subsessile fascicled on very short rusty pubescent peduncles which are ·1-·15 in. long. Calyx brown, pubescent, cup-shaped; teeth 4-5 acute, ciliate. Corolla tubular ·4-·5 in. long, densely silky pubescent outside, glabrous within; lobes short, 4-5, ovate, acute, about ·1 in. long. Stamens 16, in. pairs, connate below and inserted at the base of the corolla; anthers linear, pubescent, apiculate; pistillode rudimentary, villous. *Female flowers.*—Solitary, in the axils of leaves, subsessile, often with a ring of silky hairs at the insertion. Calyx broadly cup-shaped, about ·5 in. across; lobes 4-5 broadly ovate-acute, somewhat auricled, at the base, adpressed silky. Corolla ·6 in. long, urceolate, densely brown silky pubescent, lobes 4-5, ovate acute, recurved; staminodes pointed at the apex. Ovary villous, 6-celled; styles 3. Fruit about 1·2 in. across, globose, seated on the accrescent calyx.

Gonda (Sungarah) Nepal frontier; rare.

Resembles D. Embryopteris *Pers.*, when not in flower or fruit. It differs mainly by the more pubescent flowers, fewer stamens, villous ovary and glabrescent fruits.

Hitherto only unripe fruits have been examined, the albumen is distinctly uniform.

Fl. April-May. Fr. January.

5. **Diospyros Embryopteris,** *Pers.* Vern. *Gab, kala tendu.* Sans. *Tinduka.*

A medium-sized handsome, evergreen tree with short trunk and spreading branches forming a low, compact crown. Bark dark-grey, almost black, nearly smooth. Leaves distichous, 4-8 by 1·2-2·5 in., oblong, obtuse acuminate, sub-acute or acute, thickly coriaceous, dark glossy green and smooth, secondary nerves fine, many, obliquely ascending, rather indistinct, base rounded; petiole wrinkled, often twisted, ·25-·5 in. long. Flowers 4-merous, white or cream, scented. *Male flowers.*— In short pedunculate, rusty pubescent, 2-7 flowered cymes; peduncles ·3-·5 in. long. Calyx ·25 in. long, silky pubescent, lobes 4, broadly ovate, pubescent within, margins ciliate. Corolla ·3-·4 in. long, broadly tubular, lobes thick rounded; stamens many, in pairs at the base of the cor. tube; anthers linear, with a line-

of hairs up to the middle. *Female flowers.*—Usually solitary, drooping, about 1 in. across when fully open; peduncles pubescent about ·3-·7 in. long, stout. Calyx pubescent outside, deeply divided, lobes broadly ovate, subcordate, acute or subacute, about ·6 in. long; corolla campanulate about .5 in. long, deeply divided; lobes cordate, obtuse, recurved; staminodes up to 12. Ovary 8-celled, glabrous; styles 4 lobed at the tips. Fruit subglobose, 1·5-2·5 in. across, covered with rusty scurf, yellowish when ripe, supported on the much enlarged leathery calyx; seeds 4-8 imbedded in a glutinous pulp, compressed; albumen smooth.

South Kheri, Banda, in swampy ground, sometimes cultivated in gardens.

The pulp of the unripe fruit is used as an adhesive, also for caulking the seams of boats. An infusion of the pulp is used for rendering fishing nets more durable. The bark and the seeds have astringent properties and are used for medicinal purposes. An oil extracted from the seeds is used for diarrhœa and dysentery. The ripe fruits are edible, but are too astringent to be palatable.

Blaze reddish-brown ·5-·75 in.

Fl. June-August. Fr. Next April. Young leaves in April, bright red.

5. Diospyros tomentosa, *Roxb.* Vern. *Tendu.*

A medium-sized deciduous tree; bark dark-grey, almost black, rough, fissured, exfoliating in small oblong plates. Young parts and inflorescence densely rusty or grey tomentose. Leaves sub-opposite or alternate, 3-8 by 2-5 in., broadly ovate, oblong or elliptic, base usually rounded apex sub-acute to obtuse, coriaceous, glabrous above; undersurface at first tomentose, ultimately glabrescent, secondary nerves 6-10 pairs distant, impressed above; petiole ·3-·5 in. long. *Male flowers.*—·4 in long, shortly stalked or subsessile, in peduncled simple or branched cymes; peduncles usually, ·5-·7 in. long. Calyx ·15-·2 in. long, funnel-shaped, densely tomentose; teeth short-acute. Corolla twice the calyx, tubular, villous outside, lobes short; stamens 12-16; anthers mucronate, pilose along the connective. *Female flowers.*—·5 in. long, solitary, subsessile, on very short, stout peduncles. Calyx deeply-lobed, ·3-·4 in. across, densely woolly, lobes ovate, margins reflexed. Corolla urceolate, villous, larger than in the male flowers; staminodes 8-10, or fewer, sometimes connate in pairs. Ovary hairy, 4-8-celled; styles 2-3. Fruit globose or ovoid, yellow and smooth when ripe; seeds 4-8, in some forms 1-2; albumen ruminate.

Throughout the area, common. The ordinary wood is fairly durable and tough. In some large trees irregular masses of ebony are sometimes found. The fruits are edible. It spreads itself readily by root-suckers.

The 1-2-seeded form has been recorded from Banda. I have not seen any flowering specimens. Further studies in the field are necessary to ascertain to what extent other characters differ.

Fl. May-June. Fr. April-May next year.

XLVII.—STYRACÆ.

Trees or shrubs. Leaves alternate, simple, exstipulate. Flowers regular usually hermaphrodite and white, arranged in axillary or terminal, simple or compound racemes or spikes; bracts small, obsolete.

Calyx campanulate, more or less adnate to the ovary; limbs persistent, usually 5, rarely 4-lobed or truncate. Corolla usually 5-partite; segments almost free, imbricate. Stamens more or less adnate to the petals, indefinite, or twice as many as the petals, often in bundles, those of the outer series longer; filaments free or connate. Ovary inferior or ½-inferior, 2-5-celled or septa not reaching the apex of the ovary; stigma capitate, entire or obscurely lobed; ovules usually 2 in each cell pendulous from the inner angle. Fruit drupaceous. 1, rarely more, seeded; seeds albuminous.

SYMPLOCOS, *Linn.*

Symplocos racemosa, *Roxb.*

An ever-green shrub or a small tree. Bark grey, rough or pale yellowish and smooth when young, often with irregular horizontal wrinkles; young parts pubescent or villous. Leaves 3-7 by 1·25-2·2 in., oblong-lanceolate or elliptic-oblong, obtusely acuminate or subacute at the apex, base cuneate or rounded; serrulate, obscurely crenulate or almost entire, coriaceous, glabrous above, usually puberulous along the midrib beneath, lateral nerves distant and rather indistinct, 6-10 pairs; petiole ·35-·75 in. Flowers white, turning yellow, fragrant ·35-·5 in. across, short petioled, in axillary and terminal pubescent spicate, sometimes branched racemes up to 4 in. long; bracts ovate, silky; pedicels stout, ·05 in long. Calyx glabrous; lobes 5, rounded, almost equalling the tube, ciliate. Corolla 5-partite, much exceeding the calyx; petals elliptic-oblong. Stamens numerous; filaments connate; disk pilose; ovary inferior, 3-celled; style extended; stigma slightly dilated. Drupe ·3-·5 in. long, purplish black when ripe, cylindric oblong, crowned with the calyx lobes, obscurely ribbed when dry; seeds 1-3.

Gorakhpur, Gonda, Bahraich. The bark and leaves are said to be used in dyeing.

"The bark is medicinal and is said to have special action upon relaxed mucous membrane"—*Dr. K. L. Dey.*

Blaze pale-yellow brownish towards the surface edges green, ·3 in.

The leaves turn yellowish green on drying.

Fl. February-March. Fr. hot season.

XLVIII.—OLEACEÆ.

Trees or shrubs, often climbing. Leaves usually opposite, simple or imparipinnate, entire or toothed; stipules 0. Flowers regular, 2-sexual, polygamous or sometimes dioecious, arranged in terminal or axillary cymes, sometimes panicled, racemose or fascicled. Calyx small, inferior, truncate, 4 or more lobed. Corolla gamopetalous; petals sometimes almost free, usually 4, sometimes 5-9 or 0, valvate or imbricate in bud. Stamens 2, epipetalous or hypogynous if corolla is absent, or petals free; filaments short. Ovary free 2-celled; stigma

simple, or 2-lobed. Ovules usually 1-2 in each, attached to the inner angle near the base or the apex. Fruit capsular, baccate, or drupaceous. Seeds 1, or less often 2, in each cell, erect or pendulous, albumen present or 0.

I. Petals imbricate in bud. Corolla lobes often more than 4 :—
  A. Fruit baccate :—
    Shrubs, mostly scandent; leaves compound or simple; fruit often lobed. .. .. .. 1. *Jasminum*
  B. Fruit capsular :—
    Capsule thin-walled, compressed; leaves simple; shrub or a small tree. .. .. .. 2. *Nyctanthes.*
    Capsule woody, pyriform, leaves compound. A moderate-sized to large tree. .. .. 3. *Schrebera.*

II. Petals valvate in bud :—
  Corolla lobes 4 or less :—
  Fruit drupaceous; leaves simple. .. .. 4. *Linociera.*

1. JASMINUM, *Linn.* The Jasmines.

Erect or scandent shrubs. Leaves usually opposite, simple or imparipinnate; petioles often articulate when simple. Flowers mostly fragrant in terminal or axillary cymes, rarely solitary. Calyx 4-9-fid or -partite. Corolla salver-shaped, white or yellow, imbricate in bud, lobes 4-10 or more, spreading. Stamens 2; anthers subsessile, connective usually mucronate. Ovary 2-celled; style cylindric, short; stigma 2-lobed or simple. Berry didymous, or simple by abortion; seeds solitary in each carpel, exalbuminous, erect.

I. Leaves all simple :—
  A. Leaves ovate, subscandent or climbing; calyx pubescent :—
    Cymes dense, flowers sessile or subsessile; calyx teeth nearly as long as the corolla-tube, mature leaves pubescent beneath. .. .. 1. *J. pubescens*
    Cymes lax; flowers pedicelled; calyx teeth shorter than half the length of the corolla tube. .. 2. *J. arborescens.*
  B. Leaves linear-lanceolate; undershrubs; calyx glabrous. 3. *J. brevipetiolatum.*

II. Leaves 1-3-foliolate .. .. .. 4. *J. auriculatum*

1. Jasminum pubescens, *Willd.* Vern. *Chameli.*

An evergreen subscandent branchy shrub or dextrorse climber, with rough pale-brown bark on old stems. Young parts softly tomentose. Leaves simple 1-3·5 by ·7-1·5 in., ovate, acute, or acuminate rounded or cordate at the base, glabrescent above with age, pubescent beneath especially on the nerves, lateral nerves 3-4 pairs, lowest pair sub-basal; petioles ·2-·4 in. long, densely tomentose, jointed near

the base. Flowers ·6-1·5 in. across, white, fragrant, sessile or nearly so in dense short cymes, which are axillary, short peduncled or terminal on dwarf lateral shoots. Peduncles sometimes 2-bracteate; bracts ovate. Calyx ·5-·6 in. long, brown tomentose, teeth 6-9, filiform, much exceeding the calyx tube and nearly as long as the corolla tube. Corolla sometimes tinged with pink. tube ·7-·8 in. long; lobes oblong-lanceolate, shorter than the tube. Fruit of 1 or 2 globose or elliptic carpels about ·5 in. long, black when ripe, surrounded by the long calyx teeth.

All over the area; often cultivated in gardens in the area. "Dried leaves soaked in water and made into poultice are used in indolent ulcers to generate healthy action."—*Indian Medicinal Plants.*

In a form cultivated in Bundelkhand the corolla-tube is much elongated and considerably exceeds the calyx lobes.

"The flowers are dimorphic both in size and length of styles"—*Haines.*

Fl. November-April, also sometimes in the rains.

2. Jasminum arborescens, *Roxb.* Vern. *Chameli.* Sans. *Madhavi, nava mallika.*

A large deciduous sub-erect or scandent shrub, bark rough pale brown, young shoots pubescent. Leaves 2·5-5 by 1·4-3 in., broad-ovate or ovate-lanceolate, shortly acuminate or acute, softly tomentose specially on the under-surface when young, glabrescent with age, rounded or subcordate at the base, main lateral nerves arcuate 6-8 pairs, lowest, pair sub-basal; petiole ·3-·8 in. long, articulate below the middle. Flowers white, fragrant, 1-1·5 in. across, in lax trichotomous pubescent cymes up to 2·5 in. long; pedicels ·2-·35 in. long, slender; bracts linear up to ·15 in. long. Calyx campanulate, pubescent, teeth unequal, linear, up to ·15 in long, 5 or more—often 5-6. Corolla usually 6-9 lobed, tube about ·5 in. long, lobes linear-oblong, acute or acuminate ·4-·6 in. long. Fruit usually of one carpel, ellipsoid, black when ripe.

All over the area. The juice of the leaves is said to be an emetic.

Fl. April-May. Fr. June-July.

The scandent form is VAR. latifolia, *Roxb.*, both forms are found in our area.

3. Jasminum brevipetiolatum, *Duthie.*

An undershrub or a shrub (?) sending from a woody root-stock stiff erect shoots. Leaves opposite or ternate, rarely sub-opposite, 2-5·5 by ·5-1 in., lowest very small, entire, linear-oblong or oblong-lanceolate, with stiff margins, sub-obtuse to acuminate, subcoriaceous, glabrous above, obscurely gland punctate beneath, main lateral nerves 6-10 pairs, oblique meeting within the margin in a more or less continuous line; petiole ·1-·2 in. long, articulated and usually curved upwards above the middle. Flowers white ·8-1·2 in. across, in

glabrescent, or puberulous peduncled cymes which are terminal, or form the axils of upper leaves; peduncles up to 1 in. long; cymes sometimes corymbosely panicled by the imperfect development or abortion of the leaves on lateral branches. Bracts minute, setaceous. Calyx nearly glabrous, campanulate, tube about ·15 in. long, teeth 5-6 linear, ·05-·2 in. long, unequal, erect. Corolla tube about ·5 in. long; lobes 6-10, ·4-·5 in. long, linear oblong, acute or subacute. Fruit usually of 1 carpel, ellipsoid about ·5 in. long, black when ripe.

Pilibhit and South Kheri.

Fl. April-May. Fr. June. The shoots are annual The leaves so far as could be judged from herbarium specimens, point upwards.

I have based the identification of this species on Duthie's sheets at Dehra-Dun herbarium, with which they exactly match, but in his Flora of the Upper Gangetic Plain, Vol. II, p. 23, he describes his plant as a shrub or small tree, while our plant—so far as I have seen it—, is undoubtedly an under-shrub with the habits of species like Grewia sapida, etc. I have not seen Haines' Jasminum strictum, but from his descriptions in the Kew Bulletin (No. 8, 1921) and his Flora of Bihar and Orissa (p. 525), it appears to be very closely allied to, if not identical with our plant. Does it occasionally become subarboraceous or a shrub, as described by Duthie, when it escapes burning?

4. Jasminum auriculatum, *Vahl.* Vern. *Jáhi.* Sans. *Kunda.*

A dextrorsely climbing shrub with striate and pubescent branches. Leaves 1-3-foliolate, often with two, usually very small leaflets, which are sometimes reduced almost to auricles; terminal leaflet ·7-2 by ·4-1·5 in., ovate or broad-ovate, acute or obtuse usually mucronate, rounded at the base, pubescent on both surfaces when young, glabrescent and dark-green with age except on the nerves beneath, main lateral nerves up to 4 pairs, lower close to the base, lateral leaflets up to ·3 in. long; petiole ·05-·2 in. long Flowers white, fragrant ·3 ·4 in. across, in terminal and axillary, grey pubescent, usually compound corymbose cymes; bracts linear about ·15 in. long, lower sometimes more or less leafy; pedicels up to ·2 in. long. Calyx campanulate, with minute, acute or obscure teeth. Corolla tube ·4-·5 in. long lobes up to ·3 in. long, oblong-elliptic. Ripe carpels usually ·2-·4 in. across, globose, black when ripe.

Etawah, Bundelkhand, cultivated in gardens within our area, when it is often bushy and suberect.

Fl. May-September. Fr. cold season.

The following are commonly cultivated in gardens within the area :—

Jasminum Sambac, *Ait.* Arabian or Tuscan Jasmine. Vern. *Bela, mogra* Sans. *Varshik i, mallikā.*

A erect (or scandent, if allowed to grow sufficiently), shrub, with simple broadly ovate to elliptic nearly glabrous leaves and heavily scented flowers (double in cultivation).

Jasminum grandiflorum, *L.* The Spanish Jasmine. Vern. *Chameli,* Sans. *Jahi. Jati*

A large scandent or subscandent shrub with imparipinnate leaflets, and white single flowers tinged with pink. The exquisitely perfumed flowers are much prized.

2. NYCTANTHES, *Linn.*

Nyctanthes Arbor-tristis, *Linn.* Vern. *Harsingar, seanri,* Sans. *Shephalika.*

A small deciduous tree, with brown or greyish rough bark. Branchlets rough pubescent, quadrangular. Leaves opposite, 3-5·5 by 1·5-2·7 in. ovate, acuminate, distantly toothed, or sometimes entire, very scabrid, coriaceous, with rounded, truncate or sometimes acute base, lateral nerves 4-6 pairs, distant; petiole ·-·5 in. long, chanelled above, rough. Flowers ·5-·7 in. across, sweet scented, sessile 3-7, together on hairy quadrangular peduncles of various lengths, which are arranged in cymes or cymose panicles; bracts elliptic, pubescent. Calyx-tube funnel-shaped, ·2-·3 in. long, pubescent; teeth obscure, ultimately falling off. Corolla tube ·3-·6 in. long, orange red; lobes white, 5-8, unequal, obcordate, contorted in bud; anthers 2, subsessile near the top of the corolla-tube. Ovary 2-celled; ovule 1 in. each cell; style cylindric shortly bifid. Capsule ·3-·5 in. long, orbicular, compressed, mucronate and often emarginate at the apex, 2-celled; pericarp, reticulate, leathery; seeds roundish, compressed, exalbuminous.

Throughout the area, usually on broken ground and banks, largely cultivated for the fragrant flowers.

"The expressed juice is given with a little sugar to children as a remedy for intestinal worms."—*Major Bose.* The leaves are also said to be useful for fever, rheumatism, and ascites. The flowers are used in perfumery, the orange tubes are used for dyeing. The leaves are sometimes used for polishing ivory. The flowers open in the evening and drop off next morning.

Blaze pale-yellow, streaked with fine darker lines, turning yellow-brown on exposure, ·25-·3 in.

Fl. August-October. Fr. February-March.

3. SCHREBERA, *Roxb.*

Schrebera swieteniolides, *Roxb.* Vern. *Ghont.*

A medium-sized deciduous tree, bark nearly smooth, pale-brown or grey, exfoliating in quadrangular plates which leave shallow pits. Young parts and inflorescence softly pubescent. Leaves 9-15 in. long, imparipinnate, rachis articulate, more or less pubescent; leaflets 3-7, sometimes 9, 2·5-6 in. by 1·5-3 in., ovate-lanceolate or oblong, usually bluntly acuminate, softly tomentose when young, glabrescent or

pubescent, when mature, base usually unequal, lateral nerves up to 8 pairs, rather distant; petiolules 0-·3 in. long, chanelled. Flowers white, fragrant about ·3 in. across and ·5 in. long, in terminal peduncled compound corymbose cymes, 3-6 in. long. Bracts short, linear, pubescent; pedicels short. Calyx funnel-shaped, truncate or inequally and minutely 4-6-lobed. Corolla hypocrateriform; tube ·5 in. long, lobes, 4-7 oblong, ciliate, ·15 in. long, with brown glands on the inner face. Stamens 2, inserted near the mouth of the corolla-tube; filaments short. Ovary 2-celled; stigma bifid; ovules 3-4 in each cell, pendulous. Capsule 2 in. long, pear-shaped, loculicidal, with raised white specks, 2-celled, with 3-4 winged exalbuminous seeds in each cell.

Bundelkhand.

The wood is brownish grey, tough and close grained and according to Gamble durable. It is hardly used at present. It deserves trial.

The stem is sometimes fluted at the base. Blaze brittle, yellow-brown or yellow, with darker streaks, which turn on exposure to reddish-brown, edges green, ·3-·5 in.

Leafless February-March. Fl. May-June, with new leaves. Fr. cold season.

4. LINOCIERA, *Swartz.*

Linociera intermedia, *Wight.* Var. Roxburghii, *Clarke,* (?)

A small evergreen tree, twigs, often lenticellate, brown. Leaves 4-8 in. by 1·5-2·2 in., oblong or lanceolate, shortly acuminate with tapering or cuneate base, subcoriaceous, lateral nerves weak, up to 14 pairs, glabrous; petiole ·5-1 in. long, swollen at the base. Flowers white, ·15 in. across, subsessile, in axillary and lateral pyramidal panicles up to 2·5 in. long. Bracts minute, lanceolate. Calyx 4-fid, glabrous; lobes ovate. Petals 4, slightly connate, in pairs, narrow-oblong, much exceeding the calyx. Stamens 2, attached to the base of the petals, filaments short. Ovary 2-celled, glabrous; ovules pendulous, 2 in each cell; style short; stigma bifid. Drupe about ·5 in. long, blue pruinose, when ripe.

Record based on Duthie's sheets from Gonda and Kheri in Dehra Dun herbarium, but the specimens are without flowers and fruit.

Fl. March-May. Fr. rainy season.

XLIX.—SALVADORACEÆ.

Shrubs or trees, unarmed or spiny. Leaves opposite, entire; stipules minute or 0. Flowers small regular, bisexual, or dicœcious, in racemes or panicled spikes. Calyx campanulate or ovoid, 2-5-lobed. Corolla gamopetalous, or of 4-5 free petals, imbricate or contorted in bud. Stamens 4-5 inserted on the corolla, or at the base of the petals; filaments free or connate. Ovary superior 1-2-celled; ovules erect, 1-2 in each cell; style short; stigma entire or 2-fid. Fruit a drupe or berry. Seed usually 1, albumen 0.

SALVADORA, *Linn.*

Unarmed shrubs or trees. Flowers small, sessile or pedicellate, bracts minute. Calyx campanulate 4-lobed, corolla deeply 4 cleft, imbricate or twisted to the right in bud. Disk of 4 glands, alternating with the filaments or 0. Ovary 1-celled; ovule solitary; style very short or 0. Drupe globose, supported by the persistent calyx and corolla; endocarp crustaceous.

Leaves ·6-1 n. broad; flowers short pedicelled.	1. *S. persica.*
Leaves ·3-·5 in. broad; flowers sessile.	2. *S. oleoides.*

Salvadora persica, *Linn.* Vern. *Kharjal.* Arab. *Ark.* Pers. *Darakht-i-misvak.*

A small evergreen tree or a small shrub, with deeply cracked rough grey bark, and drooping, terete, smooth and pale branches. Leaves 1-2·5 by ·6-1 in., elliptic-lanceolate or ovate, obtuse and often mucronate or acute, coriaceous and rather thick and fleshy, glaucous; petiole ·5-·7 in. long; stipules minute. Panicles axillary and terminal lax, branches opposite, greenish-yellow. Flowers ·15 in. across, pedicels up to ·15 in. long. Calyx ·05 in. long, glabrous, cleft half way down; lobes rounded, ciliate. Corolla about twice the calyx, cleft nearly to the base, segments reflexed, oblong, Drupe about ·15 in. diameter, globose, smooth, red when ripe.

Neighbourhood of Agra often on usar lands; banks of the Ganges towards east. Often planted near Mahomedan tombs. It is believed to be the "Mustard Tree" of the Bible.

The twigs are much used for tooth-cleaners. The leaves, fruit, and roots are medicinal. "The leaves are considered to be an antidote to poisons, the juice is also given for scurvy. The bruised bark of the roots is acrid and acts as a vesicant. The fruits are believed to be purgative."—*Indian Medicinal Plants.*

Fl. November-May.

2. Salvadora oleoides, *Dec.* Vern. *Jhal, pilu.*

An evergreen shrub or a small tree, with grey bark and terete branches. Leaves 1·5-3 by ·3-·5 in., linear-lanceolate, or narrow oblong, acute or subobtuse, often mucronate, grey-green or glaucous, thick; petiole ·2-·3 in. long. Flowers ·1 in. across, greenish-white, in short compact panicled spikes, usually shorter than the leaves. Calyx up to ·08 in. long, cleft about half way down; lobes 4, rounded. Corolla a little longer than the calyx, deeply 4-cleft; petals obovate-oblong, reflexed at the tips. Drupe globose about ·2 in. across, yellow when ripe.

Etawah, and saline soils in drier portions of the area.

The fruits are edible. The oil expressed from the seeds is used in rheumatism. The leaves are said to be purgative. The root-bark is used as a vesicant.

Fl. March-April.

L.—APOCYNACEÆ.

Trees or shrubs, often twining, rarely herbs, with milky juice. Leaves usually opposite, sometimes whorled or rarely (in some exotic species) alternate, entire, exstipulate but sometimes with glands at the base of the petioles, or a stipular line. Flowers bisexual, regular, usually 5—sometimes 4—merous, in axillary or terminal cymes, sometimes panicled; bracts small. Calyx inferior, often glandular within at the base; lobes imbricate. Corolla with spreading lobes; lobes often contorted and twisted in bud, rarely valvate (in few exotic species). Stamens inserted on the corolla-tube; filaments short; anthers linear-oblong or sagitate, sometimes spurred, usually conniving over the stigma, sometimes adhering to the stigma by the produced connectives; pollen granular. Disk annular, cupular or of glands or 0. Ovary 2-celled with axile placentæ, or 1-celled with parietal placentæ, or of two distinct or connate carpels; style simple or divided at the base only; stigma usually enlarged at the top, entire or 2-fid. Ovules few or many in each carpel. Fruit baccate, drupaceous, or more usually of free or connate follicles, sometimes dry and indehiscent. Seeds often with a tuft of hairs, or rarely winged; albuminous or exalbuminous.

I. Anthers free from the stigma, cells rounded at the base :—
- A. Fruits indehiscent :—
  - Armed; leaves opposite. . . . . 1. *Carissa.*
  - Unarmed; leaves whorled. . . . . 2. *Rauwolfia.*
- B. Fruits dehiscent :—
  1. Follicles slender, over 8 in. long; seeds with tufts of hairs: trees :—
     - Leaves whorled; calyx without glands. . . 3. *Alstonia.*
     - Leaves opposite; calyx glandular inside at the base. . . . . 4. *Holarrhena.*
  2. Follicles stout, fleshy under 3 in. long, seeds arillate, a shrub. . . . . 5. *Tabernæmontana.*

II. Anthers adherent to the stigma, and forming a cone above it, cells spurred at the base :—
- A. Trees or large shrubs :—
  - Leaves opposite more than 1 in. broad, lateral nerves below 15 pairs; anthers exserted. . . 6. *Wrightia.*
  - Leaves whorled, less than 1 in. broad, lateral nerves numerous; anthers included. . . 7. *Nerium.*
- B. Climbers :—
  1. Anthers exserted; corolla rotate. . . . . 8. *Vallaris.*
  2. Anthers included; corolla salver-shaped :—
     - Follicles below 5 in. long. . . . . 9. *Ichnocarpus.*
     - Follicles over 10 in. long. . . . . 10. *Rhynchodia.*

1. CARISSA, *Linn.*

Spiny often densely branching shrubs, sometimes climbing. Leaves opposite, coriaceous. Flowers 5-merous, white, often tinged with pink, arranged in lax, 3-chotomous cymes. Calyx 5-partite. Corolla salver-shaped; tube dilated round the anthers; throat naked, lobes overlapping to the right. Stamens at the top of the tube, included.

Ovary entire, 2-celled; style filiform; stigma large, minutely 2-fid; ovules 1-4 in. each cell. Berry globose, or ellipsoid, 2, or by abortion sometimes 1-celled; seeds 2-4, peltately attached to the septum; albumen fleshy.

Leaves obscurely nerved; cells of ovary with 1 ovule in each cell; berry 2-seeded, ·2-·3 in. long. .. .. 1. *C. opaca.*
Leaves distinctly nerved; cells of ovary with 4 ovules in each cell, berry 4-seeded, ·5-1 in. long... .. .. 2. *C. Carandas.*

1. Carissa opaca, *Stapf.* Inc. C. spinarum, *F. B. I.* (not of Linnæus) in part and *C.* gangetica, *Stapf.* Vern. *Karwan, karaunda.*

A large evergreen shrub; bark pale-brown or grey, thinly corky and somewhat rough, branchlets green; spines opposite, stout, ·5-2 in. long, often forked. Young parts puberulous or pubescent. Leaves 1-2·2 in. by ·6-1·7 in., ovate, elliptic, or sub-orbicular, apex variable, usually acute, apiculate, usually tapering and rhomboid at the base, glabrous, dark-green and shining above, paler beneath, coriaceous, nerves indistinct; petiole up to ·15 in. long. Flowers ·3-·4 in. across, fragrant, in few flowered corymbose, slender, cymes, short, sometimes spinescent; peduncles 0·1·2 in. long, which arise between the forks of branches or are terminal, each branch usually 3-flowered; bracts setaceous, up to ·05 in. long; pedicels up to ·15 in. long. Calyx divided nearly to the base; lobes lanceolate, ciliate corolla-tube slender, slightly dilated at the top; lobes 5, about ·15 in. long, lanceolate, more or less pubescent, contorted in bud, overlapping to the right. Stamens 5, at the top of the corolla-tube, included, filaments short; anthers apiculate. Ovary 2-celled with 1 ovule in each; style filiform; stigma minutely 2-fid. Berry subglobose, or ellipsoid, ·2-·3 in. long, black and filled with purple pulp, when ripe; seeds 2, concavo-convex.

Common in scrub jungles, often gregarious. The fruits are edible. The leaves are used for tanning. The branches form good dry fencing. The spines originate with the branches in the leaf axils.

Blaze yellowish-brown, streaked with white or pale-yellow darkening and turning greenish-yellow on exposure.

Fl. April-June. Fr. cold season.

2. Carissa Carandas, *Linn.* Vern. *Karaunda.* Sans. *Karamardaka.*

A large shrub or a small tree, armed with a pair of stout, sometimes branched, spreading spines up to 2 in. long at the base of branchlets. Leaves 1·3-3·3 in. long, oblong or elliptic-oblong, with rounded retuse or obtuse, sometimes minutely mucronate apex, with 4-8 pairs of distinct secondary nerves. Flowers scented ·5-·6 in. across, in sessile or peduncled corymbose cymes. Corolla-tube about ·5-·7 in. long; lobes oblong, acute, pubescent. Ovary 2-celled, with 4 ovules in each. Berry ellipsoid or globose ·5-1 in. long, 4 or more seeded; black or dark-purple when ripe.

Commonly cultivated throughout the area. According to Duthie wild in Bahraich and Gonda forests and in Gorakhpur.

The fruit is largely pickled and also eaten raw and when ripe. They are reported to possess antiscorbutic properties. The root has the reputation of being a bitter stomachic.

Fl. and Fr. January-April.

2. RAUWOLFIA, *Linn.*

Rauwolfia serpentina, *Benth.* Vern. *Damarberua.* Sans. *Sarpagandha, chandrika.*

A small evergreen undershrub, with pale-brown bark. Leaves usually in whorls of 3-4, less often opposite, 3-7 by 1.2·5 in., oblong-lanceolate, elliptic or oblanceolate, acuminate or acute, tapering into the short petiole, dark glossy green, pale beneath. Flowers ·5-·7 in long, pink and white, in long peduncled, terminal or axillary, corymbose cymes. Peduncles stout, sometimes leaf-bearing, 1-4 in. long; bracts minute, lanceolate; pedicels very short, red. Calyx about ·15 in. long, deeply 5-partite; lobes oblong-lanceolate, edges red. Corolla salver-shaped; tube dilated about the middle over the stamens, often curved, usually pink; lobes 5, ovate, rounded, white sometimes tinged with pink, ·15 in. long, contorted and overlapping to the left in bud, throat villous. Stamens included, anthers dorsifixed, filaments very short. Disk large cupular, slightly lobed. Carpels 2; style connate; stigma broad and discoid, with a membranous annular appendage at the base, top 2-fid; ovules 2-collatered in each carpel. Drupe didymous or solitary, ·25 in. long, pointed, black when ripe.

Pilibhit to Gorakhpur in cool shady situations.

The roots are said to be an antidote to snake-bite and efficacious in certain forms of insanity. They are also valued as febrifuge and tonic.

Fl. May-July, probably at other times of the year also. Fr. July-September, Conspicuous when in flower or fruit from the red pedicels.

Rauwolfia canescens, *Linn.*—A spreading shrub; young parts and branches grey pubescent. Leaves in whorls 3-4, usually in unequal pairs, larger 2-2·5 by 1·1-1 8, smaller 1-1 25 by ·6-·8 in., elliptic, elliptic-oblong or ovate-lanceolate, acute, apiculate, entire or undulate, softly grey pubescent, secondary nerves 9-12 pairs, fine, base cuneate or acute; petiole up to ·25 in. long, chanelled, with minute setæ along the channel and the axil. Flowers greenish-white, regular, up to ·2 in. long, in axillary and terminal pedunculate cymes, or solitary; peduncles up to ·5 in. long, pubescent. Calyx urceolate, pubescent; lobes up to ·1 in. long, ovate with rounded apex, ciliate, about half the tube. Corolla ·15-·2 in long, pubescent, lobes short, rounded. Stamens included. Ovary slightly 2-lobed. Drupe ·25 in. long, subglobose, with 2 stones, seated on the slightly enlarged spreading calyx.

A native of West Indies.

Rajghat—Bundelkhand, probably an escape.

Fl. and Fr. April-June.

3. ALSTONIA, *Br.*

Alstonia scholaris, *Br.* Vern. *Chatian, chatiyan.* Sans. *Saptaparni (seven leaved), vishal twaka.*

A tall evergreen tree with buttressed trunk and whorled branches, bark grey, somewhat rough, lenticellate. Leaves in whorls of 4-7; 3-8 by 1-2·5 in., obovate, oblanceolate or elliptic-oblong, emarginate, rounded or bluntly acuminate at the apex, coriaceous, dark-green above, pale or glaucous beneath, lateral nerves many, parallel, ending in an intramarginal nerve, base narrowed into a short petiole ·25-·5 in. long. Flowers greenish-white, ·3-·4 in. long, in compact, umbellately branched, pubescent panicles of cymes; main branches stout, 2-4 in. long; secondary branches slender; bracts leafy; bracteoles minute, ovate; pedicels very short. Calyx small, 5-lobed, pubescent; lobes oblong, ciliate. Corolla tube ·3 in long and ·3-·5 in. across, pubescent outside, hairy within, constricted in the middle; lobes ovate, obtuse, twisted in the bud. Stamens included, attached above the middle; anthers acute. Ovary villous, carpels 2; ovules many; stigma 2-fid. Follicles 2, slender up to 24 in. long, terete pendulous, several together from the peduncles. Seeds ·3 in. long, flattened oblong, with a tuft of brownish hairs at either end which is about ·8 in. or longer.

Pilibhit, Oudh Divisions, and Gorakhpur

The wood is white, light and even-grained but seasons badly. It is used for making writing tables, packing cases, etc. "The bark is used as an astringent tonic, anthelmintic alternative and antiperiodic. It is a valuable remedy in chronic diarrhœa and advanced stages of dysentery. The milky juice is applied to ulcers and mixed with oil in ear-ache."—*Surgeon Thompson.*

Blaze pale-yellow and brown with copious flow of milk, inner layer white.

Fl. November-January Fr. May-July.

4. HOLARRHENA, *R. Br.*

Holarrhena antidysenterica, *R. Br.* Vern. *Kura, indrajau.* Sans. *Kutaja, girimallika, sakrasakhin, vatsaka.*

A small deciduous tree, sometimes irregularly fluted, with rough brown bark. Young parts pubescent. Leaves subsessile 5-12 by 1·5-5 in., glabrous or pubescent, coriaceous, elliptic or elliptic-oblong usually acuminate, base acute, obtuse or rounded, main lateral nerves 10-14 pairs. Flowers white turning yellow, ·7-1·5 in. across, fragrant puberulous, in lax terminal corymbose cymes which are 3-6 in. across. Pedicels slender, variable in length very short to ·8 in. long. Bracts lanceolate, pubescent, minute. Calyx ·1-·15 in. long, pubescent, deeply cleft; lobes lanceolate, acuminate, with glands at the base.

Corolla salver-shaped, tube ·5 in. long, slightly dilated towards the base, hairy within; throat contracted; lobes 5 oblong or obovate-oblong, ·4-·5 in. long, twisted to the left in bud. Stamens 5, inserted at the base of the cor. tube; anthers subsessile mucronate, rounded at the base. Carpels 2, distinct; style short; stigma united, oblong; ovules numerous. Follicles double, divaricate, 8-16 by ·2-·4 in., slightly curved, pericarp, usually dotted with white specks. Seeds ·5 in. long, linear, somewhat rough; coma about 1·5 in. long, silky, light tawny.

Common throughout the area.

The bark is a valuable remedy for dysentery and is also as a febrifuge and tonic. The seeds are medicinal. The wood is white, soft and even-grained. It is suitable for carving, but is little used.

Blaze yellowish with fine darker lines or yellowish-brown.

Leafless February-April. Fl. with new leaves May-June. Fr. cold season.

5. TABERNÆMONTANA, *Linn.*

Tabernæmontana coronaria, *Willd.* Syn. **Ervatamia coronaria,** *Stapf.* Vern. *Chandni.* Sans. *Tagar.*

A handsome evergreen glabrous dichotomously branched shrub with pale-brown or silvery, grey bark. Leaves opposite, 3-6 by 1-2 in., elliptic-oblong, acuminate, coriaceous, glossy green above, paler beneath, with somewhat undulate margins, secondary nerves impressed above, prominent beneath, 7-9 pairs, base narrowed into a short petiole, which is ·3 in. length and dilated at the base. Flowers white 1-2 in. across, usually in pairs on terminal lax corymbose cymes; peduncle very short up to 2 in. long, stout. Bracts minute, acute. Calyx about ·15 in. long, 5-cleft; lobes ovate-acute. Corolla salver-shaped; tube ·7-1 in. long, slightly inflated above the middle and towards the base; throat glandular; lobes 5, elliptic-oblong, obtuse, margins overlapping to the left, crumpled in bud. Stamens included; anthers acuminate. Carpels 2, distinct; stigma bifid; ovules numerous, in many series. Follicles 1-3 in. by ·4 in., divaricate, sessile or stipitate, 3-ribbed, somewhat fleshy, narrowed into a slender recurved beak, red or orange inside; seeds enclosed in red aril.

Pilibhit Largely cultivated within the area in gardens; in cultivation the flowers becomes double. The flowers are fragrant in the night.

Fl. May-October Fr. cold season.

6. WRIGHTIA, *R. Br.*

Shrubs or small trees, Leaves opposite. Flowers in terminal or sub-axillary cymes. Calyx short, 5-partite, with glands or scales inside. Corolla salver-shaped; tube short, cylindric, usually with a corona of fimbriate scales in the throat, in 1-2 series; lobes over-

lapping to the left. Stamens at the top of the corolla tube; filaments short, dilated; anthers exserted, sagitate, conniving in a cone round the stigma, cells spurred at the base; disk 0. Carpels free or connate, many-ovuled; style filiform; stigma ovoid, usually with a toothed basal ring. Follicles distinct or connate; seeds linear, compressed, with a deciduous coma at the base, albumen scanty or none.

Corona white, follicles cohering at the apex only or free. .. 1. *W. tinctoria.*
Corona orange; follicles connate throughout. .. 2. *W. tomentosa.*

1. Wrightia tinctoria, *R. Br.* Vern. *Indrajau.* Sans. *Haya-maraka.*

A small deciduous tree, with light-grey bark. Leaves subsessile 3-6 by 1-3 in., elliptic-oblong or obovate, acuminate or mucronate, more or less pubescent, pale-green, paler beneath, lateral nerves 8-12 pairs; petiole up to ·2 in. long. Flowers white ·75-1 in. across, in lax, corymbose, pubescent cymes, with dichotomous branches; bracts minute, ovate, acute. Calyx pubescent; sepals ovate, obtuse, corolla pubescent, tube twice the calyx—about ·15 in. long lobes narrow, oblong-obtuse, pubescent on both sides, overlapping to the left in bud much exceeding the tube; corona of linear scales. Follicles double, 10-20 in. by ·2-·3 in. cohering at the top till ripe, striate, covered with raised lenticular dots. Seeds up to 1·2 in. long, linear with a pointed apex, and basal coma, 1-1·5 in. long.

Bundelkhand.

The leaves yield an indigo-like dye. The roots and seeds are adulterated with, and used as substitutes for Holarrhena antidysenterica.

The specimens I have seen from our area belong to Var. Rothii, F. B. I. which has puberulous branches and leaves.

Blaze white, with green edges, latex copious. Lower leaves on branches smaller.

Fl. with new leaves March-May. Fr. December-January.

2. Wrightia tomentosa, *Roem.* Vern. *Dudhi* (a name indiscriminately applied to several plants with milky juice), *indrajau.*

A small deciduous tree; bark dark-grey or pale-brown, corky, peeling off in irregular small pieces, branches lenticellate; young parts softly tomentose. Leaves usually 3-6 by 1·5-3 in., elliptic or elliptic-oblong, caudate-acuminate, sometimes obscurely, sinuate, cuneate at the base, thin, softly tomentose, often on both surfaces, lateral nerves 8-15 pairs, close, prominent; petiole ·2-·3 in. long, with tufts of minute bristles on the axils. Flowers white turning yellow, 1 in. across, in many-flowered, terminal, corymbose, pubescent cymes; pedicels up to ·3 in. long, slender; bracts linear-lanceolate, deciduous, about ·1 in. long. Calyx tomentose, of rounded, ciliate lobes, about ·1 in. long; glands large rounded. Corolla-tube about ·25 in. long; lobes twisted to the left in bud, oblong, obtuse, papillose on both surfaces; more densely outside; corona of orange somewhat fleshy

oblong scales. Follicles 8-12 by ·5-·7 in. of two follicles united through the entire length, grooved at the junction of the carpels, and verrucose with whitish raised lenticular dots. Seeds ·5-·7 in. long, slender with pointed apex and a basal deciduous coma of silky hairs, 1·2-2 in. long.

Throughout the area.

The wood is used for carving and for turnery.

Blaze pale-yellow with green edges and copious yellowish latex, ·6 in. Stem often irregularly fluted at the base. Leaves markedly distichous.

Leafless February-March. Fl. hot season. Fr. December-February.

7. NERIUM, *Linn.*

Nerium odorum, *Soland.* Vern. *Kaner.* Sans. *Karavira.*

A large evergreen shrub or a small tree. Leaves usually ternate, 4-6 by ·5-1 in., linear lanceolate, acute at both ends, coriaceous, smooth, glossy green above, paler beneath, with numerous parallel secondary nerves; petiole ·2-·3 in. long. Flowers 1·5 in. or more across, rose red, fragrant, in terminal corymbose panicles of cymes; bracts broad-subulate. Calyx divided nearly to the base; sepals narrow oblong, acute, about ·2 in. long. Corolla-tube ·5-·7 in. long, widening and funnel-shaped above, hairy towards the base within; corona 5-lobed; lobes laciniate. Stamens at the top of the corolla-tube; anthers connivent into a cone and adhering to the stigma, sagitate, spurred; connectives produced into long thread-like hairy appendages, which are twisted together. Ovary of 2 distinct carpels; style dilated upwards; stigma subglobose. Follicles conna e 6-8 in. by ·3-·4 in., rigid, at length separating; seeds many, ·2 in. long, linear, villous and tipped with a coma of brownish hairs.

Kheri (Duthie's collectors). I have never seen it wild in our area. Largely cultivated in gardens with single or double flowers. A white-flowered variety exists in cultivation.

All parts of the plant specially the roots are poisonous and often play an important part in crimes. The flowers are important adjuncts of certain Hindu rituals.

Fl. mainly April-June; also at other times of the year.

8. VALLARIS, *Burm.*

Vallaris Heynei, *Spreng.*

A large dextrorse twining shrub, with ashy-grey lenticellate branches. Bark on old stems, pale-brown, furrowed and somewhat corky. Leaves opposite, distichous, 2-5 by ·8-2 in., oblong-lanceolate to elliptic, acuminate, base obtuse or acute, thin, glabrous, dotted with pellucid glands, light green, lateral nerves 6-9 pairs, rather fine;

petiole ·3-·5 in. long with an intrapetiolar ridge at the base, with minute, dark, deciduous, bristles. Flowers ·4-·7 in. across, white, sweet-scented, in lax axillary, usually dichotomous and compound, pubescent cymes; bracts linear lanceolate ·1-·2 in. long; pedicels ·2-·4 in. long, slender, pubescent. Calyx 5-partite, pubescent, oblong, acute. Corolla subrotate, pubescent outside; tube short ·1-·2 in. long, hairy within, limb spreading; lobes rounded, twisted in bud to the right. Stamens 5, inserted on the top of the corolla-tube; filaments dilated; connective with a round gland on the back continuous with the filaments. Anthers acute, hairy within and connivent in a cone and adhering to the stigma, cells, with rigid spurs. Disk cupular, 5-partite, lobes ciliate. Carpels 2, connate; style pubescent; stigma thick, with a conical tip. Follicle 4-6 in. by 1-1·5 in., of connate follicles, tapering from a broad base. Seeds many, beaked about ·5 in. long; coma ·7 in. long, silvery white.

Throughout the area, also in Etawah (Chakarnagar), usually in open forests, sometimes cultivated for the sake of the exquisitely-scented flowers. Fl. February-April. Fr. cold season.

9. ICHNOCARPUS.

Ichnocarpus frutescens, *Br.* Vern. *Dudhi.* Sans. *Sariva.*

A large dextrorse twiner, bark reddish-brown with circular raised lenticels; young parts, inflorescence, and branchlets rusty tomentose. Leaves opposite, 2-4 by 1-2 in., elliptic-oblong or elliptic, acute or acuminate, glabrous above, more or less rusty pubescent along the nerves beneath, lateral nerves 4-7 pairs, arching, tertiaries finely reticulate; petioles ·2-·3 in. long, puberulous, joined by a ridge bearing minute deciduous setae. Flowers white, fragrant, ·2-·3 in. across, in axillary and terminal cymes which often form leafy panicles; pedicels minute, ·1-·15 in. long: bracts minute. Calyx pubescent. 5-cleft, with minute, linear glands within, lobes oblong, subacute. Corolla salver-shaped; tube ·1-·15 in., dilated round the included anthers, about twice the calyx, throat villous; lobes 5, narrowed to a twisted acuminate tip, over lapping to the right, hairy on the upper surface. Stamens 5, filaments short; anthers sagitate, with somewhat blunt basal spurs, apiculate, connivent over, and adherent to, the stigma. Disk of 5 minute, linear, clavate lobes. Carpels 2, hairy, distinct; style short; stigma thick, oblong, jointed to an elongate conical tip; ovules many in each carpel. Follicles 3-6 in. by ·2 in., slender, straight or curved, usually double, rusty tomentose when young. Seeds ·5-·7 in. linear, with a short coma.

Throughout the area.

The roots are said to be tonic and are used as substitute for sarsaparilla. The switchy twigs are suitable for basket-making.

The latex is yellow. The leaves turn coppery red before falling. Fl. August-November. Fr. February-April.

10. RHYNCHODIA, *Benth.*

Rhynchodia Wallichii, *Benth.*

A large woody evergreen climber, bark warty, almost black. Leaves 3-7 by 1·3-3 in., opposite or ternate, elliptic or elliptic-oblong, short acuminate, acute, rounded or less often subcordate, sometimes unequal at the base, somewhat thin, glabrous, lateral nerves 8-11 pairs, mostly looped near the margin, prominent beneath; petiole ·4-1 in. long, bases joined by an intrapetiolar ridge with setaceous glands. Flowers white, fragrant, ·7 in. across, in short, subterminal corymbose panicles of cymes which are up to about 3 in. across; peduncles up to 2·5 in. long; bracts oblong, pubescent up to ·1 in. long; pedicels ·3-·6 in. long. Calyx glandular at the base, deeply cleft ·15 in. long; lobes oblong, subacute. Corolla glabrous, outside, salver-shaped; tube ·3 in. long, throat contracted, villous within; lobes obliquely obovate, tip deflexed, twisted to the left and overlapping to the right in bud. Stamens included; filaments short; anthers sagitate, with blunt spurs, apiculate, connivent in a cone round and adherent to the stigma. Disk cup-shaped, 5-lobed. Carpels free; style filiform, dilateed at the top; stigma thick oblong, with a conical tip; ovules many. Follicle 10-18 (?) in. by ·4-·5 in., slender, usually double, smooth. Seeds ·6-1 in. long, beaked. Coma silky, up to 2 in. long.

Pilibhit—Nawadia, Chukadhaia—in swampy places; rare.

Branches reddish-brown with tubercular lenticels. The nerves on young leaves are reddish; tertiary nerves subparallel with fine reticulations between.

Blaze white with brown lines exuding latex.

Fl. April. Fr. ripen March.

The following are frequently cultivated within our area :—

Thevetia nerifolia, *Juss.*—Yellow oleander. Vern. *Pila kaner.*

An evergreen shrub or small tree with spirally arranged linear glossy green leaves 3-6 by ·25-·4 in., with recurved margins; yellow fragrant flowers, about 2 in. across, in few-flowered cymes and roundish fruit, somewhat constricted along the axis with a fleshy pericarp and woody endocarp. The milky juice is extremely poisonous. A native of tropical America.

Plumeria acutifolia, *Poir.* Vern. *Gul-achin.*

A small soft-wooded tree with corky, furrowed bark and fleshy branches. Leaves 6-12 in. long, oblanceolate with an intramarginal nerve. Flowers 2 in across, white with yellow centre, pinkish outside, exquisitely scented, in terminal pedunncled panicles of cymes. Extensively cultivated, specially near temples. Flowers hot season. Probably introduced from Mexico.

Vinca rosea, *Linn.*

A small evergreen shrub with obovate, oval or oblong, glossy leaves up to 2 in. long; white or deep rose-coloured flowers 1-1·5 in. across, in axillary pairs, and single slender follicles about 1 in. long. Commonly grown; flowers almost throughout the year. It is a native of the West Indies.

Allamanda Cathartica, *Linn.*—Large evergreen suberect shrub. Leaves often whorled 2-4 in. long, lanceolate to oblanceolate, narrowed to a short petiole. Flowers yellow, large, 3-4 in. a cross, in few flowered cymes. A native of Central America and the West Indies.

LI.—ASCLEPIADACEÆ.

Herbs or shrubs, often climbing, with milky acrid juice. Leaves opposite, sometimes wanting; simple, entire, exstipulate. Flowers 2-sexual, usually small, regular, 5-merous, often in umbelliform cymes. Calyx inferior, divided nearly to the base, segments imbricate. Corolla variously shaped, gamopetalous, hypogynous, often with a ring of scales, processes or hairs within the tube, or at its mouth (*corolline corona*); lobes valvate, contorted or imbricate. Stamens inserted at or near the base of the corolla and alternating with its lobes; filaments flat, rarely free, usually connate in a tube round the ovary, often with fleshy scales or processes on the back (*staminal corona*); anthers free or adnate to the stigma, 2-celled; connectives of the anthers often produced into membranous and sometimes connate tips. Pollen forming 1 or 2 grandular or waxy masses in each cell, the pollinia of the adjoining cells of two contiguous anthers united in pairs or fours to a gland (*corpuscle*), which lies on the edge of the dilated portion of the stigma between the anthers. Ovary of two distinct superior carpels enclosed within the staminal column; styles 2, short, united above into a enlarged, usually 5-angled, stigma,* included between the anthers, or produced beyond them into a long or short, simple or 2-fid column. Ovules usually many, multiseriate on the projecting placentas. Fruit of 2 (—1) follicles, seeds compressed, usually flat, often margined, comose at the top, albumen thin or 0.

I. Filaments free or slightly connate at the base pollinia granular :—

Corolla greenish-purple, lobes valvate; flower small (under ·3 in. across). .. .. .. 1. *Hemidesmus.*

Corolla yellowish, lobes imbricate; flowers middle-sized (over ·5 in. across). .. .. .. 2. *Cryptolepis*

II. Filaments connate into a tube; pollinia waxy :— ..

A. Anthers with membranous appendage :—

1. Pollen masses pendulous :—

a. Stems erect :—

Corolla lobes valvate; coronal processes laterally compressed; shrubs and undershrubs. .. 3. *Calotropis.*

Corolla lobes imbricate; coronal processes short and fleshy; herbaceous. .. .. *Pentabothra.*

* The enlarged portion is probably the swollen top of combined style.

b. Stems twining :—

i. Follicles not echinate :—

*Flowers large, purple or with purple veins :—

Leaves opposite, nerves red ; coronal processes united. .. .. 4. *Holostemma.*

Leaves linear or linear-lanceolate ; corona 5-lobed. .. .. 5. *Oxystelma.*

**Flowers small, green ; corona 5-lobed. .. 6. *Peniatropis.*

ii. Follicles softly echinate. .. .. 7. *Dæmia.*

2. Pollen masses erect or horizontal :—

a. Corona corolline, fleshy. .. .. .. 8. *Gymnema.*

b. Corona staminal :—

i. Corolla campanulate :—

Flowers small ; coronal processes subulate, erect. .. .. 9. *Marsdenia.*

ii. Corolla salver-shaped, pale-yellow, 1 in. or more across ; coronal processes erect, on the back, notched... .. 10. *Telosma.*

iii. Corolla cup-shaped or rotate :—

Flowers middle-sized, ·5-·8 in. across ; coronal processes fleshy, spreading with flattened short beaks. .. .. 11. *Dregea.*

Flowers small ; column minute ; coronal processes of 5 small tubercles ; anthers minute. 12. *Tylophora.*

B. Anthers without membranous tip :—

Corolla-tube short, rotate or salver-shaped ; corona-coroline and staminal ; follicle beaked. .. 13. *Leptadenia.*

Corolla-tube inflated at the base ; corona single, staminal ; follicle straight. .. .. 14. *Orthanthera.*

1. HEMIDESMUS, *R. Br.*

Hemidesmus indicus, *R. Br.* Vern. *Kali-kapuri, kasturi.* Sans. *Ananta, sugandhi.*

A slender switchy twiner, with a rather thick aromatic root-stock. Leaves 2-4 by ·5-1·5 in., very variable, elliptic-oblong, linear-oblong or lanceolate, obtuse or acute, always with a pointed tip, dark-green and usually with a white band along the midrib, and sometimes along the main nerves above, undersurface whitish, sometimes pubescent, main lateral nerves 6-9 pairs, usually forming loops near the margin, rather irregular ; petiole ·15-·25 in. joined by ridges with bristly glands. Flowers greenish-purple ·2-·25 in. across, in sessile or subsessile cymes, clustered on the leaf axils. Bracts many, minute, usually ovate, acute, imbricate on the pedicels and cyme branches. Calyx 5-partite, lobes glandular at the base, ciliate, ovate, acute. Corolla rotate, greenish outside, purplish within, lobes valvate, ovate oblong,

acute, somewhat rugose. Coronal scales 5, on the throat of the corolla usually of 5 fleshy knobs, alternating with the corolla lobes. Stamens attached to the base of the corolla-tube; filaments distinct; anthers with inflexed membranous tips; pollinia granular, 2 in each cell, attached to corpuscle by dilated appendages. Stigma 5-angled, flat. Follicles divaricate, slender, 4-6 in. by ·2-·3 in. Seeds ·2-·3 in. long, flattened, with a constricted neck and truncate apex, coma, silky, ·8-1 in. long.

Throughout the area.

The roots are scented whence the Sanskrit name *Sugandhi*. They are used as substitute for sarsaparilla.

Fl. rainy season Fr. cold season.

2. CRYPTOLEPIS, *R. Br.*

Cryptolepis Buchanani, *Roem.*

A large evergreen dextrorse twiner, with smooth copper-coloured bark, peeling off in thin papery rolls in old stems; branches lenticellate. Leaves 3-6 in. by 1-2·5 in., oblong, elliptic or elliptic-oblong, acute or obtuse, abruptly short acuminate, apiculate, coriaceous, smooth and glossy above, glaucous beneath, secondary nerves transverse, many, parallel, terminating in an intramarginal vein, base usually acute; petiole up to ·5 in. long. Flowers pale-yellow about ·7 in. across, in lax dichotomous, sometimes panicled cymes, shorter than the leaves; peduncles ·3-1 in. long; pedicels ·1-·2 in. long; bracts opposite ovate-lanceolate up to ·1 in. long. Calyx deeply 5-cleft with 5 glandular scales within; lobes ovate-acute. Corolla with a short tube, widening above; lobes linear or linear-lanceolate, twisted and overlapping to the right in bud; coronal scales 5, fleshy, clavate, inserted within the tube. Stamens connate at the base, free above; anthers sagitate, connivent by their tips; pollinia granular in pairs in each cell. Stigma broadly conical. Follicles 2-4 by ·5-·7 in., divaricate, tapering and pointed at the apex. Seeds compressed, oblong-ovate, about ·25 in. long with a coma about 1 in. long.

Common throughout the area.

The gum coagulates into caoutchouc-like substance.

Fl. May-June. Fr. cold season.

3. CALOTROPIS, *R. Br.*

Erect hoary or glabrous shrubs, sometimes sub-arboraceous, or undershrubs, or stout herbs. Leaves rather thick and fleshy, broad. Flowers large or middle-sized in umbellate or subcorymbose cymes, 5-merous, calyx lobes glandular within. Corolla broadly campanulate, or subrotate, lobes broad, glabrate• valvate. Coronal scales 5,

on the staminal column, laterally compressed with dorsal spurs. Anther tips membranous inflexed, pollen masses one in each cell, stalked, pendulous, flattened and waxy. Style apex depressed, 5-angled, or lobed. Follicles thick.

Shrubs. Leaves subsessile :—

Buds ovoid ; corolla lobes spreading, lavender lilac, or bluish-purple.	1. *C. gigantea.*
Buds hemispheric, corolla lobes at first erect, with purple blotches at the tips.	2. *C. procera.*
Undershrub or stout herb ; leaves petiolate.	3. *C. Acia.*

1. Calotropis gigantea, *R. Br.* Vern. *Madar-safed, Ak.* Sans. *Arka.*

A large shrub 8-10 ft. high, sometimes almost a small tree, with deeply cracked corky bark, when of sufficient size. Young parts and undersurface of leaves covered with white floccose tomentum. Leaves subsessile, 4-8 by 1·5-4 in., obovate or oblong, acute, short, acuminate or obtuse, base narrowly cordate with auricled lobes ; glabrate when mature. Flowers 1·5-2 in. across, inodorous, lavendar, lilac or bluish-purple, in axillary and terminal, umbellate or subcorymbose cymes, which are covered with hoary floccose tomentum. Peduncles up to 3 in. long ; pedicels up to 1·25 in. long. Buds ovoid ; sepals ovate-acute, whitish about ·2 in. long. Corolla deeply divided, lobes ·7-·9 in. long, spreading, valvate in bud, ultimately revolute and twisted near the top in the open flowers, ovate-lanceolate ; corona bluish-purple, lobes dorsally convex and hairy, bases ending in curved rather blunt spurs. Apices with a symmetrical pair of undivided tubercles. Follicles 3-4 in. by 1-1·5 in., recurved, turgid. Seeds ovate, minutely pubescent ·25 in. long with a silky coma.

Throughout the area in waste-lands.

The bast yields the well-known Madar fibre. The floss (coma of the seeds) is used for stuffing and can also be spun into thread, mixed with cotton. The milky juice is regarded as a caustic and drastic purgative and is used for various ailments in Indian medicine. "The dried bark of the root is said to be an excellent substitute for Ipecacunha in the treatment of dysentery."—*Indian Medicinal Plants.* The fresh leaves are applied as dry fomentations for swellings.

Blaze yellowish exuding latex.

Fl. December-July. Fr. February-June.

2. Calotropis procera, *Br.* Vern. *Madar, ak.*

A shrub resembling the preceding species closely, but does not quite attain its size. Leaves attain 9 in. in length ; usually less cottony and sometimes glabrous on both sides. Flowers ·5-1 in. across, faintly scented ; buds hemispheric. Peduncles stouter than in the last species, attaining 3·5 in. in length. Corolla lobes erect at first, ultimately somewhat reflexed, pale-pink with a bluish or purple patch

near the apex. Corona dorsally concave or straight, apex purple, bifid, without any tubercles; spur rather acute, not curled. Follicles and seeds as in the last species.

Throughout the area, also in Etawah, in similar situations as in the last species. Economic uses are also similar.

Fl. almost throughout the year, but chiefly cold season.

3. Calotropis Acia, *Ham.*

A stout herb or undershrub; young parts floccose tomentose. Leaves 6-9 in. by 3-5 in., obovate-oblanceolate or oblong; abruptly short acuminate or acute, narrowed at the base to a short petiole, which is ·25-1 in. long. Flowers purplish, about 1 in. across, in branched umbellate cymes; peduncles up to 2 in. long. Calyx lanceolate about ·3 in. long. Corolla lobes erect apex, acuminate, with a bluish or purplish patch near the top, about ·5 in. long. Corona ciliate and concave on the back, 2-lobed, with two blunt protruberances on either sides at the apex: basal spur incurved. Follicle 4 in. long, subglobose.

Grass-lands in Pilibhit and Oudh, not common.
This species resembles C. procera to some extent, but it can be at once distinguished by its habit, petiolate leaves and subglobose follicles.

Pentabothra nana, *Aook, f.*—A slender herb 5-8·5 in. high, with a woody root-stock. Leaves 2-4 in. long, linear, acute, cordate at the base, petioles very short. Flowers reddishpurple, about ·4 in. across in dense umbellate short peduncled cymes. Calyx 5-partite, minutely glandular. Corolla campanulate, deeply 5-lobed, lobes overlapping to the right, oblong-ovate. Corona of 5 pouch-like folds at the base of the staminal column, alternating with the anthers and 5 laterally compressed fleshy processes adnate to the backs of anthers; anthers large with oblong tips; pollinia waxy, 1 in each cell.

Collected from Pilibhit (Garha) and Kheri District (Marhatal) by Duthie's collectors; rare.

Fl. May-June.

4. HOLOSTEMMA, *Br.*

Holostemma Rheedei, *Wall.*

A glabrous anti-clockwise twiner, usually much branched. Leaves 2·5-5 in. by 1·5-5 in., ovate-acute or acuminate, base cordate, glabrous above, slightly pubescent, specially along the nerves beneath, midrib usually glandular at the base: base usually 5-nerved, tertiary nerves fine, reticulate often red: petioles up to 2 in. long. Flowers in peduncled cymes often umbellate, about ·7 in. across, frosted white or pinkish outside, purple inside. Peduncles ·5-1·5 in. long; pedicels attaining the same length. Calyx divided nearly to the base, ovate, obtuse, ciliate; lobes ·2 in. long. Corolla divided deeply, lobes ovate or oblong, obtuse. Corona of a

short truncate or slightly undulate ring attached to the base of the staminal column; filaments connate; anthers with large wings, which are decurrent to the base of the staminal column, and have membranous inflexed tips; pollen masses solitary in each cell, with long, black stalks. Follicle 4-5 in. long by about ·15 in. glabrous, tapering to a point;. coma up to 1 in. long.

Pilibhit, Bahraich, probably also other Oudh Divisions.
The roots are used as a sedative specially in ophthalmia and also in diabetes.
This rainy season, mainly July-August.

5. OXYSTELMA, *R. Br.*

Oxystelma esculentum, *R. Br.*

A slender deciduous twiner. Leaves 2-5 in. long, linear or linear-lanceolate, acute or acuminate, puberulous, secondary nerves looping and forming a more or less continuous intramarginal nerve; petiole ·2-·4 in. long, slender. Flowers handsome 1 in. across, white outside, veined with purple inside, drooping, in lax few flowered sub-umbellate or racemose cymes; peduncles slender up to 2 in. long, often exceeding the leaves; pedicels up to 1·25 in. long. Calyx lobes oblong lanceolate, acute, glandular within. Corolla saucer-shaped, lobed, half-way or less down, tube short with an annular villous corona on the top; lobes acute, ciliate. Staminal corona of 5 erect scales with dilated bases, and acute or acuminate incurved tips, 2-keeled within. Anthers with inflexed membranous tips. Follicles 2-2·5 in. by ·3 in., tapering. Seeds ovate ·3 in.; coma about ·75 in. long.

Pilibhit to Gorakhpur, Bundelkhand—*Duthie.*

"The fruit is said to be eaten in Sind and the milky juice used medicinally."—*Duthie.*

Fl. rainy season. Fr. cold season.

6. PENTATROPIS, *R. Br.*

Pentatropis cynanchoides, *R. Br.* Syn. **P. spiralis,** *Done.*

A slender twining shrub, with tuberous roots: young parts sparsely pubescent. Leaves ·7-2 in. long and up to ·8 in. broad, ovate or ovate-oblong, usually mucronate, base rounded or cordate; more or less fleshy, glabrous or glabrescent; petiole slender, ·2-·5 in. long, puberulous. Flowers ·6 in. across, greenish, in 3-6- flowered axillary umbellate cymes. Peduncles short up to ·2 in. long, slender; pedicels filiform up to ·5 in. long. Calyx 5-partite, minute, lobes ovate-acuminate. Corolla ·3-·4 in. long, rotate, deeply lobed; lobes overlapping to the right, puberulous within. Corona of 5 laterally compressed lobes, adnate to the backs of the anthers, shorter than the staminal

column, lobes deltoid-ovate, acute or acuminate. Anthers with membranous inflexed tips. Follicles 2-3 in. by ·3 in. smooth, with long slender beak, somewhat narrowed towards the base. Seeds ·2 in. long, ovate, flat, minutely toothed towards the base: coma ·7-1 in. long.

Etawah and Afforestation Division, in ravine lands.
Fl. July-Aug. Fr. December. The older branches are corky.

7. DÆMIA, *R. Br.*

Dæmia extensa, *R. Br.* Syn. **Pergularia extensa,** *R. Br.* Sans. *Phala kantaka* (in allusion to the echinate follicles).

A dextrorse twiner with slender subhispid stems, fœtid when bruised. Leaves 1-3 in. long, broadly ovate, usually acuminate, deeply cordate with rounded auricles, membranous, glabrous or slightly pubescent above, more densely pubescent beneath, margin ciliate, basal nerves 5-7; petiole ·5-2 in. long, pubescent. Flowers about ·5 in. across, pale greenish-yellow or whitish, tinged with pink, in long peduncled, pubescent cymes, which are at first corymbiform and then racemose. Peduncles 2-6 in. long; pedicels filiform up to 1 in. long; bracts minute, linear, pubescent. Calyx 5-partite, glandular within; sepals about ·1 in. long, pubescent ovate-lanceolate, ciliate. Corolla about ·3 in. long, campanulate, tube short; lobes much longer than the tube, ovate, hairy near the margins, overlapping to the right in bud. Corona double; the outer membranous at the base of the staminal column, annular, 5-lobed; the inner of 5 lobes adnate to the anthers, spurred at the base and produced into subulate horns above the style apex. Anthers with membranous inflexed tips, pollinia without caudicles; style apex convex. Follicles double 2-3 by ·5 in. reflexed, beaked, covered with long soft spines. Seeds ·3 in. long, ovate, pubescent, toothed towards the base. Coma about 1·2 in. long silky.

In dry districts—Etawah, Bundelkhand. The leaves are medicinal and are believed to be expectorant and emetic.
Fl. May to August.

8. GYMNEMA, *R. Br.*

Twining shrub or undershrubs. Flowers small in crowded umbelliform cymes. Calyx 5-partite. Corolla subrotate, campanulate or urceolate, lobes thick, twisted, sub-valvate or narrowly overlapping to the right. Corona coroline, of 5 fleshy processes consisting of double villous ridges adnate to the corolla-tube or throat, or 0. Staminal column short; anther tips small membranous; pollinia one in each cell, pedicelled, erect. Style large; conical, clavate or capitate, exserted. Follicles slender or turgid, terete, smooth, acuminate; seeds ovate.

Pubescent climber; coronal processes produced beyond the throat of the corolla. .. .. .. 1. *G. sylvestre*
Almost glabrous climber; throat of corolla naked. .. 2. *G. tingens*

1. Gymnema sylvestre, *R. Br.* Vern. *Gurmar,* Sans. *Mesha-sringi.*

An extensive dextrorsely twining shrub, with pubescent branches; old stem with rather rough grey bark peeling off in flakes. Leaves 1-2·5 by ·7-1·5 in., elliptic or elliptic-oblong, acute or shortly acuminate, pubescent or glabrous above, tomentose beneath, usually cordate or rounded at the base, secondary nerves 3-5 pairs, lowest close to the base; petiole ·2-·4 in. long, pubescent. Flowers minute about ·15 in. across and ·1 in. long, yellowish, in axillary umbellate cymes up to ·5 in. long with the peduncles. Peduncles up to ·3 in. long. Calyx pubescent, 5-partite, lobes oblong, obtuse, margins thin, ciliate. Corolla with a campanulate tube; lobes (as long as the tube) thick, oblong-ovate, with thin ciliolate margins. Corona coroline, lobes fleshy, hairy on the sides, tips projecting beyond the throat of the corolla. Follicles 2-3 in. by ·2-·3 in., usually solitary gradually tapering from the base, glabrous. Seeds about ·4 in. long, flat ovate, margined. Coma 1-1·8 in., silky.

Bundelkhand.

The leaves if chewed have the property of destroying the taste for saccharine substances. An infusion of the leaves is used as a remedy for diabetes in Indian medicine with marked initial success, but the cure is not permanent. The leaves and the follicle contain a complex substance called "gymnemic acid" a portion of which is the principle which destroys the taste for sweet substances.

Blaze yellowish-brown, turning reddish-brown, exuding latex, fibrous. Certain forms of this plant are densely pubescent.

Fl. August-September. Fr. January-March.

Gymnema hirsutum, *W. & A.*—is a similar stout woody climber with broader, more tomentose leaves and subsessile cymes with larger flowers than G. sylvestre.

Bundelkhand—*Mrs. Bell.* There are no specimens at Dehra.

2. Gymnema tingens, *W. & A.*

A large dextrorsely twining shrub, with furrowed corky bark on old stems and glabrescent branchlets. Leaves 4-6 by 1·75-4 in., elliptic-oblong or ovate, usually abruptly accuminate or caudate, puberulous when young, glabrous when mature, membranous, base usually with a tuft of glands at the junction with the petiole, cordate to truncate, lateral nerves 5-7 pairs, lower pairs often close together; petiole ·8-2 in. long. Flowers ·3-·4 in. across, pale-yellow, in lax corymbiform or ultimately racemose, pubescent cymes; peduncles ·25-·75 in. long; lower pedicels longer than peduncles ·7 in. long. Calyx 5-partite; sepals pubescent outside, glandular within, ovate-oblong, obtuse. Corolla-tube campanulate; lobes oblique, oblong, obtuse, nearly as long as the tube. Corona of 5 double villous processes adnate to the corolla tube and included within it. Follicles usually single up to

4·5 in. long, smooth, with pointed tips and narrowed bases. Seeds about ·5 in. long, ovate, thin and margined; coma silky up to 2 in. long.

Pilibhit, Oudh Divisions and Gorakhpur.
Blaze white, exuding latex.
Fl. rainy season. Fr. cold season.

9. MARSDENIA, *Br.*

Twining, rarely erect, shrubs or undershrubs, with annual shoots from a woody base. Flowers medium-sized or small, in simple, branched, umbelliform cymes. Calyx 5-partite. Corolla campanulate, or urceolate or salver-shaped, lobes narrow or broad overlapping to the right. Coronal scales rarely 0, usually 5, adnate to the base of the staminal column, the free portion subulate, flattened or cuspidate, membranous and incumbent on the back of the anther. Column short; anthers with inflexed membranous tips; pollinia erect, pedicelled, waxy. Style apex flat, convex or beaked, sometimes very long. Follicles 2, often 1 by abortion, lanceolate or dagger-shaped.

Large climber; corolla tomentose externally. ..	1. *M. tenacissima.*
A slender suberect undershrub or twiner from a woody root-stock.	2. *M. Hamiltonii.*

I have excluded M. lucida, *Edgew*—It is a large evergreen climber. Leaves rather thick, elliptic or ovate, abruptly acute or acuminate, 3·5-7·5 by 2-4 in., dark glossy green above, yellowish dull green beneath; petioles stout, channelled 6-1 6 in. long. Flowers scented, purple, ·6-·8 in. across, in dense corymbiform cymes, follicles smooth solitary, beaked, about 3-5 5· in. long. Duthie records it from Bahraich, but this needs confirmation. I have seen no specimens from our area at Dehra. The usual habitat of this handsome plant, in this Province is in cool shady situations in Kumaun and Garhwal betwee 5,000—7,500 ft. where it is usually associated with oak forests.

1. Marsdenia tenacissima, *W. & A.* The Rajmahal hemp.

A large, twining shrub. Young parts, under-surface of leaves and inflorescence softly tomentose. Leaves 3-7 in. by 2·3-5 in. broad ovate, somewhat abruptly short acuminate, deeply cordate with rounded lobes and 5-7 basal nerves, upper surface pubescent or glabrate; petiole 2·4 in. long, tomentose. Flowers about ·25 in. across, greenish-yellow in spreading much branched corymbose cymes ·2-·4 in. across; peduncles intra-petiolar, short; pedicels ·15-.45 in. long. Calyx 5-partite pubescent, lobes ovate-oblong, obtuse. Corolla pubescent outside, campanulate; lobes nearly as long as the tube, oblong, obtuse, glabrous within. Corona about as long as the column, of 5 erect, oblong, obtuse lobes, which are often toothed or lobed at the apex and have two linear ridges below the middle. Style apex convex, dome-shaped. Follicles usually solitary, 4-6 in. by 1·1·2 in., with a tapering apex, tip often recurved, longitudinally wrinkled; brown velvety; seeds flat, oval ·3-·5 in. long; coma ·15-·2 in.

Pilibhit and Oudh, Bundelkhand—*Duthie.*

The fibres are strong and are used for fishing nets, lines, etc. The bark on old stems is furrowed and corky.
Fl. April—July. Fr. cold season.

2. Marsdenia Hamiltonii, *Wight.*

A slender suberect or climbing undershrub from a woody root-stock; roots usually several, annual; young parts rusty pubescent. Leaves 1·5-4 in. by 1-2 in., oblong or ovate-acuminate acute or obtuse, base cordate or subcordate, margin recurved, secondary nerves 4-8, lowest pair from near the base, ultimately glabrescent above, pubescent beneath, specially along the nerves; petiole up to 1·5 in. long. Flowers yellow ·25 in. across, in extra-axillary dense corymbose cymes, 1 in. across, shorter than the petioles; peduncles short, axillary. Calyx pubescent outside, 5-partite, lobes ovate-elliptic to oblong, obtuse, ciliate. Corolla urceolate; tube with villous throat; lobes thick broadly oblong, rounded, nearly as long as the tube. Corona fleshy with subulate membranous tips, usually exceeding the anthers and incurved. Style apex pentagonal, flat, with a conical or ovoid centre. Follicle (a fragmentary specimen only seen) about ·7 in. long, stout, ovoid, acute with somewhat rough surface. Seeds not seen.

Pilibhit to Gorakhpur in open burnt areas.
Fl. hot season.

10. TELOSMA, *Coville.*

Telosma pallida, *Craib.* Syn. **Pergularia pallida,** *W. & A.*

A large twining shrub, with corky bark when sufficiently old. Young parts and inflorescence pubescent with curled hairs. Leaves 1·5-4 by ·8-3·2 in. ovate acuminate or acute, cordate or subcordate, membranous, glabrescent or more or less pubescent specially on the nerves beneath, undersurface paler, lateral nerves 4 to 6 pairs, lowest 1-2 pairs basal, midrib glandular above at the base; petiole ·5-1·5 in. long. Flowers pale-yellow. ·7-1·3 in. across, on dense umbellate cymes; peduncles ·5 in. long; pedicels ·3-·7 in. long, slender; bracts linear minute. Calyx pubescent, deeply cleft, lobes broadly subulate, ciliate about ·2 in. long. Corolla salver-shaped, divided more than half-way down, tube swollen near the base up to ·4 in. long, lobes, linear-oblong obtuse, overlapping to the right in bud. Coronal processes staminal, arising from the base of the staminal column, flattened, each with a lamella from the inner face, which exceeds the stigma. Style apex capitate. Follicle usually solitary, 2·5-4 by ·7-1 in., bluntly beaked, smooth with a thin loose skin, somewhat turgid. Seeds ·4 in. long, margined, glabrous, broad ovate; comose.

Bahraich (Kakardari); not common.
Fl. June-September. Fr. cold season.

11. DREGEA, *E. Meyer.*

Dregea volubilis, *Benth.* Syn. **Marsdenia volubilis,** *T. Cooke.*

An extensive twining shrub; young parts tomentose, branches often pustular. Leaves 3-5 by 2·3-5 in., ovate acute or abruptly short, acuminate, subcoriaceous, softly pubescent with curled hairs, when young, becoming smoother with age, main lateral nerves 3-5 pairs, lower basal, base cuneate, truncate to broadly cordate with a tuft of bristles at the junction with the petiole above; petiole puberulous or pubescent, stout up to 2 in. long. Flowers green ·3-·5 in. across, in axillary or interpetiolar, drooping umbellate pubescent cymes: peduncles 1-3 in. long, pedicels up to 1·5 in. long; bracts densely hairy, minute. Calyx about ·1 in. long, 5-partite, lobes oval, obtuse, shaggy outside. Corolla green, becoming yellowish with age, at first cup-shaped, spreading; afterwards; tube very short; lobes ovate, obtuse, ciliate. Corona staminal; processes fleshy, gibbous with a short beak from the inner margin, bent towards the stigma. Style apex dome-shaped. Follicles usually double, 3-4 in. by about 1 in., velvety when young, divaricate, apex somewhat blunt. Seeds ·3-·4 in., broad ovate, margined; coma up to 1 5 in. long, silky.

Throughout the area in open forests, common. Bark on old stems corky and furrowed.

Blaze pale-yellow mottled with yellowish-brown.

Fl. April-July. Fr. cold season.

12. TYLOPHORA, *Br.*

Twining, rarely erect, herbs or undershrubs. Flowers small, often minute, in simple or branched racemose, umbelliform or fascicled cymes. Calyx 5-partite, ovate or lanceolate. Corolla rotate or rotate-campanulate, deeply 5-lobed, slightly overlapping to the right. Corona staminal, processes adnate wholly or in part to the very short staminal column. Anthers very small with an inflexed membranous tip, pollinia one in each cell, erect or ascending rarely transverse or pendulous from the ascending stalk. Style apex disciform, 5-angled. Follicles 2 or by abortion 1, acuminate, smooth.

Tylophora fasciculata, *Buch. Ham.*

A small undershrub 12-24 in. high, with several switchy pubescent shoots from a woody root-stock. Leaves 1-2·5 in. long, lanceolate or ovate, often mucronate, base cuneate or rounded, 3-nerved, glabrescent above, puberulous beneath, specially on the nerves, petiole up to ·5 in. long, Flowers minute greenish about ·2 in. across, in umbelliform or paniculate interpetiolar cymes, up to 2 in. long; peduncles slender, pedicels filiform, up to ·2 in. long, sepals lanceolate,

pubescent. Corolla lobes ovate lanceolate, acute. Follicles 1·5-2 in. long lanceolate, tapering smooth, usually solitary on a slender flexuous somewhat zig-zag peduncle, seeds flat ovoid.

Pilibhit, Bahraich and Gorakhpur, probably in all Oudh Divisions in open areas.

Fl. April-July. Fr. August-October.

Tylophora retundifolia, *Nam.*- A slender trailing herb, young parts and branchlets covered with curled hairs. Leaves opposite 2-4·5 in. long, elliptic-orbicular or oblong, often mucronate and rounded or emarginate at the apex, base roundered or subcordate, main secondary nerves 3-5 pairs, somewhat pubescent on the nerves specially on the under-surface ; thin, margin ciliate ; petiole pubescent, up to ·4 in. long. Flowers ·45 in. across in lax umbellate, pubescent cymes. Peduncle up to 1·6 in. long ; pedicels up to 1·5 in long, Bracts hairy, linear-lanceolate, peristent. Calyx segments ·2 in. long, narrow lanceolate, pubescent. Corolla lobes broadly ovate. Corona lobes adnate swollen and globose at the base. Follicles single 2-2·5 in. long, with a narrowed base and subacute apex, smooth. Seeds about ·3 in. long, margined, broadly oval, compressed ; coma about 1 in. long, silky.

Pilibhit Gonda, Kheri, Gorakhpur. Duthie calls it a climbing shrub. Does it flower while still herbaceous ?

Fl. May-July. Fr. cold season.

Tylophora asthmatica. *Wight & Arn.*—A slender twiner ; leaves 2-4 in. long, ovate or ovate-oblong, apiculate, thin, base rounded or subcordate, pubescent beneath ; petiole up to 1 in. Flowers yellowish-purple about ·5 in. across, in lax umbellate cymes on long filiform pedicels, often exceeding the peduncle. Follicles 2-4 in. long. The record is based on an incomplete specimen from Pilibhit ; further material is necessary for confirmation.

13. LEPTADENIA, *Br.*

Dextrorse twiners, or erect shrubs with almost leafless stiff stems. Flowers small, in lateral or axillary umbellate cymes. Calyx 5-lobed to the middle or beyond, eglandular. Corolla rotate or sub-rotate, deeply 5-lobed ; lobes valvate in bud, margins incurved, spreading, pubescent or bearded. Corona double ; the outer corolline of 5 small processes at the throat on sinuses between the lobes ; the inner staminal of an undulate fleshy ring at the base of the staminal column. Anthers inflexed on the style top but not membranous, with minute or no appendages. Pollinia erect or suberect, translucent at the apex. Style-apex 5-angled. Follicle usually solitary, thick.

Leafy twining shrub.	1. *L. reticulata.*
Erect, almost leafless shrub.	2. *L. Spartium.*

1. Leptadenia reticulata, *W. & A.*

A much branched dextrorsely twining shrub, with corky bark on old stems, young parts hoary. Leaves 2-3 by 1-1·5 in. (sometimes about 3 in. broad), ovate, ovate-oblong, sometimes broadly elliptic or suborbicular, usually acute or acuminate, rarely obtuse and mucronate, subcoriaceous, usually glabrous, sometimes scabrid above, and pubescent and paler beneath, base truncate, rounded or acute, lateral nerves 6-8 pairs. petiole ·5-1 in. puberulous or pubescent. Flowers about ·15 in. across, greyish-white or yellowish, crowded in axillary umbelliform pubescent cymes. Peduncles ·3-·75 in. long, pedicels of varying lengths but always shorter than the peduncles. Bracts ovate, acute, hairy, minute. Calyx lobes oblong-ovate. Corolla subrotate, rather fleshy; lobes pubescent on both faces, thick, ovate-oblong, valvate in bud, tip reflexed. Coroline corona of 5 broad, low, fleshy processes below the sinuses. Staminal corona a minute undulate ring beneath the anthers. Follicles usually solitary 2-3 in. by ·5-·7 in., somewhat inflated, smooth with a thick incurved beak. Seeds about ·5 in. long, narrow, ovoid, margined, coma about 1·25 in. long.

Pilibhit to Gorakhpur, Bundelkhand—*Duthie.*
In some forms the leaves are rough when young. The latex is yellowish.
Blaze yellowish-brown.
Fl. April-July. Fr. cold season.

2. Leptadenia Spartium, *Wight.*

A much branched, often leafless, grey-green shrub, branches terete, young parts puberulous. Leaves—in some young branches only,—·75-2·5 in. long, linear, glabrous. Flowers minute about ·1 in. long, yellowish, in lateral umbellate pubescent cymes; peduncles up to ·3 in. long. Calyx pubescent, minute, divided to about the middle, segments acute. Corolla deeply lobed, lobes ovate-oblong, pubescent inside, thickened towards the apex. Scales of coroline corona pubescent at the apex, minute; staminal corona a minute ring at the base of the staminal column. Follicles solitary, deflexed, 3-4·5 in. by ·25 in. lanceolate, tapering to a long beak, smooth. Seeds narrow-lanceolate about ·3 in. long; coma up to 1·5 in. long.

Bundelkhand, Afforestation Division.
The fibre is said to be suitable for making into well-ropes as it does not rot.
"The juice is clear and greenish and not milky, except in the fruit."—*Parker.*
Fl. September-December.

14. ORTHANTHERA, *Wight.*

Orthanthera viminea, *W. & A.* Vern. *Mahur-ghas.*

An erect leafless shrub, with stiff grey-green branches. Leaves rarely present, ·1 in. long, linear, brown pubescent. Flowers dull-brown about ·2 in. long, in few flowered compact tomentose cymes. Peduncles ·2-1 in. long; pedicels ·1 in. long or shorter. Calyx ·2 in.

long, 5-partite, nearly as long as the corolla ; sepals linear-acuminate, villous outside. Corolla salver-shaped, densely hair outside, glabrous within ; tube much contracted at the base ; lobes equalling the tube, valvate in bud, erect, oblong, keeled near the apex, sinuses folded. Corona staminal, of an undulate 10-lobed ring below the anthers. Anthers without apical appendages, incumbent on the style apex ; pollinia erect ; style apex conical, included, 5-gonal. Follicles single, erect, 3-6 in long, linear, tapering above, smooth and brown within, pericarp thin. Seeds ·2 in. long, brown ; coma about 5 in. long.

Pilibhit, Gonda, Bahraich, Bundelkhand in beds of dry streams.

The stem yields a good fibre, which could be made into cordage. The flower buds are said to be eaten as vegetable. It resembles at first sight Leptadenia Spartium, but it can be readily distinguished by its erect follicles, and (when present), larger flowers. The peduncles are also larger and fewer-flowered. The distribution of the two species do not coincide except in the dry south-western portion.

The following are commonly cultivated in gardens within our areas :—

1. **Stephanotis floribunda**, *Brongn.* Madagascar Jasmine.—A climbing shrub with thick smooth leaves and large clusters of fragrant, white, waxy flowers. A native of Madagascar.

2. **Asclepias curassavica**, *Linn.*—A perennial erect herb about 3 ft. high with linear-lanceolate leaves, 2-3 in. long, and orange and scarlet flowers in umbels. A native of the West Indies.

3. **Cryptostegia grandiflora** *Br.*—A scandent glabrous shrub, with coriaceous, elliptic, shining leaves, 3-4 in. long, and light purple flowers, 1·5-2 in. across. A native of Madagascar.

LII.—LOGANIACEÆ.

Trees shrubs or herbs. Leaves opposite, usually joined by a stipular line, more rarely stipules distinct. Flowers 4-5 merous, regular, in simple or panicled cymes or heads, less often solitary. Calyx inferior. Corolla gamopetalous, lobes imbricate, contorted or valvate. Stamens inserted on the corolla tube, alternating with the corolla lobes. Ovary free, usually 2-celled ; style simple ; stigma capitate 2-fid or partite ; ovules 1 or more in each cell ; placentæ on the dissepiment, or basal in the inner angle. Fruit a septicidal capsule or baccate, 1-many-seeded ; seeds albuminous.

Corolla lobes imbricate, fruit capsular. A shrub ; leaves pubescent beneath, without strong basal nerves ..	1.	*Buddleia.*
Corolla lobes valvate ; fruit baccate ; trees, leaves glabrous with strong basal nerves*	2.	*Strychnos.*

* Characters based on species occurring in our area.

1. BUDDLEIA, *L.*

Buddleia asiatica, *Lour.*

A large evergreen shrub up to about 10 ft. high with thin grey bark; young parts and under-surface of leaves hoary or grey stellate tomentose. Leaves 3-6 by ·75-1·5 in. lanceolate, acuminate, serrulate or entire, glabrate above, base narrowed, lateral nerves 11-13 pairs impressed above, prominent beneath; petiole 0-·4 in, joined by a stipular line. Flowers fragrant, white ·25-·3 in. long, sessile, bracteate in dense, axillary and terminal simple, or panicled spikes. Calyx ·15 in. long, campanulate, cleft nearly half-way down; teeth triangular. Corolla tubular-urceolate, tomentose outside and at the throat; lobes imbricate, short, rounded. Stamens included; filaments short. Ovary 2-celled, cells many ovuled. Capsule ·2-·3 in. long, glabrous, ellipsoid, septicidally 2-valved; seeds many, minute, linear or ellipsoid.

Throughout the area, often cultivated.
Fl. December—March.

2. STRYCHNOS, *Linn.*

Erect or scandent trees or shrubs with short circinate axillary tendrils. Leaves with 3-5 strong, basal or sub-basal nerves, usually coriaceous; petioles joined by stipular lines. Flowers white or yellowish, 4-5 merous, in terminal, lateral or axillary, bracteate cymes. Calyx lobes small. Corolla salver-shaped, campanulate or rotate, lobes valvate. Ovary 2-celled or 1-celled above; style usually long, less often short; stigma capitate or 2-lobed; ovules many. Fruit baccate, sometimes with woody or coriaceous pericarp, 1-many-seeded; seeds embedded in fleshy pulp, or descoid, globose or oblong; albumen horny.

Petiole ·25-·5 in. long; berry 1-2 in. across, many seeded. 1. *S. Nux-vomica*
Petiole under ·2 in.; berry ·5-·7 in. across, usually 1, sometimes 2-seeded. .. .. .. 2. *S. potatorum.*

1. Strychnos Nux-vomica. *Linn.* The Strychnine tree. Vern. *Kuchla.* Sans. *Kupilu, kulaka, vishamushti.*

An evergreen medium-sized tree with smooth grey bark. Leaves 2·5-5 by 2-3·5 in., broadly ovate, elliptic or sub-orbicular, apex subacute or rounded, base rounded, subcordate or suddenly cuneate on the petiole, 3-5-nerved—outer pairs weak, coriaceous, dark glossy green above; petiole ·25-·5 in. long. Flowers creamy-white ·3-·5 in. long in compact corymbose panicles of pubescent cymes which are mostly terminal. Peduncles short, up to 1 in. long; pedicels slender up to ·2 in. long; bracts subulate up to ·2 in. long. Calyx small, 5-lobed; lobes acute, hairy outside. Corolla salver-shaped, about ·2 in. across, tube ·2-·25 in. long; puberulous outside, hairy within towards the base, throat glabrous; lobes 5, short spreading, oblong-acute.

Stamens 5, slightly exerted between the lobes. Ovary glabrous, stigma globose. Berry 1-2 in. across, orange-red when ripe; seeds several, round, flat, grey satiny often depressed in the centre, ·5-·75 in. across, surrounded by an intensely bitter pulp.

Gorakhpur in a small plot at Chauk originally probably planted. Almost all parts of the tree are more or less poisonous, specially the seeds which contain strychnine and brucine. The seeds are used in medicine and are in considerable demand. Birds greedily eat the pulp apparently with no ill effects.

Fl. March-May. Fr. cold season.

2. **Strychnos potatorum,** *Linn. f.* The clearing nut. Vern. *Nirmali.* Sans. *Kataka, ambu prasada, jalada.*

A small branchy tree with brownish-black, cracked bark. Leaves subsessile, 2-5 by 1·2-2·7 in., ovate or elliptic, acute or sub-acute at the apex, base acute or rounded, basal nerves 3-5 pairs, strongest pair of nerves sub-basal, nearly reaching the apex in a wavy line on which a number of weaker secondary nerves terminate; petiole usually up to 1 in. long, channelled. Flowers white about ·2 in. long, fragrant, in dense glabrous, axillary cymes with very short peduncles, often from the axils of fallen leaves. Calyx 5-lobed, lobes acute. Corolla campanulate; lobes oblong, acute, about as long as the tube, hairy at the bases inside. Berry globose, ·5-·7 in. across, with a thin hard pericarp and scanty pulp; seeds 1-2, slightly compressed, covered with thick lenticels and short silvery adpressed hairs.

Banda; rare.

The seeds rubbed inside a vessel have the remarkable property of clearing turbid water. They are also used for diseases of the eye. The pulp is said to be edible.

Fl. April-May. Fr. cold season.

LIII.—BORAGINACEÆ.

Herbs, shrubs or trees, often hispid or scabrous or with superficial cystoliths. Leaves usually alternate, simple, exstiuplate. Flowers regular hermaphrodite, rarely polygamous, usually in scorpoid cymes, sometimes trichotomously panicled, rarely solitary and axillary; bracts leafy, small or 0. Calyx inferior, 5-rarely 6-8-toothed, or lobed, usually persistent, often accrescent in fruit. Corolla usually 5, sometimes 4-8-lobed, often with scales on the throat; lobes imbricate, rarely twisted in bud. Stamens on the corolla-tube, usually as many as the lobes and alternating with them; filaments often dilated at the base; anthers introrse; disk hypogynous or obsolete. Ovary superior, 2-celled with 1 ovule in each cell; style terminal or gynobasic, simple or once or twice forked; ovules erect. Fruit drupaceous or dividing into 2-4 nutlets. Seeds straight or curved; albumen scanty or none.

NOTE.—The blaze in most woody Boraginaceae rapidly change colour on exposure.

Style twice forked; trees or large shrubs ..	1. *Cordia.*
Style 2-partite or styles 2; trees or shrubs	2. *Ehretia.*
Style 1, undivided; a small shrub	3. *Rhabdia.*

1. CORDIA, *Linn.*

Trees or shrubs. Leaves alternate rarely subopposite, petiolate, often with superficial cystoliths. Flowers polygamous, ebracteate in dichotomous corymbose cymes or clusters. Calyx tubular or campanulate, accrescent in fruit, sometimes ribbed, teeth often unequal or obscure. Corolla funnel or salver-shaped or campanulate, usually white or yellowish, lobes 4-8, spreading or reflexed, stamens 4-8; filaments usually hairy at the base; anthers shortly exserted, sagitate or hastate; ovary 4-celled, ovule 1 in. each cell. Style twice 2-partite; stigmas capitate, clavate. Fruit an ovoid or ellipsoid drupe, often with viscid pulp and a hard 1-4-celled stone, usually with 1 fertile seed, seeds exalbuminous, cotyledons plicate.

I. Trees. Leaves mostly alternate, over 2 in. in breadth, basal nerves 3-5, distinct :—	
A. Leaves glabrescent or slightly rough above; calyx glabrate not ribbed :—	
Bark more or less rough furrowed	1. *C. Myxa.*
B. Leaves rough above; calyx pubescent and ribbed :—	
Leaves sub-opposite and alternate, ovate, usually cordate or rounded at the base; corolla tube glabrous within.	2. *C Macleodii.*
Leaves alternate, elliptic-oblong to suborbicular often cuneate at the base. Corolla very hairy within...	3. *C. vestita.*
II. Shrubs or small trees. Leaves opposite or sub-opposite under 2 in. broad, basal nerves not distinct ..	4. *C. Rothii.*

1. Cordia Myxa, *Linn.* Inc. C. obliqua, *Willd.* Vern. *Lissora, lassora.*

A middle-sized deciduous tree, with grey or brown bark, with shallow longitudinal furrows. Young parts pubescent, often with stellate and longer hairs mixed. Leaves variable 2·5-6 by 2-4·5 in., ovate, elliptic-oblong, or sub-orbicular, entire or sinuate dentate, coriaceous, glabrous or sometimes scabrid above, more or less pubescent beneath, specially on nerve axils, base cuneate or rounded, usually 3-nerved, main secondary nerves (excluding the basal pair) 3-5 pairs; petiole ·5-2 in. long. Flowers white ·2-·4 in. across; peduncles 1-2 in. long; pedicels short; calyx up to ·25 in. long, not ribbed, irregularly lobed, pubescent at the tips, ultimately glabrescent outside, silky inside, at first campanulate, accrescent and saucer-shaped in fruit. Corolla-tube as long as the calyx, with a few scattered hairs within; filaments glabrous, or with few scattered hairs at the base. Drupe ·5-1 in. long, ovoid, apiculate, yellow or shining when ripe, filled with a viscid pulp; stone usually 1.

All over the area; often cultivated.

Wood is soft and porous and seasons well, but is used principally for fuel. The fruit, which is called sabasten by Europeans is pickled green or eaten. Blaze pale-yellow rapidly turning bluish on exposure, fibrous.

According to Hutchinson (Kew Bulletin, 1918, 217 *et. seq.*) true Cordia Myxa *Linn.* is restricted to Asia Minor, Egypt, etc., and differs from our tree—which he calls C. obliqua, *Willd*—by its shorter, more extended style arms, almost glabrous filaments and by the leaves being lightly covered on the under-surface with short setulose hairs and also being flabellately 5-7-nerved at the base. As intermediate characters apply to local forms of the plant, I have tentatively retained the older name.

Fl. March-April. Fr. July-August.

2. Cordia Mecleodii, *Hk. f. and T.*

A medium-sized deciduous tree. Young parts grey or fulvous tomentose; bark grey, smooth. Leaves sometimes subopposite, 3-6 in. long, broadly ovate, obtuse, hard when mature, 3-5-nerved and cordate at the base, upper surface pubescent when young, rough and shining and usually covered with white disks when mature, under-surface grey or brown pubescent or tomentose; petioles 1-2 in. long, densely woolly. Flowers polygamous, white, in dense corymbose paniculate cymes which are 2-4 in. across. Calyx up to ·4 in. funnel-shaped, ribbed and tomentose; lobes obtuse. Corolla-tube about as long as the calyx-tube, hairy outside, glabrous within; lobes usually oblong, about ·3 in. long. *Male flowers.*—Stamens exserted; filaments hairy at the base; anthers larger than those of the bisexual flowers; pistils rudimentary. Drupe ·5-·75 in. long, ovoid, acute seated on the cup-shaped, ribbed calyx.

Pilibhit, N. Oudh and Bundelkhand—*Duthie.*

The wood is light-brown, even-grained and hard and is suitable for cart wheels, agricultural implements, and furniture. Fruit not edible.

"Blaze pale, turning brown."—*Haines.*
Fl. March-April. Fr. May-June.

3. Cordia vestita, *Hk. f.* Vern. *Ajanta.*

A middle-sized deciduous tree; bark quite smooth, greenish-grey or often with a touch of red, peeling off in strips, young parts fulvous or grey tomentose. Leaves 4-8 by 3-6 in., elliptic-oblong to orbicular, subacute to acuminate, margins undulate, coriaceous, rough and usually covered with white discs above, tomentose or pubescent beneath, base cuneate or rounded lateral nerves 3-5 pairs, lowest subbasal; petiole 1-1·5 in. long. Flowers polygamous, yellowish-white, in tomentose, compound cymes. Calyx at first obconic, ribbed about ·5 in. long, glabrous inside, corolla-tube as long as the calyx, very hairy within; lobes about ·3 in. long, spreading, oblong. Drupe about ·7 in. long. Yellow when ripe, globose apiculate seated on the saucer-shaped calyx, pulp gelatinous; stone; solitary.

Gonda, rare.
Timber light-brown, beautifully mottled with darker colour. Tough, even-grained and elastic, takes a fine polish and should be well suited for cabinet work. Little known in our area at present and seldom used. The fruit is edible.

Blaze white to pale-yellow, turning orange-brown on exposure, edges green, brittle, about ·75 in

Fl. and new leaves, March-April. Fr. June-July.

4. Cordia Rothii, *Roem.* Vern. *Gondi, gondni.*

A small tree with grey furrowed bark. Leaves opposite or sub-opposite, 2-5 by ·7-1·5 in., oblanceolate-oblong, with rounded apex and cuneate base, rough and covered with white disks (when dry) above, pubescent specially along the nerve axils beneath, secondary nerves obscure, about 4-6 pairs. Flowers white in lax pedunculate cymes; peduncles up to 1·2 in. long. Calyx about ·15 in. long, campanulate, lobes 4, obtuse, silky inside. Corolla about ·2 in. long; lobes nearly as long as the tube, oblong, obtuse, filaments glabrous. Drupe ovoid, apiculate, yellow, longitudinally striate about ·4 in. long, seated on the cup-like calyx.

Etawah, Bundelkhand.

The fruit is edible, the timber is suitable for buildings, agricultural implements, etc., but is rarely used.

Fl. April-June with new leaves.

2. EHRETIA. *Linn.*

Trees or shrubs. Leaves alternate. Flowers usually white, small, in terminal or axillary corymbose cymes rarely solitary. Calyx 5-partite. Corolla with a short tube, lobes 5 spreading or reflexed, imbricate in bud. Stamens 5, on the corolla-tube; anthers usually exserted. Ovary 2-celled; ovules 2 in each cell; style terminal 2-fid, or 2-partite, or styles 2; stigmas small capitate. Fruit a small globose drupe, endocarp hard consisting of one 4-celled stone, two 2-celled or four 1-celled pyrenes, one or more pyrenes or cells often suppressed.

I.	Leaves serrate	1. *E. acuminata.*
II.	Leaves entire :—	
	Leaves over 3 in. long, glabrous beneath.. ..	2. *E. laevis.*
	Leaves under 3 in. long, hairy beneath when mature	3. *E. aspera.*

1. Ehretia acuminata, *R. Br.*

A middle-sized sub-deciduous tree; bark usually deeply furrowed, pale-brown or dark-grey, young shoots pubescent. Leaves 3-7 by 1·5-2·5 in., elliptic or elliptic-oblong, acuminate, serrate, coriaceous, covered with minute, adpressed rough hairs, or glabrous and shining above, lateral nerves 6-8 pairs, forking before reaching the margin; petiole ·5-1 in. long. Flowers white ·15 in. across in dense, terminal, pyramidal panicles, lower branches of which arise from leaf axils. Calyx ·1 in. long, lobes ovate-obtuse, ciliate. Corolla twice

as long as the calyx, lobes reflexed, oblong : style shortly 2-fid. Drupe about ·15 in. across, nearly black when ripe with 2 pyrenes, each 2-seeded.

Throughout the circle, not common, usually in grass-lands.

Wood lightbrown, easily workable, suitable for posts, beams, etc., but is rarely used within the circle. The fruits are said to be edible.

Blaze pale-yellow or white turning brown, soft, about ·5-1 in.

Fl. March-April. Fr. November-December, nearly deciduous before flowering.

2. **Ehretia lævis,** *Roxb.* Vern. *Chamror, datranga, gurjia.*

A small deciduous tree, with smooth yellowish-brown or ashy mealy grey, brittle bark. Leaves 3-6 by 1·5-4 in., elliptic, sometimes broad ovate, obtuse or acuminate, entire, somewhat fleshy, when mature, usually glabrous, dark-green, lateral nerves 6-10 pairs, base acute to rounded ; petiole up to 1 in. long. Flowers white about ·3 in. across, sessile or pedicelled, unilateral on the branches of a lax, panicled, dichotomous cymes. Panicles lateral or terminal, puberulous or glabrous. Calyx pubescent outside, lobes lanceolate ; corolla exceeding the calyx, 2 in. long ; lobes 1 in. long, acuminate. Drupe ·2 in. across, deep orange when ripe, roundish with 1-4 stones.

Common.

The leaves when crushed, and freshly cut bark have a peculiar offensive smell resembling that of Holoptelea integrifolia.

Blaze at first white rapidly turning yellowish-brown.

Leafless February-April. Fl. February March. Fr. April-June.

3. **Ehretia aspera.** *Roxb.* Syn. **Ehretia lævis,** var. aspera. *Clarke.*

A deciduous shrub, shoots pubescent. Leaves 75-2 5 in. long, obovate, or elliptic-oblong shortly acuminate or obtuse, somewhat rough above and hairy beneath, petiole 2- 7 in. long. Flowers white ·3- 5 in. across in terminal and lateral corymbose, somewhat lax and pubescent, paniculate cymes. Calyx 1 in. long, hairy outside, lobes obovate-oblong, ciliate ; corolla 25-·3 in. long, tube exceeding the calyx, lobes blunt, spreading. Drupe about ·25 in. across, depressed globose ; pyrenes usually 4.

Kheri—*Duthie.* I have seen no specimens at Dehra from our area.

Fl. Feb.-March.

3. RHABDIA, *Mart.*

Rhabdia lycioides. *Mart.*

A small shrub 2-4 ft. high, with creeping and rooting branches. Young parts pubescent. Leaves 5-1 by 2-·3 in., subsessile, linear-spatulate or oblong ovate, apiculate, adpressed pubescent. Flower small, pink, 25-·4 in across, 5-merous on short pedicels, 2-3 together on

short lateral branches. Calyx ·2 in. long, 5-partite, lanceolate ciliate; persistent. Corolla-tube short, lobes spreading twice as long as the tube. Stamens 5 exserted; style terminal; stigma capitate or minutely 2 lobed. Drupe subglobose, red when ripe about ·15 in. across, with 4 pyrenes.

Bundelkhand, on rocky river beds—not common.
Fl. October-November.

LIV.—CONVOLVULACEÆ.

Herbs, undershrubs or shrubs, rarely trees, often dextrorse twiners, sometimes with milky juice. Leaves alternate, usually simple, often palminerved, sometimes palmately lobed, rarely wanting or compound, exstipulate. Flowers often showy, bisexual, regular, solitary or cymose, usually with 2 well developed bracteoles. Calyx inferior, often persistent, and sometimes accrescent in fruit; lobes imbricate, deeply 5-lobed, sepals free. Corolla plicate in bud, campanulate, funnel-shaped, tubular or rotate, limb 5-lobed or angled. Stamens 5, inserted on the corolla-tube and alternating with the lobes, sometimes unequal, included or exserted; anthers often twisted. Disk annular, entire or lobed, sometimes obsolete. Ovary usually bicarpellary, 1 or more often 2-celled, sometimes 4-celled by formation of false septa. Styles 1-2; stigma capitate, 2-lobed or stigmas 2. Ovules 2 in each carpel. Fruit usually capsular or indehiscent; seeds 4-1, often compressed at the angles; albumen usually 0, or scanty; cotyledons foliaceous and plaited.

I. Leafy plants.—
  A. Style hardly any; corolla lobulate with crisped margins:—
    Evergreen woody climber with yellowish-white panicled flowers and indehiscent fruit. .. 1. *Erycibe.*
  B. Style or styles elongate; petals not lobulate nor crisped on the margins:—
    1. Sepals not enlarged into wings; flowers large, few together in cymes:—
      Ovary 4-celled; fruit woody; leaves glabrate above, silky beneath. .. .. .. 2. *Rivea.*
      Ovary 2-celled; fruit fleshy; leaves strigose on both surfaces. .. .. .. 3. *Lettsomia.*
    2. Sepals enlarged into wings; flowers small, many in panicles. .. .. 4. *Porana.*
II. Leafless parasite. .. .. 5. *Cuscuta.*

1. ERYCIBE, *Roxb.*

Erycibe paniculata, *Roxb.*

A large evergreen woody climber, with brown or dark-grey bark, young parts and inflorescence ferruginous tomentose. Leaves 2·2-5 by 1-2·2 in., elliptic or obovate-oblong, abruptly acuminate, entire, base acute, coriaceous, glabrous, dark glossy green above when mature, paler beneath; main secondary nerves 4-6 pairs arcuate, petiole up to ·7 in. long. Flowers yellow, fragrant, about ·5 in. across, in terminal, less frequently axillary, cymose panicles

(sometimes racemes) which are up to 7 in. long; pedicels about ·2 in. long. Calyx divided to the base, ferruginous tomentose, sepals 5, about ·15 in. long, suborbicular, closely cilliate, coriaceous, central portion thick. Corolla-tube broadly campanulate, short, about as long as the calyx; lobes 5, spreading 2-fid at the top, crisped and sinuate on the margin with a hairy ovate lanceolate band on the back below the apical lobes. Stamens inserted at the base of the tube; included; filaments short, narrowed at the apex; dilated at the base; anthers with curved awns. Ovary 1-celled, 4-ovuled; stigma nearly sessile, subglobose, 5-lobed. Fruit baccate, 1-seeded, ·5-·7 in. long, ovoid, black with dark-purple pulp, seated on the persistent calyx. Seeds elliptic, albumen scanty, intruded between the folds of the cotyledons.

Pilibhit, Oudh Divisions, Gorakhpur, Banda, nowhere common.

Fl. May-June. Fr. next hot season.

2. RIVEA, *Choisy.*

Erect or twining shrubs. Leaves ovate, cordate, silky when young, petioles long. Flowers in axillary, few flowered peduncled cymes; often supported by bracts. Sepals subequal, short. Corolla large, salver-shaped; tube long, tubular, limb scarcely lobed, wide, funnel-shaped. Stamens included. Disk annular. Ovary 4-celled, 4-ovuled; style slender; stigmas, linear-oblong. Fruit indehiscent or irregularly breaking up, nearly dry, subglobose. Seeds 1-4, glabrous, in a mealy pulp.

Stout erect shrub. Leaves usually broader than long; sepals lanceolate; peduncles 3-7 flowered .. 1. *R. ornata.*

Scandent. Leaves usually not broader than long, sepals ovate-obtuse; peduncles 1-3-flowered. .. .. 2. *R. hypocrateriformis.*

1. Rivea ornata, *Choisy.* Var. Griffithii, *Clarke.*

A spreading shrub or undershrub, with woody base and herbaceous stem, up to about 6 ft. in height, young parts densely silky pubescent or villous. Leaves 3-6 in. across, orbicular-cordate or reniform, often apiculate, sometimes emarginate, silky beneath, secondary nerves 5-7 pairs; lower pairs from the base; petiole 1·5-5 in. long with a green grandular patch on either side at the junction with the midrib. Flowers white, fragrant, 2-2·5 in. across, 3-7 together on stout peduncles which are up to about 5 in. long. Sepals ·5-·6 in. long, oblong or ovate-lanceolate, acute, silky outside, persistent. Corolla-tube 2-3 in. long, sparsely hairy in bud, glabrous afterwards. Fruit reddish-brown, 1-celled, tipped by the base of the style, irregularly break ng up when ripe, seeds surrounded by a mealy pulp.

Pilibhit, Gonda, Kheri, Bahraich.

Fl. rainy season.

2. Rivea hypocrateriformis, *Chois,* Vern. *Phang.* The clove-scented or the Midnapore climber.

A twining climber with grey silky branches: young parts villous. Leaves 1-4 in. long, orbicular-cordate, rarely broade than long, sub-acute or obtuse, apiculate or emarginate, adpressed silky beneath, main lateral nerves up to 6 pairs, the lower pairs form the base; petiole up to 2 in. long, with a green gland on either side at the junction with the midrib. Flowers white about 2 in. across, 1-3-flowered on axillary peduncles, which are up to 2 in. long; pedicels very short. Sepals 3 in. long, ovate-elliptic, obtuse, silky hairy. Corolla-tube 2·5-3 in long, glabrous or puberulous outside, dilated upwards, limb spreading with well marked bands. Fruit about 5 in. in diameter, globose, reddish-brown, tipped with the remains of the style, seeds 1-4.

Gonda, Kheri (incomplete specimen), Jhansi.

The young shoots are eaten as vegetable—*Duthie.* The flowers open at sunset and close in the morning.

Fl. September Fr. cold season.

3. LETTSOMIA, *Roxb.*

More or less hairy twiners. Leaves cordate or rounded at the base. Flowers usually pink, in axillary, dense, long peduncled cymes; bracts conspicuous. Sepals somewhat enlarged in fruit. Corolla funnel-shaped with plicate limb. Stamens included (in our species); anthers straight. Disk annular or cupular. Ovary 2-celled, 4-lobed; stigma of 2 round lobes. Fruit dry indehiscent. Seeds 1-4, imbedded in mealy pulp.

Flowers subsessile in capitate cymes; calyx lobes ovate, acute; peduncles not stout. .. .. 1. *L. Thomsoni.*

Flowers pedicelled in corymbose cymes; calyx lobes round, obtuse; peduncles stout. .. .. 2. *L. setosa.*

1. Lettsomia Thomsoni, *Clarke.*

A large dextrorse climber, branchlets hirsute. Leaves 2·5-5 by 1·5-3 in., ovate-acuminate, with cordate base, secondary nerves 10-14 pairs, lower 3 close to the base, covered with long bulb-based adpressed hairs on both surfaces, more densely beneath; petiole 1-3 in. long. Flowers rose-purple, about 1·5-2 in. long and about 1·5 in. across, subsessile in few flowered heads. Peduncles 2-5 in. long; bracts spatulate-oblong, about ·4 in. long, deciduous, adpressed pubescent. Sepals exceeding the bracts, ovate-acute, villous with

long brown hairs, somewhat enlarged and coriaceous in fruit. Corolla rose-purple, covered between the folds with long straight brownish hairs outside. Berry about ·5 in. across, thin walled orange-red when ripe; seeds 2-4.

Pilibhit, Kheri, Bahraich, Gorakhpur, probably in other Oudh Divisions not common.
Bark of older stems corky. Striate; blaze exuding latex.
Fl. rainy season. Fr. cold season.

2. Lettsomia setosa, *Roxb.*

A large climber, with strigose branchlets. Leaves 2 5-6 by 2-5 in., ovate-cordate, acute or short, often abruptly. acuminate, sparsely adpressed, hairy on both surfaces when young, ultimately glabrescent; lateral nerves 8-14 pairs, lower close to the base; petioles 1-3 in. long. Flowers 1·5-2 in. long and about 1·2 in. across, purple, in dense corymbose cymes, on stout strigose peduncles, which are 3-8 in. long; pedicels up to ·3 in. long, stout. Bracts elliptic-oblong to orbicular, about ·3 in. long, densely hairy, deciduous, leaving prominent scars on falling. Sepals broadly oblong, or roundish, densely hairy, ·3,·5 in. long, subequal, somewhat accrescent in fruit. Corolla funnel-shaped, somewhat swollen in the middle, base white, glabrous, upper portion purple, strigose outside on the bands between th folds, lobes with pointed tips. Berry orange, ·3 in. long, ovoid, apiculate, 2-4-seeded.

Jhansi, N. Oudh—*Duthie.*
Fl. October -November. Fr. cold season.

4. PORANA, *Burm.*

Porana paniculata, *Roxb.* The bridal creeper.

An extensive dextrorse woody climber. Bark rough, light-brown. Young parts and inflorescence tomentose. Leaves variable, usually 2-5 in. long, small towards the inflorescence, ovate, acuminate, base cordate, 5-7-nerved. thin, glabrescent above with age, softly pubescent beneath; petiole variable up to 4 in. long. Flowers white, ·15-·25 in. long, in terminal and axillary, lax panicles, bearing leaf-like bracts; bracteoles subulate. Calyx deeply 5- lobed pubescent: lobes subulate, persistent, 3 (rarely all) of which are greatly enlarged in fruit. Corolla tubular-campanulate, about ·2 in. long, shortly 5-lobed, pubescent outside, limb plicate; stamens 5, included; filaments short. Ovary 2-celled; style short, undivided, stigma capitate, 2 obtd, subsessile. Capsule thin, fragile, pubescent outside, shortly apiculate, ·2 ·3 in. long. 1 seeded, supported by the enlarged sepals. one of which is oblong or ovate, 2-3 in. by ·7 in., others linear and much smaller, all prominently reticulate and ultimately dry.

Throughout the area very pretty when in flower with its tresses of white drooping blossoms covering the largest trees.
The twigs are suitable for coarse basket-making.
Blaze whitish, turning brown.
Fl. September-November. Fr. cold season.

5. CUSCUTA, *Linn.* The Dodders.

Cuscuta reflexa, *Roxb.* Vern. *Akas bel.*

A leafless parasite, with glabrous greenish-yellow twining stems, which are often collected together in pendulous masse on small trees or shrubs. Flowers white, about .3 in. long, solitary or in cymose, clusters, which are sometimes racemed; pedicles 0 to short, usually verrucose, bracteate. Calyx deeply 5-partite, ovate, obtuse. Corolla tubular-campanulate, somewhat fleshy, tube. 25-·3 in. long, broadening upwards, with 5 fimbriate incurved scales at the base; lobes triangular, small, reflexed. Stamens at the throat of the corolla, slightly exserted. Ovary 2-celled with a minute style with 2 fleshy lanceolate stigmas, ovules 2 in each cell. Capsule marked with black or purple dots when young; globose, circumscis near the base, seeds 2-4, with spiral peripherical embryo in fleshy albumen; cotyledons almost absent.

Throughout the area, destructive to shrubs, etc., if neglected; usually in scrubs and near cultivation. The stem and backs of bracts and sepals are often purplish verrucose.

Fl. October-February. Fr. December-March.

Calonyction Bona-nox, *Boja.* Syn. Impomœa Bona-nox, *Linn.* var. grandiflora, *F. B. I.* Moon flower.

A large glabrous twiner, stems sometimes muricate. Leaves 3-7 in. ong, broadly ovate-cordate, acute or acuminate. Flowers 3-5 in. across, pure white on 1-5-flowered peduncles, which are 2-6 in. long, sepals aristate. Corolla-tube about 3 in. long. Stamens exserted. Capsule about 1 in. long seeds yellow.

The flowers open in the evening and close on the following morning, usually cultivated; sometimes naturalized near habitations.
Fl. rainy season.

Calonyction muricatum, *G. Don.* Syn. Ipomœa muricata, *Jacq.*

A twiner usually with muricate stems. Leaves 2·5-6 in. long, broadly ovate, entire, glabrous. Flowers pink or rose-purple, peduncles 1-5 flrd.; pedicels thickened upwards in fruit. Sepals tapering, about ·5 in. long. Corolla 2-3 in. long. Stamens included. Capsules about ·5 in. across, globose, pointed at the top. Seeds black.

Bundelkhand. The thickened pedicels are eaten, Fl. rainy season.

Quamoclit coccinea, *Moench.* Syn. Ipomœa coccinea, *Linn.*

A herbaceous climber with ovate, cordate, some times acutely lobed leaves 1·5-3 in. long with red, salver-shaped flowers, about 1·5 in. long.

Cultivated, sometimes naturalized.

Quamoclit vulgaris, *Choix.* Syn. Ipomœa Quamoclit, *Linn*, Sans. *Tarulata.*

A graceful slender climber with pinnatipartite leaves, with slender, linear segments and bright red or white salver-shaped flowers. Cultivated but sometimes run wild.

Ipomœa hedaracea *Jacq.*

An extensive twining annual. Leaves 2-5 in. long, broadly ovate-cordate, acuminate, 3-angled or more or less deeply lobed, less often entire, lobes acuminate; petiole up to 4 in. Flowers blue or pink, tubular-funnel-shaped upto 2·5 in. long, about 1·5 in. across, 1-5 together on long peduncles, sepals ligulate, acuminate, ovary 3-celled 6-ovuled. Capsules ·4 in. across; seeds 4 or 6.

Cultivated, also often an escape from cultivation. The seeds known as *kaladana* are used as purgative.

Ipomœa purpurea, *Roth.* Morning Glory.

A hairy twiner, with cordate leaves and flowers varying in colour from white to bluish-purple; resembles I. hederacea to some extent, but differs by its entire leaves, smaller flowers and lanceolate, acute or short acuminate sepals.

Commonly grown in gardens, but quite common and apparently wild in the adjoining Himalayan and sub-Himalayan areas.

Ipomœa Batatas, *Lamk.* Sweet Potato. Vern. *Shakarkand.*

Glabrous or nearly so. Leaves ovate cordate, more or less lobed. Cultivated for the sake of the tubers of which there are two varieties—the red and white. It is believed to be a native of tropical America.

Ipomœa reptans, *Poir.* Syn. Ipomœa aquatica, *Forsk.* Sans. *Kalambi.* Vern. *Kalmi.*

A glabrous aquatic herb, with trailing or floating stems rooting at the nodes. Leaves hastate or cordate, entire or more or less angularly lobed, with pale rose-coloured flowers about 2 in. long.

Common in ponds and ditches. The young leaves are eaten as vegetable.

Ipomœa barlerioides, *Carke.*

A slender hairy twiner or trailing herb with a woody root-stock. Leaves 1-3 in. long, ovate-oblong, mucronate, base shallow, cordate or rounded, hairy on both surfaces; petioles up to ·75 in. long. Flowers solitary, rarely 2, on short bracteate peduncles, which elongate in fruit, pedicles very short. Sepals densely villous, unequal, outer larger, and foliaceous about ·5 in. long. Corolla purple 2·5-3 in. long, funnel-shaped from a tubular basal portion. Capsule ·5 in. long ovoid, glabrous. Seeds oblong hairy.

Oudh and Gorakhpur.

Ipomœa petaloides, *Chois.* Syn. Merremia crispatula, *Prain.*

A large climber, with woody base, older stems, often with raised lines. Leaves glabrous, very variable, attaining 7 in. by 5 in., ovate, with obtuse, often mucronate apex, base cordate, retuse or rounded upper usually narrower, sometimes only 1·5 in. long, glabrous, midrib and sec. nerves reddish, 5-9 pairs. Flowers yellow 1·5-2 in. long, subracemose; pedicels ·5-·8 in. long. Sepals ·7 in. long, glabrous, subacute, enlarged and thickened in fruit. Corolla adpressed silky outside. Capsule 2-celled with 4 membranous valves. Seeds minutely velvety with sub-villous margins.

Pilibhit, Oudh Divisions, Jhansi.

VAR. pauciflora, *C. B. Clarke.*—Leaves all narrow lanceolate: flowers 1, rarely 2 on each peduncle. Oudh and Gorakhpur—*Duthie.*

Ipomæa Turpethum, By Syn. Operculina Turpethum. *Mans.* The Indian Jalap. Vern. *Nisoth, pitohari.* Sans. *Trivrit, triputa.*

A fairly large twiner, with woody root-stock, stems with 3-4 ridges or narrow wings. Leaves, young branches, and inflorescence somewhat pubescent or glabrescent with age. Leaves 2-5 in. long, lower broadly ovate-acuminate, acute or obtuse, sometimes angled or lobulate, base cordate to truncate; upper narrower, ovate-lanceolate to oblong; all usually mucronate; petiole up to 2 in. long, margined in the lower leaves. Flowers white 1·5-2 in. across, 3-5 together on axillary pubescent peduncles, up to 2 in. long; pedicels lengthening and stout in fruit, attaining 1·3 in. Bracts oblong, cuspidate, pubescent up to 1 in. long. Sepals elliptic-oblong or ovate, ·5-·7 in. long, outer broadest, inner membranous, much enlarged, thickened, and somewhat brittle in fruit. Corolla glabrous, often covered with very minute resinous glands, limb campanulate; stamens included. Capsule ·5-·75 in. long, enclosed within the calyx segments, exocarp irregularly splitting leaving the depressed globose membranous, transparent 2-celled endocarp exposed. Seeds 1-4.

Pilibhit, Kheri, Gorakhpur, Bahraich, Bundelkhand. The roots known as "Turpeth root" are said to be equal to jalap as an effective purgative.

Ipomæa Leari, *Paxt.*

A handsome perennial climber, with broad 3-5-lobed pubescent leaves up to 5 in. long and beautiful blue flowers; often grown in gardens within the area. A native of South America.

Ipomæa pulchella, *Roth.* I. palmata, *Forsk.* The Railway Creeper.

A perennial climber with glabrous palmatipartite leaves, up to 3 in. long, with 3-7 more or less entire lobes, and purple flowers 2-3 in. across. It derives its name from being frequently used as a decorative plant in railway stations. Largely cultivated. A native of tropical America.

Ipomæa sinuata, *Ortega.* Syn. Ipomœa dissecta, *Pursh.*

Is very similar with white flowers and purple eye—hardly more than a variety of the last. Common in gardens.

Ipomæa carnea, *Jacq.*

A stout straggling or subscandent shrub, with milky juice. Leaves about 4 by 2 in., ovate or ovate-lanceolate, acuminate, glabrate, cordate at the base, with a gland on each side at the base of the midrib, petiole about ·25 in. long. Flowers large rose-purple, 2·5 in. long, 2 in. across, in peduncled cymes. Sepals broadly ovate. Corolla subcampanulate, tube puberulous. A native of South America. Commonly grown in gardens.

Mina lobata, *L. & L.*

A climber with palmately lobed leaves and orange and scarlet flowers in branched cymes. Commonly grown in gardens.

LV.—SOLANACEÆ.

Herbs or shrubs, sometimes climbing, rarely soft-wooded small trees. Leaves alternate, exstipulate, often unequal, sometimes subopposite. Flowers in axillary, extra-axillary or terminal cymes or in clusters or solitary, usually pentamerous. Calyx inferior, usually 5 lobed, and persistent, sometimes enlarged in fruit; sepals equal, rarely unequal. Corolla rotate, campanulate, or funnel-shaped, often plicate. Stamens on the corolla-tube, sometimes

unequal or some rudimentary; anthers sometimes dehiscing by pores. Disk often prominent. Ovary superior, usually obliquely 2-celled, rarely 3-5-celled, or by abortion of septum 1-celled. Ovules usually many on prominent peltate placentæ; style simple; stigma 2-lobed or partite. Fruit baccate or capsular, usually 2-celled, many-seeded. Seeds compressed, discoid or sub-reniform albuminous; embryo often peripherial in the albumen.

A. Fruit baccate;—
Corolla rotate; anthers opening apically; fruit never completely enclosed by the calyx. .. .. 1. *Solanum.*
Corolla tubular-campanulate; anthers opening longitudinally; fruit completely enclosed by the inflated calyx. .. .. 2. *Withania.*
B. Fruit capsular. .. .. 3. *Datura.*

1. SOLANUM, *Linn.*

Herbs, shrubs or less often trees, armed or unarmed, sometimes climbing. Leaves alternate or subopposite entire, lobed or pinnatifid. Flowers in cymes, or lateral racemes. Calyx 5-10-lobed or toothed, enlarged or not in fruit. Corolla rotate, rarely widely campanulate, limb 5-lobed, plicate in bud. Stamens usually 5, attached to the throat of the corolla; filaments short, anther connivent, opening by terminal pores or apical slits. Ovary 2-celled (rarely 3-4 or more-celled in cultivated species) style columnar; stigma small. Fruit a globose or elongate berry; seeds many, discoid.

Unarmed, erect shrub, covered with stellate tomentum... 1. *S. verbascifolium.*
Armed shrubs:—
Fl. bisexual in racemose cymes; berry ·3 in. across. .. 2. *S. indicum.*
Fl. polygamous; peduncle 2-branched, one bearing a solitary bisexual flower and the others a raceme of males; fruit 1 in. or more across. .. .. 3. *S. incanum.*

Solanum verbascifolium, *Linn.* Vern. *Jhula.*

A soft-wooded small tree or shrub; bark pale-brown with prominent raised lenticels; young parts, inflorescence and branchlets covered with buff-coloured, stellate, scurfy tomentum. Leaves sometimes subopposite, 4-9 by 1·5-4 in. lanceolate, elliptic-lanceolate, ovate acuminate or acute, entire, softly stellate pubescent above, grey woolly beneath, main lateral nerves 6-12 pairs; petiole ·5-2 in. long. Flowers about ·5 in. across, dirty-white in peduncled dichotomous cymes, which are usually terminal in flower and become lateral with age. Peduncles up to 4 in. long; pedicels stout up to ·25 in. long. Calyx globose in bud, stellate tomentose, about ·25 in. long, teeth triangular. Corolla lobes pubescent outside, ovate-acute or elliptic-lanceolate. Filaments short; anthers opening by terminal slits, which elongate later. Ovary villous; style glabrous. Berry globose, sparsely stellate hairy when mature, up to ·4 in. across, seated on the slightly enlarged calyx.

Throughout the area, specially on banks near water.

Solanum indicum, *Linn.* Sans. *Vrihati,* Vern. *Bhat katia* (?)

An undershrub or a shrub, up to 6 ft. high, with smooth pale-brown bark; armed with yellowish-brown compressed and polished, often curved prickles up to ·25 in. long; young parts and in orescence densely stellate tomentose. Leaves 2-6 in. by 1·3-4in., ovate or oblong, sinuate or obtusely lobed, acute to subacute at the apex, base often unequal, narrowed or truncate, stellate hairy above, woolly beneath, main lateral nerves distant up to 4 pairs, midrib often prickly; petiole up to 1·5 in. Flowers bluish-purple ·5-·75 in. across, in extra-axillary racemose cymes which are up to 2 in. long; bisexual, peduncles and pedicels often prickly; pedicels up to ·8 in. long. Calyx tomentose ·2 in. long, deeply-lobed; lobes lanceolate-oblong, usually with setaceous prickles. Corolla lobes oblong, obtuse. Filaments very short; anthers narrow upwards. Ovary hairy; style stellate hairy except at the top. Berry globose, polished yellow or orange about ·3-·4 in. across, seated on the persistent but not enlarged calyx.

Throughout the area, also in Etawah.

Flowers and fruits throughout the year.

"The roots constitute an ingredient of *dasamula,* which is used in a great variety of diseases. It is regarded as an expectorant and usetul in cough and catarrhal affectations." *Nadkarni*-Hindu Materia Medica.

3. Solanum incanum, *Linn.* Syn. S. insanum, *L.*

An erect undershrub. Young parts and inflorescence densely tomentose. Stem, branches and leaves armed with compressed straight or curved prickles, which attain ·4 in. Leaves resembling those of the last species, prickly, sometimes on both surfaces and also on the main lateral nerves; petiole very prickly up to 2 in. long. Flowers about ·8-1·2 in. across, bluish-purple, in short lateral cymes, the lowest flowers of which are usually bisexual and the upper male; pedicels often prickly. Calyx about ·4 in. long, tomentose and prickly outside; lobes oblong acuminate or lanceolate. Corolla pubescent outside; lobes broadly triangular acute, more or less pubescent inside except on the edges. Filaments very short. Ovary pubescent; style hairy at the base. Fruit round about 1 in. across smooth, yellow, seated in an accrescent calyx.

Wild or naturalized throughout the area, also in Etawah where the plant is much more densely tomentose.

The wild plant does not appear to differ by any constant character from the cultivated form commonly known as S. melongena, *Linn.* The brinjal. Vern. *Bhatta.* In cultivation the fruits are often of great size and the prickles are reduced and some forms are completely unarmed.

Fl. and fr. throughout the year.

Solanum tuberosum, *Linn.* The Potato.—Grown all over the area as a winter crop.

Solanum xanthocarpum, *Schard,* Sans. *Nidigdhika, kantakari* Vern. *Katela. katai.*

A very prickly perennial herb, with subpinnatifid, bright-green leaves, deep blue flowers 1-1·3 in. across, in few flowered cymes, and globose fruits yellow when ripe, variegated or green when young. The plant is medicinal and is much esteemed as an expectorant in bronchial diseases.

Solanum torvum, *Swartz.*

A sparsely prickly tomentose shrub, about 10 feet high. Leaves 3·5-7 in. long, sinuate or lobed, stellate hairy above, tomentose beneath; petioles about 1·5 in. long. Flowers white, about ·7 in. across, in dense, lateral, often branched, unarmed racemose cymes. Calyx unarmed, ·2 in. long, lobes abruptly apiculate. Corolla pubescent outside, lobes linear-oblong, or lanceolate, tapering to a blunt apex. Berry globose ·5-·6 in. across, seated on the calyx, which is not enlarged.

Not indigenous to the flora of the area but has now become naturalized in moist localities in many districts, e.g., Pilibhit, Kheri, Gonda, Gorakhpur.

Solanum Seaforthianum, *Andrews.* The Potato Creeper.

A handsome scandent shrub, with stout branchlets, glabrous leaves, the lower of which are pinnately lobed and the upper simple, with blue flowers about ·5 in. across, in many-flowered cymes. A native of tropical America; frequently cultivated in gardens.

Solanum jasminoides, *Paxt.*

Also known popularly as the "Potato creeper," somewhat resembling the last species in general appearance but with white flowers on slender pedicels. A native of Brazil. Commonly cultivated.

Lycopersicum esculentum, *Miller.* Syn. Solanum lycopersicum, *Linn.* The tomato.

Cultivated throughout the area in winter.

2. WITHANIA, *Pauq.*

Withania somnifera, *Dunal.* Vern. *Asgandh.* Sans. *Aswagandha.*

An erect branchy undershrub, up to 4 ft. high; branchlets and young parts mealy tomentose. Leaves 2-5 by ·8-3 in., usually ovate, less often elliptic-lanceolate or oblanceolate, with subacute or obtuse apex and cuneate base, glabrescent or thinly pubescent along the nerves, membranous; petiole up to ·7 in. long. Flowers greenish-yellow about ·2 in. across, few, usually 5 together in axillary, subsessile or sessile cymose clusters; pedicels 0-·2 in. long. Calyx about ·2 in. long, grey tomentose, usually 5-lobed; lobes linear from a widened base, acute. Corolla tubular-campanulate, tube equalling the calyx; lobes 5-6, lanceolate, hairy outside, short, valvate in bud. Stamens 5, at the base of the corolla; filaments subulate, glabrous, much longer than the longitudinally dehiscing anthers. Ovary 2-celled; style linear; stigma 2-fid. Fruit a globose berry ·3 in. across,

red when ripe, enclosed by the much enlarged and somewhat angled and inflated membranous, more or less pubescent calyx with short mouth up to 1 in. long. Seeds discoid, scurfy.

Pilibhit and Oudh Divisions, Etawah probably throughout the area.
The roots are prized in Hindu medicine and largely used as a tonic. The fruit possesses the property of coalgulating milk.
Fl. and fr. throughout the year.

Physalis peruviana, *Linn.* Vern. *Tiparee.* The Cape Gooseberry.—is frequently cultivated for its fruit. Sometimes occurs as an escape.

3. DATURA, *Linn.*

Coarse shrub-like herbs. Leaves large, entire, sinuate or toothed. Flowers large, white or purple solitary. Calyx long, tubular, 5-toothed, often ribbed. Corolla tubular-funnel-shaped; limb plicate. Stamens at the base of the corolla, included, anthers dehiscing longitudinally; ovary 2-or spuriously 4-celled. Fruit usually capsular, often spinous, 4-valved, or irregularly breaking up, rarely baccate.

I. Capsule echinate, irregularly breaking up; flowers erect or suberect :—
Flowers usually purplish outside, glabrous; spines on capsule blunt. .. .. .. 1. *D. fastuosa.*
Flowers white or cream; capsule covered with sharp spines. .. .. .. 2. *D. alba.*
II. Fruit smooth; flowers drooping. .. .. 3. *D. suaveolens.*

1. Datura fastuosa, *Linn.* Vern. *Kala dhatura.* Arabic. *Masle asvad*; Pers. *Taturahe-siah.*

Attaining about 5 ft. nearly glabrous; leaves up to 8 in. long, ovate acute, sinuate or lobed, rarely entire, tapering at the base. Flowers 5-7 in. long, corolla purplish outside, white inside, lobes with acuminate or caudate tips. Fruit nodding.

Apparently naturalized in many localities within the area. Flowers chiefly rainy season.

2. Datura alba, *Ness.* Vern. *Dhatura.*

Stems up to 6 ft. Leaves 5-7 in. long, coarsely toothed or lobed, glabrous usually unequal at the base. Flowers white or cream-coloured about 4·5-5 in. long, otherwise as in the last species. Corolla slightly puberulous.

Kheri, Gonda, and probably also elsewhere in Oudh.
The seeds are narcotic and are used medicinally and also for criminal purposes.

3. Datura suaveolens, *Humb and Bunp.* Angels trumpet. Vern. *Kanak dhatura.*

A handsome shrub with elliptic entire leaves, 5-8 in. long and white drooping flowers 9-10 in. long, which are fragrant at night.

Native of Mexico ; often cultivated in gardens.

Cestrum nocturnum, *Linn.* The Lady of the Night. Hasna-hana.—A straggling shrub with lanceolate leaves attaining 5 by 1·5 in. with greenish yellow, tubular funnel shaped flowers, usually in panicled cymes, about ·7 in. long, which are very fragrant at night.

Cultivated in gardens within the area.

Capsicum annuum, *Linn.*—The Chilli. Vern. *Mirch,* and many of its varieties are cultivated as rainy season crops. Pedicles solitary.

Capsicum frutescens, *Linn.* Vern. *Choti mirch.*—Cultivated to a lesser extent, occasionally found as an escape. It has a more robust and suffruticose habit and the fruits are erect and tiny. It is much hotter than the last and has 2 or more pedicels together.

Nicotiana Tabacum. L. and **N rustica,** *L.* The tobacco. The former with pink flowers and the latter with greenish-yellow flowers are cultivated within our area.

Petunia nyctaginiflora, *Juss* and **P. violacea** *Lind.* and their several hybrids and varieties are grown in gardens in the winter.

LVI.—BIGNONIACEÆ.

Trees, or shrubs, sometimes climbing, rarely herbs. Leaves opposite, rarely alternate, 1-3 pinnate ; rarely simple. Flowers 2-sexual, showy, irregular, arranged in racemes or panicles, rarely on short lateral branches ; bracts and bracteoles inconspicuous, rarely solitary, or crowded on old wood (exotic genera). Calyx spathaceous or funnel shaped ; lobes 2-5 or more, valvate. Corolla two-lipped, tubular ventricose ; lobes 5, subequal, imbricate in bud. Stamens inserted on the corolla-tube, 4, didynamous, fifth (anterior-most) rudimentary, rarely perfect ; anthers included or sometimes shortly exserted ; anther-cells parallel or divaricate, Disk usually annular, thick, rarely 0. Ovary subsessile, usually 2-celled (1-celled in few exotic genera) ; style long, glabrous ; stigma of 1-2 lobes ; ovules many in 1-several series. Fruit a 2-valved elongated capsule, rarely indehiscent in some exotic genera. Seeds many, exalbuminous, usually compressed and winged —

I. Perfect stamens 5 :—
  Capsule flattened, septum parallel to the valves, septifragally dehiscent. .. .. .. 1. *Oroxylum.*
II. Perfect stamens 4 :—
  A. Leaves simple. .. .. 2. *Tecomella.*
  B. Leaves pinnate :—
    Calyx spathecoous ; capsule falcate. .. .. 3. *Dolichandrone.*
    Calyx not spathaceous ; capsule, terete, seeds grooved between the wings .. .. 4. *Stereospermum.*

1. OROXYLUM, *Vert.*

1. Oroxylum indicum *Vert.* Vern. *Ullu, saona* (in allusion to the time of flowering). Sans. *Mayurjangha, shukanasa, kutanata, tutuka, katuanga,* etc.

A small deciduous tree with few branches. Bark greyish-brown and corky. Leaves collected at the ends of the branches, very large, attaining 5 feet in length, 2-3 pinnate, pinnae 3-4 pairs, lower pinnae bipinnate ; rachis stout, lenticellate, leaflets 3-5 on each pinnule, 2·5-5 by 1·5-3·5 in, elliptic or ovate, abruptly acuminate, lateral,

leaflets often oblique or unequal at the base, entire, glabrous, membranous, lateral nerves up to 6 pairs; petiolule of lateral leaflets up to ·5 in. Flowers livid purple, fleshy, in stout terminal pedunculate racemes, peduncles 2-3 feet long; pedicels up to 1 5 in. long. Calyx persistent, broadly campanulate, truncate, leathery and about 1 in. long. Corolla 2-3·5 in. long and 2-4 in. across, campanulate, tube green, limb dull-purple; lobes 5, subequal, imbricate in bud, margins crisped. Stamens 5, all perfect, exserted, four equal, one short, filaments woolly at the base; disk conspicuous. Ovary compressed. Capsule 18-30 by 2-3·5 in. in the middle, stipitate, flat, oblong, narrowed and somewhat curved at either end, septicidally 2-valved; seeds many, with a transparent, closely veined, white wing all round except at the base, 2-3 in. across the wing.

Throughout the area in the open forest.

The fruit and bark are used in tanning and dyeing. The seeds are said to be parched and ground into flour in times of scarcity. The root-bark is considered astringent, tonic and useful in diarrhœa and dysentery. The powdered bark mixed with turmeric is considered useful for allaying sore backs of horses.

Blaze yellowish with chlorophyll on edges, turning green after prolonged exposure. Leaf-scars prominent and large.

Fl. June-August. Fr. December-March. Deciduous in the cold season.

2. TECOMELLA, *Seem.*

Tecomella undulata, *Seem.* Syn. **Tecoma undulata,** *G. Don.* Vern. *Roira.*

A small tree or shrub with drooping branches; bark rough, dark grey or brown. Young shoots puberulous. Leaves simple, greyish green, 2-5 by. 4-1 in., oblong, obtuse, undulate, base often unequal, coriaceous, glabrous, lateral nerves obscure; petiole ·3-·7 in. long. Flowers orange-red, 2-3 in. across, in terminal, pubescent racemes; pedicels up to ·5 in. long, pubescent. Calyx campanulate, up to ·5 in. long, glabrous outside, lobes short, obtuse. Corolla 1·5-2·5 in. long, campanualte, tube expanded at the throat, lobes spreading, rounded. Stamens 4; anthers cells divergent downwards from the apex; disk cup-shaped. Capsule 8-12 by ·4 in., linear, slightly curved, compressed parallel to the septum, valves loculicidal; seeds ·7-1·2 by ·3-·4 with membranous wings, extended at either end.

Bundelkhand, Jamuna and Chambal ravines—*Duthie*—also often cultivated in gardens.

The wood is grey or yellowish-brown, mottled with lighter streaks; strong and durable and takes a good polish—*Gamble.*

Fl. November-April. Leaves renewed in January-February.

Tecoma stans, Juss. Syn, Stenolobium stans, *Seem.* A large shrub or a small branchy tree with imparipinnate leaves having about 7 lanceolate, acuminate, serrate leaflets 3-4 by ·7-1·5 in., and yellow flowers 1·5 in. long, in terminal panicles about 1 in. across. Capsule 6-9 in. long, linear, compressed.

Largely grown as an ornamental plant. Fl. cold season, also at other times of the year.

Tecoma radicans, *Juss.* Syn Campsis radicans, *Seem.* A shrub climbing like Ivy by adventitous roots. Leaflets 7-11, ovate acuminate, coarsely serrate, 1·5-4·5 in. long. Flowers 2 in. across scarlet and orange in corymbs. Fl. most of the year. Indigenous in North America : frequently cultivated.

Tecoma jasminoides, *Lindl.* Syn. Pandorea jasminoidea, *K. Schuman.* A scandent shrub. Leaflets 5-7, ovate, dark-green, entire. Flowers large up to 2 in. across, pinkish-white with purplish centre. Native of Australia, cultivated in gardens within the area, less commonly than the preceding species.

3. DOLICHANDRONE, *Seem.*

Dolichandrone falcata, *Seem.* Syn. **Spathodea falcata,** *Wall.* Vern. *Jachair.*

A deciduous middle-sized tree ; bark grey, exfoliating in scales young parts grey pubescent or hoary. Leaves imparipinnate 3-8 in. long : rachis jointed at the nodes, usually channelled. Leaflets 5-7, ·8-2·5 in. long broadly ovate, obovate or suborbicular, often rounded with a short obtuse tip, less frequently retuse or bluntly short acuminate, glabrous or pubescent, main lateral nerves upto 4 pairs, often unequal at the base, petiolules 0-1 in. long. Flowers handsome, white, 1-2 in. across. in few-flowered terminal racemes ; pedicels 5 in. long. Calyx ·6-·8 in. long, softly pubescent, spathaceous, cleft to the base on one side. Corolla-tube 1 in. long widening upwards to the limb ; lobes 5, subequal, rounded or oblong obovate, with undulate, crisped margins. Stamens 4, included ; anther cells parallel ; disk prominent annular. Ovary sessile, oblong, ovules many seriate in each cell. Capsule 10-18 in. by ·7 in., much curved somewhat compressed, glabrous. Seeds 1-1·2 in. long, oblong with thin wings at either end.

Bundelkhand.

Fl. April-June. Fr. December, Deciduous February-March.

4. STEREOSPERMUM, *Cham.*

Trees. Leaves 1-2 pinnate, leaflets entire or toothed. Flowers in lax terminal panicles. Calyx truncate, or shortly and inequally 2-5-lobed or toothed. Corolla curved, tubular-campanulate ; limb spreading, more or less 2-lipped with a short narrow tubular base; lobes sub equal, imbricate in bud, often crisped. toothed or laciniate. Stamens 4, didynamous ; anther-cells linear diverging. Disk cushion-like, fleshy. Ovary linear-oblong ; ovules 2-seriate in each cell. Capsule terete or obscurely 4-angled, often spirally twisted, septum enlarging and becoming corky and cylindrical with pits for lodging the seeds. Seeds trigonous grooved across the middle, wings membranous.

Filaments woolly at the base; panicle branches glabrous or nearly so; capsule obscurely 4-angled, ·3-·4 in across. .. .. 1. *S. chelonoides*
Filaments not wooly at the base; panicle branches viscid pubescent; capsule cylindric over ·6 in across. .. 2. *S. suaveolens.*

1. Stereospermum chelonoides, *F. B. I.* Syn. **Stereospermu tetragonum** *DC.* Vern. *Chota padal, parrar, padal.*

A large deciduous tree; bark usually light-brown, branchlets and leaves glabrous. Leaves clustered at the ends of the branches, imparipinnate 12-18 in. long. Leaflets 7-11; 2·5-5 by 1-2 in., elliptic or elliptic-oblong, abruptly caudate acuminate, base acute or rounded sometimes unequal, entire, main lateral nerves 7-12 pairs; petiolules up to ·5 in. long. Flowers yellow, tinged with purple, about ·75 in. long, in lax drooping terminal panicles of cymes with glabrous, or more or less pubescent branches. Calyx campanulate, usually purple, glabrous, about ·25 in. long, with 5 unequal acute teeth, corolla more or less pubescent outside, bearded within on the lower side round the base of stamens; lobes crisped, rounded filaments villous at the base. Capsule 12-24 in. by ·3-·4 in. across, usually dotted with white specks, 4-ridged, or obscurely 4-angled, often somewhat spirally twisted. Seeds 1-1·2 in. long, easily separable into two along the transverse groove.

Gonda (Sungara); rare.

The wood according to Gamble is grey, elastic, moderately durable and easy to work and could be used for furniture and constructional purposes. Fl. April-June. Fr. cold season; new leaves after the flowers.

2. Stereospermum suaveolens, *DC.* Vern. *Padar, padra, padal.*

A large deciduous tree, bark pale-brown or grey, slightly rough; young parts viscid pubescent. Leaves imparipinnate, 12-24 in. long, 5-9 foliolate. Leaflets 3-7 by 2·3·5 in., elliptic or oblong-elliptic, acuminate, serrate on young plants and coppice shoots, entire on older trees, coriaceous, more or less rough above and pubescent beneath, lateral nerves 6-10 pairs, base often unequal; petiolules about ·1 in. long. Flowers reddish-purple, fragrant, in terminal lax, trichotomous viscid panicles; pedicels up to ·7 in. long. Calyx about ·3 in. long, campanulate, viscid hairy, shortly 3-5-lobed; lobes often apiculate. Corolla 1-1·5 in. long, slightly hairy outside base cylindric, throat villous on the lower side; limb oblique 2 lipped; lobes rounded and cripsed on the edges. Stamens didynamous, fifth rudimentary; filaments sparsely gland hairy at the base. Capsule 12-24 in. by ·6-·8 in., more or less cylindric, reddish-brown, rugose with white raised dots, valves often spiral. Seeds 1·25-1·5 by ·3 in., with membranous wings at either end, which are somewhat oblique at insertion.

Throughout the area; frequently in grass-lands and also associated with other species in forests.

Heartwood small, yellowish brown mottled with darker streaks, hard, seasons and polishes well and is fairly durable. It has however but little demand as yet.

Blaze pale-yellow with green edges.

Fl. May-June. Fr. cold season. Deciduous in March.

Mellingtonia hortensis, *L.* The Indian cork tree. Vern. *Akas nim, nim chameli.*—A tall, handsome, fast-growing tree with corky bark. Leaves 2-3 pinnate up to 3 ft. long; leaflets ovate lanceolate, more or less toothed, entire 1-3 in. long. Flowers 1·2-1·5 in. long, white, fragrant, pendulous, in large terminal panicles. Corolla with long, slender tube with 5 subequal lobes.

It does not appear to fruit within the area. It sends out numerous root-suckers by means of which the plant has spread in many places. Usually planted in gardens and avenues, but is rather apt to be blown down by wind on account of the great weight its crown attains and its brittle wood. A native of Burma.

Bignonia venusta, *Ker. Gawl.* Syn. **Pyrostegia ignea,** *Presl.*

A large handsome scandent shrub. Leaves 3-foliolate with ovate leaflets, about 3 in. long, third often reduced to a tendril. Flowers orange in dense drooping masses about 3 in. long. A native of Brazil now widely cultivated.

Fl. January-March.

LVII.—ACANTHACEÆ.

Shrubs or herbs, sometimes climbing, rarely trees, often with swollen joints. Leaves opposite, rarely alternate, usually entire, sometimes lineolate with cystoliths, exstipulate. Flowers zygomorphic, in spikes, cymes or racemes sometime panicled, rarely solitary, bracteate and bracteolate; bracts often prominent, rarely absent. Calyx usually 5 or 4-partite, rarely minute and multi-fid. Corolla 2-lipped or unequally 5-lobed, imbricate or twisted in bud. Stamens 4, sometimes didynamous or 2; anther cells sometimes divergent, pollen various in form and sculpturning. Disk often conspicuous. Ovary superior, usually 2-celled, with 1 or more ovule in each cell. Fruit a loculicidal capsule, the valves often elastically recurved. Seed ovoid or compressed, smooth, rugose or covered with hygroscopic hairs, which spread out when moistened, exalbuminous, supported (with few exceptions) on curved elastic supports (retinacula) with pointed tips.

I. Erect shrubs with 4-5-lobed calyx :—

A. Corolla lobes twisted to the left in bud :—

1. Ovules more than 2 in each cell, capsule 6 or more seeded —

Braceotes leaf-like; capsule clavate. lower part solid not seed-bearing connective of anthers not excurrent .. 1. *Rue lia.*

Bracteoles small linear; capsule seed-bearing throughout; connective of anthers excurrent. .. .. 2. *Aechmanthera*

2. Ovules 2 in each cell; capsule with 4 or fewer seeds :—

a. Anthers spurred :—

Corolla-tube ventricose above the base, stamens 4. .. .. 3. *Petalidium.*

b. Anthers muticous :—

Corolla-tube slender, scarcely widened at the top; stamens 2. .. .. .. 4. *Daedalacanthus*

Corolla tubular ventricose; stamens 4 .. 5 *Strobilanthes.*
B. Corolla lobes imbricate in bud :—
1. Ovules 3-8 in each cell; capsule 6 or more seeded :—
Corolla brick red curved; capsule subterete; seeds compressed. .. 6. *Phlogacanthus*
2. Ovules 2, or sometimes 1 in each cell :—
a. Corolla lobes subequal. .. .. 7. *Barleria.*
b. Corolla 2-lipped :—
i. Stamens 4. .. .. .. 8. *Lepidagathis.*
ii. Stamens 2 :—
* Anther cells not spurred :—
Large shrub with white flowers, more than 1 5 in. long. .. .. 9. *Adhatoda.*
Undershrub with thickened rootstock and switchy shoots, with blue flowers less than 1 5 in. long. .. .. 10. *Ecbolium.*
Weak undershrub with purple pink flowers, less than 1·5 in long. .. 11. *Dicliptera.*
**Anther cells spurred. .. .. 12. *Justica.*
II. Climbers with inconspicuous, 10-15-toothed calyx. *Thunbergia.*

1. RUELLIA, *Linn.*

Herbs or undershrubs. Leaves entire or undulate. Flowers sessile or subsessile, solitary or clustered, each subtended by large leaf-like bracteoles; bracts 0. Calyx 5-fid or 5-partite, segments narrow, subequal. Corolla more or less oblique, tube ventricose, lobes subequal, twisted to the left in bud, spreading in flower. Stamens four, didynamous; anther cells subequal, muticous, glabrous. Ovary glabrous, ovules 3-10 in. each cell, stigma unequally 2-fid. Capsule clavate with solid base. Seeds thinly discoid, margined, hygroscopically hairy, supported by strong hooked retinacula.

Stems perennial, flowers dull purple. .. .. 1. *R. patula.*
Stems very short; annual, from a woody root-stock; flowers white. .. .. 2. *R. suffruticosa.*

1. Ruellia patula, *Linn.*

A hoary pubescent undershrub with much branched stems. Leaves ·5-1·5 in. long, ovate or elliptic, obtuse or apiculate, base rounded, or abruptly narrowed, pubescent on both surfaces petiole ·5-·75 in. Flowers subsessile or 2-3 together, bracteoles up to ·5 in. long, leaflike. Calyx 5-partite, ·25 in. long, densely pubescent, lobes linear-lanceolate. Corolla pale dull-purple, 1-1·25 in. long, pubescent outside; tube narrow cylindric, lobes ·25 in. broad. Capsule ·5-·75 in. long, clavate, glabrous. Seeds with a dense fringe of hairs on the margin.

Bundelkhand and Afforestation Divisions.
Fl. hot and rainy season.

2. Ruellia suffruticosa, *Roxb.*

A dwarfed undershrub with woody root-stock and stout roots, from which short shoots are produced annually. Young parts

hirsute. Leaves 2-5 in. long, elliptic or lanceolate, hairy on both surfaces, petiole up to ·5 in. long. Flowers white or pinkish about 1 in. across, usually solitary. Bracteoles ·75 in. long, resembling the leaves. Calyx 5-fid with narrow segments, lobes ·2-·25 in. long. Corolla tubular-ventricose about 2 in. long, basal portion of tube narrow, ·7-1 in. long, lobes subequal rounded; stamens didynamous. Capsule about 1·5 in. long with 12-14 thinly discoid seeds.

Gorakhpur, Pilibhit, Bahraich, probably in all Oudh Divisions in burnt areas.

Stem scarcely any when flowers first appear, afterwards elongating in rainy season, and dying down in winter. Flowers open in the night and drop off next morning.

It is one of the herbs which is said to be used by Santals in the process of fermentation of their rice beer.

Fl. April-September (?) Fr. August-October.

2. ÆCHMENTHERA, *Nees.*

Æchmenthera tomentosa, *Nees.* Var. Wallichii, *F. B. I.*

A small, erect, gregarious shrub, up to 4 ft. high; older stems felted with white wool. Leaves 2-6 by 2-3·2 in. elliptic-to ovate-lanceolate or lanceolate, acuminate or acute, crenate, lateral nerves 10-16 pairs, upper surface pubescent with stiff hairs, under-surface clothed with white woolly tomentum or pubescent, base often unequal; petiole ·7-1·5 in. long. Flowers purple about ·5 in. across, in sessile 3-8-flowered clusters, on the branches of terminal or axillary trichotomous spreading panicles. Bracts up to ·5 in. long, linear, viscid pubescent. Calyx 5-partite, segments linear, subequal, viscid pubescent, ciliate ·3-·5 in. long. Corolla 1 in. long, with a cylindric basal tube and abruptly widened limb, palate with two hairy lines; lobes spreading, subequal, rounded, twisted to the left in bud; stamens didynamous included; longer filaments hairy towards the base, connective of anthers produced into a recurved tip. Ovary hairy at the apex, style filiform, dilated towards the top, sparsely hairy; stigma linear, the second arm reduced to a minute tooth. Ovules 4-6 in each cell. Capsule ·3-·5 in. long, narrow oblong, usually 8-seeded. Seeds discoid, hairy (hairs visible after wetting); retinacula hooked, strong.

Gonda, Bahraich—rare, more or less gregarious where it grows. The leaves are obscurely marked with appressed spreading cystoliths on the upper surface. The undersurface is at first pubescent and becomes woolly with age, starting with the nerves. The branchlets also similarly increase in wooliness with age.

It said to have a life cycle of 4-5 years after which it flowers gregariously and dies down. There is also often some sporadic flowering. The period of life cycle needs confirmation.

Fl. Oct.-Jan

3. PETALIDIUM, *Nees.*

Petalidium barleroides, *Nees.*

A straggling shrub up to about 7 ft. high. Stems many, swollen at the joints; bark yellowish-brown, papery, peeling off in thin flakes, young parts pubescent. Leaves 2-5, by 1·2-2·7 in., ovate-acuminate, serrate, puberlous, base abruptly cuneate and decurrent on the petiole, lateral nerves 6-8 pairs; petiole up to 2·5 in. long. Flowers yellowish-white 1-1·5 in. long, subsessile, solitary or in pairs, on short lateral branches; bracts absent, bracteoles conspicuous, somewhat concave, ovate, acute or acuminate, with prominent green nerves, persistent, scarious with age, about ·75 in. long. Calyx 5-fid about ·5 in. long, lobes linear lanceolate, gland-pubescent. Corolla tubular-ventricose, 1-1·5 in. long, pubescent outside, tube short, narrow, brownish, ventricose portion prominently purplish veined, throat covered within with fulvous reflexed hairs; lobes 5, twisted to the left in bud, rounded, subequal, somewhat crenulate. Stamens didynamous; filaments with a few scattered hairs at the base; anthers spurred. Ovary 2-celled; ovules 2 in each cell; style linear; stigma unequally 2-lobed. Capsule about ·5 in. long, compressed and dilated upwards. Seeds 2 covered with hairs on the margins, which spread out on wetting, placentas separating from the base of the capsule and carrying the seeds with them, retinacula hard hooked.

Gonda, Bahraich, Bundelkhand, often on banks of streams.

The leaves on the flowering branches are usually very small. Old stems sometimes shallow fluted.

Fl. March-May, nearly deciduous March-April. Handsome when in flower.

4. DÆDALACANTHUS, *T. Anders.*

Dædalacanthus nervosus, *T. Anders.*

An undershrub or shrub up to 6 ft. high, with four angled stems: Leaves 4-8 in. long, elliptic or ovate acuminate usually entire, lineolate on both surfaces from embedded cystoliths, thin, dark-green cuneate at the base, secondary nerves 8-12 pairs, arching upwards near the margin; petiole ·5-1·5 in. Flowers blue ·75 in. across, in dense bracteate spikes, collected in terminal panicles, peduncles up to 3 in. long; puberulous; bracts prominent, white with green nerves, about ·6 in. long, elliptic or obovate-oblong, usually cuspidate, sometimes abruptly short-acuminate; bracteoles membranous, linear lanceolate, shorter than the calyx. Calyx about ·25 in. long, divided half way down, minutely pubescent, lobes oblong or linear, acute, thin, Corolla slender, 1·25 in. long, tube narrow cylindric, widening

near the apex, lobes subequal, rounded, twisted to the left in bud. Stamens 2; anthers exserted. Ovary 4-ovuled; style linear, long, with few scattered hairs. Capsule ·5 in. long, oblong, glabrous. Seeds 4, discoid, hairy (hairs distinct when seed is wetted).

Throughout the area, along cool shady nullahs. Sometimes grown in gardens.

Fl. February-April.

D. purpurascens, *T. Anders.*—An undershrub or a herb with minutely pubescent four angled branches. Leaves 4-7 in. long, elliptic or ovate-acuminate, dark green, thin, closely lineo late, pubescent or glabrous beneath; obscurely, crenate or entire, main lateral nerves 6-9 pairs; petiole up to 1·5 in. in the lower leaves. Flowers lilac or bluish-purple 1·25-2in. long and up to 1 in. across, in dense long peduncled axillary or terminal spikes which are 1.5-3 in. long. Bracts ·6-1 in., rhomboid or ovate, long acuminate, prominently veined, ciliate. Calyx ·25 in. long. Corolla tube, long, slightly pubescent; lobes rounded; stamens 2; anthers slightly exserted. Capsule 5-·7 in. long, glabrous.

Gonda ,Bahraich, Gorakhpur, Bundelkhand.

5. STROBILANTHES, *Blume.*

Strobilanthes angustifrons, *Clarke.*

A small weak-stemmed shrub about 3-4 ft. high with terete branches; young parts white tomentose. Leaves 3-4 by 1·5-2 in., elliptic acuminate, glabrescent above, narrowed at the base into the petiole; petiole ·5-·7 in. long; upper leaves almost sessile. Flowers about 1-1·5 in. long, purple, in lateral and terminal, often capitate spikes, forming panicles. Bracts mostly caducous, lower foliaceous, persistent. Bracteoles ·1-·2 in. long. Calyx lobes, linear, pubescent, ·3-·5 in. long. Corolla tubular-ventricose, nearly straight, lobes rounded. Stamens 4, didynamous. Ovules 2 in each cell of ovary. Capsule ·3-·5 in. long, 4-seeded; seeds hairy.

Record based on a fragmentary specimen from Gonda.

Fl. cold season.

6. PHLOGACANTHUS, *Nees.*

Phlogacanthus thyrsiflorus, *Nees.*

An evergreen shrub up to 8 ft. high, with yellowish-brown, striate bark and smooth, quadrangular branchlets. Leaves 6-11 by 1·5-3 in., oblanceolate or oblong, elliptic, acute or acuminate, tapering at the base, closely punctate, smooth, dark glossy green above, pale beneath, lateral nerves 8-12 pairs, arcuate; petiole ·8-1 in. long. Flowers orange or brick-red, dense, on terminal or sub-terminal, pubescent, thyrsoid panicles up to 10 in. long. Bracts caducous ·5-·7 in. long, linear-acuminate, pubescent; bracteoles about half the size; pedicels up to about ·25 in. long. Calyx up to ·4 in. long, pubescent outside, deeply 5-fid, lobes subulate. Corolla 2-lipped, ·5-·8 in. long, hairy

outside, lower lip of 3 short, spreading, ovate lobes; all imbricate in bud. Fertile stamens 2; filaments yellow, pilose at the base; anthers exserted from the throat; ovary 2-celled with 5-8 ovules in each; style filiform. Capsule up to 1·5 in. long, sub-4-angled, dilated at the top; glabrous. Seeds 12-14, hairy.

Pilibhit, Oudh Divisions and Gorakhpur in moist shady localities.

Fl. February-March. Blaze pale yellow.

7. BARLERIA, *Linn.*

Small shrubs or undershrubs, sometimes spinescent. Leaves opposite, entire. Flowers showy, sessile, solitary or in spikes. Calyx four-partite; sepals in decussate pairs, outer pair much the larger. Corolla funnel-shaped with elongate tube, lobes 5, subequal, imbricate in bud. Stamens 2 fertile, with 2 oblong anthers, 2 rudimentary and often a rudimentary fifth stamen present. Disk large, often cupular and toothed, ovary with 2 ovules in each cell; style long, shortly bifid or subentire. Capsule ovoid or oblong, 2-4-seeded below the middle. Seeds compressed with closely adpressed silky hairs.

I.	Armed shrub. Flowers yellow.	1. *B. Prionitis.*
II.	Unarmed. Flowers blue, pink or white:—	
	Flowers pink, white or blue; not unilateral on the few flowered spikes; outer calyx lobes pectinately toothed	2. *B. cristata.*
	Flowers blue; unilateral on the spikes; outer calyx lobes obscurely serrulate ..	3. *B. strigosa.*

1. Barleria Prionitis, *Linn.* Vern. *Kastira*, Bund.

A spiny bush or undershrub, 2-5 ft. high with obscurely 4 angled branches. Spines axillary, solitary or in fascicles of 2-4, pale-grey or white. Leaves 1·5-4 by ·6-1·5 in., usually elliptic, bristle-tipped, tapering at the base, lineolate on upper surface, pubescent or glabrous, lateral nerves up to 5 pairs; petiole 0 (in upper leaves) to ·5 in. long. Flowers 1 in. across, orange-yellow, solitary in lower axils, shortly spicate above. Bracts leafy, spatulate-oblong to elliptic-lanceolate, spine-tipped, ·6-1 in. long; bracteoles subulate, spiny. Calyx divided almost to the base, outer lobes lanceolate-cuspidate. Corolla 1-1·5 in. long, pubescent outside, somewhat 2-lipped; upper lip of 4 rounded lobes, lower somewhat shorter; lobes about as long as the tube. Staminodes 2. Capsule ·75-1 in. long with a solid tapering beak.

Kheri, Bundelkhand, also probably Afforestation Division. Sometimes cultivated in gardens.

Fl. October-March.

2. Barleria cristata, *Linn.*

A small undershrub, usually about 3 ft. high with adpressed pubescent branches. Leaves variable, 2-5 in. long, oblong or elliptic-oblong, acute, or acuminate, base acute, lineolate above, pubescent on both surfaces, specially along the nerves beneath; secondary nerves 5-7 pairs; petiole up to ·3 in. long. Flowers pink, blue or sometimes white about 1 in. across, solitary or paired or in short spikes. Bracts absent; bracteoles up to ·5 in. long, linear or linear-lanceolate, mucronate, pubescent. Outer calyx segments ·6-·8 in. long, elliptic or oblong-lanceolate, mucronate, prominently reticulate, margins pectinately bristle-toothed; inner segments lanceolate about ·3 in. long. Corolla 1-2 in. long, pubescent outside; lobes obovate-oblong, equalling the tube; staminodes 2. Capsule about ·6 in. long, ellipsoid, tapering at both ends; 4-seeded.

Throughout the area, also Etawah, often cultivated.

The outer sepals are scarious have few bristles in fruit.

Fl. September-November Fr. cold season.

3. Barleria strigosa, *Willd.*

A small undershrub up to 4 ft. high with brown strigose branches. Leaves 3-8 by 1·5-4·2 in., elliptic-acuminate, usually lineolate and sparingly pubescent along the nerves above, strigose, specially along the nerves beneath, lateral nerves 5-6 pairs, somewhat distant; base more or less abruptly narrowed and running into the petiole. Petiole 0-·2 in. long. Flowers blue, unilateral on hairy spikes, 1-3 in. long. Braceteoles oblong to ovate-elliptic, ciliate, sparsely hairy outside, ·5-·7 in. long. Outer sepals larger than the bracteoles, ovate or elliptic, obscurely serrulate, ciliate, strigose, nervose, ·8-1 in. long, scarious in fruit, inner sepals linear-acute, pubescent with adpressed silky hairs. Corolla 1 in. across, and 1·5-2 in. long, lobes obovate. Capsule ·6-·75 in., apiculate, glabrous, 4-seeded.

Kheri, Gorakhpur; probably in Pilibhit and other Oudh Divisions also.

Fl. September-December Fr. cold season.

8. LEPIDAGATHIS, *Willd.*

Lepidagathis cuspidata, *Nees.*

A suberect deciduous undershrub, 1-3 ft. high with pale-brown or grey bark, peeling off in thin papery flakes. Young parts gland-pubescent. Leaves variable, lower 1·2-4·5 in., lanceolate or elliptic, acuminate, mucronate, narrowed at the base to a short margined petiole, somewhat pubescent, upper and sometimes the earlier leaves

smaller, sessile, elliptic, spine-tipped, usually ·5-·7 in. long. Flowers ·5 ·6 in. long, dull white with purple streaks, on dense terminal spikes, which are usually up to 2 in. long. Bracts ·5 in. long, elliptic, spine-tipped, leaf like; bracteoles small r. Calyx deeply 5- obed, pubesc nt; lobes unequal, spine-tipped, posterior largest, glanoular, pubescent upwards, adpressed pubescent towards the base. Corolla 2-lipped pubescent outside, tube short, uppr lip ovate, acute lower 3-lobe. stamens didynamous, anthers bearded. Ovary 2-celled, with 2 ovules in each; style recurved. Capsule with four compressed seeds.

Gonda, Bahraich; on banks.

Fl. December-March.

L. **Hamiltoniana**, *Wall.*—A herb up to 18 in. high with a woody root-stock. Leaves 2-6 in. long, linear, nearly glabrous with the exception of the scabrous margins. Flowers ·5 in. long in very congested capitate spikes from the base of the stems, bracts and bracteoles spine-tipped. Calyx lobes tough, spine-tipped. Corolla 2-lipped, spotted with brown inside, silky pubescent. Capsule about ·25 in. long, conical, glabrous, 2-seeded.

Gonda, Bundelkhand, Etawah and Agra—*Duthie*.

L. **hyalina**, *Nees.*—A perennial herb up to 2 ft. high, with stout roots. Leaves very variable 1 (or smaller) to 3 in. long, ovate or oblong, acuminate or acute, pubescent or glabrate above, pubescent beneath, base decurrent on the petiole. Flowers ·3 in. long, white mottled with brown, in spikes which are crowded in heads. Bracts and bracteoles pubescent, mucronate, about ·3 in. long. Calyx ·3 in. long, outer segment longest pubescent, corolla 2 lipped. Capsule ·2 in. long, glabrous, 4-seeded.

In burnt areas all over. The usual form in our area is Var. ustulata, F. B. I.—a dwarfed form with very small leaves almost glabrous above.

9. ADHATODA. *Nees.*

Adhatoda Vasica, *Nees.* Syn. **Justicia Adhatoda**, *Linn.* Vern. *Arusa, bansa.* Sans. *Vakas, vasika, sinha-mukhi, ruksha, arushak*, etc.

An evergreen gregarious shrub 4-8 ft. high, with a peculiar fœtid smell. Bark smooth pale brown; young parts pubescent. Leaves 3-8 by 1-3 in., elliptic or lanceolate, acuminate, minutely pubescent, lateral nerves 8-12 pairs, base abruptly narrowed into the petiole; petiole up to 1·5 in. long. Flowers white, in dense bracteate peduncled spikes which are up to 6 in. long (including the peduncles). Spikes axillary and solitary or several together at the ends of the branches. Bracts conspicuous, ovate or obovate often mucronate up to ·75 in. long; bracteoles narrower up to ·5 in. long. Calyx deeply 5-cleft, ·4 in. long; lobes oblong, acuminate, pubescent on the margin and at the apex within. Corolla 2-lipped 1-1·25 in. long, hairy ouside. Corolla-tube with a short basal portion slightly dilated in the middle; and an inflated ascending upper portion; throat usually with two lines of oblique, purple or yellow bars; upper lip

curved notched at the apex ; lobes of lower lip rounded. Stamens 2 ; filaments hairy at the base ; anther cells minutely pointed at the base. Ovary hairy ; ovules 2 in. each cell ; style hairy at the base, slender. Capsule ·75 in. long, pubescent outside, clavate, grooved along the sutures, basal portion solid ; seeds 4, compressed suborbicular, tuberculate.

Throughout the area, fairly abundant. The plant is considered to be very efficacious in pulmonary diseases. It has undoubted antiseptic properties. This antiseptic principle known as *vasicin* has been isolated and may, if a cheap method of extraction is devised, be commercially utilized for various purposes.

The leaves are mixed with manure in many parts of India to keep off insects.

Fl. December-April. Fr. February-May.

10. ECBOLIUM, *Kurz.*

Ecbolium Linneanum, *Kurz.*

A small undershrub with a woody base usually attaining (in our area) up to 18 in. Leaves 2-6(?) in. long elliptic, lanceolate or oblanceolate, obtuse acuminate or acute, margins somewhat sinuate, tapering at the base into a short petiole, pubescent along the nerves when young, glabrate with age, dark-green above, lateral nerves 5-7 pairs, forming loops short of the margin. Flowers pale-blue in dense terminal spikes 2-3 in. long, bracts yellowish-green, ·6-·75 in. long, obovate rhomboid, acute, midrib excurrent into a sharp point, base 3-5-nerved, puberulous, ciliate, bracteoles subulate, or linear lanceolate. Calyx 5-partite ; segments broadly subulate, linear lanceolate, acute up to ·2 in. long. Corolla bluish, 2-lipped, hairy outside ; tube long cylindric. Stamens 2 ; staminodes 0 ; anthers cell ; subequal, muticous. Ovary pubescent, ovules 2 in each cell ; style filiform ·75 in. long. Capsule up to ·8 in. long, subspatulate, upper portion ·5 in. by ·3 in., seed-bearing broad-ovate, acute, abruptly narrowed at the base into the solid stipe which is up to ·3 in, long. Seed usually 1 in. each cell.

Bahraich, Gorakhpur—*Duthie*, probably also in other Oudh Divisions, in burnt areas ; not common.

The Bahraich record is based on a rather incomplete specimen. It is much stiffer plant and has smaller leaves and less acuminate bracts than Var. dentatum which has been recorded by Duthie.

11. DICLIPTERA, *Juss.*

Dicliptera bupleuroides, *Nees,* Syn. **D. Roxburghiana,** *Nees,* Var. bupleuroides, *F. B. I.*

A tufted undershrub up to 3 ft, high or a herb with a woody basal portion and pubescent stems. Leaves very variable in size, often in unequal pairs, usually 1·5-4 in. long, ovate or lanceolate-acuminate, base cuneate and narrowed into the petiole, glabrescent or thinly

hairy, lateral nerves 5-7 pairs. Flowers numerous, pink or purple in dense, axillary, capitate, compound, sessile cymes at the ends of short axillary branchlets. Bracts varying in size, usually linear oblong, aristate, covered with long hairs; bracteoles setaceous. Calyx ·2-·3 in. long, lobes unequal subulate, setaceous. Corolla ·6-·8 in. long, tube short, twisted nearly as long as the subequal lips: upper lip emarginate 2-lobed, with few purple spots on a pale-patch at the throat; lower lip 3-lobed. Stamens 2, anther cells at different levels. Style filiform; stigma shortly bifid. Ovules 2 in each cell of ovary. Capsule ·2-·25 in. long, clavate, pubescent with a short solid base; Seeds 4.

All over the area, common in cool banks.

Fl. October-March.

12. JUSTICIA, *Linn.*

Justicia Betonica, *Linn.* Var. ramosissima, *F. B. I.*

An undershrub 2-3 ft. high with weak stems from a woody root-stock. Leaves 2-4 in. long, ovate or lanceolate, acuminate or acute, base narrowed, glabrous or pubescent, secondary nerves 6-8 pairs; petiole 0-·25 in. long. Flowers dull-white with pink markings in dense simple or branched terminal spikes which are 1-5 in. long, conspicuous from the closely imbricating spikes, bracts about ·5 in. long, white veined with green, acute, glabrous; bracteoles narrower, margins ciliolate, otherwise similar to the bracts. Calyx ·3 in. long deeply 5-partite, segments linear lanceolate, acute. Corolla hairy, 2-lipped; stamens 2. Filaments hairy at the base, anthers spurred. Ovary with 2 ovules in each cell; style filiform; stigma shortly bifid. Capsule ·4 in. long, seeds 2-4, rugose.

All over the area, sometimes gregarious in Bundelkhand on rocky ground.

Justicia Gendarussa, *Linn.f.*—An undershrub 2-4 ft. high. Leaves 2·5-5 in. long, narrowly lanceolate, glabrous when mature. Flowers white with purple spots inside in interrupted terminal or axillary spikes, up to 5 in. long; bracts linear, short. Calyx about ·2 in. long, with linear segments. Corolla about ·5 in. long; stamens 2; anthers spurred, capsule ·5 in. long, clavate.

Frequently cultivated in gardens as a border plant edging walks, etc. Sometimes found as an escape. Flowers hot season.

Thunbergia coccinea, *Wall.*—An extensive climber with pendulous branches, ovate acuminate, sinuate or subentire glabrous leaves with 3-5 basal nerves, 5-7 in. long; pendulous racemes of brick-red flowers about 1 in. long mostly fasicled at the nodes and enclosed when young by reddish-purple conspicuous bracteoles; and long beaked globose capsule, 1·5 in. long, with 2 seeds in each cell.

Cultivated; sometimes an escape, e.g. in Pilibhit.

Thunbergia grandiflora, *Roxb.*—A large climber, with orbicular or ovate-cordate, sometimes angled pubescent leaves, 3·5-7 in. long and large light-blue flowers about 3 in. across in racemes.

Largely cultivated within the area. A native of Bengal.

Thunbergia alata, *Boj.*—A slender climber, with softly villous, ovate cordate leaves 1-2·5 in. long, with winged petioles, and yellow or pale corolla with a brown or purple eye.

Largely cultivated and found sometimes as an escape. A native of Africa.

Thunbergia fragrans, *Roxb.*—A slender climber, with ovate or oblong leaves, 2-3 in. long, which are truncate, cordate or hastate, and 3-5 nerved at the base and white flowers about 1·5 in. long solitary or in pairs in leaf axils

Frequently cultivated. It is believed to be indigenous to the Sub-Himalayan tracts from Jumna eastwards and may be found in North Oudh.

Graptophyllum pictum, *Griff* Syn. Graptophyllum hortense, *Nees.* Carricature plant.—A glabrous shrub with elliptic or broadly elliptic variegated leaves, 3-8 in. long and white and crimson flowers, 1·5 in. long in thyrses.

Often cultivated in gardens within our area.

Rhinacanthus communis, *Nees.* Sans. *Juthika-parni. Vern. Palak-juhi, Jui pani.*—A slender shrub. Leaves, 3-9·5 in. long, ovate, elliptic or oblong narrowed at both ends. Flowers white, in 3-chotomous panicles. Stamens 2. Cultivated in gardens. "The fresh roots and leaves bruised and mixed with lime juice are a useful remedy for ringworm and other cutaneous affectations." *Indian Medicinal Plants.* The roots contain a principle known as rhinacanthin which resembles chrysophanic acid in its antiseptic and antiparasitic properties.

LVIII.—VERBENACEÆ.

Shrubs, trees or herbs, sometimes scandent, commonly fœtid or aromatic. Leaves opposite or whorled, usally simple, less often digitate, exstipulate. Flowers 2-sexual or polygamous, often showy, zygomorphic, usually in various cymose, less often racemose, inflorescences, sometimes collected into heads. Calyx inferior gamosepalous, persistent, usually 5-4 (rarely 6-8)-lobed or toothed, sometimes 2-lipped, rarely truncate. Corolla 2-lipped or subequally 5-4 (rarely more) lobed. Stamens 4, didynamous, less often equal, rarely 2 or more than 4, inserted on the corolla tube. Disk usually inconspicuous. Ovary usually 2-4-celled, rarely 1-celled by abortion or more than 4 celled. Style terminal; stigma usually bifid: ovules 2-1 in each cell. Fruit drupaceous, with a 4-celled endocarp or of 4 (or fewer by abortion) pyrenes, or partially connate drupels, less often quite dry or capsular and 4-2-valved; seeds 1 in each cell, exalbuminous.

I. Corolla sub-regular :—

A.	Stamens unequal or didynamous. Flowers in dense capitate or ovoid spikes.	1. *Lantana.*
B.	Stamens equal; inflorescence cymose :—	
	Calyx not accrescent, drupe with 4, 1-celled pyrenes.	2. *Callicarpa.*
	Calyx accrescent; drupe with 1, 4-celled endocarp.	3. *Tectona.*

II. Corolla 2-lipped, or distinctly zygomorphic ; stamens didynamous :—

A. Fruits indehiscent :—

1. Drupe with 1-pyrene :—

a. Leaves simple :—
Flowers large, yellow ; drupe over ·5 in. long. 4. *Gmelina.*
Flowers small white ; drupe under ·3 in .. 5. *Premna.*
b. Leaves digitate, flowers small. .. .. 6. *Vitex.*

2. Drupe breaking up into 1-4 drupels or of 4 pyrenes ;—
Calyx often coloured in fruit, 5-lobed ; corolla-tube slender, cylindric ; drupe succulent. 7. *Clerodendron*
Calyx coloured, persistent, entire ; corolla-tube swollen upwards ; drupe dry. .. .. 8. *Holmskioldia*

B. Fruits dehiscent ; calyx not coloured. .. 9. *Caryopteris.*

1. LANTANA, *Linn.*

Lantana indica, *Roxb.*

A shrub up to 8 ft. high, branchlets strigose. Leaves 1·5-3·5 in. long, opposite ; ovate, acute or obtuse, coarsely crenate, somewhat rough and minutely pubescent above, paler and more densely grey pubescent or tomentose beneath, base usually abruptly narrowed and running into the petiole, lateral nerves 4-8 pairs ; petiole up to ·35 in. Flowers white to light blue, in pedunculate heads, at first about ·4 in. long, elongating and becoming cylindric in fruit and then attaining 1·5 in., peduncles up to 3 in. long. Bracts hairy, ovate, acuminate, up to ·4 in. long. Calyx minute, truncate or minutely lobed, hairy. Corolla with a slender pubescent tube about ·3 in. long, widening upwards, limb about ·3 in. across ; lobes 4, rounded. Stamens 4, in pairs, inserted on different levels on the corolla, included ; filaments short in unequal pairs. Ovary 2-celled, with one ovule in each ; style short ; stigma oblique, Fruit ·15-·2 in. in diameter, a globose drupe, purple when ripe, with two stones.

Throughout the area in waste lands—*Duthie*, also Afforestation Division. In flower and fruit during the greater part of the year.

1. **Lantana Camara,** *Linn.* Syn. L. aculeate, *Linn.*

A large spreading and sometimes subscandent shrub, usually with recurved prickles on the quadrangular branches. Leaves 2-3·5 in. long, ovate, acute or subacute, rather rough above, base abruptly narrowed to the petiole. Flowers orange or yellow, sometimes rose and orange and in cultivation purple or white, in compact pedunculate heads ·7-1 in. across, which elongate very little in fruit. Bracts spatulate-lanceolate or lanceolate up to ·4 in. long, strigose. Calyx hairy, minutely toothed ; corolla-tube pubescent within, slender about ·4 in. long, 4-lobed, upper and lower lobes equal and broader than the lateral lobes. Drupe about ·2 in. across, steely-blue,

Introduced from tropical America. It has become naturalized in many places. All parts of the plant are strongly scented. It is an invasive plant and if allowed sufficient light, tends to overrun forest areas to the exclusion of

every thing else. Once it gets a foothold, its eradication is very difficult. The leaves are believed to be poisonous to cattle. Flowers and fruits most of the year, the prickles are minute or absent in some forms.

2. **L. crenulata,** *Otto and Dietr.*—A shrub with ovate-lanceolate rough leaves, about 2 in. long; oblong bracts and yellow to orange corolla. An introduced plant. Sometimes naturalized (Kheri).

2. CALLICARPA, *Linn.*

Shrubs or trees; young parts stellate-tomentose often scurfy. Leaves rarely ternate, toothed or subentire. Flowers in axillary, peduncled, dense, dichotomous cymes which are shorter than the leaves. Calyx very small, not enlarged in fruit, minutely 4-lobed. Corolla small, tubular campanulate, purple or red, usually with 4 subquadrate spreading lobes. Stamens usually 4, equal, exserted; anthers glandular of the back. Ovary imperfectly 2-celled; style linear; stigma obscurely 2-fid; ovules 2 in each cell. Fruit a globose drupe supported by the calyx, with 4 or fewer (by suppression) 1-seeded stones. Seeds exalbuminous.

I.	Mature leaves grey beneath; peduncle and cyme branches stout :—	
	Small tree; leaves entire drupes purple. ..	1. *C. arborea.*
	Shrub; leaves crenulate; drupes white. ..	2. *C. macrophylla.*
II.	Mature leaves green beneath; peduncle and cyme branches slender.	3. *C. longifolia.*

1. Callicarpa arborea, *Roxb.*

A small evergreen tree, bark brown or grey, rough with shallow fissures; innovations scurfy; undersurface of leaves, petiole and inflorescence stellate tomentose. Leaves 5·5-10 by 2·5-4·5 in., elliptic-lanceolate, oblong or ovate-lanceolate, acuminate, coriaceous, entire or subentire, glabrescent above and finely tomentose beneath when mature, lateral nerves 8-12 pairs, ultimate reticulations very close; petioles up to 2 in. long. Cymes 2-5 in. across, peduncles up to 2 in. long. Calyx sub-truncate, stellate pubescent. Corolla about ·15 in. long, pale-purple. Drupes ·1 in. across, turning purple when ripe.

Pilibhit, Gonda, Gorakhpur, probably in other Oudh Divisions also.

Blaze white, or pale-yellow with yellowish-brown streaks soft. The petioles in opposite pairs of leaves are somewhat unequal.

Fl. hot season, also rains. Fr. August-December.

2. Callicarpa macrophylla, *Vahl.* Vern. *Motia, charpuria* (Gon).

A large spreading shrub with stellate woolly young parts and inflorescence. Leaves 5-9 by 1·7-2·5 in., oblong, elliptic or ovate-

lanceolate, acuminate, crenate or crenate-dentate, glabrate and somewhat rugose above and denscly stellate tomentose beneath, lateral nerves 10-16 pairs; petiole ·5-1·5 in. densely woolly. Flowers rose pink, in cymes, which are up 2 to in. across; peduncles up to 1 in. long. Calyx stellate pubescent, glabrate with age; teeth minute, acute. Corolla about ·1 in. across, tube cylindric; lobes subequal, spreading. Drupes about ·12 in. across, white.

Throughout the area.

Flowers principally rainy season, but sporadically at other times of the year also.

3. Callicarpa longifolia, *Lamk.* Var. lanceolaria, F. B. I. Syn. **C. lanceolaria**, *Roxb.*

A shrub, young parts scurfy stellate. Leaves 4·5-6 by 1-1·7 in., narrow lanceolate, acuminate, serrulate, base cuneate, main lateral nerves 10-13 pairs, uppersurface glabrate, undersurface covered with numerous microscopic amber coloured glands, green, stellate pubescent only along the nerves; petiole ·3-·7. in. long. Flowers rose or purple, on spreading, somewhat lax, cymes which are up to 1·5 in. across in flower, with slender tomentose branches; peduncles up to ·6 in. long; pedicels glabrate with age, glandular, specially at the junction with the calyx. Calyx glabrate, truncate, ·05 in. long. Corolla about ·1 in. across; lobes subequal. Drupes smaller than in the preceding species about ·06 in. across.

Pilibhit, Kherl.

Flowers March-August. Fr. June-September.

3. TECTONA, *Linn. f.*

Tectona grandis, *Linn. f.* Vern. *Sagon*, Sans. *Saka.*

A large deciduous tree (medium-sized tree in our area) often fluted near the base. Bark pale-brown, or grey, striate, fibrous, peeling off in thin strips; branchlets 4-angled, channelled, stellate-pubescent. Leaves 12-24 in. long, broadly elliptic or obovate, entire, rough above, stellate tomentose beneath, main lateral nerves 8-12 pairs; petiole 1·5-2·5 in. long flattened and margined. Flowers white, about ·25 in. across, in large terminal, pubescent panicles of cymes 2-3 ft. long, with decussate branches. Bracts lanceolate-oblong, acute; calyx in flower campanulate, stellate tomentose, ·12 in. long; lobes, 5-6, spreading, minute, much enlarging in fruit and forming an inflated, sparingly pubescent covering to it which is about 1 in. across. Corolla funnel-shaped, with a short tube and 5-6 subequal spreading lobes, imbricate in bud. Stamens 5-6, inserted near the base of the corolla-tube, equal, exserted. Ovary densely hairy, 4-celled with 1 ovule in each; style linear; stigma shortly bifid. Fruit a sub-globose

drupe ·5-·7 in. across with a thick spongy exocarp of matted hairs; endocarp bony. Seeds 1-4, exalbuminous.

Bundelkhand, but the trees mostly attain small size. It has been successfully planted in Gorakhpur Division, where natural reproduction is excellent. It is being introduced now in other Divisions also. For silvicultural details vide Troup's Silviculture of Indian Trees, 697-768, and U. P. Forest Pocket Book. The uses of teak are too well known to need description here.

Fl. July-August. Fr. cold season. Deciduous December-April.

The seeds unless sown early in the hot season do not usually germinate till the following rainy season. Alternate drying and watering accelerate germination. The endocarp has lateral valves which are thrown off when germination starts. Small glands which ultimately become black, occur on the undersurface of leaves and in most parts of seedlings.

4. GMELINA, *Linn.*

Gmelina arborea, *Linn.* Vern. *Gamhar, kamhar.* Sans. *Sarvatobhadra, krishna vrintaka, kambari.*

A deciduous middle-sized or large tree; bark somewhat corky with lenticular tubercles, ashy or dark-grey in old stems, with almost black patches, exfoliating in irregular plates, which leave shallow depressions. Young parts densely tomentose, branchlets mealy pubescent, quadrangular. Leaves 4-8 by 2·5-6 in., broadly ovate, acuminate, caudate or acute, glabrescent above, finely tomentose or ultimately glaucous beneath, lateral nerves 6-10 pairs, lowest subbasal; base subcordate or truncate, often abruptly cuneate and usually with two glandular swellings at the junction with petiole; petioles 1·5-5 in. long, puberulous when mature. Flowers 1 in. across, reddish-brown and yellow in decussate cymes, arranged on a terminal tomentose panicles up to 12 in. long; bracts linear lanceolate. Calyx ·2 in. long, cupular or funnel-shaped, pubescent, persistent in fruit, teeth 5, acute. Corolla densely hairy outside, 2-lipped, tube dilated upwards, upper lip usually 2-lobed, lower lip 3-lobed, longer, middle lobe largest, lateral, with crenulate margins. Stamens 4, didynamous. Ovary four celled with one ovule in each; style slender; stigma inequally bifid. Fruit a succulent ovoid or pyriform drupe about 1 in. long, smooth shining and yellow when ripe, pulp aromatic; endocarp bony; seeds 1-3, lenticular.

Throughout the area but nowhere abundant.

The wood is yellowish or greyish-white, seasons well, is easily workable, light and durable and takes a fine polish. It is suitable for boxes, panels, planking, etc. It has been rather neglected as a timber tree in the past. It deserves to be more widely grown. In Hindu medicine the juice of the leaves is used to remove fœtid discharges from ulcers (*I. M. P.*). The root is said to have anthelmintic properties. Deer are fond of the fruits and also greedily browse the shoots, which is a serious drawback to the artificial propagation of the species.

Blaze brown with fine orange lines, brittle about 1 in.

Fl. March-April with new leaves. Fr. May-June.

VAR. glaucescens, *Clarke.* Leaves large, glaucous beneath on account of minute mealy glands. Panicles large. The commoner form in the northern portion of our area.

5. PREMNA, *Linn.*

Trees, shrubs sometimes scandent, rarely undershrubs. Leaves opposite or ternate, entire or toothed. Flowers small, often polygamous, white or greenish in panicled or corymbose cymes; bracts small narrow, bracteoles 0. Calyx truncate or minutely 2-5-tooth d, or sometimes 2-lipped. Corolla small, with short, tube, hairy inside, limb 2-lipped, or subequally 5 or 4-lobed. Stamens didynamous, usually exserted. Anther cells parallel or divergent. Ovary 2 or 4-celled; 4-ovuled; style linear; stigma shortly bifid. Fruit a small drupe, seated on the calyx, globose or obovoid with 1-4-celled stones, endocarp hard, usually rugose with a cavity in the centre.

A. Large woody climber; leaves petiolate; calyx truncate .. .. 1. *P. scandens.*

B. Erect shrubs or trees; leaves petiolate :—

Corymbs large; calyx 5 toothed, enlarged in fruit. 2. *P. mucronata.*

Corymbs small; calyx lobed, not enlarged in fruit. 3. *P. barbata.*

C. Stem hardly any; an undershrub with woody root-stock; leaves sessile. .. .. .. 4. *P. herbacea.*

1. Premna scandens, *Roxb.* Syn. **P. coriacea,** Var. oblonga, *Clarke.*

A large woody climber with pale-brown bark. Leaves 6-8·2 by 2·7-4·5 in. elliptic, elliptic-oblong or ovate, caudate, rounded or subcordate at the base, entire, lateral nerves 5-7 pairs, ultimate reticulations very fine, glabrous above, puberulous along the nerves beneath; petiole 1·2-2 in. long, glabrous. Flowers about ·2 in. across, greenish-white, in large spreading corymbose pubescent panicles up to 8 in. across. Calyx truncate, cupular ·05 in. long not enlarging in fruit. Corolla nearly ·1 in. long; lobes 4, subequal, reflexed; throat villous. Drupe obovoid about ·15 in. across (immature ?).

Gorakhpur (Domakhand); rare.

The leaves have the distinctive smell of the genus.

Fl. April. Fr. October ? Deciduous March-April—*Haines.*

Blaze "cream-coloured hard, with deep-yellow streaks."—*Haines.*

2. Premna mucronata, *Roxb.* Syn. **P. mucronata,** Var. cuneata, *Clarke.*

A small or medium-sized tree, with pale-grey or brown somewhat rough bark. Leaves 2·5-5 by 1·5-3 in., ovate acuminate, base rounded or abruptly cuneate, usually entire, glabrescent above, pubescent along the nerves beneath, main secondary nerves 4-10 pairs; petiole ·4-1 in. Flowers ·1 in. across, greenish in terminal, corymbose, pubescent, spreading panicles up to 4 in. across; lower bracts lanceolate, upper linear. Calyx pubescent, with spreading hairs, 5-toothed,

·07 in. in flower, up to ·2 in. fruit. Corolla about ·15 in. long with hairy throat. Drupe supported by the enlarged calyx, globose ·16 in. across, verrucose.

Throughout the area.

The wood is said to be used for obtaining fire by friction. The leaves have a characteristic aromatic and somewhat unpleasant smell, when bruised and dry black or blue-black. Young shoots are often spiny, and have whorled leaves.

Blaze white, with the characteristic aromatic smell of the genus.

Leafless February-April. Fl. April-May. Fr. July.

3. Premna barbata, *Wall.*

A small tree or a shrub, with grey or pale-brown bark. Young parts and inflorescence pubescent. Leaves 3·5-7 by 1·5-3·5 in., ovate or oblong, acuminate often caudate, subacute, rounded or subcordate at the base, usually distantly cuspidate-serrate towards the apex, glabrescent with age or puberulous along the nerves beneath, lateral nerves 5-7 pairs, lowest close to the base; petiole ·5-2 in. long, channelled, puberulous. Flowers greenish-white, about ·2 in. across, in terminal corymbose panicles 1-2·5 in. across. Calyx pubescent in flower, ·08 in. long, deeply 4-toothed, teeth obtuse, not enlarged or slightly broader, and reticulate and glabrate in fruit. Corolla up to ·2 in. long, throat hairy, lobes 4, obtuse. Drupes about ·15 in. across, glabrous, roundish or obovate, more or less verrucose.

Pilibhit, Gonda, Gorakhpur, Bundelkhand, probably throughout the area. Leaves dry-green. The leaves and blaze have similar aromatic smell as P. mucronata.

Blaze white. Fl. and fr. February (?)-June.

4. Premna herbacea, *Roxb.* Sans. *Bhumi-jambu, bhumi-jambiraka.*

A small almost stemless undershrub from a woody root-stock; shoots up to 5 in. when in fruit. Leaves sessile, usually in rosettes of 2-3 pairs, and close to the ground or opposite on longer shoots, 2-6 by 1·5-5 in., obovate, coarsely toothed, base cuneate, glabrescent above, puberulous along the nerves beneath, when mature, lateral nerves 4-6 pairs. Flowers white or greenish-yellow, about ·1 in. across in terminal corymbose panicles, about 1-1·5 in. across. Calyx pubescent, cupular, 4-lobed slightly enlarged in fruit. Corolla ·2 in. long, limb obscurely 2-lipped, 4-lobed, throat hairy. Drupe globose about ·25 in. across, black when ripe.

Pilibhit, Oudh Divisions, and Gorakhpur; in fire lines; often on clayey soils in open ground.

The roots are considered medicinal. In rare cases the leaves are subsessile and attain up to 9 in. on more vigorous shoots, but are not proportionately broad. The shoots die down at the end of the rainy season.

Fl. February-May. Fr. June-July, sometimes up to November.

6. VITEX, *Linn.*

Trees or shrubs, often aromatic or fœtid. Leaves opposite or ternately whorled, digitately 3-5 foliolate, less often 1-5-foliolate. Flowers in terminal and axillary, corymbose panicles of cymes; bracts small, longer or shorter than the calyx. Calyx campanulate, or tubular campanulate, truncate or shortly 3-5-toothed, usually enlarged in fruit. Corolla 2-lipped, tube short; upper lip 2-lobed, lower 3-lobed, central lobe of the lip usually largest. Stamens didynamous, usually exserted. Ovary 2-4 celled, with 1 ovule in each cell; style filiform; stigma shortly bifid. Fruit a globose or obovoid, drupe supported by the somewhat enlarged calyx, endocarp bony, usually 4-(or by abortion 1-) celled.

Leaflets hoary beneath, panicles mostly terminal flowers blue or lavender. .. .. .. 1. *V. Negundo.*

Leaflets glabrescent and green beneath, panicles axillary flowers white. .. .. 2. *V. leucoxylon.*

1. Vitex Negundo, *Linn.* Vern. *Shiwari, semari.* Sans. *Nirgundi.*

A large deciduous shrub or a small tree; with thin, grey or dark-grey bark and striate branchlets; shoots, undersurface of leaves, and inflorescence grey pubescent. Leaves digitately 3-5-foliolate; petiole 1-2 in. long. Leaflets 1·5-4 in. long, entire, crenulate or coarsely toothed, lanceolate-acuminate or acute, glabrescent above. Petiolules ·3-·7 in. long, in the terminal leaflets and then gradually shorter; outermost pair of leaflets sub-sessile and smallest. Flowers lavendar to blue, about ·2 in. across, in opposite cymes, arranged on an elongated terminal panicle up to 12 in. long; bracts caducous, lanceolate about ·1 in. long. Calyx about ·1 in. long, grey tomentose, campanulate with 5 short teeth. Corolla ·4 in. long, pubescent outside and hairy at the insertion of stamens; tube short; limb 2-lipped, upper lip 2-lobed, lower longer, 3-lobed, mid-lobe largest, crenulate, broad-obovate. Stamens didynamous, exserted; anthers ultimately diviaricate. Ovary 4-celled, each cell one ovuled; style filiform; stigma shortly bifid. Drupe about ·2 in. across, fleshy outside; stone usually 4 or by suppression fewer-celled.

Usually in open forests near habitation and near water, throughout the area. Commonly planted to form hedges.

The twigs are suitable for basket-making. The leaves are regarded as vermifuge and tonic and the roots as febrifuge, tonic and expectorant. The alkali from the leaves is said to be used in dyeing.

Fl. March-August. Fr. cold season. The leaves have a strong aromatic smell.

VAR. incisa, *Clarke.* Leaflets ovate-lanceolate, coarsely serrate. It grades off into the normal form and is found in similar localities.

2. Vitex leucoxylon, *Linn. f.*

A small deciduous tree, bark light brown (on twigs) to dark-grey, furrowed; young parts silky pubescent, branchlets ascending. Leaves usually digitately 3-5-foliolate (sometimes 1-5-foliolate); common petiole ·75-1·2 in. long, channelled, glabrate; articulation of the petiolules and petioles silky pubescent. Leaflets 1-3 in. by ·25-1 in., central largest, lateral gradually smaller, oblong-lanceolate or narrow lanceolate, bluntly acuminate or acute, base acute or cuneate, entire or distantly crenulate towards the apex, coriaceous, glabrate except along the nerves beneath with age, lateral nerves 6-10 pairs, not strong, forming loops near the margin, tertiaries prominently reticulate; petiolules of the terminal leaflets ·3-·6 in. of the lateral leaflets gradually smaller, ·1-1·4 in. long, all channelled, puberulous or glabrate. Flowers white about ·6 in. long, in peduncled, compound corymbiform lax dichasia, 1·5-4 in. long; peduncles 1-2 in. long; bracts caducous linear-lanceolate, short stalked, pubescent; bracteoles minute, subulate, hairy; pedicels ·1-·3 in. long. Calyx ·25 in. long, cupular-campanulate, teeth 5, triangular, sparsely hairy with ciliolate margins or glabrate. Corolla 2-lipped, about ·45 in. long, adpressed pubescent outside, tube about ·25 in. long, throat upper part of the tube and the middle lobe of the lower lip villous, the last about ·3 in. long. Stamens extruded; filaments villous and dilated towards the base, anther cells ultimately divaricate. Drupe ellipsoid ·6-·75 in. long, seated on the accrescent calyx.

Jhansi—Rajghat along the Betwa.

Blaze soft, white turning to brown and ultimately to bluish-brown.

According to Haines (Flora of Bihar and Orissa, Part IV, P. 713) the petioles are 1-3 in. long, and the leaflets 1-4·5 in. long. In none of the specimens from our area they attains this size, whether this is due to my specimens being immature or a permanent reduction of size, I am unable to say. It is noteworthy that Haines states that this species is evergreen but in our area it is certainly deciduous.

Fl. April-May.

7. CLERODENDRON, *Linn.*

Shrubs or trees, rarely sub-herbaceous. Leaves opposite or ternate, simple. Flowers usually showy in axillary cymes or terminal panicles. Calyx campanulate, often accrescent and coloured in fruit, truncate, 5-lobed or almost 5-partite; corolla with a slender, often long tube and spreading, obliquely 5-lobed limb. Stamens 4, exserted, didynamous; filaments filiform. Ovary 4-celled, with 1 ovule in each, style filiform; stigma shortly bifid. Drupe succulent or less often dry, often somewhat depressed 4-lobed or partite, with 1-4 stones or separating into drupels.

I. Calyx slightly accrescent in fruit :—

Leaves under 3 in. long, broad-ovate or rhomboid ; calyx lobes large. Large straggling shrub. .. 1. *C. Phlomidis.*

Leaves often over 4 in., long, oblong ovate-oblong, or elliptic-oblong ; calyx lobes minute. Compact erect shrub with annual or perennial shoots. .. 2. *C. serratum.*

II. Calyx accrescent and turning red in fruit :—

Corolla-tube under 2 in. in length ; leaves broad-ovate, denticulate, more or less pubescent ; petiole long ; stem solid. .. .. 3. *C. infortunatum.*

Corolla-tube slender, over 3 in. long ; leaves narrow lanceolate or oblong, entire or sinuate, glabrous, subsessile. .. .. .. 4. *C. Siphonanthus.*

1. Clerodendron Phlomidis, *Linn. f.* Vern. *Ini, Eni.* Sans. *Vataghni.*

A large evergreen straggling shrub or small crooked tree ; bark thin, greyish-brown, peeling off in long flakes ; branches grey pubescent ; leaves, calyx and bracts often glandular. Leaves 1·2-5 by ·8-1·7 in., broadly ovate or sub-rhomboid, distantly toothed, acuminate, acute or subacute, more or less pubescent or glabrous on both surfaces ; lateral nerves 3-5 pairs, lowest pair sub-basal, base truncate and sometimes abruptly attenuate or obtuse ; petiole ·3-1 in. long. Flowers white or pinkish ·5-·6 in. across, in terminal and axillary dichotomous cymes towards the ends of the branches, often forming a panicle. Bracts obovate or lanceolate, pubescent, foliaceous .2 in. long. Calyx ·3-·4 in. long, green or purplish, divided about half-way down, glabrous ; lobes acuminate, thin. Corolla-tube up to ·8 in. long, pubescent outside, slender ; lobes 5, elliptic, obtuse ; stamens exserted. Drupe ·25 in. across, obovoid, seated on the slightly enlarged calyx, dry.

Bundelkhand, Etawah, Pilibhit and N. Oudh—*Duthie.*

Blaze greyish-white, about ·12 in. Sometimes attains 30 ft. in height and 12 in. in diameter.

Fl. August-March. Fr. May(?).

2. Clerodendron serratum, *Spreng.* Vern. *Chail barang, barangi,* Sans. *Barbara.*

A shrub with a woody base and annual shoots up to 5ft. high, or perennial. Leaves 5-9 by 1·5-3 in., sometimes attaining 12 in. by 4 in., oblong, oblong-obovate or elliptic-oblong, coarsely serrate, glabrescent when mature, base narrowed, coriaceous ; petiole 0-·2 in. long. Flowers bluish-white ·6 in. across, cymose on the lateral and opposite branches of a terminal, elongate, compact, pubescent panicle; lowest from the axils of reduced leaves ; bracts pubescent, linear lanceolate, acuminate, up to 1 in. long. Calyx ·3 in. long, cupular, pubescent ; lobes minute. Corolla-tube short, ·3 in. long, hairy within ; lobes 4, lateral, subequal, obovate-oblong, about ·3 in. long, odd

lobe longer than the others, darker in colour and concave up to ·5 in. long. Drupe, ·3 in. across, black when ripe obovoid; stones 1-4.

The root is used in febrile or catarrhal affections.
Pilibhit, Gonda, Bahraich, Jhansi.

3. Clerodendron infortunatum, *Gaertn.* Vern. *Bhant.*

An undershrub or in favourable localities large spreading shrub: often covered with large raised lenticular warts, young parts rusty villous. Leaves 4-9 by 3-6 in. broadly ovate, sometimes cordate, acuminate, denticulate, pubescent on both surfaces, main lateral nerves 6-8 pairs, branching near the margin; petiole 1-6 in. long, hairy. Flowers white tinged with pink, tragrant, in large lax pyramidal panicles of cymes; bracts elliptic-acuminate. ·4-·5 in. long. Calyx deeply 5-partite, pubescent, ·4 in. long in flower, enlarging to ·8-1 in., bright-red, and leathery in fruit; lobes acuminate. Corolla tube slender ·7-·9 in. long, pubescent outside; lobes elliptic or obovate ·3-·4 in. long; stamens declinate; style much extruded. Drupe bluish-black when ripe ·25-·3 in. across, at first hidden by the calyx which opens out towards maturity.

All over the Eastern Circle.

Various parts of the plant are used medicinally. The leaves are tonic and anti-periodic. The fresh juice of the leaves is believed to be a vermifuge (*I.M.P.*) In fruit the panicles also become reddish.

Fl. February-May. Fr. May-July. The entire plant has a peculiar fœtid smell.

4. Clerodendron Siphonanthus, *Br.* Vern. *Arni.* Sans. *Brahmayastika.*

An erect shrub with herbaceous, fluted, hollow stems. Leaves in whorls of 3-6, subsessile, 6-9 by ·5-1·5 in. long, narrowly lanceolate or oblong with 6-10 distant secondary nerves which run obliquely upwards and sometimes meet in a continuous line near the margin, glabrous, entire or sinuate. Flowers handsome, white or cream 3-4·5 in. long, drooping on opposite or whorled, few flowered cymes, forming a long rigid panicle; lower panicle branches axillary. Bracts linear or linear-lanceolate, ·5 in. long. Calyx deeply-lobed, ·4 in. across in flower and ·8-1·2 in. fruit; lobes oblong or ovate-acuminate. Corolla-tube very slender, lobes 5-·7 in. long, obovate or oblong, acuminate. Drupes blue, of 4 connate drupels seated on the much enlarged red calyx.

Pilibhit to Gorakhpur.

Sometimes cultivated on account of its handsome flowers.

The juice expressed from the herbaceous portions is used with *ghi* (boiled butter) for various skin diseases.

8. HOLMSKIOLDIA, *Retz.*

Holmskioldia sanguinea, *Retz.*

A large straggling shrub, with thin pale-brown bark and quadrangular pubescent branchlets. Leaves 2·5-4 by 2-3 in., broadly ovate usually acuminate, crenate or crenate-serrate, pubescent, base truncate or subcordate and often abruptly cuneate, minutely glandular, specially on the under-surface, lateral nerves 4-5 pairs; petiole 5-1 in. long, chanelled and puberulous. Flowers red, in short, axillary and terminal pubescent cymes. Bracts minute, spatulate. Calyx broadly obconic, scarlet or orange-red, entire with an undulate margin, membranous, prominently venose, ·7-1 in. across, persistent and somewhat enlarged in fruit. Corolla ·6-1 in. long, tube curved, ·8 in. long, limb oblique, unequally 5-lobed, Stamens didynamous, extruded, anther cells parallel. Ovary of 2, 2-celled carpels, each cell with one ovule; style terminal; stigma shortly bifid. Fruit drupaceous, included within the calyx; obovoid, deeply 4-lobed at the apex, nearly dry endocarp separating into 4-1 pyrenes.

Gonda, Bahraich.

Blaze pale-yellow.

Fl. October-December; Fr., later part of cold season.

9. CARYOPTERIS, *Bunge.*

Caryopteris Wallichiana, *Schauer.*

A large spreading shrub, with brown bark, peeling off in narrow papery strips: branchlets quadrangular pubescent. Leaves 2-5 in. long, lanceolate or elliptic-lanceolate, crenate-serrate or subentire, base usually cuneate, puberulous, often with numerous minute glistening glands on the undersurface, lateral nerves 4-5 pairs, curving upwards: petiole up to ·5 in. long, joined by an interpetiolar line. Flowers light-blue or mauve, fragrant ·5 in. across in small cymes, forming a terminal thyrsoid panicle; lower cymes axillary; upper bracts minute. Calyx about ·15 in. long, enlarging in fruit to ·2-·25 in; deeply 5-fid, segments linear-lanceolate. Corolla 2-lipped, tube short, about ·25 in. long, pubescent towards the top; lobes longer than the tube; middle lobe of lower lip deeper coloured, obcordate, and longest—about ·3 in. long, others paler and shorter. Stamens didynamous, exserted; anther cells confluent. Ovary 4-celled, each with one pendulous ovule; style much exserted, shortly bifid. Fruit capsular, globose, pubescent, about ·2 in. long, dehiscent, seated on the enlarged venose calyx, and separating into 4 concave valves each containing a seed.

Pilibhit, Gonda, Gorakhpur, almost certainly in other Oudh Divisions.

Fl. January-April. Fr. May-July.

1. **Duranta Plumieri,** *Jacq.*—A large evergreen shrub, more or less spiny. Leaves 1-2 in. long, obovate or elliptic, usually acute, with a tapering base, margins usually coarsely toothed above the middle. Flowers blue or white in drooping racemes. Calyx teeth small. Corolla-tube ·3 in. long, lobes subequal; stamens didynamous, included. Drupe globose, polished, yellow ·25 in. across.

Indigenous in tropical America. A common hedge plant within the area.

2. **Petrea volubilis,** *Linn.* The purple wreath.—A large woody climber, with opposite, rough, elliptic leaves 2-4 in. long. Flowers in racemes; calyx blue, deeply 5-cleft; corolla caducous, violet; fruits coraceous indehiscent included within the persistent calyx.

A native tropical of America; often grown in gardens within the area. A very handsome plant when in flower. Fl. April.

3. **Lippia citriodora,** *Kunth* Syn. *Aloysia citriodora, Ort.* The lemon-scented Verbena.—A shrub with aromatic, ternate, lanceolate leaves 2-3 in. long and bluish or purplish flowers in terminal panicles. Native of S. America, sometimes grown in gardens.

4. **Lippia nodiflora,** *Rich.*—A perennial creeping herb, rooting at the nodes. Leaves subsessile, ·5-1 in. long, obovate, serrate in the upper portion, minutely strigose on both surfaces. Flowers white or pale-pink about ·15 in. long, sessile in dense, globose, pedunculate heads up to ·25 in. across, which elongate in fruit. Calyx 2-lobed, lobes acuminate. Corolla sub-2-lipped, 5-lobed, lowest largest, others sub-equal. Fruit dry ·08 in. across, of 2 pyrenes embraced by the calyx.

Common on river banks or moist places. Fl. and fr. most of the year.

5. **Verbena chamædrifolia,** *Juss.*—With scarlet flowers and its various coloured hyrbids with allied species are the garden Verbenas so commonly grown in our area. Natives of S. America.

LIX.—LABIATÆ.

Herbs, undershrubs or less often shrubs, often aromatic. Stems often 4-angled. Leaves opposite or whorled, sometimes gland dotted; usually simple, exstipulate. Flowers 2-sexual, more or less zygomorphic, often small, solitary or fascicled, or in axillary cymes, forming by union, false whorls which are sometimes arranged in heads or spikes; bracts and bracteoles small. Calyx inferior, 2-lipped or tubular, persistent; lobes 4-5 subequal. Corolla hypogynous, gamopetalous, tubular at the base, sub-equally 4-5-lobed or 2-lipped; lobes imbricate in bud. Stamens inserted on the corolla tube, 4, usually didynamous or only 2 perfect; anthers connate, separate or confluent. Disk prominent. Ovary 4-celled, deeply 4-lobed or 4-partite; style arising from between the lobes, mostly gynobasic. Stigma unequally 2-fid. Ovule 1 in each cell. Fruit usually of 4 or fewer, dry, 1-seeded nutlets with a scar at the base. Seeds small, albumen scanty or none.

I Stamens declinate and lying on the lower lip or enclosed by it; anther cells confluent —
A. Lower lip of corolla scarcely longer than upper flat or not deeply concave :—
Calyx deflexed in fruit, upper lobe broader than the others, recurved, margins decurrent on the tube :—
Corolla tube short, slightly exserted, or included; stigma with two linear unequal lobes. .. .. .. 1. *Ocimum.*
Corolla tube long, exserted; stigma undivided. .. .. .. 2. *Orthosiphon.*
B. Lower lip of corolla much longer than the upper, deflexed, deeply concave :—
Calyx 5-lobed or 2-lipped; flowers in whorls or lax cymes. .. .. .. 3. *Plectranthus*
II. Stamens erect or spreading :—
A. Calyx 5-partite or 5-toothed; corolla lobes 4, sub-2-lipped or subequal; stamens subequal :—
Calyx lobes plumose in fruit; stamens included, filaments naked. .. .. 4. *Colebrookia.*
Calyx lobes not plumose; stamens exserted; filaments bearded. .. .. 5. *Pogostemon.*
B. Calyx 5-10-nerved; corolla lobes 5; stamens didynamous :—
Upper lip of corolla hooded; stamens included 6. *Leucas.*
Upper lip of corolla short, nearly flat; stamens exserted. .. .. *Anisomeles.*

1. OCIMUM, *Linn.*

Aromatic herbs or undershrubs. Leaves petiolate, often toothed. Flowers white or mauve, in whorls of 6-10 in spikes or racemes, which are sometimes panicled; bracts small. Calyx 2-lipped, ovoid or campanulate, enlarged and deflexed in fruit, 10-nerved, upper lobe broad and decurrent on the tube, lower with 4 sharp teeth, the two middle ones longest. Corolla 2-lipped, tube short, not annulate within; upper lip subequally 4-lobed, lower entire, hardly longer, declinate. Stamens 4, declinate, exserted: filaments naked, or the upper often toothed or hairy near the base; anther-cells confluent. Disk entire or lobed. Ovary 4-partite; style gynobasic, slender, stigma bifid, into two unequal linear lobes. Nutlets 4, dry, smooth or rugose.

I. Shrub; the lower calyx teeth shorter than the upper :—
Nuts not mucilaginous, when wetted. .. 1·0. *gratissimum.*
II. Undershrubs or herbs, the lower calyx teeth longer than the upper :—
A. Upper lip of the calyx elliptic or ovate; pedicels usually longer than the ripe calyx; nutlets not mucilaginous when wetted. .. .. 2·0. *sanctum.*
B. Upper lip of the calyx orbicular; pedicels shorter than the ripe calyx; nutlets mucilaginous when wetted :—
Fruiting calyx small; flowers ·15-·2 in. long; nutlets small. .. .. 3·0. *canum.*
Fruiting calyx large; flowers ·3-·5 in. long; nutlets large. .. .. .. 4·0. *Basilicum.*

1. Ocimum gratissimum, *Linn.* The Shrubby Basil. Vern. *Ram-tulsi.*

A very aromatic shrub, up to 6 ft. high with pubescent branches. Leaves 1-4 in. long, minutely glandular, elliptic lanceolate, acuminate, coarsely crenate or crenate-serrate, acute or acuminate, sparsely pubescent along the nerves, base usually abruptly cuneate and decurrent on the petiole; petioles attaining in lower leaves 2 in. or more. Flowers white, whorled in racemes, which are up to 5 in. long, pedicels much shorter than the calyx; bracts ovate narrowed at the base to a minute stalk. Calyx 2-lipped, pubescent outside; upper lip longer than the lower about ·2 in. long in fruit, obovate sub-acute at the base, reflexed upwards in fruit; lower lip 4-toothed, lateral short, lowermost teeth subulate. Corolla barely exserted, with a short tube, upper lip 4-fid, lower lip entire, curved. Stamens 4, exserted, upper pair abruptly bent near the base with a bearded tooth at the bend. Nutlets ·05 in. across, subglobose, brown, minutely verrucose.

Largely cultivated. Very sweet scented; scent stronger than that of any other cultivated basil in our area. The plant is medicinal and is said to be useful in the treatment of genito-urinary diseases.

Fl. mainly October-February.

2. Ocimum sanctum, *Linn.* The Sacred Basil. Vern. *Tulsi.* Sans. *Tulasi, Krishna-mula.*

Herbaceous from a perennial root-stock; or sometimes woody attaining 4 ft., branchlets purplish, softly hirsute. Leaves 1-2 in. long, ovate or ovate-oblong, distantly serrate, crenate or entire, pubescent, glandular. Flowers 1·8-2 in. long, purplish, or pinkish in racemed often panicled whorls up to 8 in. long; pedicels usually longer than the calyx; bracts reflexed, sessile or shortly stalked. Calyx glandular and densely pubescent outside, enlarging in fruit; upper lip obovate and acute at the base in fruit, shorter than the lower lip. Corolla ·15 in. long, upper lip hairy on the back; filaments of the upper pair of stamens bearded at the base. Nutlets ·05 in. long ellipsoid, reddish with black markings.

Much cultivated within our area; sometimes found as an escape. It is one of the most sacred plants of the Hindus. The leaves are medicinal and are much used for catarrh and other pulmonary affections. The stems are made into rosaries and worn largely by Vaishnavas.

The plant is reputed to keep off mosquitoes which is confirmed by Sir George Birdwood in a letter to the *Times* of April 29, 1904, quoted in *I.M.P.*

Fl. cold season.

3. Ocimum canum, *Linn.* Syn. **Ocimum americanum,** *Linn.* The hoary basil. Sans. *Ajaka, gambhiram, tikshnamanu.*

An erect very pubescent undershrub or a herb about 1-2 ft. high. Leaves ·5-1·5 in. in length, elliptic or elliptic lanceolate, entire or serrulate, glandular, glabrate with age.

Flowers white or pale-purple ·15-·2 in. long in whorls of 6 on terminal racemes, which are up to 4 in. long and elongate in fruit; bracts stalked, elliptic lanceolate, ciliate; pedicels shorter than the calyx, erect often adpressed to the stem, upper part much deflexed in fruit. Calyx densely villous inside, covered with spreading hairs; upper lip in fruit suborbicular, shorter than the teeth of the lower lip. Corolla white, filaments glabrous, upper pair sometimes toothed at the base; nutlets ·05 in. long, black when ripe.

Cultivated in Bundelkhand and elsewhere within the area, often naturalized in drier districts.

The seeds become very gelatinous in water. The leaves made into a paste are applied to finger and toe nails when the extremities are cold during fever for restoring warmth. (*I.M.P.*)

Fl. August-March.

4. Ocimum Basilicum, *Linn.* The Sweet Basil. Vern. *Kali-tulsi, babui tulsi.* Sans. *Vishwa-tulsi, surasa.* Ar.-*Shahasfaram, raihan* Pers. *Shuhasparam, nazbi, dabanshah.*

A strongly-scented much-branched herb, about 2-3 ft. high with glabrous or more or less pubescent stems, hairy at the nodes. Leaves 1-3 in. long, glandular ovate-acute, entire or more or less lobed or toothed; petiole ·5-1 in. long. Flowers white or pale-purple ·3-·5 in. long, in dense whorls on racemes, which attain 6 in. and are sometimes panicled; bracts stalked, ovate-acute; pedicels shorter than the calyx, much deflexed in fruit. Upper lip of calyx rounded, shorter than the teeth of the lower lip. Upper pair of stamens often toothed at the base; nutlets ·07 in. across, ellipsoid, black, slightly pitted.

Largely grown in gardens, sometimes occurring as an escape. The nutlets become very gelatinous in water. The leafy tops which have a pungent taste are used as a spice for seasoning. The leaves are used in the treatment of bronchitis. The juice of the plant is said to cure ringworm and ear-ache and an application of bruised leaves relieves pain from scorpion stings. The seeds are used in catarrh, chronic diarrhœa, dysentry, nephritis and in several other ailments.

Very variable, the leaves are usually 1-1·5 in. in length, but in some varieties attain up to 3 in. and in other forms are very similar to those of O. canum.

Fl. cold season.

2. ORTHOSIPHON, *Benth.*

Orthosiphon rubicundus, *Benth.*

An erect herb from a woody root-stock and tuberous roots. Leaves 2-5 in. long, sessile or sub-sessile, lanceolate, elliptic-oblong or oblanceolate, apex acute or rounded, coarsely serrate, covered with a few coarse hairs or glabrescent, under-surface paler, base cuneate,

Flowers white, pink or purplish in distant few flowered whorls on a long terminal racemes. Calyx ·2 in. long, in flower and about ·3 in. long, and deflexed in fruit, pubescent, closely ribbed, upper tooth broad purplish, membranous and slightly decurrent on the tube, lateral and lower teeth subulate, lowermost protruding in fruit. Corolla 2-lipped, much exceeding the calyx tube, ·3-·5 in. long, upper lip 3-4-fid, shorter than the concave lower lip. Stamens 4, didynamous, declinate; filaments glabrous, nutlets suborbicular, compressed punctulate.

In fire lines and localities open to burning from Pilibhit to Gorakhpur.

Roots swollen and fusiform or turbinate up to 3 in. long—an environmental adaptation similar to that of Ruellia sulfruticosa.

Fls. April-June.

O. pallidus, *Royle.*—A diffused, scarcely woody plant, shoots from near the rootstock, attaining about 12 in. Leaves ·5-1·5 in. long, petiolate, ovate, obtuse or acute, glabrous or sparingly hairy, pale beneath, coarsely crenate-serrate, narrowed at the base; petiole ·25-·4 in. long. Flowers ·3 in. long, white or lilac, racemed, deflexed. Calyx ·25 in. in fruit, hispidulous outside, upper lip with 3 obtuse lobes, central broadest, lowerlip awned slightly exceeding the upper lip. Nutlets globose.

"Sub-Himalayan tracts of N. Oudh"—*Duthie.* Bundelkhand—*Duthie.*

Fl. July.

3. PLECTRANTHUS, *L'Herit.*

Plectranthus ternifolius, *Don.*

An undershrub, 3-5 ft. high, young parts hoary tomentose; branchlets erect. Leaves in whorls of 3, 2-6 in. long, lanceolate-acuminate, usually rugose, serrate, upper-surface shortly hairy, under surface dense pubescent, often hoary; petioles up to ·3 in. long. Flowers white with a few pink spots at the base of the upper lip of the corolla, in 6-8-flowered cymes, whorled on the branches of a terminal panicle. Lower bracts leaf-like, smaller upwards. Calyx campanulate, tomentose, minute in flower, tubular and erect, attaining ·2 in. fruit, prominently ribbed, 5 toothed. Corolla ·2 in. long. 2-lipped with decurved tube, gibbous above the base; upper lip short, recurved, 4-lobed; lower longer boat-shaped. Stamens 4, declinate. Style sub-equally 2-fid. Nutlets 3-gonous, oblong, pointed.

Fire lines in Pilibhit and Kheri, probably also in other Oudh Divisions.

Fl. November-December.

4. COLEBROOKIA, *Smith.*

Colebrookia oppositifolia, *Sm.* Vern. *Puchera* (Buh.) *chawea* (Gor), *Kalabansa* (Pil. & Bun.).

An erect shrub, 4-10 ft. high twigs, inflorescence and petioles grey tomentose. Branchlets 4-angular grooved. Leaves 5-10 by 1·4-3·6

in., elliptic, elliptic-oblong or oblong to ovate-lanceolate, acuminate, crenate-serrate, lateral nerves 12-15 pairs, arcuate, pubescent or glabrescent above, more densely pubescent specially along the nerves and often covered with glistening glands beneath, base acute, sometimes unequal; petiole ·5-1·2 in. long. Flowers white, minute, dimorphic (functionally dicœcious) in whorls, on panicled spikes 1·5-4 in. long; panicles terminal or from upper leaf axils. Bracts linear about ·06 in. long; bracteoles cohering in threes about ·1 in. long. Calyx about ·1 in. in flower furrowed and 5 cleft; teeth plumose with silky hairs attaining ·25 in. and becoming setaceous in fruit. Corolla little shorter than the calyx, hairy outside; lobes 4, subequal. Stamens equal, 4, included in functionally female flowers; exserted in the male flowers; filaments filiform; anther cells confluent. Style 2-fid, shorter than the stamens in male flowers; nutlets minute, usually solitary, hairy at the top and included in the enlarged calyx.

Throughout the area, often gregarious near nullahs, water-courses, etc.

Fl. October-March. Fr. March-June.

5. POGOSTEMON, *Desf.*

Pogostemon plectranthoides, *Desf.*

An aromatic shrub, often gregarious, with pubescent branchlets. Older branches smooth and often purple. Leaves 2-5 by 1-2·5 in., ovate, acute or acuminate, dark-green, pubescent or glabrous, lateral nerves 4-5 pairs, arcuate ascending, margin usually doubly serrate, base cuneate; petiole up to 2 in. long. Flowers small, white and pink, in dense subcapitate whorls on pubescent, panicled, terminal and axillary spikes. Bracts foliaceous, up to ·3 in. long, ovate acuminate, glandular and pubescent with soft spreading hairs, margins ciliate, each enclosing a cluster of several flowers; bracteoles narrower, both often tinged with purple. Calyx ·2 in. long, 5-fid, glandular, hairy, teeth acuminate, shorter than the tube. Corolla about ·2 in. long, 2-lipped; upper lip 3-lobed, mid-lobe longest, lateral lobes obtuse and broader, lower lip shorter than the upper, entire, obtuse. Stamens four, exserted; filaments purple bearded with jointed hairs at the base; anther cells confluent; style shortly bifid. Nutlets minute, reddish to dark-brown, laterally compressed and polished when ripe.

Throughout the area, often gregarious on clayey soils.

Flowers mainly in rainy season and also at other times of the year. The upper herbaceous portions of the shoots often die back.

6. LEUCAS, *Br.*

Leucas mollisima, *Wall.* Syn. **L. montana?** *Spreng,* var. mollisima.

A spreading undershrub up to 4 ft. in height, with pale-brown bark and weak branches covered with grey reflexed adpressed pubescence. Leaves ·7-1·6 by ·5-1·2 in., smaller upwards, elliptic-lanceolate to oblong-ovate, apex obtuse or subacute, margins coarsely crenate-serrate, sparsely pubescent above, softly white tomentose, specially along the nerves beneath, lateral nerves up to 5 pairs, impressed beneath; petiole ·3-·4 in. long. Flowers white ·4 in. long, subsessile, usually several together, in distant axillary whorls; bracts minute, linear. Calyx ·25 in. long, declinate, densely pubescent outside and on the upper half inside, 10 ribbed, ribs ending in 10 minute teeth. Corolla 2-lipped, tube slightly constricted above the middle; upper lip hooded, shaggy outside, margin densely fringed, lower longer, 3-lobed, mid-lobe longest, lateral recurved minute; stamens 4, perfect, declinate, not exceeding the corolla, lower pair longest; filaments sparsely pubescent; anthers connate. Ovary 4-partite; style unequally 2-fid. Nutlets 4, dark-brown, triquetrous, laterally compressed, minutely tubercled on the back, attachment basal.

Bundelkhand; N. Oudh—*Duthie.*

Fl. April-May.

Leucas lanata, *Benth.*—A perennial herb about 18 in. high with woody rootstock, covered all over with woolly or silky hairs, longer hairs erect or spreading. Leaves thick, rugose, 1-2 in. long, shortly petioled or subsessile, ovate, acute or obtuse, crenate or subserrate, tomentose or silky pubescent. Flowers white, in dense whorls. Calyx ·3 in. long, silky outside and in the upper half inside. Corolla ·3-·5 in. long, tube usually included, upper lip densely hairy, hooded. Nutlets, oblong obovoid, with truncate apex.

Gonda—*Duthie*; Bundelkhand—*Edgeworth.*

Fl. cold season.

Leucas procumbens, *Desf.*—A procumbent laxly-branched herb with slender shoots 2 to 3 ft. in length and a woody rootstock. Leaves ·75-1·75 in. long, lanceolate or elliptic ovate, acute, remotely serrate or acute, thin, subglabrous, base narrowed to a short petiole. Flowers pedicellate in few-flowered (usually 1-3) whorls. Calyx ·3 in. long, 10 nerved. Subglabrous. Corolla ·5-·6 in. long, upper lip hooded, lower lip longer, with an emarginate central lobe. Stamens 4, nutlets ·08 in. obovoid.

Bundelkhand—*Duthie.* Fl. and fr. October-December.

Leonotis nepetæfolia, *Br.*—A tall, erect annual attaining 7 ft. with 4-angled and grooved puberulous stems. Leaves 2·5-6 in. long, ovate, coarsely crenate-serrate, membranous, puberulous; petiole 1-4 in. long, winged on the upper part. Flowers orange-scarlet in dense axillary globose whorls 1·5-3 in. across. Floral leaves lanceolate, deflexed; bract linear, up to ·6 in long, spine-tipped. Calyx ·75 in. ribbed, upper part densely villous, teeth 8-10, spine-tipped. Corolla 2-lipped, 1 in. long, tube exserted, villous upper lip hooded, longer than the lower lip. Stamens didynamous. Nutlets ·15 in. across, obliquely truncate.

Naturalized in village lands.

Fl. October-January.

Leonurus sibiricus, *Linn.*—A handsome tall herb attaining 6 ft. with quadrangular stems and long petioled, deeply incised, or palmatpartite leaves with linear lobes, more or less pubescent on the nerves, 1·5 to 4 in. long. Flowers red, ·5 in. long, in dense flowered axillary whorls with spinescent, subulate bracts. Calyx ·25 in. long, 5-toothed; teeth spinescent. Corolla 2-lipped; upper lip hooded, tomentose, lower equalling the upper, 3-lobed with spreading mid-lobe. Stamens 4; nutlets triquetrous, smooth ·1 in. long.

Common in hedges as a naturalized plant.

Fl. cold season.

Anisomeles ovata, *R. Br.* Syn. A indica, *O. Ktze.*—A shrub-like pubescent or tomentose herb with a strong aromatic smell. Leaves 1-3 in. long, ovate, coarsely crenate, acuminate, softly pubescent or tomentose on both sides; petioles up to 1·5 in. long, densely hairy. Flowers purple and blue in dense flowered whorls on terminal shoots; lower whorls arising from leaf axils. Calyx ·3 in. long, tubular, hirsute on both surfaces; teeth acuminate, enlarging in fruit. Corolla ·6-·7 in. long, 2-lipped with a short tube: upper lip pale-purple, short, entire, erect; lower blue, spreading 3-lobed, mid-lobe, 2-fid. Stamen didynamous, exserted; filaments hairy or bearded. Nutlets about ·1 in. long ovoid, polished, black.

Common from Pilibhit to Gorakhpur.

Fl. rainy season.

The densely woolly form of the plant is var. mollisima.

Salvia coccinea, *Juss.*—A slender herb attaining about 2 ft. with beautiful scarlet flowers about 1 in. long is often cultivated in gardens.

Coleus Blumei, *Benth* and many of its hybrids with beautifully variegated leaves are commonly grown in pots in bungalow verandahs in our area.

Meriandra bengalensis, *Benth. The Bengal Sage.* Vern. *Kapur-ka-patta.*—A shrub. Leaves 2-3 in. long, obtuse, base rounded, petiole ·3-·5 in. long. Flowers white, in globose whorls on terminal spikes. The leaves have a strong camphor-like smell. Common in Indian gardens.

LX.—AMARANTACEÆ.

Herbs, less often shrubs or undershrubs, erect or with climbing branches. Leaves opposite or alternate, exstipulate. Flowers 2-sexual rarely unisexual, usually small, arranged in terminal or axillary, simple or panicled spikes, cymes or clusters; bracts hyaline or scarious, bracteoles scarious, 2. Perianth persistent, usually of 5 free or connate, hyaline or scarious segments, imbricate in bud. Stamens 1-5, opposite the perianth segments; filaments usually connate below, or united with intervening membranous staminodes and forming a hyaline cup; anthers 1-2-celled. Ovary 1-celled; ovule 1 or more; style obsolete, simple or 2-3-cleft. Fruit a membranous utricle, rarely an irregularly dehiscing capsule, or a berry enclosed in, or supported by, the persistent perianth. Seed orbicular or reinform, compressed, with a curved embryo and copious floury albumen.

I. Leaves alternate, or alternate and opposite leaves mixed :—		
More or less glabrous. Racemes not dense; staminodes 0. Fruit a berry.	1.	*Deeringia.*
More or less tomentose; spikes dense; stamens with interposed staminodes; fruit an utricle or capsular.	2.	*Æerua.*
II. Leaves all opposite :—		
Flowers all perfect, in simple spikes.	3.	*Achyranthes.*
Flowers in fascicles, each containing one perfect and several sterile flowers, which are reduced to stellate bristles.	4.	*Puppalia.*

1. DEERINGIA, *K. Br.*

Deeringia baccata, *Mog.* Syn. **D. celosoides,** *Br.*

A subscandent or rambling shrub, with long weak branches. Leaves 2-5 by 1-2 in., ovate or ovate-lanceolate, acuminate, entire, secondary nerves 7-9 pairs arched, glabrescent, membranous, base rounded, narrowed into the petiole, sometimes abruptly; petiole up to 1 in. long. Flowers greenish, close together on spike-like simple or panicled racemes; pedicels filiform, ·05-·1 in. long; bracts minute. Perianth of 5 segments, upto ·1 in. long, oblong. Stamens 5, somewhat dilated and united at the base. Ovary with many ovules; style short; stigmas usually 3, dilated at the tip, narrowed downwards. Fruit a globose scarlet berry ·2 in. across, seated on the spreading perianth; seeds minute, black.

Pilibhit and Oudh divisions on hedges and in scrub jungles.

The juice of the red fruits can be used as a substitute for red ink.

Conspicuous and very beautiful when in fruit.

Fl. rainy season. Fr. November-January.

2. ÆRUA, *Forsk.*

Erect, scandent or weak-stemmed herbs or undershrubs. Leaves alternate or opposite. Flowers small, bisexual or polygamous, in simple or panicled spikes; bracts and bracteoles small. Perianth usually 5-, rarely 4-lobed, membranous. Stamens 5, rarely 4; filaments with intervening staminodes, both united in a short hypogynous cup; anthers 2-celled. Ovary 1-celled; ovule 1, pendulous from a basal funicle; style simple; stigma capitate or 2-fid. Fruit a membranous utricle, or a capsule with coriaceous circumsciss crown

I.	Spikes axillary and terminal :—	
	Subscandent; leaves alternate and opposite; flowers 2-sexual.	1. *Æ. scandens.*
	Erect; leaves alternate; flowers unisexual, dicecious.	2. *Æ. javanica.*
II.	Spikes all axillary; leaves alternate; flowers 2-sexual and 1-sexual.	3. *Æ. lanata.*

1. Ærua scandens, *Wall.*

A subscandent or straggling undershrub with striate pubescent branches. Leaves alternate and opposite, usually 1-4 by ·5-1·5 in., elliptic or ovate-lanceolate, acute, mucronate, adpressed pubescent on both surfaces, more densely beneath, narrowed at the base into the petioles; petioles up to ·5 in. long. Flowers white, with a greenish centre, in axillary and terminal, ovoid or cylindrical, compact spikes ·25-1 in. long, often 2-3, sometimes more together, usually forming lax panicles. Bracteoles minute, ovate acuminate, hyaline. Perianth lobes 5, about ·1 in. long, lanceolate acuminate, villous outside, scarious. Stamens 5, united in a green cup below; staminodes reduced to teeth. anthers yellow. Stigmas capitellate. Capsule broadly ovate.

Common in all open forests in the northern portion of the area.

Fl. and fr. almost all the year.

2. Ærua javanica, *Juss.*

An erect hoary undershrub, branches covered with stellate tomentum. Leaves 1-2·5 in. long, alternate, linear oblong, or linear oblanceolate, acute or obtuse, densely tomentose, specially on the undersurface, base narrowed and running into the very short petiole, or sessile. Flowers dicecious, in dense spikes 1-6 in. long, forming terminal panicles. Bracteoles hyaline, minute. *Male flowers.*

Perianth shorter than in female flrs., segments elliptic, woolly on the back; stamens 5; pistillode short. *Female flowers.*—Perianth about ·1 in.; segments narrower, apiculate; stigmas 2. Utricle broad ovoid.

Etawah, Agra, "sub-Himalayan tracts of Rohilkhand and N. Oudh."—*Duthie.* I have seen no specimens from the latter area in Dehra herbarium.

3. Ærua lanata, *Juss.*

A sub-erect or prostrate undershrub. Branches many from a woody base, striate and pubescent or tomentose. Leaves alternate, about ·3-1 in. long; obovate-elliptic or obovate, densely hairy, or villous beneath. Flowers minute, greenish white, 2-sexual, sometimes 1-sexual, on short axillary spikes ·25-·5 in. long, which are often crowded together in clusters; bracteoles apiculate. Perianth about ·05 in. long, segments oblong, silky outside, obtuse or apiculate; stigma 2-fid; utricle broadly ovoid, acute.

Bundelkhand, probably also in many other parts of the area.

The woolly spikes are said to be used for stuffing pillows in Sind.

Fl. and fr. November-January, probably also at other times of the year. The leaves on the branches are often very small.

3. ACHYRANTHES, *Linn.*

Achyranthes aspera, *Linn.* Vern. *Chit-chita.* Sans. *Apamarga.*

An erect herb. Leaves opposite, 1-5 in. long, elliptic or broadly obovate, rounded or abruptly acuminate, pubescent or glabrescent above, silky tomentose beneath. Flowers greenish, soon deflexed, on long simple or panicled pubescent spikes, which elongate in fruit. Bracts ovate, aristate, persistent, reflexed in fruit. Bracteoles about as long as the bracts, base thickened, blade ovate, awned and spinescent at the apex, which hardens in fruit and remains attached to the fruiting perianth. Perianth up to ·25 in. long; segments 5, lanceolate; stamens pink, 5, staminodes 5 forming a fimbriate ring, all connate at the base forming a membranous cup. Ovary oblong, ovule solitary; style filiform; stigma capitate. Utricle oblong, circumsciss at the top, enclosed in the hardened perianth.

A common weed all over the area and also in Etawah.

A troublesome undergrowth when in fruit on account of the sharp spiny bracteoles and sharp tips of the perianth, which stick to the clothes and prick the skin. The ashes yield a large quantity of potash. The seeds and leaves are considered to be emetic and are said to be useful in snake-bite, hydrophobia, etc. It is applied externally for treatment of insect-bites (*I.M.P.*)

4. PUPALIA, *Juss.*

Pupalia lappacea, *Juss.*

A pubescent, scarcely woody, straggling undershrub or herb, branches tomentose. Leaves opposite 2-4·5 by 1-2 in., ovate-lanceolate or elliptic-oblong, acute, often mucronate, pubescent on both surfaces, base cuneate or rounded; petiole up to ·3 in. long, pubescent. Flowers green ·25 in. long, in close or distant clusters, arranged in axillary and terminal, solitary or panicled spikes; panicles up to 18 in. long; each cluster containing one perfect and several sterile flowers. Perianth of perfect flowers of 5 lanceolate, apiculate, woolly segments; of imperfect flowers reduced to a number of hooked bristles usually 4-7, which enlarge and spread out with age. Stamens 5, slightly connate below. Style slender; stigma capitate; ovule solitary. Utricle membranous, abruptly narrowed at the apex, seated in the perianth.

Bundelkhand, Bahraich—probably in all Oudh Divisions, Gorakhpur and Pilibhit.

A conspicuous object in fruit on account of the fruiting heads ·3-·5 in. across with straw-coloured barbed bristles.

Celosia argentea, L.—An erect glabrous annual 1-3 ft. high, with narrow leaves 1-4 in. long, and white or pink scarious flowers in spikes. It is a common waste-land land weed specially in cultivated ground. The leaves are eaten in times of scarcity.

LXI.—CHENOPODIACEÆ.

Herbs or shrubs, often fleshy and glaucous. Leaves usually alternate simple, exstipulate. Flowers small, often dimorphic, 1-2 sexual, usually green, and regular; bracts 1 or none; bracteoles none or 2. Perianth persistent, often accrescent in fruit, of 3-5 free or connate lobes, imbricate in bud, sometimes wanting in female flowers. Stamens usually 5, opposite the perianth segments, perigynous or hypogynous; filaments free, or connate at the base, sometimes with intervening staminodes. Ovary 1-celled; style terminal, long or short; stigmas 2 to 5, free or slightly united, less often solitary; ovule solitary, basal or lateral. Fruit usually an utricle, rarely capsular, often enclosed in the enlarged, sometimes fleshy, perianth. Seeds often erect; testa coriaceous, crustaceous, or membranous; endosperm floury, fleshy, or 0; embryo usually peripheral surrounding the endosperm.

SUÆDA, *Forsk.*

Suæda fruticosa, *Forsk.* Vern. *Lunak, Choti lani.*

A much-branched low bush with slender, pale-brown, glabrous branches. Leaves fleshy, linear, or oblong-ellipsoid, variable, ·15-·4

in. long, subsessile. Flowers greenish 1-3 together in sessile, axillary, clusters, or on leafy spikes at the ends of branches; bracteoles 2, minute. Perianth globose; segments 5, incurved, thin at the edges, obtuse. Stamens 5; filaments short. Ovary adnate below to the perianth; styles 3, persisting in fruit; utricle obovoid; seed beaked.

In usar lands in the western portions of the province, Aligarh, Meerut District (Duthie's sheets 6,706 and 4,852 in herb. F. R. I.), may be found in the western parts of the Afforestation Division.

This is one of the plants from which crude barilla can be obtained. It is much eaten by camels.
Fl. September-October.

Salsola fœtida, *Del.*—A much branched hoary shrub attaining 4 ft., with minute subglobose, fleshy, crowded leaves and minute perianth, the segments of which develop, scarious silvery, obovate, wings above the middle in fruit. It is said to occur in Agra district (*Royle, Munro,* etc.) I have seen no specimens at Dehra Dun from U. P. The plants are much used for preparing crude barilla (carbonate of soda). The twigs often bear villous galls.

Basella rubra, *Linn.* Vern. *Poi.*—A glabrous succulent climber, often tinged with red. Leaves 2-5 in. long, broadly ovate. Flowers red or white, in lax pedunculed spikes 1-6 in. long; utricle size of a pea included within the fleshy perianth, which is black with red or purplish juice. It occurs wild and is also cultivated within the area, as a pot herb.

LXII.—ARISTOLOCHIACEÆ.

Climbing herbs or shrubs, rarely erect. Leaves alternate, exstipulate, simple, usually entire, base of petiole often dilated, sometimes decurrent. Flowers 2-sexual, usually zygomorphic, solitary, racemose, or in clusters, bracteate or not. Perianth petaloid, superior gamophyllous, variously shaped; lobes valvate. Stamens 6 or more, in one or more series, around the base of the style, with which they are often combined into a column; filaments short, free, or scarcely distinguishable from the stylar column; anthers free, or adnate, 2-celled, extrorse. Ovary 4-6-celled, placentas perietal, meeting on the axis; style thick, short, divided into 3-6 stigmatic lobes at the top; ovules numerous in each cell. Fruit capsular, rarely indehiscent usually dehiscing from base upwards. Seeds numerous, 3-sided or flattened; endosperm copious, fleshy, embryo small.

ARISTOLOCHIA *Linn.*

Aristolochia indica, *Linn.* Vern. *Chaina, isharmul.* Sans. *Rudrajata, sunanda, ishvari.*

A glabrous climber with a woody root-stock, and sulcate branches. Leaves 1·5-5·5 by ·8-3·2 in., panduriform or obovate-oblong, abruptly acuminate, acumen often short in the broader form, entire or

sub-undulate, 3-5-nerved and cuneate or subtruncate at the base, lateral nerves distant up to 4 pairs; petiole ·25-·8 in. long. Flowers attaining 1·5 in. in length, in few-flowered, axillary racemes which are about ·5 in. long; bracts about ·3 in. long, oblong to elliptic-acuminate, opposite the pedicels; pedicels slender, thicker towards the top, up to ·5 in. long. Perianth greenish-white, irregular, inflated, globose and ·25 in across at the base, then abruptly narrowed to a tube ·5-6 in long and bent almost at right angles and widened into an oblique trumpet-shaped mouth which is produced behind into a purplish-brown lip with revolute margins and up to ·6 in. long. Stamens 6, ovary inferior, 6-ribbed; column short, divided into 6, fleshy, stigmatic lobes round a depressed centre. Capsules up to 1·5 in. long, broadly oblong, or globose-oblong, narrowed into a pedicel, opening from the base upwards into 6 valves, valves remaining united above but dehiscence is continued into the pedicels which divides into 6 strands continuous with the midribs of the valves. Seeds about ·2 in. long, deltoid ovate, acute, flattened; winged.

Jhansi, Lalitpur, Gorakhpur, not common, sometimes grown in gardens.

The juice of the leaves of this plant has been in repute as a cure from snake-bite since ancient times. "The root is very bitter and is held in much esteem in country medicine, as a stimulant tonic and emmenagogue (*I.M.P.*)

Fl. rainy season. Fr. cold season.

Aristolochia bracteata, *Retz.* Vern. *Kiramar.* Sans. *Dhumrapatra.*

A slender glabrous perennial herb with trailing or decumbent striate stem. Leaves 1-1·8 in. long, reniform or ovate cordate, entire, glaucous beneath; petiole ·5-1·5 in. Flowers solitary, up to 1 7 in. long, greenish-white with a purplish mouth, peduncle with a subreniform bract at the base. Capsule 1 in. long, ovate, grooved.

Bundelkhand—*Duthie.*

Every part of the plant is nauseously bitter. It is said to possess anthelmintic and purgative properties.

Several species of Aristolochia, mostly Brazilian in origin, are cultivated in gardens for their handsome flowers.

LXIII.—PIPERACEÆ.

Herbs or shrubs, often aromatic. Leaves alternate, opposite or whorled, entire, sometimes gland-dotted, petiolate; stipules adnate to the petiole, or connate and intrapetiolar, or 0. Flowers unisexual, sometimes hermaphrodite, minute, usually in spikes, substended by peltate bracts. Perianth absent. Stamens usually 2-6, hypogynous anthers often jointed on the filament 2-celled, cells free or confluent. Ovary of 3 or 4 carpels, free or connate below, each many ovuled, or ovary 1-celled with solitary ovule; stigmas 1-5 sessile; ovule erect.

Fruit indehiscent when 1-celled; or of cocci or follicles in when many celled; seeds small with small endosperm and large mealy perisperm, and small embryo, which is enclosed in a sac at one end of the perisperm.

PIPER, *Linn.*

Aromatic shrubs or herbs, often scandent, with swoollen nodes. Leaves simple, alternate, stipulate, entire, often unequal sided, basal nerves prominent. Flowers minute, usually dioecious, in terminal or leaf-opposed spikes; bracts peltate or cupular sometimes adnate to, or decurrent on, the rachis; bracteoles if present, forming low ridges on each side of the flower, or connate in a semi-lunar form. Perianth 0. Stamens usually 2 or 3, rarely 1, 4 or 6. Ovary 1-celled with 2-6 stigmas; ovule 1 erect. Fruit a fleshy berry.

Herbaceous; branches not woody; male spikes elongate, exceeding ·5 in. .. .. *P. longum.*

Shrubby; branches woody; male spikes globose under ·3 in. long .. .. *P. brachystachyum.*

1. **Piper longum,** *Linn.* Vern. *Pipal, pipali baur, pipra mur (roots)* Sans. *Pippali.*

A creeping and rambling perennial herb. Stems many, from a woody root-stock, puberulous, young parts sometimes pubescent. Leaves 1-3·5 in. long, lower long petioled, broad ovate or suborbicular cordate; upper more oblong, and with gradually shorter petioles, often ultimately sessile and amplexicaul, bluntly acuminate, basal sinus broad or narrow, with rounded auricles, minutely dotted, membranous, undersurface pale, basal nerves up to 7, the first and largest pair reaching to the apex; petiole up to 3 in. long. Spikes solitary, erect, stipitate, ; bracts stalked, peltate with free margins in male flowers, more distant and shorter stalked, in the female flowers; bracteoles 0. *Male spikes.*—Greenish-yellow. 1-3 in. long; stamens 2-3. *Female spikes.*—·5-·75 in. in flower, up to 1·2 in. long in fruit. Ovary sunk in and more or less confluent with the rachis; stigmas 3-4, papillose. Berries distinct, ·1 in. across.

Gorakhpur and Oudh division in shady damp ground.

Fruit is chiefly used as spice for which there is some demand. The root and the fruit are valued as stimulant and carminative and also as an alternative tonic.

Fl. rainy season. Fr. cold season.

2. **Piper brachystachyum,** *Wall.*

A much-branched rambling glabrous shrub with brown bark, often rooting at the nodes; branchlets slender, green, lower portions warted due to enlarged lenticels. Leaves alternate, those on flowering stems

2·2-5·5 by 1·5-2·5 in., ovate-oblong, or elliptic-lanceolate, caudate acuminate, acute, obtuse or rounded at the base, thinly coriaceous, basal nerves 3-5, lateral nerves converging towards the apex; petiole ·4-·8 in. long, channelled; stipules membranous. Leaves of sterile shoots shorter, more rounded, and with longer petioles. Flowers dioecious; spikes solitary, stipitate, leaf-opposed. *Male spikes.*—Ovoid, ·1-·3 in. long; peduncles. ·2 in. long; bracts minute; stamens 2, anther cells confluent. *Female spikes.*—·25- 3 in. long; peduncles ·1-·2 in. long. Berry ·1 in. across, crowded into a dark-green head, each about ·3 in. across.

Sub-Himalayan tracts of N. Oudh in damp places—*Duthie.* There are no specimens from our area at Dehra.

Fl. May-June. Fr. cold season.

Piper betle, *Linn.* Vern. *Pan.* Sans. *Tambul.* The betel vine.

A perennial climber with woody roots, broadly cordate or elliptic oblong, acuminate, glabrous leaves 4-7 by 2-7 in. Largely cultivated within area. The leaves form the well-known masticatory *pan*, and are also much used as domestic remedy for various ailments.

LXIV.—LAURACEÆ.

Trees, or shrubs, or rarely a parasitic filamentous climber; aromatic with oil glands. Leaves alternate, exstipulate, rarely opposite or subverticellate, or 0, entire often, crowed at the ends of branches, glands often visible as minute pellucid dots. Flowers small, regular 1-2 sexual, in cymose clusters, racemes or panicles, usually trimerous. Perianth usually inferior, in two series of 3 each, rarely 5 or 0, rudimentary, imbricate, subequal, often connate below. Stamens in 2-4 trimerous series, of which one is reduced to staminodes, hypogynous or perigynous; filaments of inner series often with 2 large glands at base. Anthers continuous with the filaments, 2 or 4-celled, rarely 1-celled, opening by as many valves, which are deciduous from base upwards. Ovary 1-celled; style terminal; stigma often 3-lobed, discoid or dilated. Ovule 1, pendulous. Fruit a dry, or fleshy berry or a drupe, often surrounded at the base by the enlarged perianthlobes, or by the base of the perianth tube and supported on the thickened pedicel, rarely enclosed in or adnate to the perianth tube. Seeds exalbuminous, testa membranous; cotyledons plano-convex; embryo straight; radicle superior, minute.

I. Trees or shrubs :—

A. Inflorescence panicled or laxly cymose; innermost whorl of anthers (if present) extrorse and of the next two whorls introrse; flowers hermaphrodite or polygamous :—

1. Antheis 2-celled, perianth deciduous. .. 1. ***Beilschmiedia.***

2. Anthers 4-celled, perianth persistent in fruit :—
Perianth in fruit with reflexed segments which are not hardened. .. .. 2. *Machilus.*
Perianth in fruit erect, hardened. .. 3. *Phœbe.*

B. Inflorescence in umbels supported by an involucre of bracts; flowers diœcious ; anthers all introrse, 4-celled. .. .. 4. *Litsea.*

II. Leafless twining parasitic herb with the habit of Cuscuta. .. .. 5. *Cassytha.*

1. BEILSCHMIEDIA, *Nees.*

Beilschmiedia Roxburghiana, *Nees.* Vern. *Konhaia.*

A medium-sized evergreen umbrageous tree with light-yellow-brown, nearly smooth bark; innovations brown silky tomentose. Leaves alternate, crowded at the ends of branches, 3-6 in. by 1·2-5 in., oblong to elliptic-lanceolate, bluntly short acuminate, or obtuse, narrowed at the base, into the petiole, glabrous, coriaceous, lateral nerves 6-12 pairs with prominent reticulations; petiole channelled, ·5-1·2 in. long. Flowers small, ·2 in. long, yellowish-green, in short silky, pubescent, few-flowered, axillary and lateral peduncled racemes or panicles up to 1·5 in. long; bracts minute deciduous. Perianth tube short; lobes 6, subequal, oblong, acute, pubescent on both surfaces. Stamens 9 perfect, the outermost two series with introrse anthers, those of the 3rd series with extrorse anthers; fourth series of ovoid staminodes; glands 6 between the filaments of third row of stamens, as large as staminodes; filaments hairy; anthers 2-celled. Ovary glabrous narrowed into the style. Berry obovoid-oblong 1-1·5 in. long, dark purple when ripe.

Gorakhpur, Gonda, not common.

Fl. April-May with new leaves. Fr. rainy season.

Var. Dalzellii, *Meissn.* A smaller tree, buds pubescent. Leaves 5-9 by 1·75-3 in., not acuminate. Gorakhpur.

2. MACHILUS, *Nees.*

Machilus Gamblei, *King.*

A moderate-sized evergreen tree with grey somewhat smooth bark; young parts minutely silky pubescent. Leaves 2·5-6·5 by ·8-2 in., oblong to elliptic lanceolate, shortly acuminate, attenuate at the base, coriaceous, glabrous, glaucous beneath, lateral nerves arcuate, 6-12 pairs with prominent reticulations; petiole ·2-·6 in. long, channelled. Flowers small, green, fragrant, in axillary and lateral pubescent panicles of cymes 1·5-3·5 in. long, from young shoots;

cymes 2-3-flowered; bracts minute, silky pubescent, deciduous; perianth ·25 in. long; lobes 6, linear-ovate or oblong, minutely pubescent on both surfaces, and ciliate on the margins in bud, persistent and reflexed in fruit; pedicels ·1 in. long enlarging in fruit. Perfect stamens 9, all with 4-celled an hers, glabrous, the 6 outer eglandular, with introrse anthers, inner 3 with 2 glands at the base and with extrorse anthers; innermost or fourth series of 3 cordate staminodes. Stigma discoid. Berry ·3-·4 in. across, globose, black.

Pilibhit, rare.

Blaze yellowish or pink and orange, darkening on exposure, soft. Bud scales puberulous, subrotundate.

Fl. March-April. Fr. May-June.

3. PHŒBE, *Nees.*

Phœbe lanceolata, *Nees.*

A small evergreen tree usually with pale-yellow, and partly dark-grey, somewhat rough bark exfoliating in irregular, thin, corky scales. Young parts silky pubescent. Leaves 4-8 by 1-2·5 in., clustered at the ends of branches, lanceolate, caudate-acuminate, narrowed at the base to a short petiole, quite glabrous or puberulous beneath when mature, thinly coriaceous, lateral nerves 6-10 pairs, ascending; petiole ·3-·8 in. long. Flowers yellowish-green, in lax, long peduncled panicles of cymes, 2-8 in. long, clustered laterally at the base of new shoots. Bracts silky pubescent, deciduous, narrow lanceolate to linear, up to ·5 in. long; bracteoles minute. Perianth ·1 in. long, cup-shaped, segments elliptic, subacute or obtuse, enlarging and becoming obovate-oblong in fruit, glabrous outside, pubescent within. Stamens 9 perfect, outer 2 series eglandular with introrse 4-celled anthers, those of the 3rd series 2-glandular at the base and with 4-2-celled extrorse anthers; 4th series of staminodes; filaments villous at the base. Fruit 3-4 in. long, elipsoidal, clasped at the base by the erect hardened perianth.

Kheri, Gonda; probably also in other Oudh divisions and Gorakhpur; not common.

Blaze pale pinkish brown, somewhat fibrous.

Fl. February-June. Fr. June-September.

Phœbe pallida, *Nees.* Probably not specifically distinct, differs from the above by constantly puberulous undersurface of leaves and externally pubescent perianth and more distant panicles. It occurs according to Brandis in Eastern Oudh. I have seen no specimens from our area at Dehra Dun herbarium.

4. LITSEA, *Lamk.*

Trees or shrubs. Leaves alternate, rarely sub-opposite, or opposite, leaf buds, naked or scaly. Flowers dicœcious, umbellate, umbels 4-6, rarely more flowered and sessile or pedicelled, clustered, or racemed on

a common peduncle which is axillary or from leaf scars; involucral bracts 4-6, rarely more, sepaloid, concave, coriaceous or membranous. Perianth tube 0, or very short in male flowers, ovoid, campanulate in female flowers; segments 4-6, equal or unequal, sometimes 0, in male flowers. *Male flowers.*—Stamens 6-20. Stamens of the third and fourth series if present, 2-glandular, anthers introrse, 4-celled. *Female flowers.*—Staminodes arranged as the stamens in male flowers, those of the outer rows linear or clavate, those of the inner series subulate and 2-glandular. Ovary free or enclosed in the perianth tube; style thick, often curved; stigma usually irregularly lobed, sometimes peltate. Fruit a berry usually seated on the greatly enlarged perianth tube with more or less thickened pedicel; pericarp succulent.

A.	Perianth lobes incomplete or 0; stamens 9-20; common peduncle ·8-1·2 in. long.	1. *L. chinensis.*
B.	Perianth lobes complete, 5-6-partite, subequal. Stamens 6-13; common peduncle never exceeding ·5 in.:—	
	Leaves elliptic or elliptic-oblong, brown or tawny pubescent; main lateral nerves 5-10 pairs, tertiaries prominent; stamens 9-13; common peduncle of umbels 0 or very minute; fruit ovoid.	2. *L. polyantha.*
	Leaves usually narrow lanceolate, acute or acuminate, grey hoary, main lateral nerves 8-15 pairs, tertiaries not prominent; stamens 6-9; fruit ellipsoid...	3. *L. salicifolia.* *Var. laurifolia.*

1. Litsea chinensis, *Lamk.* Syn. **L. sebifera,** *Pers.* Vern. *Maida, medha. medh.*

A medium-sized evergreen tree with grey somewhat corky and lenticellate bark, which is viscid inside; young parts, undersurface of leaves and inflorescence grey tomentose or pubescent. Leaves variable, 3-10 by 1·5-4·2 in., elliptic, oblong or ovate-lanceolate, acute or shortly acuminate, entire, usually narrowed at the base, glabrescent above usually persistently soft tomentose along the midrib, coriaceous; secondary nerves 8-13 pairs; petiole ·6-1·8 in. long, tomentose. Flowers yellowish, about ·2 in. across, with short pedicels, ·1-·2 in. long, forming 8-12-flowered umbelules ·3-·6 in. across, which are supported by 4-6 concave, orbicular, tomentose bracts, ·3 in. long, and borne on slender stalks ·3-·6 in. long; umbels arranged in lax, long peduncled corymbs, or in umbellate clusters 1·5-3 in. long; common peduncle ·8-1·2 in. long. Perianth very irregular, segments often 0. Stamens 9-20; filaments villous. Fruit globose ·25-·4 in. across, supported by the thickened club-shaped pedicel.

Pilibhit, Oudh forests, and Gorakhpur—Common; also Bundelkhand, where it is rather scarce.

The inner mucilaginous bark is valued medicinally by villagers for various ailments, especially as an emollient application to bruises and wounds.

Blaze soft and brittle, pale with orange streaks darkening on exposure to dirty-brown. Outer layer chlorophyll bearing.

Fl. April-July. Fr. September-November.

New shoots April-May.

2. Litsea polyantha, *Juss.*

A medium-sized evergreen tree with brown and rather rough bark; young parts and inflorescence rusty tomentose. Leaves 3-10 by 1·3-4·5 in., obovate, oblanceolate, oblong or elliptic, tip acute or rounded, glabrescent above, glaucous and rusty pubescent beneath, main lateral nerves 5-10 pairs, tertiaries scalariform and prominent; petiole pubescent ·5-1 in. long. Flowers ·2 in. in diameter, greenish yellow with villous pedicels up to ·1 in. long, on peduncled umbellate heads ·3-·5 in. across; peduncles ·2-·5 on. long, solitary or clustered on axils of branchlets, clusters sometimes with a very short common peduncle. Pedicels of female flowers stouter than those of the male flowers, elongating in fruit to ·5 in. Bracts concave, orbicular, up to ·25 in. long. Perianth ·1 in. long, linear oblong, enlarging in fruit; segments 5, nearly free. Stamens 9-13; filaments villous; glands stipitate. Fruit ·4 in. long, ovoid, black, supported by the enlarged subcupular perianth and thickened pedicels.

From Pilibhit to Gorakhpur, Bundelkhand.

The bark is said to be medicinal. Blaze soft crisp brown and white.

Fl. March-May and also at other times. Fr. usually June-September.

3. Litsea salicifolia, *Roxb.* Var. laurifolia, F. B. I.

A small evergreen tree, with silky pubescent branches. Leaves 2·5 to 6 in. long, lanceolate or elliptic-oblong, acute or acuminate, dark-green and shining above, glaucous and minutely silky pubescent beneath, main lateral nerves 8-13 pairs; petiole ·3-·5 in. long, pubescent. Umbels usually clustered from axils, or sometimes racemed; stalks of umbels ·2-·3 in. long; involucral bracts ·2 in. long, concave rounded, gland-dotted, enclosing 4-5 flowers with villous pedicels. Perianth segments 6-7, linear-oblong, ·08 in. long, tube persisting in fruit in female flowers. Stamens 6-9, both or inner two series with glands; filaments densely pilose. Fruit ellipsoid, seated on the slightly enlarged subcupular perianth.

Oudh forests—*Brandis.* There are no specimens from our area at Dehra Dun, but it may occur in moister type of forests.

Fl. "December-January"—*Haines*, probably throughout the year.

5. CASSYTHA, *Linn.*

Cassytha filiformis, *Linn.* Vern. *Amarbel.*

A filiform leafless twining parasite, attaching itself by haustoria to the host plant. Stem dull-green, puberulous when young, glab-

rescent with age. Leaves none, or reduced to few minute hyaline scales. Flowers bisexual, white, minute—1 in. long when fully formed—on few-flowered lax spikes, from the axils of leaf scales which are up to 3 in. long. Bracteoles 3, connate at the base, broad ovate, ciliate. Perianth lobes 6, in two series; outer smaller; lobes free nearly to the base, broad ovate, concave, edges hyaline and ciliate; inner white, valvate, much exceeding the outer, lobes free to more than half the length, concave, oblong, glabrous. Stamens in whorls of 3; outermost petaloid, introrse eglandular; second series sterile and eglandular; third series extrorse and 2-glandular at the base; fourth series reduced to yellow staminodes. Ovary free, globose, 1-celled; style subulate. Fruit ·2 in. across, invested by the persistent perianth.

Jhansi Division (Rora), not common.

The plant bears a superficial resemblance to Cuscuta reflexa, from which it can readily be distinguished by its deeper green colour.

Fl. and fr. almost throughout the year.

LXV.—ELÆAGNACEÆ.

Trees or shrubs, covered with silvery or brown, often stellate and peltate scales. Leaves alternate or opposite, exstipulate, entire. Flowers small, 1-2 sexual, regular, white or yellow, in axillary fascicles of cymes. Perianth hermaphrodite or female flowers tubular, constricted above the ovary, upper portion deciduous, lower portion around the ovary persistent, and often accrescent in fruit, limb 2-4-lobed; in male flowers perianth reduced to a 2-4 lobed limb. Stamens in hermaphrodite flowers adnate to the throat of the perianth tube and as many as the lobes; in male flowers adnate to perianth base and twice as many as the lobes; filaments free; anthers 2-celled. Ovary free, 1-celled; style filiform; stigma lateral; ovule 1, basal erect; anatropous. Fruit indehiscent, closely invested by the base of the perianth; seed exalbuminous; testa hard; embryo straight; radicle inferior.

ELÆAGNUS, *Linn.*

Elæagnus latifolia, *Linn.*

A subscandent or straggling, evergreen, often spiny shrub, with recurved thorns ·5-1 in. long. Bark dark-brown often with raised lenticels. Young parts scurfy, with silvery, or brown-ferruginous, circular and lobed scales. Leaves variable 1·25-6 by 2·5 in., elliptic or elliptic-oblong, acuminate, acute or obtuse, margin entire or undulate, rounded or acute at the base, lateral nerves 5-8 pairs, distant, stopping short of the margin and ending in a loop, upper surface ultimately glabrescent, undersurface clothed with silvery or ferruginous scales; petiole ·2-·4 in. long, scaly. Flowers up to ·5 in. long, ·2 in. across, few to many in axillary often peduncled fascicles, bisexual,

brown or silvery; pedicels ·1-·15 in. long. Perianth tube ·15-·25 in. long, much constricted above the ovary; limb 4-angled, campanulate, 4-lobed, deciduous; lobes ·1 in. long, ovate, acute. Stamens 4, stellate-pubescent. Ovary 1-celled, style included, stellate pubescent. Fruit ·75-1·25 in. long, oblong, ellipsoid, ribbed, with scattered, brown or silvery scales, red or orange when ripe, consisting of an outer fleshy portion formed from the base of the perianth and a coriaceous nut which is woolly within.

Pilibhit, Gorakhpur, Kheri, probably also in other Oudh Division.
The acid and astringent fruit is edible.
Blaze pink.

Fl. November-January. Fr. February-April.

LXVI.—LORANTHACEÆ.

Parasitic evergreen shrubs. Leaves usually opposite, less often alternate, entire, exstipulate coriaceous, or 0. Flowers 1-2 sexual, racemed, spicate or fascicled, regular, usually bracteate and 2 bracteolate. Perianth double; the outer (*calyx*) adnate to the ovary, limb truncate or 0, rarely toothed, the inner (*corolla*) of 4-8 segments, free or connate into a tube which is often split down one side, segments valvate in bud, stamens equal to and opposite the corolla lobes, and inserted on them at the base; anthers usually 2-celled, opening longitudinally, by pores or transverse slits. In 1-sexual flowers pistillode present in male flowers and staminodes in female flowers. Ovary inferior, 1-celled, style short or long; ovule 1, erect, adnate all round to the walls of the ovary. Fruit a 1-seeded berry or rarely a drupe, inner layer viscid. Seed adnate to the pericarp, devoid of testa, albumen fleshy; embryo large, straight; radicle superior.

Flowers 2-sexual often showy calyx limb present.	1. *Loranthus.*
Flowers 1-sexual green or yellowish, calyx limb 0	2. *Viscum.*

All species of Loranthus and Viscum occurring within our area are called *banda* in vernacular.

1. LORANTHUS, *Linn.*

Leaves opposite or alternate. Flowers 2-sexual, green or coloured. Limb of outer perianth (calyx) produced into a ring which is sometimes reduced to a rim. Petals free, or connate into a tubular split or entire corolla with spreading or reflexed tips. Stamens inserted on the corolla; anthers adnate or versatile; cells parallel.

Flowers 4-merous usually buff, Young parts and flowers scurfy tomentose.	1. *L. cordifolius.*
Flowers 5-merous usually red, whole plant glabrous.	2. *L. longiflorus.*

1. Loranthus cordifolius, *Wall.*

An evergreen bushy parasite, stems up to 5 ft., with dark brown lenticellate bark. Young shoots densely buff or brown, scurfy (mostly

stellate) tomentose. Leaves variable usually 1·5-4 by 1·2-2·5 in., opposite, broadly ovate, suborbicular or elliptic, subacute, obtuse, or rounded at apex, base rounded or cordate, rather thick, glabrescent with age on both surfaces, lateral nerves rather indistinct 5-8 pairs; petiole ·2-·6 in. long, channelled. Flowers ·7-1 in. long, in short pedunculed fascicles; peduncles up to ·7 in. long, sometimes minute, one to several in leaf axils, bracts minute, bracteoles 0. Buds sharply pointed at the tip. Calyx-tube scarcely produced above the ovary; corolla slender, curved when fully formed, densely brown-scurfy outside, purplish-red inside; tube ·6-·7 in. long, splitting down one side; lobes 4, acute, ultimately reflexed; anthers and filaments crimson. Style purple. Berry ·25-·3 in. pyriform or clavate, scurfy. Seeds inbedded in translucent mucilage.

Gorakhpur, Gonda, Bahraich, Pilibhit, probably in all Oudh Divisions.

The species can hardly be distinguished by any constant character from L. scurrula *Linn*, of which it may be regarded as a variety or subspecies.

Fl. November-April. Fr. April-July.

2. Loranthus longiflorus, *Desv.*

An evergreen glabrous bushy parasite with grey or reddish-brown bark. Leaves opposite or sub-opposite, sometimes alternate, 3-5 by ·7-3 in., very variable in shape, ovate, obovate, obovate-oblong or elliptic often oblique, obtuse, narrowed at the base and decurrent on the petiole, fleshy, midrib red, lateral nerves obscure; petiole ·3-·5 in. long stout. Flowers 1-2 in. long, orange and scarlet, erect, in dense, upcurved, unilateral, axillary and supra-axillary racemes up to 3 in. long and solitary or fascicled from the axils; pedicles slender, short, upcurved on the rachis, ·1-·15 in. long, bract minute broad, ovate, concave clasping the base of the calyx-tube, enlarging in fruit. Calyx with a distinct annular limb with wavy margin or obscurely 5-lobed. Corolla 1-1·8 in. long, slightly curved dilated above the middle, constricted at the throat, cleft down one side to about a fourth and divided into 5, often green, linear, reflexed lobes about ·4 in. long. Stamens 5, filaments adnate below the throat extruded after reflexion of corolla lobes; style slender quadrangular stigma subglobose. Berry ·3-·5 in. long crowned with the cup-shaped calyx limb.

All-over the area.

The bark of twigs is locally used for tanning.

2. VISCUM, *Linn.*

Leaves often reduced to scales, opposite when present. Flowers unisexual, often minute, solitary or fascicled at the nodes or axils of the leaves. Perianth 3-4-partite, tube solid in male flowers; adnate to ovary in female flowers; anthers sessile; adnate to the perianth

segments opening by pores. Ovary inferior; stigma, sessile or subsessile, large, pulvinate. Fruit a succulent berry, mesocarp viscid.

Branches leafy.	..	..	..	1. *V. monoicum.*
Leafless.	..	..	..	2. *V. articulatum.*

1. Viscum monoicum, *Roxb.*

A bushy parasitic shrub; branches finely striate, terete, swollen at the nodes. Leaves variable in size, usually 1-3·5 by ·3-1·2 in., obliquely ovate or lanceolate sometimes falcate 3-5-nerved and narrowed at the base to the minute petiole, coriaceous, glabrous. Flowers minute, monœcious, greenish, in axillary, usually 3, but sometimes more flowered, sessile, or shortly peduncled clusters; central flower male, lateral female; bracts apiculate. Perianth segments 3-4, triangular oblong. Berry ·2-·3 in. long, oblong, narrowed at both ends.

Gonda, Gorakhpur, probably also in other Oudh Divisions, Bundelkhand—*Edgeworth.*

Fl. rainy season.

2. Viscum articulatum, *Brown.*

A pale-green, much-branched, often subverticellate parasite, attaining about 3 ft. Branches flattened, striate, readily disarticulating at nodes, internodes 1-2·25 by ·1 to ·25 in., constricted towards the base. Flowers minute 3-4-merous, sessile, 1-6 together, in clusters at the nodes, with cup-shaped bracts at the base; lateral flowers usually males. Perianth segments triangular, reflexed in male, erect in female flowers. Berry about ·25 in. across, globose, greenish-yellow, smooth.

Gorakhpur, Gonda, probably also other Oudh Divisions, Bundelkhand; on Acacia Catechu, Diospyros tomentosa, etc.

LXVII.—SANTALACEÆ.

Trees, shrubs or herbs, often parasitic on roots. Leaves alternate or opposite, exstipulate entire, sometimes 0. Flowers often greenish 1-2 sexual, regular, usually bracteate and bracteolate. Perianth green, or petaloid, often fleshy, usually adnate to the ovary—at least partially, rarely free, segments usually 3-8, rarely more, often with a tuft of hairs behind the stamens valvate, or slightly imbricate. Stamens as many as the perianth segments and opposite them, inserted on the segments, anthers 2-celled; disk epigynous. Ovary inferior or half inferior, 1-celled; style short; stigma 3-6-lobed, ovules 2-3, pendulous from central column or adnate to it, rarely solitary. Fruit a nut or drupe, seeds with copious albumen.

SANTALUM, *Linn.*

Santalum album, *Linn.* Vern. *Chandan, sandal.* Sans. *Chandana.* Eng. Sandal wood.

A small glabrous tree with dark rough grey bark, semi-parasitic on the roots of many species of plants, branchlets slender drooping.

Leaves 1-3 by ·5-1·5 in. ovate to oblong-lanceolate, elliptic-ovate or elliptic, acute or subacute, acute or narrowed at the base, undersurface glaucous, nerves faint; petiole ·3-·7 in. long slender. Flowers inodorous, brownish-purple, in terminal and axillary panicled cymes, shorter than the leaves. Perianth ·15 in. long, campanulate, adnate to the base of the ovary, limb of 4 valvate triangular segments, each with a tuft of hairs behind the stamens. Stamens 4, exserted, alternating with 4 rounded scales (di-k lobes). Ovary at first nearly free, at length half inferior; ovules 2-3, pendulous, from a long acuminate central column. Fruit a globose drupe abut ·3 in. across, purple black when ripe, crowned by the free margin of the perianth tube; albumen hard, ribbed.

Planted as far north as Kheri; and naturalised at Bar, in the Jhansi Division.

The sapwood is white and inodorous, the heartwood is yellowish-brown and strongly scented, which yields the sandal wood of commerce.

The seeds take about two months to germinate.

Fl. August-January. Fr. April-May.

LXVIII.—EUPHORBIACEÆ.

Herbs, shrubs, or trees, occasionally with milky juice. Leaves alternate, exceptionally opposite, sometimes reduced, usually stipulate, often glandular. Inflorescence various. Flowers usually small unisexual, mostly monœcious. Perianth usually of a single whorl, often absent in one or both sexes, rarely both whorls present. Calyx different in both sexes. Stamens 1 to indefinite, various; anthers usually 2-celled, rarely 4-celled, often branched, opening usually lengthwise, sometimes transversally or obliquely, rarely by pores; rudimentary ovary often present in the male flowers. Disk often present in both sexes, annular or of separate glands. Female flowers sometimes with staminodes. Ovary free, mostly of 3 carpels, sometimes bicarpellary, carpels rarely more than 3, more or less united. Styles as many as carpels, free or united, entire or divided, inner face of style arms stigmatic. Ovules 1 or 2 and parallel, in each carpel, pendulous; funicle often thickened. Fruit usually a capsule, often of cocci which fall away from a central axis, sometimes drupaceous, or of combined nuts. Seed albuminous, often with a conspicuous caruncle; albumen copious, fleshy; radicle superior; cotyledons usually palminerved.

ARTIFICIAL KEY.

1. Flowers monœcious, in heads resembling single flowers, enclosed in a calyx-like involucre, each containing several male flowers and one female flower in the centre; perianth none, or of 1-3 minute scales. Herbs, shrubs or trees with milky juice. .. 1. *Euphorbia.*

II. Flowers distinct, not contained in calycine involucre; perianth almost always present :—

A. Leaves trifoliolate. .. .. 14. *Bischofia.*

B. Leaves simple :—

1. Leaves opposite. .. .. 16. *Trewia.*

2. Leaves alternate: —

a. Leaves not peltate :—

(i) Leaves palmately 3-7-nerved at the base :—

* Trees or shrubs; hairs if present not stinging :—

† Petals 0; juice not abundant; twigs not markedly soft, leaves 3-5-nerved at the base :—

(x) Undersurface of leaves and young parts glandular .. .. .. 17. *Mallotus.*

(xx) Undersurface of leaves and young parts not glandular :—

Undershrub; perianth imbricate; stamens 10; disk of glands in male flowers, annular in female flowers.. .. 22. *Balisospermum.*

†† Petals present; leaf base 5-7 nerved; twigs usually soft-wooded; juice abundant, soapy, and semi-transparent. .. 21. *Jatropha.*

** Twiners with herbaceous stems and stinging hairs .. .. 18. *Tragia.*

(ii) Leaves penninerved :—

* Juice milky. .. .. 23. *Sapium.*

** Juice not milky :—

† Fruit baccate or drupaceous, sometimes breaking up into cocci :—

(x) Petals present :—

Fruit drupaceous, indehiscent; lateral nerves of leaves subparallel; trees or scandent shrubs .. .. .. 2. *Bridelia.*

(xx) Petals 0 :—

‡ Flowers of both sexes in panicled racemes or spikes :—

Deciduous shrubs. .. .. 8. *Antidesma.*

‡‡ Male flowers in axillary clusters, or in short racemes; female flowers subsolitary :—

(O) Fruit over ·5 in. long or across :—

Drupe tomentose, 1-seeded leaves over 2in. long; evergreen trees. 13. *Putranjiva.*

Drupe glabrous, 3-seeded, leaves linear, small, about 5 in. long; branchlets deciduous. .. 6. *Emblica.*

(OO) Fruit under ·5 in. long :—

Leaves distichous, under 2 in. in length :—

§ Flowers dioecious :—

Male flowers with pistillode; larger fruits fleshy, smaller dry. .. .. .. 7. *Fluggea* (*F. virosa*)

§§ Flowers monœcious :—
¶ Branchlets deciduous; stamens 5, in two series, inner 3 connate, alternate-ing with disk glands, fruit of 6-12 crustaceous seeds. . 5 *Kirganalia.*

¶¶ Branchlets not deciduous; stamens 3, connate; disk 0; ovary 3-celled; fruit dry or fleshy, with 3-6 indehiscent cocci :—
Trees or tall shrubs; perianth of male flowers turbinate, lobes obscure. Calyx scarcely enlarged, never coloured in fruit; anthers adnate (tips not free) to the column. .. 10. *Breynia.*
Slender shrubs; perianth of male flowers stellate; lobes distinct, spreading. Calyx accrescent and coloured in fruit; anthers sessile (tips free) on the trigonous column. .. 9. *Sauropus.*

(††) Fruit dry capsular :—
(x) Male flowers in elongate raceme or spikes:—
(‡) Flowers monœcious; young parts covered with scales .. .. 15. *Croton.*
(‡‡) Flowers diœcious; young parts not covered with scales:—
Leaves linear, secondary nerves over 15 pairs, prominent. Small tree with willow-like habit. .. .. 19. *Hommonia.*
Leaves elliptic oblong or lanceolate. A small tree .. 12. *Aporosa.*

(xx) Male flowers usually in clusters :—
‡ Petals present... .. .. 3 *Cleistanthus.*
‡‡ Petals absent :—
(O) Styles free; disk present :—
Stamens 3; pistillode 0, in male flowers. Monœcious .. 4. *Phyllanthus.*
Stamens 5; pistillode present in male flower. Diœcious .. 7. *Fluggea.* (*F. Leucopyrus.*)
(OO) Styles connate; disk 0 :—
Stamens 3-12, connate in a sessile or subsessile column; ovary 3-5-celled. Fruit a capsule of 3 or more, 2-valved cocci .. .. .. 11. *Glochidion.*

b. Leaves peltate . .. . 20. *Ricinus.*

1. EUPHORBIA.

Shrubs or trees with fleshy stems and stipular spines, or herbs, always with milky juice; leaves alternate or opposite, often early deciduous or much reduced in the fleshy species; stipules various. Flowers monœcious, pedicellate, grouped together in a compact inflorescence of many male florets, rarely of male florets only, which is enclosed in a calyx-like campanulate involucre with sepaloid lobes, sinuses between the involucral lobes with thick glands, which have sometimes petaloid limbs, processes or horns. Bracteoles setaceous, sometimes combined in a sheath or 0. Perianth 0, or of 1 to 3 minute scales at the junction of the pedicel. *Male florets.*—Stamens solitary, usually jointed; anthers 2-celled, opening longitudinally. *Female florets.*—Pedicel often decurved; ovary 3-celled, more or less deeply 3-lobed, with one ovule in each cell; styles 3 free or connate; stigma simple or 2-fid. Fruit a capsule of 3, two-valved, dehiscent cocci, separating elastically from the central axis; testa of seeds more or less crustaceous, often with a caruncle; radicle superior.

1. Armed with stipular spines :—

A.	Leaves over 4 in. long style entire :— Branches subterete ; spines from distant tubercles.	1. *E. Nivulia.*
	Branches angled spines arising from subconfluent tubercles, arranged on ridges in vertical rows	2. *E. neriifolia.*
B.	Leaves under 1 in. long :— Branches 3-5 winged ; style bifid at the apex. ..	3. *E. antiquorum.*

II. Unarmed small trees :—

Branches spreading cylindric ; leaves few small. ..	4. *E. Tirucalli*
Stems mostly underground	5. *E. acaulis.*

1. Euphorbia Nivulia, *Buch.-Ham.* Vern. *Sij, thuar, sendh.*

A large shrub or a small tree attaining 30 ft., with thick, corky, deeply furrowed bark on old stems. Branches fleshy, glabrous, subterete, jointed, often whorled, with somewhat distant, dark-brown, often partly corky, truncate tubercles, each bearing two stipular spines; ·2-·5 in. long. Leaves crowded at the ends of branches, early deciduous, fleshy, alternate, 3-8 by 1·2-2·5 in., obovate-spatulate, or obovate lanceolate, rounded and mucronate at the apex, narrowed at the base sessile or subsessile, sec. nerves obscure. Flower heads in peduncled, often compound cymes, from axils of fallen leaves; peduncles ·3-·5 in. long, secondary peduncles ·3-·5 in. long. The central head first to appear and sessile, disciform, containing male flowers only, lateral heads pedicelled, sub-campanulate, each containing one female flower; involucres greenish-yellow; lobes 4, erect, fimbriate ; bracteoles numerous, fimbriate ; glands transversally

oblong. Stamens numerous; "anthers purple"—*Haines*. Capsule up to ·4 in. across, trigonous, lobes compressed. Seeds small, round smooth.

Bundelkhand, Oudh—*Brandis*. The milky juice is said to be used as a purgative taken internally, and a specific for rheumatism applied externally. (*I. M. P.*).

Leaves in rainy season which persist in cool situations sometimes up to April, but usually drop out much earlier.

Fl. February-March. Fr. April-June.

2. Euphorbia neriifolia, *Linn.* Syn. **E. ligularia,** *Roxb.* Vern. *Thuar, sendh, mansa-sij.*

A shrub or a small tree much resembling the last, but the branches are angled and have 5 vertical rows of tubercles or swellings bearing sharp stipular thorns, which are sub-confluent and form 5 angles or spiral ridges; older branches rounded. Leaves early deciduous, crowded at the ends of branches, 4·5 to 12 in. long, obovate-oblong or obovate-spatulate, apex usually sub-acute, mucronate, tapering at the base to the very short petiole; stipular spines up to ·5 in. long. Heads greenish-yellow, 3-7 in peduncled cymes, from old leaf axils, central usually male and sessile. Lobes of the involucre, bracteoles and fruit as in the last species.

Nowhere wild: cultivated all over the area. The plant is put to various medicinal uses.

Fl. February-March. Fr. April-May. New leaves May—*Duthie*.

The tubercles in this species are more prominent than in the last.

Euphorbia antiquorum, *Linn.* Vern. *Tridhara sendh.*

A shrub or small tree attaining 25 ft., with rough bark on old stems; branches jointed, often whorled; branchlets usually 3, but sometimes 4-5, winged; wings repand sinuate, bearing short, paired, stipulary spines. Leaves early deciduous, small, up to ·5 in. long, subsessile, fleshy, obovate oblong, cuneate, glabrous. Heads usually in cymes of 3, from sinuses on the stem wings, lateral stalked, central sessile; bracteoles many, fimbricate. Glands 5 broad. Styles free, 2-fid at the top. Capsule ·5 in. across, glabrous.

Found sometimes in village hedges. The acrid milky juice is used medicinally.

Leaves rainy seasons. Fl. and Fr. cold season.

4. Euphorbia Tirucalli, *Linn.* The milk bush or hedge. Vern. *Sehnd.*

An unarmed shrub or a small tree attaining 25 feet, with round quill-like, smooth, fascicled or whorled, jointed, branchlets. Leaves usually absent, linear ·25-·5 in. long. Heads in compact clusters at the forks of branches, pedicelled, campanulate; glands 3-5, peltate, bracteoles lacerate, numerous. Ovary woolly; capsule ·2 in across, cocci compressed, velvety.

In hedges in Bundelkhand, also naturalized—Lalitpur, not common. The latex can yield catchouc. The wood is close-grained and said to be immune from the attack of white-ants. I have not seen it used for timber in our area.

Leaves, flowers and fruits in the rainy season.

5. Euphorbia acaulis, *Roxb.* Syn. **E. fusiformis,** *Buch.-Ham.* Vern. *Banmuraiya.*

A dwarfed species with a thick fusiform underground root-stock, which may attain 24 in. by 4½ in. in girth. Leaves sessile or subsessile, 6-12 by 1-3 in., radical, obovate or oblanceolate spatulate, with wavy margin, subacute or rounded apex, and cuneate base, fleshy, glabrous. Involucres greenish-yellow, pedicellate; 25 in. across, hemispheric; lobes spatulate, fimbriate; glands 5. Heads in long pedunckd, often dichotomously compound cymes, which are crowded at the apex of the root-stock and appear before the leaves. Cymes bracteate of various lengths, sometimes attaining 9 in., bracts at the forks, ovate lanceolate. Styles 3, combined to the middle; capsule ·3-·5 in. across, glabrous.

In all Oudh Divisions, Pilibhit and Gorakhpur usually in burnt areas, firelines, etc.

Fl. March-May. Fr. rainy season. New leaves rainy season.
Bark of underground portion light-brown.

The following species are often cultivated within our area :—

1. **Euphorbia pulcherima,** *Willd.*—The Poinsettia. A tall shrub with hollow branches. Leaves alternate, 4-8 in. long, ovate elliptic or oblong, acute, with repand sinuate margins. Involucre with a large yellow gland; heads in cymes surrounded by large usually scarlet leaf-like bracts. A striking object in flower which appears in winter. A native of Central America.

2. **Euphorbia Bojeri,** *Hk. f.*—A small straggling very spiny shrub. Leaves ·7-1·5 in. long, alternate, sessile, oblanceolate. Heads accompanied by 2, showy, semi-orbicular, mucronate, scarlet bracts on dichotomously branched peduncles. A native of Madagascar. Popularly known as E. splendens. *Boj.* which is a closed allied species probably a variety, and differs in having forked filaments.

2. BRIDELIA, *Willd.*

Shrubs or trees sometimes scandant, often spinose. Leaves stipulate, usually entire short petiolate, penninerved, lateral nerves prominent, tertiaries scalariform. Flowers small, sessile to short pedicelled, usually monœcious, less often dioecious, 5-merous, usually in clusters, in axils of leaves, or on spikes. Calyx-lobes valvate, persistent. Petals minute, alternating with the calyx-lobes, usually dentate at the apex in male flowers. Disk in male flowers cup-like, extra-staminal; in the female flowers double, outer annular, inner forming a petaloid cone, almost enclosing the ovary. Stamens united at the base and forming an androphore; filaments free, radiating above and surrounding the pistillode; anther cells parallel; pistillode 2-4-lobed or-partite.

Ovary 2-celled; ovules 2 in each cell; styles 2, free to connate; stigmas bifid to entire. Fruit drupaceous, of 1-2, single-seeded, pyrenes; seed with copious albumen, cotolydons broad, usually thin; radicle superior.

I. Erect trees or shrubs :—
Branchlets not verrucose; flower clusters axillary and on simple panicled spikes; lateral nerves 15-25 pairs; petioles pubescent; fruit globose. Spiny when young. .. .. .. 1. *B. retusa.*
Branchlets verrucose; flowers all in axillary clusters, none in spikes; lateral nerves 8-16 pairs; petioles glabrescent; fruit elliptic. Never spinous. .. .. .. 2. *B. verrucosa.*
II. Scandent shrubs .. .. .. 3. *B. stipularis.*

1. Bridelia retusa, *Spreng.* Vern. *Khaja* (*O.* & *G.*), *kangol, mirch* (*J.*) *kusai* (*Ban*).

A small or medium-sized tree, attaining 60 ft. in height armed when young with conical spines which may be up to 2 in. long; bark dark-brown, rough, exfoliating in irregular plates; young parts and inflorescence usually brown pubescent. Leaves variable in size 2·2-8 by 1·3-4 in., occasionally attaining 9·5 by 5 in., tough, elliptic-oblong, elliptic lanceolate or obovate, acute, subacute or rounded at the apex, base rounded, margin entire or slightly crenulate, coriaceous, dark-green and glabrous above, undersurface glaucous and pubescent on the nerves with bulb-based hairs, lateral nerves 15-25 pairs, subparallel, prominent, meeting in a marginal nerve, tertiaries slightly raised, areoles with minute white dots beneath; petiole ·2-·5 in. long, brown tomentose, often thickened, stipules small, deciduous, pubescent up to ·3 in. long, obliquely lanceolate. Flowers up to ·2 in across, greenish-yellow, in dense clusters which are axillary, or arranged interruptedly, on long flexuous axillary and terminal sometimes panicled spikes, often exceeding the leaves and containing both male and female flowers. Bracts acute, villous, ·2 in. long. *Male flowers.*—Calyx segments triangular, acute, glabrous to puberulous; petals about half the length of calyx-lobes, broad obovate, coarsely toothed, or lobed, sometimes with a short claw. *Female flowers.*—Subsessile to short pedicelled; pedicels lengthening in fruit; calyx-lobes triangular, outer disk annular, inner almost completely covering the ovary; petals oblong to narrow ovate, entire or undulate with acute to rounded apex; styles 2, free, bifid from the middle. Drupe ·3-·4 in. across, globose, fleshy, yellow when ripe. Ultimately purplish-black.

Throughout the area both in sal and miscellaneous forests.

The bark is a strong astringent having a very high tannic acid percentage in its composition. The leaves are much cut for fodder. The heart-wood is handsome deep-brown with black veins, but is seldom used.

Blaze pink to deep red, fibrous, moderately thick.

Fl. April-July, occasionally in September—a second flush. Fr. cold season. Leafless May-June.

The following varieties may be noted :—

1.	B. retusa proper	Spikes lax sometimes attaining 10 inches.
2.	Var. Roxburghiana	Leaves small sometimes only 2 by 1 2. inch., densely tomentose, rounded or subacute. Oudh (Gonda).

2. Bridelia verrucosa, *Haines.* Syn. **B. montana,** *Hk. f. non. Willd.* Vern. *Kasai.*

A small branchy tree, unarmed in all stages, attaining 30 ft. in height with dark-brown bark. branchlets prominently pustulate. Leaves usually 3-8 by 1·3 in., sometimes smaller on flowering shoots, elliptic obovate, elliptic, or elliptic-oblong, apex usually rounded, rarely emarginate, sometimes, subacute, base rounded, less often narrowed, rarely cuneate, entire or slightly sinuate, glabrous and glossy above, paler and glabrescent beneath, lateral nerves 8-16 pairs, somewhat arched and meeting the marginal nerve ; petiole ·2-·5 in. long, glabrous or nearly so, thick. Flowers ·1-·15 in. across ; in dense, very small axillary clusters, greenish-yellow, or from axils of fallen leaves in previous year's shoots, closely invested by numerous scarious, thinly hairy, minute bracts. *Male flowers.*—Shorter than the female flowers, each with a small villous sheath at the base Calyx segments oblong lanceolate. Petals obovate, irregularly toothed or lobed, often with a short claw. *Female flowers.*—Calyx-tube hairy at the base ; sepals lanceolate, acuminate ; petals oblanceolate, entire ; inner disc covering the ovary. Fruit elliptic, ·25 in. long.

Submontane areas in Gonda, Bahraich, also Jhansi.

Fl. October-January. Fr. February ; a second flush of flowers also in April-May.

3. Bridelia stipularis, *Bl.* Vern. *Khaji.*

A large evergreen woody climber or straggling subscandent shrub, often armed with long deflexed spines ; bark dark-grey or brown ; branchlets pendulous, lenticellate. Young parts brown tomentose. Leaves subcoriaceous, chartaceous, usually 2-6 by 1-4 in., much reduced in size on flowering shoots, broad-obovate, oblanceolate or elliptic-oblong, apex rounded or subacute, less often acute, rounded or subcordate at the base, puberulous on the nerves or glabrescent above when mature, brown tomentose and pallid beneath, margins entire undulate or cronulate, lateral nerves 8-15 pairs, slightly arching and meeting the marginal nerve ; petioles fulvous tomentose, ·2-·4 in. long ; stipules ·2-·4 in. long obliquely broad ovate, acuminate, pubescent. Flowers greenish-yellow, in dense axillary clusters, or on flexuous secondary branches with reduced leaves or spikes which are sometimes panicled ; bracts concave, broad, ovate acuminate, externally brown pubescent. *Male flowers.*—Short pedicellate, ·2-·4 in. across, externally sparsely pubescent. Calyx segments spreading, lanceolate, acute ; petals broad spatulate, apex coarsely toothed ;

disk connate with the calyx-tube, concave ; pistillode bipartite densely papillose. *Female flowers.*—·3-·4 in. across, sessile or subsessile, more or less ferruginous tomentose ; calyx segments triangular acuminate, persistent, and somewhat accrescent in fruit. Petals half as long as the sepals ; rhomboid-spatulate entire, notched or crenulate at the top. Outer disk fleshy, lining the calyx-tube, with erect, triangular, acute, scaly projections at the base, surrounding the torus ; inner disk almost completely enclosing the ovary ; torus with a ring of hairs around the ovary ; ovary glabrous ; styles 2, bifid, Drupe fleshy, ·3-·5 in. long, subglobose to ovoid, black when ripe.

Oudh Divisions and Gorakhpur.

Blaze fibrous pink.

Fl. March-May. Fr. October-May (?), probably firs. and fr. throughout the year.

3. CLEISTANTHUS, *Hk. f.*

Cleistanthus collinus, *Benth.* Syn. **Clutiya collina,** *Roxb.*

A deciduous shrub or small tree ; branches rigid ; twigs lenticellate. Bark "nearly black rough"—*Haines.* Leaves 1-4 by ·8 to 3 in. subcoriaceous, obovate-elliptic, to elliptic-oblong, rounded, retuse or subacute at the apex, dull-green, nearly glabrous when mature on both surfaces, undersurface glaucescent, secondly nerves prominent, 5-8 pairs, forming loops near the margin, tertiaries reticulate ; petiole rugose, about ·2 in. long ; stipules ·1 in. long, caducous, membranous, pilose. Flowers subsessile or sessile, ·2-·3 in. across, more or less pubescent externally, in axillary clusters or short spikes, monœcious or dioecious. *Male flowers.*—Calyx segments lanceolate, acuminate ; petals minute ; disk pulvinate ; stamens 5 on an androphore bearing a glabrous pistillode. *Female flowers.*—Calyx deciduous, sepals similar to those in male flowers ; petals minute ; disk cylindric with a thick margin, partly investing the glabrous ovary which is 3-celled, with 2 ovules in each cell ; styles 3, free, bifid. Capsule brown, smooth, shining and reticulate when dry, obscurely trigonous, ·6-1 in. long ; cells separating from a central column ; seeds globose, smooth, usually one in each cell.

Bundelkhand according to Duthie, but there are no specimens from our area at Dehra.

The wood is durable and is said to be immune from attack of white-ants. All parts of the tree are astringent and the roots and fruits are poisonous and are used for poisoning fish.

Fl. April-May. Fr. March-April following year. Deciduous March-April. "Blaze red"—*Haines.*

4. PHYLLANTHUS, *Linn.*

Herbs or shrubs with slender, sometimes deciduous branchlets, which, with small, alternate, distichous leaves, give the former a superficial resemblance to pinnate leaves. Flowers small, in axillary clusters, or subsolitary; female flowers larger than male flowers. Calyx segments 5-6, imbricate, in two series, accrescent in the female flowers in fruit. Petals 0. Disk in male flowers of glands, in female flowers of glands or annular. Stamens 3; filaments connate; anthers confluent, or didymous, dehiscing vertically or transversally. Ovary 3-celled; styles 3, free or connate at the base, 2-fid or 2-lobed. Fruit a capsule with 3, 2-valved cocci. Seeds trigonous, rounded at the back.

Leaves obovate; filaments connate; ovary not verrucose when young; disk in female flowers of glands. .. .. 1. *P. maderaspatensis.*

Leaves linear oblong; filaments free; ovary verrucose when young; disk in female flowers annular. 2. *P. simplex.*

1. Phyllanthus maderaspatensis, *Linn.*

An undershrub or a herb about 3 ft. high, much branched and decumbent below. Leaves variable from ·2 in. to 1 2 in. long, obovate, rounded and apiculate at the apex, and cuneate and tapering at the base to a very short petiole, entire, pale beneath, glabrescent, secondary nerves 4-6 pairs; stipules oblique-lanceolate, acuminate, scarious, persistent, about ·1 in. long, basifixed or peltate. Flowers small, in axillary fascicles, each consisting of several very minute males, and one female about ·1 in. across; pedicels filiform. Sepals 6, white and obcuneate in male flowers; and obovate, green, margined with white, and accrescent in fruit in female flowers. Stamens 3; filaments connate. Anthers free; disk of glands alternating with sepals in both sexes. Styles 3, minute, 2-lobed. Capsule about ·1 in. across, glabrous, shallowly 6-lobed, depressed globose. Seeds trigonous, compressed laterally, convex at the back, finely muricate in rows.

Etawah, Bundelkhand.

Fl. and fr. almost all the year round.

2. Phyllanthus simplex, *Retz.*

An annual or an undershrub up to about 2 ft. high; branches somewhat flattened, ridged from leaf bases. Leaves variable from ·2 to 1·3 in. in length, distichous, linear-oblong, glabrous, glaucous beneath, margins entire, slightly recurved, apiculate or rounded at the apex, base subcordate or rounded; petioles minute; stipules minute, scarious, broadly auricled or peltate. Flowers minute, 1-4 in a cluster, males early deciduous; pedicels slender, minute in male flowers,

much longer in the female flowers, elongating in fruit to ·2-·3 in. in. Sepals 6, oblong obtuse; of the female flowers slightly acrescent in fruit. Stamens 3, free. Anthers didymous, slit small. Disc in male flowers of glands, in female flowers annular. Ovary minutely verrucose when young. obscurely 6-lobed; styles 2-lobed, spreading on the ovary. Capsule globose, ·1 in. across, smooth. Seeds with minute raised dots in rows.

The leaves, flowers, and fruit are used medicinally.
Oudh Gorakhpur and Bundelkhand.
Fl. and fr. most of the year (?), but largely during the rains.

The following rainy season annuals may be mentioned :—

1. **Phyllanthus urinaria,** *Linn.* Vern. *Hazarmunee.* Sans. *Tamravalli.*

A somewhat woody annual, with compressed branches and slender branchlets resembling pinnate leaves. Leaves 2-7 in. long, subsessile, ovate-oblong apiculate, glabrous, glaucous beneath Flowers subsessile minute. Capsule verrucose, ·1 in. across; seeds marked with parallel ridges on the back.
All over the area.

2. **Phyllanthus Niruri,** *Linn.* Vern. *Jaramla.* Sans. *Bhuratri, bahupatri, amrita-amlika, etc.*

A common weed in cultivated ground attaining 2 ft, branchlets slender, resembling pinnate leaves. Leaves ·15-·7 in. long, distichous, elliptic-oblong or obovate, rounded or subacute. Flowers minute, pedicelled. Capsule glabrous with parallel vertical ridges.

Probably all over the area.
Both the above species are valued medicinally as diuretics.

5. KIRGANELIA, *Baill.*

Kirganelia reticulata, *Baill.* Syn. **Phyllanthus reticulatus,** *Poir.* Vern. *Makri, makhi, panjoli* (Hin.). Sans. *Krishna-Kamboji.*

A straggling or subscandent shrub with reddish lenticellate branches. Young parts pubescent or glabrous, branchlets resembling pinnate leaves and borne on the axils of dry, brown, trifid, acute scales which harden with age. Leaves ·5-1·5 by ·3-·6 in., elliptic to oblong, less often obovate, subacute to rounded at the apex, subcordate, rounded or cuneate at the base, entire, lateral nerves not prominent, 6-8 pairs, glabrous, less often pubescent along the nerves on both surfaces, under surface pale, pubescent; petiole very small, about ·1 in. long; stipules minute, dry, smaller than petioles, triangular acuminate. Flowers in axillary, few-flowered clusters, males and females mixed, about ·1 in. long, green or purplish. Flowers of both sexes externally similar; pedicels slender, ·1-·2 in. long; sepals 5, ovate-elliptic, margins scarious, disk of fleshy glands, alternating with the sepals. Stamens 5, the inner 3 connate, outer 2 free and shorter. Ovary 5-10 celled, ovules 2 in each cell, superposed, styles sessile. Berry ·2 in. across, subglobose, purplish-black when ripe. Seeds 8-10, surrounded by a pulp.

Gorakhpur, Oudh, and Bundelkhand.
The leaves are medicinal. Fl. and fr. throughout the year.

6. EMBLICA, *Gartn.*

Emblica officinalis, *Goertn.* Syn. **Phyllanthus Emblica,** *Linn.* The Emblic myrabolan. Vern. *Aonla.* Sans. *Dhatriphalam, amritaphala, amalakam, shriphalam, etc.* Ar. *Ambily.* Pers. *Amelah.*

A small to medium-sized deciduous tree with smooth, grey or pale brown bark exfoliating in irregular plates which are marked by depressions. Branchlets 4-8 in. long, pubescent, feathery with close-set distichous leaves, the whole closely resembling a pinnate leaf. Leaves ·3-·5—lower sometimes ·2 in.—by ·1 to ·15 in. subsessile, linear oblong, rounded or apiculate at the apex, margined, light-green above, paler beneath, glabrous; stipules minute, triangular acuminate, scarious, deciduous. Flowers pale-yellow, monœcious, in axillary clusters, which are usually crowded towards the lower, naked portions of branchlets from minute, fimbriate, scarious bracts. *Male flowers.*—Pedicels slender, attaining ·15 in. Sepals 6, imbricate, ovate oblong. Stamens 3, joined in a short column; anthers longitudinally dehiscent; disk of glands or 0. *Female flowers.*—Subsessile, sepals as in the male flowers; disk cupular, irregularly toothed; ovary 3-celled with 2 ovules in each cell; styles twice bifid, spreading. Fruit a globose drupe ·5-·8 in. across, (in cultivation sometimes much larger) obscurely 6-lobed, yellow or pinkish-yellow when ripe; stone tardily dehiscing, when dry, into 3, 2-seeded, bony, cocci. Seeds trigonous.

All over the area, often cultivated.

The fruit is edible and is sometimes pickled or made into a preserve with sugar. The bark and the fruit are used for tanning and also medicinally on account of their astringent properties. The wood is red, close-grained but splits and warps in seasoning, mostly used for firewood and charcoal.

Blaze pinkish brown to red, green at the edges—·25-·5 in.
Leafless February-April. Fl. with new leaves March-May. Fr. cold season.

Cicca disticha, *L.* Syn. **Phyllanthus distichus,** *Muell-Arg.* Vern. *Harpharuri, Chalmeri.* Sans. *Lavani.*

A small to moderate-sized, tree with thick branches marked with the scars of fallen branchlets. Branchlets 6-15 in. long, crowded at the ends of branches in the axils of hard trifid scales, closely resembling pinnate leaves. Leaves 1-2·5 in. long, ovate lanceolate, acute, stipules subulate. Flowers mostly in slender racemes, from tubercles in old wood, 4-merous, males red minute, females green; larger. Fruit a depressed, globose drupe, 6-8 grooved; ·5-·7 in. across.

Cultivated in gardens within the area.

The leaves and fruit are eaten. The root is an active purgative.

Fl. May. Fr. June-July.

7. FLUGGEA, *Willd.*

Shrubs sometimes armed. Leaves alternate, distichous. Flowers dicœcious, axillary, in clusters, or the females subsolitary, minute, or

disk connate with the calyx-tube, concave ; pistillode bipartite densely papillose. *Female flowers.*—·3-·4 in. across, sessile or subsessile, more or less ferruginous tomentose ; calyx segments triangular acuminate, persistent, and somewhat accrescent in fruit. Petals half as long as the sepals ; rhomboid-spatulate entire, notched or crenulate at the top. Outer disk fleshy, lining the calyx-tube, with erect, triangular, acute, scaly projections at the base, surrounding the torus ; inner disk almost completely enclosing the ovary ; torus with a ring of hairs around the ovary ; ovary glabrous ; styles 2, bifid, Drupe fleshy, ·3-·5 in. long, subglobose to ovoid, black when ripe.

Oudh Divisions and Gorakhpur.

Blaze fibrous pink.

Fl. March-May. Fr. October-May (?), probably firs. and fr. throughout the year.

3. CLEISTANTHUS, *Hk. f.*

Cleistanthus collinus, *Benth.* Syn. **Clutiya collina,** *Roxb.*

A deciduous shrub or small tree ; branches rigid ; twigs lenticellate. Bark "nearly black rough"—*Haines.* Leaves 1-4 by ·8 to 3 in. subcoriaceous, obovate-elliptic, to elliptic-oblong, rounded, retuse or subacute at the apex, dull-green, nearly glabrous when mature on both surfaces, undersurface glaucescent, secondly nerves prominent, 5-8 pairs, forming loops near the margin, tertiaries reticulate ; petiole rugose, about ·2 in. long ; stipules ·1 in. long, caducous, membranous, pilose. Flowers subsessile or sessile, ·2-·3 in. across, more or less pubescent externally, in axillary clusters or short spikes, monœcious or dicœcious. *Male flowers.*—Calyx segments lanceolate, acuminate ; petals minute ; disk pulvinate ; stamens 5 on an androphore bearing a glabrous pistillode. *Female flowers.*—Calyx deciduous, sepals similar to those in male flowers ; petals minute ; disk cylindric with a thick margin, partly investing the glabrous ovary which is 3-celled, with 2 ovules in each cell ; styles 3, free, bifid. Capsule brown, smooth, shining and reticulate when dry, obscurely trigonous, ·6-1 in. long ; cells separating from a central column ; seeds globose, smooth, usually one in each cell.

Bundelkhand according to Duthie, but there are no specimens from our area at Dehra.

The wood is durable and is said to be immune from attack of white-ants. All parts of the tree are astringent and the roots and fruits are poisonous and are used for poisoning fish.

Fl. April-May. Fr. March-April following year. Deciduous March-April. "Blaze red"—*Haines.*

8. ANTIDESMA, *Linn.*

Trees or shrubs. Leaves alternate, short petiolate entire. Flowers dicœcious, bracteate, in slender lateral or terminal, simple or panicled, spikes or racemes. Calyx 3-5-(rarely more) lobed-or-partite. *Male flowers.*—Disk entire, 5-lobed or 5-partite. Stamens 2-5, inserted on or inside the disk; filaments exserted, bases sometimes combined in a short column below the pistillode; anthers globose, on either side of a broad, semi-lunar connective; pistillode clavate, globose, or 0. *Female flowers.*—Ovary 1-celled; disk annular, cupular or pulvinate; ovules paired in each cell; stigmas 2-4, terminal or lateral, usually short, 2-fid or 2-partite, base sometimes combined into a short style. Fruit a more or less compressed drupe, crowned by the stigma, stone hard somewhat compressed, reticulately pitted.

I. Leaves acute or acuminate, glabrescent :—

Flowers pedicelled; rachis glabrescent; calyx glabrous; stamens 2. .. .. 1. *A. diandrum.*

Male flowers sessile; rachis and calyx pubescent; stamens 3-4. .. .. 2. *A. bunius.*

II. Leaves rounded at both ends, under-surface persistently pubescent :—

Flowers sessile; stamens 4-7; ovary hairy. 3. *A. Ghæsembilla.*

1. Antidesma diandrum, *Roth.* Vern. *Banmasuria, dakhi.*

A deciduous shrub with smooth brown or grey bark. Branchlets and leaves rusty pubescent when young. Leaves 1·5-6 by ·7-2 in., oblong to lanceolate or obovate, acute or acuminate, base cuneate, glabrous above, glabrous or slightly pubescent along the nerves beneath, neath, soft and fleshy, lateral nerves faint; petiole ·1-·2 in. long pubescent; stipules ·2-·3 in. long, linear oblong, acute, caducous. Flowers minute, pedicels short, each with an ovate bract at the base which is half as long as the pedicel, in slender, sometimes branched, terminal and lateral, glabrous, less often slightly pubescent racemes, 1-2·5 in. long. *Male flowers.*—Calyx cupular obscurely 4-toothed, glabrous outside; stamens 2, rarely 3 at the base of a glabrous disk; pistillode obsolete. *Female flowers.*—Pedicels stouter, and calyx more deeply cleft than in the male flowers. Disk annular. Ovary glabrous; styles terminal. Drupe about ·2 in. long, smooth, purplish-red ultimately black when ripe, stone compressed.

Pilibhit, Gorakhpur, Oudh, and Bundelkhand.

The acid leaves are largely made into *chutney* by village people. The subacid fruit is eaten.

Blaze pink with green edges. The leaves turn bright-red, before falling.

Fl. May-June. Fr. cold season. Leafless March-April.

2. Antidesma bunius, *Spr.*

A small tree with smooth grey bark ; young parts hairy. Leaves 2·5-8 by 1·2-2·5 in., oblong-lanceolate, lanceolate, oblanceolate or oblong-elliptic, somewhat abruptly short acuminate or obtuse, often mucronate, narrowed at the base, coriaceous, glabrescent and shining with age on both surfaces, lateral nerves 6-10 pairs, arcuate. Petiole chanelled more or less pubescent, ·15-·3 in. long ; stipules caducous ·15-·25 in. long, linear lanceolate or linear, acute. Flowers about ·1 in. across ; rachis of inflorescence pubescent ; males in peduncled lax spikes ; females in racemes, both up to 5 in. long ; bracts minute, villous, concave, ovate. *Male flowers.*—Spikes often branched ; flowers distant on the spikes ; calyx globose, cupular, shortly 3-lobed or subentire, thinly pubescent on both surfaces, lobes short, broad and rounded, ciliate on the margins ; disk lobed, fleshy. Stamens 3-4, inserted within the disk ; pistillode dilated at the top. *Female flowers.*—Racemes usually not branched. Calyx persistent in fruit ; cupular with minute lobes ; lobes 3-4 ciliate ; disk cupular, glabrous. Ovary ovoid, glabrous with 3-4 small, recurved stigmas. Drupe ·25 in. long, ellipsoid, compressed, red and ultimately black, when ripe, edible, on a pedicel which attains ·2 in.

Domakhand in Gorakhpur, rare. Record based on a somewhat incomplete specimen.

Fl. April-May. Fr. August.

3. Antidesma Ghæsembilla, *Goertn.* Vern. *Banmasuri.*

A deciduous shrub or a small tree with light-brown, slightly furrowed and somewhat corky bark. Young shoots rusty or brown tomentose ; branches lenticellate. Leaves 1·2-4 by ·6-3·5 in., ovate, obovate, or elliptic-oblong to broadly elliptic, rounded or obtuse, less frequently shortly blunt acuminate, subacute or truncate to subcordate at the base, glabrescent or pubescent along the nerves above, pubescent or softly tomentose beneath, subcoriaceous, lateral nerves 4-6 pairs ; petiole ·2-·6 in. long, pubescent ; stipules caducous ·2-·3 in. long, linear-lanceolate, tomentose. Flowers very minute, in densely pubescent, terminal and axillary, much-branched racemes or spikes up to 3·5 in. long. Bracts woolly very minute. *Male flowers.*—Sessile, yellowish-green ; calyx usually 5- (sometimes 7-) partite ; segments ovate, woolly tomentose. Stamens usually 4-7 ; disk 5-partite, densely pilose ; pistillode pubescent. *Female flowers.*—Subsessile ; calyx as in the male flowers ; disk annular, pilose ; ovary hairy. Drupe about ·2 in. long, red, ultimately black when ripe, subglobose.

Gorakhpur, Oudh, and Bundelkhand.
The ripe fruits are eaten.
Fl. February-June. Fr. cold season. Leafless hot season.

9. SAUROPUS, *Blume.*

Sauropus brevipes, *Muell.*

A small branchy shrub or an undershrub with compressed often ridged branchlets. Young parts glabrous. Leaves ·5-1 by ·3-·6 in., thin, elliptic-ovate or elliptic, sometimes suborbicular, subacute or obtuse, mucronate at the apex, lateral nerves 3-5 pairs, looped near the margins, glabrous on both surfaces; petiole minute, about ·05-·1 in. long; stipules lanceolate, subulate, up to ·15 in. long. Flowers greenish-red, up to 4, in axillary fascicles, or solitary. *Male flowers.*—1-4 in each axil, about ·1 in. across, stellate; pedicels filiform, up to ·25 in. long. Calyx 6-lobed; segments retuse, linear-oblong, subacute or rounded, with inflexed ligular appendages at the level of the staminal tube and alternately fitting with the grooves and opposite the anthers; stamens 3; filaments combined into a bluntly trigonous, short, 3-grooved column; anther-cells distinct, at the corners of the column. *Female flowers.*—Mostly on the upper axils, ·25 in. across, pedicels shorter and stouter than in male flowers. Calyx 6 cleft nearly to the base; segments about ·1 in. long orbicular, obovate and rounded, accrescent, brighter red and about ·25 in. in fruit. Ovary globose, 3-celled, ovules 2 in each cell; styles 3, 2-lobed, recurved at the edge of the truncate top of the turbinate ovary. Fruit ·3 in. across, depressed globose, containing 6, indehiscent, 3-angled cocci, epicarp thin.

Gonda Division; rare.

Fl. February-June (probably all the year round ?)

Based on my sheets No. 324 and 2154. There are only two specimens of the species at Kew in Wallich's herbarium represented by two not very satisfactory sheets with which my sheets agree fairly well.

10. BREYNIA, *Forest.*

Breynia rhamnoides, *Muell.* Vern. *Sikat.*

A very branchy shrub or small tree with light-brown bark, branchlets from the axils of dry trifid acute hard scales, compressed, often zig-zag, entirely glabrous. Leaves distichous thin, usually close set, variable in dimensions and shape, usually ·4-2 by ·3 to 1·2 in., elliptic-ovate, elliptic, or suborbicular, entire, subacute, obtuse or rounded at the apex, base rounded, less often narrowed, lateral nerves 3-5 pairs, lowest from near the base, looped, tertiaries fine, scalariform, dark-green above paler beneath; petioles ·1 to ·2 in.; stipules triangular-acuminate. Flowers green, minute, solitary or in few flowered fascicles from leaf axils, or less often on very short racemes covered with imbricating, acute bracts, about ·2 in. long; pedicels usually ·15 in. long slender, somewhat stouter in female flowers. *Male*

flowers.—Calyx turbinate, obscurely lobed, the small rounded segments inserted towards the centre of the truncate top, margin of the tube fleshy, lobulate, opposite the calyx-lobes; segments 6, inflexed and almost closing the mouth of the tube. Stamens 3; filaments connate into a column which is produced above the adnate anthers; disk 0. *Female flowers.*—Calyx 6-lobed, lobes ovate or triangular acute, persistent, but only slightly enlarged in fruit. Ovary exserted, truncate and hollowed at the top with 3 (rarely 5) minute styles inside the hollow, base of ovary tapering, ovules 2 in each cell. Fruit globose with a hollowed umbo at the top, up to ·25 in. across, succulent, pink and white.

Gorakhpur, Oudh, and Bundelkhand, mostly along river banks.

Fl. and fr. almost throughout the year.

11. GLOCHIDION, *Forst.*

Trees or shrubs. Leaves alternate bifarious, short petiolate, entire, petioles often swollen; stipules with sharp points. Flowers small, monœcious or diœcious, in axillary clusters. Disk 0. *Male flowers.*—Yellowish; sepals 6, rarely fewer, spreading, in two series, imbricate. Anthers 3-12, extrorse, subsessile or sessile, connate or connivent in a column, connectives more or less produced, tips free or connate in a short head; pistillode 0 or rarely minute and obscure. *Female flowers.*—Calyx usually of 6 short, imbricate lobes, nearly free or combined at the base; segments sometimes unequal. Ovary 3-15-celled; ovules 2 in each cell; styles connate in a column, toothed or lobed at the tip or minute and sunk in the depressed crown of the ovary. Fruit a globose or depressed capsule of 3 or more, 2-valved cocci with epicarp separately dehiscing, often with twice as many lobes as cells, crowned by the persistent style; seeds often with an aril-like coat on the crustaceous testa, compressed or hemispheric.

I. Glabrous shrubs or small trees :—

A. Leaves purplish glaucous beneath :—

Pedicels of male flowers ·25 in long. 1. *G. multiloculare.*

B. Leaves green beneath :—

Pedicels of male flowers filiform up to ·5 in., stamens 3; capsules 2-·3 in. across .. 2. *G. arsenicum.*

Pedicels of male flowers up to ·7 in.; stamens 4-6; capsules ·7 in. across. 3. *G. lanceolarium.*

II. Tomentose shrub. 4. *G. velutinum.*

1. Glochidion multiloculare, *Voigt.*

A low shrub or bush not ordinarily exceeding 6 ft. in height; branchlets flexuose, compressed, usually glabrous, sometimes pubescent. Leaves usually 1·5-5 by ·8-·2·5 in., those at the bottom of the branches sometimes smaller, narrowly lanceolate, oblong, or obovate,

acute or obtuse, narrowed at the base, glabrous, undersurface glaucous, usually purplish, lateral nerves 5-7 pairs, tertiaries raised beneath, fine, scalariform, subcoriaceous; petiole up to ·2 in; stipules about ·1 in., triangular or lanceolate, acuminate. *Male flowers.*—Up to ·2 in. across, on slender pedicels attaining 25 in. Calyx segments narrow-oblong, obtuse, free nearly to the base. Stamens 4-12. The male flowers often on numerous short branchlets clothed with imbricating bracts. *Female flowers.*—·3 in. across on stout pedicels. Calyx accrescent in fruit; segments about ·15 in., free nearly to the base, oblong or elliptic. Ovary globose, rayed and depressed at the centre; style forming an umbo at the top of the ovary. Capsule 75-1 in. across, more than twice as broad as long, 10-15 lobed, with thin dehiscent epicarp and a persistent carpophore on which the seeds remain attached after the dehiscence of cocci. Seeds covered with an orange aril.

Gorakhpur and Oudh; probably also Pilibhit, often in heavy soils in grasslands

Flowers most of the year, but mainly from March to October.

2. Glochidion assamicum, *Hk. f.*

A small evergreen tree attaining 40 ft. with reddish-brown longitudinally shallow-furrowed bark, peeling off in thin flakes. Leaves 2 5-6·5 by 1·2 to 2·2 in., usually elliptic-oblong, oblong-lanceolate or lanceolate, short acuminate, base often oblique and rounded, narrowed or cuneate, entirely glabrous, dark glossy green above, paler beneath, main lateral nerves 4-8 pairs, prominent and raised on the undersurface; petiole ·1-·2 in.; stipules triangular-setaceous, about ·15 in. long. *Male flowers.*—Greenish-yellow about ·15 to 2 in. across in axillary fascicles, often from minute projections, covered with imbricate bracts; pedicels filiform up to ·6 in. long. Sepals 6, obovate-oblong. Anthers 3 connate, connectives forming an umbo at the top. *Female flowers.*—Sessile crowded in leaf axils; calyx-lobes free, nearly to the base, alternately large and small, linear oblong to linear. Ovary pubescent, style thick, usually 4-fid to about half the length, each lobe 2-toothed. Capsule ·2-·3 in. across, glabrescent 4-5, rarely 3-celled—depressed globose. Seeds with orange aril.

Moist situations. Recorded from Gorakhpur, Oudh Divisions, and Jhansi Probably also occurs in Pilibhit.

Blaze pinkish, sometimes mottled.
Fl. March-June. Fr. October-March.

3. Glochidion lanceolarium, *Voigt.*

A small evergreen glabrous tree with grey striate bark, often with zig-zag branchlets. Leaves coriaceous, lowest in a branchlet smallest and comparatively broader, usually 3·5-6 by 1-2·2 in., elliptic or lanceolate, short acuminate, glossy above paler beneath, lateral nerves 8-10 pairs, looping near the margin, base narrowed and slightly decurrent into the short petiole, which is about ·2-·3 in. long: stipules

triangular acute, with stiff points about ·1 in. long. *Male flowers.*—Glabrous ·2-·3 in. across fascicled on minute axillary protruberances covered with imbricating bracts, long pedicelled ; pedicels ·5-7 in. long. Sepals ·2 in. long, oblong, rounded. Anthers 4-6 ; connectives free, about a third of the length of the anthers. *Female flowers.*—4-6 in leaf axils, sessile or subsessile ; calyx deeply cleft ; lobes unequal, those of the outer whorl larger, oblong or linear acute. Ovary hairy, narrowed into the 6-8-toothed, columnar style which is thickened and hairy at the base. Capsule about ·7 in. across, depressed globose 6-8-celled, lobes indistinct, light-brown, pubescent or glabrescent. Seeds red arillate.

Gorakhpur, Bahraich, in swamps or moist situations ; rare.

Fl. hot season. Fr. cold season.

4. **Glochidion velutinum,** *Wight.*

A subdeciduous shrub, occasionally a small tree with rough brown bark (striate on the branches) ; all parts softly tomentose or pubescent. Leaves 2-5 by 1-2 5 in., elliptic, oblong or lanceolate, acute, obtuse or abruptly short acuminate, often cuspidate, rounded or narrowed at the base, glabrescent with age between the nerves above, persistently tomentose beneath, main lateral nerves 4-7 pairs ; petiole short up to ·2 in. long, stout ; stipules subulate. Flowers in axillary clusters, monœcious both male and female flowers often from the same cluster. *Male flowers.*—·15 in. long ; pedicels filiform, ·4-·7 in. long. Sepals 6, unequal, pubescent outside, glabrous within, oblong-lanceolate, subacute to rounded. Stamens 3, connectives at the top free, minute. *Female flowers.*—On short stout pedicels ·2-·3 in. long ; calyx more pubescent than in male flowers ; segments free nearly to the base, narrow oblong, unequal. Ovary hairy, 4-7-celled produced into a more or less exserted, thick style, which is dilated, 4-7-toothed, and glabrous at the tip. Capsule depressed globose, ·3-·4 in. across, usually 4-celled and 8-lobed. Seeds with orange-red aril, often persisting after dehiscence of the capsule.

Throughout the area. The bark is used for tanning.

Blaze red wth brown streaks, stringy.

Fl. hot season. Fr. rainy season.

12. APOROSA, *Blume.*

Aporosa Sp. near A. dioica, *Muell.*

A small tree with grey bark. Leaves about 3·5 in. long, elliptic, oblong, oblanceolate or lanceolate-oblong, shortly acuminate, silky pubescent, gland toothed pubescent with deciduous tufts of hairs at the glands when young, glabrous on both surfaces with age, subcoriaceous, base narrowed or acute ; petiole ·4-·7 in. long, channelled, swollen at the top, with two minute glands often clothed

with tufts of hair at the junction with the leaf blade; stipules caducous, ·3 in. long, falcate, oblong, thinly pubescent. Flowers not seen. Fruit capsular pedicellate, clustered on short axillary protruberances, ·5 in. long, ellipsoid, pubescent, 2-celled, seated on a persistent, deeply four-cleft pubescent calyx, style persistent, 2-lobed, lobes 2-fid, laciniate; pedicels ·15 in. long, pubescent. Seed 1 in each cell with red testa.

Domakhand (Gorakhpur), very rare. More material is needed for satisfactory identification of the species.

13. PUTRANJIVA, *Wall.*

Putranjiva Roxburghii, *Wall.* Vern. *Patju, puljiya,* Sans. *Putrajiva, garbha-kara.*

A moderate-sized or large, handsome, shady, evergreen tree, with more or less smooth, dark-grey bark, with white blotches and drooping pubescent branchlets. Leaves bifarious 1-4 in. long those at the base of the shoots sometimes very small, oblong lanceolate, or elliptic oblong, acute or bluntly short acuminate, usually oblique at the base, margins wavy and serrulate, dark-green and shining above, paler beneath, glabrous, sometimes puberulous, lateral nerves fine, not prominent; petiole ·2-·3 in. long pubescent: stipules caducous, small, subulate, silky pubescent. Flowers dicœcious; bracts caducous, minute. Calyx pubescent, lobes unequal, disk 0. *Male flowers.*—Yellow, up to ·1 in. across, subsessile, densely clustered in leaf axils, often on short spikes, or on leafless short shoots from previous year's leaf axils. Calyx deeply 3-6 cleft; segments imbricate, oblong, linear to oblanceolate, ciliate; stamens 3-5, filaments connate below; anthers large, globose. *Female flowers.*—Green, long pedicelled, solitary or twin, or in few flowered short racemes, the latter usually from previous year's shoots; pedicels ·3-·5 in. long, pubescent. Calyx 6-partite, ·15 in. across; segments broad obovate-oblong or suborbicular, often irregularly toothed, concave, ciliate. Ovary ·25 in. long, white tomentose; exserted, 3-celled with 2 ovules in each; stigmas 3, broad, fan-shaped, papillose on the upper surface, slightly connate below. Drupe ·5 to ·7 in. long, grey, pale or whitish tomentose, ellipsoid, pointed at the both ends; stone rugose, hard, pointed.

Gorakhpur, Oudh and Bundelkhand usually in moist situations.
The seeds yield an oil; the nuts are strung into rosaries and worn as charm.
Blaze pale yellow to brownish.
Fl. March-May. Fr. January-March.

14. BISCHOFIA, *Blume.*

Bischofia javanica, *Bl.*

A large subdeciduous tree, with dark-brown bark exfoliating in fibrous strips. Leaves alternate, trifoliolate, very variable in size. Common petiole 2-6 in. long; stipules caducous, triangularo-blong,

acuminate ·3-·4 in. long. Leaflets petioluled, 2-6 by 1·2-3 in., terminal largest, broadly obovate, elliptic or oblong, abruptly short acuminate, often oblique at the base, crenate, glabrous, lateral nerves 6-9 pairs, arcuate; petiolules ·2-·5 in., but sometimes attaining 1 in. Flowers diœcious, in much branched lateral and axillary panicles which are usually up to 6 in. long, female flowers sometimes in racemes: disk 0. Bracts ovate, acute, scarious, deciduous, up to 1 in. long. *Male flowers.*—Minute, yellowish-green, ·1 in. across, irregularly scattered or clustered in the inflorescence, pedicels very short. Sepals 5, concave, suborbicular, enclosing the 5 inflexed stamens; anthers large, globular, pistillode broad peltate. *Female flowers.*—·2 in. across, pedicels up to ·1 in., stouter than in male flowers elongating in fruit up to ·9 in. Sepals imbricate, caducous, oblong ovate, acute or sub-obtuse. Ovary exserted, 3-4-celled, with 2 ovules in each cell, styles 3, free. Fruit a globose berry, ·25-·3 in. across, brown when fully ripe, 3-4-celled, each lined with tough endocarp, seeds smooth.

Moist situations in Gorakhpur and Oudh, probably also Pilibhit.

The timber is durable and makes good planks, but it is at present hardly used in the province. Growth fast.

Blaze pink, edges crimson

Fl. March-April. Fr. cold season. New leaves March-April.

15. CROTON, *Linn.*

Croton oblongifolius, *Roxb.*

A small, often gregarious sub-deciduous tree, with grey or brownish bark. Young shoots, petioles inflorescence and flowers covered with minute, peltate, orbicular, silvery or brown scales. Leaves 3-9 by 1·5-4·5 in., crowded at the ends of the current year's shoots, elliptic-ovate, or oblong-lanceolate, subacute or obtuse, crenate-serrate, base usually narrowed, but rounded or subcordate above the petioles, coriaceous, glabrous, covered with minute raised dots, undersurface paler, lateral nerves 10-14 pairs, faint, nerves often ending in small bristles at the serratures: petioles ·5-1 in. long, sometimes with 2 minute glands at the junction with the leaf blade; stipules ·3 in. long, caducous, linear-oblong. Flowers pale-yellowish green, solitary or fascicled in the axils of minute bracts, up to ·15 in. long, on long erect, terminal and axillary racemes, upper flowers of which are males and the lower females. *Male flowers.*—·2 in. across; pedicels up to ·15 in. long. Calyx 5-lobed, divided, more than ¾th way down, lobes ovate, obtuse; disk of 5 glands, opposite the sepals. Petals concave, oblong, obtuse, shaggy within; stamens 12, inflexed in bud; filaments hairy at the base. *Female flowers.*—·2 in. across; pedicels stout, about ·15 in. long. Calyx deeply 5-cleft; sepals acute, margins ciliate;

petals smaller than the sepals, obovate, margin woolly; disk annular. Ovary densely covered with stellate scales, 3-celled; ovule 1 in each cell. Capsule ·4-·5 in. across, subglobose, 3-grooved, separating into 3, 2-valved cocci, covered with scales; seeds ellipsoid, smooth.

Bahraich, Kheri, Gonda, Gorakhpur, often gregarious in fresh heavy soil.

The plant is sometimes dioecious. Leaves turn red before falling.

Blaze pink and white.

Fl. January-March Fr. April-May

16. TREWIA, *Linn.*

Trewia nudiflora, *Linn.* Vern. *Bhillaur, gutel* (*P*). Sans. *Pindara.*

A middle-sized deciduous tree with smooth, brown or grey bark, exfoliating in flakes, branchlets young parts and inflorescence deciduous, white or greyish tomentose. Leaves opposite, 3-8 by 2·5-7 in., broadly ovate-cordate, short acuminate, base cordate, truncate, or sometimes cuneate, 3-7-nerved, lateral nerves 4-5 pairs, with strong subparallel tertiaries, subcoriaceous, upper surface with minute raised dots, both surfaces glabrescent with age or lower sometimes thinly pubescent; petioles usually 1·5-4 in. long; stipules caducous, subulate, up to ·25 in. long. Flowers greenish-yellow, dioecious; petals 0; disk 0. *Male flowers.*—·3 in. across, in fascicles in the axils of minute, deciduous bracts, on lax interrupted racemes 3.5-9 in. long; pedicels ·1-·2 in. long, jointed. Calyx globose, hairy outside, splitting into 3-5 concave, oblong-elliptic segments, which are ultimately reflexed; stamens free, numerous. *Female flowers.*—Solitary, or in short 2-4 flowered racemes; bracts caducous, triangular about ·2 in. long; common peduncle up to 1·3 in. long. Calyx ·25-·3 in. long, narrowed upwards, closely investing the ovary, 3-4-toothed, ultimately splitting along one side to the base, densely pubescent. Ovary villous 3-4, less often 2-celled, with one ovule in each cell; styles as many as cells in the ovary, ·5-1 in. long, prominently long-papillose, stigmatic throughout, connate below. Fruit on long stalks which attain 2·5 in., drupaceous, 1-2 in. across, globose, usually greenish-brown, smooth, with pale dots; endocarp crustaceous 2-4 celled; seeds smooth, black.

Pilibhit, Gorakhpur and Oudh, usually in damp places

Wood white very light, suitable for matches.

Blaze pale-yellow.

Fl. January-March. Fr. cold season. New leaves March-April.

17. MALLOTUS, *Lour.*

Trees or shrubs. Leaves 3-7-nerved at the base, sometimes peltate, often gland-dotted beneath. Flowers dioecious or monoecious, in simple or panicled racemes or spikes; petals 0; disk 0;

Male flowers.—Often in fascicles from the axils of bracts on racemes or spikes. Calyx globose, separating into 3-5 valvate lobes. Stamens numerous; anther-cells parallel, often separated by a broad connective pistillode 0. *Female flowers.*—Solitary on the rachis of the inflorescence. Calyx spathaceous, or 3-5 lobed. Ovary 2-4-celled; ovule 1 in. each cell; styles spreading, plumose or papillose. Fruit a capsule usually glandular of 2-3, 2-valved cocci; seeds ovoid or globose, testa crustaceous.

Small erect tree; caspules covered with red glands, not tomentose. 1. *M. phillipinensis.*

Large scandent or subscandent shrub; capsule fulvous tomentose and glandular. 2. *M. repandus.*

1. **Mallotus philippinensis,** *Muell, Arg.* Vern. *Roina, roini, kamela.* Sans. *Rechnaka, Kampilla* Pers. *Kanbela. Arab—Kinbila.*

A small evergreen tree; stems often deeply fluted or buttressed at the base. Bark rough, dark-grey or brown exfoliating in small woody plates. Young parts and inflorescence fulvous, usually stellate tomentose and distantly glandular. Leaves alternate, simple, variable in size and shape, usually 3-8 by 2-5 in. oblong to elliptic ovate or lanceolate, entire, or nerves ending in small teeth, short blunt acuminate or acute, base 3-nerved with 2 brown glands at the junction with the petiole on the upper surface on either side, secondary nerves 4-7 pairs, tertiaries prominent, subparallel, glabrous above, pubescent and red gland-dotted beneath, tough; petiole 1-3·5 in. long, more or less fulvous tomentose, thickened at either end. Flowers .15 in. across, dioecious, yellowish-brown. *Male flowers.*—Clustered in racemes, in the axils of minute acute bracts. Racemes erect, usually closely approximate, or panicled and terminal, sometimes few from upper leaf axils, usually 4-10 in. long. Calyx 3-4-lobed, brown tomentose, covered with distant, orange glands, deeply 3-4-cleft; segments concave, ultimately reflexed; anthers with orange red glands at the top; torus convex. *Female flowers.*—·15 in. long, subsessile, solitary in spikes; bracts minute, acute; spikes 1-4 in. long, terminal, or a few axillary. Calyx. 1 in. long, 3-4-cleft nearly to the base, persistent; segments somewhat unequal, ovate or oblong, acute; ovary 3-celled, red glandular and stellate tomentose; ovule 1 in. each cell; styles 3, spreading. Fruit a globose capsule, .3-·5 in. across, covered with brick-red, resinous glands; seeds subglobose, black.

Throughout the area sometimes forming a dense understorey in sal forests in fresh soils, and almost monopolising the ground. Coppice shoots have often very large and serrate leaves.

The red powder from the fruits constitutes the kamela dye of commerce, which is also used medicinally as an anthelmintic and for skin disease.

Blaze pink with orange or yellowish streaks.

Fl. September-November. Fr. March-May.

2. Mallotus repandus, *Muell.* Syn. **Rottlera tricoca,** *Rods.*

A large climbing or straggling shrub, sparingly armed with strong spines. Young shoots, undersurface of leaves, petioles and inflorescence covered with fulvous, stellate, woolly tomentum. Leaves alternate, 1.6-4 by 1.6-3.5 in., broadly deltoid or rhomboid-ovate, short acuminate or acute, subentire, or distantly sinuate toothed on nerve endings, membranous, glabrescent when mature above, covered with amber coloured glands beneath, base truncate, broadly retuse or cuneate, 3-nerved, sometimes slightly peltate on the petioles which are 1-2 in. long; stipules minute, tomentose. Flowers diœcious, pale-brown, about ·15-·2 in. across, densely tomentose, distantly glandular. *Male flowers.*—In clusters of 1-5, on erect, often branched racemes 2.5-6 in. long which are fascicled at the ends of shoots, or are solitary in the upper leaf axils; bracts linear lanceolate; pedicels minute. Calyx globose in bud, divided nearly to the base, into 3-5 segments; segments ovate or elliptic, acute, ultimately deflexed; anther cells separate. *Female flowers.*—In simple or branched racemes, 1.5-3 in. long. Calyx campanulate; lobes 4, linear lanceolate or oblong, acute; ovary glandular and densely stellate pubescent, 2-celled; styles 2, spreading, plumose, laciniate, connate below. Capsule of 2 cocci, capped by the persistent stigma, ·4 in. across, densely stellate fulvous, and glandular outside. Seeds globose, ·5 in. across, black and rugulose.

Gorakhpur, (Nichlaul)—rare.

Fl. January-February. Fr. March-April.

18. TRAGIA, *Linn.*

Twining herbs often with woody base and covered with stinging hairs. Leaves simple, or digitately 3-lobed, 3-5-nerved at the base, serrate. Flowers monoecious, in terminal and leaf-opposed racemes, bearing both male and female flowers. Petals 0; disk 0. *Male flowers.*—In the upper part of the racemes. Calyx valvately 3-5-partite. Stamens 1-3, usually 3, rarely more, pistillode minute 3-fid or 0. *Female flowers.*—Calyx 6-partite; segments imbricate, often pinnatifid, accrescent, hardened and stellate in fruit. Ovary 3-celled with one ovule in each cell; styles entire and spreading above, connate below; fruit a capsule of 3, 2-valved cocci with crustaceous endocarp. Seeds globose.

Leaves simple.	1. *T. involucrata.*
Leaves palmately 3-partite.	2. *T. cannabina.*

Tragia involucrata, *Linn.* Vern. *Bichu.* Sans. *Vrishchikali.*

A perennial hispid twiner; base woody; shoots sometimes suberect; stinging hairs scattered. Leaves variable 2-4 in. long, broad

ovate to oblong-lanceolate, acuminate, coarsely serrate, base rounded or cordate, 3-5-nerved; petioles ·1-·6 in. long; stipules caducous, ovate-oblong or triangular acute, ·25 in. long. Flowers yellowish, in hairy racemes which attain 2 in. but become considerably longer in fruit; bracts ·1 in, lanceolate, acute. *Male flowers.*—Sepals ·06 in long; 3. broad ovate, stamens 3; pistillode small 3 fid. *Female flowers.*—Sepals 6, pinnatifid, hispid, much enlarged and hardened in fruit. Ovary hispid; style revolute. Capsule ·6 in. across, hispid; seeds globose.

Gorakhpur, Kheri.
The roots are used for skin diseases.

Fl. and fr. December-March.

VAR. angustifolia, F. B. I. Leaves linear or oblong, ·4-·6 in. broad, Gorakhpur.

2. Tragia cannabina, *Linn.* Syn. **L. involucrata,** var cannabina, *Muell.*

A small, hispid, erect, sometimes scandent shrub. Leaves, variable, greyish-green, 3-partite up to 3 in. long, sometimes not lobed; lobes unequal, central largest, coarsely toothed or pinnatifid. Inflorescence and male flowers as in the previous species. Styles not revolute; fruiting calyx smaller than in the last species. Capsule ·4 in. across, 3-lobed.

Etawah, Bundelkhand, probably also elsewhere within the area.
Fl. and fr. December-March.

19. HOMMONIA, *Lour.*

Hommonia riparia, *Lour.*

A rigid evergreen shrub or tree with the habits of *Salix tetrasperma*. Bark dark-grey, or brown, rough. Young parts and inflorescence pubescent. Leaves close together, 3 7·5 in. long, linear-oblong or linear-lanceolate, acute, margin entire, or more or less glandular toothed towards the apex, glabrescent above minutely papilose on both surfaces, pubescent and covered with round scales between the nerves beneath, tough, lateral nerves many—about 10-30 pairs, prominent beneath; petiole channelled, short, ·1-·4 in. long, pubescent; stipules, subulate up to ·35 in. long. Flowers dioecious, about ·15 in. across, drooping, in axillary spikes 1·5-4 in. long; bracts triangular, acuminate, concave, broader in the female flowers; bracteoles lateral, 2 in each flower; calyx deeply-partite; petals 0; disk 0. *Male flowers.*—Sepals 6, free, elliptic or suborbicular ovate, acute, nearly glabrous inside. Stamens many, in globose heads, consisting of a central column which is divided into numerous branches, which finally bear clusters of anthers; anthers red, cells globose, divaricate, connective minute; pistillode 0. *Female flowers.*—Sepals imbricate, 5, narrow ovate, unequal, persistent. Ovary pubescent, 3-celled, with one ovule in each cell; styles 3, plumose connate at the base.

Capsules globose, ·15 in. across, greyish tomentose, of 3, two-valved cocci. Seeds smooth angled on the inner face, yellowish brown.

Bundelkhand, in boulder beds along streams; not common.
Fl. March-May. Fr. May-September.

20. RICINUS, *Linn.*

Ricinus communis, *Linn.* The castor-oil plant. Vern. *Arand, rehri.* Sans. *Erandam, vatari.* Arab. *Khirva.* Pers. *Bedanjir.*

An evergreen soft-wooded shrub; young parts covered with a glaucous bloom. Leaves alternate, digitate, 9-18 in. across either way, peltate, 7 to many lobed, glabrous, lobes lanceolate or ovate oblong, acuminate, gland serrate at the nerve endings; petioles stout, about as long as the leaves, with a gland each at the base and near the top; stipules connate, caducous about 1 in. long, enclosing the young bud and leaving an annular scar on the stem. Flowers clustered in terminal or lateral racemes, monœcious, upper flowers in each raceme male, lower female; bracts scarious, marcescent, ·3 in. long. *Male flowers.*—Crowded, calyx 3-5 partite; lobes valvate, triangular ovate, acute; stamens numerous of repeatedly branched filaments on the ultimate ramifications of which the anthers are crowded; anther-cells, globular, separate. *Female flowers.*—Calyx deciduous, ·3 in. long, spathaceously opening along one side. Ovary 3-celled; ovule one in each cell; styles 3, plumose, 2-fid. Fruit an echinate, capsule about ·8 in. long, ovoid, splitting into 3, 2-valved dehiscent cocci; seeds with large caruncle and crustaceous testa.

Cultivated and also apparently wild near habitations.
The seeds yield the well-known castor-oil.
There are several varieties of the plant Pax in *Das Pflanzenreich* enumerates 17, some of which have coloured foliage or fruit and are grown as ornamental plants.
Fl., Fr., almost throughout the year.

21. JATROPHA, *Linn.*

Herbs, shrubs or trees, often with soapy latex. Leaves alternate, entire and palmately nerved, palmately-lobed or partite; stipules often ciliate. Flowers monœcious, in terminal cymes, the central flowers of the cyme, or of its forks, usually female. Calyx of 5, imbricate lobes. Petals 5, contorted, free or connate, sometimes absent in female flowers. Disk entire, or of 5 glands. Stamens numerous, flaments connate, or the outer filaments free; anther cells contiguous, and parallel. Ovary 2-4-celled; styles connate, divided; ovule 1 in each cell. Fruit a capsule of 2-4, 2-valved cocci; endocarp crustaceous or bony; testa of seeds crustaceous.

Young leaves green, not deeply lobed, not gland ciliate; stipules not glandular. Flowers greenish-yellow. .. 1. *J. Curcas.*
Young leaves bronze red; deeply lobed, gland ciliate; stipules glandular. Flowers red. .. .. 2. *L. glandulifera.*

1. Jatropha Curcas, *L.* Vern. *Renrh* (*Gor*), *pahari renrh* (*Gon*), *safed arand, bagrer* (*Gor*).

A large soft-wooded, deciduous, thick-stemmed shrub. Bark thin, yellowish-brown and papery on old stems; younger stems smooth, greenish; branchlets prominently marked with leaf scars, young parts tomentose; juice soapy, translucent. Leaves 3-6 by 3-5 in. suborbicular ovate, broadly cordate, usually 3-5-lobed, lobes abruptly short acuminate, or acute, glabrous or slightly pubescent on the under-surface along the nerves; petiole 3-9 in. long; stipules 0. Flowers greenish-yellow in long peduncled, compound, often panicled, cymes from the upper leaf axils which are 2-5 in. long; bracts linear-oblong up to ·4 in. long, disk of 5 glands. *Male flowers.*—Calyx deeply 5-cleft, ·15 in. long, lobes somewhat unequal, elliptic or obovate; corolla 5-lobed, campanulate, exceeding the calyx, hairy within; stamens 10 in two series, inner series connate half-way up, outer free. *Female flowers.*—Calyx ·2 in. long, lobes ovate acute; corolla scarcely exceeding the calyx; styles connate at the base; stigmas 2-fid. Capsule 1 in. long, ovoid; seeds oblong, brownish black ·7 in. long.

Native of tropical America. Throughout the area in hedges; occasionally as an escape.

The seeds act as a drastic purgative and in large doses are poisonous.

Fl. hot and rainy season. Fr. cold season. Leafless in winter.

2. Jatropha gossypifolia, *Linn.* Vern. *Lal arand.*

A soft-wooded shrub up to 6 ft. high. Young parts bronze-red. Leaves 2-5 in. across, membranous, digitately 3-5 partite, middle lobe largest, obovate-lanceolate to oblong, lateral smaller usually obliquely ovate oblong, all abruptly short acuminate, closely toothed and glandular ciliate, base truncate or retuse, glabrescent, upper surface covered with minute white dots; petiole 2-4·5 in. covered with distant, branched, stipitate glands; stipules finely dissected, ultimately capillary and glandular. Cymes up to 6 in. long, pubescent, terminal and lateral, pedunculate. Bracts lanceolate, gland ciliate, up to ·7 in. long; petals red. *Male flowers.*—About 2 in. long; calyx nearly free to the base; lobes ovate acute to oblong lanceolate, gland ciliate; stamens connate. *Female flowers.*—·2-·3 in. long; ovary pubescent. Capsule about ·5 in. across three grooved slightly rugose.

Throughout the area in hedges also as an escape in many districts on waste lands. A native of tropical America. Now naturalized in many parts of the world.

Deciduous in cold season. Fl. and fr. mainly rainy season. The glands are viscid.

22. BALIOSPERMUM, *Bl.*

Baliospermum axillare, *Bl.* Syn. **B. montanum,** *Muell.* Vern. *Jamalghota, danti* (*Pil*).

An erect undershrub up to 4 ft. in height with numerous shoots from the root-stock. Leaves alternate, very variable in size and shape ranging from 2 to 10 in. in length; the lower leaves largest, elliptic, ovate-lanceolate, obovate, or oblong, deeply 3-lobed to undivided, irregularly and coarsely toothed, acute, acuminate or obtuse, base cuneate, rounded or subcordate, usually 3-rarely 5-nerved, secondary nerves 3-6 pairs, distant, tertiaries prominent, subparallel, rigidly coriaceous, pubescent when young, glabrescent with age; petiole up to 3 in. long with 2 small glands at the junction with the blade; stipules reduced to two tubercles. Flowers minute, greenish, monœcious, clustered in the axils, or in short axillary branched interrupted racemes, which may attain 2·5 in. and are sometimes terminal and panicled; bracts minute. *Male flowers.*—About ·1 in long; sepals 4-5, orbicular or broad obovate, imbricate; disk thin, connate into a ring. Stamens 15-20 free; anther cells confluent, connective broad. *Female flowers.*—Subsessile, calyx persistent, deeply 5-cleft; segments ovate, irregularly toothed; disk annular, crenate. Ovary 3-celled, hairy; ovule 1 in. each cell; styles 3, each 2-fid. Capsule ·3-4 in. across, 3 lobed breaking up into 3, 2-valved cocci, the pedicel and the central axil long persisting after dehiscence; seeds mottled, caruncled.

Throughout the area in shady situation, rather rare in the dry southern part.

The seeds are a drastic purgative.

Fl. and fr. throughout the year.

23. SAPIUM, *P. Br.*

Trees or shrubs with milky juice, glabrous. Leaves alternate, penninerved; petiole often 2-glandular at the top. Flowers small monœcious—less often dioecious, in terminal or lateral, simple or panicled spikes, or racemes. Petals 0; disk 0. *Male flowers.*—Several in each bract: calyx 2-3-lobed, toothed or partite; stamens 2-3; filaments usually free, exserted; anthers 2-celled. *Female flowers.*—Calyx 2-3- fid; ovary 2-3-celled; ovule 1 in. each cell; styles free or connate, spreading or recurved. Fruit a crustaceous, fleshy, pulpy or rarely woody capsule, or sometimes indehiscent, usually 3-valved. Seeds not caruncuiate, globose, usually long persistent on the central axis.

Leaves 6-12 in. long oblong lanceolate to elliptic, crenate-serrate. Spikes unisexual, appearing before the leaves. .. 1. *S. insigne.*

Leaves under 4 in. long, rhomboid, entire. Spikes containing both male and female flowers, appearing after the leaves. .. 2. *S. sebiferum.*

1. Sapium insigne, *Benth.* Vern. *Shirwa.*

A small or medium-sized deciduous tree with rough, deeply-fissured corky bark and acrid milky juice. Twigs thick and fleshy, brown, prominently marked with leaf scars. Leaves 5-12 by 2-4 in., crowded at the ends of branches, elliptic-lanceolate to lanceolate-oblong or oblanceolate, acuminate, often abruptly narrowed at the base, crenate-serrate, lateral nerves 9-20 pairs, arcuate; petioles 1-2·5 in.; stipules minute, linear acuminate. Flowers in unisexual fleshy, spikes, 3-8 in. long. *Male flowers.*—In dense clusters in the axils of fleshy bracts. Sepals 2, minute and orbicular, concave; stamens 2, short, exserted. *Female flowers.*—Calyx-lobes ovate acuminate; ovary glabrous; styles 2-3 connate at the base. Capsule ·3 in. long, ovoid, at first fleshy, ultimately dry and irregularly dehiscent.

Bahraich, Gonda, near foothills.
Blaze yellowish-white.
Leafless January-March. Fl. February-March. Fr. cold season.

2. Sapium sebiferum, *Roxb.* The Chinese Tallow Tree.

A fast-growing, small or medium sized deciduous tree, with pale-brown or grey, rough, shallow furrowed bark. Leaves 1·5-3 in. long, rhomboid, abruptly caudate acuminate, entire, glossy above, paler beneath; petiole slender up 2 in. long. Flower yellow, in dense, drooping, sometimes branched, racemes 2-8 in. long, males more numerous, females few in the lower portion of the racemes; pedicels about ·1 in. long. Stamens exserted; ovary glabrous; styles recurved. Capsule ·4-·6 in. across subglobose, 3-valved. Seeds enclosed in a thick layer of white fatty substance.

Cultivated in Pilibhit and Oudh.
Fl. June-August Fr. early cold season.
The fatty substance round the seeds is used for making candle in China.
The leaves turn crimson before falling in winter. The tree coppices well; and reproduces itself by root-suckers freely.

The following plants which are cultivated within the area of the flora may be mentioned:—

1. Pedilanthus tithymaloides, *Poit.*—An evergreen succulent much branched shrub much resembling an Euphorbia, with copious milky juice. Leaves 1-2 in. long subsessile, ovate or ovate elliptic, sometimes variegated in garden varieties, thick. Flowers in scarlet slipper-shaped involucres. A native of the West Indies and S. America. Grown in gardens for border hedges.

2. Aleurites moluccana, *Willd.* The Indian Walnut.—A large handsome evergreen tree. Leaves 4-12 in. long, polymorphic, rhomboid or deltoid-ovate, entire or broadly palmate and 3-7-lobed, stellate tomentose when young; petiole up to 2·5 in. long, 2 glandular at the apex. Flowers white, monœcious ·4 in. across in many-flowered panicles; calyx and corolla both present. Fruit a globose drupe, 2-2·5 in. across, fleshy, containing 1-2 large edible oily seeds.

3. Codiœum variegatum, *Linn.* Commonly known as "crotons." A handsome shrub with an extraordinary variety of leaf forms in some of which the lamina is discontinuous and in others parts are cup-shaped. Numerous varieties with a wide range of colour combinations—chiefly green, bronze, yellow, and red—are grown as ornamental plants. It is a native of the Pacific Islands.

LXIX.—ULMACEÆ.

Trees or shrubs. Leaves alternate, distichous, simple, often unequal sided; stipules often caducous. Flowers unisexual or polygamous, in axillary clusters or cymes; females sometimes solitary, perianth sepaloid often persistent, 4-8-merous; lobes free or connate, imbricate. Stamens usually as many as calyx-lobes and opposite them or twice as many; filaments free; anthers 2-celled opening lengthwise; pistillode usually present in male flowers. Ovary of 2 connate carpels, usually 1-, sometimes 2-celled; styles 2, 2-fid, divergent, stigmatose on their inner faces; ovule solitary, pendulous from near the top. Fruits indehiscent, a nut—often winged—or a drupe, seeds exalbuminous.

I. Fruit winged. Leaves not 3-nerved at the base, entire; flowers appearing before the leaves. .. 1. *Holoptelea.*
II. Fruit not winged. Leaves not 3-or more-nerved at the base, toothed; flowers appearing on leafy shoots:—
Large trees. Leaves not scabrid, female flowers solitary. 2. *Celtis.*
Small trees. Leaves scabrid; all flowers cymose. 3. *Trema.*

1. HOLOPTELEA, *Planch.*

Holoptelea integrifolia, *Planch.* Vern. *Kanju, papri, chirol* (*Bundelkhand*).

A large deciduous tree, bark grey, smooth in young stems, rough, exfoliating in quadrilateral scales in old trees. Branches lenticellate, shoots pubescent. Leaves 2-4 by 1·5-2·5 in., elliptic, ovate or oblong, acuminate, entire, in vigorous shoots, sometimes distantly toothed, base rounded or subcordate, glabrous, undersurface minutely rugose, with raised dots, glabrescent or pubescent when young, main lateral nerves 5-8 pairs; petioles ·2-·4 in. long; stipules ·2-·3 in., linear-oblong, scarious, caducous. Flowers green, male or bisexual, in pubescent fascicles or short racemes, from the leaf scars of previous year's shoots and appearing before the leaves. Pedicels very short, elongating in fruit. Perianth companulate 4-8 partite, pubescent; segments up to ·15 in. long, linear-oblong. Stamens 8, in two whorls, sometimes fewer-in 2-sexual flowers; anthers pubescent; filaments at length exserted. Ovary stalked, compressed; style short, 2-fid. Fruit a samara, ·75-1·2 in. long, suborbicular-oblong, notched between the persistent styles, abruptly narrowed into a short stipe ·1-·2 in. long and jointed with the stalk which is ·2-·3 in long; wing membranous.

All over the area.

The stem is often buttressed. Blaze light-yellow, streaked with light-brown, with an offensive odour. Leaves when bruised also similar smelling.

Fl. March-April. Fr. end of May. Leafless February-March.
Var. leiocarpa. *Planch.* with prominently lenticellate branches glabrate leaves, and deeply notched glabrous samara appears to be the common variety in our area.

2. CELTIS, *Linn.*

Celtis tetrandra, *Roxb.* Vern. *Kakai.*

A large handsome deciduous tree attaining 70 ft. and sometimes more in height, with dark-grey, smooth lenticellate, bark with horizontal wrinkles. Branchlets drooping; young parts and inflorescence pubescent. Leaves 1·5-4·5 by 1-2·2 in., coriaceous when mature, obliquely elliptic, ovate, or ovate-lanceolate, acuminate, very often caudate, serrate from the middle to the base of the acumen, coriaceous, glabrescent with age, except for tufts of hair on nerve axils on the undersurface, minutely papillose on both surface, main lateral nerves (excluding the basal pair) converging towards the apex, 1-3 pairs, prominent, raised below, tertiaries strong, scalariform, petiole ·2-·5 in. long, channelled; stipules ·2 in., linear-lanceolate, caducous. Flowers small, greenish. Male cymes in lateral clusters or in short racemes in the axils of the lowest leaves, or below them; bisexual flowers 1-3 together, in upper leaf axils. Perianth 4-5 partite, imbricate, segments elliptic, woolly on the margin; torus woolly; stamens as many as perianth segments, inserted round the torus. *Male flowers.*—Pedicels ·1 in. long. *Bisexual flowers.*—Pedicels ·3 in. long; ovary sessile, pilose towards the apex; ovule solitary pendulous; styles 2. Fruit an ellipsoid drupe, ·3 in. long, orange-red and smooth when ripe, peduncle ·5-7 in. long in fruit; stone ovoid, ridged.

From Pilibhit to Gorakhpur, in cool situations near water.
Blaze pale-yellow, mottled with purple or brown spots and lines, uppermost layer containing chlorophyll, hard.
Fl. February-March. Fr. October-November. Leafless January.

3. TREMA, *Lowe.*

Small trees. Leaves oblique, with 3-7 basal nerves, usually rough with raised dots (cystoliths); stipules caducous. Flowers small, green, dioecious in axillary bracteate cymes; sepals 4-5. *Male flowers.*—Stamen 4-5, pistillode, small or 0. *Female flowers.*—Ovary sessile, ovule pendulous; styles 2-armed. Fruit a subglobose, or ovoid drupe, seated in the persistent calyx.

Leaves softly hairy beneath.	*T. orientalis.*
Leaves scabrid on both surfaces.	*T. politoria*

1. Trema orientalis, *Bl.* Syn. **Celtis orientalis,** *Linn.*

A fast-growing small tree, attaining 30 ft. with pale or brown, smooth lenticellate bark; branchlets silky pubescent. Leaves 2-6 by 1-2·5 in., ovate or ovate-lanceolate, caudate acuminate, scabrid above, softly greyish-white, tomentose, or silky pubescent, beneath, base obliquely subcordate or rounded, serrate, principal basal nerves 3, main secondary nerves 2-3 pairs, converging towards apex, petioles

·2-·6 in. long, deeply channelled, broadened at the top , stipules ·2-·3 in. acuminate, scarious, silky. Flowers dioecious, ·1 in. long, green; cymes lax, longer than the petioles. *Male flowers.*—Sepals elliptic, concave, with woolly margins; pistillode on a woolly torus, glabrous. *Female flowers.*—Sepals as in the male flowers but smaller, acute and flat; staminodes 0; ovary glabrous, on a woolly torus. Drupe ·1-·15 in. long on the persistent calyx, ovoid, black when ripe.

Gorakhpur, probably also in all Oudh Divisions and Pilibhit, near water. Blaze red, fibrous.

Fl. April-September, probably also at other times of the year. Fr. October-May.

VAR. amboinensis. Syn. T. amboinensis, *Bl.* differs by denser and more spreading pubescence and denser male cymes. This, although not hitherto recorded may be looked for in Gorakhpur, Pilibhit, and Oudh forests.

2. Trema politoria, *Planch.* Vern. *Banharia.*

An evergreen small tree attaining 30 ft. with pale-brown smooth bark dotted with lenticels; branchlets coarse pubescent, innovations silky. Leaves 1·5-5 by ·8-2 in., oblong-or ovate-lanceolate, acute or acuminate, rounded, truncate or subcordate at the base, serrulate, hard, scabrid and thinly hispid on both surfaces, dark-green above, paler beneath, basal nerves 3-5, main lateral nerves 3-6 pairs converging towards the apex; petioles ·2-·4 in. long, channelled, coarsely hairy; stipules ·3-·4 in., long, caducous, linear-lanceolate, acuminate. Flowers dioecious, greenish, about ·1-·15 in. across; cymes usually not exceeding the petioles. Male flowers a little larger than female flowers. Other characters as in T. orientalis. Drupe ellipsoid or globose, black when ripe.

Throughout the area, on loose soil on river banks, etc., hillsides, etc., where it is often a pioneer species.

The bark yields a tenacious fibre which can be used for making ropes. The leaves could be used like sand paper for polishing.

Blaze red.

Fl. April-June, perhaps at other times of the year also. Fr. October.-February.

FAM. CANNABINACEÆ.—**Cannabis, sativa,** *Linn.* Vern. *Bhang,* Sans. *Vijaya, sidhapatri.* A strong-smelling annual herb of variable height, but usually 3-8 ft. Leaves 3-8 in. long, palmatipartite, lobes narrow lanceolate, acuminate, serrate. Flowers greenish, dioecious. Fruit an achene, closely invested by the persistent perianth and bracts. Abundant on open ground, specially in camping grounds and near habitation where it springs up in profusion during the rains.

It is the source of the intoxicating drugs *bhang, ganja,* and *charas. Bhang* consists of the dried leaves and flowering shoots. *Ganja* consists of the dried flowering tops of cultivated female plants, coated with resin. Its collection necessitates the removal of all male plants in the vicinity, as the resinous exudation ceases after fertilization. *Charas* is the natural resinous exudation from various parts of the plant which is produced in cold dry climates. It is largely imported, and as it contains a larger proportion of the active principle, is more narcotic. The bast fibre can be used for making ropes, and is sometimes woven into coarse cloth in the hills.

LXX.—URTICACEÆ.

Herbs or undershrubs, less often trees or shrubs, sometimes with stinging hairs. Leaves alternate, or opposite often bifarious, with 3 basal nerves, and opaque dots due to the presence of cystoliths; stipules usually membranous, sometimes interpetiolar. Flowers small, greenish, 1-sexual. Inflorescence cymose, often much reduced or condensed into head-like clusters which may be borne in an elongated axis. *Male flowers.*—Perianth 4-5, infrequently, 2-3-merous; lobes more or less free. Stamens isomerous with the perianth segments and opposite them; filaments dilated at the base, incurved in bud; anthers 2-celled, with broad connective, dorsifixed; pistillode usually present. *Female flowers.*—Perianth gamophyllous, 4-5-lobed, sometimes accrescent and fleshy in fruit. Ovary superior, 1-celled; stigma papillose, plumose or penicillate; ovule 1, erect. Fruit a drupel or utricle, often united to the perianth, seed with membranous testa and oily albumen.

I. Leaves opposite; flower clusters in long catkin-like shoots about the same size as the leaves. .. 1. *Bœhmeria.*

II. Leaves alternate; flower clusters condensed in short peduncled or sessile cymes:—

Leaves ashy tomentose beneath, narrow lanceolate; cymes axillary. .. .. 2. *Debregeasia.*

Leaves green beneath; cymes mostly from axils of fallen leaves. .. .. 3. *Villebrunea.*

BŒHMERIA, *Jacq.*

Bœhmeria macrophylla, *Don.*

A large shrub with dark-brown bark; branchlets 4-sided; young parts and inflorescence strigose. Leaves opposite, 6-12 by 1·5-2·5 in., narrow-lanceolate, gradually tapering to the caudate acuminate apex, evenly serrulate, glabrescent or pustular and rugulose above, undersurface pale and thinly strigose on the nerves, base rounded to acute, 3-nerved, basal nerves reaching to about more than half the length of the leaf, lateral nerves anastomosing at the upper end, all pointing towards the apex, petiole ·5-1·5 in. long, strigose; stipules up to ·5 in. long, narrow lanceolate. Flowers monœcious, in dense clusters ·2-·3 in. across, arranged in drooping spikes 5-10 in. long; bracts lanceolate, scarious. *Male flowers.*—Perianth 4-lobed; stamens as many as perianth lobes; pistillode rudimentary. *Female flowers.*—Perianth tubular 2-4-toothed, persistent; ovary 1-celled; style laterally stigmatose. Achene closely invested by the perianth; fruiting perianth, obovate-cuneate, suddenly constricted upwards to the 2-4-toothed neck.

Pilibhit, Jonda, rare.

Fl. August-September. Fr. cold season.

2. DEBREGEASIA, *Gaud.*

Debregeasia velutina, *Gaud.*

A large spreading shrub or a small tree up to 25 ft. high with dark-brown bark, corky on old stems; young shoots silky pubescent. Leaves alternate, 3-6 by ·5-1·5 in., narrow or oblong-lanceolate, gradually narrowed to an acuminate apex, narrowed at the 3-nerved base, serrulate, upper surface green, rugulose due to impressed nerves, glabrescent or with few scattered hairs on the midrib; petiole ·3-1·2 in. long; stipules up to ·3 in. long intrapetiolar scarious, connate excepted at the top, flowers in dense globose heads, ·1-·2 in. across, 2-7 on dichotomous, axillary, bracteate cymes; peduncles ·1-·4 in. long. *Male flowers.*—Bracteles suborbicular, perianth 4-cleft, exceeding the bracteoles; lobes valvate, lanceolate, woolly inside; stamens 4, inflexed in bud; pistillode glabrous. *Female flowers.*—Bracteoles narrower than in male flowers, obovate; perianth ovoid, narrowed to a small obscurely toothed mouth, accrescent and succulent in fruit; stigmas penicillate, sessile. Fruit an aggregate of achenes in clusters ·3 in. across contained in the fleshy perianths, orange when ripe.

Pilibhit (Tarai Range), N. Kheri (Bankati Range)—rare.

The fruit is edible and the fibre from the stem is of superior quality and could be used for cordage.

Blaze pink.

Fl. rainy season. Fr. cold season.

3. VILLEBRUNEA, *Gaud.*

Villebrunea frutescens, *Bl.*

A slender shrub with reddish-brown or grey bark; young parts pubescent. Leaves alternate, 2-6 in. long, ovate or elliptic to oblong-lanceolate, caudate acuminate, base rounded or obtuse, 3-nerved, nerves extending to more than half the length of the blades, coarsely serrate except towards the base, membranous, thinly hispid on both surfaces, undersurface green, but paler than the upper surface; petiole ·5-3 in. long; stipules lateral, up to ·5 in. long, lanceolate, acuminate, caducous. Flowers minute, dicœcious, in lateral clusters, usually from the axils of fallen leaves, but sometimes also from leaf axils. *Male flowers.*—Perianth 4-partite; segments valvate, ovate, hairy outside; stamens 4, inflexed in bud. *Female flowers.*—Perianth ovoid, narrowed to an obscurely toothed mouth. Ovary 1-celled, stigma sessile, peltate; ovule erect. Fruit, of achenes immersed in the succulent perianth and bracteoles.

N. Oudh according to Duthie, but there are no specimens from our area in Dehra Dun herbarium.

Fl. March-September.

LXXI.—MORACEÆ.

Trees or shrubs, rarely herbs with milky latex. Leaves alternate, rarely opposite, simple, frequently dotted due to presence of cystoliths; stipules deciduous, often sheathing the bud and leaving annular scars after falling. Flowers minute, greenish or hyaline, monœcious or diœcious in cymes; cymes often condensed into heads, sometimes spiciform, or crowded in hollow or fleshy receptacles. Perianth lobes usually 4, seldom 2, 3, 5 or 6, free or connate. *Male flowers.*—Stamens as many as perianth lobes and opposite them, or fewer, sometimes solitary, inflexed or erect in bud; anthers dehiscing longitudinally. *Female flowers.*—Perianth often accrescent in fruit. Ovary superior, 2-carpellary, 1-celled; styles 2 or 1 by abortion, sometimes divided; ovule solitary, pendulous. Fruit an achene or drupe or sub-2-valvular, often aggregated into large fleshy pseudocarps; seeds albuminous or not; embryo mostly curved; cotyledons often very unequal.

I. Flowers not usually crowded on, or inside large fleshy receptacles. Receptacles sometimes globose or fleshy in fruit; stamens inflexed in bud:—
  A. Female flowers solitary or 2-3, on a peduncle; style 2-fid. Male flowers capitate or subcapitate. Leaves not 3-nerved at the base; fruit baccate. .. .. .. 1. *Streblus.*
  B. Male and female flowers in spikes or females in heads; style 2-fid. Fruit an aggregate of achenes. Leaves 5-nerved at the base. .. 2. *Morus.*
  C. Male flowers spicate; fruit of fleshy long stalked drupels on globose receptacles. Leaves 3-nerved at the base. .. .. .. 3. *Broussonetia.*

II. Flowers densely crowded in globose heads, or in, or inside fleshy receptacles; stamens, straight. Fruit a pseudocarp arising from the union of the carpels:—
  A. Flowers in dense globose heads; stamens 4. Subscandent spinescent shrub. .. .. 4. *Cudrania.*
  B. Flowers crowded on elongated or irregularly globose receptacles. Male flowers with one stamen. Unarmed trees. .. .. .. 5. *Artocarpus.*
  C. Flowers crowded inside a hollow receptacle of which the mouths are closed by bracts. Unarmed. .. .. 6. *Ficus*

1. STREBLUS, *Lour.*

Streblus asper. *Lour.* Vern. *Sehore, shiwara.* Sans. *Sakhotak.*

A small rigid often gnarled, evergreen tree, with nearly smooth grey bark, sometimes with faint ridges. Branchlets scabrous, rusty when young. Leaves alternate 1·4·5 by ·6-2 in. obovate, rhomboid-elliptic, acute or acuminate, more or less toothed in the upper half, base narrowed and entire, hard when mature and scabrid on both surfaces, main lateral nerves 4·6 pairs, forming intramarginal loops; petioles short up to ·15 in. long; stipules obliquely lanceolate,

about ·15 in. long. Flowers dicœcious. *Male flowers.*—Yellowish-green in shortly pedunculate, globose heads which are ·25-·3 in. across, peduncles up to ·3 in., 1-4 together from old leaf axils. Bracts broad ovate, outer supporting the heads. Perianth 4-partite; about ·1 in. long, segments imbricate, elliptic, pubescent outside; stamens 4, exceeding the perianth, incurved; pistillode thin, pyriform. *Female flowers.*—Peduncled; peduncles fascicled less often, solitary in leaf axils, up to ·5 in. long, thickened upwards, with 2-3 bracts at the top. Sepals 4, suborbicular, ·1 in. long, imbricate, closely investing the ovary; style with long arms. Fruit a 1-seeded globose berry, ·2 in. across, loosely covered by the accrescent perianth, yellow when ripe.

Fairly common in open scrub.

The rough leaves can be used as sandpaper for polishing. The milky juice is said to rapidly coagulate milk. The leaves are applied as paste in leucoderma (*Nadkarni-Indian Materia Medica*). The roots and seeds are also used medicinally.

Blaze yellowish-white, with thin green layer at the edges exuding latex, darkening on exposure.

Fl. January-April. Fr. May-June.

2. MORUS, *Linn.* The mulberries.

Trees or shrubs. Leaves alternate, entire, toothed or 3-lobed, base 3-5-nerved; stipules lateral, caducous. Flowers spicate, monœcious, or dicœcious; sepals 4, less often 3, imbricate. *Male flowers.*—In catkin-like spikes; stamens inflexed in bud, pistillode turbinate. *Female flowers.*—In long or subglobose spikes; sepals accrescent and succulent in fruit. Ovary 1-celled; style 2-partite, central. Fruit of achenes enclosed in the succulent perianths and forming cylindric berry like heads or spikes. Seeds subglobose.

None of the mulberries is truly wild within our area. The following may be mentioned:—

1. Morus indica, *Linn.* Vern. *Tut.*

A deciduous shrub or a small tree about 25 ft. high. Leaves 2-5 in. long, ovate, acuminate, often caudate, coarsely serrate, base truncate, rounded or cordate, scabrulous, pubescent when young, sometimes lobed; petiole ·7-1 in. long. Flowers with the new leaves. *Male spikes.*—Lax flowered ·5-1·5 in. long, on slender peduncles, hairy; sepals elliptic. *Female spikes.*—Short, ovoid; sepals 4, obovate with white margins; styles long, hairy, connate to one-fourth the length. Fruit subglobose or ovoid, black when ripe, usually ·2-·5 in. long.

Cultivated in villages in the northern portion of our area. Fl. February-March. Fr. April-May.

2. Morus leavigata, *Wall.* Vern. *Tut.*

A large tree, young shoots and stipules covered with long soft hairs. Leaves 3-7 in. long, cordate or broadly ovate, somewhat abruptly caudate, sometimes lobed, closely serrate; petiole 1-1·5 in. long. Both male and female spikes elongated, drooping; male spikes hairy; female spikes nearly glabrous. Sepals 4 in female flowers, 2 outer keeled, inner flat. Styles nearly free to the base. Fruit pale-yellow, 2-3·5 in. long, cylindric, sweetish.

Cultivated in the northern portion of our area.

3. Morus atropurpurea, *Roxb.* A large tree. Leaves cordate, serrate, usually not lobed. Syncarp, long cylindric, dark-purple and sweet when ripe. Often cultivated in gardens within the area.

3. BROUSSONETIA, *Vent.*

Broussonetia papyrifera, *Vent.* The Paper Mulberry.

A medium-sized tree with grey or brown, nearly smooth bark; shoots strigose. Leaves 3-9 in. long, obliquely ovate or acuminate, sometimes palmately 3-5-lobed, serrate, subcoriaceous, scabrous above, softly pubescent beneath, base 3-nerved; petiole ·6-2 in. long; stipules lateral, deciduous, obliquely ovate acuminate, ·6-·8 in. long. Flowers diœcious. *Male flowers.*—Greenish-yellow, in cylindric, peduncled, pubescent spikes 1-4·5 in. long; peduncles about ·7 in. long. Perianth 4-fid; segments valvate. Stamens 4, extruded. *Female flowers.*—In compact, tomentose, globose, short peduncled heads ·3-·7 in. across, mixed with persistent, hairy clavate bracts; peduncles stout, about ·25 in. long. Perianth obscurely 2-4-toothed, pink, persistent; ovary stipitate; style filiform, exserted entire. Fruit over 1 in. across, red when ripe, fleshy, of stipitate drupels, endocarp crustaceous, rugose.

A native of China, Japan, Polynesia, Siam, and Eastern Burma.
Planted and naturalized at Ramgarh in Gorakhpur Division.
The inner bark is used for manufacturing paper in Japan and also yields a textile fibre. Leaves sometimes opposite. Growth very fast.
Fl. March. Fr. rainy season.

4. CUDRANIA, *Trecul.*

Cudrania javanensis, *Trecul.*

A rambling or subscandent, evergreen, large spinous shrub, or a small tree, attaining 30 ft., with yellowish-brown, sometimes cinerous bark, exfoliating in their thin flakes; and pale-yellow latex. Young shoots pubescent; spines stout, straight or slightly curved, varying in length from ·3-1·7 in. when fully formed. Leaves alternate variable in size, 1·5-3·5 by ·75-2·25 in., elliptic, obovate or oblong-lanceolate, acute, acuminate, or obtuse and mucronate at the apex, glabrous, dark-green above, paler beneath, lateral nerves slender, 8-12 pairs, forming intramarginal loops; petiole ·2-·7 in. long, stipules lateral, minute. Flowers diœcious, in dense globose peduncled and pubescent heads, about ·25 in. across; peduncles 1-2 in leaf axils, ·2-·3 in. long, pubescent. *Male flowers.*—Yellow, perianth of 3-5 lobes, adnate to 2-4 imbricate bracts; segments obovate, inflexed at the tips; stamens 4, erect, adnate at the base to the perianth segments; pistillode minute. *Female flowers.*—Perianth embracing the ovary; lobes 4, obovate-oblong, thickened and soft tomentose at the tips; style

inequally 2-fid. Fruit globose 1-2 in. across, consisting of a fleshy pseudocarp formed from the accrescent perianth and bracts, enclosing the numerous crustaceous achenes, the thickened tips of perianth lobes showing outside, velvety and orange-red when ripe.

Not common. Pilibhit, N. Oudh (Duthie), probably also in Gorakhpur. The sweetish fruit is sometimes eaten.

5. ARTOCARPUS, *Forst.*

Evergreen trees with milky juice. Leaves alternate coriaceous often large, entire or sometimes lobed, penninerved. Stipules lateral, stipular scars often prominent and annular. Flowers monœcious, densely crowded on globose or oblong, usually axillary receptacles, often mixed with scale-like or peltate bracts. *Male flowers.*—Perianth 2-4-lobed, lobes concave, valvate or subimbricate; stamen 1, erect. *Female flowers.*—Perianth tubular, confluent with the axis of the receptacle; limb minute; style central or lateral, stigma entire, rarely 2-3-fid; ovule pendulous. Fruit a much enlarged, fleshy, irregularly oblong, cylindric or globose syncarp, covered externally with the thickened tops of perianths and carpels, which are variously hardened or spinous, containing the deeply-sunk achenes. Seed often large exalbuminous, cotyledons unequal.

Mature leaves tomentose beneath; stipules pubescent; fruit subglobose, 3-4 in. across, not tubercled. ..	1. *A. Lakoocha.*
Mature leaves glabrous, stipules glabrous, fruit cylindric, attaining 30 in. or more, covered with pointed tubercles.	2. *A. integrifolia.*

1. Artocarpus Lakoocha. *Roxb.* Vern. *Barhal.*

A large deciduous tree attaining 60 ft. or more in height, with reddish-brown rough bark exfoliating in woody plates, and a large spreading crown; young parts densely grey, tawny or rusty tomentose. Leaves coriaceous, 4-12 by 2-6 in., elliptic, or broadly oblong, entire, abruptly short acuminate, acute or obtuse, somewhat rough and glabrescent above, softly pubescent beneath, main lateral nerves 6-12 pairs, tertiaries prominent; petioles ·5-1 in. long, tawny or rusty pubescent; stipules ·3-·4 in. long, lanceolate. Flowers in globose, short pedunculed heads. *Male flowers.*—Heads lemon-yellow, pink inside, up to 1·2 in. across. Sepals 2-3, truncate; stamen 1, filaments broad below; anther exserted. *Female flowers.*—Heads green, flowers completely united. Fruit 2-3 in. across, velvety, lobulate, orange-red when ripe.

Cultivated all over the area, occasionally found as an escape in the northern portion, but doubtfully wild.

The acid fruit is edible.

Fl. March-June. Fr. rainy season. Leafless hot season.

2. Artocarpus integrifolia, *Linn. f.* The Jack fruit tree. Vern. *Kathar, kathal.* Sans. *Panasa, skandaphal.*

A large evergreen tree, with large dense crown, and prominent annular stipular scars on the branchlets. Leaves 4-8 in. long, elliptic obovate, abruptly short acuminate, coriaceous, glabrous dark-green and glossy above, pale and rough beneath, lateral nerves 6-8 pairs; petiole ·5-1 in. long; stipules caducous, glabrous, long, sheathing the buds. Flowers in cylindric, oblong, axillary receptacles and enclosed at first, within two very large leathery stipules; on special branchlets. *Male receptacles.*—2·6 in. long, sepals 2. Syncarpium irregular cylindric, 12-30 in. long covered with pointed tubercles. Seeds large, about 1 in. long, oblong, farinaceous.

Cultivated.

The timber is valued for furniture making. It is at first yellow and later on acquires a mahogany tint. The fruit does not attain the same size in our area as it does in warmer and more humid parts of India. The green fruit and the seeds are eaten as vegetable. The strongly flavoured sweet pulp of the ripe fruit is largely eaten, but in large quantity is apt to produce diarrhœa.

Firs. February-March.
Fr. July-September.

6. FICUS, *Linn.*

Trees or shrubs, sometimes scandent or epiphytic in early life, with milky juice. Leaves usually alternate, rarely opposite; stipules, caducous, investing the bud and usually forming a variously shaped cone over it and leaving an annular scar. Flowers in the inner walls of a hollow, globose, or pear-shaped receptacles, often mixed with a few bracteoles, unisexual, sometimes a few flowers pseudo-bisexual, rarely mixed with a few neuter flowers, monœcious or diœcious. Receptacles usually with 3·4 bracts at the base, and mouth closed by imbricate scales, axillary or on tubercles from the main stem and larger branches, or on special leafless shoots arising from the main stem from near its base. *Male flowers.*—Perianth 2-6fid, or partite; stamens 1 or 2 (rarely 3-6), erect in bud. *Pseudo-bisexual flowers.*—With perianth as in the male, and a pistil which does not produce seeds. *Female flowers.*—Perianth as in the male, or imperfect; ovule pendulous; style ex-centric stigma entire, or 2-armed. *Gall flowers.*—Perianth as in the female flowers. Ovary containing the pupa of a hymenopterous insect; style short. *Neuter flowers.*—Perianth as in the male. Fruit an enlarged receptacle the inner wall of which is crowded with achenes.

NOTE.—In the species within our area the receptacles may contain either (1) male, female, and gall flowers or (2) males and galls sometimes with a few pseudo-bisexual flowers in one set of receptacles, and females only in the other. The male flowers are usually near the mouth.

I. Leaves alternate :—
A. Figs, axillary :—
1. Leaves rough on one or both sides :—
a. Leaves not polymorphic :—
Leaves entire, a straggling epiphyte. .. 1. *F. gibbosa var. parasitica.*
Leaves toothed or lobed rough above; never epiphytic. .. .. 13. *F. palmata.*
b. Leaves polymorphic ; a weak shrub, sometimes trailing. .. .. 10. *F. heterophylla.*
2. Leaves glabrous or tomentose, never rough :—
a. Leaves tomentose or pubescent when young :—
Receptacles pubescent, sessile ; aerial roots present.
Aerial roots, numerous growing into supports and stems ; fruit red when ripe, 5- 7 in. across ; mid-rib of leaf not glandular. .. .. 2. *F. bengalensis.*
Aerial roots not numerous, not growing into stems ; fruit grey when ripe, mid-rib with a prominent gland at the base. 3. *F. tomentosa.*
b. Leaves glabrous :—
i. Petiole not jointed at the blade :—
Secondary nerves closely parallel; receptacles ·6-·9 in. long, stiped, orange ; never epiphytic. .. 5. *F. comosa.*
Secondary nerves oblique ; receptacles ·3- 5 in. long white or purple, sessile ; usually epiphytic in early life. .. 4. *F. retusa.*
ii. Petiole jointed at the blade :—
* Ripe fruits white ; leaves oblong abruptly short acuminate. .. 9. *F. infectoria.*
** Ripe fruit purplish-black ; leaves broad ovate, more or less caudate acuminate :—
† Apex of leaf tapering gradually to the acumen, base ultimately narrowed to the petiole :—
Receptacles not depressed at the apex. .. .. .. 6. *F. Rumphii.*
†† Apex of leaf abruptly caudate acuminate, base truncate or cordate :—
Acumen 1-2 in. long; receptacles sessile, depressed at the apex. .. .. .. 7. *F. religiosa.*
Acumen ·5-1 in. long; receptacles sub-sessile. .. . 8. *F. Arnottiana.*
B. Figs usually on special leafless branches or on protruberances on old wood :—
Leaves very oblique at the base ; stipules deciduous ; figs on special often radical branches. .. . .. 11. *F. Cunia.*
Leaves more or less symmetrical at the base ; stipules marcescent. .. 14. *F. glomerata.*
II. Leaves opposite :—
Receptacles on special branches and also axillary. Small tree, branches hispid ; leaves ovate-oblong or obovate, 2·5 in. broad, not clustered at the ends of branches. .. 12. *F. hispida.*

1. Ficus parasitica, *Kœn.* Syn. **F. gibbosa,** *Bl.* var. parasitica, *King.*

An epiphytic evergreen spreading bush with rough branchlets and more or less smooth, pale-brown or greyish bark. Leaves alternate 3-6 in. long, irregularly rhomboid, broad-elliptic or ovate, obtuse, acute or short acuminate, entire or sinuate, shining and rough above, paler and more or less hairy and scabrous beneath, subcoriaceous and somewhat hard, base narrowed and usually very unequal, main lateral nerves 3-7 pairs, including the ascending basal pair, distant, prominent and raised beneath, looping within the margin; petioles ·2-·5 in. long, channelled; stipules a little shorter than, or equalling the petioles, ovate lanceolate, convolute. Receptacles solitary or paired sometimes fascicled, axillary, or sub-axillary, covered with minute protubrances, ·2-·3 in. across, globose, rough, mammilate with a stipe about as long as the receptacle, bracteate at the base. Pseudo-hermaphrodite and gall flowers in one set of receptacles and female flowers in another. *Pseudo-hermaphrodite flowers* (male flowers).—Near the mouth of the receptacle; stamen 1, united at the base to an abortive (insect-attacked) pistil, sepals 4-6. *Gall flowers.*—Style, short lateral. *Female flowers.*—Sepals 4; style lateral long.

Bundelkhand in hollows of trees—*Duthie.*

There are no specimens from our area in the Dehra herbarium. The rough leaves could be used for polishing wood and ivory.

Fr. January-March.

2. Ficus bengalensis, *Linn.* The banyan tree. Vern. *bargat, barh.* Sans. *Vatabriksha, vahishpada, skandaja, etc.*

A large evergreen tree epiphytic in early life, sending down aerial roots from the branches which greatly thicken, and ultimately form secondary trunks. Bark, whitish-grey smooth. Young parts, softly pubescent. Leaves alternate, approximate at the ends of branches, 4-8 by 2-5 in., ovate to elliptic, entire, coriaceous, obtuse or rounded at the apex, dark-green and glossy above, pale and ultimately glabrescent or thinly pubescent beneath, base rounded, subcordate or slightly narrowed, 3-7-nerved, upper pair of nerves of strongest, lateral nerves 4-7 pairs, looped within the margin, nerves prominent beneath; petiole 1-2 in. long; stipules ·7-1 in. long, deltoid, acute, coriaceous. Receptacles ·5-·75 in. across, sessile, in axillary pairs, supported by 3 rounded coriaceous, spreading bracts, globose, puberulous, red when ripe. Male, gall and fertile (female) flowers in the same receptacle. Sepals 4 in all types of flowers, small in females; stamen 1.

One of the best shade trees in the province. The wood is durable under water and is suitable for well curbs. The shoots are much used for cattle and elephant fodder. The fruit is edible. The bark is tonic and diuretic. The young buds and milky juice are astringent.

Blaze yellow with orange streaks and milky latex, fibrous.

New leaves April-May. Fr. May-July principally, sometimes at other time of the year also.

3. Ficus tomentosa, *Roxb.* Vern. *Kathbar, kathwar.*

A small or medium-sized evergreen tree (in our area), epiphytic in early life. Bark greyish with thin aerial roots. Young parts densely buff or grey tomentose. Leaves crowded at the ends of branches, alternate, variable in size, usually 2-5 (sometimes attaining 8 in. in length) by 1-4 in., oblong ovate or broadly elliptic, less often obovate, apex obtuse, blunt apiculate, or rounded, coriaceous, glabrous, base cordate 3-7-nerved, upper pair of nerves strongest, midrib with an elongated smooth gland from which the basal nerves radiate, secondary nerves 5-7 pairs above the basal; petiole ·7-1·5 in. long, tomentose; stipules ·4 in. long, acute, woolly outside. Receptacles in axillary pairs, sessile, globose ·25-·5 in. across, tomentose, grey when ripe, apical scales minute, red, glabrous, basal bracts 3, large, coriaceous, sometimes 3-fid when young, reaching halfway up the receptacles. Male gall, and fertile (female) flowers in the same receptacle; sepals 4; stamen 1.

Bundelkhand, often on rocks.
Fr. ripens in hot season, new receptacles May-June.

4. Ficus retusa, *Linn.* Vern. *Kaper, ajwai* (*Bund*).—

A medium-sized evergreen tree, epiphytic when young, with dense umbrageous crown. All parts glabrous; branches sometimes with aerial roots. Bark grey or brown, dotted with lenticels, somewhat rough on old trees. Leaves alternate, 1·7-3·5 by 1-2 in., broad ovate or elliptic, obtuse, rounded or bluntly short acuminate, base narrowed or cuneate, 3-nerved, main secondary nerves ascending, similar to intermediate nerves not prominent, meeting in loops near the margin, forming an intramarginal nerve, coriaceous, dark glossy green above, paler beneath; petiole ·2-·6 in. long; stipules up to ·4 in. long lanceolate-acuminate. Receptacles ·3-·4 in. across, sessile, axillary solitary or in pairs, depressed globose, yellow or red and tinged with purple when fully ripe; bracts 3, broadly ovate, spreading. Male, female and gall flowers in the same receptacle, sepals 3. Male flowers scattered; stamen 1.

In cool situations. Pilibhit to Gorakhpur and also in Bundelkhand, where it is found often on rocks along river banks.
Blaze orange outside, inner layers pink.
Fr. ripens February-May and also at other times of the year.

VAR. nitida F. B. I.

Leaves 2-5 by ·8-2·5 in. lanceolate, oblanceolate or narrow elliptic, bluntly short acuminate, less often acute, base tapering. Receptacles ·2-·35 in. across, sometimes slightly verrucose, otherwise as in F. retusa proper. The flowers are sometimes stalked. It occurs in the same localities as F. retusa and is probably the commoner tree.

5. Ficus comosa, *Roxb.* Syn. **F. Benjamina,** *Linn.* var. comosa, *Kurz.*

A large handsome, umbrageous tree with dark-grey nearly smooth bark and drooping branchlets, all parts quite glabrous. Leaves 2·2-4·7 by 1·2 to 2·7 in. broadly elliptic or elliptic-ovate, apex abruptly acuminate or caudate, base rounded or obtuse, thinly coriaceous, dark-green and shining above, paler beneath, sec. nerves many, nearly horizontal, more or less parallel, similar to intermediate nerves, meeting in an intramarginal nerve close to the margin; petiole ·4-1 in. long, grooved; stipules ·4-·5 in. long, narrow lanceolate, acuminate. Receptacles ·6-·75 in. across, up to 1 in. long in pairs, or solitary by abortion in upper portions of the branchlets, smooth, globose, often narrowed suddenly to a short stipe, orange-yellow when fully ripe, basal bracts initially 3, ultimately 2, short, rounded, inconspicuous. Male, female, and gall flowers in the same receptacle. *Male flowers.*—Few, scattered, stalked, anther solitary, subsessile. *Gall flowers.*—Mostly pedicelled, sepals 3-4. *Female flowers.*—Sessile.

Rare; Bahraich, Gorakhpur in cool situations.

Fr. March-May.

6. Ficus Rumphii. *Bl.* Vern. *Gajhar, parasia* (*Pil.*).

A large deciduous tree, often epiphytic, with smooth, yellowish grey or brown bark, glabrous, with the exception of young twigs which are usually hairy. Leaves alternate, 3·5-6 by 2·25-4·25 in. broad ovate, gradually tapering to a sharp acumen, which is less than 1 in. long at the apex, entire or margin undulate, base truncate, usually narrowed at the petiole or sometimes cuneate, 3-7 nerved, uppermost pair strongest, lateral nerves (excluding basal nerves) 4-6 pairs, joined by loops close to the margin, subcoriaceous, upper surface shining, covered with minute dots; petioles 1·2-3 in. long, jointed to the blade, slightly flattened or grooved above; stipules ·5-1·7 in. long, ovate lanceolate. Receptacles ·5 in. across, sessile in pairs, in axils or leaf scars, globose, black when ripe, smooth or puberulous; basal bracts 3, orbicular. Male, female, and gall flowers in the same receptacle, sepals 3. Male flowers few, near the mouth of the receptacle; stamen 1. Achenes mucilagenous.

From Pilibhit to Gorakhpur. It is a good fodder.

Blaze, orange and red excluding latex.

Fr. April-July, also in cold season. New leaves March.

7. Ficus religiosa, *Linn.* Vern. *Pipal, pipar.* Sans. *Shreevriksha, sevya, ashwatha.*

A large deciduous tree, with a spreading crown and irregularly shaped stem. Bark ashy-grey, smooth when young, more or less uneven and darker when older. All parts glabrous except the bracts.

Leaves 3·5-7 by 2-5 in. drooping, alternate, broad or orbicular ovate, abruptly long caudate, tail about a third of the blade, entire or sinuate, base truncate, shallow cordate, or sometimes abruptly narrowed at the petiole, 5-7-nerved; lateral nerves 5-10 pairs, (excluding basal nerves), forming loops, coriaceous, dark-green and pitted above, shining on both surfaces; petiole 2-4 in. long, slender, jointed at the blade; stipules ·25-·5 in. long, ovate, acute. Receptacle ·4-·5 in. across, sessile, in lower leaf axils, or leaf scars, subglobose, usually depressed at the apex, smooth, dark-purple when ripe; bracts spreading nearly half the length of receptacles, coriaceous, one sometimes lobed, thinly pubescent or ciliate, hooding over the young receptacles. Male, gall, and fertile (female) flowers in the same receptacles. *Male flowers.*—Few, near the mouth of the receptacles, sometimes none; sepals 3, obovate; stamen 1. *Gall and female flowers.*—Sepals 5, lanceolate.

All over the area, chiefly planted near Hindu temples. In early stages epiphytic on other trees, or growing on masonry.

The tree is regarded as sacred both by Hindus and Buddhists. The leaves and twigs are good elephant fodder. The latex, bark, and fruits are used medicinally.

Blaze reddish, with lighter bands, hard outside, fibrous inside.

New leaves bright-pink February-April. Fr. ripen April-May, also November.

8. Ficus Arnottiana *Micq.* Vern. *Kathpipal, paraspipal.*

A small evergreen glabrous tree with reddish-brown or grey bark, exfoliating in woody scales; young shoots covered with deciduous bloom. Leaves alternate, crowded at the ends of branches 2·5-8 by 2-6 in., broad ovate, abruptly short caudate, tail with up to ·6 in. long, rarely acute, entire, base truncate to deeply cordate and 5-7 nerved, lower pairs of nerves weak, lateral nerves 5-7 pairs forming loops within the margin, tertiaries ultimately minute, reticulate, glabrous, upper surface with minute raised dots (when dry); petiole 2-6 in. long, jointed to the blade, slightly grooved at the top; stipules caducous, membranous up to 2·5 in. long, narrow lanceolate. Receptacles in pairs or clusters, on tubercles in leaf axils, or from leaf scars shortly peduncled, or subsessile, depressed globose, purple with greenish dots when ripe. Peduncle stout up to ·4 in. long in ripe receptacles; bracts 3 at the top of the peduncle, thickened at the base, sometimes lobed. Male, female and gall flowers in the same receptacle. *Male flowers.*—Sepals 3, lax; anther subsessile. *Female and gall flowers.*—Perianth gamophyllous, completely covering the ovary.

Jhansi, Banda on rocks.

Blaze. Reddish-brown, fibrous.

Fr. July, also November.

9. Ficus infectoria, *Roxb.* Vern. *Pakar.*

A large deciduous tree sometimes with a few aerial roots and compact spreading crown, epiphytic in early life. Bark smooth greenish-grey; young twigs usually minutely pubescent. Leaves alternate 3-7 by 1·3-2·7 in., ovate or ovate-oblong, abruptly short acuminate margins entire or undulate, base retusely cordate, rounded, truncate, or less often narrowed to the petiole, 3-nerved, main lateral nerves 5-8 pairs, looped, glabrous, thinly coriaceous and shining; petioles 1·2-2·75 in. long, glabrous, more or less shallow grooved and jointed to the blade; stipules up to ·5 in. long, broad ovate, acute, usually pubescent. Receptacles ·25-·4 in. across, axillary in pairs, globose, sessile, or on pubescent or glabrescent peduncles up to ·25 in. long, sometimes tubercled, white, flushed with red, pink dotted when ripe, glabrous or pubescent (in some forms woolly); basal bracts 3, minute, oval or spreading. Male, gall and female flowers in the same receptacle. *Male flowers.*—Near the mouth of the receptacle, sepals 4-5; stamen 1. *Female and gall flowers.*—Sepals 3-4.

All over the area

Often planted near villages. The fruit is eaten and leaves are lopped for fodder. It gives even a denser shade than the banyan, and is often planted on roadsides, and in gardens.

Leafless for a short time towards the end of the cold season. New leaves covered with flaccid, linear lanceolate, membranous, bud scales, which fall off before leaves are fully formed. In new foliage the tree is very ornamental having tints varying from copper to light-pink

Fr. ripen April-May, also in September-October.

The following varieties may be mentioned:

1. The type. Leaves narrow, receptacle sessile. Not common in our area.

2. VAR. Lambertiana, *King.* Leaves broader, than in the type, rounded or broadly cordate at the base; receptacles pedunculed: woolly, ·3-·4 in. The common form within our area.

3. VAR. Wightiana, *King.* Leaves smaller than in other varieties, often only 2·5 in. long, narrowed at the base receptacles on glabrous or pubescent peduncles. The southern edge of the Gangetic Plain has been included in the distribution of this variety in F. B. I. There is no specimen from our area at Dehra herbarium. It may be looked for in Bundelkhand.

10. Ficus heterophylla. *Linn. f.*

A straggling sometimes creeping or climbing shrub. Twigs brown, often rough. Young parts pubescent. Leaves alternate 2-7 in. by ·8-·2·5 in., polymorphic, varying from narrow lanceolate to broad ovate, variously toothed or lobed, short acuminate or acute, scabrous and thinly hispid on both surfaces, or sometimes softly pubescent

beneath (*var. repens*); base usually obtuse, rounded or cordate, 3-5-nerved, lateral nerves 4-7 pairs; petiole ·2-1·7 in. (sometimes attaining 3 in.); stipules ·3-·4 in. long, lanceolate, acuminate. Receptacles ·5-1·3 in. long, solitary in leaf axils; pedunculate, globose, or pyriform, narrowed into a stipe up to ·3 in. long, rough when young, smoother with age, apex mammilate, with a partially open centre, yellow or orange when ripe. Bracts at the base of the stipe, minute, triangular; peduncle proper ·4-1 in. long in fully formed receptacles. Male and gall flowers in one set of receptacles, female flowers in another. Perianth 3-4-cleft. Stamen 1.

All over the area, in shady damp places

Fr. January-March.

The following varieties may be separated :—

VAR. 1. heterophylla, proper. Often creeping. Leaves usually 2-4 in. long, deeply or shallowly pinnatifid or not lobed in the same plant, usually ovate in outline; receptacle rough.

VAR. 2. scabrella, *King*. Leaves usually 2-5 in. long, not lobed, narrow; petiole ·1-·3 in. long; peduncle of receptacles short; receptacles globular or subpyriform.

VAR. 3. repens, *King*. Leaves 3-4 in. long, broad-ovate or oblong-elliptic, lobed or not, base unequal, obtuse or deeply cordate, scabrous above, softly pubescent or glabrescent beneath; petiole long; receptacles usually pyriform, long pedunculate.

Gorakhpur (Kalnahi).

VAR. 4. sarmentosa, *Haines*. More robust than any of the preceding, sometimes subscandent, attaining 15 ft. (*Haines*). Leaves 3-7 in. long, oblong, or oblong lanceolate, distantly toothed, petiole ·5-·6 in long.

Is it a more robust form of var. scabrella?

Bahraich, Gonda, Kheri.

11. Ficus Cunia. *Ham.* Vern. *Khurhur, jarphali.*

A small to medium-sized tree, with reddish, or greyish-brown, somewhat rough bark; young shoots hirsute. Leaves alternate, variable in size, usually 4-10 in. long, oblong or elliptic-lanceolate, acuminate or acute, distantly serrate, crenate or entire, base semi-sagitate or semi-cordate, very unequal, with a large 3-4-nerved lobe on one side, lateral nerves 7-14 pairs, prominent, hard and coriaceous, scabrid on both surfaces, or pubescent beneath, dark glossy green above; petiole ·2-·6 in. long, rough; stipules ·5-1·5 in. long, oblong-lanceolate. Receptacles in pairs or clusters, in axils of scales, on drooping, mostly leafless, branches, often several feet long, from near the base of the tree, or from larger branches, short pedunculate, ·4-·7 in. across, globose, or pyriform, with a central aperture between the apical scales, more or less verrucose, often with irregular

bracteoles on the surface, hispid, reddish-brown or white when ripe; peduncle ·1-·3 in long. Bracts broad ovate, about ·1 in. long, 3 at the top of the peduncle. Male and gall flowers in one set of receptacles, female (fertile) flowers in another. *Male flowers.*—Perianth 3 cleft; stamen 1. *Female flowers.*—Perianth 4-lobed; achene mucilaginous.

Throughout the area on nala banks, and broken ground.

Blaze red, fibrous, with crea n coloured latex.

An inferior lac can be grown on the tree. The bark fibres can be made into rope. The fruits are edible.

Fr. almost throughout the year, but mainly in August-September.

12. Ficus hispida, *Linn. f.* Vern. *Kathgular.* Sans. *Kak-dumbara.*

A small tree with hollow twigs (internodes) bark greenish-grey or brownish, smooth, often warted or horizontally wrinkled; shoots hispid. Leaves opposite or sometimes subopposite, rarely alternate 4-9 by 2·2-4 in. (sometimes larger in young plants) obovates to obovate-oblong, elliptic, or oblong, acute or shortly acuminate, somewhat distantly toothed, rarely entire, hairy and scabrid above. base narrowed, obtuse, rounded or subcordate, rarely cuneate, lateral nerves 5-8 pairs including the basal, ascending; petiole hispid, ·5-2 in. long (sometimes up to 4 in. in young plants); stipules up to ·5 in. long, ovate lanceolate. Receptacles in pairs or clusters, on nodes of short tuberculate branches from old wood, or on long, often drooping scale-bearing, or sometimes leafy, branches; less frequently (usually in young plants or shoots) in pairs on leaf axils, ·5-1 in. across, obovoid or turbinate, narrowed to a short stipe, umbonate at the top, hispid, occasionally with brown scales and warts which sometimes bear rudimentary bracteoles, greenish-yellow and faintly ribbed when ripe; bracts usually 3, at the top of the peduncle, sometimes whorled, ·2-·6 in broad. Male and gall flowers in one set of receptacles; female in another. *Male flowers.*—Perianth hyaline, 3-cleft; stamen 1. *Female and gall flowers.*—Perianth rudimentary or nil.

An over the area.

The young figs make a wholesome curry. The figs and bark are medicinal. The leaves are lopped for fodder.

New leaves February-March. Fr. almost throughout the year.

13. Ficus palmata, *Forsk. Anjir.*

A deciduous shrub, or a small tree, with smooth, grey lenticellate bark; young parts pubescent or tomentose. Leaves very variable 1·5-6 by 1·3 5 in., orbicular or broad ovate, acute, obtuse or rounded

at the apex, crenate-dentate or palmately lobed, lobes often pinnatifid, rough above, pale and tomentose beneath, base truncate or retusely cordate, sometimes cuneate at the junction with the petiole, 3-less often 5-nerved, lateral nerves 4-7 pairs; petiole 1-2 in. long; stipules ·2-·3 in. long, ovate, acute. Receptacles ·5-1 in. in diameter, pedunculate, solitary or in pairs in leaf axils, subglobose to pyriform, umbonate, narrowed at the base, often into a short stipe, tomentose to nearly glabrous, purplish or pink when ripe. Bracts 3 or more, acute, deciduous at the top of the peduncles; peduncles ·5-1 in. long pubescent or glabrate. Male and gall flowers, in one set of receptacles, female (fertile) flowers in another. *Male flowers.*—Sepals 4-5, lanceolate; stamens 3-6. *Female and gall flowers.*—Perianth hyaline, 5 cleft.

Throughout the area, also in Etawah on banks of nallahs.

The two types of receptacles are often borne on separate trees.

Fr. June-October. New leaves March-April.

14. Ficus glomerata, *Rox.* Vern. *Gular.* Sans. *Udumbura.*

A large deciduous tree with smooth, pale or reddish-brown bark, somewhat rough and exfoliating in irregular woody plates in old trees; base of the stem usually buttressed; young parts pubescent. Leaves 3-6 by 1·5-2·75 in., ovate-oblong to elliptic lanceolate, somewhat bluntly acuminate or acute, entire, glabrous when mature on both surfaces, undersurfaces somewhat rough to the touch due to minute tubercles, base rounded or narrowed, 3-nerved, lateral nerves 4-7 pairs; petiole ·7-2·2 in., glabrous or slightly pubescent; stipules long persisting, ·3-1 in. long, ovate or oblong-lanceolate, thinly pubescent outside. Receptacles pedunculate on stout, leafless, scale bearing branches, rarely axillary, 1-1·75 in. across, globose or pyriform, narrowed at the base often to a stipe, pubescent when young, glabrate with maturity, orange or pink when ripe. Bracts 3 by ·15-·2 in., triangular ovate, silky pubescent; peduncles ·3-1 in. long, hairy. Male, gall and female flowers in the same receptacles. *Male flowers.*—Near the mouth; sepals 3-4; stamens 2; filaments connate. *Gall flowers.*—Perianth gamophyllous, irregularly toothed. *Female flowers.*—Perianth 4-5-cleft.

Throughout the area also in Etawah along banks of streams.

The fruit is eaten. The leaves are used for fodder. The root bark latex fruits and gall are used in Hindu medicine.
The receptacles are pink inside and when ripe have a pleasant flavour. Trunk often with horizontal lines. Blaze yellowish or reddish turning brown.

Fr. rarely April-July. New leaves January-April

LXXII.—SALICACEÆ.

Soft-wooded trees or shrubs. Leaves deciduous, alternate, stipulate, buds enclosed in scales. Flowers unisexual, usually dicecious, in catkins, each in the axil of a bract. Bracteoles and perianth none. Disk of one or more glands or cupular. *Male flowers.*—Stamens 2 or more; filaments usually free; anthers dehiscing longitudinally. *Female flowers.*—Ovary sessile or stipitate, 1-celled; style short or none; stigmas, notched or lobed; ovules few or many on 2-4 subbasal or parietal placentas, erect. Fruit an ovoid or lanceolate 2-4-valved capsule. Seeds few or many, each enclosed in a mass of tufted hairs; albumen none; radicle inferior.

SALIX, *Linn.*

Salix tetrasperma, *Roxb.*

A branchy, medium-sized deciduous tree with rough and deep furrowed, dark-grey or brown bark, young parts silky. Leaves 2·5-6 by ·6-1·75 in., narrowly, or broad lanceolate, caudate acuminate, cuspidate serrulate or nearly entire, subcoriaceous, dark-green and glabrous above, pale or white glaucous beneath, lateral nerves many, prominent; petiole ·2-·7 in. long, stipules caducous subulate to semicordate prominent in young shoots. Catkins on short lateral shoots, hairy, leafy at the base; male catkins 2-5 in. long; female catkins 1-4 in. long. *Male flowers.*—Bracts concave, obovate, pubescent; stamens 4-10; filaments of various lengths, hairy at the base; disk of 2 yellow glands. *Female flowers.*—Bracts smaller than in male flowers; ovary glabrous, style 0; stigma 2-branched, each branch 2-lobed; disk semicircular, fleshy, yellow. Capsule ·15-·2 in. long, on a slender stalk, half to nearly as long as itself.

Along banks of streams and swamps all over the area.

Blaze pale pink.

Fl. September-October also sometimes February-March. Fr. November-December.

S. babylonica *Linn.* The weeping willow. *Majnun.*

A middle-sized tree with drooping branchlets. Leaves 3-7 by ·4-1 in., linear-lanceolate, finely serrulate, glabrous above. Flowers with the leaves. Catkins ·5-1 in. long. Stamens 2, capsules sessile.

Sometimes cultivated in gardens

CLASS.—MONOCOTYLEDONS.

LXXIII.—AMARYLLIDACEÆ.

Perennial herbs, sometimes shrubs. Root-stock usually a bulb, tuber, or corm, rarely erect. Leaves radical. Flowers bisexual, more or less regular, on terminal leafless scapes. Perianth 6-lobed, in two whorls, stamens 6, adnate to the base of the perianth lobes; filaments free or connate below anthers, linear-oblong. Ovary inferior, 3-celled sometimes beaked; ovules many in two rows on the inner angle; style slender; stigma simple or 3-cleft. Fruit usually a loculicidal capsule, less often fleshy.

The family is of comparatively little forest interest and contains only one naturalized genus of shrubby plants.

AGAVE, *Linn.*

Stem short, or produced as an erect or procumbent woody trunk. Leaves rigid, fleshy, fibrous, usually with prickly teeth on the margins, and a stout spine at the apex. Inflorescence spicate, or flowers in peduncled cymes or clusters, forming a pyramidal panicle on a gigantic scape (our species). Perianth lobes linear, erect, or spreading, tube short. Stamens exceeding the perianth. Capsule beaked, coriaceous, often replaced by bulbils. Seeds numerous, thin, flattened, superposed, testa black.

The usual method of propagation is by means of bulbils which are produced on the scapes.

I. Leaves over 3 ft. long, tufted or in a lax rosette :—

A. Leaves not constricted above the base.

Leaves broadest at the middle, tapering in both extremities, marginal prickles ·5-·7 in. apart. .. .. .. 1. *A. vera-cruz.*

Leaves hardly widened in the middle. .. 2. *A. cantala.*

B. Leaves constricted above the base. .. .. 4. *A. americana.*

II. Leaves under 3 ft. in length, in close rosettes. .. 3. *A. Wightii.*

1. Agave vera-cruz, *Miller.*

A stout shrub with short trunk. Leaves 4-6 ft. long and 10 in. or more wide at the widest point above the middle, dark-green and glaucous, linear-oblong, sometimes concave about the middle, ends more or less decurved or drooping, hardly constricted above the base, marginal prickles blackish, spreading, decurved about ·5 in.,—rarely ·7 in.—apart; apical spine ·5-1 in. long, dark-brown. Panicles trichotomous. Perianth of a pale-amber tint, lobes linear-lanceolate anthers much exerted. Ovary exceeding the perianth.

The common grey-aloe of hedges in our area.

Native country probably Mexico: but naturalized in many parts of the world.

2. Agave cantala, *Roxb.*

Root-stock of a short ascending rhizome. Leaves laxly tufted in rosettes attaining a length of about 4 ft. and width of 3 in. at the widest point about the middle, linear-lanceolate, curving gradually outwards from the base, tip usually drooping, pale-green, darker when old, sometimes glaucous, uppersurface more or less concave, marginal prickles large, about ·2 in. long, from a light-coloured cushion, terminal spine ·5-1 in. long, cylindric-acicular, reddish or dark brown. Scape with panicle 12-18 ft. in height. Perianth greenish, lobes 1·5 in. long, linear-lanceolate obtuse; tube very short.

Throughout the area, also Etawah, *Drummond and Prain*; has been long introduced and is now fairly common in hedges. Native country unknown.

3. Agave Wightii, *Drummond* and *Prain.*

A stiff shrub, trunk, ascending or procumbent. Leaves in a compact rosette, attaining 3 ft., but usually 2·25 ft. by 3·5 in. at the widest point, pale-green often tinged with ash, marginal prickles rather weak, ·7 in. apart, recurved, terminal prickle ·5-1 in. long, pale, base thin, broadly amplexicaul. Scape with the panicle 12-15 ft. high. Perianth greenish-yellow; lobes 6, lanceolate, tips ligulate; tube short. Capsule 1·2-1·5 in. long, ovoid-globose, beaked.

Nor common in our area, but is sometimes planted in drier parts.
An agave closely allied to this species, with variegated leaves is grown in gardens.

The fibre is said to be good, but is shorter than that of A. sisalana, *Perrine.*

4. Agave americana. *Linn.* The American Aloe.

Trunk prostrate or ascending. Leaves 4-6 ft. long. and up to 6 in. broad, about the middle, constricted above the base, often variegated with white and yellow stripes, marginal prickles, recurved, tip hardened and involute, ending in the grooved terminal spine 1-2 in. long.

Scape with the panicle 15-25 ft. high. Cultivated in gardens.
Besides these a few other species of Agave are grown in our area These have not been satisfactorily identified yet.

Furcraea Sp. Mauritius Hemp. Vern. *Rambans.*

A large handsome shrub resembling an Agave, with large bright-green leaves 4-6 ft. long and about 8·5 in. wide at the widest point below the middle, obovate-lanceolate, marginal prickles weak, occasionally absent, tip blunt, grooved. Scape 10-15 ft. (*Haines*).

The species has not been satisfactorily ascertained, but is close to F. gigantea, *Vent.*

Planted usually in gardens, a variegated form is also known. Native country not known

Curculigo orchioides, *Gaertn.* Vern. *Kali musli.* Sans. *Hemapushpa, bhumitala.*—A small perennial herb with an elongated black tuberous root-stock with fibrous sheath at base of stem. Leaves 6-18 in. long, linear lanceolate or linear plicate, tapering into an elongating petiole. Flowering scape hidden by sheathing, lanceolate, hairy bracts, and leaf bases, larger portion being underground. Flowers yellow, perianth usually pushed above ground by, and borne on, the elongating beak of the ovary.

The tuberous root-stock is valued in Hindu medicine as a tonic and commands a ready sale.

Many ornamental plants belonging to this family are cultivated within our area. The following may be mentioned :—

Crinum Sp.—Stout herbs sometimes with a considerable aerial stem. Leaves fleshy. Flowers large, white or pink in umbels. Perianth funnel or salver-shaped, with linear or oblong lobes. white or pinkish.

Polianthes tuberosa. *L.* The tuberose.—A handsome plant with linear leaves, bearing a long scape, with white, flowers with suberect lobes which are very fragrant in the night. Common in gardens. Fl. hot and rainy season.

Zehpyranthes spp. Zephyr flower. Crocus-like plants, with narrowed grass-like leaves, and bearing scapes with solitary flowers invested at the base by a membranous spathaceous bract. Flowers white (*Z. tubispatha, Herb*), rose (*Z. rosea Lindl*) or yellow (*Z. flava*); common in gardens.

LXXIV.—DIOSCOREACEÆ.

Large, usually climbing herbs, with often a thick fleshy underground root-stock. Leaves alternate, or opposite, simple or compound, nerves digitate at the base. Flowers small, usually 1-sexual, in spikes racemes or panicles. Perianth superior. *Male flowers.*—Perianth 6-lobed, lobes short spreading; stamens usually 6, inserted at the base of the perianth or on the lobes, sometimes 3 reduced to staminodes, or absent; anthers 2-celled, cells contiguous, or on branches of the filament; pistillode thick, fleshy or 0. *Female flowers.*—Perianth smaller than in male flowers 6-cleft, persistent; staminodes 6, 3, or 0; ovary inferior, 3-quetrous, 3-celled; styles-3, very short; stigmas entire or 2-fid, recurved; ovules 2 in. each cell. Fruit a berry or a 3-valved capsule; seeds, often winged, albuminous.

The family contains no woody plants but is economically important as tubers of most species of Dioscorea are dug up and eaten, some after considerable preparation.

DIOSCOREA, *Linn.*

Leaves alternate or less often opposite, entire, lobed, or digitately 3-9-foliolate, sometimes bearing bulbils at the axils. Flowers usually dioecious. Fruit a 3-cornered, almost winged capsule. Seeds compressed often with a large membranous wing.

I. Leaves digitately 3-5-foliolate :—

Leaves trifoliate, stamens 6 perfect capsule 1·5-1·75 by ·8-1 in. .. .. .. 1. D. *dæmona.*

Leaves 3-5-foliolate, stamens 3 perfect; capsule ·7-·8 by ·4 in. .. .. .. 2. D. *pentaphylla.*

II. Leaves simple :—

A. Tubers directly from the base :—

1. Glabrous climbers :—

Male spikes slender, 2-6 in. long; perianth segments linear; capsule oblong; seed winged at one end; tubers subglobose, solitary... 3. D. *bulbifera.*

Male spikes stiff, usually under 2 in; perianth segments broad; capsule transversely elliptic; seeds winged all round, tubers elongate fascicled. .. .. 4. D. *Wallichii.*

2. Pubescent climber—especially inflorescence, undersurface of leaves and shoots. .. 5. D. *anguinea.*

B. Tubers borne on long fleshy fibrous roots :—

Unarmed, secondary nerves prominent; ovary and capsule beaked, capsule usually not retuse or truncate at the base .. 6. D. *belophylla.*

Often armed at the base; secondary nerves not prominent; ovary and capsule not beaked; capsule retuse or truncate at the base. 7. D. *glabra.*

1. Dioscorea dæmona, *Roxb.* Syn. D. triphylla, *Linn,* var. dæmona *Roxb.*

A strong twiner; stem and sometimes petiole covered with weak prickles. Tuber elongate, irregular, covered with root fibres and "eyes". Young parts grey pubescent. Leaves variable in size, 3-foliolate; petiole long, attaining 12 in. in lower leaves, usually about the length of leaflets or a little longer. Leaflets usually 4-10 by 2·7—4·5 in., lower sometimes attaining 12 in. smaller in flowering branches, central broad obovate, abruptly short acuminate, narrowed or cuneate at the base, lateral very oblique, all 3-5-nerved, membranous, glabrescent or pubescent along the nerves; petiolules short, pubescent. *Male spikes.*—Short pedunculate, ·2-·35 in. long, compact, pubescent in fascicles of 1-5, usually distant on short or lax racemes usually 2-10 in. long, but sometimes over 12 in. long; bracts minute, pubescent. Perianth lobes broad ovate, whorls unequal, outer smaller; stamens 6,

subsessile. *Female spikes.*—Simple 2-8 in. long; bracts linear lanceolate; ovary tomentose, not beaked. Capsule large, 1.5-1.75 in. by .8-1 in., obovate-oblong: seeds 1-1·2 in. long (including the wings), winged on one side.

From Pilibhit to Gorakhpur; Bundelkhand—*Duthie.*
The tubers are said to be edible after frequent washing and boiling.
Fl. June-July. Fr. August-September.

2. Dioscorea pentaphylla, *L.* Vern. *Ban-arwi.*

A tall slender climber, more or less distantly prickly, specially on the lower part of the stem. Tubers elongated; bulbils pyriform or elongate; young parts grey or rusty pubescent. Leaves 3-5-foliolate; petiole usually 2-5 in. long. Leaflets usually 2-5 in. long, membranous, middle one broad ovate to oblanceolate, apex abruptly caudate, base cuneate, sometimes 3-nerved glabrescent or pubescent on both surfaces. *Male spikes.*—Peduncled, .4-1·5 in. long, not compact, usually in clusters of two, sometimes more, arranged in lax hairy panicles, or less often in racemes, attaining 12 in. or more in length. Flowers sessile, or minutely stalked, bracts concave, broad acuminate or rounded; bracteoles lateral; stamens 3 perfect, staminodes 3; pistillode 3-lobed. *Female spike.*—Lax, 2-8 in. long, pendulous; ovary tomentose; bracts ·15 in. long, broad ovate, concave, sharp acuminate; bracteoles lateral, lanceolate. Capsules ·7-·8 in. by ·45 in. deflexed, oblong, 4-angled, obtuse or rounded at both ends, thinly pubescent or glabrous. Seeds ·5-·7 in. long (including the wing), winged on one side.

Common throughout. The tubers are edible.
The following varieties as defined by Prain and Burkill occur within our area:—

VAR. 1. Suli, *Prain and Burkill.*—Leaves grey pubescent, not shining.

VAR. 2. Cardonli, *Prain and Burkill.*—Leaves sparsely clothed with reddish hairs, flowers small.

VAR. 3. communis, *Prain and Burkill. Kanta-alu.* Tubers short, armed, flesh firm insipid; leaflets 3 or 5 clothed with reddish hairs.

Fl. rainy season. Fr. November-April.

3. Dioscorea bulbifera. *Linn.* Syn. **D. sativa,** *H.k.f.* Vern. *Ratalu.*

A large unarmed glabrous climber; stem sometimes winged; tuber in wild varieties small, produced at the base of the stem. Bulbils numerous warty, brown, irregular in shape, sometimes large. Leaves usually alternate, rarely opposite, usually 3-6 in. long, but sometimes attaining 10 in. or more, shorter on upper branches broadly ovate to orbicular cordate, with 9-11-nerves, primary and secondary nerves raised on the lower surface; petiole smaller than or equalling the leaves, usually 2·5 in. long, thickened and with two small decurrent membranous wings at the base. *Male spikes.*—Slender, lax, 2-6 in. long, in fascicles of 2-5 on leaf axils, or on spreading panicles. Flowers purplish, bracts broad; abruptly acuminate, perianth segments free, nearly

to the base, linear-oblong ; stamens 6, perfect. *Female spikes.*—Drooping, up to 11 in. long, several from each axil; flowers recurved; ovary glabrous, perianth as in the male flowers. Capsule oblong, ·5-·75 by ·45 in., seed with an oblique wing at one end.

Throughout the area usually in scrub forests.

Tubers sometimes elongate, they are acrid in some wild forms. In some varieties the bulbils are edible ; sometimes cultivated.

Fl. rainy season Fr. cold season.

4. Dioscorea Wallichii *Hk.f.*

A glabrous stout climber, lower parts of the stem often spiny; tubers fascicled. Leaved simple opposite or alternate usually 3-6 in. long, lower larger, ovate or orbicular cordate, cuspidate, or caudate, more or less coriaceous ; petiole about as long as the leaves, subterete, base persisting and hardening after fall of leaf. *Male spikes.*—·5-1 in. long, lax 2 or 3, on the branches of short axillary, or a lax terminal, panicle. Perianth segments broad; pistillode globose, large. *Female spikes.*—Panicled 1-2·5 in. long. Capsule transversely elliptic ; emarginate at the top and the base; seed winged all round; wing mottled (*Haines*).

VAR. vera, *Prain and Burkill.*—with glaucous capsule is recorded from Bundelkhand by Duthie, but there are no specimens from our area at Dehra herbarium.

Tubers edible.

Fl. rainy season.

5. Dioscorea anguinea, *Roxb.*

A large unarmed climber with pubescent branches; tubers borne directly at the base of the stem. Bulbils with more or less smooth skins somewhat resembling small potatoes. Leaves alternate or opposite, membranous 3·5-10 in. long, board-ovate to orbicular cordate, shortly cuspidate, base more or less deeply cordate, 7-9-nerved, secondary nerves raised on the lower surface and sub-parallel, upper-surface glabrescent, or thinly pubescent, undersurface greyish pubescent and covered with raised dots, margins tough; petiole 1·5-4 in. long, pubescent, thickened at the junction with the stem. *Male spikes.*—Pubescent ·5-·9 in. long, rather dense flowered, in fascicles or whorls on pubescent racemes which are 2-7 in. long; bracts acute, tomentose. Perianth segments unequal, outer larger, ovate elliptic, hairy; stamens 6, inserted on the perianth, pistillode globose. *Female spikes.*—2-4 in. long; bracts acuminate persistent; ovary pubescent not beaked; perianth segments broadly ovate, rounded, persistent. Capsule transversely elliptic ·7-·8 in. by 1·2-1·4 in., retuse or truncate at the apex and base, with an obconic stipe, more or less pubescent at the top and along the stipe; seed winged all round, wing small ·25 in. across, occupying a part of the loculus.

Bahraich, not common.

The tubers are sometimes lobed, edible.

Fl. October-December. Fr. cold season.

6. Dioscorea belophylla, *Voigt.* Vern. *Tarur.*

Stems twining to the right, base, elongated to a small rhizome bearing elongated cylindrical tubers at the ends of long fibres; bulbils few, 1-2 in. long, brown, nearly smooth. Leaves opposite and alternate, 2·5-6 by 1·2-4 in., lower sometimes much larger and attaining 12 in., ovate, abruptly short acuminate or cuspidate, base cordate or sagitate with rounded lobes, 9-11-nerved, undersurface bluish glaucous, secondary nerves rather prominent beneath; petiole 1·2-4 in. or more, channelled, upper portion dilated and decurrent into basal nerves. *Male spikes.*—·75-2 in. long, lax 1-3 together in leaf axils, or large leafless panicles; bracts deflexed, concave, acute. Perianth lobes oblong, pubescent outside, outer segments nearly free, broader than the inner. Stamens 6 on a short column; pistillode trifid at the top; trigonous. *Female spikes.*—2-7 in. long, drooping, simple, solitary, or several from leaf axils. Ovary glabrous, constricted into a cylindrical tube below the perianth, lobes broad, ovate. Capsule broader than long, ·7 in. long by 1-2 in. broad, truncate or retuse at the top, usually beaked, narrowed at the base. Seed eccentrically winged all round; wing ·5-·7 in. long.

Common within our area. The most highly prized of our forest yams.

Fl. September-November. Fr. January March.

7. Dioscorea glabra, *Roxb.* Syn. **D. nummularia,** *Roxb.*

Stems twining to the right; bulbils absent, base enlarged into a root-stock on which tubers are borne. Tubers elongated, often curved sometimes of large size. Leaves opposite and alternate 2·7-7 in. long, ovate elliptic or sub-orbicular, cuspidate or less often acuminate, undersurface greyish glaucous, thin, base cordate, truncate or retuse, 5-7-nerved, secondary nerves not prominently reticulate; petiole from about half the length of the blade to as long as the blade, channelled, bases enlarged at the nodes. *Male spikes.*—·5-1·25 in. long, in opposite clusters, in axillary shoots, or in lax leafless racemes; bracts acuminate. Outer perianth segments acute, inner obovate. *Female spikes.*—Elongate. Capsule about 1·3 in. by ·7 in., 3-angled, transverse elliptic, retuse at the top and at the base, stipe very short, obconical, glabrous, rarely subglaucous, tipped with the remains of the perianth which ultimately falls off; seed winged all round; wing ·7 in. across, completely filling the loculus, abruptly truncate along the axils of the capsule.

Closely resembling D. belophylla. The tubers are largely eaten, but are not so good as those of the last species.

Pilibhit, Kheri, and probably in all Oudh Divisions, Gorakhpur.

Fl. September-November. Fr. November-March.

The following are known in cultivation :—

1. **D. aculeata,** *Linn.*—Leaves cordate, tubers produced in a spreading bunch, uppermost sometimes spinose.

2. **D. alata,** *Linn.*—Stems often acutely winged. Leaves ovate, base agitate to cordate, petiole winged, dilated at the base.

LXXV.—LILIACEÆ.

Herbs or shrubs, sometimes climbing, less often small trees, with fibrous roots and underground creeping root-stocks bulbs or corms. Leaves various, sometimes reduced to scales, their function being performed by cladodes, rarely reticulately veined. Flowers 2-sexual, rarely 1-sexual, usually regular, inflorescence various. Perianth herbaceous or petaloid, of 6 segments in two whorls, usually imbricate in bud. Stamens 6, rarely 3, or fewer; filaments free or connate; anthers dehiscing longitudinally, often versatile. Ovary superior 3-celled; ovules 2 or more in each cell, from the inner angles, in 2 parallel rows; style simple long, or styles 3. Fruit usually a 3 celled capsule, or one or more-seeded berry. Seeds globose or flattened, albuminous, embryo minute.

I. Leaves with prominent basal nerves, and reticulate secondary nerves. Flowers in umbels. .. 1. *Smilax.*

II. Leaves replaced by needle-like tufted cladodes. Flowers solitary, fascicled, or in racemes. .. 2. *Asparagus.*

1. SMILAX, *Linn.*

Usually climbing shrubs. Leaves alternate, rarely opposite with 3-5 main nerves, ascending from the base and arching to the apex; petiole usually with two tendrils and sheathing, at the base. Flowers dioecious, umbelled; perianth segments 6, free. *Male flowers.*—Stamens 6, free, filaments sometimes forked separating the anther cells. *Female flowers.*—Staminodes 3 or 6, ovary 3-celled, 3-angled; ovules 1-2 in each cell, pendulous. Style 0 or very short; stigmas 3. Fruit a globose berry; seeds 1-2 less often 3; albumen horny.

I. Inflorescence of 1-5 umbels :—
A. Petiolar sheath not auricled :—
Umbels 2-5 alternate; pedicels up to ·25 in. long, staminodes in female flowers 6. .. 1. *S. macrophylla.*
Umbels usually solitary, less often 2; pedicels up to ·5 in. long; staminodes in female flowers 3. .. .. *S. Zeylanica.*
B Petiolar sheath with large auricles. .. .. *S. Roxburghiana.*
II. Inflorescence compound, of 7-20 umbels arranged in whorls. .. .. 2. *S. prolifera.*

1. Smilax macrophylla, *Roxb.* Vern. *Rampan.*

A large climber, stem distantly prickly, striate. Leaves variable, 4-9 by 2·3-8·5 in., broad elliptic or suborbicular, cuspidate, thinly coriaceous, glabrous, shining above, paler beneath, base rounded or subcordate and narrowed to the petiole, 5-7-nerved, intermediate nerves reticulate; petioles ·5-1 in. long; narrowly sheathed, sheath with two tendrils, which are up to 12 in. long, edges of sheath often infolded and meeting. Flowers many, in pedunculate umbels; umbels usually 2-3, sometimes up to 5, or 1, alternate on a common axis; peduncle of inflorescence axillary ·5-1 in. long, peduncle of umbels ·5-1·5 in. long; bracts (at the base of the peduncles) ovate acute; bracteolate many, below the pedicels, minute; pedicels ·2-·3 in. long, elongating and up to ·5 in. in fruit. Perianth segments ·2-·3 in. long, linear-oblong, obtuse, at first erect, ultimately reflexed, 3 inner, narrower than the outer. *Female flowers.*—Staminodes 6; stigmas 3 recurved. Berry ·25-·45 in. across globose, red when ripe.

Pilibhit to Gorakhpur, fairly common.

Fl. April-July. Fr. cold season.

2. Smilax prolifera, *Roxb.* Vern. *Ramdataun.*

A stout climber up to 1 in. across near the base; stem green, prickly. Leaves 4-9 by 2-6 in., oblong, broad-ovate or elliptic, apex rounded and shortly cuspidate, base rounded or subcordate and narrowed to the petiole, 5-7-nerved, inner pair connate with midrib sometimes up to about ·7 in. coriaceous, glabrous, shining above; petiole ·5-1·5 in. long; basal sheath auricled and stem clasping, auricles ·2-·4 in. broad, tendrils at the apex of the auricles, 2-4 in. long. Inflorescence of 7-20 umbels; umbels 1-4 together on an axillary or terminal rachis; bracts acute. Flowers many in each umbel, yellowish green, sweet scented; peduncles ·7-1·5 in. long; pedicels ·2-·3 in. long, elongating to ·5 in. fruit. Perianth segments ·15 in. long, linear oblong, inner narrower. Staminodes in female flowers 3; ovary oblong. Berries ·2-·3 in. across ovoid and red when ripe.

From Pilibhit to Gorakhpur, common.

The thinner stems are much used for *datauns* (tooth cleaners).

Fl. February-June. Fr. cold season.

Smilax zeylanica. *Linn.* Syn. S. indica, Vitm.

Stem with few prickles. Leaves 3·5-8 by 1·5-5 in., elliptic-oblong or ovate, shortly cuspidate-acuminate, base rounded, cuneate or obtuse, 5-7 nerved, inner pair connate with the midrib for a short distance; petiole ·3-1 in. long, sheathed and narrowly winged at the base, jointed; tendrils up to 4 in. long. Flowers ·25 in. long, yellowish-green, in dense umbels. Umbels solitary, less often on a common peduncle. Common peduncle ·4-·5 in. long; secondary

peduncles ·3 to 1 in. long, with a ring of bracteoles at the base. Perianth ultimately recurved, outer segments oblong, inner narrow. Staminodes 3, in female flower. Berry ·4-·5 in. in diameter, red when ripe.

Pilibhit (*Kanjilal* sheet no. 2672), Bahraich, record is based on somewhat incomplete material.

S. Roxburghiana, *Wall* differs mainly by having large coriaceous auricles, 1-1·5 in. long by 2- 6 in. wide, on the petiolar sheath which in old leaves overlap on the other side of the stem. According to Duthie it occurs in N. Oudh, but I have seen no specimens at Dehra herbarium from our area.

2. ASPARAGUS, *Linn.*

Shrubs, often climbing rarely herbaceous. Stem dying to the ground periodically, root-stock creeping, often with bunches of tuberous roots. Leaves reduced to minute scales, often spinescent, bearing in their axils tufts of needle-like cladodes (barren branchlets), resembling leaves. Flowers small, 2-sexual, rarely 1-sexual, axillary, solitary, fascicled or racemed; pedicels jointed. Perianth 6-partite, petaloid; stamens 6, on the bases of the perianth segments; anthers 2-celled. Ovary 3-celled; ovules 2 or more in each cell; style short; stigmas 3. Fruit a globose berry. Seeds 1-6 with black brittle testa.

I. Cladodes in tufts of 2-6, usually with recurved spines :—

Cladodes usually curved, ·4-1·5 in. long; racemes usually longer than the cladodes. .. .. 1. *A. racemosus.*

Cladodes strong, 1-2 5 in. long, exceeding the racemes. 2. *A. acerosus.*

II. Cladodes in tufts of 6-20, ·5-1 in. long usually straight and filiform, spines straight; racemes much longer than the cladodes. .. .. .. 3. *A. adscendens.*

1. Asparagus racemosus, Willd. *Vern. Satawar.* Sans. *Shatamuli.*

A much branched slender scandent or scrambling shrub or undershrub with tuberous roots, and recurved spines at the nodes. Spines ·25-·5 in. long; cladodes ·4-1·5 in. long, in tufts of 2-6, more or less curved, angled, channelled below, sharp-pointed. Flowers white, fragrant ·1 in. across, in short solitary or fascicled, simple or branched racemes attaining 2·5 in. Berries about ·25 in. across, scarlet when ripe.

Throughout the area. Deciduous or dying back to the roots in hot season.

The roots are valued as tonic in Ayurvedic medicine.

Fl. September-October.

There is a distinct form of the species in our area with slender cladodes below ·5 in. long and straight, reflexed and larger spines. In some forms the racemes are very short, but this character is not constant, and intermediate forms occur in which the racemes are larger like the type. Is this var. *Prainii*?

2. Asparagus acerosus, *Roxb.*

A slender scrambling or scandent shrub like the last, but with stronger, larger and straight cladodes 1-2·5 in. long, exceeding the racemes. There is a fragmentary specimen at Dehra from Bahraich (*Duthie* 23879) which may belong to this species, but cannot be satisfactorily determined in the absence of sufficiently complete material.

3. Asparagus adscendens, *Roxb.* Vern. *Santawar, chatawar.*

A suberect prickly shrub with tuberous roots. Branches ashy-grey, striate, armed; branchlets strigose; spines ·5-·75 in. long, straight, or sometimes curved; cladodes in dense tufts of 6-20, ·4-1 in. long, slender, filiform, soft, terete. Flowers white, ·1 in. across, in simple, sometimes branched racemes 1-3 in. long. Perianth segments spreading; stamens shorter than the perianth. Berry ·2-·3 in. across, more or less lobed, 1-3-seeded, scarlet.

Pilibhit to Gorakhpur. The young shoots are edible.

Fl. April-June. Fr. cold season.

Asparagus plumosus *Baker.*—A small climber with horizontally spreading branches; branchlets and cladodes in one plane. Cladodes 3-·5 in. long, in tufts, filiform; pedicels solitary or paired. Grown in gardens for its ornamental foliage.

Urginea indica, *Kunth.* Vern. *Jangali piyaz.*—The Indian squill. A herb with an ovoid tunicate bulb 2-4 in. long. Leaves 6-18 in. long appearing after the flowers, linear acute. Flowers greenish-white, or dirty-brown, racemed on an erect scape. Perianth ·4 in. long, campanulate with 6 segments; stamens included. Fruit a loculicidal capsule. Seeds many, compressed. Common: the bulbs are used for sizing cloth by local weavers.

Gloriosa superba, *Linn.*—Sans. *Agnishikha.*—An annual with tendrils at the ends of leaves. Flowers with beautifully crisped and waved perianth, lower half of which are yellow, upper red, ultimately turning red; lobes much reflexed. Common in scrubs. The root-stock is said to be poisonous. A remarkably pretty plant in flower. The Sanskrit name, lit. blazing flame, very aptly describes the flowers.

Cordyline terminalis, *Kunth.*—An ornamental shrub. Leaves collected at the ends of branches, 2 ft. long, oblong lanceolate, ascending, with deeply channelled broad petioles. Flowers white or pinkish, subsessile, on lax panicles. Leaves are often red or purple variegated. Often cultivated.

Yucca gloriosa, *Linn.*—A stout shrub somewhat resembling an Agave with rigid entire ensiform leaves and large handsome drooping white flowers on long scapes. Often grown in gardens.

Besides the above, many plants—largely herbs—belonging to this family are cultivated in gardens on account of their handsome flowers or ornamental appearance.

LXXVI.—PALMACEÆ.

Shrubs or trees. Stems rarely branching. Leaves often crowded at the apex of the stem, alternate, plicate, mature leaves palmate or pinnate; petiole sheathing sometimes armed. Flowers usually lateral; rarely terminal, small, 1-sexual, rarely 2-sexual, male and female flowers of different form, monœcious or diœcious, in simple or branched inflorescences (spadices), sheathed when young, with one or more large spathes. Perianth inferior, usually dry and coriaceous; segments usually 6, 2-whorled, valvate or imbricate. Stamen 3 or 6, rarely more; filaments free or connate in a ring or tube; anthers versatile, rarely basifixed, 2-celled. Ovary of free carpels, or 1-3 celled; ovule one in each carpel. Fruit various, indehiscent, often a drupe.

I. Erect or stemless.
  A. Leaves pinnate:—
    Lower leaflets of thorns. Leaflets under 1 in. broad. .. .. 1. *Phœnix.*
    Lower leaflets not of thorns. Leaflets more than 1 in. broad. Unarmed shrub. .. 2. *Wallichia.*
  B. Leaves palmate; tall trees; flowers diœcious .. 3. *Borassus.*
II. Climbing. Leaves scattered, armed at the base .. 4. *Calamus.*

1. PHŒNIX, *Linn.*

Trees or shrubs. Leaves pinnate; leaflets often fascicled; entire, linear-lanceolate, longitudinally folded and attached by their folded bases to the woody rachis, lowest often transformed into long straight thorns. Flowers small, diœcious, yellowish, coriaceous, in branched, inter-foliar spadices. Calyx cupular, 3-toothed in both sexes. *Male flowers.*—Petals (inner whorl of perianth) 3, obliquely ovate, valvate. Stamens usually 6, with subulate filaments and erect dorsifixed anthers; pistillode 0, or minute. *Female flowers.*—Globose; calyx accrescent, lobes rounded, imbricate; staminodes 6, or of a 6-toothed cup; carpels 3, free, stigmas sessile, hooked. Fruit an oblong, terete drupe, with a fleshy pericarp, seed grooved on one side, albumen horny, adnate to the testa.

I. A tree; fruit dark-red when ripe. .. .. 1. *P. sylvestris.*
II. Shrubby; fruits black when ripe:—
  Stems up to 12 ft.; leaflets not thickened nor decurrent on the axis; fruiting peduncle 2 ft. or more long. .. .. 2. *P. humilis.*
  Stems under 2 ft., globose, bulb-like, considerable portion underground; leaflets thickened at the base and often decurrent on the axis; fruiting peduncle short, hidden within the leaves .. 3. *P. acaulis.*

Phœnix sylvestris, *Roxb.* Vern. *Khajur.* Sans. *Kharjur.*

A tall palm attaining 50 ft. Stem rough, with the bases of fallen petioles, base often surrounded by a mass of adventitious roots. Leaves 10-15 ft. long, grey-green, pinnate; rachis compressed towards the apex. Leaflets 6-18 in. by ·7-1 in., much fascicled, 2-4-farious, distance between the fascicles up to 3 in., rigid, sharp-pointed, glaucous, lowest transformed into prickles 4 in. long. Spadix 2-3 ft. long; peduncle much compressed, spathe almost as long as spadix, separating into 2 boat-shaped valves, scurfy-coriaceous, almost woody. *Male flowers.*—·25-·3 in. across, white, scented, spikes numerous towards the apex of the peduncle, generally in fascicles, flexous, and zig-zag. Petals much longer than the calyx, concave ·2-·25 in. long. *Female flowers.*—Distant, roundish; spikes arranged in distant groups, up to 13 in. long, lower 4-6 in. long, sterile. Petals 3, broad imbricate; staminodes 3-4. Fruiting spadix 3 ft. long, drooping much compressed. Drupes 1-1·2 in. long, dark reddish-brown when ripe, with somewhat scanty sweet pulp, seated on the persistent perianth.

Throughout the area on waste-land, but hardly a forest tree. The tree is much tapped for toddy for which incisions are made in the lower part of the crown. The leaves are made into baskets and mats. The freshly drawn juice is sweet and is used for manufacturing sugar in Bengal.

Fl. April-May. Fr. May-June.

Phœinx humilis, *Royle.* Vern. *Khajuri.*

A shrub rarely more than 10 ft. high (in our area), usually 4-6 ft. in height, densely covered with the remains of leaf bases, often developing root-suckers when the primary stem is injured or burnt. Leaves 4-8 ft. long, rachis compressed. Leaflets up to 4-farious, usually 7-20 by ·4-·5 in., those at the top and the base often smaller pliable, in interrupted fascicles, bases not thickened nor decurrent on the common axis, basal prickles up to 4 in. long. *Male flowers.*—Pale-yellow, ·2 in. long in spikes which are up to 4 in. long, arranged on a long peduncled spadix up to 12 in. long. Peduncle compressed up to 8 in. long; spathe-keeled, coriaceous and almost woody. Petals oblique, ovate, concave. *Female flowers.*—Yellowish-green, globose, distant on flexous spikes up to 4·5 in. long, which are stouter than male spikes, and arranged on a long peduncled, bright-yellow spadix, which in fruit is up to 4 ft. long; peduncle compressed up to 3 ft. long about ·5 in. across. Fruit ·5 in. long, black when ripe, seated on the persistent perianth.

Common in grass-lands and open forests.

The pith at the top of the stem is eaten. The fruits are edible but contain very little pulp.

Fl. December-January. Fr. hot season.

Phœnix acaulis, *Buch-Ham.* Vern. *Khajur.*

A dwarf palm with a bulb-like very short stem of which there is but little above ground and which is covered by the bases of the fallen leaves, up to 9 in. in diameter. Leaves 2-5 ft. long, rachis compressed, petiole 1 ft. or more long. Leaflets 9-20 by ·4-·7 in., shorter towards the apex and base, subopposite, distance between insertions unequal, folded at first, opening out when mature, base thickened and shortly decurrent with the rachis, basal prickles 2-6 in. long. Spadix 6-10 in. long, with compressed peduncle and pale-yellow branches, shortly exceeding the spathe. *Male flowers.*—·25-·3 in. long, petals obliquely lanceolate, slightly connate at the base. *Female flowers.*—Alternate and somewhat sunk on stout spikes which are branched more or less digitately from the top of the spadix; bracts prominent, ovate; petals subrotund, finely nervose. Fruiting peduncle usually concealed among the sheaths of the petioles.
Fruit ·5-·7 in. long, blue-black when ripe.

From Pilibhit to Gorakhpur, common.

The fruit is edible.

Fl. December-January. Fr. April-May

Phœnix rupicola, *T. And.* A handsome palm about 15-20 ft. in height. Leaves up to 10 ft. long, dark-green, leaflets about 18 in. long, bright-green. Fruiting peduncle 3-4 ft. Fruit shining yellow. Cultivated in gardens as an ornamental plant. Wild in Sikkim and Bhotan.

2. WALLICHIA, *Roxb.*

Wallichia densiflora, *Mart.*

A handsome shrub, stems very short or 0, often several together, trunks sheathed; sheaths villous, resolving into strong fibres. Leaves 5-10 ft. long, pinnate, rachis scurfy when young. Leaflets many, alternate or sub-opposite, or the lower 2-4-nate, 6-18 in. long, oblong, irregularly sinuate, upper part sharply croso-dentate, base entire cuneate, mid-rib prominent glabrous, above, silvery beneath, terminal leaflets broadly cuneate and more or less 3-lobed with 3-4 strong basal nerves. Spadices interfoliar, monœcious. *Male spadix.*—Axillary, curved, about 1·5 ft. long, spathes imbricated, flowers numerous, yellow, in slender spikes together forming the spadix, the tips projecting beyond the spathes. Calyx cylindric, nearly entire; corolla as long as the calyx, tripartite; segments reflexed; stamens 6. Spathes of female spadix brown, conduplicate, the outer ones sometimes very long and acuminate. *Female flowers.*—About ·2 in. long, purplish, somewhat sunk on the stout branches of the spadix, each two bracteate. Calyx short, cleft to about half into 3, broad, rounded

lobes. Corolla trifid, lobes broad, acute or obtuse; ovary exceeding the corolla. Fruit about ·5 in. long, oblong, dull purple with tough epicarp, and scanty pulp, seated on the persistent perianth.

Bahraich—rare. Record based on incomplete specimen.

Fl. May-July.

3. BORASSUS, *Linn.*

Borassus flabellifer, *L.* The palmyra palm. Vern. *Tarh.* Sans. *Tala, trinaraja.*

A tall palm with a straight and more or less smooth trunk up to 100 ft. in height and 2-3 ft. in diameter, often slightly swollen at the middle and marked with ring-like scars of the petiole sheaths and having a mass of rootlets at the base near the ground. Young stems covered with base of petioles. Leaves 3-5 ft. in diameter, rigidly coriaceous, palmately cleft, segments 60-80 spreading, linear or lanceolate, 2-fid at the top, folded along the midrib and spinulose along margin, glabrous; petiole 2-4 ft. long, stout, sometimes with hard spinescent serrature along the margin and a short ligule at the insertion of the blade. Flowers dioecious. Spadices stout, very large, interfoliar, simply branched, peduncle sheathed with open spathes. Male spadix with 1-3 stout, cylindric branches 9-15 in. long, clothed with closely imbricating bracts and enclosing numerous spikelets which thus appear as if sunk in the cavities of the branches. *Male flowers.*—Small, secund in two rows on the spikelets, mixed with scaly bracteoles, and appearing above the bracts one by one as the spikelets elongate. Perianth dry; sepals 3, narrowly cuneate, tips inflexed truncate; petals shorter obovate-spatulate, imbricate; stamens 6; filaments connate with the corolla into a stalk; pistillode of 3 bristles. *Female spadix.*—Sparingly branched, spikes enveloped in bracts and terminating the branches of the spadix; flowers larger than the male flowers, globose, 1 in. across, scattered on the spikes, perianth fleshy accrescent in fruit; sepals imbricate, reniform; petals smaller, convolute; staminode 6-9; ovary 3-4-celled. Fruit a subglobose drupe 6-8 in. across. Pyrenes 1-3 obcordate, mesocarp fleshy and fibrous, endosperm hollow, horny.

Gorakhpur, Bundelkhand.

Mostly planted, occasionally an escape. The fruit is eaten; the tree is tapped for toddy wherever it grows in any quantity. The leaves are used for fans.

Fl. March-April. Fr. rainy season.

4. CALAMUS, *Linn.*

Calamus tenuis, *Roxb.* Vern. *Bet, bent.* Sans. *betra, betasi.*

A climbing palm growing in clumps from an underground rhizome. Stems smooth, glabrous, upper part covered with sheaths of leaves. Leaves pinnate 1·5-3 ft. long; rachis armed with a row of conical prickles. Leaflets many, equidistant, 4-12 by ·3-·5 in., smaller towards the apex, linear-lanceolate, acuminate, 3-nerved at the base, with slender sparse bristles above, dark glossy green, secondary nerves, numerous, parallel joined by cross nervules. Petiole and sheath covered with adpressed sharp prickles up to 1 in. long, and bearing a long thin switchy flagellum, armed with recurved prickles. Spadices axillary, very long, branched, ending in a prickly flagellum; spathes tubular, lower 6-10 in. long prickly, upper partial and small, scurfy when young. Flowers very small. *Male flowers.*—In 3-4 rows on spikelets; calyx 3-toothed; petals coriaceous acute, valvate. Stamens 6; filaments short, anthers dorsifixed. *Female flowers.*—Distichous, calyx as in the male, slightly accrescent; corolla tubular, 3-fid, ovary 3-celled, scaly; style with 3 stigmas. Fruit ·4 in. across, ellipsoid, shortly mucronate, clothed with very small, closely imbricating, adpressed, very small, polished, palebrown, rhombic scales, with shallow grooves on the backs.

In swamps from Pilibhit to Gorakhpur.

Fl. rainy season.

Many ornamental palms are grown in gardens in our area, often in grass conservatories. Their inclusion is obviously outside the scope of this Flora. For a full account of these Blatter's "Palms of British India and Ceylon" may be referred to.

LXXVII.—PANDANACEÆ.

Trees or shrubs, sometimes climbing; stems cylindric, annulate, often 2-3-chotomously branched, usually with aerial or stilt-roots. Leaves at the ends of the branches and spirally 3-farious, long, narrow acuminate, coriaceous, keeled, keels and margins usually spinous toothed. Flowers diœcious, minute, on simple or branched terminal or axillary spadices covered by leafy spathes; bracts and bracteoles 0. Perianth 0. *Male flowers.*—Sessile or pedicellate; stamens many, filaments free or connate; anthers erect, basifixed; pistillode present or 0. *Female flowers.*—Staminodes present or 0; carpels free or connate with those of contiguous cells; stigmas distinct, subsessile, papillose; ovule solitary and sub-erect or many and parietal in each carpel. Fruit a clavate, globose, syncarp of fleshy or woody, free or connate angular drupes, each 1-many celled. Seeds minute, testa striated; endosperm hard fleshy. Embryo minute.

PANDANUS, *Linn. f.* The Screw Pines.

Pandanus odoratissimus, *Linn. f.* Syn. **P. fascicularis,** *Lam.*; Vern. *Kewra,* Sans. *Ketaki,* Ar. *Kadir, kazim* Per. *Kadi.*

A tall evergreen shrub or a small tree up to about 15 ft. in height, branching from near the base, with many thick stilt-roots. Leaves 3-5 ft. long, 3-farious, close together at the ends of branches, linear elongate, caudate acuminate, upper portion drooping, glossy green, coriaceous, margins spine-toothed. Spathes white. *Male inflorescence.*—Very fragrant; spadix branched, with a spathe in each branch; spathes boat-shaped keeled, spinulose on the keel and margins. Flowers pedicellate, anthers spicately arranged on the axis of connate filaments, connectives produced. *Female spadices.*—Unbranched; spathes 3-farious, staminodes 0; carpels connate in groups of 4-9; stigmas sessile; ovule 1 in each carpel. Syncarp globular to oblong, drooping, 4-10 in. long by 4-8 in. across; drupes 1·5-2 in. long, obpyramidal, trigonous, woody, with tubercled tops crowned with the remains of the stigma.

Run wild in many parts in Jhansi along streams. Often cultivated. From the fragrant spathes of the male flowers an oil and an otto are extracted.

Fl. end of summer or early part of rainy season. Fr. May-June.

LXXVIII.—TYPHACEÆ.

(TYPHA, *L.*)

Marsh or aquatic herbs with creeping rhizomes, clothed with distichous scales. Leaves linear, in two rows. Flowers monœcious, naked, minute, often mixed with hair-like bracteoles with clavate tips, on cylindric spikes at the ends of scapes which are divided into two parts; the upper male the lower female. *Male flowers.*—Stamens 2-3, sometimes up to 5, rarely 1; filaments connate, connective thickened and projecting beyond the anthers. *Female flowers.*—Ovary of 1 carpel, very minute on a capillary stalk, densely invested with persistent hairs (regarded by some botanists as perianth), narrowed at the top into a capillary style with filiform or clavate stigma, sometimes reduced to a hair with a clavate tip; ovule 1 pendulous. Fruit very minute, indehiscent or laterally dehiscent, becoming detached with the hairy capillary stipe, pericarp membranous; seed albuminous.

A small unimportant family of which the following species may be mentioned:—

Leaves trigonous above the sheath; pollen 4-globate... 1. *T. elephantina.*

Leaves sub-cylindric above the sheath; pollen simple... 2. *T. angustata.*

1. **Typha elephantina,** *Roxb.* Vern. *Pater.* Elephant Grass; Greater Indian Reed-mace.

A gregarious perennial marsh plant 6-12 ft. in height with creeping elongated rhizome. Leaves equitant, 4-6 ft. by 1-1·5 in., linear, trigonous in section towards the sheath, erect, margins somewhat undulate. Scape embraced by the leaf sheaths, glossy. *Male spikes.*—8-12 in. long, pale or yellowish-brown, with a deciduous basal spathe, and 2-3 upper ones; rachis clothed with short often forked hairs, anthers 1-5, ·1 in. long, with 4-globate pollen; bracts many between the flowers, 2-3-cleft. *Female spikes*—Stouter, 6-10 in. long, ·3-1 in. across, brown, embraced by an early deciduous spathe. Flowers mixed with clavate pistillodes; bracteoles with expanded tips and longer than the hairs on the stipes.

Marshes and jhils all over the area.
The leaves are used for stuffing elephant *qaddis*. The minute fruits become detatched with hairy stipes giving the infructescence a very shaggy appearance.
Fl. July-August.

2. **Typha angustata,** *Chaub* and *Bory.* Vern. *Pater.*

Similar to the last, but usually somewhat smaller. Leaves up to 8 ft. long, lower part above the sheath planoconvex, often exceeding the flowering scapes. Pollen simple. Bracteoles of female flowers sub-spatulate, equalling the linear stigmas, both exceeding the hairs on the stipes.

Perhaps occurs all over the area, but not collected on account of the difficulty of separating it from the previous species, which it closely resembles.
Fl. May-June.

LXXIX.—ARACEÆ.

Herbs, often with tubers or rhizomes, more rarely scandent shrubs. Leaves alternate in species with aerial stems, more or less fleshy, simple or sometimes palmately or pedately lobed, intermediate nerves often reticulate, usually with a membranous sheath at the base of the petiole. Flowers small, minute, usually crowded on a fleshy spadix with a green or coloured spathe, 1-sexual and monœcious, with the male and female flowers on different parts of the same spadix, less often 2-sexual. Perianth inferior, 0 or cupular or of 4-8 segments, anthers 1-many, often united or in hermaphrodite flowers 4-8. Ovary sessile, 1-many-celled; ovules 1-many in each cell. Fruit of distinct or confluent berries. Seeds 1-many, usually with copious albumen.

Ovule 1, leaves usually entire; petiole winged; fruiting spadix drooping. .. .. 1. *Scindapsus.*

Ovules many, leaves usually with one or more deep cuts; petiole not winged; fruiting spadix erect. .. 2. *Raphidophor.*

1. SCINDAPSUS, *Schott.*

Scindapsus officinalis, *Schott.* Vern. *Gajpipar.*

A stout climber with deeply furrowed, corky bark, and soft stems, climbing tallest trees by adventitous roots, young stems, green annulate. Leaves alternate, 5-12 by 3·5-8 in.. ovate, or elliptic ovate, caudate acuminate, entire, base obliquely rounded or subcordate, lateral nerves arcuate, smooth and glossy ; petiole 3-7 in., long, abruptly bent, about ·25 in. from the top, winged from below the bend to the base, wing widening downwards, and amplexicaul at the base. Peduncle lateral from near the terminal bud, solitary, stout, up to 2·5 in. long. Spathe 4-6 in. long, terminated by a cusp, ·5-·7 in. long, green outside dull-yellow within. Spadix as long as the spathe, cylindric. Flowers bisexual; perianth 0. Ovary truncate, prismatic with one ovule. Fruiting spadix 5-6 in. by 1·25-1·75 in., drooping, berries, closely adpressed, exposed surface polygonal.

From Pilibhit to Gorakhpur.

Fl. hot season. Fr. cold season.

S. aureus, *Engl.* Syn. Pothos aurea, *Lind & Andre.*

A climbing aroid with ovate, more or less entire leaves variegated with golden-yellow.

Cultivated in gardens within our area.

2. RAPHIDOPHORA. *Schott.*

Raphidophora glauca, *Schott.*

A larger climber with the habits and appearance of Scindipsus officinalis. Leaves 6-12 by 3·5-9 in., broad ovate, acuminate, base unequally retuse or cordate, with one or more deep cuts on the margin, less frequently quite entire ; petiole 4-12 in. long, not winged but deeply grooved on the upper surface. Peduncle solitary, subterminal up to 4 in. long stout. Spathe 2·5-3·5 in. long, ovate, acuminate ; spadix cylindric. Flowers 2-sexual ; stamens 4-6 ; ovary truncate imperfectly 2-celled, ovules many. Berries, confluent. Fruiting spadix 2-3 in. long, erect.

Kheri (Gauriphanta forest), rare, record based on a single specimen. The above description applies to the plant found in our area.

Fl. hot season.

Acorus calamus ; *Linn.* Vern. *Buch.* Sans. *Vacha.* The Sweet flag.

A perennial marsh herb with aromatic rhizome. Leaves ensiform 1-3 ft or more long with sheathing bases. Spadix 2-4 in. long. Flowers bisexual. Peduncle angled, and ending in an ensiform blade.

Gonda, Bahraich.

Colocasia antiquorum, *Schott.* Vern. *Arwi*—A stemless herb arising from a tuberous rhizome, and bearing large ovate peltate, leaves over 12 in. long, commonly grown as a garden or field crop within the area.

Monstera deliciosa *Liem.* (Philodendron pertusum of horticulturists.)

A stout aroid climbing like Scindapsus, with large dark-green coriaceous pinnatifid leaves which are often perforated. Fruiting spadix oblong large. Berries sweet and with a delicious flavour when ripe.

Often cultivated in gardens.

A native of tropical America.

LXXX.—GRAMINEÆ.

Tribe Bambuseæ.

Woody grasses often gregarious, rarely climbing. Rhizome stout; and either twisted and knotted, sometimes exposed and producing tufted stems (culms); or creeping and branching and producing distant culms. Stems jointed; nodes more or less prominent, bearing culms sheaths, and having usually two rings of which the more indistinct and upper marks the node and the lower is the scar of the culm sheath. Culm sheaths alternate, dry, yellow or brown, often hairy outside specially when young, terminating in more or less imperfect blades; and having buds at the axil. Leaves distichous, narrow midrib prominent, longitudinal nerves with finer intermediate ones between them, which are joined by transverse nerves at intervals; petiole short, articulated with a leaf sheath which is split to the base and variously auricled, and bearing a small appendage (ligule) at the point of junction. Flowering annual and sporadic or periodic and gregarious, the culms often dropping leaves at the time. Inflorescence a large panicle with spicate branches. Flowers mostly bisexual in spikelets, consisting of a number of distichous, stiff bracts (glumes), the lower and sometimes the upper empty, or bearing imperfect flowers. Flowering glumes each bearing on its axil a membranous usually transparent bract, which is usually 2-keeled, and often ciliate along the keels (the palea); between the palea and a flowering glume are the ovary, stamens and usually 2 or 3 membranous, ciliate scales (lodicules). Stamens 3 or 6, rarely more, filaments capillary; anthers versatile. Ovary 1-celled; style terminal; stigmas 2 or 3, plumose. Fruit usually a caryopsis, pericarp adnate to, or separable from the seed. Seed usually with a large mealy endosperm.

I. Culms armed or unarmed with large fringed auricles on culm sheaths, pericarp adnate to the seed (introduced species). .. .. .. 1. *Bambusa.*

II. Culms unarmed, culm sheaths without large fringed auricles, pericarp separable from seed (indigenous) 2. *Dendrocalamus.*

1. BAMBUSA, *Schreb.*

Erect bamboos, sometimes branchlets transformed into stout spines. Culms tufted or distant. Culm sheath various, often with large

fringed auricles; blade triangular. Leave linear or oblong-lanceolate, acuminate; leat sheaths variously auricled. Spikelets sessile, clustered on branches, 1-many-flowered; empty glumes 1-4; flowering glumes ovate-lanceolate usually mucronate; palea 2-keeled, keels ciliate or not; lodicules 3, generally obtuse; stamens 6, filaments often exserted; ovary hairy at the apex. Caryopsis oblong or linear-oblong, furrowed on one side, pericarp thin, adherent.

Armed; stems tufted; back of culm sheaths ciliate when young, otherwise glabrous. .. . . 1. *B. arundinacea*.

Unarmed; stems distant, back of culm sheaths with adpressed black hairs when young, scabrid with age.. 2. *B. nutans*.

1. Bambusa arundinacea, *Willd.* Vern. *Kanta bans, bans,* Sans. *Vansa.*

A tall bamboo, culms attaining 60 ft. and a diameter of 7 in. with many leafless spinescent branches at the base. Culm sheaths 9-12 in. long., ciliate with golden-yellow hairs when young, ultimately glabrous, rounded at the top, blade triangular, margins infolded, wavy, plaited, covered with dark bristles inside, base hardly auricled. Leaves up to 8 by ·7 in., main secondary nerves 4-6 on either side of the midrib. Spikelets ·5-1 in. long, few to many in capitate clusters. Flowers 3-7, upper male, with a few imperfect flowers. Fruit beaked.

Mostly planted within our area sometimes (Khori) apparently wild. This bamboo is fairly strong and is largely used, but is difficult to extract on account of the thorny branches.

2. Bambusa nutans, *Wall.* Vern. *Bans, kagzi bans.*

Culms 20-40 ft. high and 1·5-3 in. across, not crowded, unarmed, internodes 15-18 in. long. Culms sheaths 6-9 in. long, covered with adpressed black hairs on the back, when young, rounded at the top, blade acute, margins recurved, black hairy within, base auricled. Leaves 4-12 by ·7-1·5 in., secondary nerves 7-10, tip twisted, base, rounded or narrowed, margins somewhat rough; petiole ·1-·2 in. long; ligule hairy. Spikelets in interrupted, capitiate clusters, each ·7 in. long, glabrous, lowermost 2-3 flowers sterile; fertile flowers 3-7 with several imperfect flowers. Fruit oblong, hairy at the top.

Occasionally planted, but by no means common.

2. DENDROCALAMUS.

Dendrocalamus strictus, *Nees.* Vern. *Lathi bans, bans.*

A tufted often gregarious, subdeciduous bamboo, culms variable in size according to locality from 20 to 50 ft. high and 1-4 in. in diameter, covered with white waxy bloom when young; internodes 10-15 in. long, basal portion sometimes solid or with a small cavity. Culm sheaths variable in size, 3-12 in. long, rounded at the top glabrous or with yellowish-brown hairs on the back, ciliate on the edges, slight-

ly auricled; blade triangular, hairy, specially within; ligule narrow. Leaves very variable 1-10 by ·2-1·2 in., linear oblong, sharply acuminate, tip twisted, somewhat rough and more or less pubescent on both surfaces, specially alongt henerves, base abruptly rounded and narrowed to a short petiole ·1-·2 in. long; sheath hairy, striate, ending in a callus and short auricles with few deciduous cilia. Spikelets ·3-·5 in. long, in dense spinescent heads, at intervals on the branches of a panicle; fertile flowers 2-3, with several sterile flowers. Glumes ovate, acute, spinescent, hairy at the top; palea emarginate; lodicules 0. Stamens 6, long exserted, filaments fine; anthers yellow. Ovary hairy at the top; stigma simple purple plumose. Caryopsis ovoid beaked, pericarp coriaceous, separable.

Bundelkhand, sporadically in Oudh, often planted.

A most useful bamboo. Its uses are too well-known to need mentioning here. Readily grown both from seeds and cuttings.

Fl. February-April. Fr. May-June. Sometimes also flowers in winter.

Besides the cultivated cereals and grasses there are many forest grasses of considerable importance. It is not possible to include them all here; the following may however be mentioned :—

1. **Phragmites Karka,** *Trin.* Syn. Arundo karka, *Roxb.* Vern. *Nal, nar., narkat.*

A very tall perennial grass attaining 20 ft. with hollow stems. Leaves distichous 12-24 by 1-1·5 in., smaller upwards erect, stiff; spikelets 3-7 flowered in large decompound erect panicles with widely spreading branches pedicels glabrous; glumes 5-9, glabrous, lower two empty, 3rd. male or neuter, rachilla silkily penicillate above 3rd glume and not produced above flowering glumes.

Jhils and river banks.

Fl. September-December.

2. **Arundo Donax,** *L.* Vern. *Nal nar.*

A tall reed-like grass 6-10 ft. high. Leaves broader than in the last species usually 12-24 by 1-2 in., sharp pointed, with amplexicaul bases and ligule of long hairs. Spikelets ·3-·5 in. long, in decompound panicles which are 1-2 ft. long with more or less rough branches. Glumes 4 or more, lower two empty; rachilla shortly produced between the glumes; flowering glumes with short awns, clothed dorsally with long spreading hairs.

Pilibhit to Gorakhpur, in jheels along rivers.

Differs from the last by less robust habit, amplexicaul leaves, hairy flowering glumes, and rachilla not being silky.

Fl. October-November.

3. **Cynodon dactylon,** *Pers.* Syn. Chloris cynodon, *Trin.*; Panicum dactylon, L. Dog's tooth or Bermuda grass. Vern. *Dub, dubra, Sans. Dubra.*

A perennial soft, creeping or ascending bluish glaucous grass, often with matted stems when creeping. Leaves linear lanceolate or subulate ·5-3 in. long; ligule hardly any, or of hairs. Spikelets minute unilateral and 1-2 seriate on slender digitately spreading spikes; spikes 2-8 together; ·5-3·5 in. long.

Glumes 3, lower two empty, 3rd largest, boat shaped with softly ciliate keel. Grain minute, brown.

All over the area.

One of the best grasses for fodder and lawns. It is an essential ingredient of most Hindu rituals and symbolizes eternal continuity of life. The expressed juice is very useful for stopping bleeding. It is also used as a diuretic.

Fl. and fr. most of the year.

4. Thysanolæna Agrostis, *Nees.*

A tall reed-like grass, with solid stems about ·5 in. across, attaining 10 ft. in height, sometimes more. Leaves distichous, rather broad about 18 by 3 in., puncticulate, mouth of sheaths more or less hairy, ligule truncate rather obsolete. Spikelets minute, 1-flowered, sub-secund in large decompound panicles, with glaucous rachis and crowded subercct branches, attaining 3 ft.; pedicels often in pairs. Glumes 4, the lower 3 empty; grain very minute, enclosed in the hardened glumes.

Throughout the area in shady ravines.

It is a good fodder.

Fl. and fr. hot season.

5. Saccharum spontaneum, *Linn.* Vern. *Kans.*

A coarse grass, usually 5-7 ft. in height, but sometimes attaining about 15 ft. Leaves glaucous, very variable in length, attaining up to 4 ft., very narrow, varying from ·05-·7 in. in width, margins scabrid, sheath villous at the mouth, sulcate; ligule minute, membranous, often fimbriate when old. Spikelets from ·08-·2 in. long, 1-flowered, in pairs, one pedicelled and the other sessile, on the capillary jointed branches and branchlets of a panicle which attains about 2 ft. and is purplish or coppery in colour in flower; callus hairs closely adpressed to the branches, several times longer than the spikelets; panicle branches subverticellate. Fruiting panicle silvery-white with long, wide, spreading white callus hairs, and ascending branches. Glumes 4, in fruit lower becoming hard and polished and more or less brown.

Usually along sandy river banks but also on loamy and water-logged soil, adopting its habit to the environment.

"The hairs of neighbouring spikelets becoming entangled together, characteristic flocculent masses of several spikelets are often seen carried by wind or hanging on adjacent vegetation"—*Hole.* Easily recognised by the narrow leaves, long callus hairs and brown coriaceous base of lower two glumes.

Used for thatching and valued as fodder for buffaloes.

Fl. and fr. August-November.

6. Saccharum Munja, *Roxb.* Syn. S. arduninaceum, F. B. I. (part). Vern. *Munj, sar.*

A tall tufted grass attaining 18 ft. in height and a diameter of ·5 in. in favourable localities. Leaves variable, lower up to 7 ft. and up to ·75 in. wide (sometimes only ·15 in. wide), upper smaller, long acuminate, narrowed towards the base, glaucous, scabrid along the margins, white villous behind the ligule at the base, sheath striate, pale straw coloured longer than the internodes, shortly silky at the base, otherwise smooth; ligule minute membranous, truncate. Spikelets in pairs, one pedicellate and the other sessile, 1-flowered, awnless, on decompound panicles which are purplish in flower and greyish or

white in fruit. Primary rachis glabrous, sulcate, more or less scabrid on ridges, primary branches subverticellate, ultimate branchlets triquetrous, more or less villous, with long white hairs on the angles and two faces, branches adpressed to the axis in fruit. Callus hairs equalling or shorter than the spikelets. Glumes 4, the lowermost glume of the sessile spikelet and the lower two glumes of pedicelled spikelets villous on the back, the hairs exceeding the glumes.

In dry sandy river banks and in open areas all over the area.

The fibre of upper leaf sheaths is used for making mats, ropes, etc., and is also suitable for making paper. The thin upper portion of the flowering culm is used for making winnowing trays, cart covers, etc., and thick lower portion is used instead of split bamboos for thatching and making screens. The leaves are sometimes used for thatching.

7. Saccharum Narenga. *Wall.*

A tall grass attaining about 15 ft. in height, and diameter of ·5 in., stem with long adpressed hairs at the nodes and at the base of the panicle, otherwise glabrous. Leaves up to 6 ft. by 1 in., upper smaller, dark-green with prominently white midrib, upper surface with scattered bulbous based hairs towards the apex, densely bearded above the ligule; leaf sheath more or less pubescent with bulbous, based hairs specially towards the top; ligule membranous, very small. Spikelets in pairs (as in the last species), small, awnless, in decompound purplish panicles which are up to 2 ft. long and bearded at the nodes; rachis sulcate hairy on the ridges, branches brittle on fruiting panicles. Callus hairs purple, little longer or shorter than the spikelets. Glumes 4, lower 2 puberulous, hairs not exceeding the glumes.

Sal forests in our area. A good indicator of suitability of local conditions for sal. "The hairy leaf sheaths, the culms bearded at the leaf insertions, the narrow purple very fragile fruiting panicle, and the dark-green leaves readily distinguish this species in the field"—*Hole.*

Fl. and fr. August-November.

8. Saccharum Ravennæ, *Mur.* Syn. **Erianthus Ravennæ,** *Beauv.*

A large tufted grass, stems sometimes attaining 19 ft. and a diameter of ·7 in. finely pubescent at the nodes. Leaves usually 4-5 ft. long, but attaining upto 6 ft. by 1 5 in., upper small, acuminate, dark-green, midrib white, upper surface densely hairy towards the base, more or less rough along the nerves, margins scabrid; sheath usually hirsute with bulb-based hairs; ligule short up to ·7 in. long, ciliate. Spikelets ·13-·16 in. long, in pairs, one pedicelled and the other sessile, distinctly awned, on spreading panicles up to 3 ft. long, purple in flower and dirty-white to brown in fruit. Rachis sulcate, scabrid on ridges, primary branches subverticellate. Glumes 4, the lower two rough more or less pubescent on the back, hairs shorter than the glumes.

From Pilibhit to Gorakhpur often in glades.

Fl. end of rainy season.

Resembles to some extent Sacchrum Munja from which it can be distinguished by its broader green leaves, browner fruiting panicle, and awned spikelets.

9. Imperata arundinacea, *Cyrill,* Vern. *Charui,* (*Kah.*) *khalui* (*Gon.*) *dachela,* (*Gar*).

A gregarious grass usually 1-3 ft. in height with slender stem and tumid nodes which are glabrous or bearded. Leaves 3-4 ft. by 1·1 in. when fully formed, upper smaller, acuminate narrowed towards the base, smooth except on the margin, leaf sheath glabrescent or glabrous: ligule up to ·13 in

long truncate or two-lobed. Spikelets not awned, in pairs on the capillary branches of spike-like terminal panicles which are short (in depauperate forms) to 20 in. long. Rachis hairy at the nodes with long spreading hairs; callus hairs soft, white 2-3 times the spikelets. Flowering panicles purplish from the exserted stigmas, fruiting panicle silvery-white. Glumes 4, the two lowermost dorsally villous, the hairs exceeding the glumes. Anthers 2, yellow; grain small oblong.

Common in open clayey or loamy soils from Pilibhit to Gorakhpur.

Often cut for thatching. It is often the dominant grass in damper types of *majhar* lands in Gorakhpur where on account of frequent cutting, the depauperate form is mostly seen. In this form it has minute culm and small soft light green leaves. Hole distinguishes besides this :—(*a*) the savanah form attaining a height of 3 ft., (*b*) a robust form found in swamps attaining 9 ft. in height.

Conspicuous specially after jungle fires from its silvery-white panicles with the yellow anthers and purple stigmas among the hairs.

Fl. hot season, but also at other times of the year.

10. Pollinidium angustifolium, *Hack. Comb. nov.* Syn. **Ischæmum angustifolium,** Vern. *Bhabar, baib, sabai.*

A tufted grass woolly at the base. Leaves up to 3 ft. by ·1 in. wiry, at first flat ultimately involute, very fibrous, glabrous except at the mouth of the sheath. Spikes up to 2 in. long, compound and terminating slender axillary and terminal peduncles, covered at the joints with dense brownish hairs.

All over the area, usually on broken ground. Much in demand both locally for making ropes and also for export for paper-making.

"Fire improves the crop by removing shade."—*Haines.* Could be artificially propagated by division of roots-stocks. Grown from seeds, it is fit for cropping according to Haines in about 3 years. Buffaloes eat it but not other cattle.

Fl. February-June. Fr. May-July.

11. Vetiveria zizanioides, *Stapf.* Syn. **Phalaris zizanioides,** *Linn.* **Andropogon squarrosus,** *Hack.* Vern. *khas-khas.* Sans. *Usira.* Arab. *Usir,* Pers. *Khas.* Eng. Kus-kus grass.

A somewhat stout tufted grass attaining 6 ft. Leaves imbricate, distichous, 1-2 ft. long and up to ·3 in. wide, linear, glabrous, rigid, margins scabrid with distant minute teeth, lower leaf sheaths compressed; ligule minute. Spikelets muricate, paired, one sessile hermaphrodite, slightly laterally compressed, up to. ·17 in. long, and the other pedicelled, shorter, male; usually awnless, on an oblong or pyramidal panicle which is 6-12 in. long. Branches of panicles subverticellate, fragile in fruit, joints and pedicels slightly thickened upwards, callus shortly bearded on one side. Glumes 4, purplish.

Common.

The dried roots are very pleasantly scented when moistened with water. They are used largely in perfumery both in India and Europe. An oil is distilled which commands a high price, being an ingredient of many superior perfumes. The roots are also used for manufacturing well-known *ta tis* for summer use and fans and form an important ingredient of several cooling medicines.

Fl. August-December.

12. Chrysopogon montanus, *Trin.* Syn. **Andropogon monticola,** *Schult,* Vern. *Dhaula, guria, chikna.*

A slender grass with glabrous stem attaining about 3-4 ft. in height, often fastigiate from the upper nodes developing leafy and flowering shoots. Leaves up to 17 in. by ·3 in., conduplicate when young, linear acuminate, tapering from the base, more or less rough on upper surface specially towards the apex, often ciliate towards the base with tubercle based hairs; sheath glabrous, usually compressed; ligule minute, membranous, ciliate. Spikelets subequal in clusters of three, up to ·2 in., rarely ·3 in. long, central sessile and hermaphrodite the two lateral pedicellate; clusters terminating capillary subverticellate branches of a yellowish to purple panicle 2-6 in. long, and falling of together leaving an oval scar with a ring of brownish hairs. Sessile spikelet with a sharp fine awn, laterally compressed, glumes 4, lower two empty, 2nd glume awned and dorsally obtusely keeled. Pedicelled spikelets dorsally compressed awned or not.

Pilibhit, Gonda, Kheri, Bundelkhand, usually on dry sloping ground.

A useful fodder. The fine bristly awns of the spikelets stick to clothes which they often penetrate and are then very irritating and difficult to get rid of.

Fl. end of rainy season and autumn.

13. Heteropogon contortus, *Roem.* Syn. **Andropogon contortus,** *Linn.* Vern. *Parua.* The Spear Grass.

A tufted usually gregarious grass, usually 1-3 ft. in height. Leaves 4-12 by ·1-·2 in., more or less rough above and along the midrib below, sheaths flattened, hairy at the mouth; ligule minute, scarious. Spikelets in pairs on the rachis of solitary terminal peduncled spikes. Lowest 2-4 pairs of spikelets green, closely imbricate, similar, not awned, male or neuter, upper pairs pedicelled and sessile: sessile spikelets up to 25 in. turned to one side, hermaphrodite with stout, brown, twisted awns which are often all entangled together; pedicelled spikelets male, unawned.

A notorious grass, the long twisted awns stick to clothes in masses, an the barbed fruits penetrate clothing and skin.

Used for thatching and when not too old considered to be fairly good fodder.

Fl. end of rainy season and autumn. Fr. cold season.

14. Cymbopogon Martini, *Stapf.* Syn. **Andropogon Schœnanthus,** *F. B. I.* Rusa oil grass.

An erect sweet-scented grass attaining about 6 ft. with glabrous culms. Leaves 1 ft. or more, long, flat, usually broad, often up to 1 in. with an amplexicaul or subcordate base, margins more or less scabrid, otherwise glabrous; ligules scarious. Panicles 1-1½ ft. long, much branched, with a leafy, reddish-brown spathe-like bracteole under each order of branches. Spikes ·5-·75 in. long, paired, few flowered, supported by bracteoles ·75-1 in. long. Spikelets paired, sessile and pedicellate; sessile spikelets ·15-·2 in. long, awned, often bluish, ultimately reddish-brown each with a hermaphrodite flower, pedicellate spikelets empty or male.

Throughout the area, nowhere extensive.

A valuable oil is distilled from this grass which is exported in large quantities from Bombay and used in perfumery. The green variety of the oil is known as "sophia" and the white variety is known as "motia" in commerce. The roots are medicinal.

When cut remarkable short curled leaves are formed from which the clumps can be at once distinguished from those other grass in the locality.

15. Themeda caudata, *Dur. & Jack.* Syn. Anthistiria gigantea, *Cav.* Subsp. caudata, *Hack.* Vern. *Ullah, dhonra.*

A tall often gregarious coarse grass, sometimes up to 20 ft. high with hard flattened stems. Leaves 3-5 ft. by ·3-·75 in., margins scabrid. Spikelets in clusters arranged on leafy panicles, together converting the top of the culm into a large compound drooping panicles. Clusters in the axils of spathe-like bracts and consisting of 4 lower spikelets ·4-·6 in. long, in equal pairs, two of which are neuter and two males, all awnless and forming an involucre round a very short central spike of 2-3 sessile, hermaphrodite, brown hirsute, awned spikelets each about ·4 in. long with barbed callus and a pair of sterile pedicelled spikelets. Glumes 4, in sessile spikelets, 1-3 in pedicelled spikelets. Grain oblong brown ·14 in. long.

Common in glades and phantas, readily comes up in openings in sal forests.

Notorious for the long awns of the spikelets which penetrate clothes and the skin.

Fl. end of rainy season and autumn.

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