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REPORT ON A BOTANICAL TOUR IN THE
LAKHIMPUR DISTRICT, ASSAM,

BY

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This tour was undertaken and accomplished during the months of March and April 1894.

Although at this season of the year the bulk of the herbaceous vegetation is either dormant or has not yet appeared, still from the similarity of the Flora to that of the Sub-Himalayan tracts to the westward, I was able to identify many plants from long and intimate acquaintance with their general appearance.

A representative collection of specimens was made, chiefly from trees and shrubs in flower or fruit, which has afforded me a good insight into the composition of the woody vegetation, and while engaged in determining my plants in the Calcutta Herbarium, I often found it possible to correlate materials obtained by former collectors. Of these the first were Dr. Wallich and Dr. Griffith who were deputed by Government, in 1834, to examine the tract of country producing the indigenous tea plant. The latter botanist has left on record (in the Transactions of the Agricultural and Horticultural Society of India, Volume V, 1838) a valuable systematic list of plants collected in the neighbourhood of Sadiya in which he emphasizes the strong affinities of this Flora with that of China. Of more recent collections the chief have been those formed by Mr. Gustav Mann, late Conservator of Forests in Assam, and Mr. C. B. Clarke. Both have devoted much of their leisure time and attention to the Flora of this province greatly to the advantage of Botanical Science. Thanks to the labours of these and other botanists and collectors, little of novelty can now remain undiscovered in the valley, but the surrounding mountains must yield rich harvests to naturalists in the future.

Joining the daily despatch steamer at Jatrapur I went direct to Dibrugarh, the chief town in Lakhimpur. This rapid voyage up the

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Brahmaputra (occupying only five days) affords few facilities for the observance of the details of the Flora, but it allows one to note the chief features of the country and its vegetation. In my case, unfortunately, the view was circumscribed by the obscurity caused by the haze over the country.

Up to within a short distance of Gauhati the banks of the river are low, and the depressed expanses of sand on either side are absolutely bare or are covered with extensive savannahs of tall grasses. The scenery is, therefore, extremely monotonous. Forests are confined to the mountain ranges seen in the distance and to the small peculiarly isolated hills which are scattered throughout Assam. The country is well-wooded around Gauhati which lies at the base of the northern slopes of the Khasia Hills. Low ranges of hills clothed with trees are seen on the opposite side of the river. Again the country is botanically poor until we arrive at Tezpur where the valley narrows considerably. The undulating hills here bear scrubby vegetation. Further on there are successions of grassy wastes, cultivated land and forests now more imposing in appearance and enlivened by the white flowers of *Æsculus punduana* which is very common. Towards Dibrugarh the forests are of still greater extent and at Sadiya and in the great forest of Makúm they seem boundless as they sweep through the plain up to the rugged heights of the encircling Himalayas of whose Natural History in this most interesting region we possess but fragmentary knowledge. The increase of elevation between Goalpara (150 feet) and Sadiya (440 feet) is only 290 feet, a remarkable fact when we take the distance between these places into consideration.

To supplement this meagre account of the Assam Valley, and especially of its lower area, I take the liberty of transcribing the excellent remarks concerning the sequence of the vegetation furnished by Dr. (now Sir Dietrich) Brandis in his "Suggestions regarding Forest Administration in Assam." He classified the forests and waste lands of Assam as follows:—

"*First.*—Grass lands often with scattered trees (semul, *e.g.*).

Second.—Sal Forest.

Third.—Forests of *sissu* and *khair* with other deciduous trees.

Fourth.—Mixed forests. Semul (*Bombax malabaricum*), *Sterculia villosa*, *Albizzia procera*, *Spondias mangifera*, *Anthocephalus Cadamba*, *Semecarpus Anacardium*, *Careya arborea*, *Dillenia pentagyna*, *Lagerstræmia parviflora*, *etc.*

Fifth.—Evergreen forests which vary exceedingly in different parts of the valley. Species of *Amoora*, *Michelia*, *Magnolia*, *Quer-*

cus and *Castanopsis* are invariably found on them and on low grounds *Dillenia indica* is, throughout the valley, one of the constituent trees. On high ground *Artocarpus Chaplasha* occurs all over the valley, while "Nahor" (*Mesua ferrea*) is common in the evergreen forest of the upper portion. *Stereospermum chelonoides* is a characteristic tree of the evergreen forests of Upper Assam. The "Soom" (*Machilus bombycina*) forests of Upper Assam form a remarkable subdivision of this class of evergreen forest. The remaining types are bamboo forests and cane brakes.

Lagerstræmia Reginæ, *Artocarpus Chaplasha*, *Dillenia indica*, and *Bombax malabaricum* are found throughout the Assam Valley. *Mesua ferrea* is only found in the upper part although it is common in the evergreen forests of the Garo and Khasia Hills. *Sâl*, *sissu* and *khair* are only found in the lower part of the valley. *Dillenia pentagyna* and *Lagerstræmia indica* extend upwards as far as *sâl* with which they are associated."

Immediately on arrival at Dibrugarh I made arrangements for visiting the Makúm forest and, next morning, departed by train to Margherita, a beautiful place lying at the foot of the Naga Hills and a deservedly favourite holiday resort of the Europeans resident in the district. The railway is owned by the Assam Coal and Trading Company and runs about eight miles beyond Margherita to the mines. For many miles the train speeds through cultivated fields and tea plantations most prosperous in appearance and in reality. The continuous extension of the latter and the influx of industrious immigrants from various congested districts in India will, in course of time, tend to transform this mainly forest clad division of Assam into a wealthy and well populated tract.

It appears that the Assamese, addicted to the use of opium, from false pride of race refuse to render labour for hire and thus leave the field open to strangers. Great areas in Upper Assam certainly bear traces of the existence of a former large and industrious population, and the present indolence of the people may be the outcome of years of oppression by surrounding tribes whose constantly recurring barbarous raids would render life and property so insecure that they would naturally exert themselves only for their immediate personal requirements. However it may be, there is no reasonable doubt regarding the fact that Upper Assam was once in a most flourishing condition and that great areas afterwards relapsed from cultivation because the invading hill tribes and the Burmese devastated the land and carried off the bulk of the population to slavery leaving the remainder in a state of hopeless despair and lethargy from which they may never free themselves.

The outskirts of the great forest of Makúm are reached at the railway junction of that name. Onwards is Digboi where petroleum wells have been tapped. Here the land becomes rugged for a short distance and the railroad is carried through the forest which is dense and penetrable with difficulty on account of the overwhelming mass of vegetation. Bamboos of several species are common. The most noteworthy are a large species growing in gigantic clumps (*Dendrocalamus*) and another (*Pseudostachyum polymorphum*) with multitudes of scattered culms. The latter was in flower and specimens were collected. It is advisable never to omit gathering specimens of any bamboo when in flower or fruit as years may elapse before such an opportunity may occur again.

The more characteristic features of the vegetation in the Makúm forest may be summed up shortly as, in my opinion, it is preferable to exhibit the subject according to a systematic method at the end of this paper.

The coal mines are at some elevation on the face of the hills eight miles eastward of Margherita. From there a comprehensive view can be obtained of the boundless forests extending to the horizon with the river Dihing winding through their midst. To the west are seen the grassy slopes of the settlement with smaller clearances scattered through the forest in its vicinity.

Large trees form a predominant feature in these forests whose aspect is relieved from uniformity by their extremely diverse forms. No single species is gregarious and the component individuals represent widely different orders and genera.

Many tower over the observer who is impressed by the imposing grandeur afforded them by their height and bulk. Chief among these are a tall clear stemmed species of *Dipterocarpus* (*D. pilosus*); *Mesua ferrea*, the famous "Nahor" or Iron Wood; *Dunbanga sonneratioides*, a stately tree with tabular, weeping branches terminated by panicles of large white flowers; *Bischofia javanica*, of wide distribution and justly valued for the quality of its timber; *Talauma Hodgsoni*, always a tree of note with dense foliage of large dark-green lucid leaves and glaucous flower buds opening into white flowers which shed their numerous petals immediately they unfold.

Of trees prominent from, other peculiarities we have *Mallotus albus*, *Mallotus denticulatus*, *Pterospermum acerifolium*, *Castanopsis indica*, *Actinodaphne obovatum* and *Myristica longifolia* all distinguished by the light colour on the undersurfaces of their leaves; *Bombax* and *Erythrina* armed at all points with hard conical prickles; *Aralia Thomsonii*, with slender, prickly stem crowned by a head of

large, radiating decomposed leaves giving it somewhat of the appearance of a Tree Fern; *Ficus Roxburghii*, with large leaves and clusters of enormous figs in great masses towards the base of the stem and in smaller groups along the strong, diverging branches; *Ficus Cunia*, bearing quantities of round figs, the size of marbles, along the pendulous branches thrown out by the tree to bear its fruits. Another again is *Gynocardia odorata* which bears flowers over the surface of its stem and branches. The flowers are succeeded by hard globular fruits which render the tree a conspicuous object in the forest.

Other remarkable trees are *Alstonia scholaris*, with branches and also leaves in whorls; *Oroxylum indicum*, with huge strap-shaped fruits; *Dillenia indica*, *Meliosma simplicifolia* and *Saurauja Roxburghii* with large, strongly veined leaves; *Salix tetrasperma*, the only tropical Indian representative of its genus; the laurels *Litsæa citrata*, with leaves and fruits strongly citron scented, *Litsæa salicifolia* and *Litsæa polyantha*, one of the commonest trees in the Makúm forest.

Not less remarkable than the diversity of forest trees is the wealth of epiphytal vegetation which everywhere arrests attention. *Pothos* and *Rhaphidophora* of several species cling closely to the trunks of trees and cover them to their very tops with their creeping stems and peculiar foliage.

The common climbing fern *Acrostichum scandens* also grows in the same manner, its graceful drooping pinnæ depending in close order along the whole length of tall trees. *Asplenium Nidus* and *Polypodium punctatum* are common on branches, the former growing with its long broad fronds in a cup-shaped manner which has suggested its trivial English name of "Birds' Nest Fern," the latter with somewhat similarly shaped fronds springing thickly and irregularly from dense masses of root fibres. *Davalliæ* and *Asplenia* of various species with delicately cut fronds occur in profusion. As a rule, in the dry season, these are altogether deciduous, the rhizomes remaining dormant until the succeeding rains or they curl up becoming dry and wilted although not dead and only unfold to resume their freshness when their roots are drenched with rain or saturated with aqueous vapour. To state the case succinctly, most epiphytic rhizomatous ferns with articulate stipes are deciduous in the dry season, while tufted species, forming a decided minority, are not so.

Two remarkable ferns *Drymoglossum carnosum* and *Polypodium nummularifolium* with widely creeping rhizomes and small tongue-like, succulent fronds, crawl over the branches of shrubs. Other striking examples of epiphytal ferns are *Lindsaya repens* and *Neph-*

rolepis exaltata both with scandent stems; *Antrophyum reticulatum* with its sori arranged along the lines of venation and *Vittaria elongata* with dense masses of drooping grass like fronds. Of orchids, the most typical and extensive order of Epiphytes in tropical regions, there are fewer representatives than one would expect to find. *Dendrobium*, *Saccolabium*, *Aerides*, *Sarcanthus* and *Bulbophyllum* are most in evidence.

The shrubby vegetation forming the undergrowth is dense, more especially so in places where the light is not excluded by the canopy of trees. In open parts where the forests have been more or less cleared away the commonest shrubs are *Mæsa indica*, which so often monopolizes abandoned cultivated lands to the detriment of more useful vegetation in the Eastern Himalayas; *Croton caudatus* (often becoming a tree); *Clerodendron infortunatum* whose white flowers in large open panicles exhale an overpowering fragrance; *Solanum indicum* and *Combretum chinense*. On the river banks free of the larger competing vegetation are *Homonoia riparia* which grows gregariously on river shoals sometimes covered by floods for months; *Ficus heterophylla*, *Ficus pyriformis*, *Ficus hispida*, *Acacia Intsia* and many more. On the borders of cleared tracts and even within them the small scrubby bushes are often completely enveloped by the subscaudent fern, *Gleichenia dichotoma* and the climbing species, *Lygodium microphyllum*, while over all trails a wide spreading *Selaginella*.

Their presence has been fostered by recent clearances of virgin forest and I have never yet met with these plants except in similar localities. *Davallia tenuifolia* and *Pteris semipinnata* have also effected a permanent footing on the steep sides of road cuttings and ditches in the vicinity, and as these five species of plants (and, of course, many others) do not exist in the natural forests around, one is puzzled to account for their apparently spontaneous appearance.

The botanical traveller in the Himalaya (to speak from my experience alone) could without difficulty produce scores of instances proving the multiplication of many otherwise rare forms of plant life induced through the development of a country by means of cultivation and roads. Similar conditions also materially hasten the extinction of indigenous vegetation.

In the confines of the forest the shrubby vegetation is for the greater part composed of species different from those noted in the more open tracts.

For convenience of discussion it can be readily divided into erect and climbing shrubs. As examples of the former we may take *Gar-*

denia campanulata, one of the commonest in the forest, a spinose virgate shrub redeemed from absolute ugliness by the beauty of its fragrant white flowers, *Phyllanthus reticulatus*, *Glochidion hirsutum*; *Villebrunea integrifolia*, *Boehmeria platyphylla*, *Sarcochlamys pulcherrima*, three Urticaceous plants all yielding strong, serviceable fibres; *Leea sambucina*, an undershrub often gregarious; *Styrax serrulatum*, sometimes attaining the stature of a tree, most beautiful when in flower with pure white corollas and bright-yellow anthers; *Buddleia asiatica*, also a most striking plant when its branches droop with the burden of the closely set panicles of perfumed white flowers; *Viburnum Colebrookinum*, another plant also conspicuous when in bloom; *Acanthus leucostachys*, a low shrub with holly like leaves more remarkable for its rarity than for beauty; *Sapindus attenuatus*, a loosely growing small shrub with flowers of a peculiarly dingy brown colour; *Morus indica*, the Indian Mulberry, moderately common as a spreading shrub and its black fruit clusters are palatable in a country where there is so little variety in edible fruits; *Callicarpa macrophylla*, with hoary leaves; *Dædalacanthus nervosus*, a handsome plant with veined bracts and bright deep blue flowers; three interesting species of *Rubiaceæ*, *Wendlandia tinctoria*, *Saprosma ternatum* (with many of its leaves arranged in whorls of three), and *Psychotria denticulata*.

These only are cited as types of the erect shrubby vegetation but many others could readily be named as one reviews the Flora within reach of the winding and intersecting paths of the forest.

We now transfer our attention to the scandent shrubs which are a decidedly predominant feature of the locality.

Jasminum undulatum is a common dense climber. *Mussaenda glabra* attaining to considerable heights, betrays itself by its milk white foliaceous calyx lobes. *Uncaria sessilifructus* and *Uncaria macrophylla* are large climbers with hard, curving, stipular thorns resembling buffalo-horns in miniature.

Tournefortia viridiflora, of lurid green aspect, represents the order *Boraginaceæ*.

Heptapleurum venulosum, one of the few *Araliaceous* plants existing here, is an enormous climber with numerous branches each terminated by copious panicles of red-brown fruits. *Rubus lucens*, belonging to a genus characteristic of Temperate Regions, forms tangled and impenetrable thickets in association with the equally well armed *Zisypus funiculosa*, *Z. rugosa* and *Zanthoxylum Hamiltonianum*. *Aspidopterys Roxburghiana* is a soft leaved climber bearing masses of light brown winged fruits. *Aristolochia saccata* has also large soft leaves.

To continue the list we have *Pæderia tomentosa* whose flowers resemble those of Cinchona; *Naravelia seylanica*, a widely climbing plant with long plumose achenes; *Melodorum bicolor*, an abundant Anonaceous plant whose brown tomentose buds open out into dark red flowers; *Tapiria hirsuta*, a climbing member of *Anacardiaceæ*, and *Conocephalus suaveolens*, a gigantic large-leaved climber both common throughout the tropical forests of the Eastern Himalaya. Several very prickly species of *Acacia* also prevail as climbers.

Other plants to name for the further illustration of climbing vegetation would be *Thunbergia grandiflora*, *Thunbergia coccinea*, *Thaladiantha*, *Hodgsonia heteroclita*, *Trichosanthes*, *Gynostemma*, *Vitis*, *Ipomœa* and other genera of *Convolvulaceæ*, *Trachelospermum*, *Ecdysanthera*, *Illigera*, *Combretum*, *Ficus scandens*, *Pagrza obovata*, etc.

The order of Palms also finds a place in this Flora. *Calami* of several species are gregarious and add to the difficulty of exploration in this forest by the bristly array of strong, sharp spines with which all are invested. *Phœnix sylvestris*, the Toddy Palm, and *Areca Catechu*, the Betel Nut, are not indigenous but are cultivated by the villagers. Some noble species seem to be truly wild, such as *Caryota urens* one of the most graceful palms in India; *Wallichia disticha*, most worthy of note from producing its fronds in two regular series on opposite sides of the stem as in *Ravenala*; *Wallichia densiflora*, a short stemmed species with *Caryota*-like leaves; *Livistona Jenkin-siana*, with a crown of large fan-shaped fronds; and *Pinanga gracilis*.

Plantains (*Musa*) of several varieties are cultivated by the natives and a small slender stemmed species with an erect inflorescence—*Musa rosacea*—grows here and there throughout the forest.

Tree ferns are also comparatively numerous—*Alsophila glauca* and *A. glabra*; but here neither make any approach towards their maximum development, indeed I did not observe the former with caudices more than 10 feet high and then the stems were thin and bare but a scanty crown of fronds.

Angiopteris evecta is of normal growth and this is the western limit (so far as our knowledge at present stands) of *Dicksonia Barometis*, formerly distinguished as *D. assamica*. This has large glaucous tree-fern-like fronds rising from a depressed caudex covered with bright, chestnut-coloured scales.

The last observations to be noted before we finally leave this forest are those concerning the herbaceous vegetation which, as may be presumed, is poor in comparison with the abundance of arboreal and shrubby types.

Ferns flourish under a variety of forms. *Davallia Speluncæ*, *D. Hookeriana*, *D. tenuifolia*, *Pteris quadrifurcata*, *P. biaurita*, *P. semi-pinnata*, *P. cretica*, *P. aquilina*, *Asplenium esculentum*, *Asplenium platyphyllum*, *Nephrodium decurrens*, *N. membranifolium*, *Polypodium nigrescens*, *Gymnogramme Hamiltoniana*, *Acrostichum variabile*, *A. axillare*, *Blechnum orientale* are a few of the many that could be enumerated.

In marshy situations *Phrynium* and *Alpinia* grow in dense masses supplying a never failing stock of fodder for wild and domesticated elephants. In shallow lakes we find a distinctive type of vegetation such as *Enhydra fluctuans*, *Grangea*, *Hypericum japonicum*, *Equisetum debile*, *Polygona*, the rare little *Pilea peploides*, *Mimulus*, *Torenia*, *Sagittaria*, *Ottelia alismoides*, *Potamogeton*, the bristly Aroid *Lasia heterophylla*, *Coix lachryma*, *Arundo*, *Saccharum cylindricum*, *S. spontaneum*, *Anthistiria gigantea*, *Cyperus* of many species, *Equisetum debile*, etc., and floating on the surface, *Lemna* and other stagnant water plants.

The ordinary herbaceous vegetation is too varied to allow of even a moderately exhaustive list to be given here. The majority consist of weeds of cultivation common to all the warmer parts of India. The following selection may serve to illustrate the subject. *Ranunculus sceleratus* is common in marshes. *Nasturtium indicum*; *Enanthe bengalensis*; *Seseli daucifolium*; *Stellaria media*, covering the banks of ponds; *Fragaria indica*; *Hydrocotyle rotundifolia*; *Ammannia rotundifolia*; *Blumea* of several species; *Xanthium strumarium*, in great quantity in waste places; *Vernonia cinerea*; *Saussurea affinis*; *Crepis japonica*; *Gnaphalium luteoalbum*; *Gnaphalium indicum*; *Siegesbeckia orientalis*; *Spilanthes Acmella*; *Lobelia affinis*; *Verbena officinalis*, *Masus*, *Vandellia*; *Torenia*, *Oldenlandia*, several species of *Hedyotis* and *Ophiorrhiza*. *Cynodon dactylon* forms good turf on cleared plots. On river banks are coarse grasses, sedges, *Rumex maritimus*, *Elatostema rupestre*, and several species of *Polygonum*. Labiates are common, such as, *Stachys oblongifolia*, *Leucas limifolia*, *Elsholtzia blanda*, *Mosla dianthera*, *Leonurus sibirica*, *Perilla ocimoides*, etc.

Having obtained a fairly complete collection of plants in flower and fruit in the forest of Makúm I returned to Dibrugarh where I remained two days to make arrangements for an excursion to Sadiya, about 60 miles further up the Brahmaputra. The town of Dibrugarh is well laid out and drained and the roads are bordered by avenues of shady trees. *Tectona grandis*, *Tamarindus indica*

and *Ficus religiosa* all form good trees. *Melia Azederach* is also commonly planted and I saw a few bushes of *Punica granatum* in full flower. The gardens in the compounds of the European residents are tastefully arranged and most of them contain plants of showy Indian orchids which thrive on the trees.

At this season of the year the river is at a very low ebb leaving beaches of glittering white sand on both banks.

In travelling to Sadiya the railway again proves a convenience as it runs to a tea plantation named Talap. The journey is completed by a walk of 10 miles and a voyage of 6.

From Talap a good road runs to Saikwa at present a village and market place where few supplies can be obtained, but formerly it was also a military outpost.

The greater part of this route is through rice-cultivated land broken in many parts by forests, generally of secondary growth, which become continuous as the Brahmaputra is approached. The rice fields which had become marshy since the heavy rainfall of the previous week were full of *Sagittaria*, *Ammannia*, *Polygonum sagittatum*, *P. strigosum*, and other common species of *Polygonum*, *Jussiaea suffruticosa* and a profusion of Cyperaceous plants. The arboreal and shrubby vegetation was mainly identical with that of Makúm. *Æsculus punduana* is exceedingly abundant and the undergrowth is tangled and dense. *Cuscuta reflexa* covered the latter, in many places, with its festoons of slender interlacing stems and white flowers.

From Saikwa Ghât the last 6 miles to Sadiya on the opposite bank are covered by a voyage in dug out canoes which are poled rapidly enough up stream by two men in each. The ordinary country boat built up of separate planks does not seem to be in use in this part of the river which is wide but rather shallow, and its sandy banks are skirted by forests of great extent.

The military outpost of Sadiya, situated close to the right bank, of the river, is surrounded by far reaching stretches of grass savannahs interspersed by coppices of small trees. A large annual bazar was formerly held here to the mutual advantage of traders from the wild tribes in the mountains and merchants from the low countries, but I believe they were discontinued a year or two ago on account of the virulent epidemics which broke out among these large gatherings of people.

In favourable situations in Sadiya, the trees are of noble growth compared with those that form the copses.

In addition to the grass lands at this isolated settlement a

remarkable feature is the sterile aspect of some very large tracts covered by a close scrub composed of *Solanum torvum* and *Flemingia congesta* but principally the former.

Regarding this plant Captain W. H. Lowther sounded a note of alarm in the Journal of the Agri.-Horticultural Society of India, Volume XI (1861), page 290. The article is entitled "On the mischievous increase of a gigantic species of *Solanum* on the North-East Frontier of Bengal, more especially in the Tea Districts of Assam."

He states that the plant was identified as *Solanum torvum*, Swartz, and that it promised to be one of the most stubborn and formidable antagonists with which Indian agriculture would ever have to contend.

So far as he could ascertain the plant was of spontaneous origin and only forced itself on human notice some ten or twelve years before in Upper Assam where its rapid growth and productiveness had earned for it an evil repute. The fruits are too nauseous to be palatable to human beings, but they are devoured by many animals and birds and the seeds always pass undigested.

The military outpost at Saikwa on the Brahmaputra was deserted chiefly because it was overwhelmed by this plant, which no outlay could diminish or keep in check, and now, at Sadiya, on the opposite bank, the same state of affairs seemed imminent. The heaviest growth is observed on recently deserted fields.

Fortunately we can say, after the lapse of 33 years, that the writer's fears have not been realized and, although *Solanum torvum* is still a pest in the deserted homesteads of Upper Assam, it readily succumbs to the influence of careful and continuous cultivation. Where it flourishes (and that is never in the forests), it stands bearing eloquent testimony to the pernicious results caused by "joom" cultivation, a custom still followed by the mountain and sub-montane tribes, but this system is now greatly checked and will soon be traditional in the settled districts. Many areas of valuable land abandoned by indolent cultivators are overrun by this *Solanum* with other equally harmful shrubs and by many species of strong coarse grasses long before a more valuable type of vegetation is strong enough to compete with them on equal terms. *Artemisia vulgaris*, *Plectranthus ternifolius* and *Lespedeza sericea* are very common as are also three remarkable climbers not observed at Makum, namely, *Acanthopanax aculeatum*, *Myxopyrum smilacifolium* and *Miquelia Kleinii*. Of trees the most interesting are *Ficus pomifera* with clear, grey, cylindrical trunk bearing figs in clusters; *Echino-*

carpus sterculiaceus, with large fruits armed with long, closely packed, stiff spines which made progression through some patches of jungle a matter of difficulty and pain to the native collectors; *Prunus Jenkinsii*; *Cordia Myxa*, abundant; *Stereospermum chelonoides*; *Castanopsis indica* and *citribuloides*; *Mangifera indica*, *Artocarpus integrifolia* and *Eugenia Jambos* are common in groves (apparently of considerable age) which mark the sites of once prosperous villages. The mango seldom comes to perfection in Upper Assam as the young fruit is generally destroyed by grubs.

Of the smaller trees prevalent in the scattered copses already mentioned there are *Phyllanthus Emblica*, *Glycosmis pentaphylla*, *Lepionurus oblongifolius*, *Baccaurea sapida*, *Gardenia companulata*, *Ficus silhetensis*, *Micromelum pubescens*, *Randia fasciculata*, *Pavetta indica*, *Linociera macrophylla*, *Symplocos spicata* and a few others.

At this season of the year, and probably all the year round from indications observed, there is but scanty herbaceous vegetation in these groves.

Some shrubs are common here which seem to be absent from Makúm, such as *Coffea bengalensis*, *Justicia Gendarussa*, *Desmodium laxiflorum*, *Lippia geminata*, *Pogostemon parviflorus*, *Adhatoda Vasica* (which has recently attracted attention by its virtues as an insecticide), *Dracæna angustifolia*, *Dracæna petiolata*, *Cannabis indica* and *Physalis minima* are common as escapes on cultivated land.

Rubus rosæfolius with double flowers and *Rubus lasiocarpus* are both common. Of herbaceous plants we find some interesting examples. *Veronica javanica* grows on banks; *Viola Patrini* abounds in grassy fields; *Potentilla Kleiniana* and *Cynoglossum glochidiatum* thrive on the sandy banks of the river. These three species are manifestly immigrants from the adjacent mountains.

Commelina nudiflora, *Aneilema nudiflorum*, *Celosia argentea*, *Oldenlandia*, *Blumea*, *Rungia*, *Chenopodium album*, *Bryophyllum calycinum* are a few more instances of the herbaceous vegetation which in all respects resembles that of other parts of the district.

We know but little of the Botany of the surrounding mountains. The Abor tribe only cultivates the land lying on the plain at the foot of their territory. Their principal crops are Indian corn, irrigated and dry ground rice, *Eleusine* and various other millets, Job's tears (*Coix*) beans of various kinds, pumpkins, gourds, etc.

I was informed by Mr. Needham, the Political Officer at Sadiya, who possesses an unique knowledge of the languages, manners and

customs of his turbulent neighbours, that the Mishmi tribe still brings down Rubber but in greatly diminished quantities compared with what was brought in former years, so their trees are probably becoming exhausted. He also told me that the Abors do not collect any Rubber whatever as they are deterred from doing so by the belief that the vindictive spirits which haunt all trees (and consequently all trees are spared from destruction) would immediately resent any damage done to their habitations. The Abors will not even allow sceptics to brave the terrors of ghostly indignation, but the Chalikatas, a tribe to the westward of them, although sharing in the same superstition, do not refuse to strangers the privilege of tapping the Indian Rubber trees (*Ficus elastica*), pecuniary considerations doubtless outweighing their scruples and fears. These Chalikata (or crop-haired) Mishmis are said to be the first people on the Indian side of the Himalayas to discover the valuable properties of the Rhee fibre; it is also said that from some species of nettle they manufacture cloth so strong that it is impervious to arrows when worn as loose jackets.

As regards the whole district of Lakhimpur, with its sparse population, Robinson, in his "Descriptive Account of Assam" in 1840, says that it presents a miserable picture of depopulated villages and orchards and plantations run to waste or covered with dense jungle.

This statement still holds good for a great part of the district. Sir W. W. Hunter has given a graphic sketch of its physical aspects in the Statistical Account of Assam.

To sum up, Lakhimpur presents most diversified scenery. It is situated at the extreme north-east end of the Assam Valley so that it is narrowly confined on three sides by the Himalayas and their offshoot, the Naga Hills. In populated parts there is much rice land and many tea plantations. The forests are large and contain good timber. Throughout the area, and especially near river banks, gigantic grasses cover ground which is either perennial marsh or flooded only during the rains.

Houses are built with frameworks of wooden posts arranged to suit the disposition of the rooms. Natives cannot be particular regarding the kind of wood used for this purpose, but stems of "Nahor" (*Mesua ferrea*) are preferred by the European residents. To form the walls, the spaces between the posts are often filled with single vertical lines of stripped *Arundo* stems and a coating of plaster and white-wash on both sides gives them an air of solidity. The high pitched roofs are thatched with the long leaves of the tall grasses abounding everywhere.

The climate, as can be deduced from the selection of plants I have

given, is subtropical, the average annual temperature being about 65° Fahrenheit. The rainfall is heavy (about 115 inches annually) and the wet season is of long duration, lasting from April to October. North-easterly winds are said to prevail throughout the greater part of the year.

The chief crop cultivated by the Natives is rice. The minor crops are identical with those grown in Bengal, such as Indian corn, millets, pulses, mustard, pumpkins, gourds, brinjals, potatoes and many others. Tomatoes seem to thrive most admirably.

Near a few villages I saw plots of castor oil plants (*Ricinus communis*) on which are reared the "eri" Silkworms. I was informed that since cloth could be obtained so cheaply in the bazaars the people had almost abandoned the practice of sericulture, and evidence is not wanting to show that in a few years the art will be lost to this people.

In the following pages I append a list of plants found in the Lakhimpur District, arranged according to the systematic method for convenience. This list is based mainly on my own observations and thus is far from being complete, but I am able to include in it many species not brought into the preceding account and it may serve the purpose of exhibiting, in a small degree, the affinities of the Flora.

LIST OF THE PRINCIPAL PLANTS FORMING THE VEGETATION OF LAKHIMPUR.

Ranunculaceæ.

Naravelia seylanica, DC. | common ; *Ranunculus sceleratus*, L. and *Ranunculus pensylvanicus*, L., both tall herbs abounding in swamps and on river banks.

Coptis Teeta, Wall.—This plant is indigenous in the Mishmi mountains and is included in this list because its roots are brought by the hill people to Sadiya from where it is exported to Bengal and other parts of India where it is held in much esteem as a drug possessing tonic and febrifugal properties. The yellow colouring matter in the roots is quickly soluble in water, but the quantity imported must be far too limited to allow of any part to be used as a dye, besides the expensive nature of the product would debar its utilization for such a purpose. So far as I can ascertain the plant has never been subjected to experimental culture.

Aconitum Napellus, L.—The roots of this and perhaps of other species are used by the hill tribes to make their deadly arrow poison. The plant is said to grow only on the interior highlands inhabited by the Tibetans who take the precaution of dipping the roots in boiling

water to destroy their vitality before exporting them to the lower hills. The approved method of preparing the roots by the Abors (and, doubtless, by the other tribes) is to pound them into a rough powder which is mixed with pigs fat (or, it is said, sometimes with the mucilage from the fruits of *Dillenia indica*) to ensure perfect and continuous adhesion. The mixture is applied firmly to the arrow-head leaving the point bare. The shaft is often incised just behind the head, so that it easily breaks off when an animal is struck.

Dilleniaceæ.

Delima sarmentosa, L.—A common large climber in the forests.

Dillenia indica, L.—One of the commonest trees in the district and throughout the province.

Magnoliaceæ.

In Dr. King's valuable monograph of this order, eight species of forest trees yielding good timber are recorded from this district. They are *Talauma Hodgsoni*, Hk. f. and T., *Magnolia pterocarpa*, Roxb., *M. Gustavi*, King, *M. Griffithii*, Hk. f. and T., *M. Pealiana*, King, *Manglietia insignis*, Bl., *M. Caveana*, Hk. f. and T., *Michelia Mannii*, King. There is one climbing species, *Kadsura Roxburghiana*, Arn.

Anonaceæ.

Of this order there are three climbers, *Uvaria Hamiltonii*, Hk. f. and T., *Melodorum bicolor*, Hk. f., *Miliusa Roxburghiana*, Hk. f. and T.; two shrubs, *Unona discolor*, Vahl., and *Goniothalamus sesquipedalis*, Hk. f. and T. and one small tree, *Polyalthia simiarum*, Bth. and Hk. f.

Menispermaceæ.

The plants I noted of this order were *Tinospora* sp., *Anamirta Cocculus*, W. and A., *Pericampylus incanus*, Miers, and *Cissampelos Pareira*, L., which is very common on the outskirts of small woods at Sadiya.

Papaveraceæ.

Argemone mexicana, L.

Papaver somniferum, L.—The cultivation of opium is forbidden in Assam, but as it is grown by the hill tribes the inhabitants of the valley can probably smuggle as much as they require. In the "Englishman" newspaper of the 14th April 1894 an interesting extract was published of an account of the Singpho tribe. The

original article was communicated to the Royal Geographical Society by Mr. Errol Gay, a Tea Planter, who attempted, unsuccessfully, to journey from Assam to Western China. The following are his statements relating to opium culture. "Every Khamti village has a large extent of poppy cultivation, generally in its immediate vicinity, and there are very few Khumits abstainers from the drug. About the middle of February, the capsules, of which there are three or four to a plant, begin to ripen; a small incision is now made with a sharp knife in each and the sap oozing out is wiped off on a piece of clean cloth. The following day the plant is given a rest and on the third day another incision is made and the sap wiped off as before. The process is repeated every other day until the capsule is exhausted. The cloth is carefully set aside in long strips about 3 inches wide until required when a small piece is cut off and steeped in tepid water which extracts all the drug and has an intoxicating effect."

From this it would appear that the opium is never smoked.

Cruciferae.

Nasturtium palustre, DC., and *N. indicum*, DC., are common weeds in moist places. *Brassica juncea*, Hk. f. and T., is cultivated for the sake of the oil expressed from the seeds, universally used in native cookery. The leaves are eaten as pot-herbs. *Raphanus sativa*, L., the radish, is grown in small enclosed plots by the villages.

Capparideae.

Cleome viscosa, L., *Capparis olacifolia*, Hk. f. and T., and *C. viminea*, Hk. f. and T., are subscandent shrubs.

Violaceae.

Viola Patrinii, DC., grows in the grass at Sadiya, our first instance of a mountain plant extending to the plains of this district.

Bixineae.

Gynocardia odorata, R. Br.—Common tree in the Makúm forest. The oil of the seeds is used for curing skin diseases. The ripe fruit, when breaking up, exhales a powerfully fragrant odour.

Caryophylleae.

Three common weeds, *Stellaria media*, L., *Polycarpon Læflingia*, Bth. and Hk. f., and *Drymaria cordata*, Willd. The adhesive capsules of the last named adhere firmly in large numbers to cloth and render the plant a well-known pest.

Portulacæ.

Portulaca oleracea, L., common on the sands of river banks.

Hypericinæ.

Hypericum japonicum, Thumb, a common mountain weed, rare in the plains.

Guttiferæ.

Various species of *Garcinia* and *Mesua ferrea*, L., one of the characteristic large trees of Upper Assam yielding a most valuable wood difficult to work on account of its hardness.

Ternstramiacæ.

Saurauja Roxburghii, Wall., a common small tree; *Schima Wallichii*, Choisy, yields good timber, which is, however, liable to warp; *Camellia theifera*, Griff., indigenous in the higher lands of Assam and Cachar. Tea cultivation is a large and important industry which is increasing in extent every year.

Dipterocarpeæ.

Dipterocarpus pilosus, Roxb., and *Shorea assamica*, Dyer, both lofty trees yielding good timber.

Malvaceæ.

Malva verticillata, L.; various species of *Sida* common to all the hotter parts of India; *Urena lobata*, L.; Cotton (*Gossypium herbaceum*, L.), of very poor quality, is grown both in the lower hills and plains. *Kydia calycina*, Roxb., grows at Makúm; *Bombax malabaricum*, DC., a large soft-wooded tree is common throughout the Assam Valley.

Sterculiacæ.

Sterculia urens, Roxb.—A strong coarse fibre is obtained from the bark and large quantities of a clear gum exude from cut surfaces. *Sterculia villosa*, Roxb.; *Sterculia Roxburghii*, Wall., are two other species of the genus. *Pterospermum acerifolium*, Willd., is a large tree. *Abroma augusta*, L., is a small bush yielding good fibre.

Tiliacæ.

Grewia excelsa, Vahl, and other species. *Triumfetta pilosa*, Roth.

Echinocarpus sterculiaceus, Bth., common at Sadiya; several species of *Elæocarpus*.

Malpighiaceæ.

Aspidopterys nutans, Hook. f., a large climber.

Geraniaceæ.

Oxalis corniculata, L., a common weed in waste places.

Impatiens tripetala, Roxb., in damp forests near rivers.

Rutaceæ.

Zanthoxylum Hamiltonianum, Wall., an extensively scandent, armed shrub. *Glycosmis pentaphylla*, Correa, an extremely common small tree, especially at Sadiya; *Micromelum pubescens*, Bl.; *Luvunga scandens*, Ham., a strong climber.

Burseraceæ.

Garuga pinnata, Roxb. *Canarium bengalense*, Roxb.

Meliaceæ.

The following trees all yield good timber useful for many purposes.

Melia Asadirachta, L., commonly planted; *Dysoxylum binectariferum*, Hk. f., *D. procerum*, Hiern, *Amoora Rokhituka*, W. and A., *Cedrela Toona*, Roxb.

Olacineæ.

Erythropalum vagum, Mast., a common climber at Sadiya; *Lepionurus oblongifolius*, Mast., a tree common in copses at Sadiya; *Miquelia Kleinii*, Meissn., a common climber at Sadiya; *Natsiatum herpeticum*, Ham., also common at Sadiya.

Celastrineæ.

Celastrus paniculata, Willd., and *C. monosperma*, Roxb., both large climbers.

Rhamnææ.

Zisypus jujuba, Lamk.

Zisypus ficulnosa, Ham., and *Z. rugosa*, Lamk., both strongly armed, wide rambling shrubs.

Ampelideæ.

Several species of *Vitis*; *Leea sambucina*, Willd., and other species.

Sapindaceæ.

Cardiospermum Halicacabum, L., *Erioglossum edule*, Bl., a tree of Makúm forest, *Allophyllus seylanicus*, L., a shrub of the same locality.

Æsculus punduana, Wall., common throughout the valley. *Sapindus attenuatus*, Wall., occurs in Makúm as a straggling shrub.

Turpinia pomifera, DC. This tree is exceedingly common in the Makúm forest.

Sabiaceæ.

Sabia lanceolata, Colebr., a climber. *Meliosma simplicifolia*, Roxb., a common tree in Makúm.

Anacardiaceæ.

Mangifera indica, L., cultivated. *Tapiria hirsuta*, Hk. f., a large climber.

Odina Wodier, Roxb., *Drimycarpus racemosus*, Hk. f.; *Spondias mangifera*, Willd.

Leguminosæ.

I found very few examples of this order in flower or fruit during my tours, but the following (with others) occur in the district, *Crotalaria*; *Millettia*; *Lespedeza sericea*, Miq., at Sadiya; *Desmodium laxiflorum*, DC., and other species; *Mucuna*; *Erythrina indica*, Lam.; *Phaseolus*, *Dolichos*, and *Cajanus indicus*, Spreng., cultivated; *Flemingia*; *Dalbergia*; *Derris ferruginea*, Bth.; *Cæsalpinia*; *Cassia*, *Bauhinia*; *Mimosa*, *Acacia*, *Albissia*, *Pithecolobium*.

Rosaceæ.

Prunus Jenkinsii, Hk. f. and T., a tree at Sadiya. *Rubus lucens*, Focke, forms extensive thickets at Makúm. *Rubus lasiocarpus*, Sm., and *Rubus rosæfolius*, Sm., perhaps introduced in Sadiya. *Fragaria indica*, Andr., common in waste places, fruit very insipid. *Potentilla Kleiniana*, W. and A., not common at Sadiya, is perhaps introduced.

Crassulaceæ.

Bryophyllum calycinum, Salisb., only observed at Sadiya.

Combretaceæ.

Terminalia; *Combretum chinense*, Roxb.; *Illigera* sp., a large climber at Makúm, with broadly four-winged fruits.

Myrtaceæ.

Psidium Guyava, L., cultivated for its fruit ; several species of *Eugenia*.

Melastomaceæ.

Melastoma malabathricum, L., common in wooded parts of the district.

Lythraceæ.

Several species of *Ammannia* in rice fields. *Duabanga sonneratioides*, Ham., a tall tree of the Makúm and other forests. It yields good timber for tea boxes, etc.

Punica granatum, L., cultivated.

Onagraceæ.

Jussiaea repens, L., and *J. suffruticosa*, L.

Passifloreæ.

Modecca trilobata, Roxb., a climber.

Cucurbitaceæ.

Hodgsonia heteroclita, Hk. f. and T., a large climber in forests. The seeds are edible after roasting and taste like nuts.

Trichosanthes palmata, Roxb., *T. cordata*, Roxb., common climbers. *Momordica Charantia*, L., cultivated ; *Cucumis sativus*, L., and *Cucurbita Pepo*, DC., also cultivated ; *Mukia scabrella* ; Arm., a common small climber ; *Zehneria umbellata*, Thwaites, another small climber remarkable from its polymorphous leaves. *Thladiantha dubia*, Bunge, a common dense climber with bright yellow corollas ; *Actinostemma tenerum*, Griff., *Gynostemma pedata*, Bl., both weak climbers.

Begoniaceæ.

Begonia Roxburghii, A. DC., *B. silhetensis*, Clarke, both in damp forests.

Umbelliferæ.

Hydrocotyle asiatica, L., *Seseli daucifolium*, C. B. C. *Ænanthe stolonifera*, Wall., *Ænanthe benghalensis*, Benth.

Araliaceæ.

Aralia Thomsonii, Seem., at Makúm ; *Acanthopanax aculeatum*, Seem., a common climber at Sadiya ; *Heptapleurum venulosum*, Seem., variety *macrophylla*, a very large climber at Makúm.

Cornaceæ.

Marlea begonizifolia, Roxb., a small tree at Makúm.

Caprifoliaceæ.

Sambucus javanica, Bl., a large virgate shrub ; *Viburnum Colebrookianum*, Wall., a shrub at Makúm.

Rubiaceæ.

Anthocephalus Cadamba, Miq., a large tree ; *Uncaria sessilifrutus*, Roxb., *Uncaria macrophylla*, Wall., large climbers ; *Wendlandia tinctoria*, D C., *W. paniculata*, DC., small trees ; *Hedyotis scandens*, Roxb., a small climber ; *H. vestita*, Br., *H. Auricularia*, L., *H. hispida*, Retz., *H. monocephala*, Br., are all weeds ; various species of *Oldenlandia* in rice fields ; *Spiradiclis bifida*, Kurz., at Makúm ; various species of *Ophiorrhiza*, of which *O. oppositiflora*, Hk. f., the most interesting is common in shady places at Makúm ; *Mussaenda* of several species ; *Myrioneuron nutans*, Wall. ; several species of *Randia* ; *Gardenia campanulata*, Roxb. ; several species of *Ixora* ; *Pavetta indica*, L., *Coffea bengalensis*, Roxb., common at Sadiya ; *Psychotria fulva*, Ham., *P. calocarpa*, Kurz., *P. denticulata*, Wall., at Makúm and Sadiya ; *Saprosma ternatum*, Hk. f., at Makúm and Sadiya ; *Pæderia tomentosa*, Bl.

Compositæ.

Ethulia conyzoides, L. ; several species of *Vernonia*, mostly small plants, but *V. arborea*, Ham., is a small tree. *Ageratum conyzoides*, L., some species of *Blumea* ; *Gnaphalium luteo-album*, L., and *G. indicum*, L., gregarious weeds in dry places ; *Xanthium strumarium*, L., common on roadsides ; *Siegesbeckia orientalis*, L. ; *Eclipta alba*, Hassk. ; *Spilanthes Acmella*, L., *Bidens pilosa*, L. ; *Cotula hemisphærica*, Wall. ; *Artemisia vulgaris*, L. ; *Saussurea affinis*, Spreng. ; *Crepis japonica*, Benth. ; *Sonchus oleraceus*, Linn.

Campanulaceæ.

Lobelia affinis, Wall. *Lobelia rosea*, Wall.

Myrsinæ.

Mæsa indica, Wall. ; several species of *Ardisia*.

Styraceæ.

Symplocos spicata, Roxb., *S. racemosa*, Roxb.; *Styrax serrulatum*, Roxb., a small tree in Makúm.

Oleaceæ.

Several species of *Jasminum*; *Linociera macrophylla*, Wall., common at Sadiya, *Olea dioica*, Roxb.; *Myxopyrum smilacifolium*, Bl., a common climber at Sadiya.

Apocynaceæ.

Melodinus monogynus, Roxb., a climber; *Alstonia scholaris*, Br., a common soft-wooded milky tree; *Ecdysanthera micrantha*, A. DC., a large climber at Makúm; *Trachelospermum fragrans*, Hook. f., in the same locality.

Asclepiadaceæ.

Cryptolepis Buchanani, Rœm. and Sch., a small climber; *Asclepias Curassavica*, L.; introduced from the West Indies, now naturalized throughout the tropics; *Dischidia benghalensis*, Colebr.

Loganiaceæ.

Buddleia asiatica, Lour.; *Fagraea obovata*, Lour., a large scandent shrub in Makúm.

Boraginaceæ.

Cordia Myxa, L., a common tree at Sadiya; *Tournefortia viridiflora*, Wall.; *Heliotropium indicum*, L.; *Cynoglossum glochidiatum*, Wall., at Sadiya.

Convolvulaceæ.

Various species of *Argyreia*, *Lettsomia*, *Ipomœa*, *Porana*, *Cuscuta reflexa*, Roxb., is common.

Solanaceæ.

Solanum nigrum, L., a common weed; *Solanum verbascifolium*, L., *S. torvum*, Sw.; *S. indicum*, L.; *Solanum Melongena*, L., cultivated; *Lycopersicum esculentum*, Miller, cultivated; *Physalis minima*, L., common at Sadiya; *Physalis peruviana*, L., cultivated; *Capsicum frutescens*, L., cultivated; *Nicotiana Tabacum*, L., cultivated.

Scrophularinæ.

Mimulus nepalensis, Benth.; *Morus rugosus*, Lour.; *Limnophila Roxburghii*, G. Don, and other species in wet places; *Torenia peduncularis*, Bth., *Torenia flava*, Ham.; *Vandellia crustacea*, Bth.; *Vandellia pedunculata*, Bth.; *Scoparia dulcis*, L., on waste ground only.

Lentibulariæ.

Several species of *Utricularia* in rice swamps.

Gesneraceæ.

Æschynanthus gracilis, Parish; *Bœixa filiformis*, Clarke; *Rhynchotechum ellipticum*, A.DC., and *R. vestitum*, Hk. f. and T. They are all found in dense forests.

Bignoniaceæ.

Oroxylum indicum, Vent., a small tree with long sword-shaped capsules; *Stereospermum chelonoides*, DC., very common at Sadiya. Canoes are made from the stems and the timber is moderately good for most purposes.

Acanthaceæ.

Thunbergia alata, Bojer, a small climber at Sadiya; *T. grandiflora*, Roxb., and *T. coccinea*, Wall., both common large climbers in forests; *Nelsonia campestris*, Br., a common weed; *Hygrophila polysperma*, T. Anders.; *Dædalacanthus nervosus*, T. Anders., at Makúm; *Acanthus leucostachyus*, Wall., at Makúm, near the coal mines, not common; *Codonacanthus pauciflorus*, Nees, at Makúm. *Phlogocanthus curviflorus*, Nees, *P. thyrsiflorus*, Nees, *P. asperulus*, Nees; *Lepidagathis hyalina*, Nees; *Justicia Gendarussa*, Linn. f.; *Adhatoda vasica*, Nees; *Rungia parviflora*, Nees, var., *pectinata*; *Dicliptera Roxburghiana*, Nees.

Verbenaceæ.

Lippia nodiflora, Rich., *L. geminata*, H. B. K.; *Verbena officinalis*, L., common in waste places; *Callicarpa arborea*, Roxb.; *C. macrophylla*, Vahl; *Tectona grandis*, Linn. f., cultivated only; *Gmelina arborea*, L., yields good timber and the wood is valued for turnery; *Vitex Negundo*, L.; *Clerodendron infortunatum*, Gærtn., and other species.

Labiatae.

Several species of *Ocimum*; *Plectranthus ternifolius*, Don., common at Sadiya; *Pogostemon parviflorus*, Bth.; *Elsholtzia blanda*, Bth., at Talap; *Perilla ocimoides*, L., cultivated; *Anisomeles ovata*, Br.; *Leonurus sibiricus*, L., *Leucas linifolia*, Spreng.; *Gomphostemma parviflorum*, Wall.

Nyctagineae.

Boerhaavia repens, L.

Amarantaceae.

Celosia argentea, L.; *C. cristata*, L.; *Amarantus spinosus*, L., and other common species; *Alternanthera sessilis*, Br.

Chenopodiaceae.

Chenopodium album, L., cultivated, also common as an escape; *Basella rubra*, L., cultivated.

Polygonaceae.

Polygonum plebejum, Br., *P. orientale*, L., *P. glabrum*, Willd., *P. barbatum*, L., *P. Posumbu*, Ham., and a few more species, all common on river banks and in swampy places. *Rumex maritimus*, L., *R. dentatus*, L., in wet places.

Aristolochiaceae.

Aristolochia Roxburghiana, Klotzsch, *A. saccata*, Wall.

Piperaceae.

Houttuynia cordata, Thumb., at Sadiya; several species of *Piper*.

Chlorantacheae.

Chloranthus officinalis, Bl.

Myristicaceae.

Myristica longifolia, Wall., a common tree at Makúm.

Laurineae.

Cryptocarya amygdalina, Nees; *Cinnamomum obtusifolium*, Nees, common at Makúm; *Machilus bombycina*, King; throughout the district and province. The "muga" Silkworms are fed with its

leaves; *Actinodaphne obovata*, Bl., a small tree with large glaucous leaves, common at Makúm. *Litsæa citrata*, Bl., common at Makúm; *Litsæa polyantha*, Juss., a very common tree; *Litsæa salicifolia*, Roxb., *L. oblonga*, Wall., and other species.

Loranthaceæ.

Several species of *Loranthus*.

Euphorbiaceæ.

Euphorbia hypericifolia, L.; *E. pilulifera*, L.; *Bridelia retusa*, Spreng.; *B. assamica*, Hk. f., common at Makúm as a small, spreading tree; *Phyllanthus reticulatus*, Poir.; *P. Emblica*, L., *P. urinaria*, L.; some species of *Glochidion*; *Breynia patens*, Bth.; *Bischofia javanica*, Bl.; *Antidesma diandrum*, Roth., and other species; *Baccaurea sapida*, Muell. Arg.; *Croton oblongifolius*, Roxb.; *Croton caudatus*, Geisel.; *Alchornea tilixfolia*, Muell. Arg.; *Trewia nudiflora*, L.; *Mallotus Roxburghianus*, Muell. Arg.; *M. albus*, Muell. Arg.; *M. philippinensis*, Muell. Arg.; *Cleidion javanicum*, Bl.; *Macaranga denticulata*, Muell. Arg.; *Homonoia riparia*, Lour.; *Ricinus communis*, L., cultivated; *Sapium baccatum*, Roxb.

Urticaceæ.

Trema amboinensis, Bl., a short lived, quickly growing tree; *Cannabis sativa*, L.; *Morus indica*, L.; *Morus lævigata*, Wall., a large tree yielding excellent timber; many species of *Ficus*; *Artocarpus integrifolia*, Linn. f., cultivated; *Artocarpus Chaplasha*, Roxb.; *Conocephalus suaveolens*, Bl.; *Laportea crenulata*, Gaud.; *Girardinia heterophylla*, Dcne; *Pilea peploides*, Hk. and Arn.; *Elatostema sessile*, Forst, and other species; *Bæhmeria nivea*, Hk. and Arn., cultivated; *Bæhmeria macrophylla*, Don; *B. platyphylla*, Don; *Pouzolsia indica*, Gaud., and other species; *Sarcochlamys pulcherrima*, Gaud.; *Villebrunea integrifolia*, Gaud.

Cupuliferæ.

Quercus Listeri, King, is recorded (amongst other localities) from Makúm and Sadiya. *Castanopsis indica*, A. DC., and *Castanopsis tribuloides*, A. DC., are both common.

Salicineæ.

Salix tetrasperma, Roxb.

Hydrocharideæ.

Hydrilla, *Vallisneria*, *Ottelia alismoides*, Pers.

D

Orchidaceæ.

Many species of *Dendrobium* and *Bulbophyllum*; *Phajus Wallichii*, Ldl., *Pholidota imbricata*, Ldl.; *Eulophia*; *Cymbidium aloifolium*, Swartz; *Geodorum*; *Rhynchostylis retusa*, Bl.; *Ærides*; *Saccolabium*; *Sarcanthus secundus*, Griff.; *Zeuxine sulcata*, Ldl.; *Goodyera procera*, Hk., *Pogonia*, etc.,

Scitamineæ.

Several species of *Curcuma*, wild and cultivated; *Kæmpferia*; *Zingiber officinale*, Roscoe, cultivated; *Costus speciosus*, Smith; *Alpinia*; *Phrynium*; *Canna indica*, L., cultivated; *Musa Sapientum*, L., several varieties cultivated, *Musa rosacea*, Jacq, at Makúm.

Hæmadoraceæ.

Peliosanthes Teta, Andr.; *Curculigo recurvata*, Dryand; *Crinum*.

Dioscoraceæ.

Several species of *Dioscorea*, wild and cultivated.

Liliaceæ.

Smilax; *Dracæna augustifolia*, Roxb.; *Dracæna petiolata*, Hook. f.

Commelinaceæ.

Pollia subumbellata, Clarke; *Commelina nudiflora*, L., and other species; *Anilema nudiflorum*, Br., and other species; *Forrestia*; *Cyanotis*.

Palmeæ.

Areca Catechu, L., cultivated; *Pinanga gracilis*, Bl.; *Wallichia densiflora*, Mart.; *Wallichia disticha*, T. Anders.; *Caryota urens*, L.; *Phœnix sylvestris*, Roxb., cultivated; *Livistona Jenkinsiana*, Griff.; *Calamus* of several species.

Aroideæ.

Amorphophallus bulbifer, Bl.; *Colocasia antiquorum*, Schott., cultivated; *Colocasia Mannii*, Hk. f. (recorded from Makúm); *Alocasia*; *Scindapsus*; *Rhaphidophora*; *Lasia heterophylla*, Schott.; *Pothos scandens*, L.; *Pothos Cathcartii*, Schott.

Lemnaceæ.

Lemna, growing on the surface of stagnant ponds.

Alismaceæ.

Alisma ; *Sagittaria* ; in rice fields and swamps.

Naiadaceæ.

Aponogeton ; *Potamogeton* ; in shallow ponds.

Cyperaceæ.

This order is represented by most of the genera and species common to the warmer parts of India.

Gramineæ.

In point of importance as regards appearance and utility the Bamboos occupy the chief place. They form a characteristic feature of the Flora of Upper Assam. They are often widely gregarious and their culms are applied to multifarious uses by the natives.

Dendrocalamus giganteus, Munro, and *Dendrocalamus Hamiltonii*, Nees and Arn, exceed all in size and height. *Pseudostachyum polymorphum*, Munro, is very common on the outer skirts of the Makúm forest where I was fortunate enough to find it in flower. Other common species are *Bambusa Tulaa*, Roxb., *Bambusa Balcooa*, Roxb., *Cephalostachyum pergracile*, Munro, and *Phyllostachys Manni*, Gamble.

I am indebted to Mr. Gamble for the identification of the bamboos collected during this tour.

The tall grasses covering large tracts of low-lying country belong to the genera *Imperata*, *Saccharum*, *Arundo* and *Anthistiria* (*Androscepia*). Their culms and leaves are used in house building as I have already pointed out.

The smaller grasses consist of various species of *Paspalum*, *Panicum*, *Pennisetum*, *Eragrostis*, *Coix*, *Cynodon*, *Setaria* and other genera.

Although there are large areas which could be utilized for grazing grounds where one would expect the cattle to be of a good class, the cattle are certainly the most degenerated I have seen in India.

Filices.

This district is rich in ferns as might be inferred from its climate and situation. As in most parts of the world the plants of this order shun the open cultivated tracts and usually frequent the forests.

A total number of about one hundred species has been recorded from Upper Assam. Some collected in recent years by Mr. Gustav Mann are rare and may yet prove to be forms or varieties of species already known to us.

The geographical affinities of the higher Cryptogamic Flora coincides with that of the flowering plants.

The following species extend from the Eastern Himalayas and Assam throughout the Malayan Peninsula. *Gleichenia linearis*, Burm., *Alsophila glauca*, Sm., *A. glabra*, Hk., *Dicksonia Barometz*, Link, *Davallia divaricata*, Bl., *Lindsaya repens*, Desv., *L. ensifolia* Sw., *Adiantum lunulatum*, Burm., *Onychium auratum*, Kaulf., *Pteris longifolia*, L., *P. cretica*, L., *P. pellucida*, Presl., *P. ensiformis*, Burm., *P. semi-pinnata*, L., *P. quadriaurita*, Retz., *P. biaurita*, L., *P. incisa*, Thumb., *Ceratopteris thalictroides*, Burm., *Blechnum orientale*, L., *Asplenium Nidus*, L., *A. longissimum*, Bl., *A. nitidum*, Sw., *A. bantamense*, Baker., *A. polypodioides*, Mett., *A. latifolium*, Don., *A. esculentum*, Presl., *A. Finlaysonianum*, Hk., *Aspidium vastum*, Bl., *A. variolosum*, Wall., *A. heterosorum*, Hk. and Bk., *A. decurrens*, Presl., *A. cicutarium*, Sw., *A. membranifolium*, Mett., *Nephrodium Leuseanum*, Hk., *N. calcaratum*, Bl., *N. ochthodes*, Hk., *N. syrmatium*, Baker, *N. Blumei*, Bedd., *N. tenericaule*, Hk., *N. unitum*, R. Br., *N. aridum*, Hk., *N. moulmeinense*, Bedd., *N. molle*, Desv., *N. amboinense*, Presl., *N. procurrens*, Hk., *N. crinipes*, Hk., *N. truncatum*, Presl., *Nephrolepis cordifolia*, Hk., *N. exaltata*, Schott., *N. acuta*, Presl., *Polypodium punctatum*, L., *P. proliferum*, Roxb., *P. adnascens*, Sw., *P. stigmatosum*, Sw., *P. fissum*, Hk., *P. nummulariaefolium*, Mett., *P. quercifolium*, L., *P. lineare*, Thunb., *P. superficiale*, Bl., *P. pteropus*, Bl., *P. longissimum*, Bl., *P. nigrescens*, Bl., *P. leiorrhizon*, Wall., *Gymnogramme Hamiltoniana*, Hk., *Meniscium triphyllum*, Sw., *Antrophyum reticulatum*, Kaulf., *A. latifolium*, Bl., *Vittaria elongata*, Sw., *Vittaria scolopendrina*, Presl., *Drymoglossum piloselloides*, Presl., *Acrostichum palustre*, L., *A. appendiculatum*, Willd., *A. variabile*, Hk., *A. axillare*, Cav., *A. flagelliferum*, Wall., *Lygodium microphyllum*, R. Br., *Angiopteris evecta*, Hoffm., *Kaulfussia æsculifolia*, Bl., *Helminthostachys zeylanica*, L.

The following Assam Ferns are found in the Chinese Flora, *Davallia Griffithiana*, Hk., *D. Hookeriana*, Wall., *D. Speluncæ*, Baker, *D. chinensis*, Sw., *Lindsaya orbiculata*, Lam., *Adiantum caudatum*, L., *A. flabellulatum*, L., *Cheilanthes varians*, Hk., *C. tenuifolia*, Sw., *Pteris longifolia*, L., *P. cretica*, L., *P. aquilina*, L., *Asplenium lanceum*, L., *A. bantamense*, Baker, *A. esculentum*, Presl., etc.

A few species are more restricted in habitat so far as we know at present, thus, *Pteris Griffithii*, Hk., *Blechnum cartilagineum*, Sw., *Polypodium subfurfuraceum*, Hk., are more or less confined to Mishmee and its adjacent mountains.