

## A BOTANICAL TOUR IN THE SIKKIM STATE, EASTERN HIMALAYAS

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## A B S T R A C T

The paper gives an account of the collections of Angiosperms and other lower groups of plants made and studied by the author from the Sikkim State of the Eastern Himalayas during April-June 1955. The area under study lies between  $27^{\circ}10'$ — $28^{\circ}5'$  N and  $88^{\circ}30'$ — $89^{\circ}$  E and includes the Lachen and Lachung river valleys, the upper Tista river valley and the neighbouring mountain slopes and meadows of the Northern Sikkim and the mountain ranges and meadows on way to Nathu La from Gangtok and Jelap La from Rongli, covering an altitude between 1400 and 4400 m. During the period under study, nearly 5000 specimens comprising 471 species of flowering plants, 6 species of Gymnosperms, 38 species of Pteridophytes and 14 species of Algae, were collected. Notes on several medicinal and economic plants growing in wild condition, based on the data collected from the villagers and forest guards, are also incorporated in the paper.

## INTRODUCTION

Botanical collection work and the study of the vegetation in the northern and the eastern parts of the Sikkim State ( $27^{\circ}10'$ — $28^{\circ}5'$  N and  $88^{\circ}30'$ — $89^{\circ}$  E) with special reference to medicinal and economic plants as far as possible were undertaken by the writer during the period April-June 1955. A detailed report of this work was prepared and submitted to the Government of India in April 1959 for onward transmission to the Government of Sikkim State. Important aspects of the data gathered, are summarised and given in this paper.

The Sikkim Himalayas form one of the botanically well-worked regions of India, the study of whose flora was started with the famous explorations of J. D. Hooker as early as 1848 and all his data were incorporated in his *Flora of British India* published during 1872-1897. Several papers in different forms on the Flora of the Sikkim Himalayas have since been published by different workers, particularly by the staff of the Botanical Survey of India in the Records of the Botanical Survey of India. Enormous data in the form of collections and notes have since been gathered and are available in the Central National Herbarium, Botanical Survey of India, Calcutta. As such, without repeating the data on Geology, Soil, Climate etc. of the area under study, the author has presented in this paper only the data collected by him on the flora including the medicinal and economic plants, during the short period of his work in the Sikkim State.

(i) A list of medicinal plants discussed in the text of the paper, (ii) a list of interesting species mostly indigenous to the Sikkim Himalayas, suitable for the Arboretum at Gangtok, and (iii) a brief data on the Temperature of different parts of Sikkim State noted during the period under study and which for certain parts have been recorded for the first time, are included in the paper as appendices I, II and III respectively at the end.

It will not be out of place here to add that it would be most useful or rather very necessary if a comprehensive flora of the Sikkim State is prepared by the

Botanical Survey of India, utilising the extensive data available with the Department. There are, however, a few difficult or not easily accessible parts in the Sikkim State which need a good study but such study together with a good collection of photos of representative types of vegetation and interesting plants of medicinal and horticultural importance, can be carried out while a beginning for the preparation of the flora of the Sikkim Himalayas with the available materials, is made.

The plant collections made during this brief study amount to nearly 5000 specimens comprising 387 species of Dicots representing 77 families, 84 species of Monocots representing 12 families, 6 species of Gymnosperms, 38 species of Pteridophytes and 14 species of Algae.

## ACKNOWLEDGMENTS

The author wishes to express his thanks to His Highness the Maharaj Kumar of Sikkim (now the Maharaja of Sikkim), Shri A. B. Pant, Political Officer, Sikkim State in 1955, Shri N. K. Rustomjee, Dewan of Sikkim State in 1955 for all their best co-operation and help during the period of work and to Rev. Father H. Santapau who initiated this work as the Chief Botanist, Botanical Survey of India in the beginning of 1955 and has been encouraging the author for completing his work for publication and to Dr. J. C. Sen Gupta former Chief Botanist for his constant interest in this work. The author's thanks are also due to Dr. Lakshminarayana formerly of the Botany Department, Hindu University, Varanasi, for identifying the algal collections. The author also wishes to express his gratitude to Shri N. A. Irani of the St. Xavier's College, Bombay for his assistance during the field work and to Shri Haripada Naskar, a veteran Herbarium Assistant formerly of the Calcutta Herbarium for his assistance in the identification work.

## ITINERARY AND GENERAL FLORISTIC ACCOUNT

A party of the Botanical Survey of India led by the author carried out Botanical collection work

and the study of vegetation in the Sikkim State with special reference to the medicinal and economic plants as far as available during the season from the 18th April to the 19th June, 1955 and the following are the details of the itinerary and the regions studied during the respective periods:

18-4-55	Left Calcutta
19-4-55	Reached Gangtok
20-4-55 } 21-4-55 }	Halt at Gangtok (for arrangements)

#### I NORTHERN SIKKIM

22-4-55	Left Gangtok (1677 m. = 5500 ft.)
22-4-55	Reached Dikchu (656 m. = 2150 ft.)
23-4-55	Left Dikchu Collection and study along the
23-4-55	Reached Singhik track. (1479 m. = 4850 ft.)
24-4-55	Collection and study in surrounding forests
25-4-55	Left Singhik Collection and study along the
25-4-55	Reached Toong track. (1525 m. = 5000 ft.)
26-4-55	Left Toong Collection and study along the
26-4-55	Reached Chung Thang track. (1693 m. = 5550 ft.)
27-4-55	Collection and study along the surrounding slopes
28-4-55	Left Chung Thang Collection and study along
28-4-55	Reached Lachung the track. (2775 m. = 9100 ft.)
29-4-55	Collection and study along the slopes towards
30-4-55 } 1-5-55 } 2-5-55 }	Yumthang and Thanka La tracks, covering the altitude upto 3340 m. (= 10950 ft.)

*N. B.* Yumthang area could not be covered as the track to Yumthang was blocked by heavy landslide during that period.

3-5-55	Left Lachung A few collections on the way
3-5-55	Reached Chung Thang
4-5-55 } 5-5-55 }	Halt for study and preservation of material and for arrangements.
6-5-55	Left Chung Thang Collection and study along
6-5-55	Reached Lachen the track. (2745 m. = 9000 ft.)
7-5-55	Collection and study along the surrounding slopes
8-5-55 } 9-5-55 } 10-5-55 }	and the Zemu valley track to a certain extent covering the altitude upto 3500 m. (= 10500 ft.)
11-5-55	Left Lachen Collection and study along
11-5-55	Reached Thangu the track. (3965 m. = 13000 ft.)
12-5-55 } 13-5-55 } 14-5-55 }	Collection and study along the slopes towards Sipba La, Donkya La and Lona La to a certain extent, covering the altitude upto 4422 m. (= 14500 ft.)
15-5-55	Left Thangu A few collections on the way
15-5-55	Reached Lachen
16-5-55	Left Lachen "
16-5-55	Reached Chung Thang
17-5-55	Left Chung Thang "
17-5-55	Reached Singhik "
18-5-55	Left Singhik "
18-5-55	Reached Dikchu "
19-5-55	Left Dikchu "
19-5-55	Reached Gangtok
20-5-55 } 26-5-55 }	Halt at Gangtok for study, preservation and for arrangements and for obtaining drying paper from Calcutta.

#### II EASTERN SIKKIM

27-5-55	Left Gangtok Collection and study along
27-5-55	Reached Karponang the track. (2897 m. = 9500 ft.)
28-5-55	Collection and study along the North-eastern Slope towards Namgyal point covering an altitude of 3294 m. (= 10800 ft.)
29-5-55	Left Karponang Collection and study along
29-5-55	Reached Changu the track. (3843 m. = 12600 ft.)
30-5-55 } 31-5-55 }	Collection and study along the surrounding mountain slopes and valleys, covering an altitude upto 4392 m. (= 14400 ft.) and also the region upto
1-6-55 } 2-6-55 }	Nathu La (4392 m. = 14400 ft.)
3-6-55	Left Changu Collection and study along
3-6-55	Reached Kupup the track. (3965 m. = 13000 ft.)

4-6-55 } 5-6-55 } 6-6-55 }	Collection and study along the surrounding alopes towards Bithang Lake and upto Jelap La (4389 m. = 14390 ft.)
7-6-55	Left Kupup Collection and study along
7-6-55	Reached Gnathong the track. (3751 m. = 12300 ft.)
8-6-55 } 9-6-55 }	Collection and study along the surrounding forests.
10-6-55	Left Gnathong Collection and study along
10-6-55	Reached Sedonchen the track. (1982 m. = 6500 ft.)
	(Padanchen)
11-6-55	Collection and study of the surrounding forests
12-6-55	Left Sedonchen Collection and study along
12-6-55	Reached Rongli the track.
13-6-55	Collection and study of the surrounding vegetation
14-6-55	Left Rongli
14-6-55	Reached Gangtok (via Ari etc.)
15-6-55 } 16-6-55 }	Halt at Gangtok for preservation and study of the collections.
17-6-55	Left Gangtok
17-6-55	Reached Siliguri
18-6-55	Left Siliguri
19-6-55	Reached Calcutta.

There have been several notes and publications on the general vegetation of the Sikkim Himalayas dividing the region starting from Terai to Snow line into Tropical and Sub-tropical, Sub-temperate and Temperate, and Sub-alpine and Alpine zones with the characteristic composition of species in relation to altitude and climate. The present report which is purely a record of the observations made stage by stage while covering the varying altitudes along the Northern and the Eastern Sikkim, is prepared on a different line, giving brief notes on vegetation and the interesting plants (including medicinal and economic species) recorded at various stages of the journey and with some of the notes supported by photographs. A detailed enumeration of the species collected together with the field notes, locality etc., is, however, given at the end.

#### I. Northern Sikkim :

(Vernacular names given in the text are in Nepali).

The region from Gangtok to Dikchu is mostly under cultivation. The vegetation, as the altitude changes from about 1500 to 600 m., changes from moist sub-tropical to moist tropical, semi-evergreen type composing tree species of *Macaranga*, *Schima*, *Eugenia*, *Sapium*, *Engethardia*, *Castanopsis* and others mixed with the undergrowth comprising shrubby species of *Datura*, *Clerodendrum*, *Mussaenda*, *Embelia*, *Baliospermum* and the herbs like *Asclepias*, *Ariopsis*, *Pratia* and several others. At certain places, the climbing species of *Vitis*, *Hoya*, *Paraboena*, *Uncaria* and *Trichosanthes* intertwine among the trees and shrubs and form dense thickets. Species of *Nephrolepis*, *Lycopodium*, *Dendrobium* are the ferns and epiphytes commonly observed.

*Asclepias curassavica*, commonly known as the West Indian Ipecac, though a native of the West Indies, is often grown in gardens and naturalised in many parts of India. This species has been collected near about Dikchu (probably an escape from cultivation). The root and the expressed juice are emetic and cathartic.

While passing Dikchu towards Singhik, deserted plantations of *Ficus elastica* mixed with *Pandanus sikkimensis* have been observed. Pl. 1(1). The vegetation along the track whose altitude varies from 650 to 1500 m. gradually changes from tropical to sub-tropical type. The tree species comprising *Ostodes*, *Macaranga*, *Dysoxylum*, *Castanopsis*, *Phoebe*, *Symingtonia* and few others form the dominant composition of the vegetation mixed with shrubs and large herbs like *Boehmeria*, *Maesa*, *Clerodendrum*, *Chasalia*, *Phyllanthus*, *Ardisia*, *Melastoma*, *Fragaria*, *Edgeworthia*, *Girardinia* and several others forming the undergrowth. Along humid and shady areas, climbing species of *Piper*, *Pothos*, *Vitis*, *Rhaphidophora*, *Smilax* mixed with epiphytic fern species of *Aspidium*, *Nephrolepis*, *Asplenium* and rarely orchids like *Dendrobium densiflorum* and *Vanda cristata* covering the trees and shrubs, present dense green cover. Herbaceous species of *Crepis*, *Gymura*, *Polygonum*, *Impatiens*, *Pilea*, *Plantago*, *Potentilla* and several others and grasses like *Thysanolaena*, *Arundinella*, *Panicum* form the ground cover. Along watery edges species of *Oxalis*, *Ranunculus*, *Nasturtium*, *Mimulus*, *Viola*, *Dichrocephala*, *Cerastium* and several others have been collected. In shady and moist rocky crevices and slopes *Selaginella monospora* has been found to be growing very common. Tree fern *Cyathea* has been observed here and there along the track.

A few medicinal plants such as *Dichroa febrifuga* (vern. Bhasak), *Gynocardia odorata* (vern. Gante), *Astilbe rivularis* (vern. Budi Vakthi) have been collected. Rhizome of *Astilbe* is considered to be good for lumbago and it is said that the rhizome is crushed and taken as decoction after boiling in water or chewed as 'supari' for relieving body pains. Though detailed chemical properties of many *Arisaemas* are still unknown, some of the Glucosides, obtained from the preliminary analysis of rhizomes of *Arisaema consanguineum* (as worked out from material by the Eastern Circle of Botanical Survey of India from Khasi Hills and sent recently to the Central Drug Laboratory, Lucknow) have been found to be very interesting and the work is still in progress at the Central Drug Research Laboratory, Lucknow. Such species of *Arisaema* has also been collected along this tract in Sikkim. The bark of *Fraxinus floribunda* (vern. Lakuri) contains several Glucosides including Traxin. The paste of this bark together with egg, honey, cow's milk and stem paste of *Viscum articulatum* is said to possess good healing properties for external and internal pains and broken bones and is used both for men and animals. The bark is also bitter and astringent and reported to possess febrifugal action. This species is said to be growing along the areas from Chung Thang to Lachen and Lachung. Huge quantities of this bark are said to be taken to the plains and to Tibet also. Many of the trees in this area are seen with their

bark mercilessly stripped off. *Piper thomsonii* (vern. Pipila or Jungli Pan) is very abundant in this area and the leaves are used as 'pan' with lime and 'supari' by local people. The roots of *Stephania glabra* (vern. Tamarki) growing at a few places along this track, are acrid and considered to be medicinal. *Gynocardia odorata* (vern. Gante) is a fairly common tree along this area and the seeds yield Gynocardia oil which does not contain any chaulmoogric acid or its homologue, but consists of glycerides of linolic, palmitic, and a few other allied acids. Region with an average altitude of about 1500 m. is mostly of sub-tropical type Pl. 1(2). with tree species of *Engelhardtia*, *Castanopsis*, *Symingtonia*, *Alnus*, *Toona*, *Daphniphyllum* mixed with sparsely growing species of *Eugenia*, *Ehretia*, *Michelia* and few others, covered by epiphytes and climbers such as *Pholidota*, *Coelogyne*, *Dendrobium*, *Vaccinium*, *Aeschynanthus*, *Rhaphidophora*, *Pothos*, *Hoya*, *Stephania* and others, forming the dominant components. The undergrowth is densely covered by shrubby and herbaceous species of *Viburnum*, *Solanum*, *Rubus*, *Elatostema*, *Begonia*, *Arisaema*, *Cannabis*, *Paris* and the dominant bamboo species of *Arundinaria* and several others. Along the moist and shady areas, a few members of Bryophytes have been collected. Lichens lie rather common on various stems, branches and rocks.

The decoction of leaves of *Pithecolobium bigeminum* (vern. Bhalimora, Tikpikung), observed to be growing sparsely, is used as an external application in upper India in Leprosy and as a stimulant for the growth of hair. The seeds are in great demand in certain parts of Burma where the people use them as a condiment after repeatedly boiling in water and discarding the water every time. The bark contains 8% of an alkaloid which acts as a fatal poison to fish and also contains a saponin. The leaves contain two acids but no alkaloids, glucosides or tanins.

From Toong to Chung Thang, there is no appreciable change in altitude and consequently almost similar vegetation continues with a few more species of *Eurya*, *Saurauja* among the trees mixed with the undergrowth of shrubs like *Stachyurus*, *Celastrus*, *Maesa* and herbs such as *Cerastium*, *Phytolacca*, *Fragaria*, *Didymocarpus*, *Viola*, *Lysimachia* and several others. A few interesting ferns belonging to the species of *Loxogramme*, *Drymoglossum*, and *Polypodium* epiphytic on trees and *Equisetum*, profusely growing along the sandy slopes of the river bed and open slopes, have been collected. Approaching Chung Thang, a few plantations of *Alnus nepalensis* have been observed.

*Daphne bholua* (= *D. cannabina* Wall. p. p.) (vern. Kalo Argili or Kakati) which yields useful stem fibre for making Lama paper, has been found to be quite common. The roots of this species are said to be used for relief of stomach troubles. But so far there is no record of the medicinal utility of

the most of the species of *Daphne*. But it is very likely that such properties may be occurring in this species as in the roots of *Daphne mezereum* (the real mazeron of Europe) and *Daphne oleoides*, the so called Mezereon of Afganistan, regularly imported to India and are medicinally used. *Swertia chirata* (Chirata), a well known drug plant has also been recorded growing sparsely. The bark of *Edgeworthia gardneri* (Argili), a very common plant, is considered to be useful for ropes. The tubers of *Dioscorea deltoidea* which grows at certain places along this track, are rich in Saponin and are used in washing silk, wool and hair and in dyeing and are also reported to kill lice. *Cissampelos pareira* (vern. Batul pale) whose roots are highly medicinal grows commonly in this area. *Hedera helix* (vern. Dudela), a common climbing shrub along the slopes in this area was at one time highly valued in medicine. Nearly all parts of the plant, namely, leaves, fruits and seeds contain the glucoside, hederin and also other poisonous glucosides. On the basis of slight differences between the European and the Himalayan specimens of this species, Tobler considers the Himalayan species as *Hedera himalaica*. *Stephania glabra* has also been occasionally collected along this track.

The area round about Chung Thang is mostly under cultivation with *Triticum* (Wheat), *Hordeum* (Barley), *Brassica* (Mustard). A few stray plants of *Avena* (Oat) and infection of several ears of Barley with *Ustilago* (Smut) have been observed along these fields. Fruiting trees of *Prunus* (vern. Aru), *Pyrus* (Pear—vern. Naspathi) and *Photonia* are also under cultivation round about Dak bungalow. Most of the vegetation of the surrounding mountain slopes are constantly subjected to clearing for fuel and a few shrubby species of *Mahonia*, *Maesa* have been observed growing along with the species already recorded in the previous paragraphs.

*Skimmia laureola* (Lepcha-Timburnyok) which grows round about Chung Thang, yields a poisonous alkaloid, Skimmiamine from its leaves together with an essential oil. Recently from the notes collected by the author from the tribals of Mishmi hills in NEFA, it has been found that the fruits of this species, though poisonous, are considered by them as medicinally useful for the treatment of gastric pain. This utility of the fruits has so far been not recommended in any literature dealing with Indian drugs. Taxonomically, this species growing along the Eastern Himalayas has been considered to be slightly different from the real *Skimmia laureola* of the Western Himalayas. *Arisaema consanguineum* recorded along the lower tract between Dikchu and Singhik, has also been collected near about Chung Thang but rather rare.

From Chung Thang to Lachung, the vegetation gradually changes from the sub-tropical or sub-temperate to distinctly temperate type as the altitude changes from 2400 to 2700 m. Cultivation

of *Triticum* (Wheat), *Hordeum* (Barley), *Fagopyrum* (vern. Papad), *Solanum* (Potato) and *Capsicum* (Chillies) has been found to be common along the tract and near villages. The components of the vegetation gradually change to species of *Acer*, *Michelia*, *Quercus*, *Juglans*, *Rhododendron*, *Ilex* mixed with shrubby species of *Elaeagnus*, *Prinsepia*, *Deutzia*, *Rubus*, *Berberis*, *Viburnum*, *Rosa*, *Rhododendron*, *Zanthoxylum*, *Lobelia* and others covered by small climbing species of *Jasminum* and epiphytic orchids like *Cleisostoma*, *Coelogyne* and others forming the dense undergrowth. Several herbs like *Arisaema*, *Valeriana*, *Ajuga*, *Hemiphragma*, *Artemisia*, *Capsella*, *Euphorbia*, *Primula*, *Aster*, *Elatostema* and several others together with a few species of Bryophytes form the ground cover. Along the way, plantations of *Juglans regia* (vern. Okhar) have been observed at few places after Chung Thang. *Daphne bholua* has also been observed to be growing sparsely along this area.

Most of the area round about Lachung is under cultivation Pl.1.(3). Orchards of *Pyrus malus* (Apple) and *Pyrus sinensis* (Pear) maintained in this area are said to be yielding good quantity of fruits. Vegetation along the track for about five miles only from Lachung to Yumthang reaching upto an altitude of about 3300 m. had been studied, as the track to Yumthang was blocked at that stage due to extensive land slides. The forest at several places of this area has been heavily denuded. The components of the temperate vegetation along these altitudes conspicuously change to the Conifer species, particularly *Abies densa* which is mixed with *Picea* at higher elevation and *Tsuga* at slightly lower elevation. Pl.1(4). Of the undergrowth comprising several shrubby species of *Rhododendron*, *Berberis*, *Enkianthus*, *Euonymus* and others, the yellow flowered *Piptanthus nepalensis* mixed with small trees of *Maddenia himalaica*, forms the dominant component along several cleared spots. Pl.2(5). Large bushes of *Pteris formosa* with their attractive bunches of pearl-white flowers have been found to be common along the track. Pl.2(6). Along the *Abies* forest at higher elevation, fruiticose and foliaceous lichens, particularly *Usnea*, are profuse in their development. Along the extensive land slide zone, large tracts of *Abies* have been destroyed. Pl.2(7).

On way to Thanka La towards east of Lachung which was covered for about four miles reaching the altitude of about 3300 m., similar vegetation with *Abies densa* as the dominant species along the higher elevation has been observed. Here also large tracts mountain slopes cleared of their forest, present *Berberis* and *Rhododendron* gregariously growing. Pl.2(8). At certain points along such barren slopes littered with huge rocky boulders, interesting regeneration though sparsely, of *Larix griffithiana* has been observed. Pl.3(9).

Unfortunately regions surrounding Yumthang could not be reached (for the reason stated above)

in search of interesting medicinal plants such as *Aconitum* and other species. Along the track to Yumthang, only a few plants of aromatic *Selinum tenuifolium*, gregariously growing, have been collected. The pungent root stock of this species is considered to be useful for stomach troubles and fever. *Daphne bholua*, the species used commonly for paper making has been recorded at several places in this area. Small herbs of *Theropogon pallidus* (vern. Jungli Pyaz) which is used as condiment, have been found to be fairly common along moist slopes on way to Thanka La. *Drosera peltata*, a tiny interesting carnivorous plant, commonly occurring as small patches is considered to possess powerful rubefacient properties, probably due to Napthaquinone which is irritant and is used as a blistering agent in the Western Himalayas. *Artemisia vulgaris* (vern. Taknyl), a very common weed along various tracts in Sikkim from 1500 to 3600 m., is occasionally used in India and elsewhere for medicinal purpose as an anthelmintic, expectorant and antiseptic. Indian samples have been found to yield an essential oil containing  $\alpha$ -thujone borneol etc. Fruits of *Zanthoxylum oxyphyllum* (vern. Timur) which was collected round about Lachung and also along the track to Chung Thang from Lachung, contain an essential oil which acts as an antiseptic and disinfectant. The stem bark, root bark, branches and thorns are considered to be medicinal similar to those of *Zanthoxylum alatum*.

It may not be out of place to mention here that several attempts have been made to elucidate any useful information through the Lamas of Lachung including the well-known Shri Rimuchi Lama of Thamachi Gompa regarding the medicinal plants employed by the Tibetan Vaidas and Herbalists who used to visit these areas during September-October months both for collection of drug plants and also for earning money by way of administering their medicines to the sick. But all the Lamas who usually attempt to relieve the sufferings of the sick by their prayer and mantras, appear to be ignorant of these medicinal plants used by the Tibetans for their medicines. Necessary request to collect small samples of such medicinal plants together with some useful data about their localities etc. from the Tibetan Vaidas during their visits to Sikkim borders, had been made to the Teacher Lama of Lachung Gompa and the same had been informed to the authorities of the Sikkim State administration but nothing has so far been materialised.

The region along the Lachen river from Chung Thang upto Lachen reaching upto about 2700 m. presents typical temperate vegetation comprising tree species of *Quercus*, *Acer* and *Populus* as the dominant, mixed with several herbaceous species of *Fragaria*, *Hedychium*, *Disporum*, *Arisaema*, *Trigonotis*, *Cardamine*, *Tiarella* and *Gallium*. The

fern species of *Gleichenia* and *Equisetum* form dense undergrowth and ground cover all along. Climbing species of *Jasminum*, *Aristolochia*, *Premna* and *Hedera* mixed with parasitic species of *Viscum* and *Taxillus* and epiphytic species of *Stauroopsis*, *Cymbidium*, *Pentapterygium*, *Polypodium*, *Asplenium*, have been observed frequently.

*Dichroa febrifuga*, the well known 'Bhasak' of the Indian Medicine, has been found to be growing very common along the track of about 1800 m. altitude, a little away from Chung Thang towards Lachen. The paste made of green flattened stems of *Viscum articulatum* (vern. Hur-jur) mixed with hen's egg, is said to be efficacious in cases of bone fractures. *Geranium nepalense*, the sweet Nepal Geranium which has also been collected growing in this area at an altitude of about 2400 m., is used as an astringent and the roots of this species known as 'Roel' or 'Bhand' in the Indian Medicine are used for colouring medicinal oils. *Hedera helix* has also been collected along this track.

The temperate vegetation of the regions surrounding Lachen towards Thepa La and Naram village on the other side of Zemu river and a part of Zemu valley reaching upto about 3200 m. altitude, has been studied. The general composition of the vegetation along these areas is almost similar with, however, a few types of species characteristic to each area. *Acer* with about four species mixed with *Salix*, *Daphniphyllum*, *Prunus*, *Rhododendron*, *Pentapanax*, *Pyrus* and *Betula* form the dominant components of the lower vegetation. The upper slopes of the surrounding mountains are, however, covered by the dense growth of *Abies densa* and *Tsuga brunoniana*. The shrubby vegetation comprising the undergrowth is quite dense with species of *Berberis*, *Gaultheria*, *Rhododendron*, *Hippophae*, *Maddenia*, *Pieris*, *Viburnum*, *Enkianthus*, *Daphne*, *Piptanthus* and several others. The herbaceous growth, though poor due to extensive use of these tracts as Yak grazing grounds, comprises species of *Primula*, *Sambucus*, *Draba*, *Clintonia*, *Fragaria*, *Chrysosplenium*, *Tiarella*, *Cardamine* and many others. The climbers are few of which species of *Celastrus*, *Hedera*, *Holbellia* are commonly observed. Of the epiphytes *Coelogyne*, *Vaccinium*, *Polypodium* species are common.

The two species of *Berberis*, *B. umbellata* and *B. wallichiana* from which the alkaloids, Umbellatine from the former and Oxyacanthine and Umbellatine from the latter are extracted, have been found to be very common in these areas and also other parts of Sikkim. Powdered roots of the climber, *Clematis montana* (vern. Pinasi Lara) is said to be very efficacious for cold and headache. The raw root is quite aromatic and the crushed root when smelt, creates a burning sensation. Though the chemical properties of this species have not been well worked out, the occurrence of anemonin and a few other alkaloids shown to be present in some

foreign species, may be possible. *Iris ensata* (vern. Bhoji) is quite abundant along the marshy tract near Chetan village. The rhizome of this species has pleasant Citronella oil scent and is used externally after crushing for the relief of cold and cough. Water mixed with crushed rhizome is used for washing horses attacked with fleas. The delicate plant parts of *Streptopus simplex* and *Polygonatum cirrhifolium* both known as 'Gari-muchi' which are used as green vegetable by the local people are quite common along moist shady slopes. The juice of the flowers of some *Rhododendron* species is considered to be effective for blood dysentery when taken in after soaking the flowers in water and crushing them. This interesting property is worth investigating. *Hedera helix* has been found to be very common along the track to Naram village. *Zanthoxylum oxyphyllum* (vern. Temur) grows along the track to Thepa La.

From Lachen to Thangu, the altitude increases rapidly from 2700 to 3900 m. and the vegetation from the typical temperate type gradually changes to the sub-alpine type at higher elevations. Shrubs and small trees of *Rhododendron* with variety of species are predominant mixed with *Gaultheria*, *Euonymus*, *Viburnum*, *Juniperus*, *Ribes*, *Berberis* and occasionally trees of *Prunus*, *Larix*, *Lindera* and among the herbaceous flora species of *Primula*, clumps of *Cassiope* along rocky corners, *Coriaria*, *Corydalis*, *Anaphalis*, *Morina*, *Arisaema*, *Bryocarpum* and several others. Among the climbers which are very few, *Sabia* and *Clematis* have been collected. Along the upper slopes of the mountains, *Abies densa* is the most dominant species. Wide areas at several points along the track are under cultivation.

*Clematis montana* and *Skimmia laureola*, the two medicinal plants discussed earlier have also been recorded in this area.

While studying the vegetation along the tracks towards Goichand and Sipba La, upto Taling towards Donkya La and towards Lona La, an altitude of slightly more than 4400 m. has been covered. The vegetation along these regions and higher above, comprises typical alpine moorland type where tree growth is completely arrested. The stunted bushy growth along these slopes consists predominantly of several species of *Rhododendron* mixed with tough clumps of *Juniperus*, *Salix*, *Myricaria*, *Cotoneaster*, *Berberis*, *Rosa*, *Lonicera* and a few others. Extensive tracts of moraine land mostly devoid of vegetation and covered by huge rocky boulders, form the common sight in these areas. Along the suitable slopes favouring the herbaceous and small clumps of bushy growth, species of *Anemone*, *Thermopsis*, *Primula*, *Aconitum*, *Sedum*, *Ephedra*, *Mandragora*, *Potentilla*, *Pedicularis* and a few others have been found to be common. Of all the species, *Rhododendron campanulatum* with its stunted, tough, bushy growth is ideally suited for this type of

terrain and is capable of reaching even bleak and inaccessible corners along this altitude and withstanding extreme cold conditions. This species in particular has several floral colour forms and the relation between such floral colours and the habitat conditions together with introgressive hybridization occurring in nature among the various populations of this species and closely related species of *Rhododendron*, would be an interesting piece of study.

*Ephedra saxatilis* var. *sikkimensis* (Tibetan vern. Chi) grows in abundance along the dry slopes surrounding Thangu. The material collected during middle of May, 1955 had been analysed at the Central Drug Research Laboratory, Lucknow and the percentage of Ephedrine from that particular collection has been found to be not very encouraging. But on the basis of available data with other species of *Ephedra* collected from the N. W. Himalayas, it is evident that the percentage of Alkaloids together with Ephedrine varies with the different months and seasons in the year. It is, therefore, essential to analyse the *Ephedra* material collected from Thangu area in the months of May-June-July, August-September and October-November, before any opinion is offered with regard to their approach to the Indian Pharmacopoeial standards. *Aconitum luridum* (vern. Bikh) is also quite common along this region and no detailed chemical investigation of this species, particularly, the material collected from the Sikkim Himalayas has so far been carried out. It is, however, recorded that according to J. D. Hooker as quoted by Stapf in his monograph on Aconites, the rhizome is said to be as potent as that of *Aconitum ferox* and *A. nepellus*, the well known Aconites of the Indian and European markets respectively. It is, therefore, worth investigating the chemical properties of *Aconitum luridum* collected from different parts of Sikkim as distinct samples. It is said that there used to be a good demand for this plant before but of late the demand has fallen. *Berberis concinna* together with other species of *Berberis* reported from the Sikkim State may be found to be useful as a good source of alkaloids if further investigated. The leaves of *Rhododendron anthopogon* and *R. lepidotum*, the most common bushes along these altitudes in Sikkim, form the well-known 'Sonpathi Dhup' of the State.

## II. Eastern Sikkim :

Along the Eastern Sikkim, vegetation of the various regions lying along the track between Gangtok to Rongli via Changu, Kupup and Sedonchen including Nathu La and Jelap La, has been studied.

The vegetation along the track from Gangtok to Karponang (Pusum) (1700 to 2900 m.) gradually approaches to the temperate type with tree species of *Schinus molle*, *Quercus*, *Prunus*, *Symplocos* mixed with tall and short shrubs of *Viburnum*, *Melastoma*, *Cestrum*, *Maesa*, *Photinia*, *Rubus*, *Leycesteria*, *Rhododendron*, *Neillia*, *Brassiopsis* and several others



forming the dominant components. At certain parts plantations of *Symingtonia* (= *Bucklandia*) have been observed. Species of *Vaccinium*, *Polypodium*, *Oleandra* and *Coelogyne* and a few other orchids epiphytic on tree branches and moss covered rocks are common. Along certain regions the vegetation becomes quite dense due to the growth of climbing species of *Aeschynanthus*, *Vitis*, *Actinidia*, *Celastrus*, *Stephania* and *Cinnamomum* on various trees and shrubs.

The commonly known medicinal plant, *Dichroa febrifuga* (vern. Bhasak) has been found to be growing abundant a little away from Gangtok towards Karponang. Various parts of *Zanthoxylum acanthopodium* (vern. Timur) are also considered to be medicinal like those of *Z. alatum* and a few plants of this species have been collected. The juice of its fruits is considered to be a fatal poison for the small leeches. *Rhus succedanea* (vern. Bolai) contains a watery juice which is very acrid and possesses vesicant properties. This juice yields Indo-China lac similar to the Japan lac with laccol, a toxic phenol. The root and stem bark of *Cinnamomum obtusifolium* (vern. Cinchouli, Bara Singoli), less common along this track, is aromatic and used for dyspepsia and liver diseases in Nepal. The leaves are aromatic and used as a spice. *Stephania glabra* (vern. Bathul patti) whose medicinal properties have already been noted earlier, has also been collected at a few places along this region. *Gaultheria fragrantissima*, a useful medicinal plant, also grows along this area. *Edgeworthia gardneri* (vern. Argili) whose bark is utilised in various ways grows quite abundant in this area.

Along the North-eastern mountain slope above Karponang dak bungalow on way to Dikchu valley, upto Namgyal point (2900 to 3300 m.) the vegetation is typically of temperate type with dense growth of *Rhododendron arboreum* mixed with *Acer*, *Quercus* and a few shrubby species of *Viburnum*, *Rosa*, *Ilex* and a good covering of herbaceous species of *Arisaema*, *Ranunculus*, *Veronica*, *Selinum*, *Cnicus*, *Paris*, *Bryocarpum* and others along moist slopes and shady corners. Some of the lower parts of the slope are mostly cleared of vegetation by cutting and grazing, thus presenting somewhat barren, eroded rocky boulders. Along the upper parts above 3300 m., the vegetation becomes more dense with thin bamboo species of *Arundinaria racemosa* as the dominant, mixed with a few species of *Rhododendron*, whose stems and branches are profusely covered by *Hymenophyllum*, mosses and a few lichens. *Cyperus* forms thick cover on moist soil slopes mixed with a few herbs like *Cathcartia*, *Sanicula*, etc., and bushy undergrowth of *Ilex*. A fungal species of *Ramaria* has been found to be growing on decaying wood in this area.

*Clematis montana* (vern. Pinasilara), a climbing species whose root powder is dried and used against

cold and coughs, has also been collected along this slope.

The track from Karponang to Changu gradually rises from 2900 to 3850 m., thereby presenting higher temperate vegetation and slowly merging into the lower alpine vegetation. Different shrubby and small tree species of *Rhododendron* mixed with shrubs of *Gaultheria*, *Ribes* and *Juniperus* form the dominant components of the flora along the track. Herbaceous species are very common along the undisturbed slopes with the species of *Primula*, *Fragaria*, *Iris*, *Anemone*, *Potentilla*, *Oxygraphis*, *Meconopsis*, *Arisaema* and a few other genera. While approaching Changu, beyond 3200 m. altitude, tall trees of *Abies densa* begin to appear and the general pattern of the vegetation changes with dense *Rhododendron*, particularly *Rhododendron thomsoni* forming the important middle canopy along the slopes and with the upper canopy of sparse growth of *Abies* trees and *Juniperus coxii* layer. Pl.3(10).

As the track forms the main trade route from Sikkim to Tibet via Nathu La, most of the vegetation including *Abies* trees has been very much cleared and burnt as fuel.

*Skimmia laureola* whose leaves are used as incense in Kashmir and also used in small-pox and which contain an alkaloid Skimmianine and a useful essential oil, was collected from the slopes between the 13th and 14th mile.

While camping at Changu, vegetation along the various slopes surrounding Changu lake, Thegu, Bui Khola valley and along the track upto Nathu La was studied covering the altitude ranging from 3800 to 4500 m. The general vegetation is typically alpine. The tree growth is completely absent and dense thickets of *Rhododendron* species form the dominant cover along the various slopes. Slopes leading to Bui Khola valley are densely covered with the shrubs of *Rhododendron campulatum* and *R. wightii*. Pl.3(11). Spiny *Berberis* bushes mixed with *Ribes* and *Daphne* grow in some of the suitable slopes on way to Thegu. The ground cover along these various slopes though dominated by crawling bushes of *Rhododendron anthopogon*, *R. lepidotum*, *R. setosum*, *Juniperus recurva* is composed of several varieties of herbs of which *Primula*, *Saxifraga*, *Potentilla*, *Cassiope*, *Caltha*, *Ranunculus*, *Meconopsis*, *Lloydia*, *Carex* and a few others form the dominant genera. Along the edges of Changu lake particularly towards the northern part along the slope between the dak bungalow and the lake, the soil is more moist and loose, developing swampy conditions specially during rainy season and thereby offers a suitable substratum for the formation of alpine moorland type of vegetation in small patches, comprising a few stunted species of *Cassiope*, *Rhododendron*, *Saxifraga*, etc. Such areas are worth studying in detail with regard to the succession of vegetation at such an altitude.

as the nature of substratum changes from dry to swampy conditions.

*Picrorhiza kurroo* (vern. Kudhi), a well-known and recognised substitute in Indian Pharmaceutical Codex 1953 for the Indian Gentian root, has been found to be common along the slopes on way to Bui Khola and also Thegu. The rhizome of this species is a bitter tonic and is considered to be as efficacious as the drug Gentian. It has the reputation of being an antiperiodic and cholagogue.

The region from Changu to Kupup particularly from Sherbathang where the trade route to Tibet deviates and proceeds towards Nathu La, presents picturesque surroundings with less disturbed vegetation along a few slopes. Wide grassy meadows and swampy and water-logged low areas are also quite common. The altitude varies from 3700 to 3900 m., presenting lower alpine vegetation with several species of *Rhododendron*. Patches of *Abies* forest have been observed at several places along the track. Extensive grassy meadows are predominantly covered by species of *Primula* and *Meconopsis*. The herbaceous flora on edges of water-logged and swampy areas characteristically represent species of *Draba*, *Caltha*, *Chrysosplenium*, *Lagotis*, *Corydalis* and *Cochlearia*.

An interesting medicinal plant, *Fritillaria cirrhosa*, whose underground, garlic, onion-like bulbs are, of late, considered to be possessing valuable properties of local anaesthetic nature comparable to Cocaine, grows rather commonly along the slopes in shady places under the bushes of *Berberis* and other species. Another species of *Fritillaria* chemically worked out in Russia was reported to be medicinally useful. *Fritillaria cirrhosa* is widely distributed along the high Himalayan ranges from 3600 to 4500 m. and some of the tribes in the Lohit valley (NEFA) use externally the crushed paste of the starchy bulbs for relief of muscular and other pains. A good collection of such bulbs from Lohit valley (about 2½ to 3 kilos of dry weight) was sent for getting the material chemically analysed at the Central Drug Research Institute, Lucknow. It is, therefore, worthwhile to make such a collection of the bulbs from these areas of Sikkim and send them after proper authentication to the Central Drug Research Institute, Lucknow, for chemical analysis.

While camping at Kupup, the vegetation along the various slopes surrounding Bithang Chu lake and Jelap La covering an altitude of 3900 to 4300 m., was studied. The track from Kupup to Jelap La forms the last phase of the other trade-route to Tibet from Kalimpong. The vegetation along the lower part of the track was very much cleared and burnt including huge trees of *Abies*. Extensive meadows, partly marshy, with deep-violet flowered *Primula calderiana* growing as a dense matt cover on either side of the track and *Rhododendron anthopogon*, *R. lepidotum*, and *R.*

*setosum* as bushy patches along the upper slopes form the common sight. Pl.3(12). Along the upper slopes just below Jelap La, the vegetation is typically of alpine moorland type with extensive covering of small stunted, crawling bushes of *Rhododendron* species (as noted above) mixed with *Cassiope fastigiata*, *Sedum himalense*, *Anemone rupestris*, *Potentilla filiforme* and others. Pl. 4(13).

*Fritillaria cirrhosa*, whose interesting medicinal property is already noted above grows along these slopes under *Rhododendron* bushes.

The general pattern of vegetation along the slopes above Bithang Chu lake\* does not differ very much from that of Kupup and Jelap La surroundings except that the species of *Rhododendron* are more profuse on these slopes. Yellow flowered *Rhododendron wightii* is the most common species mixed with other species of *Rhododendron*. The lower slopes nearer to the watery edge of the lake, are mostly marshy and at certain spots water-logged, presenting no special type of species characteristic to such areas. This may be evidently due to constant grazing of large flocks of sheep as seen during this period of the year.

While proceeding from Kupup to Gnathong, the altitude varies from 3600 to 3900 m., but at certain places like Neo La and Taku La, the altitude rises upto 4100 m. and 4000 m. respectively. The vegetation is practically uniform as an alpine moorland with the same components of species as noted in preceding paragraphs. As this forms the main trade route from Kalimpong to Tibet, the biotic influence on the vegetation by way of cutting for fuel and grazing the mules is considerably high, thereby presenting certain slopes along the way, barren and desolate. Besides the various species of *Rhododendron*, *R. thomsoni* var. *candelabrum* has been found to be more common. Species of *Potentilla*, *Primula*, *Anemone*, *Gypsophila*, *Caltha*, *Senecio*, *Fragaria* are common along the slopes and meadows on the way. While approaching Gnathong, slopes on either side of Gnathong Chu are seen covered with dense patches of *Juniperus recurva* and *Rhododendron* scrub with a few trees of *Abies densa* sparsely scattered, indicating the extent of damage caused to the *Abies* forest along the trade route. Pl. 4(14).

Vegetation of most of the slopes surrounding Gnathong was generally studied. Though *Rhododendron* and *Juniperus* scrubs form the dominant ground cover along the various slopes, several interesting herbaceous species were seen growing rather profusely. The beautiful blue and light-violet flowered *Meconopsis simplicifolia* mixed with *Iris clarkei* and a tiny fern, *Athyrium duthiei* presents an attractive sight particularly along the North-eastern slope from Gnathong village. Pl.4(15) *Arisaema wallichianum* with its dark violet lined serpent-hood-like spathe grows quite abundant along these slopes mixed with *Anemone obtusiloba*. Pl.4(16).



During this study several species of herbs belonging to various genera, such as, *Gaultheria*, *Bupleurum*, *Potentilla*, *Lloydia*, *Barbarea*, *Polygonatum*, *Rheum*, *Mandragora*, *Androsace*, *Primula*, *Juncus*, *Trollius*, *Cardamine*, *Onosma*, *Trigonotis*, *Smilacina*, *Orchis* and diatomic species of *Navicula*, *Cosmarium* and *Diatoma* in some of the stagnant waters have been collected.

Along the uneven meadows on the Eastern and South-eastern sides of Gnathong village a few specimens of the well-known medicinal plant *Podophyllum sikkimensis* (Papra-Hindi), were collected. Rhizome and roots of this Indian *Podophyllum* contain the resin Podophyllin which is used as a cholagogue purgative in chronic cases of constipation. As the red fruits of this species are mostly eaten for its sweet pulp by the sherpa boys while grazing their yaks and sheep, propagation of the plant by seed-method might not be very encouraging. *Fritillaria stracheyi*, another species of the genus *Fritillaria* whose underground bulbs may turn out to be quite promising in their medicinal value as discussed in the preceding paragraphs under *Fritillaria cirrhosa*.

As the altitude changes while proceeding from Gnathong to Sedonchen (Padonchen), from 3700 to 2000 m. the consequent change of vegetation from lower alpine to typical temperate is also quite marked. The light red flowered *Rhododendron thomsoni* mixed here and there with *Rhododendron cinnabarinum* which covers most of the slopes along the upper part of the track, gradually disappears as the lower altitudes below 2400 m. are reached. Deep-violet flowered *Iris clarkei* mixed with other herbs grows abundantly along the moist sandy beds on either side of the track. As Sedonchen approaches, epiphytic orchids, climbers, stragglers and ferns like *Coelogyne*, *Clematis*, *Smilax*, *Rubia*, *Polypodium* and others begin to appear.

Vegetation along the slopes surrounding Sedonchen towards Kibek village and on the North-western side was studied. Species of *Quercus*, *Symplocos*, *Actinidia*, *Zanthoxylum*, *Vaccinium* and several others form the common components of the temperate vegetation.

A few interesting medicinal plants were collected along the track and slopes surrounding Sedonchen, *Geum elatum* whose root is considered officinal in Kashmir and used in dysentery, diarrhoea and sore throat, was found to be quite common along upper part of the track. *Clematis montana* (Pinasi-lara) whose medicinal properties have already been discussed in the earlier pages is quite a common climber. Nearer to Sedonchen, *Symplocos racemosa* (Sanskrit vern. Lowhra) whose bark contains two alkaloids, Loturine and Colloturine which are chemically related to Harmine found in *Peganum harmala*, grows quite common. Its bark has cooling and astringent properties useful in menorrhagia, bowel complaints, eye diseases, ulcers, etc. The underground corms of *Arisaema consanguineum*,

a common aroid around Sedonchen (Khasia hills material of the same was recently analysed at the Central Drug Research Institute, Lucknow), have aroused much interest regarding their poisonous glucosides. Chemical analysis of Sikkim material of the same species is worth studying for obtaining actual data. *Zanthoxylum acanthopodium* (vern. Nangryupot—Lepcha; Bogaŷtimur—Nepali) and *Z. oxyphyllum* (vern. Siritakdangji—Lepcha; Timur—Nepali) with their essential oils, are used as an aromatic tonic in fever and dyspepsia and also used as fish and leech poison. These species were also found to be quite common around Sedonchen.

From Sedonchen to Rongli the vegetation gradually changes to subtropical type with the appearance of *Castanopsis hystrix* (encircled by the climbing fern species of *Polypodium*), *Erythrina*, *Bischofia*, *Engelhardtia*, *Cinnamomum*, *Talauma*, *Gynocardia*, *Terminalia*, *Aphanamixis*, *Ailanthus*, *Ostodes* and several species characteristic of the altitude 1800 to 1900 m.

There are several medicinal plants common along this track such as *Bischofia javanica* (vern. Kanjal—Nepali & Bengali) whose leaves contain Vitamin C and seeds a drying oil, *Cinnamomum zeylanicum* (vern. Singkoli—Nepali; Dalchini—Bengali) whose bark is aromatic, astringent and stimulant, *Gynocardia odorata* (vern. Bandare—Nepali; Chaulmugra—Bengali) whose oil from seeds is used in leprosy and other skin diseases. *Aphanamixis polystachya* (= *Amoora rohituka*) (vern. Lashune—Nepali; Pittaraj—Bengali) whose bark is astringent and used in liver and spleen diseases and seed oil as liniment in rheumatism and *Erythrina variegata* var. *orientalis* (= *E. indica*) (vern. Phalatho—Nepali; Palitamandar—Bengali) whose bark is astringent and febrifuge and used in liver troubles and leaves applied externally for dispersing venereal buboes and for relieving pain in joints.

While proceeding from Rongli towards Ari, dense growth of *Schima wallichii* evidently plantations once used for the Sikkim State Plywood Industry, was observed. Most of the trees noted in the preceding paragraph together with *Toona*, *Acer*, *Phoebe*, *Beilschmiedia*, *Albizia*, *Macaranga*, *Symingtonia* mixed with undergrowth of *Dendrocalamus* and other bamboos, *Eurya*, *Maesa*, *Litsaea*, *Viburnum*, *Strobilanthes* and several others, form the wet subtropical mixed type of vegetation along the track to Gangtok via Ari and Rhenock.

#### ENUMERATION OF SPECIES

Note: The collector's name for all the field numbers cited in the enumeration is Rolla.

#### ANGIOSPERMS

##### Dicotyledons

#### RANUNCULACEAE

*Aconitum luridum* Hook. f. & Thoms. (Nep. Bikh)  
Thangu to Goichand and Sipba La track,  
no. 546; Changu towards eastern mountain slopes,

no. 820; Kupup to Jelap La, no. 897; around Gnathong, no. 990.

Erect herb with thick root-stock, common and sometimes abundant on moist slopes and open meadows. A permit from Sikkim Forest Dept. is required for its collection. Formerly it was in great demand but not so now.

**Anemone obtusiloba** Don

Lachen to Thangu, no. 528; Thangu to Goichand and Sipba La track, no. 536; Thangu towards Donkya La and Lona La, no. 568; Karponang to Changu, no. 772; Changu towards Bui Khola valley, no. 798; Changu towards eastern mountain slopes, no. 813, 822; Changu to Nathu La, no. 825; two miles from Kupup towards Changu, no. 866; Kupup to Bithang Chu Lake, no. 920, 921; Kupup to Gnathong, no. 939, 940.

A small herb with very variable floral colours which are yellow, sometimes with deep purple spots on outside of petals, white with persian-blue tinge on outside of petals, mauve, pinkish, light violet or blue. Anthers yellow or purple. Normally each population produces flowers of two or three colour combinations. Common and abundant in open moist meadows.

**A. rivularis** Ham.

Thangu to Lachen, no. 591.

Erect herb, 15 cm. high, flowers white. Not common.

**A. rupestris** Walf.

Changu towards Bui Khola valley, no. 791, 796; Kupup to Jelap La, no. 888, 889; Kupup to Bithang Chu Lake, no. 914.

Small herb with floral colours varying from white with bluish tinge outside to rose-purple deep purple, light mauve and lilac, common and abundant in open moist meadows.

**Callianthemum cachemirianum** Camb.

Thangu, no. 578.

Herb, flowers pale pink, common along stream near dak bungalow.

**Caltha palustris** Linn.

Four miles from Lachung towards Yumthang, no. 264; Changu towards eastern mountain slopes, no. 819; around Gnathong, no. 983, 985 and 1001.

Herb, 25-35 cm. high, flowers yellow with greenish tinge outside, common on moist slopes.

**C. scaposa** Hook. f. & Thom.

Changu towards Bui Khola valley, no. 794; Changu to Kupup, no. 835; two miles from Kupup towards Changu, no. 853; Kupup to Gnathong, no. 948.

Herb, sometimes prostrate, flowers yellow with greenish tinge outside, common and abundant on moist banks of running water, sometimes in water-logged areas.

**Clematis montana** Ham. (Nep. Pinasi-lara)

Lachen to Naram village, no. 451; Karponang

upwards to top of hill, no. 743; Gnathong to Sedonchen, no. 1044.

Climber, flowers yellowish-green, less common. Root when crushed and inhaled has pungent burning smell and said to be good for curing cold and cough. It loses its power when dried.

**Isopyrum adiantifolium** Hook. f. & Thoms.

Sedonchen towards Kibek, no. 1093.

Herb, 8 cm. high, flowers white, calyx petaloid and white, corolla small, spatulate, yellowish-tipped, common along moist moss-covered crevices.

**Oxygraphis polypetala** Hook. f. & Thoms.

Karponang to Changu, no. 780; Changu towards Bui Khola valley, no. 782; Changu towards eastern mountain slopes, no. 802; two miles from Kupup towards Changu, no. 855.

Herb, flowers yellow, turning to white with age, common and abundant on moist slopes.

**Ranunculus diffusus** DC.

Singhik towards Mangan, no. 66; Lachung towards Thanka La, no. 327; Chung Thang to Lachen, no. 394; Gangtok to Karponang, no. 699; Karponang upwards to top of hill, no. 725; mountains around Gnathong, no. 976.

Prostrate herb, flowers yellow, common on moist places and watery edges.

**R. flaccidus** Hook. f. & Thoms.

Changu towards Bui Khola valley, no. 790; around Gnathong, no. 1018.

Small herb, flowers yellow, common and abundant in water-logged soil, sometimes growing in dense tufts along moist sandy bed of stream.

**R. hirtellus** Royle

Lachung towards Yumthang, no. 290; two miles from Kupup to Changu, no. 865; Kupup to Bithang Chu Lake, no. 912.

Small herb, flowers yellow, common and abundant in open meadows.

**R. pulchellus** C. A. Mey.

Thangu towards Donkya La, no. 365.

Herb, growing profusely in half submerged condition in a pool of shallow water.

**Trollius pumilus** Don

Around Gnathong, no. 995.

Herb, flowers yellow with greenish tinge outside, less common on moist slopes.

MAGNOLIACEAE

**Schizandra elongata** Hook. f. & Thoms.

Gnathong to Sedonchen, no. 1065.

Climbing shrub, flowers yellow, common.

MENISPERMACEAE

**Cissampelos pareira** Linn. (Nep. Batul-pale)

Lachen to Chung Thang, no. 622.

Climber, female flowers yellowish green, less common. Leaves used for stomach ache.

**Parabaena sagittata** Miers

Dikchu to Gangtok, no. 655.

Climber, flowers greenish yellow, less common.

**Stephania glabra** (Roxb.) Miers(< i>S. rotunda Hook. f. & Thoms. non. Lour.)  
(Nep. Tamarkhi; Bathul-Patti).

Dikchu to Singhik, no. 12; Chung Thang to Singhik, no. 625; Gangtok to Karponang, no. 690.

Climber, young flowers yellowish-green, less common.

## BERBERIDACEAE

**Berberis angulosa** Wall.

Kupup to Jelap La, no. 896.

Spiny, bushy shrub, common.

**B. concinna** Hook. f.

Thangu to Goichand and Sipba La track, no. 554. Spiny, bushy shrub, common.

**B. insignis** Hook. f. & Thoms.

Chung Thang to Lachung, no. 217.

Small shrub, flowers yellow, common.

**B. umbellata** Wall. (Nep. Katinc; Tib. Je-tumo)

Lachen to Naram village, no. 415, 446.

Shrub, 120-150 cm. high, flowers yellow, very common and abundant.

**B. wallichiana** DC.

Lachung towards Yumthang, no. 263; Lachung towards Thanka La, no. 302; Lachen to Thepa La, no. 440; Lachen towards Zemu valley, no. 489.

Spiny, bushy shrub, 60-120 cm. high, flowers yellow, common.

**Decaisnea insignis** Hook. f. & Thoms. (Tib. Thigo-Tzimo)

Lachen to Naram village, no. 456.

Shrub, flower buds pale purple, open flowers greenish, fruit edible, common.

**Holboellia latifolia** Wall. var. **angustifolia** Wall.  
(Nep. Gulpha; Tib. Am-togonia)

Lachen to Thepa La, no. 414.

Climber, flowers pink with violet tips turning creamy white with age, fruit pulp edible, rare.

**Mahonia acanthifolia** G. Don

Chung Thang to Lachen, no. 405.

Large shrub, 180-240 cm. high, flowers yellow, common and abundant.

**M. nepalensis** DC.

Eastern slope beyond Chung Thang, no. 188.

Shrub, flowers yellow, less common.

**Podophyllum sikkimensis** Chatterjee et Mukerjee  
(= *P. emodi* Wall. p.p.)

Around Gnathong, no. 989.

Herb with horizontal rhizome, flowers pink, fruit edible. Rhizome highly medicinal, less common.

## PAPAVERACEAE

**Cathcartia villosa** Hook. f.

Karponang upwards to top of hill, no. 731; Karponang to Changu, no. 767.

Herb covered with yellow hairs, flowers yellow, fairly common on moist slopes and rocky crevices.

**Meconopsis paniculata** Prain

Kupup to Gnathong, no. 933; around Gnathong, no. 963.

Herb, 90-100 cm. high, covered with orange-yellow hairs, latex orange coloured, flowers yellow, common and abundant on slopes and rocky crevices.

**M. simplicifolia** Hook. f. & Thoms.

Thangu to Lachen, no. 582; Karponang to Changu, no. 774; Changu towards Bui Khola valley, no. 797; Changu towards eastern mountain slopes, no. 823; Kupup to Gnathong, no. 955.

Herb covered with yellowish hairs, latex light orange coloured, flowers blue to light violet, fairly common on moist slopes and rocky crevices.

## FUMARIACEAE

**Corydalis cachemiriana** Royle

Changu to Kupup, no. 843; Kupup to Jelap La, no. 884; Kupup to Bithang Chu lake, no. 924.

Herb, 6 cm. high, flowers bluish violet, common on moist slopes and moss-covered shady areas.

**C. leptocarpa** Hook. f. & Thoms.

Chung Thang to Lachung, no. 213; Chung Thang to Lachen, no. 308.

Decumbent herb, flowers purple or pinkish purple, common on moist slopes.

**C. ophiocarpa** Hook. f. & Thoms.

Thangu to Lachen, no. 589.

Erect herb, 50 cm. high, flowers yellow with bright yellow tips, rare on moist soil.

## BRASSICACEAE (=CRUCIFERAE)

**Barbarea vulgaris** R. Br.

Karponang to Changu, no. 775; Kupup to Gnathong, no. 954; around Gnathong, no. 970.

Erect herb, 15-30 cm. high, flowers yellow, fairly common in moist places.

**Brassica juncea** Hook. f. & Thoms.

Eastern slope beyond Chung Thang, no. 172.

Herb, flowers yellow, cultivated in wheat fields.

**Capsella bursa-pastoris** Moench.

Chung Thang to Lachung, no. 210.

Erect herb, 30 cm. high, growing as a weed in wheat fields.

**Cardamine hirsuta** Linn.

Eastern slope beyond Chung Thang, no. 175.

A stray plant near the monastery on moist soil.

**Cardamine impatiens** Linn.

Chung Thang to Lachen, no. 399.

Erect herb, 30-45 cm. high, flowers white, common.

**C. macrophylla** Willd.

Lachen towards Zimu valley, no. 495.

Erect herb, 60 cm. high, flowers violet, rare.

**C. trifoliolata** Hook. f. & Thoms.

Around Gnathong, no. 993 and 1027.

Herb, sometimes prostrate, flowers pink, less common on moist sandy beds of streams.

**Cochlearia scapiflora** Hook. f. & Thoms.

Two miles from Kupup towards Changu, no. 854; Kupup to Jelap La, no. 899 and 905.

Small herb with root stock, flowers white with bluish-green tinge, common on open meadows and also water-logged soil.

**Draba gracillima** Hook. f. & Thoms.

Lachen to Thepa La, no. 436; Karponang to Changu, no. 777; Changu to Kupup, no. 832.

Decumbent herb, flowers yellow, sometimes white, common on moist soil.

**Nasturtium officinale** Br.

Singhik towards Mangan, no. 67; Lachung towards Gompa, no. 259.

Decumbent herb, flowers white, common along water-logged rock corners.

**Sisymbrium mollissimum** C. A. Mey.

Kupup to Jelap La, no. 886 and 887; around Gnathong, no. 1002.

Erect herb, 15-25 cm., flowers yellow, less common on moist slopes.

**Thlaspi arvense** Linn. (Nep. Cheka-chumu)

Chung Thang to Lachung, no. 227; Lachung towards Thanka La, no. 320.

Erect herb, 30 cm., flowers white, common in cultivated fields and moist banks of streams. Leaves eaten as vegetable.

## VIOLACEAE

**Viola biflora** Wall.

Lachung towards Thanka La, no. 308; Lachen to Naram village, no. 468; Gangtok to Karponang, 718; mountains around Gnathong, no. 1015.

Herb, flowers yellow with deep-purple lines on petals, fairly common on moist slopes and soil or moss-covered rocks.

**V. distans** Wall.

Singhik towards Mangan, no. 68; Singhik to Toong, no. 109; Toong to Chung Thang, no. 159; Chung Thang to Lachen, no. 370.

Herb with radical leaves, flowers lilac or white with purple striations on tips of petals and on labellum, common on moist slopes, crevices and watery edges.

**V. kunawarensis** Royle

Thangu, no. 579.

Herb, 6 cm. high, flowers violet, common along stream near Thangu dak bungalow. This record widens the range of distribution of the species in Sikkim.

## BIXACEAE

**Gynocardia odorata** R. Br.

Singhik to Toong, no. 26.

Tree, 15-18 meter high, flowers yellowish green, fairly common.

## CARYOPHYLLACEAE

**Arenaria orbiculata** Royle

Lachen to Thepa La, no. 437.

Prostrate herb, flowers white, common in moist places along the way to Thepa La.

**Cerastium vulgatum** Linn.

Singhik towards Mangan, no. 72; Singhik to Toong, no. 110; Toong to Chung Thang, no. 138.

Erect herb, 15 cm. high, flowers white or lilac, common in moist places, watery edges and rocky crevices.

**Drymaria diandra** Willd. (Nep. Abijul)

(= *D. cordata* auct. non Willd.)

Dikchu to Singhik, no. 15.

Decumbent herb, very common. Juice given for intestinal troubles.

**Gypsophila cerastioides** Don

Karponang to Changu, no. 773; Changu to Nathu La, no. 824; Kupup to Gnathong, n. 938.

Prostrate herb, flowers white with distinct purple veins, common along road sides and open meadows.

**Sagina procumbens** Linn.

Singhik towards Mangan, no. 63.

Small tender herb, flowers white, fairly common along moist edges of small streams and moist crevices.

## TAMARICACEAE

**Myricaria germanica** Desv.

Thangu to Goichand and Sipba La track, no. 545.

Prostrate shrub, flowers pink, common along stream near Thangu dak bungalow.

## HYPERICACEAE

**Hypericum reptans** Hook. f. & Thoms.

Lachung towards Gompa, no. 253.

Prostrate herb, gregarious in moist rocky crevices.

## TERNSTROEMACEAE

**Actinidia strigosa** Hook. f. & Thoms.

Gangtok to Karponang, no. 707; Gnathong to Sedonchen, no. 1056.

Tall climber, 9-12 m. high, young branches covered with red hairs, flowers white with a faint

pinkish tinge in the centre, fragrant, fairly common.

**Eurya cerasifolia** (Don) Kobuski  
(=*E. symplocina* Bl.) (Nep. Zingani)

Toong to Chung Thang, no. 151.

Tree, 9-12 m. high, in fruit, less common.

**E. japonica** Thunb. (Nep. Zingani)

Lachen towards Zemu valley, no. 492.

Shrub, 4 m. high in fruit, less common.

**Saurauja fasciculata** Wall. (Nep. Rani-gogan)

Toong to Chung Thang, no. 143; Lachung to

Chung-Thang, 341; Dikchu to Gangtok, 656.

Tree, 6-9 m. high, flowers pink, rare.

**S. roxburghii** Wall.

Sedonchen to Rongli, 1114.

Shrub, 2-3 m. high, flowers pink, fairly common on slopes.

**Schima wallichii** Choisy (Nep. Chilaurie)

Dikchu to Gangtok, no. 661.

Tree, 18-20 m. high, flowers white, very common and abundant along road side.

**Stachyurus himalaicus** Hook. f. & Thoms.

Toong to Chung-Thang, 136.

Shrub, much branched from base, in fruit, less common.

#### OXALIDACEAE

**Oxalis corniculata** Linn.

Singhik towards Mangan, no. 62; Lachung to Chung Thang, no. 334; Chung Thang to Lachen, no. 365.

Prostrate herb, flowers yellow, common and abundant.

**O. corymbosa** DC.

Rongli to Ari, no. 1135.

Herb, with underground bulb, flowers pink, abundant as a weed in Chandra Nursery, Rhenock.

#### GERANIACEAE

**Geranium nepalense** Sweet.

Lachen to Chung Thang, no. 594.

Herb, flowers pink with distinct red lines on petals, less common on moist slopes.

#### BALSAMINACEAE

**Impatiens arguta** Hook. f. & Thoms.

Singhik towards Mangan, no. 73.

Erect herb, flowers deep violet, common along moist banks and shady crevices.

**I. drapanophora** Hook. f. & Thoms.

Toong to Chung Thang, no. 137.

Decumbent herb with succulent stem, flower yellow with pink spur, common in moist places.

**I. gamneana** Hook. f. & Thoms.

Chung Thang to Lachen, no. 389.

Erect herb, 30-45 cm. high, flowers white with purple spots on lip, locally abundant on moist slopes.

**I. longipes** Hook. f. & Thoms.

Gangtok to Karponang, no. 700.

Herb, flowers yellow with deep red lines on spur, rare.

**I. lutea** Hook. f. & Thoms.

Dikchu to Singhik, no. 46.

Sub-erect herb with succulent stem, flowers yellow, rare.

**I. pulchra** Hook. f. & Thoms.

Gangtok to Karponang, no. 697.

Erect herb, flowers blue, rare.

**I. scabrida** DC.

Dikchu to Singhik, no. 24; Sedonchen towards Kibek, no. 1074 and 1094; Rongli to Ari, 1132.

Erect herb, 10-90 cm. high, flowers pink to red or yellowish with red spots inside, fairly common in shady, moist slopes.

**Impatiens** sp.

Around Gnathong, no. 1023.

Herb, 8 cm. high with succulent stem, leaves with glandular outgrowths in crevices of serrate margin, rare on moist watery edges.

#### RUTACEAE

**Skimmia laureola** Sieb. & Zucc. ex Walp.

Eastern slope beyond Chung Thang, no. 184; Lachung towards Thanka La, no. 306; Thangu to Lachen, no. 587; Karponang to Changu, no. 762.

Shrub, 1 m. high, flowers yellow or yellowish-green, less common. Leaves poisonous.

**Zanthoxylum acanthopodium** DC. (Nep. Timbur)

Gangtok to Karponang, no. 679; Sedonchen towards Kibek, no. 1086.

Tree, 6-8 m. high in fruit, less common. The juice of the fruits kills leeches quickly.

**Z. oxyphyllum** Edgew. (Nep. Areli; Tib. Katona)

Lachung towards Gompa, no. 244; Lachung to Chung Thang, no. 329; Lachen to Thepa La, no. 419; Sedonchen towards Kibek, no. 1084.

Straggling shrub, 1.5-2.5 m. high, flower bud with violet calyx and yellow corolla, less common.

#### MELIACEAE

**Dysoxylum procerum** Ham. (Nep. Pat-pate)

Dikchu to Singhik, no. 19.

Tree, 12 m. high, flowers yellowish-green, less common.

**Toona ciliata** Roem. (Nep. Tooni)

Singhik to Toong, no. 113.

Tree, 15-18 m. high, flowers white, very common.

#### ILICACEAE

**Ilex dipyrrena** Wall.

Chung Thang to Lachung, no. 214; Lachung towards Yumthang, no. 267.

Small tree in fruit, less common.

**Ilex fragilis** Hook. f.

Gnathong to Sedonchen, no. 1064.  
Tree, 9-12 m. high, fairly common.

**I. intricata** Hook. f.

Karponang upwards to top of hill, no. 739.  
Bushy undergrowth, creeping along ground level in bamboo forest, flowers pinkish, very common and abundant.

## CELASTRACEAE

**Celastrus championii** Benth.

Toong to Chung Thang, no. 150.  
Straggling shrub, flowers white, rare.

**C. hookeri** Prain

Lachen to Naram village, no. 467.  
Climber in buds, rare.

**C. stylosa** Wall.

Lachen towards Zemu valley, no. 483; Gangtok to Karponang, no. 708.  
Climber, flowers yellowish-green, less common.

**Euonymus frigidus** Wall.

Lachung towards Yumthang, no. 293; Lachen to Thangu, no. 513; Gnathong to Sedonchen, no. 1052.  
Shrub, 60-90 cm. high in buds, less common.

## VITACEAE

**Cayratia pedata** (Vahl) Gagnep

Dikchu to Gangtok, no. 643.  
Climber in buds, common.

**Vitis rumicisperma** Laws. (Nep. Char-Chare Laura)

Dikchu to Singhik, no. 55; Gangtok to Karponang, no. 687.  
Climber, rare.

## SAPINDACEAE

**Acer campbellii** Hook. f. & Thoms. (Nep. Kapasi)

Chung Thang to Lachen, no. 378; Lachen to Naram village, no. 472; Karponang upwards to top of hill, no. 727.  
Tree, 15 m. high, flowers pink, common.

**A. pectinatum** Wall. (Nep. Kapasi; Tib. Yalli)

Lachen to Thepa La, no. 434; Lachen towards Zemu valley, no. 485, 493.  
Tree, 9-12 m. high, flowers red, common.

**A. stachyophyllum** Hiern

Lachen to Naram village, no. 471; Lachen towards Zemu valley, no. 479.  
Tree, 6-8 m. high, male flowers greenish, common.

**A. villosum** Wall. (Nep. Kapasi)

Lachen to Naram village, no. 469, 470; Lachen towards Zemu valley, no. 481.  
Tree, 15 m. high, common.

**Turpinia pomifera** DC. (Nep. Thali)

Chung Thang to Singhik, no. 626.  
Tree, 8 m. high, flowers greenish-yellow, rare.

## SABIACEAE

**Meliosma pungens** Wall.

Chung Thang to Lachen, no. 380.  
Small tree with white buds, rare. The present record extends the distribution of the species further east along the Himalayan ranges.

**Sabia campanulata** Wall.

Lachen to Thangu, no. 510.  
Climber, rare.

## ANACARDIACEAE

**Rhus succedanea** Linn. (Nep. Bolai)

Gangtok to Karponang, no. 681.  
Straggler on rocks, rare. Watery juice of the plant causes irritation on skin.

## CORIARIACEAE

**Coriaria terminalis** Hemsl.

Thangu to Lachen, no. 588.  
Herb, 20-30 cm. high with succulent stem, common.

## FABACEAE (=PAPILIONACEAE)

**Parochetus communis** Ham.

Singhik towards Mangan, no. 71; Lachung towards Gompa, no. 258.  
Prostrate herb, flowers deep blue, common along watery edges.

**Piptanthus nepalensis** Don (Nep. Sirlingi)

Chung Thang to Lachung, no. 228; Lachung towards Yumthang, no. 268; Lachen to Thepa La, no. 442; Lachen towards Zemu valley, no. 482.  
Shrub, 1-3 m., flowers yellow with purple lines on labellum, common and at certain places abundant.

**Pisum arvense** Linn.

Gangtok to Karponang, no. 685.  
Herb, flowers white, stray plant along the road.

**Thermopsis barbata** Royle

Thangu to Goichand and Sipba La track, no. 539; Thangu towards Donki La and Lona La, no. 571.  
Herb, 8 cm. high, buds deep purple, common on dry slopes.

## MIMOSACEAE

**Acacia pinnata** Willd.

Sedonchen to Rongli, no. 111.  
Tree, 18 m. high, common.

**Albizzia gamblei** Prain

Sedonchen to Rongli, no. 1127.  
Tree, 10 m. high, common. This record widens the range of distribution of the species in Sikkim.

**Pithecolobium bigeminum** Mart. (Nep. Bhalimova)

Singhik to Toong, no. 104.  
Tree, 8 m. high, flowers yellowish-green, rare.



## ROSACEAE

**Cotoneaster microphylla** Wall.

(= *C. thymifolia* Hort.)

Thangu to Goichand and Sipba La track, no. 553.

Prostrate herb, woody stem, abundant on soil slopes and rocks.

**Fragaria daltoniana** J. Gay

Karponang to Changu, no. 750.

Herb, flowers white, common on slopes.

**F. indica** Andr.

Dikchu to Singhik, no. 53; Lachung to Chung Thang, no. 339.

Prostrate herb, flowers yellow, fruits red, fairly common on moist slopes.

**F. vesca** Linn. var. **rubicola** Hook. f.

Toong to Chung Thang, no. 147; Chung Thang to Lachen, no. 350; eastern slope beyond Chung Thang, no. 178; Lachung towards Gompa, no. 251; Lachen to Naram village, no. 460; Gangtok to Karponang, no. 703; Kupup to Gnathong, no. 949.

Herb, flowers white, fruits red, fairly common and abundant in open lands and moist slopes.

**Geum elatum** Wall.

Gnathong to Sedonchen, no. 1062.

Herb, flowers yellow, common.

**Maddenia himalaica** Hook. f. & Thoms. (Nep. Arupati) (Tib. Khikasi)

Lachung towards Yumthang, no. 269;

Lachen to Thepa La, no. 431; Lachen to Naram village, no. 473.

Shrub, 4-5 m. high, common.

**Neillia rubiflora** Don

Gangtok to Karponang, no. 709.

Shrub, flowers yellow, on rocks, common.

**Photinia integrifolia** Lindl.

Eastern slopes beyond Chung Thang, no. 190;

Lachen to Chung Thang, no. 609; Gangtok to Karponang, no. 680.

Large woody climber, flowers creamy-white, rare.

**Potentilla albifolia** Wall.

Two miles from Kupup towards Changu, no. 864; Kupup to Gnathong, no. 936.

Prostrate herb, flowers small, yellow, abundant in open land.

**P. filiforme** Hook. f.

Kupup to Jelap La, no. 895.

Prostrate herb, flower buds tiny, common.

**P. fruticosa** Linn.

Changu towards Bui Khola valley, no. 787.

Creeper on rocks abundant.

**P. kleniana** Wt. & Arn.

Dikchu to Singhik, no. 58; Singhik towards Mangan, no. 64; Lachung towards Gompa, no. 236.

Prostrate herb, flowers yellow, common.

**P. monanthes** Lindl.

Karponang to Changu, no. 776; Changu to Kupup, no. 851; Changu towards eastern mountain slopes, no. 818; two miles from Kupup towards Changu, no. 874; Kupup to Gnathong, no. 934.

A prostrate herb, flowers small, yellow, common.

**P. nivea** Linn.

Thangu towards Donki La and Lana La, no. 570.

Herb, flowers yellow, petals cuneate with an orange spot at the base of each petal on the inside.

**P. peduncularis** Don

Lachung towards Gompa, no. 240; two miles from Kupup towards Changu, no. 863; Kupup to Gnathong, no. 951.

Prostrate herb, leaves flat on the ground, flowers yellow, abundant.

**P. sibbaldi** Hallier f.

Two miles from Kupup towards Changu no. 860; Kupup to Bithang Chu lake, no. 907; Kupup to Gnathong, no. 937; mountains around Gnathong, no. 962 and 971.

A creeping herb, flowers small, yellow, common.

**Prinsepia utilis** Royle

Chung Thang to Lachung, no. 201.

Straggling shrub, common.

**Prunus cerasoides** Don (Nep. Yalli)

(= *P. puddum* Roxb.)

Lachen to Thangu, no. 508.

Tree, 7 m. high, flowers pink, common.

**P. nepalensis** Koch. (Nep. Arupate)

Chung Thang to Lachen, no. 406; Gangtok to Karponang, no. 691.

Tree, 12-13 m. high.

**P. padus** Linn.

Lachen to Naram village, no. 466; Lachen towards Zemu valley, no. 482.

Tree, 6-10 m. high, flowers white, fragrant, common.

**P. persica** Benth. & Hook. f. (Nep. Aru.)

Eastern slope beyond Chung Thang, no. 176; Sedonchen to Rongli, no. 1099.

Tree, 8 m. high, fruits oval, tomentose, cultivated.

**P. rufa** Wall.

Lachen to Thangu, no. 508.

Small tree, 5-8 m. high, common.

**Pyrus communis** Linn. (Nep. Naspati)

Eastern slopes beyond Chung Thang, no. 177.

Small tree, planted.

**P. foliolosa** Wall.

Mountains around Gnathong, no. 1011.

Small tree, flowers white, common.

***Pyrus malus* Linn.**

Chung Thang to Lachung, no. 235.  
Tree, flowers pink, planted.

***P. sikkimensis* Hook. f. (Nep. Pipsi)**

Lachen to Thepa La, no. 425.  
Tree, flower buds with rose tips, open flowers, white, common.

***Rosa sericea* Lindl.**

Chung Thang to Lachung, no. 224; Lachung towards Gompa, no. 254; Lachung towards Yumthang, no. 294; Thangu towards Donki La and Lona La, no. 560; Karponang upwards to top of hill, no. 722; Gnathong to Pedonchen, no. 1048. Straggling shrub, flowers creamy-white, common.

***Rubus calycinus* Wall.**

Chung Thang to Lachen, no. 393.  
Runner, flowers white, common.

***R. ellipticus* Sm.**

Singhik towards Mangan, no. 86; Gangtok to Karponang, no. 682.  
Straggling shrub, fruits yellow, edible, very common.

***R. hookeri* Focke**

Gangtok to Karponang, no. 704.  
Straggling shrub, flowers creamy white, rare.

***R. lasiocarpus* Sm.**

Singhik towards Mangan, no. 85; Singhik to Toong, no. 122; Chung Thang to Lachen, no. 366.  
Straggling shrub, flowers deep pink, fruits yellow, edible, common.

***R. macilentus* Camb.**

Chung Thang to Lachung, no. 205; Chung Thang to Lachen, no. 392.  
Straggling shrub, flowers white, abundant.

***R. molluccanus* Linn.**

Dikchu to Singhik, no. 52.  
Climber, on exposed rocky edges with soil cover, rare.

***R. rosaefolius* Sm.**

Dikchu to Singhik, no. 57.  
Straggling shrub, fruits red, rare.

***R. treutleri* Hook. f. (Nep. Pankara)**

Lachung towards Yumthang, no. 274.  
Shrub, common.

## SAXIFRAGACEAE

***Astilbe rivularis* Ham. (Nep. Budi vakti)**

Singhik towards Mangan, no. 95.  
Hairy herb, rare. Rhizome highly medicinal.

***Chrysosplenium griffithii* Hook. f. & Thoms.**

Changu to Kupup, no. 836.  
Herb, flowers yellow, on banks of running streams, common.

***C. nepalense* Don**

Lachung towards Yumthang, no. 297; Lachen towards Zemu valley, no. 486.

Herb, 15 cm. high, flowers small, common.

***Deutzia staminea* Br.**

Chung Thang to Lachung, no. 200.  
Shrub, 1-2 m. high, flowers white, common.

***Dichroa febrifuga* Lour. (Nep. Bhasak)**

Dikchu to Singhik, no. 45; Singhik towards Mangan, no. 78; Chung Thang to Lachen, no. 346; Singhik to Dikchu, no. 631; Gangtok to Karponang, no. 668.

Shrub, 2-3 m. high, flowers white, abundant. Leaves boiled and taken in Malaria.

***Hydrangea robusta* Hook. f. & Thoms.**

Chung Thang to Lachen, no. 382.  
Shrub, 3-5 m. high; common along the stream near open meadows.

***H. vestita* Wall. (Nep. Kamli) (Tib. Pyakasingh)**

Lachen to Thepa La, no. 430.  
Tree, 8 m. high.

***Philadelphus coronarius* Linn.**

Lachen to Naram village, no. 453.  
Shrub, 3-4 m. high, fruit with persistent calyx.

***Ribes glaciale* Wall. (Tib. Rimbo)**

Lachung towards Yumthang, no. 277; Lachung towards Thanka La, 301; Lachen to Thangu, 512; Karponang to Changu, no. 761; Changu towards eastern mountain slopes, no. 807; mountains around Gnathong, no. 996.

Shrub, 3-5 m. high, flowers red, rare.

***Saxifraga purpurescens* Hook. f. & Thoms.**

Changu towards Bui Khola valley, no. 786; Changu towards eastern mountain slopes, no. 803; two miles from Kupup towards Changu, no. 856.  
Herb with rootstock, flowers rose, abundant.

***Tiarella polyphylla* Don**

Chung Thang to Lachung, no. 230; Chung Thang to Lachen, no. 400; Lachen towards Zemu valley, no. 490.

Herb, 15-45 cm. high, flowers small, pink, abundant in water-logged soil.

## CRASSULACEAE

***Sedum himalense* Don**

Thangu to Goichand and Sipba La track, no. 555; Thangu towards Donki La, no. 576; Changu towards Bui Khola valley, no. 789; Kupup to Jelap La, no. 880.

Herb, flowers deep purple, abundant along sides of running water and rare in other places.

***Triactina verticillata* Hook. f. & Thoms.**

Gangtok to Karponang, no. 688.  
Weak herb, flowers yellow, common on moist rocks.

## DROSERACEAE

***Drosera peltata* Sm.**

Lachung towards Thanka La, no. 309.  
Insectivorous plant, 2 cm. high, on moist slopes, rare.

## HAMAMELIDACEAE

- Symingtonia populnea** (R. Br.) van Steenis  
(=*Bucklandia populnea* R. Br.)  
Gangtok to Karponang, no. 683.  
Tree, 15-16 m. high, common.

## MYRTACEAE

- Eugenia kurzii** Duthie (Nep. Amlalsi)  
Singhik to Toong, no. 105.  
Tree, 4-6 m. high, fruits edible.

## MELASTOMACEAE

- Medinilla rubicunda** Bl.  
Dikchu to Singhik, no. 30.  
Epiphyte, fruits edible, common.
- Melastoma malabathricum** Linn.  
Dikchu to Singhik, no. 50; Singhik towards Mangan, no. 87; Gangtok to Karponang, no. 669.  
Shrub, 1-2 m. high, flowers purple, common.
- Osbeckia crinita** Benth.  
Chung Thang to Lachen, no. 391.  
Shrub, 1-1.5 m. high, not common but abundant in this locality.

## SAMYDACEAE

- Casearia glomerata** Wall.  
Chung Thang to Lachen, no. 344.  
Tree, 7-8 m. high, common.

## CUCURBITACEAE

- Trichosanthes wallichiana** Wt.  
Dikchu to Gangtok, no. 651.  
Climber, flowers white, common.

## BEGONIACEAE

- Begonia cathcartii** Hook. f.  
Singhik to Toong, no. 108; Gangtok to Karponang, no. 693; Padonchen surrounding mountains (Sedonchen towards Kibek), no. 1083.  
Succulent herb, flowers white covered with red hairs, scented, common.
- B. gigantea** Wall.  
Singhik to Dikchu, no. 639.  
Herb, 20-30 cm. high, flowers creamy white, common.

## APIACEAE (=UMBELLIFERAE)

- Bupleurum falcatum** Linn.  
Mountains around Gnathong, no. 961.  
Herb, flowers tiny, purple, common on grassy slopes.
- B. longicaule** Wall.  
Two miles from Kupup towards Changu, no. 861; Changu to Kupup, no. 838.  
Herb, flowers deep purple, common on grassy slopes.
- Chaerophyllum villosum** Wall.  
Mountains around Gnathong, no. 988.

Herb, 15 cm. high, young leaves reddish-brown.

**Oenanthe thomsoni** C. B. Clarke

Toong to Chung Thang, no. 134; Chung Thang to Singhik, no. 627.

Herb, flowers tiny, pale lilac, common in wet shady corners.

**Sanicula europea** Linn.

Lachen to Chung Thang, no. 602; Karponang upwards to top of hill, no. 732; Padonchen surrounding mountains (Sedonchen to Kibek), no. 1079.

Succulent herb, 8-10 cm. high, flowers white, common.

**Selinum tenuifolium** Wall. (Nep. Bhut-kes)

Lachung towards Yumthang, no. 266; Karponang upwards to top of hill, no. 730.

Herb with root stock, common in moist slopes.

## ARALIACEAE

**Brassaiopsis alpina** C. B. Clarke

Gangtok to Karponang, no. 713.  
Shrub, common.

**B. hainla** Seem.

Gangtok to Karponang, no. 713A. Twig dried.  
Small tree, common.

**Hedera helix** Linn.

Toong to Chung Thang, no. 149; Chung Thang to Lachen, no. 384; Lachen to Naram village, no. 474.

Large root climber, ripe fruits yellow, abundant on sloping ground.

**Panax pseudo-ginseng** Wall.

(=*Aralia pseudo-ginseng* Benth.)

Lachen towards Zemu valley, no. 494.

Perennial herb growing with underground rhizome, flower buds in compound umbels, rare.

**Pentapanax leschenaultii** Seem.

Lachen to Naram village, no. 464; Lachen towards Zemu valley, no. 484.

Tree, 6-10 m. high, common.

**P. racemosum** Seem.

Lachen to Chung Thang, no. 613.  
Liane, rare.

**Schefflera venulosa** (W. & A.) Harms. var. **macrophylla** Wall.

(=*Heptapleurum venulosum* Seem. var. *macrophylla* Wall.)

Singhik towards Mangan, no. 89.

Big tree, young fruits orange, rare.

## CORNACEAE

**Alangium chinense** (Lour.) Rehder

(=*Marlea begoniifolia* Roxb.)

Chung Thang to Lachen, no. 383; Dikchu to Gangtok, no. 647; Padonchen to Rongli, no. 1117

Tree, 12-13 m. high, flowers white, rare.

**Cornus macrophylla** Wall.

Lachen to Chung Thang, no. 607.

Tree, 9-10 m. high, flowers creamy-white, common.

## CAPRIFOLIACEAE

**Leycesteria belliana** W. W. Sm.

Gangtok to Karponang, no. 701.

Shrub, flowers creamy-white, ripe fruits violet, common.

**Lonicera obovata** Royle

Thangu to Goichand &amp; Sipba La track, no. 540.

Shrub, 60-80 cm. high, flowers yellow, very common.

**L. spinosa** Jacq.

Thangu to Goichand &amp; Sipba La track, no. 535.

Busy shrub, flowers pink, abundant.

**Sambucus adnata** Wall.

Lachen to Thepa La, no. 439; Lachen towards Zemu valley, no. 501; Padonchen to Rongli, no. 1128.

Shrub, 1-2 m. high, leaves with pungent smell, abundant.

**S. javanica** Bl.

Lachen to Thepa La, no. 439A.

Small shrub, common.

**Viburnum cordifolium** Wall.

Lachung towards Yumthang, no. 299; Lachen to Thangu, no. 511; Karponang upwards to top of hill, no. 734.

Small tree, 6-7 m. high, flowers white, scented, rare.

**V. erubescens** Wall. (Nep. Osare)

From Singhik to Toong, no. 100; Chung Thang to Lachung, no. 218; Chung Thang to Lachen, no. 410; Lachen to Naram village, no. 457; Gangtok to Karponang, no. 667 and 706; Karponang upwards to top of hill, no. 723; Gnathong to Padonchen, no. 1055.

Small tree, 4-7 m. high, flowers yellow, fruits red, abundant.

**V. nervosum** Don

Lachen to Thangu, no. 532.

Shrub, 2 m. high, flowers white, common.

## RUBIACEAE

**Adenosacme longifolia** Wall.

Dikchu to Gangtok, no. 658.

Shrub, 1 m. high, flowers yellow.

**Chasalia curviflora** Thw.

Dikchu to Singhik, no. 28; Singhik to Dikchu, no. 636.

Shrub, 1 m. high, flowers red-purple, rare.

**Gallum mollugo** Linn.

Chung Thang to Lachen, no. 401.

Herb, flowers white, abundant.

**Mussaenda roxburghii** Hook. f.

Dikchu to Gangtok, no. 648; Padonchen to Rongli, no. 1107.

Shrub, 1-3 m. high, flowers orange, common.

**Ophiorrhiza harrisiana** Heyne

Singhik to Dikchu, no. 635; Padonchen surrounding mountains (Padonchen towards Kibek), no. 1076.

Herb, 30 cm. high, flowers white, common on moist places.

**Rubia cordifolia** Linn. (Nep. Manjito)

Eastern slope beyond Chung Thang, no. 174; Gnathong to Padonchen, no. 1058.

Climber, common. Red dye is extracted from the plants.

**Uncaria pilosa** Roxb.

Dikchu to Gangtok, no. 657.

Climber, rare.

**Wendlandia wallichii** Wt. & Arn. (Nep. Duwari-phul)

Padonchen to Rongli, no. 1108.

Tree, 10 m. high, flowers creamy-white, fragrant, common.

## VALERIANACEAE

**Valeriana wallichii** DC.

Toong to Chung Thang, no. 146; Chung Thang to Lachung, no. 198; Chung Thang to Lachen, no. 371.

Succulent herb, flowers white, abundant on moist slopes.

## DIPSACACEAE

**Morina betonicoides** Benth. (Nep. Athi-barkara)

Lachung to Chung Thang, no. 332; Lachen to Thangu, no. 521; Thangu towards Donki La and Lona La, no. 574; Kupup to Jelap La, no. 879; Kupup to Bithang Chu lake, no. 913.

Herb with radical leaves, common in moist places.

## ASTERACEAE (= COMPOSITAE)

**Anaphalis contorta** Hook. f.

Lachen to Thangu, no. 531.

Decumbent herb, leaves aromatic, common.

**Ainsliaea pteropoda** DC.

Chung Thang to Lachen, no. 373.

Herb, flowers white, less common, locally abundant at one spot.

**Artemisia vulgaris** Linn.

Lachung towards Gompa, no. 250.

Herb, aromatic, common.

**Aster tricephalus** C. B. Clarke

Chung Thang to Lachung, no. 232.

Herb, with radical leaves, flowers violet.

**Bidens biternata** (Lour.) Merrill & Sherff.(=*Bidens pilosa* auct. non Linn.)

- Dikchu to Singhik, no. 32; Lachung to Chung Thang, no. 335.  
Herb, 15-45 cm. high, yellow heads, rare.
- Blumea laciniata** DC.  
Dikchu to Singhik, no. 22 and 34.  
Herb, 15-60 cm. high, heads pale yellow, common.
- Cnicus involucratus** DC.  
Karponang upwards to top of hill, no. 733.  
Herb, with radical leaves, common on moist slopes.
- Conyza ambigua** DC.  
(=*Erigeron linifolius* Willd.)  
Dikchu to Singhik, no. 51.  
Undershrub, 1-2 m. high, common.
- C. japonica** Less.  
Chung Thang to Lachen, no. 353.  
Herb, 30-60 cm. high, heads pale yellow, common in loose soil on rocks.
- Crepis japonica** Benth. (Nep. Udasin)  
Dikchu to Singhik, no. 3; Singhik towards Mangan, no. 80; Toong to Chung Thang, no. 139.  
Herb, 20-30 cm. high, heads yellow, not very common at high altitudes.
- Dichrocephala latifolia** DC.  
Singhik towards Mangan, no. 83; Gnathong to Padonchen, no. 1068.  
Decumbent herb, heads white, common.
- Eupatorium adenophorum** Spreng.  
Sedonchen to Rongli, no. 1097.  
Herb, 30-45 cm. high, heads white.
- Gerbera kunzeana** Braun & Asch.  
Thangu towards Donki La and Lona La, no. 556.  
Herb with root stock. Ray florets pinkish-red and disc florets white, common along moist slopes.
- Gnaphalium indicum** Linn.  
Dikchu to Singhik, no. 59; Lachung towards Gompa, no. 241.  
Herb, 5-25 cm. high, heads yellow, abundant in open lands.
- G. luteo-album** Linn. var. **multiceps** Hook. f.  
Dikchu to Singhik, no. 48; Singhik towards Mangan, no. 76; Gnathong to Padonchen, no. 1071.  
Herb, heads yellow, common.
- Gynura nepalensis** DC. (Nep. Dheruphule)  
Dikchu to Singhik, no. 4; Singhik towards Mangan, no. 81.  
Hairy herb, 30-45 cm. high, heads orange, common on moist edges.
- Saussurea taraxicifolia** Wall. var. **depressa** Hook. f.  
Kupup to Bithang Chu lake, no. 915.  
Herb, common in moist rocky crevices.
- Senecio diversifolius** Wall.  
Kupup to Gnathong, no. 950; Changu to Kupup, no. 839.  
Herb, 20-30 cm. high, common.
- Sonchus arvensis** Linn.  
Lachen to Chung Thang, no. 606.  
Herb, 75 cm. high, heads yellow, rare, on moist slopes.
- Spilanthes acmella** Linn.  
Singhik towards Mangan, no. 101.  
Creeping herb, heads yellow, rare.
- Tussilago farfara** Linn.  
Lachen to Naram village, no. 459.  
Herb, heads yellow with a tinge of orange, common on moist slopes, rare in other places.
- Vernonia volkameriaefolia** DC.  
Singhik to Toong, no. 118.  
Shrub, 4-6 m. high, rare.
- CAMPANULACEAE
- Lobelia pyramidalis** Wall.  
Singhik towards Mangan, no. 82; Lachung to Chung Thang, no. 330; Chung Thang to Lachen, no. 355.  
Herb, 30-60 cm. high, flowers white, rare.
- Pratia begonifolia** Lindl.  
Dikchu to Singhik, no. 21; Dikchu to Gangtok, no. 652.  
Prostrate herb, flowers pink, abundant. Juice coagulates blood and stops copious flow of it.
- VACCINIACEAE
- Agapetes auriculata** Hook.  
Singhik to Dikchu, no. 630.  
Epiphyte, young fruits red, common.
- Pentapterygium serpens** Bl.  
Toong to Chung Thang, no. 163; Chung Thang to Lachen, no. 411.  
Epiphyte with large swollen root stock, flowers red, common.
- Vaccinium dunalianum** Wt.  
Padonchen surrounding mountains (Sedonchen towards Kibek), no. 1092.  
Shrub, flowers pale green, common.
- V. nummularia** Hook. f. & Thoms.  
Lachung towards Yumthang, no. 275; Lachen to Naram village no. 462; Karponang upwards to top of hill, no. 728.  
Epiphyte on rocks and tree trunks laden with mosses and lichens, flowers creamy-white, with red tips, common.
- V. retusum** Hook. f.  
Lachung towards Gompa, no. 246; Gangtok to Karponang, no. 719; Gnathong to Padonchen, no. 1053.  
Epiphyte, flowers pink with red stripes, common.

**Vaccinium serratum** Wt.

Singhik to Toong, no. 112; Pedonchen surrounding mountains, no. 1106; Gangtok to Karponang, no. 671.

Epiphyte with thick root stock, common.

## ERICACEAE

**Cassiope fastigiata** Don

Lachen to Thangu, no. 530; Thangu towards Donki La and Lona La, no. 575; Thangu to Lachen, no. 584; Changu towards Bui Khola valley, no. 788; Changu to Kupup, no. 852; Kupup to Jelap La, no. 882.

Herb, 15-25 cm. high, flowers creamy-white gregarious among rocks and dry stream beds.

**Enkianthus himalaicus** Hook. f. & Thoms. (Nep. Chatusin; Tib. Thibushi)

Lachung towards Yumthang, no. 265; Lachen to Thepa La, no. 423; Lachen towards Zemu valley, no. 487.

Tree 2-8 m. high, flowers red, common.

**Gaultheria fragrantissima** Wall. (Tib. Kaloma)

Lachen to Thepa La, no. 418; Gangtok to Karponang, no. 712.

Shrub, 1-2 m. high, flowers white, common.

**G. fragrantissima** Wall. var. **ovalifolia** (Wall.) (Tib. Kalumbo)

Lachen towards Naram village, no. 445; Lachen to Thangu, no. 507.

Shrub, 1-2 m. high, flowers pink, common.

**G. griffithiana** Wt.

Gangtok to Karponang, no. 714; Karponang to Changu, no. 754.

Shrub, flowers creamy-white, common.

**G. nummularioides** Don

Karponang to Changu, no. 760.

Prostrate herb, abundant on rocks.

**G. trichophylla** Royle

Changu towards Bui Khola valley, no. 795; mountains around Gnathong no. 957.

Prostrate herb, flowers pinkish white, small, abundant on moss covered soil and rocks.

**Lyonia ovalifolia** (Wall.) Drude

(= *P. ovalifolia* Don) (Nep. Angeri)

Lachung to Chung Thang, no. 337; Thangu, no. 566; Chung Thang to Lachen, no. 345 and 349; Lachung towards Yumthang, no. 262.

Tree, 6-8 m. high, flowers white, common.

Leaves poisonous to cattle. The leaves if touched causes itching sensation on the skin.

**Pieris formosa** Don (Tib. Empe)

Chung Thang to Lachung, no. 226; Lachung towards Gompa, no. 237; Lachen to Naram village, no. 447.

Shrub, 1-3 m. high, flowers white, abundant. Leaves poisonous to cattle.

**Rhododendron glaucum** Hook. f.

Lachen to Thangu, no. 505; Karponang to Changu, no. 757.

Shrub, 1-2 m. high, flowers rosy, common.

**R. griffithianum** Wt.

Lachung towards Gompa, no. 256; Lachen to Naram village, no. 477.

Tree, 6 m. high, flowers white with pinkish tinge, common.

**R. hodgsoni** Hook. f.

Chung Thang to Lachung, no. 208; Lachung towards Yumthang, no. 300; Karponang upwards to top of hill, no. 745; Karponang to Changu, no. 770; mountains around Gnathong, no. 1016.

Tree, 6-10 m. high, flowers rose-purple, common.

**R. imberbe** Hutch.

Lachung towards Thanka La, no. 321; Lachen to Thangu, no. 522.

Tree, 7-10 m. high, flowers red, abundant.

**R. lepidotum** Wall.

Lachung towards Gompa, 245; Lachen to Chung Thang, no. 590; Changu towards eastern mountain slopes, no. 810; Kupup to Jelap La, no. 902.

Shrub, 60-90 cm. high, leaves scented, flowers pale yellow, abundant in slopes and open meadows.

**R. setosum** Don

Thangu to Goichand and Sipba La track, no. 551; Changu to Kupup, no. 831; Kupup to Jelap La, no. 881 and 901.

Spreading shrub, 30-40 cm. high, flowers rose or red; common.

**R. thomsoni** Hook. f.

Thangu to Lachen, no. 586; Karponang to Changu, no. 763 and 769; Gnathong to Padonchen, no. 1029 and 1030.

Large shrub or small tree, 1-6 m., flowers red or pink, calyx large and cup-shaped, common.

**R. thomsoni** Hook. f. var. **candelabrum** Hook. f.

Lachen to Thangu, no. 519, 523 and 524; Kupup to Gnathong, no. 945, 946 and 947; mountains around Gnathong, no. 967.

Shrub, 1-5 m. high, flowers red, calyx inconspicuous, abundant on slopes.

**R. triflorum** Hook. f. (Tib. Khemu)

Chung Thang to Lachung, no. 229; Lachen to Thepa La, no. 416; Lachen to Naram village, no. 449; Lachen towards Zemu valley, no. 491.

Shrub, 1-3 m. high, flowers creamy-white, orange spot on large petals, common.

**R. virgatum** Hook. f. (Nep. Bherung-pathi)

Lachung towards Gompa, no. 239; Lachen to Thepa La, no. 420.



Shrub, 60-90 cm. high, flowers pink, leaves having brown glands on the underside, common.

#### PRIMULACEAE

##### **Androsace croftii** Watt

Mountains around Gnathong, no. 1003 and 992.

Prostrate herb, flowers red, abundant on the top of mountains and open meadows.

##### **A. geraniifolia** Watt

Chung Thang to Lachung, no. 223; Lachung towards Thanka La, no. 314; Lachung to Chung Thang, no. 331; Chung Thang to Lachen, no. 397.

Herb, with radical leaves, flowers pink, common on moist slopes.

##### **Bryocarpum himalaicum** Hook. f.

Lachen to Thangu, no. 517; Karponang upwards to top of hill, no. 746.

Herb, with an underground corm, flowers yellow, abundant in moist shady places.

##### **Lysimachia evalvis** Wall.

Toong to Chung Thang, no. 160; Lachung to Chung Thang, no. 340; Chung Thang to Singhik, no. 620.

Herb, flowers yellow, common on moist slopes.

##### **L. prolifera** Klatt.

Lachung towards Gompa, no. 252; Lachung towards Yumthang, no. 272.

Decumbent herb, flowers white, common.

##### **Primula calderiana** Balf. f. et Cooper

(= *P. roylei* Balf. f. et W. W. Sm.)

(= *P. gammieana* King ex Balf. f.)

Lachen to Thangu, no. 534; Thangu to Goichand and Sipba La track, no. 542; Changu towards Bui Khola valley, no. 871; Changu towards eastern mountain slopes, no. 804; Changu to Kupup, no. 833; Kupup to Jelap La, no. 891.

Herb, leaves radical, flowers deep violet with a yellow lining at the mouth of the corolla, common. This species shows high degree of variability due to its different habitats and its considerable altitudinal range.

##### **P. denticulata** Sm. (Tib. Ghem-thang)

Chung Thang to Lachung, no. 225; Lachung towards Yumthang, no. 286; Lachen to Thangu, no. 516; Lachen to Thepa La, no. 422.

Herb, leaves radical, flowers pink, common in moist slopes. A very variable species widely distributed throughout the Himalayas from Afghanistan and most of the so-called varieties of this species have been reduced to the species proper by W. W. Smith and Fletcher.

##### **P. elongata** Watt

Changu to Kupup, no. 828.

Herb, flowers yellow, common on moist slopes.

##### **P. glabra** Klatt

Changu to Kupup, no. 842; Kupup to Bithang Chu lake, no. 911.

Tiny herb, 3-4 cm. high, flowers pink, common on moist slopes.

##### **P. Kingii** Watt

Mountains around Gnathong, no. 978.

Herb, 15 cm. high, flowers red-purple, common.

##### **P. obliqua** W. W. Sm.

Changu towards eastern mountain slopes, no. 801; two miles from Kupup towards Changu, no. 858; Kupup to Jelap La, no. 876; Kupup to Bithang Chu lake, no. 931.

Herb, leaves radical, flowers yellow, common in moist places. According to Smith, Hooker confused this species with *P. stuartii* in his Fl. Br. India.

##### **P. petiolaris** Wall.

Karponang to Changu, no. 771; Changu towards eastern mountain slopes, no. 815; mountains around Gnathong, no. 968.

Prostrate herb, flowers purples, abundant in rocky crevices on top of mountains.

##### **P. pseudomalacoides** Stewart

Lachung towards Thanka La, no. 325.

Herb, flower colour varies from white, lilac and pink in different plants, mostly cultivated.

##### **P. pulchra** Watt

Kupup to Gnathong, no. 941.

Herb, flowers purple, rare.

##### **P. sapphirina** Hook. f. & Thoms.

Mountains around Gnathong, no. 1004.

Herb, leaves radical, flowers pale blue, abundant in marshy land.

##### **P. scapigera** Craib

(= *P. petiolaris* Wall. var. *scapigera* Hook. f. in part)

Karponang to Changu, no. 758.

Herb, abundant in loose moist soil and rocks laden with moss.

According to Craib, this species is mostly collected from Western part of Sikkim. It is now recorded from the Eastern part.

##### **P. sikkimensis** Hook. f.

Changu to Kupup, no. 834 A.

Tall herb with large leaves, flowers profuse, yellow, less common.

##### **P. stuartii** Wall. var. *macrocarpa* Watt

Two miles from Kupup towards Changu, no. 859; Kupup to Bithang Chu lake, no. 908.

Herb, 8-10 cm. high, leaves radical, flowers chocolate coloured, common in very moist places.

##### **P. vaginata** Watt

Changu to Kupup, no. 834.

Herb, flowers violet, common in rocky crevices under shade.

## MYRSINACEAE

- Ardisia humilis** Vahl  
Dikchu to Singhik, no. 43.  
Shrub, 1-2 m. high, rare.
- A. macrocarpa** Wall.  
Dikchu to Singhik, no. 43 A.  
Shrub, 1-1.5 m. high, rare.
- Embelia floribunda** Wall.  
Dikchu to Gangtok, no. 660.  
Straggling shrub, rare.
- Maesa indica** Wall. (Nep. Bilauni)  
Dikchu to Singhik, no. 18.  
Shrub, 1-4 m. high, common.
- M. rugosa** C. B. Clarke (Nep. Pholami)  
Eastern slope beyond Chung Thang, no. 185;  
Chung Thang to Lachen, no. 347; Gangtok to  
Karponang, no. 675; Toong to Chung Thang,  
no. 152.  
Shrub, 1-3 m. high common.
- Myrsine semiserrata** Wall.  
Chung Thang to Lachung, no. 206.  
Tree, rare.

## STYRACEAE

- Symplocos glomerata** King  
Chung Thang to Lachen, no. 408.  
Shrub, 3 m. high, flowers white, rare.
- S. ramosissima** Wall.  
Gnathong to Padonchen, no. 1067; Gangtok  
to Karponang, no. 674.  
Tree, 9-12 m. high, flowers white, common.

## OLEACEAE

- Fraxinus floribunda** Wall. (Nep. Lakurni)  
Singhik to Dikchu, no. 632.  
Tree, 18-20 m. high, less common. The bark is  
tied round in case of fractures. The bark of this  
plant mixed with egg, honey, cow's milk *Viscum*  
stem powder and is drunk in case of broken bones.
- Jasminum dispersum** Wall.  
Chung Thang to Lachung, no. 195; Chung  
Thang to Lachen, no. 375.  
Climber, flowers pinkish-white, corolla tube  
pink and lobes white, fragrant, rare.
- J. humile** Linn.  
Chung Thang to Lachung, no. 231; Lachen to  
Naram village, no. 443.  
Shrub, 1-2 m. high, flower buds yellow,  
common.

## APOCYNACEAE

- Chonemorpha fragrans** (Moon) Alston  
Sedonchen to Rongli, no. 1125.  
Climber, flowers large white, rare.
- Tabernaemontana ophiorhizoides** Kurz  
Dikchu to Gangtok, no. 662.  
Shrub, flowers white, rare.

## ASCLEPIADACEAE

- Asclepias curassavica** Linn.  
Dikchu to Gangtok, no. 641.  
Herb, 45-60 cm. high, flowers orange, rare.  
(This is rather a common weed in the plains of  
India).
- Hoya arnottiana** Wt. (Nep. Dudbala-sao)  
Dikchu to Gangtok, no. 646.  
Climber, hanging from rocks, flowers waxy,  
creamy white, abundant.
- H. linearis** Wall. var. **nepalensis** Hook. f.  
Singhik to Toong, no. 120.  
Climber, among moss on tree trunks, rare. The  
distinction between this variety and the variety  
*skimensis* Hook. f. is not quite clear.
- H. longifolia** Wall.  
Chung Thang to Singhik, no. 628.  
Climber, leaves thick and fleshy, flowers creamy-  
white with few red spots, common.

## GENTIANACEAE

- Gentiana albicalyx** Burkill  
Thangu towards Donki La, no. 564. Stunted  
herb, flowers blue, common. The present data  
indicate wider distribution of the species in  
Sikkim.
- Swertia chirata** Ham. (Nep. Cherata)  
Toong to Chung Thang, no. 161.  
Herb, 30 cm. high, rare.

## BORAGINACEAE

- Cynoglossum denticulatum** A. DC.  
Lachung to Chung Thang, no. 338.  
Decumbent herb, flowers blue, rare.
- C. furcatum** Wall.  
Gnathong to Padonchen, no. 1049.  
Herb, 45 cm. high, flowers deep blue, rarely  
found in moist loose soil.
- Ehretia wallichiana** Hook. f. & Thoms.  
Singhik to Toong, no. 121.  
Tree, 12-13 m. high.
- Onosma emodi** Wall.  
Mountains around Gnathong, no. 1024.  
Herb, flowers light violet, common along moist  
sandy edges of streams.
- Trigonotis microcarpa** Benth.  
Chung Thang to Lachen, no. 377.  
Decumbent herb, flowers blue, common in  
moist shady places.
- T. ovalis** Benth.  
Mountains around Gnathong, no. 980 and 1005;  
Kupup to Bithang Chu lake, no. 917.  
Decumbent herb, with root stock, flowers light  
blue, abundant in moist places.

## SOLANACEAE

**Cestrum nocturnum** Linn.

Gangtok to Karponang, no. 670.

Shrub, flowers bright yellow, cultivated as a hedge plant (introduced).

**Datura suaveolens** Humb.

Dikchu to Gangtok, no. 644.

Shrub, 3-5 m. high, flowers large, white, abundant.

**Mandragora caulescens** C. B. Clarke

Thangu towards Donki La, no. 557 and no. 561; Kupup to Bithang Chu lake, no. 923; mountains around Gnathong, no. 984 and 1006.

Herb with radical leaves, flowers purple, rare, found on crevices of moist rocks.

**Solanum khasianum** C. B. Clarke (Nep. Kachrenda)

Singhik to Toong, no. 102; Sedonchen to Rongli, no. 1116.

Shrub, 60 cm. high, flowers white, common.

**S. nigrum** Linn.

Dikchu to Singhik, no. 35.

Herb, flowers white, rare.

## SCROPHULARIACEAE

**Calceolaria mexicana** Benth.

Gangtok to Karponang, no. 705; Padonchen surrounding mountains (Padonchen to Kibek), no. 1085.

Herb, 8-15 cm. high, flowers yellow, common in moist places under shade of rocks and trees.

**Hemiphragma heterophyllum** Wall.

Chung Thang to Lachung, no. 207; Lachung towards Gompa, no. 248; Karponang to Changu, no. 752; Kupup to Jelap La, no. 883.

Prostrate herb, flowers pink, abundant on mountain slopes and open fields.

**Lindenbergia indica** (Linn.) O. Ktze.

(=*L. urticaefolia* Lehm.)

Dikchu to Singhik, no. 33.

Prostrate herb, flowers yellow, rare.

**Mazus dentatus** Wall.

Gangtok to Karponang, no. 698.

Herb, abundant on moist slopes.

**M. surculosus** Don

Singhik towards Mangan, no. 69; Toong to Chung Thang, no. 140.

Small herb with radical leaves, flowers purple, common.

**Mimulus nepalensis** Wall.

Singhik towards Mangan, no. 70; Sedonchen to Rongli, no. 1101; Padonchen surrounding mountains (Padonchen to Kibek), no. 1072.

Decumbent herb, flowers blue, common on rocky crevices in slopes and on moist banks of rivers.

**Picrorhiza kurrooa** Benth. (Nep. Kudhi)

Changu towards Bui Khola valley, no. 800;

Changu towards eastern mountain slopes, no. 817.

Runner, with thick underground root-stock, common. Leaves eaten for curing fever.

**Scrophularia urticaefolia** Wall.

Gangtok to Karponang, no. 715.

Herb, 30 cm. high, flowers pale greenish, shaped like a nun's hood, rare, on moist slopes.

**Veronica cana** Wall.

Lachen to Chung Thang, no. 595; Karponang upwards to top of hill, no. 724; Changu to Nathu La, no. 826.

Herb, 15 cm. high, flowers pale lilac, common on moist slopes.

**V. capitata** Benth.

Gnathong to Padonchen, 1041.

Herb, 6-8 cm. high, flowers lilac, common on moist slopes.

**V. hederacifolia** Linn.

Lachung towards Thanka La, no. 326.

Prostrate herb, flowers blue, common in moist places.

**Wulfenia amherstiana** Benth.

Lachung towards Yumthang, no. 289.

Herb, common in moist shady places.

## GESNERIACEAE

**Aeschynanthus gracilis** Parish.

Dikchu to Singhik, no. 42; Singhik towards Mangan, no. 77.

Climbing herb, flowers red, common, seen growing on tree trunks mixed with other epiphytes and moss.

**A. hookeri** C. B. Clarke

Padonchen surrounding mountains (Padonchen to Kibek), no. 1087.

Climber, flowers orange, with deep red streaks at the top, common.

**A. ramossissima** Wall.

Gangtok to Karponang, no. 678; Singhik to Toong, no. 117.

Climber, on tree trunks, leaves thick and fleshy, flowers red, common.

**Chirita urticaefolia** Ham.

Padonchen surrounding mountains (Padonchen to Kibek), no. 1073.

Herb, stem succulent, flowers red, found under shade on moist slopes.

**Didymocarpus podocarpa** C. B. Clarke (Tib. Saro)

Chung Thang to Lachen, no. 352; Gangtok to Karponang, no. 711; Toong to Chung Thang, no. 148; Lachen to Thepa La, no. 438.

Herb, with aromatic leaves, common in slopes on loose soil.

## SELAGINACEAE

**Lagotis glauca** Gaertn.

Changu to Kupup, no. 837; mountains around Gnathong, no. 979.

Herb, common along moist watery edges.

## VERBENACEAE

**Callicarpa arborea** Roxb.

Singhik to Dikchu, no. 637; Sedonchen to Rongli, no. 1121.

Tree, 6-8 m. high, flowers pink, common.

**Clerodendrum bracteatum** Wall.

Dikchu to Singhik, no. 29; Dikchu to Gangtok, no. 645.

Shrub, 1-3 m. high, flowers white, common.

**C. squamatum** Vahl

Rongli to Ari, no. 1136.

Herb, 60-90 cm. high, flowers red, common.

**Duranta plumieri** Jacq.

Sedonchen to Rongli, no. 1123.

Shrub, 1-2 m. high, flowers pale violet, used as a hedge plant.

**Premna interrupta** Wall.

Lachen to Chung Thang, no. 614; Gangtok to Karponang, no. 672.

Straggling shrub, flowers white, common.

## LAMIACEAE (=LABIATAE)

**Ajuga lobata** Don

Gangtok to Karponang, no. 716; Chung Thang to Lachung, no. 204.

Prostrate herb, underside of leaves red, flowers violet, common on rocky slopes.

**A. macrosperma** Wall. var. **thomsoni** Hook. f.

Toong to Chung Thang, no. 156.

Prostrate herb, common on moist sloping ground.

**Elsholtzia strobilifera** Benth.

Lachung towards Gompa, no. 242.

Herb, 30 cm. high, common.

**Lamium amplexicaule** Linn.

Lachung towards Thanka La, no. 318; Thangu towards Donki La, no. 580.

Herb, 7-15 cm. high, flowers purple, common along moist banks of streams.

**Leucosceptrum canum** Sm.

Chung Thang to Lachung, no. 203.

Tree, under surface of leaves with silvery pubescence, rarely found on barren hill tops.

**Phlomis tibetica** Marq. & Airy-Shaw

Kupup to Bithang Chu lake, no. 919.

Herb, abundant in open meadows.

**Prunella vulgaris** Linn.

(= *Brunella vulgaris* Linn.)

Gnathong to Padonchen, no. 1069.

Herb, flowers deep violet, common in open lands.

## PLANTAGINACEAE

**Plantago major** Linn.

Dikchu to Singhik, no. 40; Singhik towards Mangan, 74.

Herb, leaves radical, flowers small, white, common along moist watery edges.

## PHYTOLACCACEAE

**Phytolacca acinosa** Roxb.

Toong to Chung Thang, no. 145.

Herb, 60 cm. high, flowers yellowish-green, rare.

## POLYGONACEAE

**Fagopyrum cymosum** Meissn.

Lachung to Chung Thang, no. 333.

Climber, flowers white, common.

**F. tartaricum** Gaertn. (Nep. Titephaphar)

Dikchu to Singhik, no. 13.

Herb, 60-90 cm. high, cultivated, flour made from seeds.

**Oxyria digyna** Hill

Mountains around Gnathong, no. 999.

Herb, flowers pink, rare, found in rocky crevices on slopes.

**Polygonum alatum** Ham.

Singhik towards Mangan, no. 79.

Herb, flowers white or rose, common in moist crevices.

**P. capitatum** Ham. (Nep. Ratnaula)

Chung Thang to Lachen, no. 359; Dikchu to Singhik, no. 17 and 20.

Runner, leaves reddish green with a brown spot in the centre, flowers pink, abundant on slopes.

**P. microcephalum** Don

Singhik towards Mangan, no. 65; Sedonchen towards Kibek, no. 1091.

Scandent herb, flowers white, common in moist places.

**P. molle** Don (Nep. Khotne, Thothin)

Chung Thang to Lachen, no. 358; Gangtok to Karponang, no. 686; Singhik to Toong, no. 125.

Shrub, 2-3 m. high, flowers creamy-white, with unpleasant smell, rare.

**P. runcinatum** Ham. (Nep. Ratnaula)

Gangtok to Karponang, no. 673; Chung Thang to Lachen, no. 360.

Weak herb, flowers white or pink, common in moist shady places on slopes.

**P. sphaerostachyum** Meissn.

Gnathong to Padonchen, no. 1042.

Herb, 4-8 cm. high, flowers pink, rare.

**P. viviparum** Linn.

Mountains around Gnathong, no. 977, 986 and 1022.

Herb, 4-8 cm. high, flowers pink, rare, found on sandy soils along roads.

**Rheum acuminatum** Hook. f. & Thoms.

Mountains around Gnathong, no. 982.

Herb, 30 cm. high, common along sides of running water.

**Rumex nepalensis** Spreng.

Kupup to Gnathong, no. 968; Gnathong to Padonchen, no. 1047; Sedonchen to Rongli, no. 1096.

Herb, 30-45 cm. high, abundant along moist road sides.

ARISTOLOCHIACEAE

**Aristolochia griffithii** Hook. f. & Thom.

Chung Thang to Lachen, no. 381.

Large climber, flowers yellow, deep purple on the inner side of the throat, common along meadows and sides of streams.

PIPERACEAE

**Houttuynia cordata** Thunb.

Singhik to Dikchu, no. 638.

Herb, 30 cm. high, flowers white, common on moist places.

**Peperomia heyneana** Miq. (Nep. Chauri)

Dikchu to Singhik, no. 14.

Climber, abundant on rocks and tree trunks among moss.

**Piper pedicellatum** A.DC. (Nep. Rukchava)

Dikchu to Singhik, no. 11.

Climbing herb, inflorescence yellow, abundant.

**P. reflexa** A. Dietr.

Chung Thang to Lachung, no. 193.

Climber, abundant on rocks and tree trunks.

**P. thomsoni** Hook. f. (Nep. Pipila)

Singhik to Dikchu, no. 633.

Herbaceous climber, spike greenish, abundant. Leaves eaten as 'Pan'.

LAURACEAE

**Cinnamomum obtusifolium** Nees (Nep. Cinchouli)

Gangtok to Karponang, no. 684.

Tree, 10 m. high.

**Lindera griffithii** Meissn.

Lachen to Thangu, no. 514; Lachung towards Yumthang, no. 279.

Tree, 7-8 m. high, flowers yellow, filaments of stamens petaloid.

**Litsaea lancifolia** Roxb. (Nep. Kalikat)

Padonchen to Rongli, no. 1109.

Tree, 15 m. high, flowers yellow, common.

THYMELAEACEAE

**Daphne bholua** Ham. ex Don (Nep. Kala-argali, Kageiti) (= *D. cannabina* Wall., p.p.)

Thangu to Goitchand, and Sipba La track, no. 548; Changu to Nathu La, no. 827; Chung

Thang to Lachung, no. 233; mountains around Gnathong, no. 997; Toong to Chung Thang, no. 144; Lachen to Thepa La, no. 435.

Shrub, 1-2 m. high, flowers purple, common. Bark used in Paper industry and root is medicinal.

**Edgeworthia gardneri** Meissn. (Nep. Argali)

Gangtok to Karponang, no. 676; Singhik towards Mangan, no. 90; Toong to Chung Thang, no. 165.

Shrub, 3-4 m. high, flowers yellow, common. Bark used in making ropes.

ELAEAGNACEAE

**Elaeagnus umbellata** Thunb.

Chung Thang to Lachung, no. 202.

Shrub, 4-5 m. high, common.

**Hippophae salicifolia** Don (Nep. Tarbo)

Lachen to Thepa La, no. 421.

Shrub, 1-2 m. high, abundant along slopes.

LORANTHACEAE

**Dendrophthoe falcata** (Linn. f.) Etting.

(= *Loranthus longiflorus* Desr.)

Chung Thang to Lachen, no. 364.

Partial stem parasite, rare.

**Viscum articulatum** Burm. (Nep. Hur-jur)

Chung Thang to Lachen, no. 362.

Total stem parasite, rare. Plant used in fractures; powdered and mixed with hen's egg and honey and taken internally.

SANTALACEAE

**Thesium himalense** Royle

Thangu towards Donki La and Lona La, no. 581.

Herb, flowers white, common.

EUPHORBIACEAE

**Baliospermum corymbiferum** Hook. f.

Dikchu to Gangtok, no. 664.

Shrub, 1-2 m. high, abundant.

**Daphniphyllum himalayense** Muell. (Nep. & Tib. Bokta)

Lachen to Thepa La, no. 417; Chung Thang to Lachen, no. 385 and 386; Lachen to Naram village, no. 450; Lachen towards Zemu valley, no. 488.

Tree, 12-15 m. high, dioecious, common.

**Euphorbia himalayensis** Boiss.

Kupup to Bithang Chu lake, no. 926 and 925; Kupup to Gnathong, no. 942; two miles from Kupup towards Changu, no. 872.

Herb, 15-30 cm. high, yellow, abundant in rocky crevices and open meadows.

**E. pulcherrima** Willd. (Nep. Lalphul)

Dikchu to Singhik, no. 16.

Shrub, 3-4 m. high, common in inhabited area.  
A garden escape.

**Euphorbia sikkimensis** Boiss.

Lachung to Chung Thang, no. 328; Chung Thang to Lachung, no. 222.

Herb, 30-60 cm. high, young leaves reddish, abundant.

**E. stracheyi** Boiss.

Thangu towards Donki La, no. 563; Kupup to Gnathong, no. 935.

Herb, 2-4 cm. high, common on moss covered soil and rocks.

**Macaranga denticulata** Muell. (Nep. Hathipaili)

Dikchu to Singhik, no. 61; Dikchu to Gangtok, no. 650.

Tree, 15-18 m. high, common.

**Ostodes paniculata** Bl.

Dikchu to Singhik, no. 39; Rongli to Ari, no. 1131.

Tree, 9-12 m. high, flowers white, common.

**Phyllanthus reticulatus** Poir

(= *P. dalbergioides* Wall.)

Dikchu to Singhik, no. 36.

Shrub, found along road side, common.

**Sarcococca pruniformis** Lindl. var. *hookeriana* Hook. f.  
(= *S. hookeriana* Baill.)

Lachen to Naram village, no. 463; Chung Thang to Lachen, no. 387.

Shrub, 60-90 cm. high, abundant as an undergrowth in shady forest areas.

**Sapium baccatum** Roxb.

Dikchu to Gangtok, no. 659.

Tree, 18-21 m. high, less common.

URTICACEAE

**Boehmeria platyphylla** Don var. *rotundifolia* Wedd.  
(Nep. Lek-kauli)

Dikchu to Singhik, no. 9; Padonchen to Rongli, no. 1118.

Undershrub, 120 cm. high, common.

**Cannabis sativa** Linn.

Singhik to Toong, no. 123; Padonchen to Rongli, no. 1124.

Herb or small shrub, 30-90 cm. high, abundant.

**Debregeasia wallichiana** Wedd. (Nep. Bokati)

Chung Thang to Singhik, no. 624; Rongli to Ari, no. 1134.

Tree, 9-10 m. high, common at the edge of the forest.

**Elatostema dissectum** Wedd. (Nep. Gucklata)

Singhik to Toong, no. 106

Herb, stem succulent, common on moist shady places among moss.

**E. hookerianum** Wedd.

Chung Thang to Lachen, no. 374.

Pendulous herb, stem succulent, common on moist rocks among moss.

**E. surculosum** Wt.

Lachung to Chung Thang, no. 336.

Herb, leaves fleshy, common on bare rocks among moss.

**Girardinia heterophylla** Dcne.

Dikchu to Singhik, no. 44.

Herb, 90-120 cm. high, stem and leaves covered with spines.

**Pilea symmeria** Wedd.

Gangtok to Karponang, no. 710; Gnathong to Padonchen, no. 1060; Dikchu to Singhik, no. 21.

Herb, 20-30 cm. high, common in moist edge of forests.

**P. ternifolia** Wedd.

Lachen to Chung Thang, no. 601; Padonchen surrounding mountains (Sedonchen towards Kibek), no. 1080.

Herb, 15-20 cm. high, on moist rocky slopes, rare.

**P. umbrosa** Wedd.

Sedonchen to Rongli, no. 1104.

Succulent herb, flowers small, common in moist shady places.

**Pouzolzia hirta** Hassk.

Sedonchen to Rongli, no. 1098 and 1129.

Prostrate herb, 6 cm. high in rock crevices along sides of roads.

FAGACEAE

**Quercus lineata** Bl. var. *thomsoniana* Wenzig

Chung Thang to Lachen, no. 363 and 372.

Tree, 9-12 m. high, loaded with *Viscum* and at another place with *Dendrophthoe*, abundant.

BETULACEAE

**Alnus nepalensis** Don (Nep. Utis)

Singhik to Toong, no. 124

Tree, 10-12 m. high.

**Betula utilis** Don (Nep. Bhoj-patra)

Chung Thang to Lachen, no. 407; Lachen towards Zemu valley, no. 499.

Tree, 15-18 m. high, abundant. The bark of this is red; peels off very easily, used as writing paper.

**Corylus ferox** Wall.

Chung Thang to Lachen, no. 409.

Tree, 18 m. high, common.

SALICACEAE

**Populus ciliata** Wall.

Chung Thang to Lachen, no. 379.

Tree, 18 m. high, common.

**Salix calyculata** Hook. f.

Mountains around Gnathong, no. 991.

Prostrate shrub, on the bank of running water streams, rare.



**Salix daltoniana** Anders.

Lachung towards Thanka La, no. 305.

Shrub, 1-3 m. high, undersurface of the leaves greyish-white, rare.

**S. oreophila** Hook. f.

Kupup to Jelap La, no. 898; Lachen to Thangu, no. 504.

Prostrate shrub, on the sides of running water, abundant.

**S. sikkimensis** Anders.

Thangu towards Donki La, no. 562; Thangu to Goichand & Sipba La track, no. 541.

Shrub, 1-2 m. high, common.

**S. tetrasperma** Roxb.

Lachen towards Thangu, no. 444 and 465; Lachung towards Compa, no. 257.

Tree, 6-8 m. high, seeds with wooly aril, abundant along river bank.

**Monocotyledons**

## ORCHIDACEAE

**Aerides multiflorum** Roxb.

Rongli to Ari, no. 1137.

Epiphyte, flowers white with pink spots, labellum pink, common.

**Arundina graminifolia** (Don) Hochr.

[=*A. bambusifolia* (Roxb.) Lindl.]

Sedonchen to Rongli, no. 1100.

Ground orchid, cultivated along hedges. Flowers rose or red with brighter red labellum.

**Calanthe brevecornu** Lindl. (Nep. Sonakhari)

Sedonchen towards Kibek, no. 1081.

Terrestrial orchid with underground creeping rhizome, flowers yellow, abundant in moist shady places.

**Coelogyne corymbosa** Lindl. (Nep. Sunakhari)

Gangtok to Karponang, no. 717.

Epiphyte, among moss on rocks and tree trunks, flowers white, lip with yellow spots and orange streaks, common.

**C. flavida** Wall.

Sedonchen to Rongli, no. 1113.

Epiphyte, with creeping stem and a thick pseudobulb, flowers yellow with orange streaks on the labellum, abundant.

**C. orchracea** Lindl. (Nep. Safed-sunalkhari)

Lachen to Thepa La, no. 429; Chung Thang to Lachung, no. 221; Singhik to Toong, no. 103.

Epiphyte, on tree trunks, flowers white, labellum white with yellow spots and brown streaks, abundant.

**Cymbidium sammeanum** King & Pantl.

Chung Thang to Lachen, no. 395.

Epiphyte, on tree trunks, flowers yellow, lip pinkish with red spots.

**Dendrobium amoenum** Wall.

Sedonchen to Rongli, no. 1103.

Epiphyte on tree trunks among moss, flowers light pink, labellum yellow with red streaks, abundant.

**D. densiflorum** Wall. (Nep. Sunakhari)

Dikchu to Singhik, no. 37.

Epiphyte on *Ficus*, flowers yellow, rare.

**D. heterocarpum** Wall.

Singhik to Toong, no. 116.

Epiphyte, common.

**D. nobile** Lindl.

Toong to Chung Thang, no. 141.

Epiphyte, flowers pink, inside of the lip deep purple, common.

**Orchis habenarioides** King & Pantl.

Gnathong to Sedonchen, no. 1054.

Terrestrial orchid, common.

**O. spathulata** Rechib. f.

Kupup to Bithang Chu lake, no. 910; mountains around Gnathong, no. 960.

Terrestrial orchid, flowers purple, rose-purple, abundant.

**Otochilus alba** Lindl.

Sedonchen to Rongli, no. 1115.

Epiphyte, with creeping pseudobulb, flowers white with yellow spots, abundant.

**Pholidota articulata** Lindl.

Sedonchen to Rongli, no. 1110.

Epiphyte, with a creeping pseudobulb, flowers small, creamy-white, abundant.

**P. imbricata** Lindl.

Singhik to Toong, no. 115; Sedonchen to Rongli, no. 1112.

Epiphyte, with very thick pseudobulb, flowers creamy white, abundant.

**Pleione hookeriana** (Lindl.) T. Moore

(=*Coelogyne hookeriana* Lindl.)

Gangtok to Karponang, no. 720; Gnathong to Padonchen, no. 1043.

Epiphyte, flowers pale violet, lip with yellow and brown spots, common on moss-covered tree trunks.

**Pogonia plicata** Lindl.

Sedonchen to Rongli, no. 1126.

Terrestrial orchid, abundant as a forest undergrowth in shade.

**Saccolabium gemmatum** Lindl.

(=*Cleisostoma gemmatum* King & Pantl.)

Chung Thang to Lachung, no. 197.

Epiphyte, among moss on tree trunks, flowers small spur, purple, deep white, common.

**Stauroopsis undulatus** (Lindl.) Benth. ex. Hook. f.

Lachen to Chung Thang, no. 608.

Epiphyte, flowers white with pinkish streaks outside, labellum yellow with pink streaks, common.

**Thunia alba** Lindl.

(=*Phaius albus* Lindl.)

Sedonchen to Rongli, no. 1120

Epiphyte, flowers white, rare.

**Vanda cristata** Lindl.

Singhik to Dikchu, no. 640.

Epiphyte, flowers yellow, lip red, common.

## ZINGIBERACEAE

**Amomum dealbatum** Roxb. (Nep. Elaichi)

Dikchu to Singhik, no. 54.

Herb, with underground rhizome, flowers yellow, cultivated for its fruits.

**Cautleya lutea** Royle

Gnathong to Padonchen, no. 1070; Gangtok to Karponang, no. 692.

Perennial herb, flowers yellow, common in moist places.

**Globba racemosa** Sm.

Rongli to Ari, no. 1138.

Perennial herb, with underground rhizome, flowers yellow, common on slopes.

**Hedychium gardnerianum** Rosc.

Chung Thang to Lachen, no. 369.

Perennial herb, 90 cm. high with underground rhizome, common on slopes.

## HAEMODORACEAE

**Aletris nepalensis** Hook. f.

Mountains around Gnathong, no. 1026.

Herb, 3-8 cm. high, common on moist grassy slopes.

**Mondo wallichianus** (Kunth) Bailey

(=*Ophiopogon wallichiana* Hook. f.)

Sedonchen towards Kibek, no. 1078.

Herb, root tips tuberous, flowers lilac, common on moist slopes as a forest undergrowth.

## IRIDACEAE

**Iris clarkii** Baker

Gnathong to Padonchen, no. 1038.

Perennial herb, with an underground horizontal rhizome, flowers deep violet, with yellowish-white markings on the lip, common along road side on sandy soil.

**I. ensata** Thunb. (Nep. Bhoju; Tib. Shetaka)

Lachen to Thepa La, no. 441.

Herb, with underground rhizome, abundant in marshy land. The rhizome smells of *Citrus* leaves. Crushed rhizome and its essence applied externally for cold and cough.

**I. nepalensis** Don

Karponang to Changu, no. 765.

Herb with an underground rhizome, abundant on slopes.

## AMARYLLIDACEAE

**Crinum amoenum** Roxb.

Sedonchen to Rongli, no. 1122.

Perennial herb, flowers white, cultivated.

**Molineria crassifolia** Hook. f.

(=*Curculigo crassifolia* Hook. f.)

Sedonchen towards Kibek, No. 1075.

Herb, flowers yellow, abundant on the slopes.

## DIOSCOREACEAE

**Dioscorea deltoidea** Wall.

Chung Thang to Singhik, no. 619.

Climbing shrub, very rare.

**D. sativa** Linn.

Sedonchen to Rongli, no. 1111.

Climber, common.

## LILIACEAE

**Clintonia alpina** Kunth

Lachen towards Zemu valley, no. 497; Lachen to Thangu, no. 502; Lachen to Naram village, no. 455.

Perennial herb, with underground rhizome, flowers white, abundant on shady slopes.

**Disporum pullum** Salisb.

Chung Thang to Lachung, no. 199; Chung Thang to Lachen, no. 368.

Herb, 60-90 cm. high, flowers creamy-white, common.

**Fritillaria cirrhosa** Don

Kupup to Jelap La, no. 885; Changu to Kupup, no. 841.

Herb with underground bulb, flowers green with purple spots inside, common under *Rhododendron* bushes.

**F. stracheyi** Hook. f.

Kupup to Gnathong, no. 952.

Herb with horizontal rhizome, abundant in moist open places.

**Hemerocallis fulva** Linn.

Mountains around Gnathong, no. 1010.

Herb, on moist rocky crevices, common along banks of river.

**Lilium giganteum** Wall.

Lachen towards Zemu valley, no. 500; Lachung towards Thanka La, no. 315.

Perennial, with underground bulb, aerial portion 2-3 m. high, common.

**Lloydia serotina** Reichb.

Two miles from Kupup towards Changu, no. 857; Changu towards eastern mountain slopes, no. 814; mountains around Gnathong, no. 966; Kupup to Bethang Chu lake, no. 909.

Perennial herb, 6 cm. high, with an underground bulb, flowers yellow, common on slopes and abundant at the top of the mountain.

**Paris polyphylla** Sm.

Lachen to Naram Village, no. 461; Singhik towards Mangan, no. 96; Chung Thang to Lachen, no. 367 and 403; Karponang upwards to top of hill, no. 735 and 737; Singhik to Toong, no. 127; Lachung towards Thanka La, no. 317; Gnathong to Sedonchen, no. 1059.

Perennial herb, with underground rhizome, common on moist shady slopes.

**Polygonatum cirrhifolium** Royle (Nep. Singhani, Gara-muchi)

Karponang upwards to top of hill, no. 736; Lachen to Naram Village, no. 452; Chung Thang to Lachen, no. 402; mountains around Gnathong, no. 973 and 1013; Changu towards eastern mountain slopes, no. 811; Lachung towards Thanka La, no. 303; Kupup to Jelap La, no. 890; Thangu towards Donki La, no. 572; Kupup to Gnathong, no. 944.

Perennial herb, 60-100 cm. high, with an underground rhizome, common in moist shady slopes. Leaves eaten as a vegetable.

**P. hookeri** Baker

Mountains around Gnathong, no. 973; Kupup to Jelap La, no. 890; Thangu towards Donki La, no. 572; Kupup to Gnathong, no. 944.

Small herb, with an underground rhizome on grassy slopes, flowers violet, rare.

**P. oppositifolium** Royle

Eastern slopes beyond Chung Thang, no. 189; Toong to Chung Thang, no. 164; Chung Thang to Lachen, no. 348; Lachung towards Thanka La, no. 304.

Perennial herb with an underground rhizome, abundant on moist shady slopes. Eaten as a vegetable.

**Smilacina oleacea** Hook. f. & Thoms.

Padonchen surrounding mountains (Sedonchen towards Kibek), no. 1095.

Pendulous herb, flowers pink, rare.

**S. oligophylla** Hook. f.

Mountains around Gnathong, no. 994 and 1012; Gnathong to Sedonchen, no. 1039 and 1040.

Perennial herb with an underground rhizome, flowers purple, common on slopes.

**Smilax aspericaulis** Wall.

Singhik towards Mangan, no. 88.

Climbing shrub, flowers creamy-white, common on moist ridges.

**S. rigida** Wall.

Gnathong to Padonchen, no. 1050.

Scandent shrub, flowers small, pale brown, common on slopes.

**Streptopus simplex** Don (Nep. Gari-muchi)

Lachen to Naram Village, no. 448.

Herb, among moss on rocks in shade, Eaten as a vegetable.

**Theropogon pallidus** Maxim. (Nep. Jungli-piaz)

Lachung towards Thanka La, no. 311.

Herb, common on moist slopes. Taken as a condiment.

**Trillium govanianum** Wall.

Mountains around Gnathong, no. 987.

Perennial herb, flowers purple, common.

**T. obovatum** Pursh

Chung Thang to Lachen, no. 404.

Perennial herb, on moist slopes, rare. A north-American plant, evidently an escape from garden. Cultivated.

**T. tschonoskii** Maxim.

Lachen to Naram Village, no. 454; Lachen towards Zemu valley, no. 496.

Perennial herb, with underground rhizome, common on moist slopes.

## COMMELINACEAE

**Cyanotis cristata** (Linn.) Don

Sedonchen to Rongli, no. 1130.

Herb, in rocky crevices, common.

## JUNCACEAE

**Juncus leucanthus** Royle

Kupup to Jelap La, no. 878; mountains around Gnathong, no. 959, 972 and 1019.

Herb, 2-3 cm. high, common in moist rocky crevices and bed of rivers.

**J. ochraceus** Buchen.

Lachung towards Thanka La, no. 323.

Herb, common in moist rocky crevices and bed of streams.

**J. sikkimensis** Hook. f.

Mountains around Gnathong, no. 974.

Herb, with root-stock, common in bed of streams.

**J. uniflorus** W. W. Sm.

Mountains around Gnathong, no. 1020.

Herb, common on the bank of running water.

**Luzula campestris** DC.

Lachung towards Yumthang, no. 298.

Herb, found among moss and roots of trees, rare.

## ARACEAE

**Ariopsis peltata** Nimmo

Dikchu to Gangtok, no. 642.

Perennial herb, with underground corm, common along moss and soil on rocks.

**Arisaema consanguineum** Schott

Lachung towards Chung Thang, no. 342; Singhik towards Mangan, no. 93; Sedonchen surrounding mountains (Sedonchen towards Kibek), no. 1077.

Perennial herb, with underground corm, spathe with green, white and purple lines, common on moist slopes.

**Arisaema griffithii** Schott

Karponang to Changu, no. 755; Lachung towards Thanka La, no. 322; Kupup to Bithang Chu lake, no. 922.

Perennial herb, spathe purple with yellow streaks, common in rocky crevices and open land.

**A. jacquemontii** Bl.

Lachen to Thangu, no. 520; Lachung towards Yumthang, no. 273; Chung Thang to Lachung, no. 234.

Perennial herb, with underground rhizome, spathe greenish with purple lines on outside and white lines inside, common in moist places.

**A. speciosum** Mart.

Chung Thang to Lachung, no. 191; Singhik to Toong, no. 111 and 126.

Perennial herb, with an underground rhizome, spathe deep purple with white lines, found in rocky crevices, rare.

**A. tortuosum** Schott

Chung Thang to Lachen, no. 376; Gangtok to Karponang, no. 694.

Perennial herb, spathe green, common.

**A. wallichianum** Hook. f.

Lachung towards Yumthang, no. 295; Karponang upwards top of hill, no. 721.

Perennial herb, spathe deep purple with white lines, common in moist shady slopes.

**Arisaema** sp. (Nep. Thu)

Lachung towards Thanka La, no. 319.

Perennial herb, with underground stem, common.

**Gonatanthus pumillus** (Don) Engler

(= *G. sarmentosus* Klotz.)

Sedonchen to Rongli, no. 1102; Sedonchen towards Kibek, no. 1082; Toong to Chung Thang, no. 153.

Perennial herb, with underground corm, spathe green below and yellow above, deep purple inside, abundant on moist shady slopes.

**Pothos cathcarti** Schott

Dikchu to Singhik, no. 27; Singhik to Toong, no. 107; Singhik to Dikchu, no. 634.

Root climber, on tree trunks, rare in some places and abundant in some other places.

CYPERACEAE

**Carex cruciata** Vahl

Chung Thang to Lachen, no. 388; Gangtok to Karponang, no. 695.

Stout herb, rare.

**C. decora** Boott

Karponang upwards to top of hill, no. 740.

Stout herb, abundant on moist soil.

**C. vesiculosa** Boott (Nep. Arkat)

Toong to Chung Thang, no. 142.

Herb, abundant on bare exposed rocks.

**Kobresia uncinoides** C. B. Clarke

(= *Carex uncinoides* Boott)

Mountains around Gnathong, no. 958; Changu towards Bui Khola valley, no. 792; Kupup to Bithang Chu lake, no. 918.

Herb, 6 cm. high, common on moist open land.

POACEAE (=GRAMINEAE)

**Arundinaria racemosa** Munro (Nep. Preng, Mallinga)

Singhik to Toong, no. 119; Karponang upwards to top of hill, no. 744; Lachung towards Yumthang, no. 278.

A bamboo, common in dense thickets and rare in slopes.

**Arundinella intricata** Hughes (Nep. Kharuki)

(= *A. braziliensis* Raddi.)

Dikchu to Singhik, no. 2.

Grass, common on lower altitudes. Used as fodder for cattle.

**Avena sativa** Linn. (Oat)

Eastern slope beyond Chung Thang, no. 171.

Grass, growing as a weed in *Triticum* crop. Used for cattle.

**Hordeum vulgare** Linn. (Barley)

Chung Thang to Lachung, no. 209 and 211; eastern slope beyond Chung Thang, no. 168, 169 and 170.

Grass, cultivated along the slopes.

**Panicum plicatum** Lamk. (Nep. Dotiskro)

Dikchu to Singhik, no. 10.

Grass, common.

**Poa sikkimensis** (Stäpf) Bor

(= *Poa annua* Linn.)

Singhik towards Mangan, no. 75; Lachung towards Thanka La, no. 324; mountains around Gnathong, no. 1021; Gnathong to Padonchen, no. 1063.

Grass, growing in loose soil, among rocks and on bed of river, common.

**Stipa orthoraphium** Steud.

Thangu to Goichand and Sipba La track, no. 549.

Grass, abundant on rocks in shallow soil.

**Thysanolaena maxima** (Roxb.) O. Ktze.

(= *T. agrostis* Nees)

Dikchu to Singhik, no. 1.

Grass, abundant. Inflorescence is used for making sweeping brooms.

**Triticum aestivum** Linn. (Wheat)

(= *T. vulgare* Vill.)

Chung Thang to Lachung, no. 212; eastern slope beyond Chung Thang, no. 167.  
Grass, cultivated along the slopes.

## GYMNOSPERMS

## GNETACEAE

**Ephedra saxatilis** Royle var. **sikkimensis** (Stapf) Florin (Tib. Chi)  
Thangu to Goichand & Sipba La track, no. 543.  
Herb, 15-25 cm. high, abundant among rocks.

## PINACEAE

**Larix griffithiana** Carr. (Nep. Sansing)  
(= *L. griffithii* Hook. f.)  
Thangu to Lachen, no. 583; Lachung towards Gompa, no. 255.  
Tree, 9-10 m. high, in cones, along the slopes, rare.

**Picea spinulosa** Beissner  
(= *P. morindoides* Rehd.)  
Lachung towards Yumthang, no. 291; Chung Thang to Lachung, no. 215; Lachen to Thepa La, no. 432.  
Tree, 10-15 m. high, with male and female cones, planted on roadside.

**Tsuga brunoniana** Carr.  
Chung Thang to Lachung, no. 216.  
Tree, 9-12 m. high, rare.

## CUPRESSACEAE

**Juniperus coxii** A. B. Jacks. (Nep. Dhoopi; Tib. Dasu)  
Lachen to Thangu, no. 518; Karponang to Changu, no. 759.  
Big tree, 20-30 m. high, common.

**J. recurva** Ham.  
Thangu to Goichand & Sipba La track, no. 552; Lachung towards Yumthang, no. 292; mountains around Gnathong, no. 969; Changu to Nāthu La, no. 816.  
Bushy shrub or small tree, common at higher altitudes.

## PTERIDOPHYTES

## GLEICHENIACEAE

**Gleichenia longissima** Bl.  
Chung Thang to Lachen, no. 390.  
Fern, 1-2 m. high, abundant on the slopes.

## HYMENOPHYLLACEAE

**Mecodium exsertum** (Wall.) Copel.  
(= *Hymenophyllum exsertum* Wall.)  
Singhik to Dikchu, no. 629.  
Fern, on bare rocks, common.

**M. polyanthos** (Sw.) Copel.  
(= *Hymenophyllum polyanthos* Swartz.)  
Karponang upwards to top of hill, no. 729;

Lachung towards Yumthang, no. 282.  
Fern, on bare rocks.

## POLYPODIACEAE

**Arthromeris himalayensis** (Hk.) Ching  
(= *Polypodium himalayense* Hook.)  
Sedonchen towards Kibek, no. 1089.  
Fern, among moss on tree trunks, common.

**Crispinus ebenipes** (Hk.) Copel.  
(= *Polypodium ebenipes* Hook.)  
Lachen to Chung Thang, no. 603.  
Fern, among moss.

**C. malacodon** (Hk.) Copel.  
(= *Polypodium malacodon* Hook.)  
[= *Pleopeltis malacodon* (Hk.) Bedd.]  
(= *P. stewartii* Bedd.)  
Gnathong to Padonchen, no. 1046; Sedonchen towards Kibek, no. 1088.  
Epiphytic fern, among moss on tree trunks, common.

**C. oxylobus** (Wall. ex Kuntze) Sledge  
(= *Polypodium oxylobum* Wall.)  
Gangtok to Karponang, no. 689.  
Fern, among moss on moist rocks.

**Drynaria propinqua** (Wall.) J. Sm.  
(= *Polypodium propinqua* Wall.)  
Rongli to Ari, no. 1133.  
Climbing fern, on tree trunks, abundant.

**Goniophlebium subauriculatum** (Bl.) Pr.  
(= *Polypodium subauriculatum* Bl.)  
Lachen to Chung Thang, no. 610.  
Fern, among moss on rocks, common.

**Lemnaphyllum carnosum** (Wall.) Pr.  
[= *Drymoglossum carnosum* (Wall.) J. Sm.]  
Toong to Chung Thang, no. 162.  
Fern, among moss on bare rocks, common.

**Lepisorus excavatus** (Bory.) Ching  
[= *Pleopeltis simplex* (Sw.) Bedd.]  
Lachen to Chung Thang, no. 604.  
Fern, among moss and decaying leaves.

**Loxogramme involuta** (Don) Pr.  
Toong to Chung Thang, no. 155.  
Epiphytic fern, among moss on tree trunks.

**Microsorium lucidum** (Roxb.) Copel.  
(= *Polypodium leiorrhiza* Wall.)  
Chung Thang to Lachung, no. 196.  
Fern, among moss on bare rocks, rare.

**M. membranaceum** (Don) Ching  
(= *Polypodium membranaceum* Don)  
Lachen to Chung Thang, no. 611.  
Fern, among moss on rocks.

**Pleopeltis thunbergiana** Kaulf.  
(= *Polypodium lineare* Thunb.)  
Lachung towards Yumthang, no. 270; Toong to Chung Thang, no. 154.  
Fern, common on moist rocks and tree trunks.

**Polypodium amoenum** Wall.

Chung Thang to Lachen, no. 354; Lachen to Chung Thang, no. 593; Chung Thang to Singhik, no. 623.

Fern, among moist rocks, common.

**P. atkinsoni** C. Chr.

[=*Goniophlebium hendersoni* (Atkins.) Bedd.]

Lachen to Chung Thang, no. 612; Sedonchen towards Kibek, no. 1090.

Fern, among moss on tree trunks, common.

**Pyrrhosia flocculosa** (Don) Ching

[=*Niphobolus flocculosus* (Don) Bedd.]

(=*Polypodium flocculosum* Don)

Toong to Chung Thang, no. 157; eastern slope beyond Chung Thang, no. 183.

Epiphytic fern, on tree trunks among moss, common.

REMAINING GENERA OF FERNS :  
ASPLENIUM GROUP :

**Asplenium ensiforme** Wall.

Dikchu to Singhik, no. 38.

Fern, among mosses on tree trunks, common.

**A. latifolium** Don

Dikchu to Singhik, no. 56.

Fern, common.

**A. macrocarpum** Bl.

Singhik towards Mangan, no. 94.

Fern, on moist slopes, abundant.

**A. nidus** Linn.

Dikchu to Singhik, no. 25.

Epiphytic fern, leaves big, abundant.

**A. thelypteroides** Michx.

Lachen to Chung Thang, no. 600.

Fern, on loose moist soil, common.

ATHYRIUM GROUP :

**Athyrium duthiei** Bedd.

Mountains around Gnathong, no. 1007.

Fern, found in clumps, abundant on slopes.

BLECHNUM GROUP :

**Woodwardia radicans** (Linn.) Sm.

Lachen to Chung Thang, no. 605.

Fern, on moist soil.

DRYOPTERIS GROUP :

**Dryopteris sparsa** (Don) O. Kze.

(=*Nephrodium sparsum* Don)

Dikchu to Singhik, no. 5.

Fern, common on bare exposed rocks.

**Polystichum aculeatum** Sw.

Lachen to Chung Thang, no. 618.

Fern, with sori, found in loose soil.

**P. prescottianum** (Wall.) Bedd.

(=*Aspidium prescottianum* Wall.)

Mountains around Gnathong, no. 1008.

Fern, with perennating rhizome on slopes, common.

**Polystichopsis aristata** (Forst.) Holtt.

(=*Aspidium aristatum* Sw.)

(=*Lastrea aristata* Moore)

Dikchu to Singhik, no. 7.

Fern, on loose soil and also on bare rocks.

NEPHROLEPIS GROUP :

**Nephrolepis cordifolia** (Linn.) Presl.

Dikchu to Singhik, no. 8; Dikchu to Gangtok, no. 649.

Fern, on mountain slopes in rocky soil, abundant.

**Oleandra neriiformis** Cav.

Gangtok to Karponang, no. 696.

Fern, among moist rocks.

**Pteris subindivisa** C. B. Clarke

Chung Thang to Singhik, no. 621.

Fern, among moss on bare rocks.

EQUISETACEAE

**Equisetum diffusum** Don

Lachen to Chung Thang, no. 598; Toong to Chung Thang, no. 135.

Abundant on slopes.

LYCOPODIACEAE

**Lycopodium cernuum** Linn.

Eastern slope beyond Chung Thang, no. 186.

Common among rocky crevices.

**L. clavatum** Linn.

Lachung towards Yumthang, no. 288.

Common among rocky crevices.

**L. serratum** Thunb.

Lachung towards Yumthang, no. 281.

Common among moss on rocks.

**L. squarrosum** Forest.

Dikchu to Gangtok, no. 666.

Epiphytic, on tree trunks, abundant.

SELAGINELLACEAE

**Selaginella monospora** Spr.

Dikchu to Singhik, no. 6; Singhik towards Mangan, no. 91.

Abundant along moist rocky crevices among moss.

ALGAE

The following algal species with field nos. 427(a) to 427(h) were found growing together as green filaments on moist moss-laden rocky slopes constantly moistened by dripping water.

Locality: Lachen towards Thepa La.

**Cymbella cymbiformis** Agardh. no. 427(g)

**Epithemia sorex** Kutz. no. 427(b)

**Gomphonema longiceps** Ehr. var. **subclavata** Grun. no. 427(d)



*G. olivaceum* (Lyngbye) Kutz. var. *calcareum*  
Clere. no. 427(c)

*G. sphaerophorum* Ehr. no. 427(e)

*Rhopalodia gibba* (Shr.) O. Mull. no. 427(h)

*Sirogonium* sp. no. 427(a)

*Synedra ulbra* (Nitzsch) Ehr. var. *amphyrrhynchus* (Ehr.) Goun. no. 427(f)

The following algal species with field Numbers 1014(a) to 1014(f) were found along edge of small stream, partly immersed, green in colour.

Locality: North-eastern slope down Gnathong river, Gnathong.

*Cosmarium undulatum* Corda no. 1014(e)

*Diatoma heimale* (Lyngbye) Heibarg no. 1014(a)

*D. heimale* (Lyngbye) Heibarg no. 1014(b)

var. *mesodon* (Shr.) Grun.

*Navicula falaisinensis* Grun. var.

*lanceola* Grun. no. 1014(d)

*N. verecunda* Hust. no. 1014(c)

*Spirulina* sp. (very few filaments) no. 1014(f)

## APPENDIX I

## LIST OF MEDICINAL AND ECONOMIC PLANTS DISCUSSED IN THE GENERAL FLORISTIC ACCOUNT AND ENUMERATION OF SPECIES

Serial No.	Latin name	Vernacular name	Page Number in	
			Text	Enumeration
1	<i>Aconitum luridum</i> Hk.f. & T.	Mahoor, Bikh (Hindi)	170	173
2	<i>Aphanamixis polystachya</i> (Wall.) Parker	Harinhara (Hindi)	173	
3	<i>Arisaema consanguineum</i> Schott	Birbanka (Nepali)	167, 168	193
4	<i>Artemisia vulgaris</i> Linn.	Nagadouna (Hindi)	169	182
5	<i>Asclepias curassavica</i> Linn.	Kakatundi (Hindi)	166	186
6	<i>Astilbe rivularis</i> Ham.	Budi vakthi (Nepali)	167	180
7	<i>Berberis concinna</i> Hk.f.	Chitra (Nepali)	170	175
8	<i>B. umbellata</i> Wall.	Katini (Nepali)	169	175
9	<i>B. wallichiana</i> DC.	Dieng-niang-matshynarang (Assamese)	169	175
10	<i>Bischofia javanica</i> Bl.	Bhillar, Paniala (Hindi)	173	
11	<i>Cinnamomum obtusifolium</i> Nees	Tezpat (Bengali)	171	189
12	<i>C. zeylanicum</i> Breyn.	Dalchini (Hindi)	173	
13	<i>Cissampelos pareira</i> Linn.	Akandi (Hindi)	168	174
14	<i>Clematis montana</i> Ham.	Pinasi Laura (Nepali)	169, 170, 171	174
15	<i>Daphne bhulua</i> D. Don	Kala argeli (Nepali)	167, 169	189
16	<i>D. cannabina</i> Wall.	Kala argeli (Nepali)	167	189
17	<i>Dichroa febrifuga</i> Lour.	Basak (Hindi)	167, 169, 171	180
18	<i>Dioscorea deltoidea</i> Wall.	Kildri, Kins (Kashmiri)	168	192
19	<i>Drosera peltata</i> Sm.	Mukhajali (Hindi)	169	180
20	<i>Edgeworthia gardneri</i> Meissn.	Aryili (Nepali)	168, 171	189
21	<i>Ephedra saxatilis</i> Royle var. <i>sikkimensis</i> (Stapf) Florin	Chi (Tibetan)	170	195
22	<i>Erythrina variegata</i> Linn. var. <i>orientalis</i> (Linn.) Merr.	Asmania (Panjabi)	170	195
		Dadap (Hindi)	173	
23	<i>Fraxinus floribunda</i> Wall.	Angan (Hindi)	167	186
24	<i>Fritillaria cirrhosa</i> D. Don	Yathu (Tibetan)	172, 173	192
25	<i>F. stracheyi</i> Hk.f.	Yathu (Tibetan)	173	192
26	<i>Gaultheria fragrantissima</i> Wall.	Michino (Nepali)	171	184
27	<i>Geranium nepalense</i> Sw.	Bhand, Bhand (Hindi)	169	177
28	<i>Geum elatum</i> Wall.	Gogjimul (Kashmiri)	173	179
29	<i>Gynocardia odorata</i> Br.	Chaulmogra (Hindi)	167, 173	176
30	<i>Hedera helix</i> Linn.	Karmora (Kashmiri)	168, 169, 170	181
31	<i>Iris ensata</i> Thunb.	Irisa, Sosun (Hindi)	170	192
32	<i>Peganum harmala</i> Linn.	Hurmali (Hindi)	173	
33	<i>Picrorhiza kurroa</i> Royle ex Benth.	Katki, Kuru (Hindi)	172	187
34	<i>Piper thomsoni</i> Hk.f.	Pipla (Nepali)	167	189
35	<i>Pithecolobium bigeminum</i> Benth.	Kachlora (Hindi)	167	178
36	<i>Podophyllum sikkimensis</i> Chatterjee et Mukherjee	Papra (Hindi)	173	175
37	<i>Polygonatum cirrhifolium</i> Royle	Mithadudia (Hindi)	170	193
38	<i>Pyrus malus</i> Linn.	Seb (Hindi)	168	180
39	<i>P. sinensis</i> Lindl.	Naspathy (Hindi)	168	
40	<i>Rhododendron anthopogon</i> D. Don	Dhupi (Nepali)	170, 171, 172	
41	<i>R. lepidotum</i> Wall.	Tsaluma (Bhutia)	170, 171, 172	184
42	<i>Rhododendron</i> sp. (other species)		170, 171, 172, 173	184
43	<i>Rhus succedanea</i> Linn.	Kakrasingi (Hindi)	171	178
44	<i>Selinum tenuifolium</i> Wall.	Bhut-Kes (Nepali)	169	181
45	<i>Skimmia laureola</i> Hk. f.	Chumlani (Nepali)	168, 170, 171	177
46	<i>Stephania glabra</i> (Roxb.) Miers.	Nimilabara (Nepali)	167, 171	175
47	<i>Streptopus simplex</i> D. Don	Garimuch (Nepali)	170	193
48	<i>Sweetia chirata</i> Ham.	Chireta (Hindi)	168	186
49	<i>Symplocos racemosa</i> Roxb.	Lodh (Hindi)	173	
50	<i>Theropogon pallidus</i> Maxim.	Junglipiaj (Nepali)	169	193
51	<i>Viscum articulatum</i> Burm.	Pudu (Hindi)	167, 169	189
52	<i>Zanthoxylum acanthopodium</i> DC.	Tumra (Hindi)	171	177
53	<i>Z. alatum</i> Roxb.	Tejbal (Hindi)	169, 171	
54	<i>Z. oxyphyllum</i> Edgew.	Timur (Hindi)	169, 170	177

## APPENDIX II

SPECIES SUITABLE FOR AN ARBORETUM AT GANGTOK, SIKKIM STATE  
(ALT. 1500-2800 m.)

During 1950-55, when the author was attached to the Herbarium of the Indian Botanic Garden, Calcutta, there used to be several enquiries regarding the suitable and attractive flowering plants for cultivation in and around Gangtok, the capital of Sikkim State. Particularly the entire estate of the Residence of the Political Officer of Government of India at Gangtok comprises a good range of altitude from 1500-2500 m. as one unit and Shri Appa B. Pant, the then Political Officer at the time of the author's visit to the State showed keen interest in developing the estate into a sample arboretum with, however, a few fruit trees. On his request, the author made out a preliminary outline of the plan giving full prominence to the indigenous and attractive flowering

species of the Sikkim Himalayas; some more species, however, were added representing a few fruit trees (some of them growing in humid parts of south Indian hills) and a few attractive flowering plants growing in the neighbouring regions of the Himalayas. The species selected for such a small arboretum are enumerated below. It would be of considerable interest both from the horticultural and the botanical points of view, if an attempt is made to develop an arboretum at Gangtok. Though *Rhododendron* species are quite well known to the world for their beautiful flowers, other wild species noted below, by such introduction and subsequent understanding and appreciation of their beauty and development, may find their place gradually in the nurseries and different gardens of suitable climates in India and other parts of the world and thus develop into well-known species and hybrids in the field of Horticulture.

FLOWERING AND FRUIT TREES SUITABLE FOR CULTIVATION ALONG THE SLOPES  
SURROUNDING GANGTOK. (ALT. 1500-2800 m.)

## I. Lawns and Lower slopes (1500—1800 m.)

Name	Suitable Altitude	Habit and Flower colour	Sources of availability
1	2	3	4
<b>(A) Flowering Plants :</b>			
<i>Buddleia asiatica</i> Lour.	900-1800 m.	Shrub ; flowers white.	Rhenock ; Ari.
<i>Michelia excelsa</i> Bl.	1500-2500 m.	Tall tree ; flowers white.	Sedonchen ; Ari.
<i>M. lanuginosa</i> Wall.	1800 m.	Tree ; flowers white.	Chungthang ; Sedonchen.
<i>Rhododendron maddenii</i> Hook.f.	1800 m.	Shrub ; flowers pinkish white.	Toong ; Chungthang.
<i>Nymphaea</i> sp. (Water lilies)	1500 m.	Water plants ; Flowers with variety of colours.	Chandra Nursery, Rhenock.
<i>Nelumbium</i> sp. (Lotus)	1500 m.	-do-	-do-
<i>Amaryllis</i> sp.	1500 m.	Herbs for lawns with variety of floral colours.	-do-
<i>Gloriosa</i> sp.	"	"	-do-
<i>Hedychium</i> sp.	"	"	-do-
<i>Lilium</i> sp.	"	"	-do-
<i>Passiflora</i> sp.	"	Climbers with different floral colours.	-do-
<i>Livistona chinensis</i> R. Br.	"	Tree about 10 m. high, quite hardy.	Seeds from Indian Botanical Garden, Calcutta or Chandra Nursery, Rhenock.
<i>L. Jenkinsiana</i> Griff.	"	"	Lower Sikkim Forests.
<i>Talauma hodgsonii</i> Hook. f. & T.	"	Tall tree ; flowers white and scented.	Sikkim Forests.
<i>Vaccinium serratum</i> Wt.	1500-1800 m.		Toong ; Sedonchen.
<b>(B) Fruit plants :</b>			
(i) Pears			
<i>Pyrus baccata</i> Linn.	1500-2200 m.	Small tree	Dept. of Agriculture, Govt. of Assam.
<i>P. khasiana</i> Hook. f.	"	-do-	Cultivated in Shillong.
(ii) Plums :			
<i>Prunus salicina</i> Lindl.	1200-1800 m.	Small tree	10 varieties grown in Nilgiris (Dept. of Agriculture, Madras).
(iii) Various other fruit plants : Can be tried if possible.			

## II. Higher slopes (1800—2800 m.)

1	2	3	4
<b>(A) Flowering Plants :</b>			
<i>Buddleia colvillei</i> Hook. f.	2000 m.	Small tree ; flowers crimson.	Lachen.
<i>B. macrostachya</i> Benth.	2500-2800 m.	Shrub ; flowers white or pinkish-white	Lachen.
<i>Hydrangia altissima</i> Wall.	2500-3300 m.	Shrub ; flowers attractive	Lachen ; Shamdong.
<i>H. robusta</i> Hook. f. & T.	-do-	-do-	-do-
<i>Lyonia ovalifolia</i> (Wall.) Druds	1500-2800 m.	Small tree ; flowers white.	Lachen ; Lachung.
<i>L. villosa</i> (Hook. f.) H. Nazzt.	2800-3000 m.	-do-	-do-
<i>Magnolia campbellii</i> Hook. f. & T.	1800-2500 m.	Tree ; large white flowers.	Chung Thang ; Lachen ; Sedonchen and many other places.
<i>M. globosa</i> Hook. f. & T.	2800-3000 m.	Small tree ; flowers white and scented.	Lachung ; Tanka La ; Zemu valley.
<i>M. obovata</i> Thunb.	2800 m.	Japanese bushy tree 5-10 m. tall ; flowers white, fragrant.	
<i>M. delavayi</i> Franch.	2800 m.	Small tree ; flowers large fragrant, creamy white.	From China, if possible or Royal Botanic Gardens, Kew, England.
<i>Mecanopsis paniculata</i> Prain	2000-3000 m.	Large herb ; yellow flowers.	Changu ; Kupup and also other places.
<i>M. simplicifolia</i> Walp.		Small bush, bluish pink.	Gnathong
<i>Pteris formosa</i> D. Don	1800-2800 m.	-do-	-do-
<i>Primula denticulata</i> Sm.	2500-3300 m.	Herb ; flowers pale purple and other varieties.	Karponang — Changu ; also other places.
Other species of <i>Primula</i> (given in enumeration of species).	2800 m.	Herbs ; flowers very attractive in different colours.	Changu and other localities.
<i>Rhododendron arboreum</i> Sm.	1800-2500 m.	Tree ; flowers pinkish-red.	Karponang and many other places.
<i>R. barbatum</i> Wall.	2500-2800 m.	Tree ; flowers deep red.	Above Lachen ; Lagyep (Chola range).
<i>R. ciliatum</i> Hook. f.	"	Shrub ; flowers white or pinkish.	Lachen ; Lachung.
<i>R. cinnabarinum</i> Hook. f.	"	Shrub ; flowers cinnabar ; red.	Karponang ; Lachung ; Lachen
<i>R. dalhousiae</i> Hook. f.	1800-2500 m.	Epiphytic on trees ; flowers whitish-pink.	Chung Thang.
<i>R. edgeworthii</i> Hook. f.	"	-do-	Tasiling ; Rungbee.
<i>R. falconeri</i> Hook. f.	2500-2800 m.	Tree ; flowers white or yellow.	Above Lachen.
<i>R. fulgens</i> Hook. f.	"	Shrub ; flowers blood-red.	Lachung.
<i>R. glaucum</i> Hook. f.	"	Shrub ; flowers pink.	Lachen ; Lachung.
<i>R. grande</i> Wt.	2200-2800 m.	Tree ; flowers white.	Tonglu ; Rungbee.
<i>R. griffithianum</i> Wt.	"	-do-	Above Lachen.
<i>R. imberb</i> Hutchinson	2500-2800 m.	Shrub ; flowers red.	Between Gnathong and Sedonchen.
<i>R. niveum</i> Hook. f.	"	Shrub ; flowers lilac.	Lachen.
<i>R. thomsoni</i> Hook. f.	"	Shrub ; flowers deep crimson.	Lachung ; above Lachen.
<i>R. thomsoni</i> Hook. f. var. <i>candelabrum</i> Hook. f.	"	-do-	Karponang—Changu
<i>R. triflorum</i> Hook. f.	"	Shrub ; flowers light yellow and fragrant.	Lachen ; Lachung.
<i>R. wightii</i> Hook. f.	"	Shrub ; flowers yellow.	Karponang-Changu and other places.
<i>R. vaccinioides</i> Hook. f.	1800-2800 m.	Shrub ; flowers pinkish-white.	Lachen ; Lachung.
<i>Vaccinium dunalianum</i> Wt.	2200-2500 m.	-do-	Sedonchen.
<i>V. glauco-album</i> Hook. f.	2500-2800 m.	-do-	Zemu valley.
<i>V. nummularia</i> Hook. f. & T.	"	Epiphytic ; flowers rosy.	Karponang ; Chakung Chu.

## APPENDIX III

## TEMPERATURE AND OTHER DATA RECORDED DURING THE TOUR

Date	Locality	Max. Temp. Centigrade°	Min. Temp. Centigrade°	Note on Rainfall
<b>I. NORTHERN SIKKIM</b>				
22-4-1955	Dikchu	—	—	No rain.
23-4-1955	Singhik	—	—	Slight rain in afternoon.
24-4-1955	"	—	—	-do-
25-4-1955	Toong	—	—	-do-
26-4-1955	Chung Thang	—	—	-do-
27-4-1955	"	—	—	-do-
28-4-1955	Lachung	—	—	Good rain after 1 p.m.
29-4-1955	"	15.6	8.9	Heavy rain all day.
30-4-1955	"	15.6	8.3	Good rain in afternoon.
1-5-1955	"	16.7	10	-do-
2-5-1955	"	16.7	10	-do-
3-5-1955	Chung Thang	—	—	Slight rain after 12 noon.
4-5-1955	"	20	15.6	-do-
5-5-1955	"	20.6	16.1	No rain, cloudy afternoon.
6-5-1955	"	—	—	Slight rain in evening.
7-5-1955	Lachen	17.8	11.7	Cloudy and slight rain in afternoon.
8-5-1955	"	17.8	11.1	Slight rain now and then.
9-5-1955	"	20	8.9	Slight rain in night.
10-5-1955	"	21.1	13.3	No rain.
11-5-1955	Thangu	—	—	No rain.
12-5-1955	"	13.3	5.6	No rain ; cloudy in evening.
13-5-1955	"	13.3	5.6	Slight rain now and then.
14-5-1955	"	14.4	6.7	No rain.
<b>II. EASTERN SIKKIM</b>				
27-5-1955	Karponang	—	—	Good rain after 6 p.m.
28-5-1955	"	—	—	Slight rain in evening.
29-5-1955	Changu	—	—	-do-
30-5-1955	"	13.3	5.6	Slight rain after 2 p.m.
31-5-1955	"	12.2	5	Good rain all day.
1-6-1955	"	13.3	6.7	Slight rain in afternoon.
2-6-1955	"	12.2	6.1	Good rain all day.
3-6-1955	Kupup	—	—	Good rain after 10 a.m.
4-6-1955	"	9.4	3.9	Slight rain and foggy all day.
5-6-1955	"	10	3.3	Good rain after 10 a.m.
6-6-1955	"	11.1	4.4	Good rain after 11 a.m.
7-6-1955	Gnathong	—	—	Slight rain after 10 a.m.
8-6-1955	"	12.2	6.7	Slight rain now and then.
9-6-1955	"	12.8	7.8	Slight rain in afternoon.
10-6-1955	Sedonchen	—	—	Cloudy and foggy all day.
11-6-1955	"	16.7	13.3	Slight rain now and then.
12-6-1955	Rongli	—	—	Cloudy in evening.
13-6-1955	"	28.9	23.3	No rain.

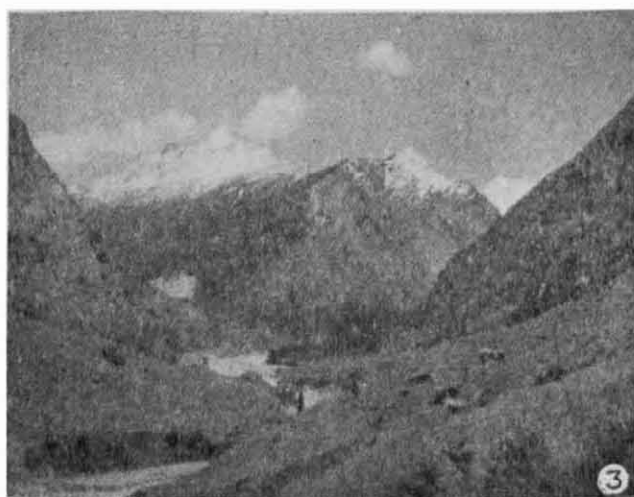
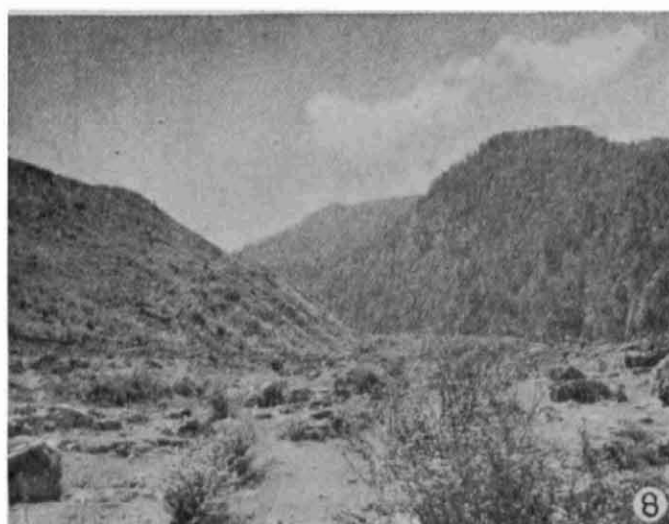


PLATE 1

- (1) *Pandanus sikkimensis*, hanging over the Teesta river along the slope on way to Singhik from Dikchu at an altitude of 670 metres.
- (2) 20-23 metres tall trees of *Toona* and *Castanopsis* along the track from Singhik to Toong at an altitude of 1500 metres.
- (3) Lachung valley showing extensive clearance of vegetation from slopes and small patches of *Rhododendron*, *Berberis*, *Viburnum* and *Rubus* on either side of the Lachung river and snow clad peaks in the background and Lachung village in the foreground, as seen from an altitude of 2800 metres.
- (4) Upper temperate vegetation along the track from Lachung to Yumthang with tall trees of *Abies densa* as the dominant species in upper canopy, *Maddenia himalaica* in the middle canopy and yellow-flowered *Piptanthus nepalensis* in the lower canopy at an altitude of 3250 metres.



## PLATE 2

- (5) Open western slope along the track from Lachung to Yumthang, densely covered with yellow flowered shrubs of *Piptanthus nepalensis* as seen in the foreground and small and stunted trees of *Maddenia himalaica* in the background at an altitude of 3100 metres.
- (6) *Pieris formosa* with beautiful bunches of pearl-white flowers, a common species at an altitude of 2900 metres.
- (7) Heavy landslides into Lachung river at an altitude of 3200 metres on way to Yumthang from Lachung with *Abies densa* in the distant background.
- (8) Valley towards Thanka La as seen from the track from Lachung to Thanka La at an altitude of 2800 metres with mixed temperate forest on the right, snow-covered peaks in distant background and *Berberis wallichiana* bushes in the foreground.

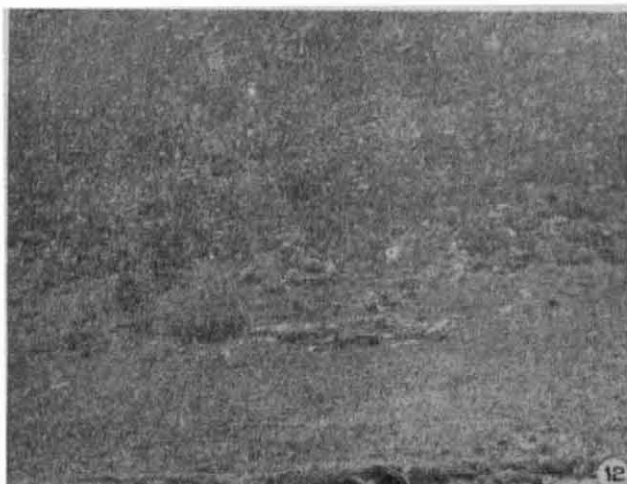


PLATE 3

- (9) Vegetation-cleared, barren and rugged mountain slope on way to Thanka La from Lachung at an altitude of 3300 metres with *Abies densa* at the top and natural regeneration of *Larix griffithiana* along the slope.
- (10) Cleared forest along the slopes on way to Changu from Karponang at an altitude of 3200 metres, showing shrubs of *Rhododendron thomsoni* in the foreground mixed with trees of *Juniperus caxii* and *Abies densa* in the background.
- (11) Dense thickets of *Rhododendron campanulatum* and *R. wightii* at an altitude of 3700-4000 metres along the slope leading to Bui Khola river from Changu camp.
- (12) Mountain slope on way to Jelap La from Kupup showing dense growth of *Primula calderiana* along the meadow in the foreground and gregarious patches of *Rhododendron anthopogon* and *R. lepidotum* mixed with *Cassiope fastigiata* along the slope in the background at an altitude of 4020 metres.





PLATE 4

- (13) Extensive rocky mounds below Jelap I.a at an altitude of 4300 metres, presenting typical alpine moorland vegetation with small, stunted, crawling bushes of *Rhododendron anthopogon*, *R. lepidotum* and *Cassiope fastigiata* mixed with tender plants of *Sedum*, *Anemone* and *Potentilla*.
- (14) General view of the vegetation-cleared mountain slopes-covering an altitude of 3700-4200 metres as seen from Gnathong showing the track leading to Kupup, sparse growth of patches of *Juniperus recurva* mixed with *Rhododendron* scrub and few remnants of *Abies densa* trees in the background.
- (15) Blue and light-violet flowered *Mecanopsis simplicifolia* mixed with *Iris clarkei* on the right side and small fern *Athyrium duthiei* in front along the slopes near Gnathong at an altitude of 3700 metres.
- (16) *Arisaema wallichianum* with their serpent hood-like spathes covered by bright violet and white coloured streaks and *Anemone obtusiloba* with their white flowers along the slopes near Gnathong at an altitude of 3700 metres.



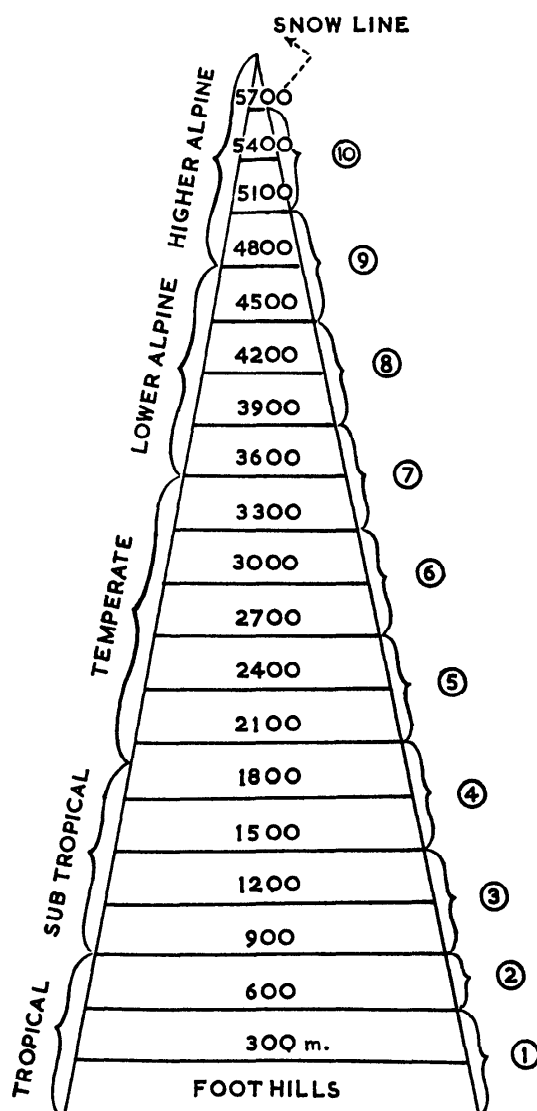


FIG. I

Diagrammatic representation indicating the chief components of the vegetation of different altitudes in the Sikkim Himalayas.

1. *Ficus*—*Sterculia*—*Terminalia*—*Shorea*—*Dillenia*—*Erythrina*—*Saccharum*—*Narenga* association
2. *Amoora*—*Lagerstroemia*—*Syzygium*—*Daubanga* association
3. *Phoebe*—*Castanopsis*—*Lagerstroemia*—*Alnus*—*Callicarpa* association
4. *Ostodes*—*Machilus*—*Castanopsis*—*Michelia*—*Acer*—*Daphne*—*Symplocos* association
5. *Rhododendron arboreum*—*Quercus*—*Engelhardtia*—*Bambusa* association
6. *Quercus*—*Rhododendron*—*Betula*—*Rosa*—*Arundinaria* association
7. *Abies*—*Tsuga*—*Rhododendron*—*Berberis* association
8. *Rhododendron*—*Juniperus*—*Cassiope*—*Caltha*—*Berberis*—*Ranunculus*—*Saxifraga* association
9. Straggling cushions of *Rhododendron*—*Arenaria*—*Ephedra*—*Rheum*—*Saussurea*—*Festuca* ground association
10. Small scattered patches of Lichens, mixed with *Sedum*—*Stellaria*—*Saussurea*