

REPORT ON A BOTANICAL TOUR TO MILAM GLACIERS

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Introduction

During the month of June 1958, the author accompanied by an artist, a fieldman and two peons surveyed the flora on the route to Milam glaciers. The party spent 4 weeks in this area, trekked nearly 200 miles and made intensive collections upto 5200m. in the glacial moraine and bugyals. The interesting collection includes species of certain endemic genera like *Vicatia*, *Pentapanax*, *Hemiphragma* and *Picrorhiza*, three new records, viz., *Callitriche verna*, *Corallorhiza trifida* and *Leptodermis parkeri* and three little known plants, viz., *Polygonum sagittatum* L, *Mazus dentatus* Wall and *Falconeria himalaica* Hk.f., a genus of doubtful systematic position. The total number of species collected in this tour is 540, of which 513 are Angiosperms, 7 are Gymnosperms and 20 are Pteridophytes. A few specimens of algae, fungi and bryophytes were also collected. Most of the identification of specimens was done at the herbarium of the Forest Research Institute and the Regional Herbarium of our Circle.

HISTORICAL ACCOUNT

The Garhwal and Kumaon Himalayas include some of the most attractive and picturesque peaks and valleys and as such have provided considerable attraction for naturalists. Thomas Hardwicke was perhaps the first European to collect in N.W. Himalayas which he did in the Alaknanda valley in Garhwal and he was followed by Moorcraft who made a journey beyond the sources of the Ganges over the Niti pass and to the sources of Satlej in Manassarovar bringing back a collection of dried plants. Wallich sent his collectors to the mountains west of Kali River and T. Thomson made collections from the Himalayas while stationed in Rohilkand (1839). Edward Madden made important collections from the Shattul and Burum passes and later from the Pendras pass and the Pindari Glacier (1846). The most outstanding collections, however, from the Garhwal and Kumaon Himalayas have been those of Strachey and Winterbottom which were made between 1846 and 1849. Among other places these two Survey Officers visited many river valleys and mountain passes from Almora to Manassarovar and in Garhwal Himalayas. The original list of plants collected by Strachey and Winterbottom which was drawn up in 1852-53 was first published in 1882 and in the same year a list of plants of Kumaon was published by W.

Watson. Col. Davidson had also made important collections in the area.

Strachey's catalogue was later revised and published in 1906 by Duthie who incorporated in it the results of his own subsequent collections and also of previous collections from the time of Wallich, Royle, Falconer and others. Champion visited the Pindari Glacier in 1920 and an account of this tour was published by Champion and Lambert in 1921. Osmaston's forest flora of Kumaon published in 1927 is another important contribution to our knowledge of the flora of Kumaon. In recent years, Raizada (1934-1941) has described some of the interesting and little known plants from Kumaon. The results of the joint expedition of the California Academy of Sciences and the Forest Research Institute to the Panch Chuli range have been published by Sahni and Raizada (1955). S. Sinha (1954) has given an account of the vegetation of glacial moraines of the Pindari Glacier. Plants occurring in and around Nainital have been recorded by Jain (1956).

The results of the exploration tour undertaken by the Northern Circle of the Botanical Survey of India are described in the following pages together with a list of plants collected which is appended.

The vegetation on the route to Milam glaciers

The main bridle path to Milam glacier starts from Bageshwar situated at an altitude of 1100m. in a valley at the confluence of the rivers Gomati and Saryu. The mountains surrounding the Bageshwar valley support pine trees and other deciduous trees. The herbaceous vegetation was completely dry due to prolonged drought at the time of this present visit. However, on the river banks and near moist areas one could see the abundance of shrubby *Indigofera hirsuta*, *Jasminum sambac* and trees like *Toona ciliata*, *Sapium insigne* and *Ficus religiosa*.

From Bageshwar the bridle path leads to Kapkot through Saryu valley. The vegetation in the valley is more or less the same as observed in the Bageshwar valley. The interesting feature on this brazen tract is the occurrence of rose-purple coloured orchid *Aerides multiflorum* and pale pink or violet flowered *Rhynchostylis retusa*, growing in abundance on the trunks of *Toona ciliata*. At Kapkot, the valley is surrounded on all sides by mountains ranging from 1300m. to 2000m. The

mountain slopes are covered with rich growth of *Quercus incana* and *Quercus glauca*. Associated with the *Quercus* is the shrubby *Crataegus crenulata* growing gregariously on the mountain slopes. The striking feature of the *Quercus* association is the abundance of Lichens and Orchids like *Luisia teretifolia*, *Oberonia ensiformis*, *O. falconeri* and *Aerides multiflorum* growing on their shady branches. The banks of Saryu exhibit the abundance of shrubs like *Callicarpa macrophylla*, *Rhamnus dahuricus*, *Grewia oppositifolia*, *Sarcococca saligna*, *Zanthoxylum alatum*, *Ligustrum compactum*, *L. nepalense* and *Cotoneaster bacillaris*. The most common trees of the valley are *Sapium insigne*, *Toona ciliata*, *Terminalia chebula* and *Pistacia integerrima*. The other interesting collections of this area include epiphytic *Peperomia reflexa* and parasitic *Viscum nepalense* and *Helixanthera ligustrina* on *Rhamnus dahuricus*. Associated with trees and shrubs are the climbing *Stephania glabra*, *Vitis parvifolia* and *Smilax parvifolia*. The surroundings of the valley especially the herbaceous vegetation was bleak and desolate due to prolonged drought. The only common herb met with in our collection is that of *Rungia parviflora*, probably a drought resisting herb.

From Kapkot the bridle path follows the Saryu river and branches off from the Pindari glacier route at Kharbagar four miles above Kapkot, and proceeds to Samadhura of Joharpatti situated at an altitude of 1620m. All along the path the vegetation consists of shrubs like *Indigofera hirsuta*, *Spiraea canescens*, *Rubus ellipticus* and *R. lasiocarpus*. Other interesting and not abundant tree of this area is *Cinnamomum tamala* growing on the banks of Saryu river along with *Glochidion velutinum*. The herbaceous vegetation was poorly represented on account of exposure and drought. The tree trunks are clothed with epiphytic orchids like *Ceologyne cristata*, yellow flowered *Vanda cristata*, yellow flowered *Dendrobium chrysanthum* and rose-purple flowered spikes of *Aerides multiflorum*. Associated with the orchids are pendent *Hoya longifolia*, succulent *Peperomia reflexa* and ferns growing gregariously on the shady branches. In addition, sometimes one could see the growth of certain climbers like *Schizandra propinqua* and *Cryptolepis bunchanani*. Near the moist sources especially the big sized boulders in their crevices support *Rhus wallichii*, *Leptodermis lanceolata*, *Ficus luducca* and many sciophytic herbs like *Elatostema rupestre*, *Agrimonia eupatoria*, *Polygonatum cirrifolium*, *Leea aspera* and the white flowered pendent *Pentasacme wallichii*. An ascent of over 1400m. towards Samadhura, the vegetation becomes that of mixed type. The temperate plants *Rhododendron arboreum*, *Carpinus viminea* and species of *Quercus* form the distinct arboreal life of this region. Associated with them or under their shade are in abundance *Rhamnus dehuricus*, ringal bamboo clumps (*Arundinaria spathiflora*) *Lonicera quinquelocularis*,

Viburnum erubescens, *Cotoneaster acuminata* and *Lyonia ovalifolia*. The handsome plant of Samadhura area is a small sized tree *Cornus capitata* with its showy yellow petal-like ovate big bracts surrounding red globose heads. The mountain tops are covered with gigantic Chir pines. Associated with it are the tall Banj oak (*Quercus incana*) followed by ringal bamboo in clumps, *Rosa moschata* and *Sapium insigne*.

Next the bridle path from Samadhura to Tejum passes under the shade of mixed vegetation of temperate and deciduous trees. The path leading to Tejum is a steep descent of more than 1000 ft. towards Ramaganga valley. The slopes support gigantic pines interspersed by deciduous trees. In this mixed belt *Dalbergia hircina*, *Macaranga pustulata*, *Litsaea polyantha* and temperate plants *Rhododendron arborea*, *Carpinus viminea*, *Acer* sp. *Juglans* sp. and *Lyonia ovalifolia* are frequently seen. The shrubby flora consisted mostly of *Excoecaria acerifolia*, *Callicarpa macrophylla*, *Cryptolepis wallichii*, the nettle *Urtica parviflora* and species of *Berberis*. Associated with the dried root stocks of grasses are the pretty blue coloured bell shaped flowers of *Campanula sylvatica* and *Androsace sarmentosa* growing in abundance in shade.

Next the Ramaganga valley was explored up to Tejum. The valley is surrounded by mountains ranging up to 3500 m. and the river bed consists mostly of sand, stones and silt. The river banks are extensively used for terrace cultivation. The river bed supports scanty natural vegetation. Near Tejum the surrounding mountains exhibit abundance of Chir pine and Banj oak. The shrubby vegetation consisted mostly of *Berberis* sp., *Indigofera hebeptala* and *Maesa indica*. The interesting collections of this area is *Uncaria pilosa*, a stout climber of Rubiaceae.

From Tejum the bridle path to Girgaon follows closely the river Jakul, a tributary of Ramaganga. The vegetation from Tejum up to the base of Girgaon mountain range is chiefly composed of deciduous trees. The most common trees are *Toona ciliata*, *Casuarina tomentosa*, *Sapium insigne*, *Wendlandia exserta* and *Glochidion velutinum*. The dry shrubby vegetation was mostly represented by *Colebrookea oppositifolia*, *Callicarpa macrophylla*, *Excoecaria acerifolia*, *Butea minor*, *Cocculus laurifolius* and *Sarcococca saligna*. The trees trunks are covered with distinct attractive epiphytic orchids and ferns. The dominating climber of this area is *Uncaria pilosa*, growing in abundance. The Jakul valley is very much disturbed due to cultivation and the surrounding mountains are rich in calcium and gypsum. At several places there are big land slides and the vegetation is bleak and desolate. The path from the river bed to Girgaon situated at 1350m. passes through mountains. The mountain slope facing the Jakul valley exhibits scanty vegetation, on account of steep gradient and constant wind. The only tree of impor-

tance near Girgaon is that of Himalayan cypress, *Cupressus torulosa*.

Beyond Girgaon the Kalamuni range presents many plants of temperate climate and undergrowth is carpeted with many small wild flowers of varied hue and colour. The rich forest is chiefly composed of *Rhododendron arboreum*, *Acer oblongum*, *Carpinus viminea*, *Quercus semecarpifolia*, *Symplocos crataegoides* and *Castanea sativa*. Above 2600m. chir pine and banj oak is replaced by Tilonj (*Quercus dilatata*) and Karshu (*Quercus semecarpifolia*). Up to the Kalamuni pass and its environs horse chestnut and sycamore are found in abundance. The striking features of many plants of tree habit are their stately tall appearance with very few branches. The Kalamuni range also presents conifers of economic value. The Himalayan silver fir extends from 2200m. onwards. Associated with it were blue pine, yew and cypress growing in abundance. Among the widespread and common herbaceous alpine plants are the white flowered *Anemone obtusiloba*, nodding white flowered *Rubus natans*, mauve coloured pretty *Roscoea alpina* and *Primula edgeworthii*. A rare find of this area is *Falcoeneria himalaica*, a sciophytic blue flowered herb in moist areas.

The interesting climbers which are frequently seen in this range are *Pentapanax leschenaultii*, the handsome *Hydrangea altissima*, white flowered *Rosa macrophylla*, *Elaeagnus latifolia* and *Parthenocissus semicordata*. Associated in open grassy meadows are the tiny blue coloured flowers of *Gentiana pedicellata*, yellow flowered *Geum urbanum*, *Polygonatum cirrifolium*, *Paris polyphylla*, *Arisaema wallichianum*, *Arisaema tortuosum*, *Acanthopanax cissifolius*, *Ribes acuminatum* and *Prunella vulgaris*. The moist slopy regions are covered with mat forming pendent or prostrate *Hemiphragma heterophyllum*, *Stellaria semivestita* and also *Corydalis cornuta* and *Tylophora govanii*.

From Kalamuni pass the bridle path proceeds to Mansari situated on the right bank of Goriganga river. Mansari is a collective name given to a group of six villages inhabited by Bhotia traders. From the pass to the foot of Goriganga flowing at 650m. the gentle slope is interspersed with terrace cultivation. The natural vegetation consists of Banj oak and *Aesculus indica*. Rath, a village situated at 2000m. presents the abundance of shrubby species of *Spiraea*, *Sarcococca*, *Crataegus*, *Zanthoxylum* and *Berberis*. Among the interesting collections of this area are that of big white flowered tall spiked *Lilium giganteum* growing in abundance near water sources and violet coloured bell shaped flowers of *Campanula cashmeriana*.

The vegetation all round Rath is shrubby and plants of tree habit are very rarely seen. From Rath the bridle path descends to the Goriganga river bed and closely follows the river to the next halting place Bogdwar. Up to 1650m. the vegetation on the way consists mostly of

deciduous trees interspersed though not frequently with a few temperate plants of tree habit. The tree trunks are clothed with vines, orchids, epiphytic *Polypodium* and *Davallia* species. It is not uncommon to observe ferns and orchids growing gregariously on big boulders. The shrubby vegetation is represented by species of *Urtica*, *Girardinia*, *Crataegus* and *Sarcococca*. Among the rare new record for this area is the collection of *Callitriche verna*, a slender semi-aquatic herb in fruiting stage growing profusely in a stagnant pool. Beyond 1650m. the Goriganga river flows in a deep canyon. This canyon of 16 miles length is one of the world's deepest for its steep precipitous wall mountains. The flora is a mixed one. Pines and cedrus predominate at higher elevations. The undergrowth is chiefly composed of shrubby vegetation, chiefly represented by *Buxus wallichiana*, *Rhamnus dahuricus*, *Cornus capitata*, *Lonicera quinquelocularis*, *Colquhounia coccinea* and *Debregeasia hypoleuca*. The striking feature of the trees of this area is that they are tall with very few branches especially the oak species.

Next the bridle path leads into a raised ridge called Bogdwar which is an important halting place on the way to Milam Glaciers. The ridge is more or less a flat place surrounded by snow crowned mountains on all sides. One could see the luxuriant growth of *Paeonia emodi* almost to the exclusion of other plants in this area. Situated as it is at 3000m. the ridge and its environs present thick forests of oak, pines, cedrus and yew. Under their shade one could see species of *Lonicera*, *Acer*, *Juglans*, *Euonymus*, *Elaeagnus* and *Viburnum*. The striking features of the surrounding snow crowned mountains are the formation of Bugyals or alpine grassy meadows. The Bugyals are formed beyond the tree limit at about 3500m. and extends up to the snow line. The conifers extend up to 3500m. Above 3500m. and especially near the bugyals one could see the dominance of decumbent Bhojpatra (*Betula utilis*) growing in grooves and in the valleys. Associated with *Betula utilis* and especially under its shade are the alpine shrubs and herbs. The interesting alpine plants from Bogdwar bugyals include blue flowered grass like herb *Nomocharis nana*, yellow flowered *Nomocharis oxypetala*, sky blue flowered *Anemone obtusiloba*, blue flowered Himalayan prickly herb *Mecynopsis aculeata*, purple flowered *Primula macrophylla*, yellow flowered *Caltha palustris* and maroon coloured *Smilacina pallida*. Associated with *Betula utilis* are *Rhododendron campanulatum*, *R. hypenanthum* and *Lonicera hispida*. The interesting stately robust herb with silvery hairy drawn out bracts and deep red root system growing in rocky places is *Macrotomia benthami*, locally known as 'Ratanjot', a valuable plant used in indigenous medicine. Another striking feature of Bogdwar bugyals is the gregarious growth of *Megacarpaea polyandra* locally called 'Rooki' a stout crucifer

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herb of 3 to 5 ft. bearing creamish fragrant compound umbels. The plant is very much sought by local people as a source of vegetable.

Beyond Bogdwar gradually the tree life becomes scanty and one could see the dominance of shrubby vegetation all along the bridle path. The Goriganga gorge supports on the left bank thick shrubby forest chiefly composed of *Buxus wallichiana*, *Syringa emodi* and clumps of mountain bamboos (*Arundinaria* sp.). Intermixed with the shrubs are *Quercus*, *Rhododendron* and *Acer* of moderate height. The tree trunks of *Quercus* are covered with rich moss carpets and lichens. The path from Bogdwar to Reelkote is a gradual ascent up to 3600m. and the path is interspersed with numerous steep snow bridges. All along the way especially on the rocks one finds the prettiest rose-purple coloured cushions of *Androsace*. The cushion habit is also exhibited by species of *Arenaria* and *Astragalus*. The gentle slopes are covered with *Iris kumaonensis*, *Osmunda claytoniana*, *Nomocharis oxypetala*, *Roscoea alpina*, *Thymus serpyllum*, *Anaphalis triplinervis*, *Oxyria digyna* and many delicate herbs of Cruciferae and Boraginaceae. The shrubs are chiefly represented by *Syringa emodi*, *Salix elegans*, *Rhododendron lepidotum*, *Berberis* sp. and white flowered *Rosa*.

The main road to Martoli branches off from the Milam glaciers route above Reelkote and proceeds to Martoli situated on a high spur above the right bank of Goriganga river. Situated at 4000m. the flat ridge is surrounded on all sides by snow crowned mountains. The ridge is close to Nandadevi and Bankattia range of mountains, interspersed by numerous glaciers of considerable interest. Collections were made from the bugyals up to the snow line and also nearby Shelanga glacier formed by Bankattia mountain. The bugyals are covered with many delicate alpine herbs of considerable interest. The interesting collection includes *Allium victorialis*, *Anemone rupicola*, *Sedum ewersii*, and *Corallorhiza trifida*, a terrestrial orchid having joined coralloid rhizome with sheathed elongate scape bearing small pale green flowers. Similarly the moraine flora also abounds in plants of varied colours. The glacial vegetation includes *Macrotomia benthami*, *Primula elliptica*, *Saxifraga imbricata*, species of *Androsace*, *Iris kumaonensis* and *Myricaria bracteata*. The interesting collections of the day were golden yellow flowered *Trollius acaulis*, woolly herb like *Allardia tomentosa*, *Anaphalis cristata*, *Anemone rupicola*, a fragrant herb *Geranium grandiflorum*, a grass like bulbous herb *Allium stracheyi*, orange coloured *Potentilla argyrophylla* and pink coloured *Potentilla atrosanguinea*. Intermixed with the alpine herb sedges and grasses are the shrubs of *Berberis*, *Salix*, *Myricaria* and *Ephedra Gerardiana*.

From Martoli the path descends down to 3650m. and joins the main bridle path to Milam closely following

the Goriganga valley. This area is completely devoid of plants of tree habit. The Goriganga valley widens out and is flanked by mountains of gigantic heights. The right side of the valley exhibits bugyals extending up to the snow line, whereas the left bank presents woody shrubs of *Juniperus*, *Berberis*, *Rosa*, *Ribes*, *Salix*, *Lonicera* and *Caragana*. The interesting aspect of their distribution is that they form closely set associations like *Juniperus-Caragana* association and *Berberis-Rosa* association. Intermixed with *Juniperus-Caragana* association one can see *Ribes grossularia*. Similarly *Salix lindleyana* is associated with *Berberis-Rosa* association.

The path from Martoli to Milam is very rich with alpine herbs. As this area is constantly swept by piercing icy winds it is destitute of trees, however, dwarf *Betula utilis* forests are found to exist in valleys sheltered by precipitous or gentle slopy mountain walls. The plants of shrubby habit often appear in hemispherical mounds to overcome the injurious effects of ice cold winds. Under the shade of decumbent woody shrubby plants one could see species of *Polygonatum*, *Thalictrum*, *Lactuca* and *Bupleurum*. The most interesting collection of the day is the insectivorous herb *Pinguicula alpina* growing in abundance near moist soil. The other alpine herbs of this area are *Gueldenstaedtia himalaica*, *Primula elliptica*, species of *Androsace* and *Pedicularis longiflora*. On the moist grassy meadows a giant puff ball, *Calvatia*, and the edible morel *Morchella* were collected. The other alpine herbs are *Cousinia thomsoni* a woolly thistle and tufted *Astragalus* species of yellow, pink and orange coloured flowers.

Next the path leads into Milam, Bhotia village situated in latitude 30°21' north and longitude 80°9' east near the junction of Goriganga and Gunka rivers. Milam is the last Indian village on the Indo-Tibetan trade route through Untadhura pass. Milam and its environs command a beautiful scenery, all round. The area chiefly composed of sub-alpine vegetation is destitute of trees. The Goriganga valley is rich in alluvial soil and it is extensively used to grow buck-wheat, barley and potato. The other weeds of cultivation are *Veronica biloba*, *Physochlaina praealta* and *Asperugo procumbens*.

From Milam onwards towards the glacial belt the whole area is a waste of glacier and snow covered mountains. Many water falls are seen coming from the adjacent mountains and joining the river. Milam glacier is India's biggest glacier. It extends 9 miles in length and 300 yards broad. It is formed by the snow precipitated from Eastern Trisul peaks (7735m.) and surrounding number of craggy peaks. The glacier gives birth to Goriganga river which flows down and joins the Kali river (Sharada). The glacial zone gently raises from 3000m. to 5500m. The beauty of the glacier in the beginning is concealed under mud and stone for nearly 7 miles and

the remaining two miles exhibits the enormous craggy icy deposits, which is followed by Trisul (East) at its head. Another interesting aspect of this glacier is the presence of several small and big kunds or lakes all along the way to the foot of the glacial Trisul zone.

The vegetational types in this area are very distinct and they are distributed in the Goriganga valley and moraine belt and bugyals extending from 4000m. to 5000m. In addition the big kunds support all along their margin many interesting alpine plants.

The vegetation of glacial moraine

Beyond Milam up to the beginning of glacier the path is interspersed by boulders of varied sizes and land slides. The sub-alpine vegetation is represented by yellow flowered *Berberis* sp., white flowered *Rosa*, *Ribes grossularia*, species of *Juniperus*, *Lonicera* and *Ephedra gerardiana*. Intermixed with the shrubs are small semi erect, prostrate, cushion or tufted species of *Androsace*, *Arenaria*, *Stellaria*, *Sedum*, *Astragalus* and *Thymus*. The interesting carpet forming herbs are the species of *Potentilla*, *Ranunculus* and *Anemone*. The vegetation of Goriganga valley is almost represented in beginning of the glacial zone. As the glacier is receding at a fast rate the newly formed moraine belt is an excellent area to study the invasion of plants from the adjacent mountains and bugyals. The successful invaders are the species of *Lonicera* and *Berberis* followed by *Rosa* and *Ephedra*. Among the herbs species of *Sedum*, *Ranunculus*, *Stellaria* followed by species of *Taraxacum*, *Trifolium*, *Anemone* and *Astragalus* are found in abundance. In addition to the above graceful herbs the newly formed area oftentimes exhibits deep sheet of water locally called kunds. Such kunds support at the periphery some sedges like *Eleocharis palustris* and grasses. It is not uncommon to observe rich growth of a species of *Cladophora* at the periphery of kunds. The newly formed tract is generally U-shaped. The rocky slopes of the valley are mostly invaded by species of *Cotoneaster* and *Juniperus*. They seem to stabilise the falling slopes and offer an opportunity for the successful invasion and colonisation of surrounding plants. The stabilised lateral moraines present gregarious growth of *Rumex nepalensis*, aromatic *Artemisia brevifolia*, and *Hippophae rhamnoides* mixed with species of *Cotoneaster*, *Berberis* and *Ephedra*. At several places the lateral moraine is bleak and desolate of plant life due to constant land slides.

Observations on the Flora of Bugyals

The fine grassy slopes met with at higher altitudes are locally known as the Bugyals. The flora is very distinct and the slopes are covered with graceful herbs of different growth forms and colours of their flowers. Their formation is generally noticed above 3500m. and especially near the glacial valleys and mountains. They are

formed on the gentle mountain slopes or sometimes on ridges or plateaux. The rich meadows are found to be extremely nourishing and invigorating for sheep and other animals. On account of this local people leave their sheep, cows, yak and their hybrids and ponies on the slopes to graze as they like.

In Johar, especially in Malla Johar patti the Bugyals extend from the Tibetan border down to the Goriganga valley as far as its junction with the Ralam valley. Their continuity is often disturbed by perpetual snow crowned peaks or passes. The landscape consists of continuous stretch of green meadows interspersed with shallow or deep gorges or valleys. The striking feature of the Bugyal is the dominance of alpine herbs sometimes almost to the exclusion of grasses and sedges. The shallow valleys or grooves are often forested with *Betula utilis*. Associated with it are the alpine shrubby vegetation and some sciophytic undergrowths.

The rich herbage is chiefly composed of delicate semi-erect or decumbent, prostrate, cushion or tufted plants of varied colour. Plants of tree habit are found in shallow valleys or grooves up to 4000m. Beyond 4000m. up to snow line plants of tree habit are not seen. The woody shrubs are frequently stunted and often exhibit suffrutescent habit. Another pleasing aspect of the flora is continuous successive occurrence of carpets of graceful herbs in patches almost to the exclusion of other plants from early April to the end of September.

The distribution pattern of Bugyal flora mostly depends upon soil and climatic conditions. As the winter snow begins to melt in late March or early April, the areas thus exposed form an ideal spot for the appearance of certain species of *Primula*, *Adonis*, *Trollius* and *Anemone*. Within a short time they display their variegated colour. One of the loveliest of this group of herbage was *Primula macrophylla*, with big flowers of purple colour. Associated with it are hundreds of yellow and red *Potentilla* and yellow flowered *Caltha palustris* growing close to the melted snow. In between it was not uncommon to see the handsome yellow flowered *Nomocharis oxypetala* and here and there the grass like herb *Nomocharis nana* with deep blue coloured flowers. Next in turn one could see hundreds of *Alchemilla vulgaris* and species of *Ranunculus* springing up. A noteworthy feature of all these plants is that they are short lived and one set of plants is replaced by another as the summer wears on. The main reason for their short life is the incessant changes in edaphic conditions. With the onset of Summer, every patch of ground undergoes constant changes of its physical condition. This is the root cause for the instability and succession of plants. Another striking feature of Bugyal plant distribution is that in the same habitat one could see the growth of several related or unrelated species and nearby only one species dominating the entire habitat almost to the exclusion of the other species. This may be due to difference in the

physicochemical make up of the soil. Just like edaphic factors, climatic factors are also equally important in the study of Bugyal vegetation. Most of the perennial herbs appear only when conditions are congenial for their life, if not, they lie buried in snow. This accounts, for the sudden appearance of hundreds of graceful herbs on the newly exposed soil near the snow line.

Of botanical interest above the snow line is the appearance of certain fleshy herbs of the genera *Crasula*, *Sedum* and *Saxifraga* in the exposed rocky crevices situated far from meadows. The rising air-currents from the mountains and valleys are the main agents in the distribution of seeds to such inaccessible places. Thus the importance of air-currents and plant distribution in the Himalayas await careful investigation. In any such study the importance of Birds and Animals cannot be overlooked.

The distribution pattern of Bugyal flora is of much interest, because the vegetation changes in accordance with the elevation and each species has its own range of toleration beyond that they cannot grow. The lower zone of the Bugyals between 3000m. to 4000m. is always forested by the stunted low bushes of *Rhododendron campanulatum*, *R. hypenanthum*, *Lonicera hispida*, *Salix lindleyana*, *Cotoneaster bacillaris* and *Betula utilis*. Their luxuriant growth is often seen when they happen to grow in grooves or valleys. The wind swept birch trees adopt a recumbent habit and their formation in the groove protects them from icy cold wind from the surrounding glacial mountains. The soil beneath them is generally rich in humus and is well drained under its shade and especially near the edges one could see the above mentioned stunted bushes displaying handsome coloured flowers. The birch forests at Martoli Bugyals are very extensive and form an important source of fuel for the local people during the summer months. The well drained humus soil beneath the birch forest forms an ideal habitat for many alpine sciophytic herbs. The interesting collection from the zone includes *Allium victorialis*, *Viola biflora*, *Anemone rupicola*, *Sedum ewersii*, *Primula elliptica* and *P. denticulata*. Close to the streams in the *Betula* groove, there are yellow flowered *Caltha palustris*, yellow flowered *Corydalis gowaniana* with slender feathery foliage, white-pink flowered *Primula elliptica*, bell shaped pink white flowers of *Gaultheria trichophylla* and bloomy delicate creamy bell shaped flowers of *Cassiope fastigiata*.

Unlike the Martoli Bugyals the Milam Bugyals support thick forest of *Juniperus communis* and *J. wallichiana* shrubs. The Birch forest is completely replaced by low bushes of procumbent *Juniperus*. They are found to grow very well on sunny and dry zones of the bugyals. The Junipers prefer sunny stabilised dry habitat to well drained humus habitat of birch trees. Under their shade one could see plants which prefer to grow in dry soil. The interesting shady herbage of this includes *Bupleu-*

rum falcatum, *Polygonatum verticillatum*, *Androsace sarmentosa*, *Vicatia millefolia*, *Scutellaria angulosa*, *Thymus serpyllum* and the parasitic *Orobanche epithymum*. The Junipers are sometimes found in association with *Caragana versicolor*, *Ribes grossularia* and *Lonicera purpurascens* as undergrowths. However, near moist places and grooves of Milam Bugyals one can see thick stunted bushes of *Rhododendron campanulatum*, *Rhododendron hypenanthum*, *Salix lindleyana* and *Lonicera hispida*.

Next the extensive Bugyal vegetation was surveyed. In and about 3500m. to 4000m. elevation the meadow is composed of *Ranunculus cymbalaria*, *R. hirtellus*, *R. laetus*, *R. natans*, *R. pulchellus*, *Thalictrum elegans* and *T. alpinum*. The graceful anemones are represented by *Anemone rivularis*, *A. polyanthes* and beautiful white or blue flowered *A. obtusiloba* and *A. rupicola*. Close to the streamlets, carpets of *Caltha palustris* in association with *Primula elliptica* and *Gaultheria trichophylla* are often found.

The Cruciferae are represented by many species of *Arabis*, *Sisymbrium* and *Capsella bursa-pastoris*. Among the high altitude members of Leguminosae, frequently seen plants are *Parochetus communis*, *Gueldenstaedtia himalaica*, *Trigonella emodi*, white flowered *Trifolium repens* and blue, orange and pink flowered species of *Astragalus*. The noteworthy plants of Rosaceae are *Alchemilla vulgaris*, mat forming woody *Cotoneaster microphylla*, *Sibbaldia parviflora* and several yellow, red and pink flowered carpets of *Potentillas*. In this range white flowered *Anaphalis*, yellow flowered *Senecio* and pink flowered *Saussurea* represented the vast family of Compositae now in bloom. The interesting Ericaceae are the tufted growth habit displayed by *Cassiope fastigiata*, and delicate water loving *Gaultheria trichophylla*. All over the slopes hundreds of *Primula* species, followed by dense blazing red carpets of *Polygonum affine* are seen. Associated with them frequently one can see *Polygonum viviparum*, *Euphorbia stracheyi*, white flowered *Lloydia serotina* and white flowered *Callianthemum cachmerianum*. The grassy carpet is often times covered with brilliant blue flowered Gentianas in thousands, pink to white flowered *Thymus serpyllum*, *Plantago brachyphylla*, *Oxyria digyna* and a rare specimen of *Polygonum sagittatum* and *Iris kumaoensis*. In stony places and particularly in the rocky crevices frequently species of big leaved *Rheum* and *Sedum* make their appearance. Most of the wind swept stony places are covered with lovely cushions of parti-coloured flowers of *Androsaces* and *Saxifragas*. Sometimes all around the rocky places the meadows exhibit hemispherical mounds of clumps of *Juniperus* and *Lonicera obovata*. The Bugyals are mainly represented by species of *Pycnus*, *Cyperus*, *Scripus*, *Carex* of the sedge family. The dominating grasses are species of *Setaria*, *Pennisetum*, *Phleum*, *Alopecurus* and *Agrostis*. Above

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4000m. the meadow consists of *Deyeuxia scabrescens*, *Avena aenea*, *Danthonia cachemyriana*, *Bromus tectorum*, *Elymus sibiricus* and sedges like *Eleocharis palustris*, *Scirpus setaceus*, *Scirpus caricis*, *Kobresia hookeri*, *K. filcina*, *Carex atrata*, *C. nubigena* and *C. obscura*. The most interesting handsome green nodding grass above 5000m. is *Hierochloa laxa* growing in abundance on cold damp slopes. Mixed with the above grass there are species of *Stipa* and *Oryzopsis*.

In and about 5000m. up to the snowline the vegetation is scanty more or less scattered and seldom do they appear in close association. The handsome herbs are short lived and bloom during short summer season when the warm moist air is blowing. They appear to complete their life cycle between the cold winds of spring and autumn. Thus the importance of air currents and its influence on the phenological features of plants in the Himalayas at higher altitudes await careful investigation. Many of the herbs found above 5000m. have graceful silvery woolly vegetative as well as floral parts. The interesting woolly herbs of *Compositae* are *Allardia tomentosa*, *Anaphalis cuneifolia*, *A. nubigena* and *Saussurea* species with wool like foliage. The family *Boraginaceae* is represented by *Macrotomia benthami*, *Onosma bracteata* and species of *Eritrichium*. Next the members of *Primulaceae* many species of *Androsaces* are woolly and closely set to form pretty small cushions. The interesting woolly plants of this area are *Delphinium cashmerianum*, *Geranium grandiflorum*, *Thermopsis barbata* and *Lonicera hispida*.

The striking features of the vegetation round about kunds of the glacial zone is very interesting. Kunds are nothing but small or big sized water collection or lakes fed by glacial water or rain and snow. As already observed, of the several kunds in this zone only Shandilya kund at 4000m. and Surya kund at 5200m. are of considerable size and the vegetation in and around them are of some interest. Shandilya kund is situated on the lateral moraine and it is a clean sheet of water fed by rain and snow. The lake supports *Ranunculus aquatilis*, *Potamogeton pectinatus* and a few sedges and grasses, confined only to margins. The next kund that received our attention was Surya kund situated at 6200m. surrounded by glacial wall of considerable height. The glacial fed lake, especially the edges and the surrounding areas present herbage of varied hue and colour. The prettiest leak like herb is the deep purple flowered *Primula macrophylla*. This is followed by the golden yellow coloured *Trollius acaulis*. Associated with it are the sky blue bell shaped flowers of *Nomocharis nana*, scarlet coloured spikes of *Polygonum affine*, yellow coloured flowers of *Podophyllum emodi* and *Aconitum heterophyllum*, locally called Atis whose root is officinal. The other interesting lacustral herbs of this area are *Oxygraphis polypetala*, *Ranunculus pulchellus* and the cotton wool like foliage of *Allardia tomentosa* with pink

flowers. The rocky crevices are covered with fleshy herbs like *Saxifraga flagellaris* with long questing tendrils, *Saxifraga imbricata*, *Sedum crenulatum*, *S. crassipes*, and a new record find *Leptodermis parkeri*. On the lateral moraines and also amidst boulders *Epilobium latifolium* is frequently seen. On the moraine zones are *Iris kumaonensis*, small bell like pink-white flowers of *Gaultheria trichophylla* and *Cassiope fastigiata* along with the species of *Linociera*, *Salix*, *Cotoneaster* and *Astragalus*.

LIST OF PLANTS COLLECTED*

RANUNCULACEAE

- Anemone obtusiloba* Don. FBI. 1 : 8
A tufted herb with white purple flowers.
Bogdwar & Martoli bugyals, T. A. Rao, Nos. 6795 & 7114, Alt. 3000-4500 m.
- A. polyanthes* Don. FBI. 1 : 9
A perennial herb with white flowers.
Milam bugyals, T. A. Rao, No. 7031, Alt. 4000-5000 m.
- A. rivularis* Ham. FBI. 1 : 9
A silky pubescent herb with creamish white flowers.
Girgaon, Kalamuni pass, Bogdwar Martoli bugyals, T. A. Rao, Nos. 6617, 6632 & 6764, Alt. 4100-4500 m.
- A. rupicola* Camb. FBI. 1 : 8
A silky pubescent herb with white flowers.
Bogdwar, Martoli bugyals & Shelanga glacial moraine, T. A. Rao, Nos. 6795 & 6916, Alt. 3000-4500 m.
- A. tetrasepala* Royle FBI. 1 : 10
A perennial robust herb with white flowers.
Kalamuni pass, T. A. Rao, Nos. 6659 & 7190, Alt. 3200 m.
- A. vitifolia* Ham. FBI. 1 : 8
An erect herb with white flowers and woolly achenes.
Rathi & Bogdwar, T. A. Rao, No. 6731, Alt. 2000-3000 m.
- Thalictrum alpinum* L. FBI. 1 : 12
A small slender herb with flowers and achenes.
Martoli & Milam Bugyals, T. A. Rao, Nos. 6886 & 7057, Alt. 3500-4500 m.
- T. elegans* Wall. FBI. 1 : 10
A tender aromatic herb with greenish flowers.
Shelang glacial moraine, T. A. Rao, No. 6919, Alt. 5000 m.
- T. foliolosum* DC. FBI. 1 : 14
A shady herb with small white flowers.
Martoli & Milam bugyals, T. A. Rao, No. 6952, Alt. 4000 m.

*Plants marked with an asterisk are not mentioned in Strachey's catalogue (1906).

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T. javanicum B.B. FBI. 1 : 13

A small herb with greenish flowers.

Rathi & Girgaon, T. A. Rao, No. 7189, Alt. 2000-3200 m.

Callianthemum cachemirianum Camb. FBI. 1 : 14

A small sciophytic herb with white flowers.

Martoli bugyals, T. A. Rao, No. 6892, Alt. 4000-5000 m.

Ranunculus aquatilis L. FBI. 1 : 16

A small herb with dissected leaves and white flowers.

Shandilya kund and Milam, T. A. Rao No. 7004, Alt. 4000 m.

R. cymbalariae Pursh FBI. 1 : 17

A small herb with yellow flowers.

Milam bugyals, T. A. Rao, No. 7054, Alt. 4000-5000 m.

R. hirtellus Royle. FBI. 1 : 18

An erect herb with yellow flowers.

Bogdwar, Martoli & Milam, T. A. Rao, Nos. 6773, 6871, 6961 & 7068, Alt. 3000-5000 m.

R. laetus Wall. FBI. 1 : 19

A herb in moist soil with yellow flowers.

Tejum & Girgaon, T. A. Rao, No. 6605, Alt. 1350-1400 m.

R. natans C.A. Mey. FBI. 1 : 18

A small perennial herb in moist places.

Milam bugyal, T. A. Rao, No. 7094, Alt. 4000 m.

R. pulchellus C.A. Mey. FBI. 1 : 17

An aquatic herb with yellow flowers

Martoli & Milam, T. A. Rao, Nos. 6931 & 7096, Alt. 4000-5000 m.

Oxygraphis polypetala H.f. & T. FBI. 1 : 21

A perennial stemless plant with yellow flowers solitary on the scape.

Surya kund & Milam glacier, T. A. Rao, No. 7081, Alt. 5200 m.

Caltha palustris L. FBI. 1 : 21

An erect herb near snow-streams with large yellow flowers.

Bogdwar, Martoli & Milam bugyals, T. A. Rao, No. 7119, Alt. 3000-5000 m.

Trollius acaulis Lindl. FBI. 1 : 22

A small stout herb with golden yellow flowers.

Martoli & Milam bugyals, T. A. Rao, Nos. 6863, 6870 & 7076, Alt. 4000-5000 m.

Aconitum ferox Wall. FBI. 1 : 28

An erect herb with 5 fid palmate leaves (sterile specimen).

Martoli bugyals, T. A. Rao, No. 6845, Alt. 4200 m.

A. heterophyllum Wall. FBI 1 : 29

A large herb (sterile). Root used locally in curing fevers.

Local name: ATIS.

Surya kund & Milam glacier, T. A. Rao, No. 7078, Alt. 5200 m.

Paeonia emodi Wall. FBI. 1 : 30

An erect perennial herb with ovoid follicles.

Bogdwar bugyals, T. A. Rao, No. 6755, Alt. 3000 m.

MAGNOLIACEAE

Schizandra propinqua H.f. & T. FBI. 1 : 45

A climbing shrub with white flowers.

Kapkot & Samadhura, T. A. Rao, No. 6544, Alt. 1300-1615 m.

MENISPERMACEAE

Stephania glabra Miers. FBI. 1 : 103

A climbing herb with flowers (specimen showing bulbous portion at the base).

Kapkot, T. A. Rao, No. 6509, Alt. 1200-1300 m.

BERBERIDACEAE

Berberis aristata DC. FBI. 1 : 110

An armed shrub with red cylindrical fruits.

Shelang glacial moraine, T. A. Rao, No. 6913, Alt. 5600 m.

B. asiatica Roxb. FBI. 1 : 110

An armed shrub with fruits.

Tejum & Girgaon, T. A. Rao, No. 6574, Alt. 1350-1400 m.

B. chitria Lindl. FBI. 1 : 110

A large shrub with yellow flowers.

Girgaon, T. A. Rao, No. 6628, Alt. 1400-1500 m.

Podophyllum emodi L. FBI. 1 : 112

A succulent erect herb with flowers.

Milam bugyals, T. A. Rao, Nos. 7019 & 7051, Alt. 4000-5000 m.

PAPAVERACEAE

Meconopsis aculeata Royle FBI. 1 : 118

A perennial, prickly herb with sky blue flowers.

Bogdwar & Milam bugyals, T. A. Rao, Nos. 6779 & 7115, Alt. 3000-5000 m.

FUMARIACEAE

Corydalis cornuta Royle FBI. 1 : 126.

A procumbent annual herb with purple tipped yellow flowers.

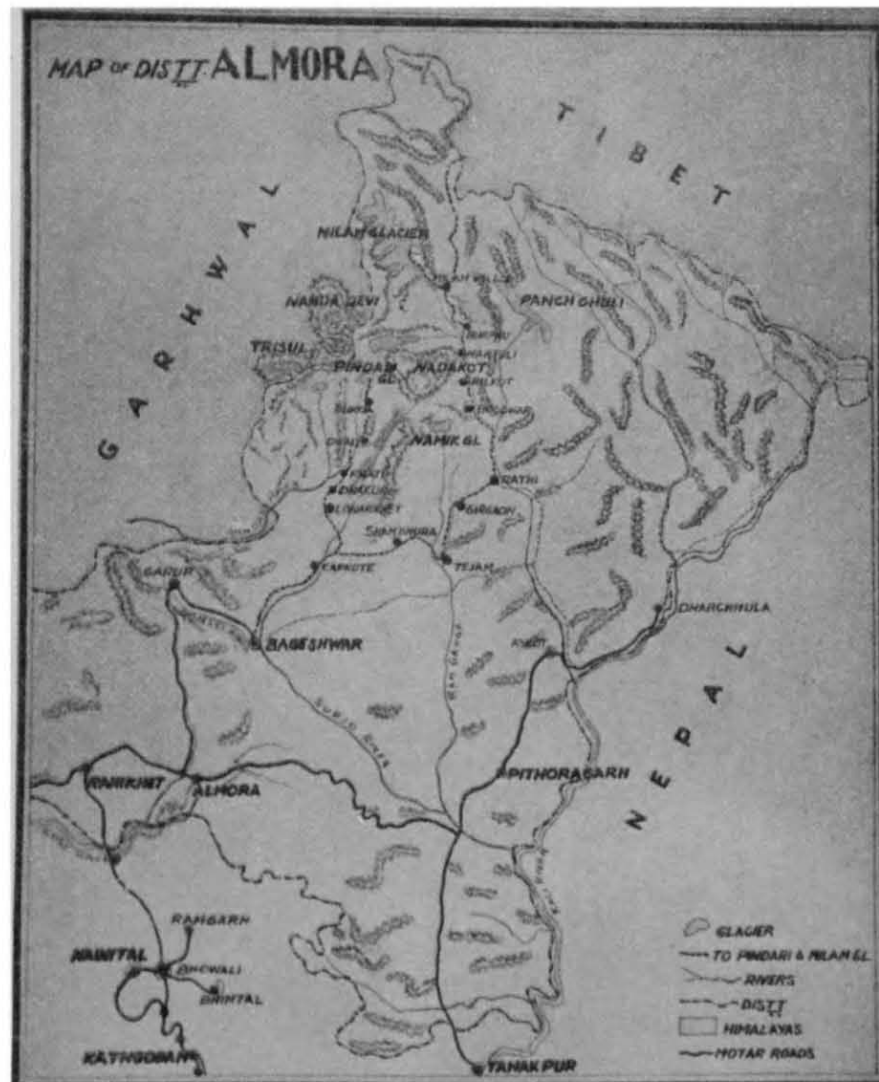
Kalamuni pass, T. A. Rao, No. 6686, Alt. 3200 m.

C. govaniana Wall. FBI. 1 : 124.

A herb with bright yellow flowers.

Martoli & Milam bugyals, T. A. Rao, Nos. 6843 & 7059, Alt. 4000-5000 m.

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Map indicating the route followed by the party in the journey to MILAM GLACIERS.

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Megacarpaea polyandra, Benth. the 'ROCK', grows in abundance above 4000m. at Bogdwar.



Pinguicula alpina Linn. an interesting insectivorous plant.

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CRUCIFERAE

Megacarpaea polyandra Benth. FBI. 1 : 161
A tall robust herb with small white flowers, stem stout and hollow. Local name: ROOKEE.
Bogdwar bugyals, T. A. Rao, Nos. 6756 & 7129, Alt. 3500-4000 m.

Roripa indica (L.) Hochreut.
Syn. *Nasturtium indicum* DC. FBI. 1 : 134
A small herb with white flowers.
Martoli bugyals, T. A. Rao, No. 6768, Alt. 4000-5000 m.

Capsella bursa-pastoris Moench FBI. 1 : 159.
A small erect herb with flowers and fruits.
Milam, T. A. Rao, No. 6791, Alt. 4200 m.

VIOLACEAE

Viola biflora L. FBI. 1 : 182.
A small herb with yellow flowers.
Bogdwar & Martoli, T. A. Rao, No. 6803 & 6857, Alt. 3000-4000 m.
V. caespitosa D. Don. FBI. 1 : 183.
A small herb with pink or pinkish blue flowers.
Kalamuni pass, T. A. Rao, No. 6644, Alt. 3200 m.
V. serpens Wall. FBI. 1 : 184.
A small herb with white or blue flowers.
Martoli bugyals, T. A. Rao, Nos. 6651, 6781 & 6873, Alt. 4000 m.

POLYGALACEAE

Polygala abyssinica R.Br. FBI. 1 : 202.
A slender herb with pink flowers with purple markings.
Kapkot & Samadhura, T. A. Rao, No. 6563, Alt. 1300-1615 m.

CARYOPHYLLACEAE

Stellaria media L. FBI. 1 : 230.
A procumbent herb with white flowers.
Bogdwar & Rath, T. A. Rao, No. 7147, Alt. 2000-3000 m.
S. semivestita Edgew. FBI. 1 : 230.
A pendent or trailing herb with white flowers.
Kalamuni pass, T. A. Rao, Nos. 6613 & 6637, Alt. 3000 m.
S. longissima Wall. FBI. 1 : 232.
A weak herb with hairy leaves and stem.
Realkot & Bogdwar, T. A. Rao, Nos. 7108 & 7167, Alt. 3000-3500 m.

TAMARICACEAE

Myricaria bracteata Royle FBI. 1 : 250.
A shrub with pink flowers.
Shelang glacial moraine, T. A. Rao, No. 6904, Alt. 5000 m.

HYPERICACEAE

Hypericum cernuum Roxb. FBI. 1 : 253.
A shrub on rocks with fruits.
Kapkot & Samadhura, T. A. Rao, No. 6540, Alt. 1300-1615 m.
H. patulum Thunb. FBI. 1 : 254.
A glabrous shrub with yellow flowers.
Rathi & Girgaon, T. A. Rao, No. 7192, Alt. 3200 m.

TERNSTROEMACEAE

Eurya acuminata DC. FBI. 1 : 285.
A shrub with baccate fruits having many seeds.
Ticksane, T. A. Rao, No. 6692, Alt. 2500 m.

MALVACEAE

Urena lobata L. FBI. 1 : 329.
A herb with pink flowers.
Bogdwar & Rath, T. A. Rao, No. 7185, Alt. 2000-3000 m.

TILIACEAE

Grewia oppositifolia Roxb. FBI. 1 : 384.
A small sized tree with white flowers.
Kapkot, T. A. Rao, No. 6510, Alt. 1200-1300 m.

GERANIACEAE

Geranium grandiflorum Edgew. FBI. 1 : 430.
A tall hairy herb with large white flowers.
Shelang glacial moraine, T. A. Rao, No. 6923, Alt. 5000 m.
G. nepalense Sweet FBI. 1 : 430.
A small sciophytic herb with white flowers.
Kalamuni pass & Bogdwar, T. A. Rao, Nos. 6634 & 7170, Alt. 3200 m.
G. wallichianum Sweet FBI. 1 : 430.
A hairy perennial herb with large blue-purple flowers.
Kalamuni pass & Bogdwar bugyals, T. A. Rao, Nos. 6811 & 7103, Alt. 3200 m.

Oxalis corniculata L. FBI. 1 : 436.
A small herb with yellow flowers and fruits.
Bogdwar & Rath, T. A. Rao, No. 7179, Alt. 2000-3200 m.

RUTACEAE

Boenninghausenia albiflora Reichb. FBI. 1 : 486.
A large herb with white aromatic flowers.
Bogdwar & Rath, T. A. Rao, No. 7143, Alt. 2000-3200 m.

Zanthoxylum alatum Roxb. FBI. 1 : 493.
An armed shrub with fruits.
Kapkot, T. A. Rao, No. 6508, Alt. 1200-1300 m.

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Murraya koenigii Spreng. FBI. 1 : 503.

A small aromatic tree or large shrub with flowers and fruits.

Kapkot, T. A. Rao, No. 6506, Alt. 1000-1300 m.

ILICINEAE

Ilex dipyrena Wall. FBI. 1 : 599.

A small sized tree with fruits.

Ticksane, T. A. Rao, No. 6699, Alt. 2500 m.

CELASTRACEAE

Gymnosporia rufa Wall. FBI. 1 : 620.

Tejum & Girgaon, T. A. Rao, No. 6610, Alt. 1350-1400 m.

RHAMNACEAE

Zizyphus mauritiana Lamk.

= *Zizyphus jujuba* Lamk. FBI. 1 : 632.

A shrub with big leaves and pale flowers.

Kapkot, T. A. Rao, No. 6521, Alt. 1200-1300 m.

Rhamnus dahuricus Pall. FBI. 1 : 639.

A thorny or small tree with fruits.

Kapkot, Rathi & Bogdwar, T. A. Rao, Nos. 6523, 6567 & 6735, Alt. 1200-3200 m.

R. procumbens Edgew. FBI. 1 : 640.

A shrub with prostrate branches & green flowers.

Tejum & Samadhura, T. A. Rao, No. 7218, Alt. 1350-1615 m.

R. prostrata Jacq.

A stunted prostrate armed shrub with red fruits.

Milam glacial moraine, T. A. Rao, No. 6984, Alt. 4000-5200 m.

R. purpureus Edgew. FBI. 1 : 639.

A shrub with small greenish axillary flowers.

Bogdwar & Rathi, T. A. Rao, No. 7144, Alt. 2000-3200 m.

AMPELIDEAE

Parthenocissus semicordata Planch.

A large climbing shrub with flowers.

Kalamuni pass, T. A. Rao, No. 6650, Alt. 3200 m.

Vitis lanata Roxb. var. *rugosa* FBI. 1 : 651.

A stunted shrub with green flowers.

Samadhura & Tejum, T. A. Rao, No. 6576, Alt. 1350-1615 m.

V. parvifolia Roxb. FBI. 1 : 652.

A climbing shrub with fruits in umbellate cymes.

Kapkot, T. A. Rao, No. 6525, Alt. 1200-1300 m.

Tetrastigma obtecta DC.

Syn. *Vitis obtecta* Wall. FBI. 1 : 657.

A climbing shrub with small fruits leaflets usually five.

Rathi & Bogdwar, T. A. Rao, No. 6717, Alt. 2000-3200 m.

T. affine Gagnep.

A climbing herb with flower buds.

Rathi & Bogdwar, T. A. Rao, No. 6718, Alt. 2000-3200 m.

Leea aspera Edgew. FBI. 1 : 667.

An erect herb with umbellate inflorescence having white flowers.

Kapkot & Samadhura, T. A. Rao, No. 6537, Alt. 1300-1615 m.

ANACARDIACEAE

Rhus wallichii Hk. & f. FBI. 2 : 11.

A tree with tomentose leaves and yellow green flowers.

Kapkot & Samadhura, T. A. Rao, 6527, Alt. 1300-1615 m.

Pistacia integerrima Stewart FBI. 2 : 13.

A large sized tree with fruits, crushed herbage aromatic.

Kapkot, T. A. Rao, No. 6503, Alt. 1200-1300 m.

LEGUMINOSAE

Thermopsis barbata Royle FBI. 2 : 62.

A woolly herb with deep pink flowers.

Local name: LAL JADEE.

Milam bugyals, T. A. Rao, No. 7027, Alt. 4000-5200 m.

Gueldenstaedtia himalaica Baker FBI. 2 : 117.

A prostrate herb with silky pubescent leaves and blue flowers.

Martoli & Milam bugyals, T. A. Rao, Nos. 6934, 7003 & 7070, Alt. 4000-5000 m.

Dalbergia hircina Benth. FBI. 2 : 236.

A large sized tree with fruits.

Samadhura & Tejum, T. A. Rao, No. 6586, Alt. 1615-1350 m.

Caragana versicolor (Wall.) Benth. FBI. 2 : 116.

A spiny shrub with yellowish pink flowers.

Martoli & Milam, T. A. Rao, No. 6954, Alt. 4000-4500 m.

Indigofera hebeptala Benth. FBI. 2 : 101.

A shrub with violet flowers.

Kalamuni pass, T. A. Rao, No. 6671, Alt. 3200 m.

Desmodium tiliaefolium Don. FBI. 2 : 168.

A shrub with blue flowers.

Girgaon & Kalamuni pass, T. A. Rao, Nos. 6626 & 7110, Alt. 1500-3200 m.

Parochetus communis Ham. FBI. 2 : 86.

A small herb near water with deep blue flowers.

Tejum & Girgaon, T. A. Rao, No. 6612, Alt. 1350-1400 m.

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Trigonella emodi Benth. FBI. 2 : 88.
A prostrate herb with golden yellow flowers.
Milam glacial moraine, T. A. Rao, No. 6999, Alt. 4000-5200 m.

Indigofera gerardiana Wall. FBI. 2 : 100.
A shrub with small pink flowers.
Kapkot & Samadhura, T. A. Rao, No. 6546, Alt. 1300-1615 m.

I. gerardiana Wall. var. *heterantha* FBI. 2 : 100.
A shrub with pink flowers.
Tejum, T. A. Rao, No. 7207, Alt. 1350 m.

Butea minor Ham. FBI. 2 : 195.
A tall shrub with buds.
Tejum & Girgaon, T. A. Rao, No. 6595, Alt. 1350-1400 m.

ROSACEAE

Prunus undulata Buch.-Ham. FBI. 2 : 316.
A big sized tree with fruits. Leaves are said to be poisonous to cows.
Samadhura, Tejum & Ticksane, T. A. Rao, Nos. 6571 6697, Alt. 1350-1615 m.

Alchemilla vulgaris L. FBI. 2 : 360.
A prostrate rhizomatic herb with pale green flowers
Martoli bugyal, T. A. Rao, No. 6889, Alt. 4000-5200 m.

Geum urbanum L. FBI. 2 : 342.
An erect herb with flowers in heads.
Kalamuni pass, T. A. Rao, No. 6640, Alt. 3200 m.

Crataegus crenulata Royle FBI. 2 : 384.
A shrub with thorns under Quercus shade, very common.
Kapkot, T. A. Rao, No. 6518, Alt. 1200-1300 m.

Cotoneaster acuminata Lindl. FBI. 2 : 385.
A shrub with white or orange coloured flowers.
Bogdwar & Martoli, T. A. Rao, No. 6786, Alt. 3000-4500 m.

C. bacillaris Wall. FBI. 2 : 384.
A medium sized shrub with white flowers, fruits and black bark.
Milam bugyals & Kalamuni pass, T. A. Rao, Nos. 6975 & 7188, Alt. 3000-5000 m.

**C. disticha* Lange
A woody prostrate shrub with red flowers, growing under Juniperus shade.
Martoli & Milam, T. A. Rao, No. 6953, Alt. 3500-4500 m.

C. microphylla Wall. FBI. 2 : 387.
A woody prostrate shrub with red fruits.
Samadhura & Tejum, T. A. Rao, No. 6570, Alt. 1350-1615 m.

Pyrus aucuparia Gaertn. FBI. 2 : 375.
A shrub with white flowers and compound leaves.
Bogdwar, Martoli & Milam, T. A. Rao, Nos. 6807 & 7029, Alt. 3200-4500 m.

Spiraea vacciniifolia Don. FBI. 2 : 325.
A trailing shrub with creamish flowers.
Kapkot & Samadhura, T. A. Rao, Nos. 6529 & 7220, Alt. 1300-1615 m.

Rubus ellipticus Smith FBI. 2 : 336.
A hairy shrub with fruits.
Kapkot & Samadhura, T. A. Rao, No. 6566, Alt. 1300-1615 m.

R. lasiocarpus Smith FBI. 2 : 339.
A shrub with fruits.
Kapkot & Samadhura, T. A. Rao, No. 6541, Alt. 1300-1615 m.

R. macilentus Camb. FBI. 2 : 336.
A small woody herb in fruits.
Rathi & Bogdwar, T. A. Rao, No. 6745, Alt. 2000-3200 m.

R. niveus Wall. FBI. 2 : 335.
A large shrub with fruits.
Kalamuni pass, T. A. Rao, No. 6661, Alt. 3200 m.
R. nutans Wall. FBI. 2 : 334.
A trailing herb with white flowers.
Girgaon, T. A. Rao, No. 6617, Alt. 1400-1500 m.
R. paniculatus Smith FBI. 2 : 329.
A straggling shrub with fruits.
Bogdwar & Rathi, T. A. Rao, No. 7160, Alt. 2000-3000.

Sibbaldia parviflora Willd. FBI. 2 : 346.
Syn. *Potentilla sibbaldi* Haller, f. FBI. 2 : 345.
A small stout herb with small yellow flowers.
Bogdwar & Martoli, T. A. Rao, No. 6812, Alt. 3000-4500 m.

Potentilla atosanguinea Lodd. FBI. 2 : 357.
A perennial tomentose herb with dark crimson flowers.
Shelang glacial moraine & Realkot, T. A. Rao, Nos. 6926 & 7102, Alt. 3500-5200 m.

P. argyrophylla Wall. FBI. 2 : 356.
A perennial tomentose herb with yellow flowers.
Bogdwar, Martoli & Milam bugyals, T. A. Rao, Nos. 6819, 6925, 7008, 7011 & 7012, Alt. 3000-5200 m.

P. ambigua Camb. FBI. 2 : 348.
A stout stunted herb with large yellow flowers.
Bogdwar & Martoli, T. A. Rao, No. 6774, Alt. 4000-5200 m.

P. bifurca L. FBI. 2 : 353.
A small herb with yellow flowers.
Martoli bugyals, T. A. Rao, No. 6864, Alt. 4500-5000 m.
P. fruticosa L. FBI. 2 : 347.

A tomentose shrub with deep yellow flowers.
Milam glacial moraine, T. A. Rao, No. 7001, Alt. 4000-5200 m.

P. gelida C.A.Mey. FBI. 2 : 357.
A small herb with yellow flowers.
Martoli & Milam, T. A. Rao, No. 6941, Alt. 4000-5200 m.

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P. multifida L. FBI. 2 : 353.

A small herb with yellow flowers.

Martoli & Milam, T. A. Rao, No. 6970, Alt. 4000-5200 m.

Spiraea bella Sims FBI. 2 : 324.

A large shrub with pink flowers.

Bogdwar bugyals, T. A. Rao, No. 7122, Alt. 3200 m.

S. canescens Don FBI. 2 : 325.

An aromatic shrub with white flowers.

Ticksane, T. A. Rao, No. 6695, Alt. 2500 m.

S. lindleyana Wall. FBI. 2 : 324.

A large shrub with attractive white flowers.

Rathi & Bogdwar, T. A. Rao, No. 6738, Alt. 2000-3000 m.

S. vestita Wall. FBI. 2 : 323.

A shrub with white flowers.

Kalamuni pass, T. A. Rao, No. 6662, Alt. 3200 m.

Rosa anserinaefolia Boiss. FBI. 2 : 365.

A large prickly shrub with white flowers.

Bogdwar & Martoli, T. A. Rao, Nos. 6805 & 6942, Alt. 3000-4500 m.

R. moschata Mill. FBI. 2 : 367.

An armed climbing shrub with pale-brown fruits.

Kapkot & Samadhura, T. A. Rao, No. 6547, Alt. 1300-1615 m.

R. macrophylla Lindl. FBI. 2 : 366.

An armed shrub with large pink flowers.

Kalamuni pass, T. A. Rao, No. 6648, Alt. 3200 m.

R. sericea Lindl.

A prickly shrub with white flowers.

Rathi & Bogdwar, T. A. Rao, No. 6739, Alt. 2000-3000 m.

Stranvaesia glaucescens Lindl. FBI. 2 : 382.

A small shrub with fruits.

Kapkot & Samadhura, T. A. Rao, No. 6543, Alt. 1300-1515 m.

SAXIFRAGACEAE

Saxifraga flagellaris Willd. FBI. 2 : 397.

A prostrate rhizomatic herb with pale green flowers.

Surya kund & Milam, T. A. Rao, Nos. 7062 & 7082, Alt. 4500-5200 m.

S. imbricata Royle FBI. 2 : 394.

A small mat forming herb with white flowers.

Shelang glacial Moraine, T. A. Rao, No. 6907, Alt. 5000 m.

S. stracheyi H.f. & T. FBI. 2 : 398.

A small herb on rocks with cream or pink colored flowers.

Martoli & Milam bugyals, T. A. Rao, Nos. 6867 & 7019, Alt. 4000-5200 m.

S. ligulata Wall. FBI. 2 : 398.

A stout herb with pinkish white flowers, on rocks.

Rathi & Bogdwar, T. A. Rao, No. 6733, Alt. 2000-3500 m.

S. sibirica L. FBI. 2 : 390.

A small perennial herb with flowers.

Milam bugyals, T. A. Rao, Nos. 7024 & 7026, Alt. 5000 m.

Ribes acuminatum Wall. FBI. 2 : 410.

An erect shrub with young fruits.

Kalamuni pass, T. A. Rao, No. 6662, Alt. 3200 m.

R. rubrum L. FBI. 2 : 411.

An erect shrub with pale green to brown flowers.

Bogdwar bugyals, T. A. Rao, No. 7126, Alt. 3200 m.

R. grossularia L. FBI. 2 : 410.

An armed shrub with white flowers.

Martoli & Milam bugyals, T. A. Rao, No. 6957, Alt. 4000-5200 m.

Hydrangea altissima Wall. FBI. 2 : 404.

A climbing shrub with fruits.

Kalamuni pass, T. A. Rao, No. 6688, Alt. 3200 m.

Philadelphus coronarius L. FBI. 2 : 407.

A climbing shrub with white flowers.

Rathi & Bogdwar, T. A. Rao, No. 6754, Alt. 2000-3000 m.

Deutzia staminea R.Br. FBI. 2 : 407.

A shrub with white flowers.

Kapkot & Samadhura, T. A. Rao, No. 6542, Alt. 1300-1615 m.

CRASSULACEAE

Sedum crassipes Hk.f. & T. FBI. 2 : 419.

A large fleshy herb with yellow green flowers.

Milam bugyals & Surya kund, T. A. Rao, Nos. 7017 & 7093, Alt. 4500-5200 m.

S. crenulatum H.f. & T. FBI. 2 : 417.

A fleshy herb with white flowers in heads.

Surya kund, T. A. Rao, No. 7089, Alt. 4500-5200 m.

S. ewersii Ledeb. FBI. 2 : 421.

A small herb with fruits on rocks.

Martoli & Milam bugyals, T. A. Rao, No. 6802 & 6997, Alt. 4000-5200 m.

S. rhodiola DC. FBI. 2 : 417.

A succulent herb with flower buds on rocks.

Milam bugyals, T. A. Rao, No. 7028, Alt. 4500-5200 m.

S. rosulatum Edgew. FBI. 2 : 420.

A small herb on rocks with fruits and flowers.

Rathi & Bogdwar, T. A. Rao, Nos. 6753 & 7154, Alt. 2000-3000 m.

S. quadrifidum Pall. FBI. 2 : 418.

A succulent stout herb with dried up fruits.

Martoli & Milam bugyals, T. A. Rao, Nos. 6872 & 6978, Alt. 4000-5200 m.

S. tibeticum H.f. & T. var. *stracheyi* FBI. 2 : 418.

A succulent herb with flower buds.

Milam bugyals, T. A. Rao, No. 7056, Alt. 4000-5200 m.

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HALORAGIDACEAE

- * *Callitriche verna* L. FBI. 2 : 434.
A tender semi-aquatic herb with fruits. New record.
Rathi & Bogdwar, T. A. Rao, No. 6746, Alt. 2000-3000 m.

COMBRETACEAE

- Terminalia chebula* Retz. FBI. 2 : 446.
A large tree with flowers and flower buds in dense axillary spikes.
Kapkot, T. A. Rao, No. 6512, Alt. 1200-1300 m.

MYRTACEAE

- Syzygium cumini* (L.) Skeels.
Syn. *Eugenia jambolana* Lamk. FBI. 2 : 499.
A middle sized tree with flowers.
Kapkot, T. A. Rao, No. 6524, Alt. 1200-1300 m.

ONAGRACEAE

- Epilobium latifolium* L. FBI. 2 : 583.
A herb with pink flowers.
Martoli & Milam moraine, T. A. Rao, Nos. 6910 & 6990, Alt. 4500-5200 m.
Hartmannia rosea G. Don
Syn. *Oenothera rosea* Sol. FBI. 2 : 582.
Samadhura & Kapkot, T. A. Rao, No. 7200, Alt. 1300-1600 m.

CUCURBITACEAE

- Trichosanthes bracteata* Voigt.
Syn. *T. palmata* Roxb. FBI. 2 : 606.
A climber with white flowers.
Rathi & Bogdwar, T. A. Rao, No. 6715, Alt. 2000-3000 m.

UMBELLIFERAE

- Vicatia millefolia* (Wall.) Clarke FBI. 2 : 671.
A shady aromatic herb with small pink flowers.
Samadhura & Martoli, T. A. Rao, Nos. 6554 & 6835, Alt. 1600-4500 m.
Heracleum candicans Wall. FBI. 2 : 714.
An erect stout herb with white flowers.
Bogdwar bugyals, T. A. Rao, Nos. 7139 & 7129, Alt. 3200 m.
Bupleurum falcatum L. FBI. 2 : 676.
A tall erect herb with small yellow flowers in compound umbels.
Milam & Martoli bugyals, T. A. Rao, Nos. 6963 & 7050, Alt. 4000-5200 m.
B. lanceolatum Wall. FBI. 2 : 674.
A tall erect herb with pale white flowers.
Bogdwar & Rathi, T. A. Rao, No. 7138, Alt. 2000-3000 m.

- Sanicula europaea* L. var. *elata* Ham. FBI. 2 : 670.
A tender shady herb with small yellow flowers.
Samadhura & Bogdwar, T. A. Rao, Nos. 6554 & 6726, Alt. 1600-3200 m.

- Chaerophyllum acuminatum* Link FBI. 2 : 691.
A small hairy herb with white flowers.
Bogdwar bugyals, T. A. Rao, Nos. 6763 & 7109, Alt. 3200 m.
C. reflexum Link FBI. 2 : 691.
An erect perennial herb with white flowers.
Rathi & Girgaon, T. A. Rao, No. 7195, Alt. 2000-3000 m.

ARALIACEAE

- Acanthopanax cissifolius* (Griff.) Harms
Syn. *Aralia cissifolia* Griff. FBI. 2 : 722.
A sciophytic herb with flower buds in compound umbels.
Kalamuni pass, T. A. Rao, No. 6655, Alt. 3200 m.
Pentapanax leschenaultii Seem. *umbellatum* Seem. FBI. 2 : 725.
A climbing shrub with flowers in compound umbellate heads.
Kalamuni pass, T. A. Rao, No. 6668, Alt. 3200 m.

CORNACEAE

- Benthamidia capitata* (Wall.) Hara.
Syn. *Cornus capitata* Wall. FBI. 2 : 745.
A small sized tree with fruits in bracts.
Samadhura & Bogdwar, T. A. Rao, Nos. 6738, 6565 & 6737, Alt. 1600-3000 m.
Cornus macrophylla Wall. FBI. 2 : 744.
A large sized tree with fruits.
Samadhura, T. A. Rao, No. 6549, Alt. 1600 m.

CAPRIFOLIACEAE

- Lonicera hispida* Pall. FBI. 3 : 11.
Local name: "SATBUGDIA"
A shrub with large bracts holding large creamish flowers.
Bogdwar bugyals, T. A. Rao, No. 7124, Alt. 3200-4000 m.
L. obovata Royle FBI. 3 : 14.
A shrub with yellow flowers.
Martoli bugyals, T. A. Rao, No. 6848, Alt. 4000-5200 m.
L. parvifolia Edgew. FBI. 3 : 13.
A shrub with white flowers.
Bogdwar, Martoli & Milan bugyals, T. A. Rao, Nos. 6818, 6980 & 6984, Alt. 3000-5200 m.
L. purpurascens H.f. FBI. 3 : 12.
A shrub with pink flowers.
Martoli & Shelang glacial moraine, T. A. Rao, Nos. 6839 & 6880, Alt. 4500-5000 m.

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L. quinquelocularis Hardw. FBI. 3 : 14.
A small shrub with fruits.
Kapkot & Samadhur, T. A. Rao, No. 6564, Alt. 1300-1615 m.

L. spinosa Jacqu. FBI. 3 : 13.
A shrub with pinkish white flowers.
Milam glacial moraine, T. A. Rao, No. 6982, Alt. 4000-5200 m.

Viburnum cotinifolium Don FBI. 3 : 3.
A shrub with pinkish white flowers.
Milam bugyals, T. A. Rao, No. 7022, Alt. 4000-5000 m.
V. erubescens Wall. F.B.I. 3 : 7.
A small tree with pendent fruits.
Kapkot & Samadhura, T. A. Rao, No. 6556, Alt. 1300-1615 m.
V. nervosum Don FBI. 3 : 8.
A small sized tree with pendent fruits.
Girgaon, T. A. Rao, No. 6623, Alt. 1400-1500 m.

RUBIACEAE

Uncaria pilosa Roxb. FBI. 3 : 32.
A climbing shrub with flowers in axillary heads.
Tejum & Girgaon, T. A. Rao, No. 6609 & 7210, Alt. 1350-1400 m.

Wendlandia exserta DC. FBI. 3 : 37.
A small tree with fruits.
Tejum & Girgaon, T. A. Rao, No. 6591, Alt. 1350-1400 m.

Leptodermis kumaonensis Park.
A small shrub with violet blue flowers.
Kalamuni pass, Bogdwar & Martoli, T. A. Rao, Nos. 6660, 6758 & 7132, Alt.

L. lanceolata Wall. FBI. 3 : 198.
A shrub on rocks with white pink or cream coloured flowers.
Kapkot, Bogdwar, T. A. Rao, Nos. 6535 & 6732, Alt. 1200-3000 m.

L. parkeri Dunn.
A shrub with cream coloured flowers and stem with scalariform pith. New record.
Milam, on the way to Surya kund, T. A. Rao, No. 7080, Alt. 4700 m.

Galium triflorum Michx. FBI. 3 : 205.
A tender herb with small flowers.
Girgaon, T. A. Rao, No. 6621, Alt. 1500 m.
G. aparine L. FBI. 3 : 205.
A tender herb with hooked fruits.
Martoli bugyals, T. A. Rao, No. 6884, Alt. 4500-5200 m.
G. asperifolium L. FBI. 3 : 207.
A tender herb with flowers.
Bogdwar & Martoli, T. A. Rao, No. 6776, Alt. 3000-5200 m.

G. rotundifolium L. FBI. 3 : 204.
A herb with flowers.
Bogdwar & Rathi, T. A. Rao, No. 7145, Alt. 2000-3000.

COMPOSITAE

Gnaphalium luteo-album L. FBI. 3 : 288.
A woolly herb with golden yellow flowers.
Kapkot & Samadhura & Bogdwar, T. A. Rao, Nos. 6538 & 7176, Alt. 1200-3200 m.

Launaea nudicaulis Less. FBI. 3 : 416.
A stout herb with flower heads.
Samadhura & Tejum, T. A. Rao, No. 6580, Alt. 1350-1615 m.

Cnicus wallichii DC. FBI. 3 : 363.
A spinescent herb with large flower heads.
Samadhura & Bogdwar, T. A. Rao, Nos. 6573 & 7171, Alt. 1615-3200 m.

Lactuca dissecta Don FBI. 3 : 405.
A stout herb with blue flowers.
Kalamuni pass, T. A. Rao, No. 6638, Alt. 3200 m.

Dichrocephala latifolia DC. FBI. 3 : 245.
A herb with white heads.
Tejum & Girgaon, T. A. Rao, Nos. 6099 & 6608, Alt. 1350-1400 m.

Anaphalis cuneifolia H.f. FBI. 3 : 280.
A small villous herb with white heads.
Bogdwar & Martoli bugyals, T. A. Rao, Nos. 6772 & 6897, Alt. 3000-5200 m.

A. nubigena DC. FBI. 3 : 279.
A small villous herb with white heads.
Bogdwar, Martoli & Milam bugyals, T. A. Rao, Nos. 6785 & 7018, Alt. 3200-5200 m.

Inula cappa DC. FBI. 3 : 295.
Bogdwar bugyal, T. A. Rao No. 7131, Alt. 3000-5000 m.

Cousinia thomsoni Clarke FBI. 3 : 360.
A spinescent thistle with pubescent heads.
Milam & Goriganga valley, T. A. Rao, No. 6955, Alt. 4000 m.

Senecio arnicoides Wall. FBI. 3 : 351.
An erect herb with flower buds.
Milam bugyals, T. A. Rao, Nos. 7032 & 7016, Alt. 4000-5200 m.

Prenanthes violaefolia Decne. FBI. 3 : 412.
A small herb with blue ligulate flowers on rocks.
Rathi & Bogdwar, T. A. Rao, No. 6751, Alt. 2000-3000 m.

Pterotheca falconeri H.f. FBI. 3 : 399.
A small herb with yellow heads.
Milam moraine, T. A. Rao, No. 7000, Alt. 4000-5200 m.

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Crepis flexuosa (DC.) Benth. H.f. FBI. 3 : 394.
A small herb with yellow flowers.
Milam bugyals, T. A. Rao, No. 6987, Alt. 4000-5000 m.

Artemisia brevifolia Wall. FBI. 3 : 324.
An aromatic herb with dried flowers.
Milam moraine, T. A. Rao, No. 6998, Alt. 4000-5200 m.
A. vulgaris L. FBI. 3 : 325.
An aromatic herb with greenish white flowers.
Rathi & Bogdwar, T. A. Rao, No. 6752, Alt. 2000-3000 m.

Bidens pilosa L. FBI. 3 : 309.
A large shrubby herb with yellowish white flowers.
Bogdwar & Rathi, T. A. Rao, No. 7168, Alt. 2000-3000 m.

Allardia tomentosa Decne. FBI. 3 : 313.
A woolly herb with flower heads.
Shelang moraine & Surya kund, T. A. Rao, Nos. 6909 & 7088, Alt. 4000-5000 m.

Saussurea sp. FBI. 3 :
A tomentose herb with flower buds.
Milam bugyals, T. A. Rao, No. 6977, Alt. 4000-5200 m.

CAMPANULACEAE

Campanula cashmiriana Royle FBI. 3 : 441.
An erect herb with linear leaves and blue or violet campanulate flowers.
Ticksane, T. A. Rao, No. 6704, Alt. 2500 m.
C. sylvatica Wall. FBI. 3 : 439.
A slender herb with pinkish white flowers.
Samadhura & Tejum, T. A. Rao, Nos. 6575 & 7215, Alt. 1350-1615 m.

ERICACEAE

Gaultheria trichophylla Royle FBI. 3 : 457.
A small wiry herb with fruits.
Bogdwar & Martoli bugyals, T. A. Rao, Nos. 6814, 6834 & 6858, Alt. 3200-4500 m.

Cassiope fastigiata Don. FBI. 3 : 459.
An ericoid herb with white flowers.
Martoli & Milam bugyals, T. A. Rao, Nos. 6841 & 7035, Alt. 4000-5200 m.

Rhododendron campanulatum Don. FBI. 3 : 466.
A shrub with pale blue flowers.
Martoli & Milam bugyals, T. A. Rao, Nos. 6878, 6826, Alt. 4000-5200 m.
R. hypenanthum Balf.
Syn: *R. anthopogon* Don. FBI. 3 : 472.
An aromatic shrub with cream coloured flowers.
Martoli & Milam bugyals, T. A. Rao, Nos. 6850, 7034 & 6877, Alt. 4000-5200 m.

R. lepidotum Wall. FBI. 3 : 471.
An aromatic shrub with red flowers and fruits.
Bogdwar & Martoli bugyals, T. A. Rao, No. 6787, Alt. 3000-4200 m.
R. arboreum Smith. FBI. 3 : 465.
A small sized tree with fruits.
Kalamuni pass, T. A. Rao, No. 6670, Alt. 3200 m.

Lyonia ovalifolia (Wall.) Drude
Syn. *Pieris ovalifolia* (Wall) Don. FBI. 3 : 460.
A small sized tree with white flowers under Rhododendron shade.
Kalamuni pass, T. A. Rao, Nos. 6534 & 6697, Alt. 3200 m.

PRIMULACEAE

Primula denticulata Sm. FBI. 3 : 485.
A herb with blue flowers.
Bogdwar, Martoli & Milam bugyals, T. A. Rao, Nos. 6800, 6846, 7055 & 7090, Alt. 3500-5200 m.
P. edgeworthii Pax.
A herb with bluish violet flowers.
Kalamuni pass, T. A. Rao, No. 6676, Alt. 3200 m.
P. elliptica Royle FBI. 3 : 488.
A small herb with pink flowers.
Shelang glacial moraine, T. A. Rao, No. 6905, Alt. 4500-5000 m.
P. involucrata Wall. FBI. 3 : 488.
A semi-aquatic herb with creamish or pinkish white flowers.
Bogdwar & Martoli, T. A. Rao, No. 6815, Alt. 3500-5200 m.
P. macrophylla Don. FBI. 3 : 490.
A herb with large pinkish purple flowers.
Milam & Surya kund, T. A. Rao, Nos. 7018, 7038 & 7077, Alt. 4000-5000 m.
Primula sp. FBI. 3 :
A small herb with radicle leaves, succulent, fragrant with yellow flowers.
Martoli bugyals, T. A. Rao, No. 6866, Alt. 4500-5000 m.
P. sp. FBI. 3 :
A small herb with pink flowers.
Martoli bugyals, T. A. Rao, No. 6874, Alt. 4500-5000 m.

Androsace geranifolia Watt FBI. 3 : 497.
A small herb with radicle leaves and white flowers.
Kalamuni pass, T. A. Rao, No. 6652, Alt. 3200 m.
A. rotundifolia Hardw. FBI. 3 : 496.
A small herb with pink or while flowers.
Tejum & Samadhura, T. A. Rao, No. 7216, Alt. 1360-1615 m.
A. sarmentosa Wall. FBI. 3 : 498.
A small herb with pink flowers.
Samadhura & Milam bugyals, T. A. Rao, Nos. 6579 & 7046, Alt. 1600-4200 m.

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A. villosa L. FBI. 3 : 499.

A small villous herb forming cushions, with white to pale pinkish flowers.

Martoli & Milam bugyals, T. A. Rao, No. 6956, Alt. 4500-4000 m.

A. sp.

A small herb forming cushions on rock with solitary pink or violet flowers.

Bogdwar, Martoli & Milam, T. A. Rao, Nos. 6780 & 6825, Alt. 3500-5200 m.

A. sp.

A small herb with fruits forming cushions.

Shelang glacial moraine, T. A. Rao, No. 6908, Alt. 5600 m.

Lysimachia japonica Thunb. FBI. 3 : 505.

A decumbent herb with yellow flowers.

Kalamuni pass & Bogdwar, T. A. Rao, Nos. 6630, 6730 7148, 7155 & 7191, Alt. 3200 m.

MYRSINACEAE

Maesa indica (Roxb.) A.DC. FBI. 3 : 509.

A shrub with fruits in long axillary spikes.

Tejum & Girgaon, T. A. Rao, Nos. 6602 & 7209, Alt. 1350-1400 m.

STYRACEAE

Symplocos crataegoides Buch.-Ham. FBI. 3 : 573.

Local name : LUDHIA.

A large sized tree with white aromatic flowers.

Kalamuni pass, T. A. Rao, No. 6689, Alt. 3200 m.

S. ramosissima Wall. FBI. 3 : 577.

A small shrub with white flowers.

Rathi & Bogdwar, T. A. Rao, No. 6744, Alt. 2000-3000 m.

OLEACEAE

Jasminum humile L. FBI. 3 : 602.

A climbing shrub with yellow flowers.

Kapkot & Samadhura, T. A. Rao, No. 6568, Alt. 1300-1615 m.

J. officinale L. FBI. 3 : 603.

A shrub with white fragrant flowers.

Kalamuni pass, T. A. Rao, Nos. 6633 & 6748, Alt. 3200 m.

J. multiflorum (Brunf.) Andr. FBI. 3 : 592.

A shrub with white fragrant flowers.

Kapkot, T. A. Rao, No. 6505, Alt. 1200-1300 m.

Ligustrum compactum H.f. & T. FBI. 3 : 616.

A shrub with white flowered spikes.

Kapkot, T. A. Rao, No. 6513, Alt. 1200-1300 m.

L. nepalense Wall. FBI. 3 : 617.

Shrub with fragrant white flowers.

Kapkot, T. A. Rao, No. 6501, Alt. 1200-1300 m.

Syringa emodi Wall. FBI. 3 : 605.

A small sized tree with white flowers and fruits.

Bogdwar & Martoli, T. A. Rao, No. 6783, Alt. 3200-4500 m.

APOCYNACEAE

Trachelospermum lucidum (Don.) K. Schum.

A glabrous climber with white fragrant flowers.

Rathi & Bogdwar, T. A. Rao, No. 6720, Alt. 2000-3000 m.

ASCLEPIADACEAE

Pentstemon wallichii Wight FBI. 4 : 28.

A pendent shady herb with white flowers.

Samadhura & Tejum, T. A. Rao, Nos. 6557 & 7221, Alt. 1350-1615 m.

Cryptolepis buchmanii R. & S. FBI. 4 : 5.

A climbing shrub with flowers and young fruits. Flowers creamish green.

Kapkot & Samadhura, T. A. Rao, No. 6530, Alt. 1300-1615 m.

Tylophora govanii Decne. FBI. 4 : 40.

An erect perennial herb with crimson flowers.

Girgaon, T. A. Rao, No. 6624, Alt. 1400-1500 m.

Hoya longifolia Wall. FBI. 4 : 56.

A climbing herb with fleshy leaves and white or yellow flowers in umbels.

Kapkot & Samadhura, T. A. Rao, No. 6561, Alt. 1300-1615 m.

GENTIANACEAE

Gentiana argentea Royle FBI. 4 : 112.

A small herb with sky blue flowers.

Bogdwar, Martoli & Milam bugyals, T. A. Rao, Nos. 6806, 6831 & 6833, Alt. 3500-5200 m.

G. carinata Griseb. FBI. 4 : 113.

A small rosette type herb with blue flowers.

Martoli & Milam bugyals, T. A. Rao, Nos. 6885, 6887 & 7061, Alt. 4200-5200 m.

G. leucomelaena Max.

A small spreading herb with blue flowers.

Milam moraine, T. A. Rao, No. 7002, Alt. 4200-5200 m.

G. pedicellata Wall. FBI. 4 : 111.

A small herb with deep blue flowers.

Kalamuni pass, T. A. Rao, No. 6683, Alt. 3200 m.

BORAGINACEAE

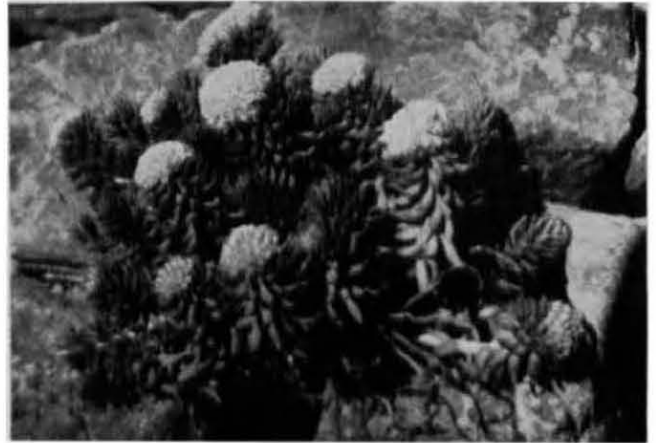
Macrotomia benthamii DC. FBI. 4 : 177.

A large herb with pink to pale rosy flowers. Roots red coloured ; whole plant covered with long silky hairs.

Local name : RATANJOT.

Bogdwar & Shilang glacial moraine, T. A. Rao, Nos. 6903 & 7125, Alt. 4500-5000 m.

REPORT ON A BOTANICAL TOUR TO MILAM GLACIERS



Sedum crassipes H.f. & T. grows at 5600m.



KALAMUNI Pass with stately *Quercus dilatata* and *Quercus semicarpifolia*.

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Macrotomia benthami DC. the 'RATANJOT' occurs above 4000m. used in indigenous medicine.



Primula macrophylla D. Don.

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Myosotis sylvatica Hoffm. FBI. 4 : 173.
A small hairy herb with sky blue flowers.
Martoli bugyals, T. A. Rao, No. 6861, Alt. 4500-6000 m.

Eritrichium strictum Decne. FBI. 4 : 164.
A small herb with blue flowers.
Martoli & Milam bugyals, T. A. Rao, No. 6971, Alt. 4000-4500 m.

Asperugo procumbens L. FBI. 4 : 167.
A small herb with blue flowers.
Martoli & Milam bugyals, T. A. Rao, Nos. 6929 & 6960, Alt. 4000-4500 m.

Hackelia glochidiata (Wall.) Brand.
Syn. *Paracaryum glochidiatum* Benth FBI. 4 : 161.
A tall tender herb with blue flowers.
Milam bugyals, T. A. Rao, No. 7069, Alt. 4500 m.

SOLANACEAE

Solanum nigrum L. FBI. 4 : 229.
A small herb with flowers and fruits.
Samadhura & Tejum, T. A. Rao, No. 6584, Alt. 1350-1615 m.

S. indicum L. FBI. 4 : 234.
A shrubby herb with white flowers and fruits.
Bogdwar & Rath, T. A. Rao, No. 7183, Alt. 2000-3000 m.

S. verbascifolium L. FBI. 4 : 230.
A large shrub with tomentose leaves and white flowers and fruits.
Tejum & Girgaon, T. A. Rao, No. 6594, Alt. 1350-1400 m.

Physalis minima L. FBI. 4 : 238.
A small herb with fruits.
Tejum, T. A. Rao, No. 7206, Alt. 1350 m.

Physochlaina praealta H.f. FBI. 4 : 244.
An erect herb with pale yellow flowers.
Milam bugyals, T. A. Rao, No. 7075, Alt. 4000-4500 m.

SCROPHULARIACEAE

Scrophularia edgeworthii Benth. FBI. 4 : 255.
A tall stout herb with dark green flowers.
Bogdwar & Martoli, T. A. Rao, No. 6766, Alt. 3000-4200 m.

S. decomposita Royle FBI. 4 : 256.
An erect herb with yellow flowers.
Martoli & Milam bugyals, T. A. Rao, Nos. 6849, 6915 & 6944, Alt. 4000-4500 m.

Hemiphragma heterophyllum Wall. FBI. 4 : 289.
A prostrate pendent herb with red fruits.
Kalamuni pass, T. A. Rao, No. 6669, Alt. 3200 m.

Picrorhiza kurroa Royle FBI. 4 : 290.
A stoloniferous herb with flower buds.
Milam bugyals, T. A. Rao, Nos. 7025 & 7063, Alt. 4000-5200 m.

Lindenbergia urticaefolia Lehm. FBI. 4 : 262.
A small herb with yellow flowers.
Girgaon, T. A. Rao, No. 6616, Alt. 1400-1500 m.

Pedicularis hoffmeisteri Klot. FBI. 4 : 313.
A herb with yellow flowers.
Kalamuni pass, T. A. Rao, No. 7199, Alt. 3200 m.
P. longiflora Rudolph.
A small herb with yellow flowers.
Martoli & Milam bugyals, T. A. Rao, Nos. 6937 & 7097, Alt. 4000-4500 m.
P. pectinata Wall. FBI. 4 : 306.
A small herb with flower buds.
Milam bugyals, T. A. Rao, No. 7037, Alt. 4000-4500 m.

Veronica biloba L. FBI. 4 : 294.
A tender herb with blue flowers and fruits.
Shelang glacial moraine, T. A. Rao, No. 6927, Alt. 5000 m.

V. cana Wall. FBI. 4 : 295.
A small herb with blue flowers.
Kalamuni pass, T. A. Rao, Nos. 6651 & 6657, Alt. 3200 m.

V. serpyllifolia L. FBI. 4 : 296.
A small herb with blue flowers.
Martoli & Milam bugyals, T. A. Rao, No. 6948, Alt. 4000-4500 m.

Euphrasia officinalis L. FBI. 4 : 305.
A small herb with white flowers.
Bogdwar & Martoli, T. A. Rao, No. 6760, Alt. 3000-4200 m.

Mazus surculosus Don. FBI. 4 : 260.
A small running herb.
Kalamuni pass, T. A. Rao, Nos. 6578 & 7161, Alt. 3200 m.

M. dentatus Wall. FBI. 4 : 260.
A herb with big violet flowers.
Kalamuni pass, T. A. Rao, No. 7194, Alt. 3200 m.

Falconeria himalaica H.f. FBI. 4 : 319.
A sciophytic blue flowered herb in moist areas.
Near Kalamuni pass. T. A. Rao, 6701, Alt. 3000 m.

OROBANCHACEAE

Orobanche epithymum DC. FBI. 4 : 325.
A brownish herb with flowers parasitic on *Thymus serpyllum* roots.
Milam bugyals, T. A. Rao, Nos. 7041 & 7044, Alt. 4000 m.

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LENTIBULARIACEAE

- Pinguicula alpina* L. FBI. 4 : 335.
An insectivorous herb with cream coloured flowers.
Martoli and Milam, T. A. Rao, Nos. 6935 & 7100, Alt.
4000-4200 m.

ACANTHACEAE

- Rungia parviflora* Nees FBI. 4 : 550.
A prostrate herb with small blue flowers.
Kapkot, T. A. Rao, No. 6526, Alt. 1300 m.

VERBENACEAE

- Callicarpa macrophylla* Vahl FBI. 4 : 568.
A large herb with pink flowers in dense spikes.
Girgaon & Tejum, T. A. Rao, No. 7201, Alt.
1350-1400 m.
Verbena officinalis L. FBI. 4 : 565.
A herb with many long spikes bearing white flowers.
Kapkot & Samadhura, T. A. Rao, No. 6539, Alt.
1300-1615 m.

LABIATAE

- Thymus serpyllum* L. FBI. 4 : 649.
A procumbent aromatic herb with pink-purple or rarely
white flowers.
Bogdwar, Martoli & Milam bugyals, T. A. Rao, Nos.
6771 & 6981, Alt. 3000-4200 m.
Colquhounia coccinea Wall. FBI. 4 : 674.
A tomentose shrub with orange coloured flowers.
Rathi & Bogdwar, T. A. Rao, No. 6734, Alt.
2000-3000 m.
Lamium amplexicaule L. FBI. 4 : 679.
A small much branched herb with pink flowers.
Bogdwar, Martoli & Milam, T. A. Rao, Nos. 6824, 6941
& 6939, Alt. 3000-4500 m.
L. album L. FBI. 4 : 679.
An erect herb with white flowers.
Rathi, Bogdwar & Martoli, T. A. Rao, Nos. 6729, 6635
& 6762, Alt. 2000-4200 m.
Phlomis bracteosa Royle FBI. 4 : 693.
A tall herb with pink aromatic flowers.
Bogdwar bugyals, T. A. Rao, No. 7127, Alt.
3200-5200 m.
Leonurus cardiaca L. FBI. 4 : 678.
A herb with white flowers.
Bogdwar & Rathi, T. A. Rao, No. 7142, Alt.
3200-2500 m.
Scutellaria angulosa Benth. FBI. 4 : 669.
A small shrub with creamish or pinkish white flowers.
Girgaon, T. A. Rao, No. 6627, Alt. 1400-1500 m.

- Colebrookea oppositifolia* Sm. FBI. 4 : 642.
A large shrub with dense flowered spikes.
Girgaon & Tejum, T. A. Rao, No. 7203, Alt.
1300-1400 m.

- Leucas lanata* Benth. FBI. 4 : 681.
A villous herb with white flowers.
Samadhura & Tejum, T. A. Rao, No. 6577, Alt.
1350-1615 m.

PLANTAGINACEAE

- Plantago asiatica* L. FBI. 4 : 705.
A herb with long spikes.
Tejum & Girgaon, T. A. Rao, No. 6607, Alt.
1350-1400 m.
P. brachyphylla Edgew. FBI. 4 : 706.
A small herb with radicle leaves and flowers on spikes.
Martoli & Milam bugyals, T. A. Rao, No. 7098, Alt.
4500-5200 m.

AMARANTHACEAE

- Cyathula tomentosa* Moq. FBI. 4 : 722.
A herb with globose heads.
Tejum & Girgaon, T. A. Rao, No. 6611, Alt.
1350-1400 m.
Achyranthes bidentata Blume FBI. 4 : 730.
A tall woody herb with white spikes.
Rathi & Bogdwar, T. A. Rao, No. 6747, Alt.
2000-3200 m.

CHENOPODIACEAE

- Chenopodium album* L. FBI. 5 : 3.
A small tender herb with green flowers.
Bogdwar & Rathi, T. A. Rao, No. 7177, Alt.
2000-3000 m.

POLYGONACEAE

- Polygonum affine* Don. FBI. 5 : 33.
A prostrate perennial herb with pink spikes.
Martoli & Milam bugyals, T. A. Rao, Nos. 6853, 7007,
7020 & 7060, Alt. 4500-4200 m.
P. amplexicaule Don. FBI. 5 : 32.
A tall herb with red spikes.
Rathi & Bogdwar, T. A. Rao, No. 7198, Alt.
2000-3000 m.
P. capitatum Ham. FBI. 5 : 44.
A creeping herb near water with pink flowers in heads.
Bogdwar & Rathi, T. A. Rao, No. 7178, Alt.
2000-3200 m.
P. viviparum L. FBI. 5 : 31.
A diffuse herb with small white flowers on slender
spikes.
Martoli bugyals, T. A. Rao, No. 6827, Alt. 4200-5200 m.
P. sphaerocephalum Wall. FBI. 5 : 43.
A prostrate herb with pink flowers.
Kalamuni pass, T. A. Rao, No. 6649, Alt. 3200 m.

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P. sagittatum L. FBI. 5 : 47.

A herb near water with flowers in terminal spikes.

Surya kund, T. A. Rao, Nos. 7064 & 7086, Alt. 5200 m.

P. chinense L. FBI. 5 : 44.

An erect shrub with pinkish white heads.

Girgaon, Rathi & Bogdwar, T. A. Rao, Nos. 6620 & 6725, Alt. 1400-3200 m.

P. recumbens Royle FBI. 5 : 25.

A small tender herb with green flowers.

Martoli & Milam bugyals, T. A. Rao, No. 6950, Alt. 4200-5200 m.

Rumex nepalensis Spreng. FBI. 5 : 60.

A tall herb with fruits.

Martoli & Milam bugyals, T. A. Rao, Nos. 6946 & 7173, Alt. 4200-5200 m.

Fagopyrum cymosum Meissn. FBI. 5 : 55.

A tall tender herb with white flowers.

Bogdwar & Rathi, T. A. Rao, Nos. 7133 & 7165, Alt. 3200-2000 m.

Oxyria digyna Hill. FBI. 5 : 58.

A perennial herb with flowers.

Martoli bugyals, T. A. Rao, No. 6859, Alt. 4200-5200 m.

O. reniformis Hk. FBI. 5 : 58.

A perennial herb with flowers.

Martoli & Milam bugyals, T. A. Rao, Nos. 6759 & 6937, Alt. 4200-5200 m.

Rheum emodi Wall. FBI. 5 : 56.

A stout herb with axillary panicles.

Martoli bugyals, T. A. Rao, No. 6799, Alt. 4200-5200 m.

R. moorcroftianum Royle FBI. 5 : 56.

A stout rhizomatic herb on rocks with whitish flowers on long spikes.

Milam bugyals, T. A. Rao, No. 7014, Alt. 4000-5200 m.

R. webbianum Royle FBI. 5 : 57.

A stout rhizomatic herb on rock with short floral heads. Petiole edible.

Milam bugyals, T. A. Rao, No. 7413, Alt. 4000-5000 m.

PIPERACEAE

Peperomia reflexa A. Dietr. FBI. 5 : 99.

A small herb with flowers on slender spikes.

Kapkot, T. A. Rao, No. 6504, Alt. 1200-1300 m.

P. heyneana Miq. FBI. 5 : 99.

An epiphytic herb with spikes.

Jakul valley, T. A. Rao, No. 7932, Alt. 1400 m.

LAURACEAE

Litsaea polyantha Juss. FBI. 5 : 162.

A small sized tree with fruits.

Samadhura & Tejum, T. A. Rao, No. 6588, Alt. 1350-1615 m.

L. umbrosa Nees FBI. 5 : 179.

A shrub with fruits.

Rathi & Bogdwar, T. A. Rao, No. 6721, Alt. 2000-3200 m.

Cinnamomum tamala F. Nees FBI. 5 : 128.

A large sized tree with fruits.

Kapkot & Samadhura, T. A. Rao, No. 6548, Alt. 1300-1615 m.

Machilus odoratissima Nees FBI. 5 : 139.

A large sized tree with fruits.

Samadhura & Tejum, T. A. Rao, No. 6590, Alt. 1350-1615 m.

THYMELAEACEAE

Wikstroemia canescens Meissn. FBI. 5 : 195.

A herb with pale yellow flowers.

Samadhura & Kapkot, T. A. Rao, No. 7222, Alt. 1650-1350 m.

Daphne cannabina Wall. FBI. 5 : 193, 862.

A shrub with red fruits.

Bogdwar & Rathi, T. A. Rao, No. 7151, Alt. 2000-3200 m.

ELAEAGNACEAE

Elaeagnus latifolia L. FBI. 5 : 202.

A straggling shrub with fruits.

Girgaon, A. A. Rao, No. 6619, Alt. 1400-1500 m.

Hippophae rhamnoides L. FBI. 5 : 203.

A small sized shrub with small shining leaves (sterile).

Milam moraine, T. A. Rao, No. 7225, Alt. 4200-5200 m.

LORANTHACEAE

Helixanthera ligustrina (Wall.) Danser

A semi-parasitic shrub with fruits and flowers on *Dalbergia* sp.

Kapkot & Tejum, T. A. Rao, Nos. 6514 & 7213, Alt. 1200-1350 m.

Scurrula elata (Edgew.) Danser

A semi-parasitic shrub with fruits on *Xolisma ovalifolia*. Tejum, Rathi & Bogdwar, T. A. Rao, Nos. 6572, 6625 & 7187, Alt. 1200-3000 m.

EUPHORBIACEAE

Excoecaria acerifolia L. FBI. 5 : 473.

A shrub with trilobed fruits on a spike.

Samadhura & Tejum, T. A. Rao, No. 6583, Alt. 1350-1615 m.

Sapium insigne Benth. FBI. 5 : 471.

A large sized tree with flowers on cylindrical spikes.

Kapkot, T. A. Rao, No. 6515, Alt. 1200-1300 m.

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Macaranga pustulata King FBI. 5 : 445.

A medium sized tree with fruits.

Samadhura & Tejum, T. A. Rao, No. 6587, Alt. 1350-1615 m.

Glochidion velutinum Wight FBI. 5 : 322.

A small tree with schizocarpic fruits.

Kapkot & Samadhura, T. A. Rao, No. 6533, Alt. 1350-1615 m.

Buxus wallichiana Baill.

Syn. *B. sempervirens* L. FBI. 5 : 267.

A shrub with, big, tricarpedal fruits.

Rathi & Bogdwar, T. A. Rao, No. 6737, Alt. 2000-3000.

Euphorbia hypericifolia L. FBI. 5 : 249.

A herb with small green flowers and fruits.

Tejum, T. A. Rao, No. 7205, Alt. 1350 m.

E. pilosa L. FBI. 5 : 260.

An erect herb with fruits.

Girgaon, T. A. Rao, No. 6618, Alt. 1400-1500 m.

E. stracheyi Boiss. FBI. 5 : 259.

A small tender herb with green flowers.

Martoli bugyals, T. A. Rao, No. 6681, Alt. 4500-5200 m.

E. wallichii H. f. FBI. 5 : 258.

A tall herb with fruits.

Bogdwar bugyals, T. A. Rao, No. 7121, Alt. 3000-3500 m.

URTICACEAE

**Elatostema rupestre* Wedd. FBI. 5 : 564.

A pendent shady herb with flowers in sessile heads.

Kapkot & Samadhura, T. A. Rao, No. 6553, Alt. 1300-1615 m.

E. sessile Forst. FBI. 5 : 563.

A sciophytic herb with sessile heads.

Bogdwar & Rathi, T. A. Rao, No. 7149, Alt. 2000-3000 m.

Cannabis sativa L. FBI. 5 : 487.

A tall perennial herb with flowers and fruits.

Tejum & Milam, T. A. Rao, No. 6604 . 7043, Alt. 1350-4000 m.

Lecanthus wightii Wedd. FBI. 5 : 559.

A small pubescent herb with flowers.

Bogdwar & Rathi, T. A. Rao, No. 7140, Alt. 2000-3000 m.

Pilea scripta Wedd. FBI. 5 : 556.

An erect herb with lanceolata leaves and flowers.

Rathi & Bogdwar, T. A. Rao, No. 6741, Alt. 2000-3000 m.

P. umbrosa Wedd. FBI. 5 : 556.

An erect herb with ovate leaves and flowers.

Kalamuni pass, T. A. Rao, No. 6672, 6685 & 7193, Alt. 3200 m.

Chamabainia cuspidata Wedd. FBI. 5 : 580.

An erect herb with opposite leaves and stalked flower heads.

Kalamuni pass, T. A. Rao, No. 6678, Alt. 3200 m.

Urtica dioica L. FBI. 5 : 548.

An erect perennial herb with flowers and stinging hair on young parts.

Bogdwar & Rathi, T. A. Rao, No. 7135, Alt. 2000-3000 m.

U. parviflora Roxb. FBI. 5 : 548.

An erect woody herb with bisexual flowers in axillary cymes.

Kalamuni pass, T. A. Rao, No. 6631, Alt. 3200 m.

Boehmeria platyphylla Don FBI. 5 : 578.

A small shrub with flowers buds on long catkins.

Rathi & Bogdwar, T. A. Rao, Nos. 6708 & 6728, Alt. 2000-3000 m.

Debregeasia hypoleuca Wedd. FBI. 5 : 591.

A shrub with sessile axillary heads.

Rathi & Bogdwar, T. A. Rao, No. 6706, Alt. 2000-3000 m.

Ficus clavata Wall. FBI. 5 : 520.

A shrub on rocks with small globular fruits.

Rathi & Bogdwar, T. A. Rao, No. 6706, Alt. 2000-3000 m.

F. luducca Roxb. FBI. 5 : 528.

A shrub with fruits.

Kapkot, T. A. Rao, No. 6516, Alt. 1200-1300 m.

F. nemoralis Wall. FBI. 5 : 534.

A small sized tree with fruits.

Kapkot & Samadhura, T. A. Rao, No. 6328, Alt. 1300-1615 m.

F. palmata Forsk. FBI. 5 : 530.

A shrub with fruits.

Tejum & Girgaon, T. A. Rao, No. 6603, Alt. 1350-1400 m.

CUPULIFERAE

Betula utilis Don FBI. 5 : 599.

A small tree with flowers in axillary spikes.

Martoli bugyals, T. A. Rao, Nos. 6838 & 6899, Alt. 4500-5200 m.

Quercus incana Roxb. FBI. 5 : 603.

A middle sized tree with acorns.

Kapkot, T. A. Rao, No. 6517, Alt. 1200-1300 m.

Q. floribunda Wall. FBI. 5 : 602.

A small sized tree with acorns.

Kalamuni pass, T. A. Rao, No. 7186, Alt. 3200 m.

Q. semecarpifolia Smith FBI. 5 : 601.

A large tree with acorns.

Kalamuni pass, T. A. Rao, Nos. 6646, 6653 & 6698, Alt. 3200 m.

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Castanea sativa Mill.

A large tree with flowers on large pendent spikes (chestnut tree).

Ticksane, T. A. Rao, No. 6690, Alt. 2500 m.

SALICACEAE

Salix elegans Wall. FBI. 5 : 630.

A shrub with white flowers.

Martoli & Milam bugyals, T. A. Rao, Nos. 6784 & 6993, Alt. 4000-5200 m.

S. fruticulosa Anders. FBI. 5 : 637.

A prostrate shrub with pink flowers on spikes.

Martoli & Milam bugyals, T. A. Rao, Nos. 6837 & 7053, Alt. 4000-5200 m.

S. hastata L. FBI. 5 : 630.

A woolly herb with flowers on long spikes.

Martoli & Milam buyals, T. A. Rao, No. 6840 & 6876, Alt. 4000-5200 m.

S. lindleyana Wall. FBI. 5 : 634.

A prostrate small leaved shrub with flowers.

Martoli & Milam bugyals, T. A. Rao, Nos. 6895, 6917 & 6894, Alt. 4000-5200 m.

GNETACEAE

Ephedra gerardiana Wall. FBI. 5 : 640, 863.

A low shrub with male yellow flowers.

Milam moraine, T. A. Rao, No. 6959, Alt. 4200-5000 m.

CONIFERAE

Cupressus torulosa Don FBI. 5 : 645.

A large tree with cones.

Girgaon, T. A. Rao, No. 6614, Alt. 1500 m.

Taxus baccata L. FBI. 5 : 648.

A tree with red baccata fruits.

Bogdwar, T. A. Rao, No. no, Alt. 3500 m.

Juniperus communis L. FBI. 5 : 646.

A low shrub with small globular female cones.

Shrub with male cones.

Martoli bugyals, T. A. Rao, Nos. 6852 & 6836, Alt. 4200-5200 m.

J. wallichiana Hk. f. FBI. 5 : 646.

A low shrub with globular female cones.

Milam bugyals, T. A. Rao, No. 6947, Alt. 4000 m.

Pinus roxburghii Sargent

Syn. *P. longifolia* Roxb. FBI. 5 : 652.

Bogdwar & Kalamuni pass, T. A. Rao, No. no, Alt. 2000-3000 m.

Cedrus deodara Roxb. FBI. 5 : 653.

A lofty tree with cones.

Bogdwar, T. A. Rao, No. no, Alt. 3500-4200 m.

ORCHIDACEAE

Oberonia ensiformis Lindl. FBI. 5 : 679.

An epiphytic herb with fruits.

Tejum & Girgaon, T. A. Rao, No. 6600, Alt. 1350-1400 m.

O. falconeri Hk. f. FBI. 5 : 678.

An epiphytic herb with flowers on a long spike on *Quercus* sp.

Kapkot & Samadhura, T. A. Rao, No. 6559, Alt. 1300-1615 m.

Dendrobium chrysanthum Wall. FBI. 5 : 747.

An epiphytic herb with deep yellow flowers (on *Quercus* sp.)

Kapkot & Samadhura, T. A. Rao, No. 6551, Alt. 1300-1615 m.

Coelogyne cristata Lindl. FBI. 5 : 829.

An epiphytic herb without flowers.

Kapkot & Samadhura, T. A. Rao, No. 6560, Alt. 1300-1615.

Bulbophyllum affine Lindl. FBI. 5 : 756.

An epiphytic herb with fruits on *Dalbergia* sp.

Samadhura, Tejum & Girgaon, T. A. Rao, Nos. 6589, 6601 & 6716, Alt. 1350-1500.

Orchis latifolia L. FBI. 6 : 127.

A terrestrial herb with pink flowers.

Realkot & Bogdwar, T. A. Rao No. 7106, Alt. 3000-3500 m.

Aerides multiflorum Roxb. FBI. 6 : 44.

An epiphytic herb with violet flowers.

Tejum, T. A. Rao, No. no, Alt. 1350 m.

Luisia teretifolia Gaud. FBI. 6 : 22.

An epiphytic herb with cylindrical leaves and fruits.

Kapkot, Tejum & Bogdwar, T. A. Rao, Nos. 6511, 6593 & 6707, Alt. 1200-3000 m.

Vanda cristata Lindl. FBI. 6 : 53.

A yellow flowered epiphytic herb on *Juglans* tree.

Kapkot & Samadhura, T. A. Rao, No. 6550, Alt. 1300-1615 m.

Cleisostoma micranthum K. & P.

An epiphytic herb with pink flowers on *Toona* sp.

Jakul valley, T. A. Rao, 6599, Alt. 1300-1400 m.

**Corallorhiza trifida* Chatel.

C. innata Br. FBI. 5 : 710.

A terrestrial herb with coralloid roots. Pale yellow flowers with white lip without coloured blotches. A new record.

Martoli bugyals, T. A. Rao, No. 6851, Alt. 5000 m.

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SCITAMINEAE

- Roscoea alpina* Royle FBI. 6 : 207.
A small herb with white flowers with blue tint and fruits.
Kalamuni pass & Bogdwar, T. A. Rao, Nos. 6641, 6643 & 6656, Alt. 3200 m.

HAEMODORACEAE

- Aletris nepalensis* Hk. f. FBI. 6 : 264.
A small herb with dried flower stalk.
Martoli bugyals, T. A. Rao, Nos. 6851 & 6896, Alt. 4200-5200 m.
- Ophiopogon intermedius* Don FBI. 6 : 269.
A herb with white flowers.
Kalamuni pass, T. A. Rao, No. 6642, Alt. 3200 m.

IRIDACEAE

- Iris kumaonensis* Wall. FBI. 6 : 274.
A grass like herb with solitary blue or blue purple flowers (bright lilac).
Bogdwar, Martoli & Milam bugyals, T. A. Rao, Nos. 6797, 6922 & 7092, Alt. 3000-5200 m.

DIOSCOREACEAE

- Dioscorea deltoidea* Wall. FBI. 6 : 291.
A climbing herb with flowers.
Bogdwar & Rath, T. A. Rao, No. 7164, Alt. 2000-3000 m.

LILIACEAE

- Smilax aspera* L. FBI. 6 : 306.
A climbing shrub with fruits.
Local name: "KUKKUDENA".
Kapkot & Tejum, T. A. Rao, Nos. 6519 & 7212, Alt. 1200-1400 m.
- S. parvifolia* Wall. FBI. 6 : 304.
A climber with fruits.
Ticksane, T. A. Rao, No. 6691, Alt. 2500 m.
- Polygonatum verticillatum* All. FBI. 6 : 321.
A tall herb with pinkish white flowers.
Kalamuni pass & Bogdwar, T. A. Rao, Nos. 6665 & 6749, Alt. 3200 m.
- P. cirrifolium* Royle FBI. 6 : 322.
A tender herb with pink flowers and circinate leaves.
Samadhura & Martoli bugyals, T. A. Rao, No. 6545 & 6842, Alt. 1600-4500 m.
- Smilacina pallida* Royle FBI. 6 : 323.
A small herb with maroon coloured flowers.
Bogdwar bugyals, T. A. Rao, No. 7116, Alt. 3200-4500 m.

- Lloydia serotina* Reichb. FBI. 6 : 354.
A small herb with purple marked white flowers.
Martoli & Milam bugyals, T. A. Rao, No. 6890, 7010 & 7073, Alt. 4200-5200 m.

- Lilium giganteum* Wall. FBI. 6 : 349.
A tall stately herb with big white flowers.
Ticksane, T. A. Rao, No. 6694, Alt. 2500 m.

- Allium blandum* Wall. FBI. 6 : 339.
A bulbous herb with white flowers enclosed in pink bracts.
Milam bugyals, T. A. Rao, No. 6974, Alt. 4000-5000 m.
- A. stracheyi* Baker. FBI. 6 : 340.
A grass like herb with bulbs, long stalk bearing flowers.
Shelang glacial moraine, T. A. Rao, No. 6920, Alt. 5000 m.
- A. victorialis* L. FBI. 6 : 342.
A sciophytic herb with white flowers in bracts.
Martoli & Milam bugyals, T. A. Rao, Nos. 6809, 6847 & 7030, Alt. 4000-5200 m.

- Theropogon pallidus* Maxim. FBI. 6 : 270, 324.
A grass like herb with white flowers.
Bogdwar & Rath, T. A. Rao, No. 7159, Alt. 3000-2000 m.

- Paris polyphylla* Sm. FBI. 6 : 362.
A glabrous herb with thick creeping root stock.
Kalamuni pass, T. A. Rao, No. 6647, Alt. 3200 m.

JUNCACEAE

- Juncus bracteatus* Buch. FBI. 6 : 397.
A grass like herb with terminal cream coloured slender spikes.
Martoli & Milam bugyals, T. A. Rao, No. 6949, Alt. 4000-5200 m.
- J. glaucus* Ehrh. FBI. 6 : 393.
A grass like herb with white flowers.
Rath & Bogdwar, T. A. Rao, No. 6711, Alt. 2000-3000 m.
- J. himalensis* K. & G. FBI. 6 : 398.
A grass like herb, spikelets black or deep brown.
Milam bugyals, T. A. Rao, No. 7021, Alt. 4000-5000 m.
- J. leucomelas* Royle FBI. 6 : 397.
A grass like herb near water with white flowers.
Martoli & Milam bugyals, T. A. Rao, Nos. 6823 & 6932, Alt. 3500-5000 m.
- J. membranaceus* Royle FBI. 397.
A grass like herb with white flowers.
Bogdwar & Martoli bugyals, T. A. Rao, No. 6809, Alt. 3000-5000 m.
- Luzula spicata* DC. FBI. 6 : 401.
A grass like herb with spikes.
Martoli & Milam bugyals, T. A. Rao, Nos. 6854, & 6900, Alt. 4200-5200 m.

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ARACEAE

- Arisaema tortuosum* Schott FBI. 6 : 502.
An erect fleshy herb with spathe and pedately compound leaves.
Kapkot & Samadhura, T. A. Rao, No. 6558, Alt. 1300-1615 m.
A. wallichianum Hk. f. FBI. 6 : 500.
A stout fleshy herb with ribbed spathe.
Kalamuni pass, T. A. Rao, No. 6645, Alt. 3200 m

NAIADACEAE

- Potamogeton pectinatus* L. FBI. 6 : 567.
A submerged herb with filiform leaves.
Shandliya kund, T. A. Rao, No. 7005, Alt. 4200 m.

CYPERACEAE

- Eleocharis palustris* Br. FBI. 6 : 628.
A semi aquatic herb with terminal spikelets of chestnut colour.
Martoli & Milam bugyals, T. A. Rao, Nos. 6902 & 6986, Alt. 4000-5200 m.
- Kobresia capillifolia* C. B. Clarke FBI. 6 : 697.
A slender perennial with chestnut-coloured spikes.
Martoli bugyals, T. A. Rao, No. 6844, Alt. 4500 m.
K. laxa Boeck. FBI. 6 : 698.
A grass like perennial with long slender spikes.
Martoli bugyals, T. A. Rao, No. 6792, Alt. 4500 m.
K. royleana Boeck. FBI. 6 : 698.
A stout stemmed perennial with brown spikelets.
Martoli bugyals, T. A. Rao, No. 6891, Alt. 4500-5200 m.
- Carex alpina* Sw. FBI. 6 : 730.
A glabrous tufted sedge with spikes.
Shelang glacial moraine & Milam bugyals, T. A. Rao, Nos. 6829 & 7036, Alt. 4000-5200.
C. atrata L. FBI. 6 : 731.
A glabrous stoloniferous sedge with big nodding spikes.
Shelang glacial moraine & Milam bugyals, T. A. Rao, Nos. 6912 & 7083, Alt. 4000-5200 m.
C. setigera Don FBI. 6 : 743.
A glabrous sedge with many cylindrical spikes.
Martoli bugyals, T. A. Rao, No. 6879, Alt. 4500-5000 m.
C. stenophylla Wahlenb. FBI. 6 : 700.
A small sized sedge with black thick walled urtricles holding nuts.
Milam bugyals, T. A. Rao, No. no, Alt. 4200-5400 m.
C. muricata L. var. *foliosa* C. B. Clarke FBI. 6 : 703.
Tall or short sedge distinguished by the crested anthers and flat leaves.
Kalamuni pass, T. A. Rao, No. 6658, Alt. 3200 m.

GRAMINEAE

- Setaria viridis* Beauv. FBI. 7 : 80.
An annual grass with spike like panicle having 3-6 involucre bristles.
Tejum, T. A. Rao, No. 7208, Alt. 1350 m.
- Pogonatherum paniceum* (Lamk.) Hack.
Syn. *P. saccharoideum* Beauv. FBI. 7 : 141.
A tufted grass with small spikes ; hairs of callus shorter than the spikelet.
Kapkot & Samadhura, T. A. Rao, No. 6532, Alt. 1300-1615 m.
- Apluda varia* Hack. FBI. 7 : 150.
A perennial grass having leafy panicle.
Samadhura & Tejum, T. A. Rao, No. 6585, Alt. 1350-1615 m.
- Hierochloa laxa* Br. FBI. 7 : 222.
A handsome green nodding grass above 5000 m.
Milam bugyals, T. A. Rao, Nos. 7023 & 7072, Alt. 5000 m.
- Phleum alpinum* L. FBI. 7 : 236.
A perennial grass with ovoid panicles.
Milam, T. A. Rao, No. 7039, Alt. 3800 m.
- Polypogon fugax* Nees ex Steud.
Syn. *P. littoralis* Sm. var. *higeweri* FBI. 7 : 246.
A tufted grass, leaves with geniculate base with small spikes and awns.
Rathi & Bogdwar, T. A. Rao, Nos. 6712, 7182 & 7202, Alt. 2000-3000 m.
- Chrysopogon fulvus* (Spreng.) Chiov.
Syn. *C. montanus* Trin. FBI. 7 : 193.
A tall grass with long blades and arrow on a long stalk.
Bogdwar & Rathi, T. A. Rao, No. 7174, Alt. 2000-3000 m.
- Poa alpina* L. FBI. 7 : 338.
An alpine tufted grass with parti-coloured spikelets.
Martoli & Milam bugyals, T. A. Rao, Nos. 6830, 6856 & 6860, Alt. 4000-5200 m.
P. annua L. FBI. 7 : 345.
A stoloniferous grass with geniculate stems with green or purplish spikelets.
Kalamuni pass & Milam, T. A. Rao, Nos. 6639 & 6972, Alt. 3000-5200 m.
P. pratensis L. FBI. 7 : 339.
A tall stoloniferous grass with truncate or subovate ligule and green orate spikes.
Martoli & Milam bugyals, T. A. Rao, No. 6938, Alt. 4000-5200 m.
- Festuca polycolea* Stapf. FBI. 7 : 349.
A densely tufted grass with greenish spikelets, leaves 5 nerved.
Milam bugyals, T. A. Rao, No. 7047, Alt. 4000-5200 m.

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F. valesiaca Schleich. FBI. 7 : 348.

A perennial grass with setiform leaves and contracted panicle.

Martoli & Milam bugyals, T. A. Rao, No. 6996, Alt. 4500-5200 m.

Thamnocalamus spathiflorus (Trin.) Munro

Syn. *Arundinaria spathiflora* Trin. FBI. 7 : 382.

A gregarious shrub having tassellate reticulated leaves.

Local name: THAM or Ringal bamboo.

Samadhura, Bogdwar, T. A. Rao, Nos. 6555 & 7130. Alt. 1615-3000 m.

Eulaliopsis binata (Retz) C. E. Hubbard

Syn. *Andropogon binatus* Retz. FBI. 7 : 129.

A paper yielding grass.

Ticksane, T. A. Rao, No. 6724, Alt. 2000-3000 m.

FILICINEAE

Osmunda claytoniana L.

A latescent fern with sori.

Bogdwar & Martoli bugyals, T. A. Rao, No. 6801 & 6875, Alt. 3000-4500 m.

Asplenium septentrionale Hoffm.

A rock fern with sori.

Bogdwar & Martoli, T. A. Rao, No. 6808, Alt. 3000-5200 m.

Polypodium ebenipes Hk.

A fern on rocks.

Rathi & Bogdwar, T. A. Rao, No. 6714, Alt. 2000-3000 m.

P. linearis Thunb.

An epiphytic fern.

Bogdwar-Martoli, T. A. Rao, No. 6765, Alt. 3000-4000 m.

P. flocculosum Don.

An epiphytic fern with sori.

Bogdwar & Rathi, T. A. Rao, Nos. 7184 & 7219, Alt. 2000-3000 m.

Woodwardia radicans Smith

A fern on rocks with sori.

Rathi & Bogdwar, T. A. Rao, Nos. 6722 & 7166, Alt. 2000-3000 m.

Pteris longifolia L.

A sciophytic fern on rocks with sori.

Tejum-Samadhura, T. A. Rao, No. 7214, Alt. 1350-1615 m.

Adiantum venustum Don.

A sciophytic fern in moist soil.

Bogdwar-Rathi, T. A. Rao, No. 7163, Alt. 2000-3000 m.

Onychium multisectum F. Henderson

A fern on rocks with much dissected leaves.

Kapkot-Samadhura, T. A. Rao, No. 6552, Alt. 1300-1615 m.

LYCOPODIACEAE

Lycopodium annotinum L.

An epiphyte with strobilus.

Bogdwar bugyals, T. A. Rao, No. 7123, Alt. 3000-4000 m.

EQUISETACEAE

Equisetum arvense L.

A horsetail with cones.

Martoli bugyals, T. A. Rao, No. 6822, Alt. 4200-5200 m.

FUNGI

Lycoperdon sp.

Martoli bugyals, T. A. Rao, No. no, Alt. 5000 m.

Calvatia sp.

Martoli bugyals, T. A. Rao, No. no, Alt. 5000 m.

Morchella sp.

Milam bugyals, T. A. Rao, No. no, Alt. 4500 m.

ALGAE

Cladophora sp.

Glacial kunds at Milam, T. A. Rao, No. no, Alt. 4000 m.

LICHENS

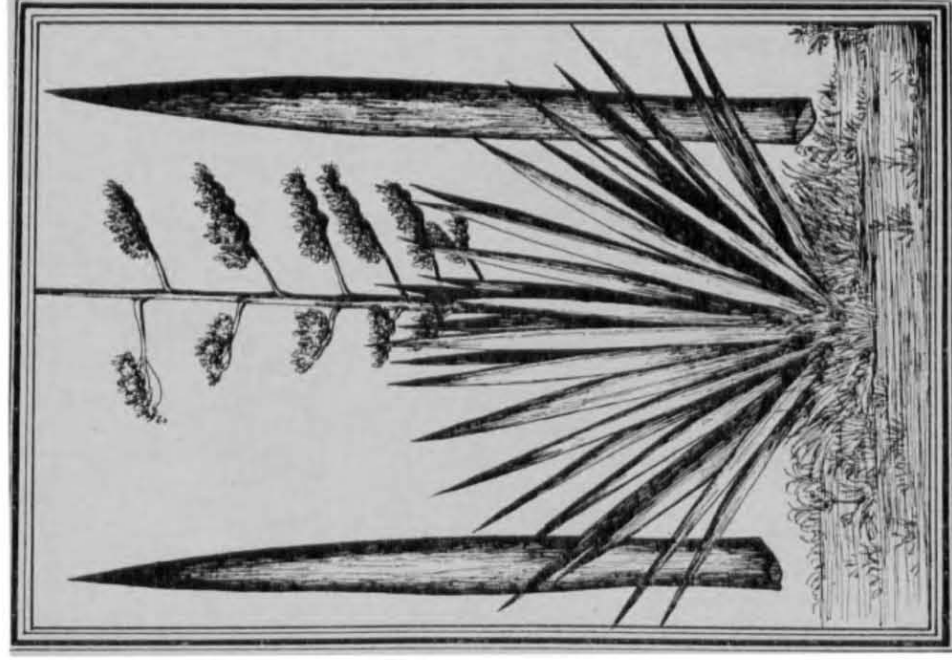
Usnea sp. (on *Quercus* sp.)

Bogdwar-Martoli, T. A. Rao, No. no, Alt. 3000-4000 m.

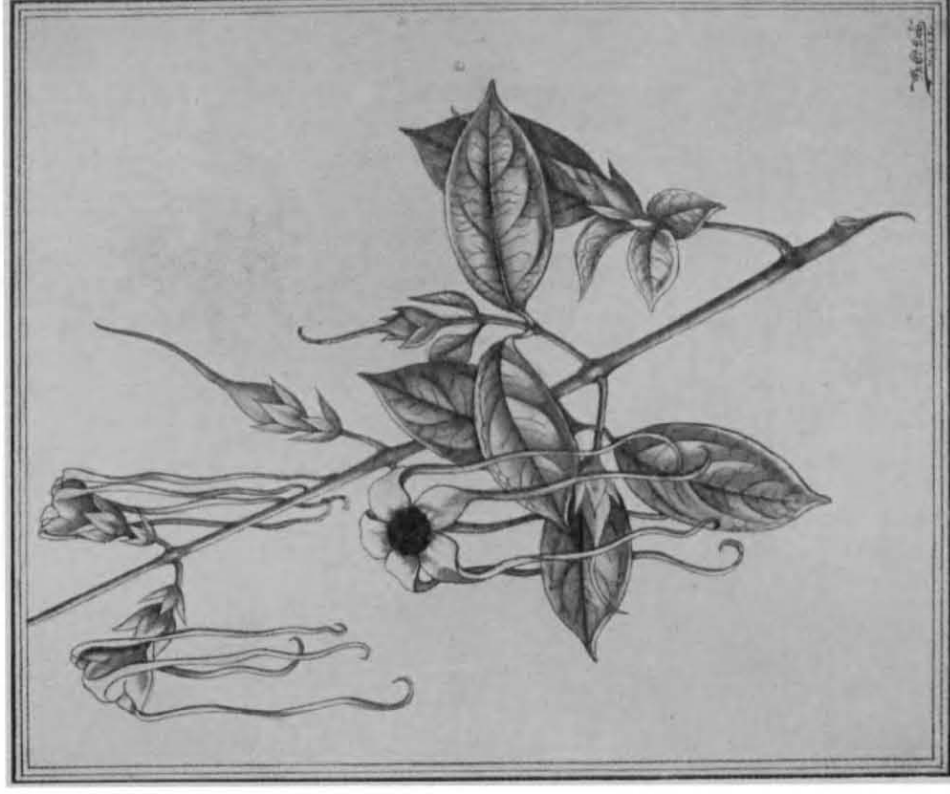
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CORTISONE FROM VEGETABLE SOURCES



AGAVE SISALANA Perrine.

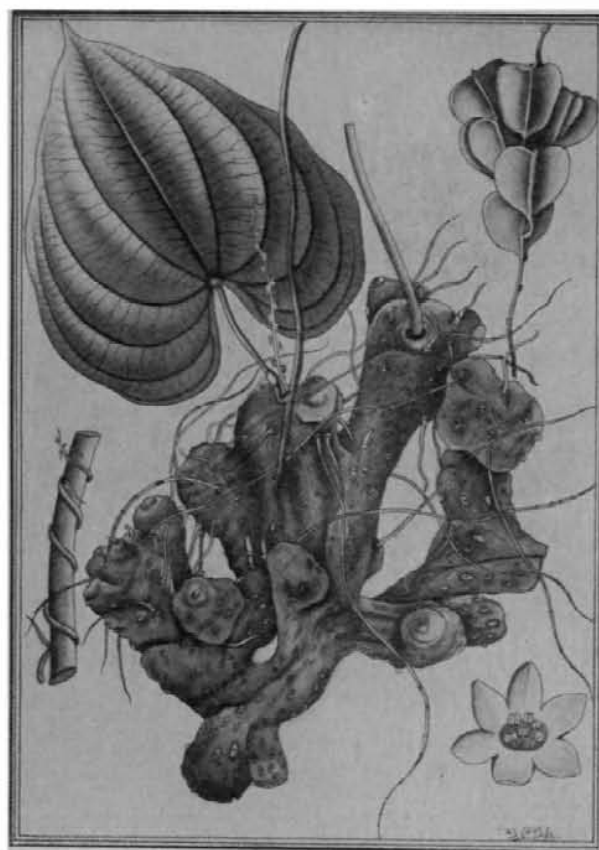


STROPHANTHUS SARMENTOSUS DC.

CORTISONE FROM VEGETABLE SOURCES



DIOSCOREA DELTOIDEA Wall.



DIOSCOREA PRAZERI Prain & Burkill.