

A BOTANICAL TOUR IN THE RAJMAHAL HILLS OF BIHAR

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ABSTRACT

The paper presents the main features of geology, topography, climate and vegetation met with in Rajmahal hills and enumerates 364 species of angiosperms, 13 species of Pteridophytes, and 16 species of mushrooms collected during a short tour undertaken in December, 1957. An analysis of different plant communities characterising various habitats and of the floristics and distribution of species collected brings up 9 species viz. *Arthraxon castratus* (Griff.) Narayanaswami, *Bidens biternata* (Lour.) Merr. & Sherff., *Carpesium cernuum* Linn., *Cyathula prostrata* Bl., *Echinocarpus murex* Benth., *Epilobium angustifolium* Linn., *Evolvulus nummularius* Linn., *Hygrophila salicifolia* T. And., *Inula eupatorioides* DC. as new records of species and *Cyathula* as new record of genus for Bihar. A new combination, viz. *Embelia tsjeriam-cottam* (R. & S.) A. DC. var. *ferruginea* (Wall.) Panigrahi comb. nov. is proposed.

INTRODUCTION

Botany of Bihar and Orissa (Haines 1925) presents a very comprehensive treatment of the vegetation and flora of the hills and forests of Bihar in particular. Subsequently, Mooney's supplement (1950) which deals mainly with the flora of Orissa, records 183 species occurring as new records for Orissa, although there are random references in his supplement to a few species occurring in Bihar alone. But Haines (1925, p. vii) admits that his herbarium "is exceedingly deficient in the flora of the open country and in that of jheels and tanks as well as epiphytic orchids, collections of which entailed more time than could be given".

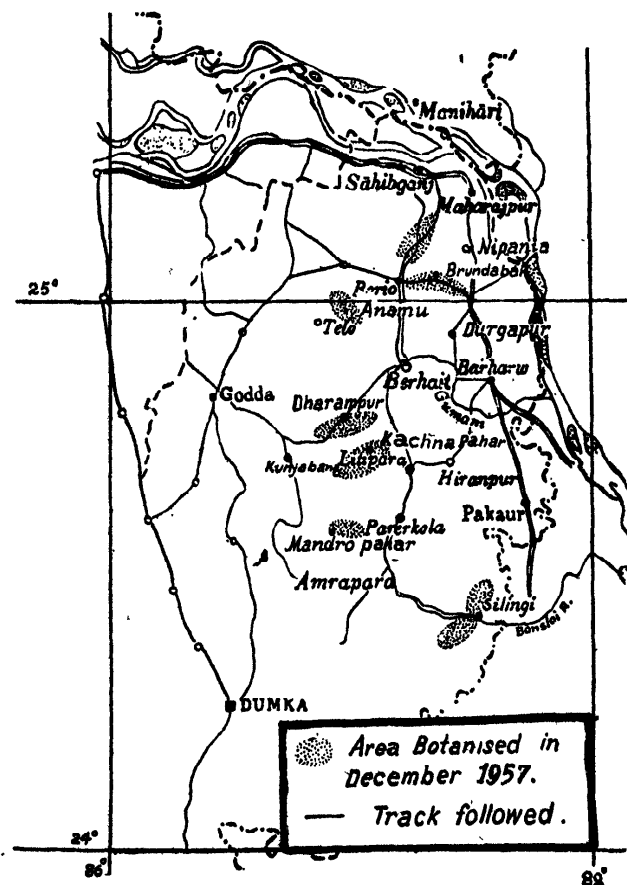
Bearing in mind the inadequacy of our knowledge on the vegetation and flora of India in general and in pursuance of a well-planned programme of botanical collection and exploration of Eastern India (Rao and Panigrahi 1959), a botanical tour was undertaken by me in Rajmahal Hills of Bihar. The tract covered lies between $24^{\circ}20'-25^{\circ}20'$ N and $87^{\circ}20'-87^{\circ}50'$ E and is bounded by the river Ganges in the north and Bonsloi in the south, the railway lines in the east and Sahibganja-Borio and Silingi in the west (Map). During this tour, undertaken over a period of 13 days in the second and third weeks of December, 1957, various groups of plants belonging to 556 field nos. were collected.

An analysis of these floristic elements brings about the occurrence of 11 species discovered as new records for the flora of Bihar. Important characteristics of habitats, exact locality of occurrence followed by field numbers and degree of abundance of the species in the area, are appended to each species. Correct nomenclature is used as far as practicable.

GEOLOGY, TOPOGRAPHY AND SOIL

Rajmahal hills of Bihar form the northern limit

of the "Central tract", one of the three topographical divisions to which Haines (1925) divides Bihar and Orissa. These hills form a long broad-back-



Map of Rajmahal Hills, Bihar.

bone in the Santal Parganas running south to north and almost abutting on to the Ganges. They belong to the upper Gondwana system and correspond to Jurassic age. The hills of Brundaban and Anamu, both lying within a radius of 12 km from Borio and the hill slopes of Dharampur and

Nipania villages show intercalations of clay, carbonaceous shale and siliceous porcellanoid shale. Once proverbially rich with fossils, Nipania hills and rice fields are now almost without any, being subjected to frequent visits by paleobotanists whereas hills of Brundaban, Anamu and Dharampur yet untrodden by fossil botanists contain an abundance of beautifully preserved fossil plants in form of impression of *Ptilophyllum* leaves. Two excellent casts of a stem were collected from Anamu Hills proper and these are now being worked upon by D. D. Pant of the Allahabad University.

The highest altitude in the area visited is about 340 m (Kachna pahar) whereas most of the areas are low tracts (30 m to 150 m) of undulating country comprising isolated hillocks with flat tops and ridges with intertrappean beds. Bonsloi and Gumani rivers, which rise in these hills are the only big rivers cutting their channels exposing the underlying gneiss. Near the river banks, soil is generally alluvial and sandy, but on the hills and hill sides, soil is rocky, sandy and brown and covered over by trap boulders. The higher hills are capped by laterite whereas the valleys are made up of cotton soil formed as a product of trap.

CLIMATE

Bihar enjoys a monsoon climate; dry and comparatively cool season prevailing from mid-October to mid-February; a dry hot season from mid-February to June and warm wet season from July to September. Rajmahal and Pakaur on the east enjoys 1325 mm and 1500 mm of annual rainfall respectively whereas Godda to the west receives only 1175 mm and Dumka to the south 1425 mm, there being no rainfall at all in the months of November and December.

There are great differences between temperature and relative humidity between day and night and very heavy dew falls at night. Due to drought and less of rain in 1957, the average temperature was high (22.8°C.) and average percentage of humidity (55) was rather low.

VEGETATION

The Rajmahal and the surrounding hills, according to Walter Hamilton (of Haines l.c. p. vii) consisted of "wild and wooded countries affording little or no revenue or supplies... so much overgrown with thick jungles that no army of any considerable number or equipment could penetrate them" as late as 1820. At present the vegetation of the entire Rajmahal tract is very much disturbed

by biotic interference. Although most of Rajmahal hills are included in the large Government estate of the Damin-i-Koh, the forests are not reserved and these display rapid denudation due to biotic factors and soil erosion. The "Korwa" practice of the Santhal and Paharia tribes inhabiting these hills, who have systematically carried on deforestation work after obtaining Govt. lease, has left the once jungle-clad hill tops and valleys almost completely barren. The hill slopes of Kachna pahar have now almost lost their forest cover and are now studded with rectangular blocks of cleared patches devoted to 'jhuming' cultivation. The hills just in front of the Parerkola Inspection bungalow, covered with thick impenetrable forests upto 1937 (cf. Survey of India topographical sheet), exhibit their naked flat tops at present owing largely to woodman's axe.

At places, the forest is found to be comparatively less disturbed such as over a stretch of about 7 miles between Borio and Brindaban, on Kachna pahar near Kunjabana, on Mandro pahar lying between Nipania and Dumurchira off Parerkola and again along the banks of Bonsloi river near Silingi etc. These forests may be classed under dry deciduous forest type (Rao & Panigrahi 1961) and are essentially tropophilous exhibiting marked xerophytic tendency. No where even a pocket of true "rain forest" is met with in Rajmahal hills.

These tropical dry deciduous forests are characterised by *Shorea robusta* Gaertn. f. (Sal) as the principal tree species occurring as pure stands at certain places viz., Bansloi river bank. Generally, however, Sal has a number of co-dominants, the chief amongst which are *Terminalia tomentosa*, *Anogeissus latifolia*, *Careya arborea* and *Pterocarpus marsupium*.

PLANT COMMUNITIES

The floristic elements met with and collected from different parts of the areas visited may be classed into the following plant communities on an ecological basis:

AREAS MOSTLY WITH FOREST TREE COVER

While *Shorea robusta* and *Terminalia tomentosa* associated with *Buchanania lanzan*, *Bridelia squamosa*, *Mallotus philippensis*, occur almost throughout the area under study, the first two species attain their best growth in low moist valleys. These species grow mixed with *Anogeissus latifolia*, *Bridelia stipularis*, *B. tomentosa*, *Cassia fistula*, *Cleidion javanica*, *Diospyros melanoxylon*, *Kydia calycina*, *Lagerstroemia parviflora*, *Madhuca longifolia*,

Morinda angustifolia, *Oroxylum indicum*, *Pterocarpus marsupium*, *Semecarpus anacardium*, *Terminalia bellerica* etc. in Borio-Dharampur-Brundaban forest section; with *Acacia catechu*, *Dillenia pentagyna*, *Embllica officinalis* etc. in the forest surrounding Dharampur; with *Alstonia scholaris*, *Callicarpa arborea*, *Croton roxburghii*, *Ficus rumphii*, *Wrightia tomentosa* on Kunjabana-Kachna pahar forest, and with only *Adina cordifolia*, *Anthocephalus cadamba*, *Embelia tsjeriamcottam* on Mandro pahar. *Tectona grandis* plantations are met with only at Hirapur, off Durgapur.

The small trees, shrubs and undershrubs in these forests are represented by *Antidesma diandrum*, *Breynia rhamnoides*, *Croton roxburghii*, *Helicteres isora*, *Moghania strobilifera*, *M. chappar*, *Nyctanthes arborescens*, *Symplocos racemosa* and *Thespesia lampas* etc. *Butea monosperma* and *Woodfordia fruticosa* occupy more sunny situations throughout this area whereas *Ardisia solanacea*, *Murraya paniculata*, *Tabernaemontana divaricata* occupy shady and sheltered corners in the forests of Silingi only. *Zingiber casumunar* occurs as a common undergrowth in the forests of Mandro pahar. Amongst the lianes *Butea parviflora*, *Combretum roxburghii*, *Millettia auriculata*, *Mucuna prurita*, *Ventilago calyculata* are more conspicuous, whereas *Abrus precatorius*, *Dioscorea* spp., *Mukia scabrella*, *Porena paniculata*, *Smilax macrophylla* are the more common climbers in the area.

Dendrophthoe falcata with its profusely red flowers and young red leaves, as a hemi-parasite, perches on any tree species throughout the area. *Vanda tessellata* is the most abundant epiphytic orchid species whereas *Oberonia falconeri* occurs rather sparingly in the area.

The fern flora is represented by only a few species of *Adiantum*, *Cyclosorus*, *Heterogonium* and *Pteris* on Kachna pahar (340 m) and near Silingi where higher percentage of humidity is prevalent. *Selaginella* and wood-rotting fungi viz., *Daedalea flavida* are very common whereas lichens and bryophytes are conspicuously rare at least during the month of December.

THORN-SCRUB

"Thorn scrubs" met with between Sahibganja and Borio and elsewhere, comprise of the thorny and spinescent species viz. *Aegle marmelos*, *Zizyphus mauritiana*, *Z. oenophia*, *Acacia nilotica* subsp. *indica*, *A. catechu*, *A. concinna*, *Caesalpinia bonduc*, mixed with *Calotropis gigantea*, *Holarrhena antidysenterica*, *Nyctanthes arborescens* among the shrubs and *Eranthemum purpurascens*, *Elephantopus scab-*

er, *Barleria cristata*, *Sida acuta*, *Anisomeles indica*, *Andrographis paniculata*, *Aerva lanata*, *Apluda mutica* and *Eragrostis gangetica* as the undershrubs. *Cuscuta reflexa* occurs as a common parasite and form a nettled appearance on many shrubs. Haines considers the thorn-scrubs of Bihar and Orissa as induced, resulting from selective cutting and browsing. He maintains that these induced scrub would gradually give way to less thorny species with the protection of forests.

WASTE GROUNDS AND PASTURES

The hill slopes and flat grounds denuded of forest cover and other waste grounds, such as at Sahibganja, Nipania village, Silingi and elsewhere, develop a different plant community comprising of *Calotropis gigantea*, *Zizyphus mauritiana*, *Vitex negundo* associated with *Aerva lanata*, *Achyranthes aspera*, *Argemone mexicana*, *Chrozophora prostrata*, *Eragrostis* spp., *Evolvulus alsinoides* and *Volvuropsis nummularia*, *Knoxia sumatrensis*, *Leucas* spp., *Martynia annua*, *Scoparia dulcis*, *Striga euphrasioides*, *Tridax procumbens* in general.

In open grazing grounds, *Amaranthus spinosus*, *Boerhaavia diffusa*, *Borreria articularis*, *Cleome viscosa*, *Cocculus hirsutus*, *Evolvulus alsinoides*, *Volvuropsis nummularia*, *Hybanthus suffruticosus*, *Peristrophe bicalyculata*, *Rungia parviflora* and *Solanum surattense* are found in association. *Aerva sanguinolenta*, *Schizachyrium brevifolium* and *Heteropogon contortus* occur in rocky places devoid of Sal.

In open plain areas, *Acacia nilotica* subsp. *indica*, *Aegle marmelos*, *Borassus flabilifer*, *Phoenix sylvestris*, *Mangifera indica*, *Madhuca longifolia*, *Azadirachata indica* A. Juss., *Spondias pinnata* etc. are the common tree species.

On damp ground and on alluvial silt, on the other hand, the community of *Alternanthera sessilis*, *Blumea flava*, *Commelina haskarlui*, *Croton bonplandianus*, *Cyathula prostrata*, *Eragrostis gangetica*, *Justicia simplex*, *Lippia geminata*, *Limnophila rugosa*, *Marsilea minuta*, *Ocimum canum*, *Sida acuta*, *Solanum nigrum*, *Sorghum nitidum* and *Telanthera philoxeroides* flourish well.

MARSHES AND TANKS

There are many large perennial tanks which, in fact, represent natural depressions in the flat cultivated rice fields in the area. Margins of these tanks, bunds of rice fields and banks of rivers are inhabited by a community of *Ammania multiflora*, *Hygrophila auriculata*, *Blumeopsis falcata*, *Hydrolea zeylanica*, *Ipomoea repens*, *Ludwigia octovalvis*

subsp. *sessiliflora*, *Nymphoides indicum*, *Lindernia anagalis*, *Marsilea minuta*, *Murdannia spirata*, *Nymphaea pubescens*, *Ottelia alismoides*, *Smithia sensitiva*, *Sacciolepis interrupta*, *Vallisneria spiralis* etc. which occur either as submerged or floating on water.

Amongst the frost hardy species *Aegle marmelos*, *Bauhinia purpurea*, *Embelia tsjeriam-cottam*, *Emblia officinalis*, *Lagerstroemia parviflora*, *Mallotus philippensis*, *Woodfordia fruticosa* are found in the area together with a few frost tender species viz. *Sal*, *Dillenia pentagyna* etc.

The ten dominant families in respect of their species numbers, represented in the collections are:

Leguminosae	— 51 spp.	Rubiaceae	— 15 spp.
Gramineae	— 34 „	Amaranthaceae	— 15 „
Compositae	— 24 „	Malvaceae	— 12 „
Euphorbiaceae	— 18 „	Cyperaceae	— 12 „
Acanthaceae	— 17 „	Labiatae	— 12 „

NEW RECORDS FOR BIHAR

The genus *Cyathula*, as well as the species, *Arthraxon castratus* (Griff.) Narayanaswami, *Bidens biterinata* (Lour.) Merr. & Sherff., *Carpesium cernuum* Linn., *Cyathula prostrata* Bl., *Echinocarpus murex* Benth., *Epilobium angustifolium* Linn., *Voluropsis nummularia* Linn., *Hygrophila angustifolia* R. Br., *Inula eupatorioides* DC., as the wild species, varieties and *Chrysanthemum indicum*, *Gomphrena globosa*, *Portulaca pilosa* var. *hortualis* Roxb. as species of horticultural interest are new records for Bihar. The broad features of their morphology and exact localities of occurrence are given against the respective species in the enumeration.

An analysis of the distributional range of the species collected brings out certain interesting points regarding phytogeographical relationships of the flora of Bihar. While certain species viz. *Aeschynomene indica*, *Vernonia anthelmintica* etc. extend from Kashmir to Assam and through Bihar to Ceylon, *Cyathula prostrata*, *Hypericum japonicum*, *Desmodium gangeticum*, *Moghania strobilifera*, *Thespesia lampas* etc. common to Bihar, Ceylon and Assam Himalayas, appear to be absent from Kashmir. On the other hand, *Polygala crotalaroides*, *Reinwardtia trigyna*, *Sphaeranthus indicus* and *Wendlandia tinctoria* etc. though common to Bihar, Orissa and Assam Himalayas, have a more restricted range of distribution and seem to be absent from Kashmir and Ceylon.

ECONOMIC PLANTS

December is the harvesting season for paddy. Accordingly, many families of Santhal and Paharia

tribes were out in the fields busy cutting and bundling the paddy plants, whereas others at the village home, were seen storing paddy grains in granaries improvised with straw-made ropes.

Next to rice, was *Nicotiana rustica* in the eastern parts of Rajmahal hills bordering upon West Bengal; hundreds of acres of flat fields bore a luxuriant growth of these tobacco plants in December.

Guizotia abyssinica, an introduced species from Africa with its deep yellow ray florets, coloured many acres of the country-side of Durgapur-Sibpahar section in this season. Its black seeds are said to be used as a dileutent with mustard seeds to facilitate extraction of oil.

Plantations of *Carica papaya* are quite popular in Dharampur. The fruit which is usually more than 30 cm in length is very delicious. One ripe fruit was cut and served to the delight of about six persons of the Botanical Survey party who, however, could not consume more than half the fruit.

The ash of the dry leaves of *Terminalia tomentosa* with properties of "Washing Soda" is freely used by the Santhals of Dharampur for cleaning their clothes.

While a few clumps of *Rauvolfia serpentina* was seen cultivated round about the villages, *Cissus quadrangularis* popularly known as "Hath-jora", "Asthi-sanchar" etc. throughout Rajmahal hills, is used for joining and rejuvenating the fractured bones. Yet, the species is extremely rare in wild state in the area and only 2-3 cuttings were shown to me by the "Gan Bora" of Dharampur, as a treasured plantation within forest undergrowth, about 1 furlong away from the village.

ENUMERATION*

DILLENACEAE

Dillenia pentagyna Roxb.

Occasional, Dharampur 11770.

ANNONACEAE

Annona squamosa Linn.

Occasional, Dharampur 11827.

MENISPERMACEAE

Cocculus hirsutus (Linn.) Diels

Flowering, occasional, Borio 11670.

Tinospora malabarica Miens

On *Thespesia*, occasional, Sahibganja 11614.

*For reference as "collector", "PANIGRAHI" may be cited. All the species enumerated, were collected in December, 1957.

NYMPHAEACEAE

Nymphaea pubescens Willd.

Flowering, occasional, Dharampur tank 11805.

N. nouchali Burm. f. var. **versicolor** (Roxb.) comb. nov.

In a shallow pond, flowering, occasional, Durgapur 12137.

CRUCIFERAE

Rorippa indica (Linn.) Hiern

On black alluvial soil in drain, flowering, occasional, Sahibganja 11617.

Raphanus sativus Linn.

Widely cultivated, flowering, Silingi 12047.

CAPPARIDACEAE

Cleome viscosa Linn.

Weed in cultivated fields, flowering, occasional, Silingi 12016, 12041.

C. gynandra Linn.

Flowering & fruiting, occasional, Dharampur 11792, Kunjabana 11894.

VIOLACEAE

Hybanthus suffruticosa (Linn.) Baill. ex Lanessy

In the crevices of rocks, flowering, scarce, Silingi 12017.

POLYGALACEAE

Polygala crotalarioides Buch.-Ham. ex DC.

Fruiting, occasional, Silingi 12120.

PORTULACACEAE

Portulaca pilosa Linn. var. **hortualis** Bailey.

Cultivated, flowering, Borio 11697. (*Lakshman Buti* - Hindi). New record for Bihar.

HYPERICACEAE

Hypericum japonicum Thunb.

Next to water edge of a pond, flowering, occasional, Dharampur 11830.

DIPTEROCARPACEAE

Shorea robusta Gaertn. f.

Dominant forest species, Silingi, Parerkola, Borio 1164.

MALVACEAE

Abelmoschus moschatus Medic.

Fruiting, occasional, Kunjabana 11910.

A. manihot (Linn.) Medic.

Fruiting, occasional, Borio 11728.

Abutilon indicum G. Don

Flowering & fruiting, occasional, Dharampur 11789.

Hibiscus cancellatus Roxb.

Fruiting, scarce, Mandro pahar 11977.

H. cannabinus Linn.

Widely cultivated. Flowering & fruiting, Dharampur 11786.

H. pungens Roxb.

Fruiting, occasional, Brindaban 11722.

H. rosa-sinensis Linn.

Cultivated. Flowering, Amjhari-Silingi 12062.

Kydia calycina Roxb.

Flowering & fruiting, occasional, Borio 11717.

Sida acuta Burm. f.

Flowering & fruiting, occasional, Borio 11637.

S. rhombifolia Linn.

Flowering, occasional, Kunjabana 11861.

Thespesia lampas (Cav.) Dalz. & Gibs.

Occasional, Borio 11729.

Urena lobata Linn.

In dry soil or bank of rice fields. Flowering & fruiting, occasional, Parerkola, Borio 11655.

STERCULIACEAE

Helicteres isora Linn.

Fruiting, occasional, Kachna 11926.

Melochia corchorifolia Linn.

In wet places and in fields. Flowering & fruiting, abundant, Silingi 12053.

Pentapetes phoenicea Linn.

Fruiting, scarce, Dharampur 11790.

TILIACEAE

Corchorus olitorius Linn.

Fruiting, fairly abundant, Dharampur 11798.

Echinocarpus murex Benth.

Fruiting, occasional, Kunjabana 11918.

Grewia glabra Bl.

In the edge of forest, fruiting, scarce, Parerkola 11998.

G. flavescens Juss.

Fruiting, occasional, Dharampur 11824.

LINACEAE

Linum usitatissimum Linn.

Cultivated, flowering, Durgapur 12150. (*Tisi* - Hindi).

Reinwardtia trigyna (Roxb.) Planch.

Flowering, occasional, Dharampur 11842.

OXALIDACEAE

Biophytum sensitivum DC.

In the shady banks of rice fields, flowering, fairly abundant, Kunjabana 11878.

RUTACEAE

Aegle marmelos Corr.

Fruiting, abundant, Borio 11694.

Murraya paniculata (Linn.) Jack.

Near a dried-up rivulet, fruiting, fairly abundant, Borio 11741.

OLACACEAE

Olex scandens Roxb.

Flowering & fruiting, occasional, Borio-Anamu hills 11665.

RHAMNACEAE

Ventilago calyculata Tul.

Fruiting, fairly abundant, Kunjabana 11941, Borio 11685.

Zizyphus mauratiana Lamk. non Mill.

In the edges of wheat fields, flowering, fairly abundant, Sahibganja 11610, Borio 11760.

Z. oenoplia Mill.

Flowering & fruiting, abundant, Borio 11671. (*Kana-Koli-Oriya*).

Z. rugosa Lamk.

Fruiting, fairly abundant, Borio 11759.

VITACEAE

Ampelocissus latifolia (Roxb.) Planch.

Fruiting, abundant, Borio 11682.

Cissus quadrangularis Linn.

It is reputed to be used in joining broken fractures of bones. Scarce, Dharampur 11796. (*Hath-Jora-Hindi*).

Leea acuminata Wall.

Fruiting, occasional, Kachna pahar 11928.

L. macrophylla Roxb. ex Horn.

Next to a swamp, fruiting, scarce, Silingi 12044.

SAPINDACEAE

Cardiospermum halicacabum Linn.

Fruiting, scarce, Kunjabana 11877.

ANACARDIACEAE

Buchanania lanzan Spreng.

Flowering & fruiting, fairly abundant, Borio 11763, Dharampur 11816, 11906. (*Chirongi, Achar-Hindi*).

Semecarpus anacardium Linn. f.

Fruiting, abundant, Borio 11704. (*Bhalia-Hindi*).

Spondias pinnata (Linn. f.) Kurz

Fruiting, fairly abundant, Borio 11751.

LEGUMINOSAE

Abrus precatorius Linn.

On *Vitex negundo*, *Duranta* & *Acacia* hedges, fruiting, fairly abundant, Kunjabana 11864, Borio 11706.

Acacia torta (Roxb.) Craib

Fruiting, occasional, Dharampur 11813.

A. catechu Willd.

On road side, fruiting, scarce, Borio 11672.

A. concinna DC.

In open fields and valleys not on hill sides, flowering, fairly abundant, Borio (2nd. mile from Sahibganja) 11629.

Aeschynomene indica Linn.

In swampy ponds, flowering & fruiting, occasional, Dharampur 11802.

Alysicarpus rugosus DC.

In the muddy swamp, flowering, scarce, Silingi 12033.

A. vaginalis DC. var. **nummularifolius** Baker

Flowering & fruiting, occasional, Kunjabana 11903.

Atylosia platycarpa Benth.

Commonly cultivated, fruiting, Dharampur 11818. (*Kulathi-Hindi*).

A. scarabaeoides (Linn.) Benth.

Flowering & fruiting, occasional, Borio 11688, Dharampur 11815. (*Kulathia-Hindi*).

Bauhinia purpurea Linn.

On road sides, flowering, occasional, Borio 11647.

Butea parviflora Roxb.

Flowering, occasional, Silingi 12008, 12112.

Caesalpinia bonduc Linn. emend. Dandy & Exell

On road side, fruiting, scarce, 92 miles to Borio 11645. (*Gila-Oriya*).

Cajanus cajan (Linn.) Millsp.

Widely cultivated, flowering, Kunjabana 11863 (*Arhar-Hindi*).

Cassia fistula Linn.

Fruiting, occasional, Borio 11749.

C. hirsuta Linn.

Introduced, flowering & fruiting, Dharampur 11823.

C. occidentalis Linn.

On dry hill slopes, fruiting, abundant, Borio 11991, Mandro 11643.

Crotalaria alata Buch.-Ham.

Cultivated, flowering, Silingi 12095.

C. albida Heyne

Flowering & fruiting, fairly abundant, Dharampur 11810, Kunjabana 11880.

C. sericea Retz.

Growing under the shade of mango tree, flowering & fruiting, scarce, Brindaban forest 11719.

C. calycina Schrank

Flowering, fairly abundant, Rajmahal hill and Silingi-Bonsloi river 11634.

C. prostrata Roxb.

Flowering & fruiting, occasional, Borio 11644.

Cicer arietinum Linn.

Cultivated, flowering & fruiting, Durgapur 12134.

Desmodium microphyllum (Thunb.) DC.

In the crevices of boulders, in the edge of sal forest, fruiting, occasional, Silingi 12015.

D. triangulare (Retz.) Merr.

Fruiting, occasional, Dharampur 11841.

D. gangeticum DC.

Flowering & fruiting, fairly abundant, Dharampur 11779.

Desmodium motorium (Houtt.) Merrill

Next to a swamp, flowering & fruiting, scarce, Silingi 12074.

D. heterocarpon (L.) DC.

In the dry rocky hills, fruiting, occasional, Kachna pahar 11896, Borio 11653.

D. pulchellum (Linn.) Benth.

Along roadside, fruiting, occasional, Dharampur 11808.

D. triflorum (Linn.) DC.

Fruiting, occasional, Dharampur 11820.

Dolichos lablab Linn.

Cultivated, flowering, Silingi 12050, 12051, 12097. (*Sima-Oriya*).

Dumasia villosa DC.

Fruiting, scarce, Borio 11745.

Indigofera hirsuta Linn.

In open ground along with "thatch" grass, fruiting, fairly abundant, Dharampur 11807.

I. linifolia Retz.

Flowering & fruiting, fairly abundant, Dharampur 11812.

Lathyrus sativus Linn.

Cultivated widely, flowering, Sahibganja 11613.

Milletia auriculata Baker

Fruiting, abundant, Borio 11649.

Mimosa himalayana Gamble

Common, fruiting, Borio 11673.

M. pudica Linn.

Along the ditches of roadside & on open ground, fruiting, abundant, Borio 11755.

Moghania chappar (Ham. ex Benth.) O. Ktze.

Abundant, Silingi 12078, Borio 11705.

M. strobilifera (Linn.) St. Hil. ex Jacks.

Flowering & fruiting, fairly abundant, Silingi 12077.

Mucuna prurita Hook.

Fruiting, abundant, Borio 11686.

Phaseolus mungo Linn.

Cultivated, flowering & fruiting, Sahibganja 11607.

Pterocarpus marsupium Roxb.

Fruiting, fairly abundant, Borio 11747.

Sesbania aegyptiaca Pers.

Flowering & fruiting, scarce, Anamgachii 12124. (*Mandar-Mali-Beng.*).

S. bispinosa (Jacq.) W. F. Wight

Flowering & fruiting, scarce, Borio 11696.

Smithia sensitiva W. Ait.

Weeds in rice fields, flowering & fruiting, fairly abundant, Parerkola 11972.

Tephrosia purpurea Pers.

Flowering & fruiting, abundant, Mandro 11978, Sahibganja 11693.

Vicia hirsuta Koch.

Weeds in cultivated fields, flowering, abundant, Durgapur 12135.

V. tetrasperma Moench

Weeds in cultivated fields, flowering, abundant, Durgapur, 12136.

Vigna sinensis (Linn.) Savi ex Hassk.

Cultivated, flowering, Kunjabana 11916. (*Berbat-Hindi*; *Borgudi-Oriya*).

COMBRETACEAE

Anogeissus latifolia Wall.

Fruiting, abundant, Borio 11734, Parerkola 12003. (*Dhaura-Hindi*).

Combretum roxburghii Spreng.

On many trees near nalas and wet places, flowering, abundant, Dharampur 11844.

Terminalia bellerica (Gaertn.) Roxb.

Fruiting, scarce, Borio 11678.

MYRTACEAE

Careya arborea Roxb.

Fruiting, abundant, Mandro pahar 11990.

LYTHRACEAE

Ammannia multiflora Roxb.

Weeds in rice fields, flowering & fruiting, abundant, Borio 11716, Kunjabana 11867.

Lagerstroemia parviflora Roxb.

Fruiting, fairly abundant, Borio 11750.

Lawsonia inermis Linn.

Fairly abundant in villages, flowering & fruiting, Borio 11703, Silingi 12073.

Rotala indica (Willd.) Koehne

In wet muddy rice fields, flowering, Kunjabana 11879.

Woodfordia fruticosa (Linn.) Kurz

Flowering in December, abundant, Kunjabana 11915, Dharampur 11845, Borio 11715, Silingi 12113.

ONAGRACEAE

Epilobium angustifolium Linn.

Next to water edge of a pond and in swamps near a hill stream, flowering & fruiting, scarce, Parerkola 11970, Silingi 12054. New record for Bihar.

Ludwigia octovalvis (Jacq.) Raven. subsp. *sessiliflora* (Mich.) Raven.

Flowering, abundant, Dharampur 11839. (*Dhai-Hindi*).

CARICACEAE

Carica papaya Linn.

Cultivated throughout the area, flowering, Kunjabana 11853.

CUCURBITACEAE

Cucumis melo Linn.

Weeds in wheat fields, flowering & fruiting, abundant, Sahibganja 11615.

Gymnopetalum cochinchinense Kurz

Fruiting, fairly abundant, Dharampur 11835.

Luffa cylindrica (Linn.) M. V. Roem.

Cultivated, flowering & fruiting, Dharampur 11787, (Tarada-Oriya).

Lagenaria siceraria (Molina) Standby

Cultivated, flowering & fruiting, Sahibganja 11625. (Lau-Oriya).

Mukia scabrella Arn.

Flowering & fruiting, fairly abundant, Kunjabana 11908, Silingi 11897.

UMBELLIFERAE

Trachyspermum ammi (Linn.) Sprangue.

Cultivated, flowering, Dharampur 11772.

RUBIACEAE

Adina cordifolia (Roxb.) Hook. f. ex Brandis.

Flowering, fairly abundant, Borio 11762, Mandro 11981. (Keli Kadamba-Oriya).

Anthocephalus cadamba Miq.

Flowering, scarce, Mandro 11994.

Borreria articularis (Linn. f.) F.N. Will.

Flowering, fairly abundant, Silingi 12009, Dharampur 11836.

Spermadictyon suaveolens Roxb.

In edges of forest, flowering, abundant, Brindabana 11642, Anamu 11667.

Hedyotis hispida Retz.

Flowering, abundant, Durgapur 12148.

H. pinifolia Wall.

On shaded rock boulders with scanty soil cover in the bank of a dried-up stream, fruiting, scarce, Silingi 12059.

Hymenodictyon excelsum Wall.

In the edge of forest, fruiting, fairly abundant, Borio 11754.

Knoxia sumatrensis (Retz.) DC.

In the shade of bushes on scanty soil cover on rocks, along with *Heteropogon contortus*, flowering & fruiting, fairly abundant, Borio 11736, Silingi 12066.

Mitragyna parvifolia (Roxb.) Korth

Flowering, abundant, Mandro pahar 11981.

Morinda angustifolia Roxb.

Fruiting, scarce, Borio 11679. (Achu-Oriya).

Oldenlandia diffusa Roxb.

In the mud and swamps, flowering & fruiting, scarce, Parerkola 12007.

O. herbacea (Linn.) Roxb.

In the mud and swamps, flowering and fruiting, scarce, Silingi 12040.

Pavetta crassicaulis Bremk.

Fruiting, scarce, Borio 11730.

Randia brandisii Gamble

Flowering & fruiting, abundant, Dharampur 11753, Mandro 11993, Kachna pahar 11917, Silingi 12043. (Donduk-Hindi).

Wendlandia tinctoria DC.

Flowering, scarce, Borio 11757.

COMPOSITAE

Adenostemma lavenia (Linn.) Ktze.

In swampy rice fields, flowering, abundant, Amjhari spring 12070.

Ageratum conyzoides Linn.

Weeds in black alluvium, flowering, abundant, Sahibganja 11622.

Bidens pilosa Linn.

Flowering, scarce, Kunjabana 11860.

B. biternata (Lour.) Merr. & Sherff.

Common, flowering & fruiting, Dharampur 11800. New record for Bihar.

Blumea fistulosa (Roxb.) Kurz

Flowering, scarce, Kunjabana 11914.

Blumeopsis falcata (D. Don) Merr.

Flowering, fairly abundant, Borio 11737, Parerkola 11973.

Caesulia axillaris Roxb.

In the swampy muddy drain, very common in all wet swampy rice fields upto Silingi. Flowering, Sahibganja, Borio 11688.

Carpesium cernuum Linn.

Fruiting, scarce, Kunjabana 11900. New record for Bihar.

Centanthrum anthelminticum (Willd.) Ktze.

Flowering & fruiting, abundant, Kunjabana 11858.

Chrysanthemum indicum Linn.

Cultivated, flowering, Dharampur 11834. Not recorded by Haines.

Cyathocline purpurea (Don.) Ktze.

On the bank of streams nearly dried up. Flowering, abundant, Parerkola, Nipania and Kunjabana, Dharampur 11832, Borio 11744.

Eclipta prostrata (Linn.) Linn.

On alluvial loam, fruiting, abundant, Sahibganja 11623, Kunjabana 11873.

Elephantopus scaber Linn.

Fairly abundant in forest floor. Flowering, Borio 11631.

Gnaphalium luteo-album Linn.

In rice fields in semi-dried mud, flowering, abundant, Durgapur 12146.

Guizotia abyssinica Cass.

Extensively cultivated. Flowering & fruiting, Durgapur 12126. (Surguja-Hindi).

Helianthus annuus Linn.

Cultivated, flowering, Kunjabana 11887.

Inula eupatorioides DC.

Along roadside. Flowering, scarce, Kachna 11936.
New record for Bihar.

Sphaeranthus indicus Linn.

In the swampy drain, flowering, scarce, Borio 11699.

Tridax procumbens Linn.

Common along roadsides and on open hill sides amidst grasses, flowering, fairly abundant, Borio 11652.

Vernonia cinerea Less.

Under the shade of trees, flowering, fairly abundant, Dharampur 11822, Sahibganja 11621.

V. roxburghii Less.

Associated with *Blumea glomerata* and *Blumea flava*, flowering, fairly abundant, Parerkola 11975, Borio 11740.

Vicoa indica (Willd.) DC.

On dry slopes of hills, flowering, fairly abundant, Durgapur 12149, Borio 11638.

Wedelia calendulacea Less.

In rice fields, flowering, abundant, Silingi 12070.

Xanthium strumarium Linn.

In the semi-dried mud of rice fields, flowering & fruiting, fairly abundant, Durgapur 12147.

CAMPANULACEAE

Lobelia alsinoides Lamk.

Next to a drain in the crevices of soil or amidst grasses, flowering & fruiting, scarce, Silingi 12029.

PLUMBAGINACEAE

Plumbago zeylanica Linn.

Fruiting, scarce, Dharampur 11788.

MYRSINACEAE

Ardisia solanacea (Poir.) Roxb.

In the wet ground next to a spring, fruiting, scarce, Silingi 12118.

Embelia tsjeriam-cottam (R. & S.) A. DC.

Fruiting, scarce, Parerkola 11999.

E. tsjeriam-cottam (R. & S.) A. DC. var. *ferruginea* (Wall.) Panigrahi comb. nov. (Basynym: *Embelia ferruginea* Wall. cat. n. 2310, 1828; *E. robusta* Roxb. var. *ferruginea* (Wall.) Clarke in Hook. f., F.B.I. 3:515, 1882.

A small tree upto 6 m, leaves and branches rusty tomentose, flowers creamy white. Rare. Rolla, Dandakaranya, Orissa, 18628.

SAPOTACEAE

Madhuca longifolia (Koenig.) MacBride

On open ground and also in the mixed forests on open hill slopes, flowering & fruiting, abundant, Borio 11702.

EBENACEAE

Diospyros peregrina (Gaertn.) Gurke

Along nallas, fruiting, scarce, Dharampur 11843.

D. melanoxylon Roxb.

Fruiting, abundant, Dharampur 11843, Silingi.

STYRACACEAE

Symplocos racemosa Roxb.

Flowering & fruiting, scarce, Kachna 11920, Bonsloi river bank 12071.

OLEACEAE

Jasminum multiflorum (Burm. f.) Andr.

Flowering, scarce, Borio 11743.

Nyctanthes arbortristis Linn.

Very common in all forests, flowering & fruiting, abundant, Sahibganja 11646.

APOCYNACEAE

Alstonia scholaris Brown.

Fruiting, fairly abundant, Kunjabana 11862.

Catharanthus roseus (Linn.) G. Don

In dry open fields of the hill sides, flowering & fruiting, fairly abundant, Parerkola 11969.

Carissa spinarum Linn.

Fruiting, scarce, Anamu 11666.

Holarrhena antidysenterica Wall.

Undershrubs in all forests, fruiting, abundant, Borio 11648.

Plumeria rubra Linn. forma *acutifolia* (Poir.) Woodson

Flowering, scarce, Silingi 12068.

Rauvolfia serpentina Benth. ex Kurz

Flowering & fruiting, scarce, Kunjabana 11865, Silingi 12096. (*Gada-Santhal*).

Tabernaemontana divaricata (Linn.) R. Br.

Cultivated, flowering, Silingi 12072.

Thevetia peruviana (Pers.) K. Schum.

Flowering & fruiting, scarce, Silingi 12069.

Wrightia tomentosa Roem. & Sch.

Fruiting, scarce, Kachna pahar 11924.

ASCLEPIADACEAE

Calotropis gigantea (Linn.) R. Br.

Along road sides, fairly abundant, Borio 11628.

Cryptolepis buchanani Roem. & Sch.

Forming canopy on shrubs, fruiting, scarce, Borio 11742.

Hemidesmus indicus (Linn.) Schult

Fruiting, fairly abundant, Dharampur 11801, Silingi 12023.

Marsdenia hamiltonii Wt.

Fruiting, scarce, Mandro pahar 11997.

Pergularia daemia (Forsk.) Chiov.

On road side shrubs, flowering & fruiting, scarce, Borio 11669.

GENTIANACEAE

Canscora decussata Roem. & Sch.

On rock boulders in shade, flowering & fruiting, scarce, Silingi 12058.

C. diffusa R. Br.

Along wet places in the shades of bushes, drains and streams, flowering, abundant, Dharampur 11771, Mohanpur river bank 11840, Kunjabana 11881.

Hopaea dichotoma Willd.

In the muddy rice fields, flowering, abundant, Kunjabana 11875, Dharampur 11819.

Nymphoides indicum (Linn.) O. Ktze.

In ponds, flowering & fruiting, scarce, Durgapur 12738.

HYDROPHYLLACEAE

Hydrolea zeylanica (Linn.) Vahl

In the muddy rice fields, flowering abundant, Parerkola 11967.

BORAGINACEAE

Ehretia laevis Roxb.

Flowering, scarce, Kachna pahar (300 m) 11925.

CONVOLVULACEAE

Cuscuta reflexa Roxb.

Flowering, abundant, Kunjabana 11886, Sahibganja 11636.

Erycibe paniculata Roxb.

Fruiting, scarce, Kachna pahar 11944.

Evolvulus alsinoides Linn.

In the rocky meadow, flowering, fairly abundant, Silingi 12004.

Ipomoea aquatica Forsk.

On mud and also floating on water, flowering, fairly abundant, Litipara 11942.

I. obscura (Linn.) Ker-Gawl.

Fruiting, scarce, Borio 11624, Silingi 12009.

I. quamoclit Linn.

Flowering & fruiting, scarce, Kunjabana 11895.

Merremia emarginata (Burm. f.) Hallier f.

On mud, fruiting, scarce, Litipara 11947.

M. umbellata (Linn.) Hallier f.

In rice fields, flowering, scarce, Durgapur 12142.

M. hirta (Linn.) Merr.

Fruiting, scarce, Borio 11723.

Porana paniculata Roxb.

Fruiting, scarce, Borio 11746.

Rivea hypocrateriformis Choisy

Fruiting, scarce, Borio 11768, Mandro 17987.

Volvuopsis nummularia (L.) G. Rob.

In the rocky meadow and in banks of rice fields, flowering & fruiting, fairly abundant, Kunjabana 11893, Parerkola 12005, 12006. New record for Bihar.

SOLANACEAE

Capsicum frutescens Linn. var. **baccata** Irish
Flowering & fruiting, scarce, Kachna 11935.

Datura stramonium Linn.

Flowering & fruiting, scarce, Dharampur 11837.

Nicotiana rustica Linn.

Very widely cultivated, flowering, Durgapur 11775.

Solanum indicum Linn.

Flowering & fruiting, scarce, Silingi 120408.

S. nigrum Linn.

Weed in mustard fields, flowering, scarce, Sahibganja 11606, Silingi 12038.

S. verbascifolium Linn.

Flowering & fruiting, scarce, Kachna pahar 11930.

S. surattense Burm. f.

On dry rocky road, flowering & fruiting, scarce, Silingi 12037, Dharampur 11826.

SCROPHULARIACEAE

Limnophila indica (Linn.) Druce.

In muddy rice fields, and swamps of running streams, flowering & fruiting, scarce, Litipara 11946, Silingi 12060.

L. rugosa (Roth.) Merrill

In swampy places, flowering & fruiting, scarce, Silingi 12076.

Lindernia anagallis (Burm.) Pennell

Flowering & fruiting, scarce, Silingi 12061.

L. crustacea (Linn.) F. V. Mueller

In muddy fields, flowering, scarce, Durgapur 12187.

Scoparia dulcis Linn.

In rocky sandy soil and in semi-wet soil, flowering & fruiting, abundant, Borio 11761.

Striga euphrasioides Benth.

In the shelter of *Holarrhena* and *Sal*, fruiting, scarce, Anamu hills 11664.

OROBANCHACEAE

Orobanche aegyptiaca Pers.

On *Brassica* (mustard), flowering, scarce, Silingi 12109.

BIGNONIACEAE

Oroxylum indicum (Linn.) Vent.

Fruiting, fairly abundant, Borio 11709.

PEDALIACEAE

Martynia annua Linn.

Fruiting, abundant, Borio 11739.

Sesamum indicum Linn.

Cultivated, flowering, Mandro pahar 11995.

ACANTHACEAE

Adhatoda vasica Nees

In the outskirts of the town at one place only. flowering, scarce, Sahibganja 11619.

Andrographis echinoides Nees

Flowering & fruiting, scarce, Mandro pahar 11988.

A. paniculata Nees

Flowering & fruiting, fairly abundant, Sahibganja 11640, Dharampur 11814. (*Chiraita*-Oriya).

Barleria cristata Linn.

In dry rocky soil, fruiting, scarce, Sahibganja 11635.

B. strigosa Willd.

Fruiting, scarce, Kachna pahar 11927.

Ebermaiera glauca Nees

In rice fields, flowering, scarce, Nipania 11724, Silingi 12057.

Eranthemum purpurascens Nees

On stony soil in the shade of *Sal* and *Holarrhena*, flowering, scarce, Borio 11658.

E. roseum (Vahl) R. Br.

Flowering, scarce, Kunjabana 11907, Borio 11630. New record for Bihar.

Hygrophila polysperma T. Anders.

In swampy muddy places, flowering, abundant, Parerkola 11966, Durgapur 12141.

H. angustifolia R. Br.

Flowering & fruiting, scarce, Silingi 12065. New record for Bihar.

H. auriculata (Schumach.) Heine

In the swampy drains, partly submerged in water, flowering, abundant, Borio 11700.

Justicia diffusa Willd.

Flowering, scarce, Durgapur 12145.

J. quinqueangularis Koen.

Flowering, scarce, Mandro pahar 11984.

J. simplex D. Don

Growing amidst grasses in alluvial loam, flowering, scarce, Sahibganja 11620.

Peristrophe bicalyculata Nees

Flowering, fairly abundant, Dharampur 11785.

Rungia parviflora Nees

In the open meadow amidst grasses, sometimes in wet places, flowering, abundant, Borio 11738, Kunjabana 11885, Silingi 12067.

VERBENACEAE

Callicarpa arborea Roxb.

Fruiting, scarce, Kachna pahar 11898.

Holmskioldia sanguinea Retz.

Flowering, scarce, Borio 11677.

Lantana camara Linn. var. *aculeata* (Linn.) Moldenke

On dry open hills, flowering & fruiting, abundant, Borio 11735.

Lippia geminata H. B. & K.

Flowering, scarce, Sahibganja 11609.

Tectona grandis Linn.

Planted, fruiting, Hironpur 12156.

Vitex negundo Linn.

On dry open flat tops of hills, flowering & fruiting, abundant, Kunjabana 11891.

LABIATAE

Acrocephalus indicus (Burm.) O. Ktze.

Fruiting, scarce, Kunjabana 11884, Dharampur 11846.

Anisomeles indica (Linn.) O. Ktze.

On the rocky soil and also in all open places, flowering, abundant, Sahibganja 11639.

Colebrookea oppositifolia Smith

Common in all the forests, flowering, abundant, Brindaban 11721.

Leonotis nepetaefolia R. Br.

Flowering, scarce, Dharampur 11791.

Leucas cephalotes Spreng.

Flowering, abundant, Sahibganja 11618.

L. lanata Benth.

In cultivated fields, flowering, fairly abundant, Borio 11695.

L. lavandulaefolia Rees

In mustard fields, flowering, abundant, Durgapur 12125.

L. procumbens Desf.

Scarce, Silingi sal forest 12014.

Ocimum basilicum Linn.

Flowering, abundant, Kunjabana 11856. (*Nandabati*-Oriya).

O. americanum Linn.

In swamp, flowering, scarce, Sahibganja 11604, Nipania 11992.

Pogostemon plectranthioides Desf.

Flowering, scarce, Silingi 12114.

NYCTAGINACEAE

Boerhavia diffusa Linn.

Flowering, fairly abundant, Dharampur 11776.

AMARANTHACEAE

Achyranthes aspera Linn.

Along hedges and under shade of trees, abundant, Sahibganja to Silingi 11689.

Aerva lanata (Linn.) Juss.

Flowering, fairly abundant, Sahibganja 11611.

A. sanguinolenta (Linn.) Blume

Flowering, fairly abundant, Kunjabana 11919.

Alternanthera sessilis (Linn.) DC.

In alluvial soil, in shady places, flowering, abundant, Sahibganja 11650.

Amaranthus tricolor Linn.

Cultivated, flowering, Silingi 12042.

A. paniculatus Linn.

Flowering, scarce, Kunjabana 11854.

Amaranthus polygamus Linn.

In wet black alluvium of drains, flowering, scarce, Sahibganja 11605.

A. spinosus Linn.

Fruiting, fairly abundant, Dharampur 11799.

A. viridis Linn.

Flowering, scarce, Kachna 11922.

Celosia argentea Linn.

In "Bajra" fields, flowering, abundant, Dharampur 11828.

C. argentea Linn. var. **cristata** (Linn.) Haines
Cultivated, flowering, Kunjabana 11855.

Cyathula prostrata Bl.

In cultivated fields of alluvial loam, flowering, abundant, Sahibganja 11601. New record for Bihar.

Gomphrena globosa Linn.

Cultivated. Flowering, Kaldam (Dharampur) 11911. New record for Bihar.

Psilotrichum trichotomum Bl.

In semi-dried rice fields, flowering, scarce, Kunjabana 11869, Dharampur 11774. New record for Bihar.

Telanthera philoxeroides Moq.

In sugarcane fields, flowering, scarce, Sahibganja 11626. (Introduced weeds to India from Brazil).

CHENOPODIACEAE

Chenopodium album Linn.

In mustard fields, flowering, fairly abundant, Silingi 12039.

POLYGONACEAE

Polygonum glabrum Willd.

In the muddy bank of a pond, flowering, abundant, Dharampur 11804.

ARISTOLOCHIACEAE

Aristolochia indica Linn.

Fruiting, scarce, Kunjabana 11913, Silingi 12123.

LORANTHACEAE

Dendrophthoe falcata (Linn. f.) Etting.

Very common on sal, *Bassia* etc. flowering, abundant, Anamu hills 11674.

Viscum nepalense Spreng.

On *Diospyros*, fruiting, scarce, Brindaban 11720.

V. monoicum Roxb.

On sal, fruiting, abundant, Borio 11656.

EUPHORBIACEAE

Antidesma diandrum Roth.

Fruiting, scarce, Borio 11732.

Bridelia squamosa Gehrm.

It is one of the host species of *Dendrophthoe falcata*, fruiting, fairly abundant, Sahibganja 11674, Kachna pahar 11921, Dharampur 11825.

B. stipularis Bl.

Fruiting, scarce, Borio 11680.

B. tomentosa Bl.

Fruiting, scarce, Borio 11748.

Melanthesa rhamnoides (Retz.) Bl.

Fruiting, fairly abundant, Kachna pahar 11931.

Cleidion javanicum Bl.

Vegetative, abundant, Borio 11712.

Croton roxburghii Bal.

Flowering, fairly abundant, Borio 11681; Kunjabana 11905, Kachna 11923.

C. bonplandianus Baill.

In drains and open fields, flowering & fruiting, abundant, Sahibganja, 11603.

Euphorbia dracunculoides Lamk.

In 'Surguja' fields, flowering, scarce, Silingi 12139.

E. hirta Linn.

In the shady rocky places, flowering, abundant, Borio 11756, Kunjabana 11883.

E. nivulia Buch.-Ham.

Flowering, fairly abundant, Silingi 12075.

E. thymifolia Linn.

In open meadows, flowering, abundant, Silingi 12013.

Embllica officinalis Gaertn.

Fruiting, abundant, Dharampur 11809.

Jatropha curcas Linn.

Fruiting, abundant, Silingi 12052.

Mallotus philippensis Muell.

Flowering & fruiting, abundant, Dharampur 11817, Mandro pahar 11983, Kachna pahar 11932, Parerkola 12001. (*Sinduria*-Hindi).

Phyllanthus maderaspatensis Linn.

Flowering & fruiting, scarce, Kunjabana 11904.

Ricinus communis Linn.

Flowering, abundant, Kachna pahar 11934.

Sebastiania chamaelea Muell.

Fruiting, scarce, Dharampur 11847.

Tragia involucrata Linn.

Flowering & fruiting, scarce, Borio 11713. (*Bich-huati*-Oriya).

URTICACEAE

Artocarpus heterophyllus Lamk.

Cultivated, fruiting, Kachna pahar 11933. (*Kathal*-Hindi).

Boehmeria platyphylla Don

Fruiting, scarce, Kachna pahar 11899.

Ficus racemosa Linn.

In the bank of a pond, fruiting, scarce, Nipania 11965.

F. rumphii Bl.

Fruiting, scarce, Kachna pahar 11929.

HYDROCHARITACEAE

Nechamandra alternifolia (Roxb.) Thw.

In ponds, flowering, abundant, Nipania 11958.

Vallisneria spiralis Linn.

In ponds, flowering, abundant, Durgapur 12153, 12154.

ORCHIDACEAE

Oberonia falconeri Hk. f.

Flowering & fruiting, scarce, Borio 11726, Parerkola, Silingi.

Vanda parviflora Lindl.

On *Diospyros*, scarce, Borio 11765.

V. tessellata Hook.

On many trees, flowering & fruiting, abundant, Borio 11690, 11691, Kachna pahar 11939, Parerkola 12000.

SCITAMINAE

Costus speciosus (Koenig) Smith

Flowering, fairly abundant, Dharampur 11073.

Zingiber capitatum Roxb.

Flowering & fruiting, scarce, Borio 11766.

Z. casumunar Roxb.

Flowering & fruiting, abundant, Borio 11769, Mandro 11979.

DIOSCOREACEAE

Dioscorea glabra Roxb.

Flowering, scarce, Borio 11714, Kunjabana 11912.

D. oppositifolia Linn.

Abundant throughout the Rajmahal hills, fruiting, Nipania hills 11701.

D. pentaphylla Linn.

Flowering, occasional, Nipania hills 11711.

LILIACEAE

Asparagus racemosus Willd. var. *subacerosus* Baker

Only one fruit seen, fruiting, abundant, Silingi 12022.

Chlorophytum arundinaceum Baker

In rocky soil, fruiting, abundant, Silingi 12021.

Smilax zeylanica Linn.

Common in all forests of Rajmahal hills, fruiting, Borio 11708, Mandro pahar 11985.

COMMELINACEAE

Commelina hasskarlii Clarke

In the swampy banks of pond, flowering & fruiting, abundant, Parerkola 11964, Dharampur 11703.

Murdannia spiratum (Linn.) Bruckner

In muddy drains, flowering & fruiting, abundant, Silingi 12030.

ARACEAE

Amorphophallus campanulatus (Roxb.) Blume.

In stony soil of forest floor, fruiting, scarce, Borio 11707, Brindaban 11718.

POTAMOGETONACEAE

Potamogeton crispus Linn.

In ponds, common, fruiting, Durgapur 12151.

ERIOCAULACEAE

Eriocaulon quinquangulare Linn.

In rice fields in semi-dried mud or on rock boulders with soil cover, flowering, abundant, Silingi 12055, Kunjabana 11876.

CYPERACEAE

Courtoisia cyperoides (Roxb.) Nees

In the wet rice fields, flowering, scarce, Kunjabana 11892.

Cyperus haspan Linn.

In rice fields on semi-dried mud, flowering, scarce, Durgapur 12144.

C. hyalinus Vahl

In the rice fields, flowering, scarce, Kunjabana 11868.

C. brevifolius (Rottle) Hassk.

In muddy rice fields, flowering, abundant, Mandro pahar 11986.

C. michelianus (Linn.) Link. subsp. *pygmaeus* (Roxb.) Asch. & Grab.

In dried-up rice fields, flowering, abundant, Durgapur 12140.

C. radiatus Vahl

In muddy bank of a pond, flowering abundant, Dharampur 11803.

Fimbristylis millacea (Burm.) Vahl

Flowering, abundant, Kunjabana 11871 A.

F. dichotoma Vahl

Flowering, abundant, Kunjabana 11871.

F. diphylla Vahl

In sandy soil beds of stream, flowering, abundant, Kunjabana 11889, Silingi 12116.

Scirpus articulatus Linn.

In the muddy swamps, flowering, scarce, Durgapur 12129, Parerkola 11960.

S. supinus Linn.

In the drying-up muddy rice fields, flowering, abundant, Kunjabana 11870.

GRAMINEAE

Agrostis brachiata Munro

On wet rock surface, flowering, scarce, Silingi 12082.

Arthraxon castratus (Griff.) Narayanaswami

On dry rock, flowering, scarce, Borio 11752, Mandro pahar 11876. New record for Bihar.

Apluda mutica Linn.

In the bank of a pond, flowering, abundant, Borio 11654, Parerkola 11962.

Coix gigantea Koenig ex Roxb.

Fruiting, scarce, Dharampur 11850.

Dactyloctenium aegyptium (Linn.) Beauv.

Flowering, fairly abundant, Dharampur 11782.

- Dichanthium annulatum** (Forsk.) Stapf
Flowering, abundant, Dharampur 11777, Silingi 12046.
- D. caricosum** (Linn.) A. Camus
Flowering, abundant, Durgapur 12155, Anamu hills 11662.
- Eleusine indica** (Linn.) Gaertn.
Flowering & fruiting, abundant, Dharampur 11783.
- Eragrostis gangetica** (Roxb.) Steud.
Flowering, scarce, Sahibganja 11632.
- E. diplotachne** Steud.
Flowering, scarce, Borio 11684, Kunjabana 11874 A.
- E. coarctata** Stapf apud Hook. f.
In the rocky meadow, flowering, abundant, Silingi 12018.
- E. diarrhena** (Schult.) Steud.
In the dried-up rice fields, scarce, Silingi 12133.
- E. tenella** (Linn.) Beauv. ex Roem. & Sch.
In the rice fields, flowering, abundant, Dharampur 11874.
- E. tremula** Hochst. ex Steud.
In the soil cover on rock boulders in the river bank, fruiting, scarce, Silingi 12027.
- E. unioloides** (Retz.) Nees ex Steud.
In the bank of a nala, flowering, fairly abundant, Mandro pahar 11989.
- Eriochloa procera** (Retz.) Hubb.
Flowering, scarce, Sahibganja 11612.
- Hackelochloa granularis** (Linn.) O. Ktze.
Flowering & fruiting, scarce, Anamu hills 11663, Silingi 12084.
- Hygroryza aristata** (Retz.) Nees ex Wt. et Arn.
In swamps, abundant, Durgapur 12131.
- Heteropogon contortus** (Linn.) Beauv.
In open sunny hill slopes of the Rajmahal hills, fruiting, abundant, Anamu hills 11668.
- Ischaemum rugosum** Salisb.
In rice fields, fruiting, Kunjabana 11890.
- Oryza sativa** Linn.
In shallow pond, fruiting, abundant, Nipania 11971.
- Oplismenus burmanii** (Retz.) Beauv.
Flowering, scarce, Mandro pahar 11996.
- Panicum austroasiaticum** Ohwi.
Flowering, scarce, Dharampur 11872.
- P. montanum** Roxb.
Flowering, scarce, Silingi 12081.
- P. paludosum** Roxb.
Flowering, abundant, Durgapur 12130.
- Paspalum scrobiculatum** Linn.
Next to water edge of a pond flowering, scarce, Parerkola 21963.

- Pennisetum polystachyon** (Linn.) Schult.
Flowering, abundant, Dharampur 11889.
- Sacciolepis interrupta** (Willd.) Stapf
In the edge of swamp, flowering, abundant, Durgapur 12128.
- S. myosuroides** (R. Br.) A. Camus
Flowering, scarce, Silingi 12032.
- Schizachyrium brevifolium** (Sw.) Nees
On rocky soil, flowering, abundant, Anamu hills 11600, Silingi 12080.
- Setaria glauca** (Linn.) Beauv.
In open dry rocky soil, flowering, scarce, Sahibganja 11659.
- Sorghum vulgare** Pers.
Cultivated widely, Sahibganja 11611.
- Themeda strigosa** (Ham.) A. Camus
Flowering, fairly abundant, Dharampur (Santal Village) 11780.

PTERIDOPHYTES

- Adiantum lunulatum** Burm.
In the crevices of rock gravels and in brown laterite soil or under the shade near swamp, abundant, Dharampur 11831, Silingi 12034.
- A. edgeworthii** Hk. f.
In the sandy loam of the river bank, almost drying up, fertile, scarce, Silingi 12024.
- Ceratopteris thalictroides** (Linn.) Brogn.
In muddy bank of a pond, scarce, Kachna 11943.
- Cheilanthes tenuifolia** (Burm.) Sw.
In the crevices of rock boulders and in sandy loam, fertile, drying-up, scarce, Silingi 12025.
- Cyclosorus dentatus** (Forsk.) Ching.
Fertile, abundant, Silingi 12100.
- Heterogonium saxicolum** (Bl.) Holtt.
In the crevices of rocks, fertile, scarce, Kunjabana 11902.
- Lygodium flexuosum** (Linn.) Sw.
Fertile, abundant, Borio 11710, Kachna 11928, Silingi 12008.
- Marsilea minuta** Linn.
In the dried-up rice fields, scarce, Dharampur 11781.
- Pteris cretica** Linn.
In the crevices of rocks, fertile, scarce, Kunjabana 11902.
- Selaginella pruriiflora** (Lamk.) Bak. & Hieron.
On rock boulders next to a spring, scarce, Silingi 12110.
- S. repanda** (Desv.) Spring.
In the crevices of rock boulders, in the shade, on sandy loam, fertile, drying-up, scarce, Silingi 12026, Kunjabana 11937.

Selaginella subdiaphana (Wall.) Spring.

On rocky wall, fruiting, abundant, Borio 11727, Kachna pahar 11937.

FUNGI

Daedalea flava Lev.

On dead rotten wood, scarce, Silingi 12085.

Daldinia concentrica (Bolt.) Ces. et De not.

On floating log in a pond, fertile, scarce, Parerkola 11954.

Fomes fastuosus Lev.

On dead log, fertile, rare, Silingi 12103.

Guepinia sp.

On dead log without any bark, branched, scarce, Silingi 12107.

Hexagonia discopoda Pat. et Har.

On dead branch of *Diospyros*, rare, Kachna 11945.

Hymenochaete rubiginosa (Schrad) Lev.

On dead trunk of a living tree, scarce, Parerkola 11956.

Irpex flavus Kl.

On dead fallen wood, scarce, Silingi 12090.

Lentinus praerigidus Berk.

On dead log, scarce, Silingi 12087, Parerkola 11725. (*Kandhuataka*-Hindi).

Polyporus sp.

On dead log, scarce, Silingi 12105.

Polystictus sanguineus (Linn.) May.

On dead twigs, scarce, Parerkola 11955.

P. versatilis Berk.

On rotten log, fertile, scarce, Silingi 12102.

Stereum percome Berk. & Br.

On dead wood, fertile, abundant, Silingi 12086. Dharampur 11940.

Stereum sp..

Forming a crust on wood, associated with *Irpex flavus*, scarce, Silingi 12091.

Trametes corrugata (Pers.) Bres.

On dead log, scarce, Silingi 12101.

T. cubensis (Mont.) Sacc.

On dead log, scarce, Silingi 12104.

Xylaria sp.

On dead log without any bark, scarce, Silingi 12106.

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