

October 1954 to June 1955, the plant was watered regularly every day, but it did not flower; after the monsoon rains of 1955, the plant was left unwatered until this year's monsoon supervened. During the period when the plant was regularly watered, its vegetative growth was fast; during the dry season, when it was left unwatered, growth was slow, but this seems to have induced profuse flowering. At the end of April of this year we noticed the first signs of the coming flowers; by the middle of May 1956 it showed a large bunch of flowers (a central rachis with four lateral branches).

Towards the end of May of this year the flowering spike gave rise to a vegetative proliferation at its end; gradually 4-6 fleshy leaves, much smaller in size than those at the base of the plant, appeared beyond the flowers; these terminal leaves gradually fell off, but new leaves appeared in their place, so that 4-6 were always present on the plant.

Unfortunately we had only one specimen, and so could not carry out experiments with proper controls, on the effect of the profuse watering during the dry season. It is quite possible that the early flowering of the plant and its vegetative proliferation may be due to the abnormal watering it received. The plant in its wild state is known to flower only between the end of May and the middle of June.

The diagram herewith appended was drawn by one of us from the living specimen. At present the preserved plant is kept in Blatter Herbarium of our College.

ST. XAVIER'S COLLEGE,  
BOMBAY,

July 5, 1956.

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### 37. SOME NEW PLANTS FOR THE DANGS FOREST, BOMBAY STATE

(With two plates)

Under the auspices of the Gujerat Research Society, the senior author has been conducting intensive botanical surveys in the Dangs Forest; some of his research students have joined in many of his outings. The results of the survey of the Dangs Forest have been published in the *Jour. of the Gujerat Res. Society*; the work is still continuing. The present paper gives details of two striking plants that have been found to be rather common all over the Dangs. The junior author has been working on the Papilionaceae of Bombay State and has accompanied the senior author on several excursions to the Dangs.

*Indigofera oreophila* spec. nov.

Accedit ad *Indigoferam tritum* Linn. caractere generali florum, foliorum et habitus; ab ea tamen differt praesertim sequentibus notis:

foliorum magnitudine et forma, inflorescentia aequae longa ac folia vel hisce duplo longiore, fructibus tenuioribus.

*Suffrutex* valde ramosus, 150-180 cm. altus; *culmi* teretes et sublignosi ad maturitatem, tenues et paulo angulati in juvenili conditione, adpresse albo-pilosi. *Folia* trifoliata, alterna, petiolata, stipulata; petiolus 20-27 mm. longus, productus 10-13 mm. ultra foliola lateralia, adpresse pubescens, supra late et tenuiter canaliculatus. *Foliola* 3, membranacea, 22-45 × 12-15 mm., elliptico-oblonga, rotundato-apiculata ad apicem, obtusa ad basim, integra, paulo adpresse pubescentia in superiore pagina, in inferiore vero plus pubescentia et pallide viridia; nervi laterales 4-5-jugi, alterni, indistincti; petioluli 1-2 mm. longi, aliquantum tumescentes, pubescentes; stipulae 3 mm. longae, subulatae, ciliatae, persistentes; stipellae minutae, lineares, persistentes. *Inflorescentia* axillaris, racemosa; inflorescentiae rachis 5-20 cm. longa, angulosa, pubescens, tenuissima, saepe ad apicem curvata, fructifera evadens aliquanto robustior. *Flores* 20-40, laxae dispositi, pedicellati, bracteati, pedicelo 1 mm. longo, erecto sub alabastro, reflexo sub flore et fructu, bracteis singulis sub unoquoque pedicelo, 2-2.5 mm. longis, subulatis, pubescentibus, eaducis. *Calyx* 3-4 mm. longus, fere ad basim usque divisus, dense et adpresse pubescens, sub fructibus persistens; dentes 5, inter se aequales, lineari-lanceolati, ciliati. *Corolla* rubra, exserta; vexillum 5 × 4 mm., suborbiculare, sessile, fastigatum ad basim, tenuiter pubescens in parte dorsali; alae 5 × 1.5 mm.; carina 5 × 1 mm., calcarata ad basim, ungue 2 mm. longo ornata. *Stamina* 9+1; filamenta 5 mm. longa, sub apice libera per 1 mm., alterna quidem breviora; antherae uniformes, basifixae, apiculatae. *Ovarium* 3 mm. longum, lineare, tenuissime pubescens; stylus 1 mm. longus, angulum rectum cum ovario efformans; stigma capitatum, terminale. *Legumen* 25-30 × 1 mm., tetragonum, lineare, apiculatum, adpresse pilosum, reflexum, intus septatum. *Semina* 7-8, singula 2 × 1 mm., ovoidea, levia, ochracea colore.

*Typus* lectus in Dangs Forest, in loco Waghai, die 23 mensis octobris, anni 1955 a D. P. Panthaki, et repositus in Blatter Herbario, Bombay, sub numero 2,350; paratypi Santapau 19,985, 20,081 et 20,281 lecti eodem in loco et positi in Blatter Herbario et in herbario Hortus Regii Kewensis, in Anglia, paratypus alius, Panthaki 2,415, positus in Blatter Herbario.

#### **Indigofera oreophila** spec. nov.

This new species approaches in many respects *Indigofera trita* Linn.; the general character of the plants is the same, the shape and structure of flowers is rather closely similar. The main differences are the following: the leaves are much larger, the leaflets broader, the inflorescence much longer, at times even twice as long as the leaves, the fruits somewhat more slender in the new species.

*Undershrub*, much branched, 150-180 cm. tall. *Stem* terete and subwoody when old, slender and slightly angled when young, appressedly white-pubescent. Leaves trifoliolate, alternate, petiolate, stipulate; petiole 20-27 mm. long, produced 10-13 mm. beyond the attachment of the lateral leaflets, appressedly pubescent, with a broad shallow groove. *Leaflets* 3, membranous, 22-45 × 12-15 mm., elliptic

—oblong, apex rounded-apiculate, entire, base obtuse, upper side appressedly slightly pubescent, the lower one more so and pale green; lateral nerves 4-5 pairs, alternate, rather faint; petiolules 1-2 mm. long, slightly tumid, pubescent; stipules 3 mm. long, subulate, ciliate, persistent; stipels minute, linear, persistent. *Inflorescence* axillary, racemose; rachis 5-20 cm. long, angled, pubescent, very slender, often curved at the apex, becoming somewhat stouter in fruit. *Flowers* 20-40, laxly arranged, pedicellate, bracteate; pedicels 1 mm. long, straight in bud, reflexed in flower and fruit; bracts one at the base of each pedicel, 2-2.5 mm. long, subulate, pubescent, caducous. *Calyx* 3-4 mm. long, divided nearly to the base, strongly and appressedly hairy, persistent in fruit; teeth 5, equal, linear-lanceolate, ciliate. *Corolla* red, exerted; standard  $5 \times 4$  mm., suborbicular, sessile, tapering at the base, downy on the dorsal side; wings  $5 \times 1.5$  mm.; keel  $5 \times 1$  mm., connate dorsally except for the claw, bearing a short spur before tapering into a 2 mm. long claw. *Stamens* 9+1; filaments 5 mm. long, free for less than 1 mm. from the apex, every alternate one slightly shorter; anthers uniform, basifixed, apiculate. *Ovary* 3 mm. long, linear, puberulous; style 1 mm. long, bent at right angles to the ovary; stigma capitate, terminal. *Fruits*  $25-30 \times 1$  mm., tetragonous, linear, apiculate, appressedly hairy, reflexed, septate within. *Seeds* 7-8, each  $2 \times 1$  mm., ovoid, smooth, yellow ochre.

The type of this new species has been collected at Waghai, in the Dangs Forest, on the 23rd October, 1955 by Miss D. P. Panthaki, and has been deposited in the Blatter Herbarium, Bombay, under the number *Panthaki* 2,350; the paratypes, *Santapau* 19,985, 20,081 and 20,281, collected from the same locality, have been placed in Blatter Herbarium and in the Herbarium of the Royal Botanic Gardens, Kew, in England; another paratype, *Panthaki* 2,415, has also been deposited in Blatter Herbarium.

This new species is quite a striking plant. It grows gregariously in dense clumps usually in the undergrowth of tall forest, the clumps at times being over 5 m. in diameter; the usual or average height of the clumps is well over one metre, and some individual plants reach nearly to 2 metres. Another noteworthy feature of the plant is the size of the inflorescence, which often is at least twice as long as the full-grown leaves. In general appearance the plant is decidedly a shrub or undershrub, as against *Indigofera trita* L., which is only a more or less robust herb.

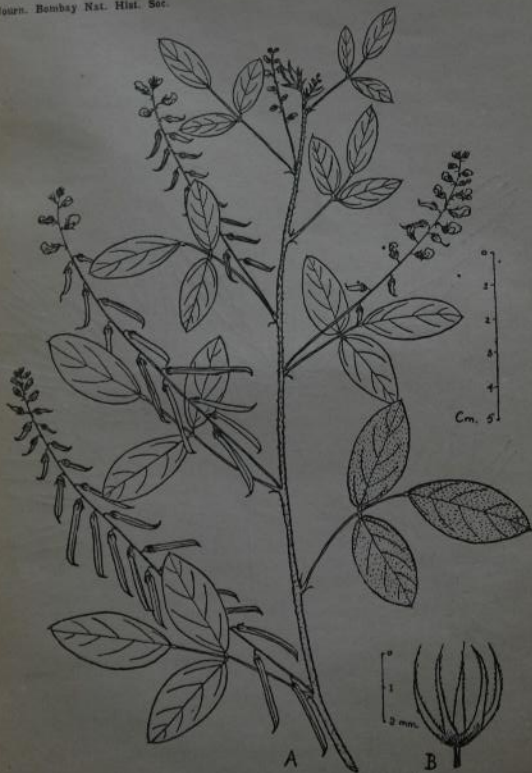
Our new species has been found in flower in October-November, in fruit from November to January. Examination of the species of *Indigofera* from Bombay State, in Blatter Herbarium, has revealed that our new species is fairly widely distributed in Bombay State; we have seen specimens from various parts of the Dangs Forest, from Purandhar Hill, Poona Dt., and from Borivli; in every case the plant grows in the undergrowth of the forest, or where no forest is present, in the undergrowth of tall shrubs. We have named it *oreopijia* to commemorate the fact that the new species seems to be restricted to the hills in Bombay State; we have seen no specimen from the low parts of the Konkan proper.

The main differences between our new species and *Indigofera trita* Linn. can be given in tabular form as follows:

	<i>Ind. trita</i> L.	<i>Ind. oreophila</i> .
Stems ...	60-120 cm. high	150-180 cm. high.
Leaves ...	8.22 × 5.13 mm.	22.45 × 12-15 mm.
Leaflets ...	Obovate-oblong or sub-orbicular.	Elliptic-oblong.
	Petiole 4-13 mm.	Petiole 20-27 mm.
	prolongued 1-6 mm.	prolongued 10-13 mm.
	Petiolule less than 1 mm. long.	Petiolule 1-2 mm.
Racemes ...	0.6-4 cm. long.	5-20 cm. long.
	Flowers close.	Flowers lax.
	6-12	20-40.
Fruit ...	Woody, 2 mm. thick.	Slender, 1 mm. thick.

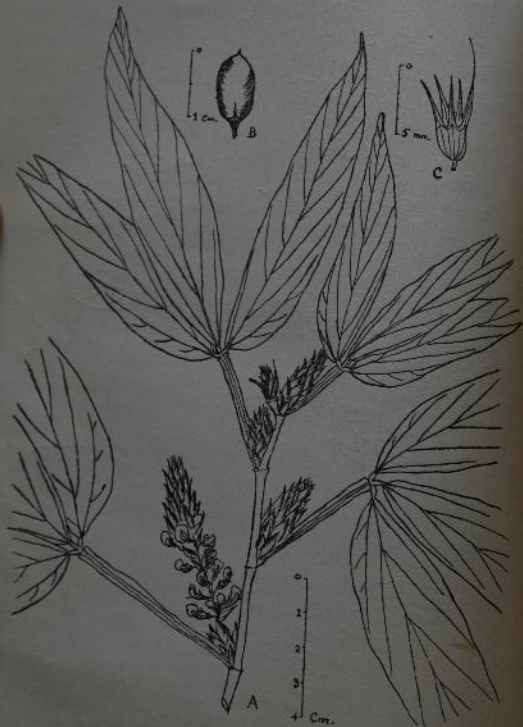
*Moghania praecox* H.L.Li., var. *robusta* Mukerjee in Bull. Bot. Soc. Bengal 6: 19, 1953.

An erect undershrub, 120-210 cm. high, much branched; stem woody, terete, younger parts somewhat triquetrous, faintly striate, glabrous. Leaves trifoliate, alternate, petiolate, stipulate; leaflets 11.25 × 2-6.8 cm., subcoriaceous, oblong-ovate, or lanceolate, obscurely repand, acuminate, base of central leaflet cuncate, that of lateral ones oblique and rounded, upper surface glabrous, lower one dotted with minute golden brown glands, and puberulous especially about the veins; nerves three strong ones from the base with in addition 6 or 7 pairs higher up; petioles 4.5-8.5 cm. long, slightly winged, smooth on the dorsal side, deeply fluted on the upper or ventral side, puberulous, the base expanded into a slight pulvinus; stipules 10-13 mm. long, scarious, ovate, acuminate, ciliate, striate, conduplicate, caducous; stipels absent. Inflorescence axillary, racemose; rachis 2.5-8 cm. long, angled, glabrous. Flowers 30-50 in each raceme, close, each supported by a bract and pedicellate; bracts 6.8 × 2.4 mm., the basal ones ovate to broadly-ovate, the higher ones elliptic, all striate, ciliate, caducous; pedicels 1-2 mm. long, slender, glabrous. Calyx 6-9 mm. long, glabrous, persistent in fruit; tube 2 mm. long, campanulate; teeth 5, free, ovate-acuminate 4 mm. long, the lower ones the longer, nearly 7 mm. long. Corolla dark purple, exserted; standard 8 × 6 mm., greenish with dark purple veins, suborbicular, acute, with two short spurs before tapering into a claw, which is 2 mm. long, wings 6 × 1 mm., white or green with a few purple veins, each with a spur just above the 2 mm. long claw; keel 8 × 3 mm., almost purple black at the tip, the colour gradually becoming lighter towards the base, connate on the dorsal side up to the claw, which is 2 mm. long. Stamens 9+1, filaments 8 mm. long, united together except for about 1 mm. near the apex; anthers uniform, minute. Ovary 2 × 1 mm., straight on the dorsal side, rounded on the ventral, glabrous; style 7 mm. long, slender, inflexed; stigma hairy. Fruit 10 × 6 mm., turgid, oblong, slightly apiculate, glabrous, brown. Seeds 2, black, smooth, truncate, each 2 × 2 mm.



*Indigofera oreophila* Santapan and Panthaki

A. Upper branch in flower and fruit; B. Calyx in fruit.



*Moghania prucea* var. *robusta* Mukerjee  
A. Flowering branch; B. Fruit; C. Flowering calyx

This plant is very noticeable on account of its size and its gregarious habit; it grows in dense clumps at the edges of forest; it is also found in the undergrowth of some of our more dense forests. It comes into flower in January-March, and into fruit in March. The records of this species which we have been able to examine are the following:

- T. R. D. Bell 3634/11, from North Konkan, February 1918.  
 Santapau 19227, from Waghai, in the Dangs Forest, September 1954.  
 N. A. Irani 1688-1689, from Waghai, February 1956.  
 D. P. Panthaki 2571-2573, Waghai, February 11, 1956; Panthaki 2591 from Waghai, 12 February 1956.

Distribution: *Moghania praecox* proper has been recorded only from Chittagong in East Pakistan (C. B. Clarke 19916 A, B, C); the present variety has been recorded from Yenkatapur, in Chanda Dt. of C.P., Thana and Dangs Forests in Bombay.

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### 38. CHINA'S BOOK-LIKE ROCK FORMATION WITH 25-MILLION YEAR OLD PLANT FOSSILS

Numerous plant fossils of the Upper Miocene Age some 25-million years old can still be seen today near Shanwang Village in the Linchu district of northern Shantung Province. They are imbedded in a peculiar rock formation locally called the 'Ten Thousand Volumes'.

The district in which Shanwang Village is located lies twenty kilometres south of the Tanchiafang station on the Tsingtao-Tsinan Railway which cuts across the peninsula. At a place called Hsiehchiachuang, in a valley which faces the northeast, outcrops of volcanic sediments one and a half kilometres long are covered with basalt of the Pliocene epoch. In the shale rockbeds are found large quantities of volcanic ash intermingled with which are numerous thin layers of diatomaceous earth. With only the help of a pen-knife, these thin layers can be easily pried loose. And there, lying among these layers, are leaves, flowers and fruits of ancient plants. The peasants here call them 'Ten-thousand-volume' rockbeds because these thin layers of white volcanic ash resemble the pages of an enormous book. This is a very significant and descriptive name indeed.

By 'opening' this 'heavenly book' as it is otherwise called, scientists are able to know the various kinds of plants in this 25-million year old area as well as the difference between plants of that time and now. They can also find out what changes have happened during the past 25-million years and the causes that have brought about these changes.

The plants hidden in the rock beds of the 'Ten-thousand-volumes', covering a wide range of varieties, are so well preserved that they