



FASCICLES OF FLORA OF INDIA

FASCICLE 21

Edited by
P.K. Hajra
A.R.K. Sashtry
M. Sanjappa

BOTANICAL SURVEY OF INDIA

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LEGUMINOSAE - PAPILIONOIDEAE : TRIBE - INDIGOFEREAE

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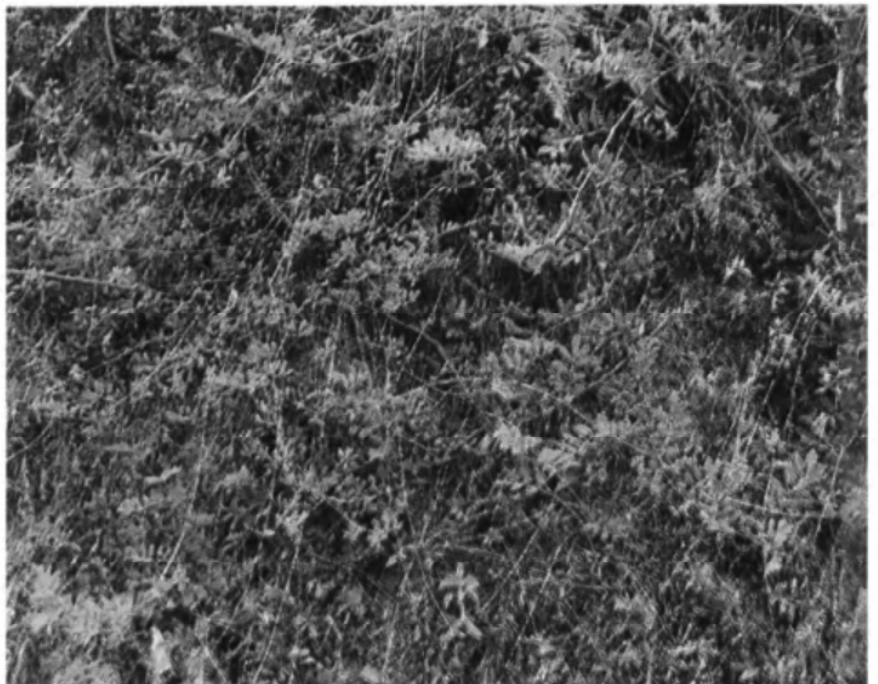


Indigofera trifoliata L.



Indigofera cassioides
Rottler ex DC.

Indigofera
hendecaphylla
Jacq.



LEGUMINOSAE - PAPILIONOIDEAE

TRIBE : INDIGOFEREAE

M. SANJAPPA*

INDIGOFEREAE

Indigofereae (Benth.) Rydberg, N. Amer. Fl. 24: 137. 1923; Hutch., Gen. Fl. Pl. 1: 399. 1964; Polhill in Polhill & Raven, Adv. Legum. Syst. 1: 289. 1981. *Galegeae* subtribe *Indigofereae* Benth. in Benth. & Hook. f., Gen. Pl. 1: 444. 1865.

Herbs or shrubs, rarely small trees or treelets (sometimes with cladodes or even leafless branches as in Madagascan genus *Phylloxylon*). Indumentum characteristically biramous, sometimes mixed with multicellular gland-tipped hairs and more often with pearl bodies. Leaves generally imparipinnate, sometimes 3-foliolate, or 1-foliolate or simple; stipellae present or absent; leaflets opposite or alternate, entire or toothed along margins, usually hairy on both surfaces or rarely glabrous adaxially, sometimes gland-dotted beneath; bracteoles absent except in *Phylloxylon*. Flowers generally in axillary racemes, rarely solitary or in panicles. Corolla generally red or pinkish-red, sometimes pink, rarely white, caducous. Stamens 10, all united or with vexillary stamen free, anthers uniform, apiculate, gland-tipped or with an expanded connective, sometimes a tuft of hairs present at base and/or tip; pollen tricolporate, generally with thickened endexine, columellae granular. Pods 2-valved, usually dehiscent, rarely indehiscent; endocarp septate between the seeds, often spotted with tannin deposits. Seeds spherical to subtetragonous; endosperm usually rather copious. Seedlings mostly epigeal, usually with 1-foliolate, opposite eophylls, occasionally with adventitious cladodes from hypocotyl (as in *Phylloxylon*). Chromosome numbers are $2n = 14, 16, 32, 48$. Free aminoacid canvanine generally present in seeds, sometimes with Indospicine.

Type : *Indigofera* Linn.

4 genera viz., *Indigofera*, *Cyamopsis*, *Rhynchotropis*, *Phylloxylon*, principally in tropical Africa, South Africa, Madagascar and Asia. The genus *Indigofera* is widely distributed in tropical and subtropical regions of the world. *Indigofera* and *Cyamopsis* are represented in India.

* Botanical Survey of India, P.O. Botanic Garden, Howrah 711 103.

Key to the Genera

- 1a. Vexillary stamen lightly attached to others forming a closed tube; leaflets often dentate; pods broad, flat, longitudinally ridged 1. *Cyamopsis*
- b. Vexillary stamen free or attached to others at base only; leaflets entire; pods subcylindric to globose 2. *Indigofera*

1. CYAMOPSIS

DC., Prodr. 2: 216. Nov. 1825 & Mem. Legum. 230. Feb. 1826; Benth. in Benth. & Hook. f., Gen. Pl. 1: 493. 1865; Taub. in Engler & Prantl, Pflanzenfam. 3,3: 259. 1894; Baker in Hook. f., Fl. Brit. India 2: 92. 1876; Gillett in Kew Bull. Add. Ser 1: 6. 1958; Hutch., Gen. Fl. Pl. 1: 400. 1964; Polhill in Polhill & Raven, Adv. Legum. Syst. 1: 289. 1981. *Cordaea* Sprengel, Gen. Syst. 2: 581. 1831.

Type species : *C. tetragonoloba* (Linn.) Taub.

Annual, erect herbs; hairs biramous. Leaves imparipinnate, 3 - 7-foliolate, rarely 1-foliolate; leaflets opposite, entire or dentate to crenate along margins, exstipellate; stipules small, setaceous. Flowers small, pink to purplish in axillary racemes; bracts caducous; bracteoles absent. Calyx broad, oblique, 5-toothed, ventral tooth the longest. Petals caducous; standard obovate, sessile, glabrous, distinctly veined; wing petals oblong, free from keel petals; keel petals erect, slightly incurved, obtuse, shortly spurred on sides. Stamens 10, monadelphous, all connate into a closed tube; anthers uniform, apiculate; Pollen spheroidal to subprolate, P/E 1.1 - 1.18, size: P 35 (39.5) - 44, E 30 (34) - 39 μ m, coarsely rugulate, perforate; exine stratification somewhat complex. Ovary sessile, many-ovuled; style incurved at apex; stigma capitate. Pods flat, linear, ascending, longitudinally ridged, often faintly torulose, beaked, 2-valved, 3 - many-seeded, septate between seeds, somewhat compressed, minutely tuberculate, estrophiolate.

Distrib.: Arabia, India and drier parts of Africa, 3 species; one in India.

Cyamopsis tetragonoloba (Linn.) Taub. in Engler & Prantl, Pflanzenfam, 3, 3: 259. 1894; Gamble, Fl. Pres. Madras 304. 1918 (*Repr.* 1: 215. 1967); Haines, Bot. Bihar Orissa 3: 236. 1922 (*Repr.* 2: 247. 1961); Gillett in Kew Bull. Add. Ser. 1: 7. 1958. *Psoralea tetragonoloba* Linn., Mant. Pl. 104. 1767. *Dolichos fabaeformis* L' Her., Strip. Nov. t. 78. 1791; Roxb., Fl. Ind. 3: 316. 1832; *Cyamopsis psoralioides* (Lam.) DC., Prodr. 2: 216. 1825 & Mem. Legum. 231. 1826; Wight & Arn., Prodr. 197. 1834 nom. illeg.; Baker in Hook. f., Fl. Brit. India 2: 92. 1876; Duthie, Fl. Upp. Gang. Pl. 1: 248. 1903 (*Repr.* 1: 228. 1960); Prain, Bengal Pl. 1: 429. 1903 (*Repr.* 1: 308. 1963) Fig. 1

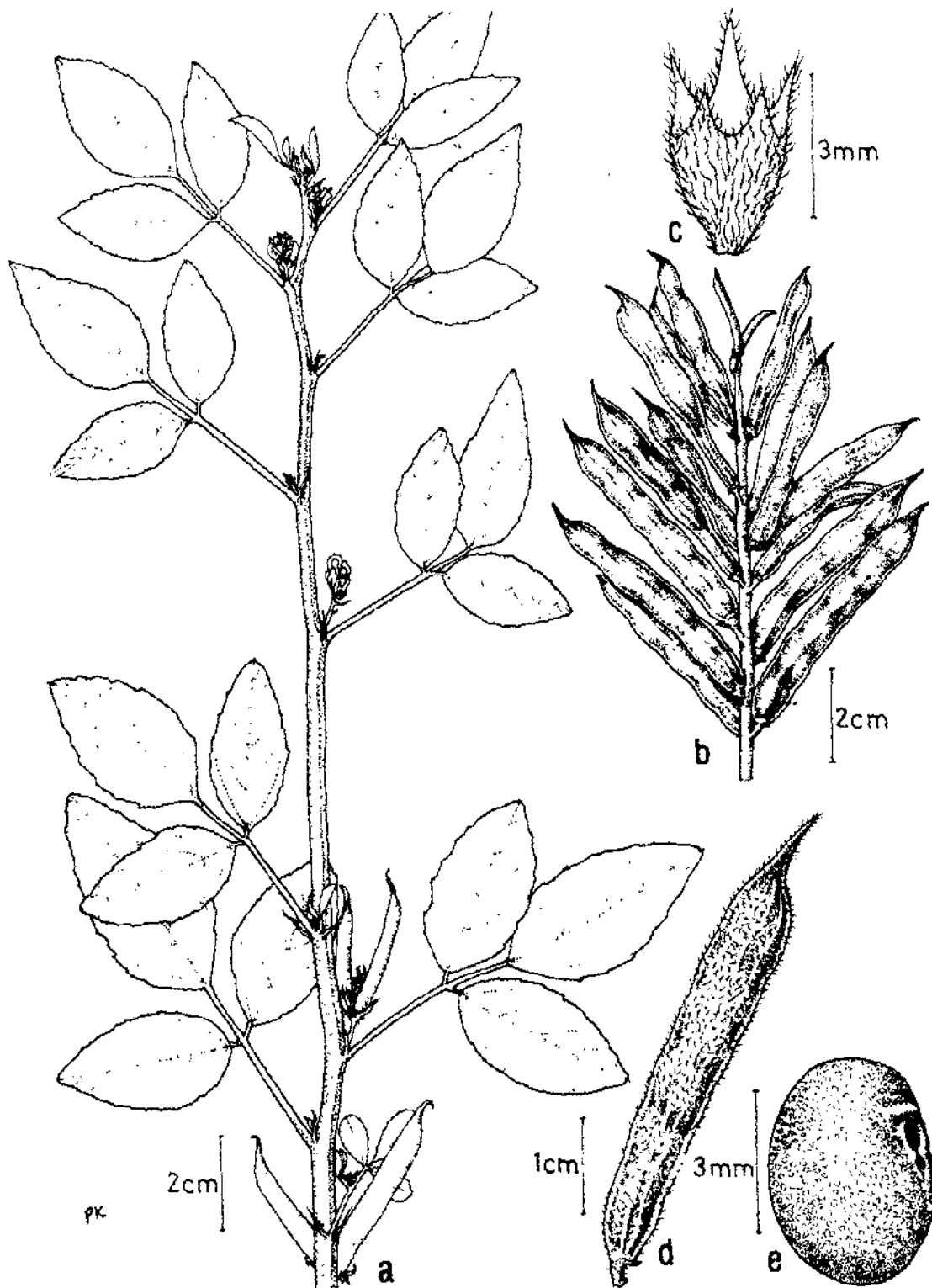


Fig. 1. *Cyamopsis tetragonoloba* (Linn.) DC. : a. Habit, b. Infructescence, c. Calyx, d. Pod, e. Seed-hilar view (a - b : *Wadhwa* 4757; c: *Mackenna & Burkill* 31461, BSIS; d - e: *G. P. Roy* 3850).

Local names: Bilati sim (Beng.), Cluster bean, Gur (Eng.), Gowar (Hindi), Gawar, Guwar (Guj.), Chavalikayi, Gorikayi (Kan.), Barachi, Gavari, Makti (Mar.), Kulti, Guar, Kuwara (Punj.), Dridhabija, Nishandhyagni, Sushka, Vakra-simbi, Gorani, Gorakshapalani, Bakuchi (Sans.), Koth-avery (Tam.), Gorchi-kurkai (Tel.).

Annual, erect herbs, 10 - 120 cm high; branches angular or grooved, adpressed with biramous hairs when young, glabrous when mature. Leaves 2 - 15 cm long including 0.8 - 4 cm long petiole; stipules 3 - 10 mm long, setaceous, glabrous or with few hairs outside; rachis 4 - 12 cm long, flat above; petiolules 1 - 4 mm long; leaflet 1 - 7 x 0.5 - 4 cm, ovate to ovate-lanceolate, cuneate to rounded at base, obtuse to acute at apex, dentate to crenate with lateral veins ending in teeth along margins, sparsely to somewhat densely hairy on both surfaces, sometimes glabrous. Racemes 5 - 15 cm long including 3 - 5 mm long peduncle; rachis adpressed hairy, 6 - many-flowered. Flowers pinkish-white to purplish, 4 - 5.5 mm long; bracts 3 - 5 mm long, setaceous, hairy outside, subpersistent; pedicels ca 1.3 mm long, hairy, stout in fruits. Calyx ca 4.5 mm long, oblique, adpressed hairy outside, glabrous inside, 5-toothed, teeth 2 - 2.5 mm long, narrowly triangular, cup 1.5 - 2 cm long. Standard 3 - 5 x 1.5 - 3 mm, ovate to rotund, cuneate and clawed at base, rounded at apex, veined, glabrous; wing petals 2 - 4 mm long, glabrous; keel petals 2.5 - 4.5 mm long, glabrous. Stamens 10, 2.5 - 4.2 mm long, monadelphous; anthers less than 1 mm long, apiculate. Ovary 1.8 - 3.5 mm long, channelled on vexillary side, glabrous, 3 - 8-ovuled; style 1.5 - 2.3 mm long, glabrous; stigma capitate. Pods 2 - 6 x 0.6 - 1.3 cm, linear, slightly oblique at base, abruptly apiculate; sutures broad, valves longitudinally ridged (usually 3-ridged), somewhat torulose, adpressed hairy. Seeds 3 - 4 x 3 - 4 mm, greyish, flat, nearly spherical, minutely tuberculate, black spot present below micropyle.

Type: India, Suratte, Herb. Linn. 928. 23(LINN !)

Fls.: Aug. - Dec.; *Frts.:* Sept. - Jan.

Distrib.: India (cultivated throughout and is known from very ancient period; several cultivars are recorded from different parts of India). In wild state it is collected from Kutch (Gujarat) and Etawah (Uttar Pradesh); cultivated throughout tropics.

Exsicc.: In wild : Gujarat; Kutch, *Dr. Stoliczka s.n.* (CAL Acc. No. 109526); Uttar Pradesh: Etawah, *Herb. Kurz.* (CAL Acc. No. 109529); *In Cultivation :* Andaman & Nicobar Islands, Car Nicobar, Agricultural farm, 23 Sept. 1976

*Specimens cited in this work unless indicated are represented in CAL.

N.G. Nair 4479; Gujarat: Nadiad, 21 Sept. 1957, S.K. Jain 24329; Rajasthan, Ganganagar Dist. 300 mm, 12 Nov. 1976 G.P. Roy 3850.

Chr. No.: $2n = 14$ sub *C. psoraloides* DC. (Ayyanagar & Krishnaswamy, Indian Jour. Agric. Sci. 3: 934 - 935. 1933; Frahm-Leliveld, Euphytica 2: 46 - 48. 1953).

Uses: Young tender pods eaten as vegetable, seeds and whole plant (green fodder) are relished by cattle and horses. The seed flour is the commercial source of 'Guar gum' and is used in food, paper and textile industries. It is cultivated on commercial scale in Gujarat, Punjab and Uttar Pradesh.

2. INDIGOFERA

Linn., Sp. Pl. 751. 1753 & Gen. Pl. 333. 1754; Benth. in Benth. & Hook. f., Gen. Pl. 1: 494. 1865; Baker in Hook. f., Fl. Brit. India 2: 92. 1876; Taub. in Engler & Prantl, Nat. Pflanzenfam. 3, 3: 259. 1894; Gillett in Kew Bull. Add. Ser. 1: 1. 1958; Hutch., Gen. Fl. Pl. 1: 400. 1964; Polhill in Polhill & Raven, Adv. Legum. Syst. 1: 289. 1981. *Sphaeridiophorum* Desv. in Jour. Bot. 3: 125, t. 6, f. 35. 1814. *Ameocarpus* Benth. in Lindley, Veg. Kingd. 554. 1846, nom. nud. *Acanthonotus* Benth. in Hook., Niger Fl. 293. 1849.

Annual or perennial herbs on shrubs, rarely small trees or treelets (*I. heterantha* Wallich ex Brandis, *I. zollingeriana* Miq.); branches spreading or ascending, hairs adpressed to spreading medifixed, biramous with equally or unequal arms, often with pearl bodies, in some species mixed with stiff, erect, multicellular often gland-tipped hairs or with sessile, yellowish to reddish-brown disc-shaped glands. Leaves alternate, usually imparipinnate, pinnately or digitately trifoliolate, or unifoliolate or simple; stipules usually small, persistent; petioles pulvinate, hairy; rachis canaliculate above, hairy, leaflets opposite or alternate, linear to orbicular, the terminal one larger than the lateral ones, rounded to cuneate at base, acute or obtuse to retuse and mucronate at apex, entire, usually adpressed pubescent on both surfaces, rarely glabrous above, midrib sunken above and raised beneath, lateral nerves inconspicuous, form marginal arches when distinct. Flowers usually in axillary racemes, sometimes in pseudo panicles or very rarely solitary; pedicelled or subsessile, always single in the axil of a setaceous, caducous bract; bracteoles absent. Calyx campanulate, pubescent outside, usually glabrous inside, rarely pubescent (*I. mysorensis*), teeth 5, subequal, the lowest the longest. Corolla usually red or pink, rarely white, caducous; standard sessile or shortly clawed, blade elliptic to orbicular, strigose to tomentose or rarely glabrous on the back, sometimes glandular, usually glabrous inside, very rarely with a tuft of hairs (*I. nigrescens* Kurz ex King & Prain); wing petals shortly clawed, free or adnate to keel petals, shorter or as long as keel petals, oblong to spatulate, glabrous or sometimes ciliate,

veined, upper auricle well developed; keel petals shortly clawed, falcate, valvately connate along lower margin from about middle to apex, upper auricle well developed, lateral spur present or absent, usually hairy towards apex and along margins to the base outside, sometimes glandular, ciliate along upper margins. Stamens diadelphous (9 + 1), filaments persistent, vexillary (upper) filament free, the other 9 connate, alternately shorter and longer, gradually longer towards the lowerside; anthers uniform, basifixed, connective apiculate, sometimes with a tuft of hairs at its base and apex. Ovary sessile or subsessile, linear to spherical, glabrous or hairy, in some species with glands at the tip of ovary, 1 many-ovuled; style curved upwards, glabrous or with a few hairs, sometimes with glands throughout; stigma capitate. Pods deflexed or spreading or ascending, dehiscent or indehiscent, linear to globose, straight or curved, cylindrical or subtetragonous, some species with longitudinal wings or crests, rarely with curved spines, hairy or glabrous outside, beaked at apex, sometimes uncinately, disconnecting by means of a more or less distinct circumferent articulation near the base, the persistent basal articulation generally glabrous and/or paler outside; endocarp septate between seeds, often tannin-spotted. Seeds globose or cylindrical or ellipsoid or quadrangular, smooth or pitted or foveolate.

Type species : *I. tinctoria* Linn.

Distrib.: Throughout the tropical and subtropical regions of the world, ca 700 species; ca 60 species and 10 varieties in India.

KEY TO THE SPECIES

- | | |
|--|------------------------------|
| 1a. Leaves simple or unifoliolate | 2 |
| b. Leaves compound | 5 |
| 2a. Pods 1 - 2-seeded, sutures narrow | 3 |
| b. Pods up to 7-seeded, sutures broad | 16. <i>I. dalzellii</i> |
| 3a. Pods 1 - 2-seeded, endocarp red-spotted; racemes globose | 14. <i>I. cordifolia</i> |
| b. Pods always 1-seeded, endocarp never spotted; racemes elongated | 4 |
| 4a. Leaf blades obovate-orbicular, glabrescent; minute gland-dotted beneath; pods falcate, echinate; seeds kidney-shaped, smooth | 39. <i>I. nummularifolia</i> |
| b. Leaf blades linear to obovate, densely adpressed pubescent, never gland-dotted; pods globose, not echinate; seeds globose, tuberculate | 34. <i>I. linifolia</i> |
| 5a. Leaves trifoliolate, if rarely multifoliolate then mixed with trifoliolate ones (as in <i>I. angulosa</i> , <i>I. aspalathoides</i> , <i>I. trita</i> var. <i>marginulata</i> and var. <i>scabra</i>) | 6 |
| b. Leaves multifoliolate | 18 |
| 6a. Leaflets gland-dotted beneath (except <i>I. thothathrii</i>), styles and pods covered with glands | 7 |
| b. Leaflets not gland-dotted beneath; styles and pods without glands | 15 |
| 7a. Leaves pinnately trifoliolate | 8 |
| b. Leaves digitately trifoliolate | 12 |

- 8a. Leaflets stipellate 5
 b. Leaflets exstipellate 10
- 9a. Leaflets gland-dotted beneath; pods obscurely constricted between seeds, distinctly beaked
 7. *I. barberi*
- b. Leaflets not gland-dotted beneath; pods neither constricted between seeds nor beaked
 52. *I. thoatharii*
- 10a. Pods 3 - 4-seeded, constricted between seeds 45. *I. santapani*
 b. Pods 1 - 2-seeded, not constricted between seeds 11
- 11a. Pods prominently winged, wings fringed, valves not veined 24. *I. glandulosa*
 b. Pods obscurely winged, wings entire, valves veined 54. *I. tirunelvelica*
- 12a. Racemes longer than leaves; flowers distinctly long pedicelled 42. *I. pedicellata*
 b. Racemes much shorter than leaves; flowers short pedicelled or sessile 13
- 13a. Plants densely spreading pubescent 32. *I. karuppiana*
 b. Plants sparsely adpressed pubescent 14
- 14a. Pods 1 - 1.5 mm broad, obscurely winged; terminal petiolule as long as lateral ones
 43. *I. prostrata*
- b. Pods more than 1.5 mm broad, prominently winged; terminal petiolule slightly longer than the lateral ones
 55. *I. trifoliata*
- 15a. Pods constricted between seeds 16
 b. Pods not constricted between seeds 17
- 16a. Leaves always trifoliolate; pods straight, shallowly constricted 17. *I. deccanensis*
 b. Leaves trifoliolate but always mixed with 5-foliolate ones; pods curved, deeply constricted
 1. *I. angulosa*
- 17a. Leaves digitately trifoliolate mixed with 5-foliolate ones; flowers solitary or rarely in pairs; leaflets narrow with a tubular glands at apex beneath 4. *I. aspalathoides*
 b. Leaves pinnately trifoliolate mixed with 5 - 7-foliolate ones; flowers many in racemes; leaflets broad without glands at apex 56. *I. trita*
- 18a. Standard glabrous; keel petals rostrate never laterally spurred; pods always 2 or more-seeded 41. *I. parviflora*
 b. Standard pubescent, sometimes only at tips and margins; keel petals not rostrate, laterally spurred; pods 1 - many-seeded 19
- 19a. Pods flat, curved, papery, endocarp never spotted; fruiting pedicels reflexed
 30. *I. hochstetteri*
- b. Pods subcylindrical or subtetragonous, endocarp often spotted; fruiting pedicels variable 20
- 20a. Flowers solitary or in pairs; leaflets and calyx teeth with a tubular gland at apex beneath 21
 b. Flowers many in racemes; leaflets and calyx teeth never with tubular glands at apex beneath (except *I. glabra* which has capitate stalked glands) 23
- 21a. Leaves distinctly pinnate, 9 - 12-foliolate; bracts distinct, subulate; calyx pubescent inside and outside 37. *I. mysorensis*
 b. Leaves digitate or obscurely pinnate, 3 - 5-foliolate; bracts minute; calyx glabrous inside 22
- 22a. Stiffy erect shrublets with woody branches, often with very short internodes; pedicels stout; pods 6 - 8-seeded 4. *I. aspalathoides*
 b. Prostrate herbs with slender stems and branches, internodes distinctly longer; pedicels slender, filiform; pods 3 - 5-seeded 57. *I. uniflora*

23a. Stems and branches glabrous	8. <i>I. bracteata</i>
b. Stems and branches pubescent	24
24a. Leaflets opposite or subopposite	25
b. Leaflets alternate	60
25a. Plants with gland-tipped hairs	26
b. Plants without gland-tipped hairs	27
26a. Pods 4 - 6-seeded; seeds punctate; racemes 1.5 - 3 cm long	2. <i>I. argentea</i>
b. Pods more than 6-seeded; seeds foveolate; racemes more than 3 cm long	12. <i>I. colutea</i>
27a. Racemes laxly 4 - 8-flowered	28
b. Racemes compactly more than 8-flowered	30
28a. Young leaflets and calyx teeth tipped with capitate stalked glands; flower bearing part of rachis glabrous	23. <i>I. glabra</i>
b. Young leaflets and calyx teeth without glands at tips; flower bearing part of rachis pubescent	29
29a. Leaflets glabrous adaxially; pods 1 - 1.5 cm long, densely spreading pubescent; obliquely depressed between seeds; seeds foveolate except at ends	58. <i>I. vicifolides</i>
b. Leaflets pubescent on both surfaces; pods more than 1.5 cm long, sparsely adpressed pubescent, never obliquely depressed between seeds; seeds foveolate all over	31. <i>I. karnatakana</i>
30a. Corolla (except for margins) and pods glabrous	31
b. Corolla and pods pubescent, if glabrous then bracts minute and pedicels slender	34
31a. Bracts cymbiform, membranous, abruptly setaceous at apex	26. <i>I. hebeptala</i>
b. Bracts linear to ovate, gradually narrowed towards apex	32
32a. Bracts 2 - 3 mm broad; anthers always with hairs at base; racemes often with sterile bracts at base	9. <i>I. cassioides</i>
b. Bracts 1 - 1.5 mm broad; anthers without hairs at base; racemes without bracts at base	33
33a. Leaflets usually 3 - 5, rarely up to 11, smaller (15 - 25 x 8 - 12 mm)	25. <i>I. hamiltonii</i>
b. Leaflets more than 11, larger (25 - 35 x 15 - 25 mm)	6. <i>I. atropurpurea</i>
34a. Standard with a tuft hairs at base inside; calyx and bracts bluish black-spotted	38. <i>I. nigrescens</i>
b. Standard glabrous inside; calyx and bracts never bluish black-spotted	35
35a. Racemes velvety or hispid with densely spreading soft or stiff hairs	36
b. Racemes adpressed pubescent	39
36a. Calyx lobes linear, much longer than the cup; endocarp spotted; seeds pitted-punctate; leaflets 5 - 7, 10 - 20 mm broad	37
b. Calyx lobes deltoid, much shorter than the cup; endocarp not spotted; seeds smooth; leaflets 13 - 51, 3 - 6 mm broad	38
37a. Peduncles up to 2.5 cm long; pods 3 - 6-seeded, 3 - 3.5 mm broad; leaflets 7 - 11, rarely up to 15	5. <i>I. astragalina</i>
b. Peduncles 4.5 - 6.5 cm long; pods 5 - 9-seeded, 1.5 - 2.5 mm broad; leaflets (3 -) 5 - 7	29. <i>I. hirsuta</i>

- 38a. Shrubs; racemes up to 8 cm long; pods quadrangular, spreading, rarely a few lower ones deflexed 18. *I. dosua*
- b. Large shrubs or treelets; racemes more than 8 cm long; pods subcylindrical, deflexed 50. *I. stachyodes*
- 39a. Seeds discoid, arranged like a pile of coins in ca 5 mm broad pods 60. *I. zollingeriana*
- b. Seeds cylindrical to angular, arranged differently in 1.5 - 2.5 mm broad pods 40
- 40a. Pods straight, never torulose or constricted 41
- b. Pods curved, if straight then pods somewhat sparsely adpressed pubescent 54
- 41a. Pods fastigately grouped with apices pointing towards tip of rachis; endocarp red-spotted; seeds punctate to shallowly foveolate (species restricted to NE and SW India) 42
- b. Pods spreading or deflexed; endocarp not spotted; seeds smooth (species restricted to Himalayas except *I. sesquipedalis* and *I. lacei* of Khasi and Naga hills in NE India) 43
- 42a. Leaflets large (2 - 3 x 0.3 - 1.7 cm); calyx cup longer than teeth; pods 6 - 7.5 cm long including a beak of 4 - 8 mm, glabrescent, 15 - 18-seeded; seeds 2.5 - 3 x 1.5 mm 21. *I. galeoides*
- b. Leaflets small (1 - 1.5 x 0.5 - 0.8 cm); calyx cup shorter than teeth; pods 2 - 3.5 cm long including beak of 1 - 1.5 mm, densely adpressed pubescent, 8 - 12-seeded; seeds 1 - 1.5 x 0.8 - 1.2 mm 59. *I. wightii*
- 43a. Racemes up to 5 cm long 44
- b. Racemes more than 5 cm long 47
- 44a. Pedicels 2 - 3 mm long; branches rusty brown pubescent 19. *I. emmae*
- b. Pedicels ca 1 mm long; branches grey pubescent 45
- 45a. Branches and pods densely spreading pubescent 22. *I. gangetica*
- b. Branches and pods adpressed pubescent 46
- 46a. Stipellae 1 between pairs of leaflets; racemes stiffy erect; leaflets glabrous to adpressed pubescent adaxially 48. *I. silvestrii*
- b. Stipellae 2 between pairs of leaflets; racemes not stiffy; leaflets always adpressed pubescent adaxially 27. *I. heterantha*
- 47a. Pods glabrous 48
- b. Pods adpressed pubescent 51
- 48a. Pods ascending 49
- b. Pods reflexed-spreading 50
- 49a. Stipules 5 - 10 mm long, persistent; leaves 21 - 31-foliolate; young branches and calyx grey pubescent; biramous hairs slender on abaxial surface of leaflets 33. *I. lacei*
- b. Stipules 3 - 4 mm long, deciduous; leaves 9 - 19-foliolate; young branches and calyx brown pubescent; biramous hairs stout on abaxial surface of leaflets 15. *I. cylindracea*
- 50a. Leaves 7 - 11-foliolate; standard and keel petals glabrescent; calyx teeth narrowly triangular, longer than the cup 28. *I. himalayensis*
- b. Leaves 13 - 23-foliolate; standard and keel petals densely adpressed pubescent; calyx teeth deltoid, shorter than the cup 20. *I. exilis*
- 51a. Calyx rusty brown tomentose; trailing or prostrate shrubs; hairs grey and brown mixed on abaxial surface of leaflets 44. *I. pseudoreticulata*
- b. Calyx grey tomentose; erect shrubs; hairs grey on abaxial surface of leaflets 52

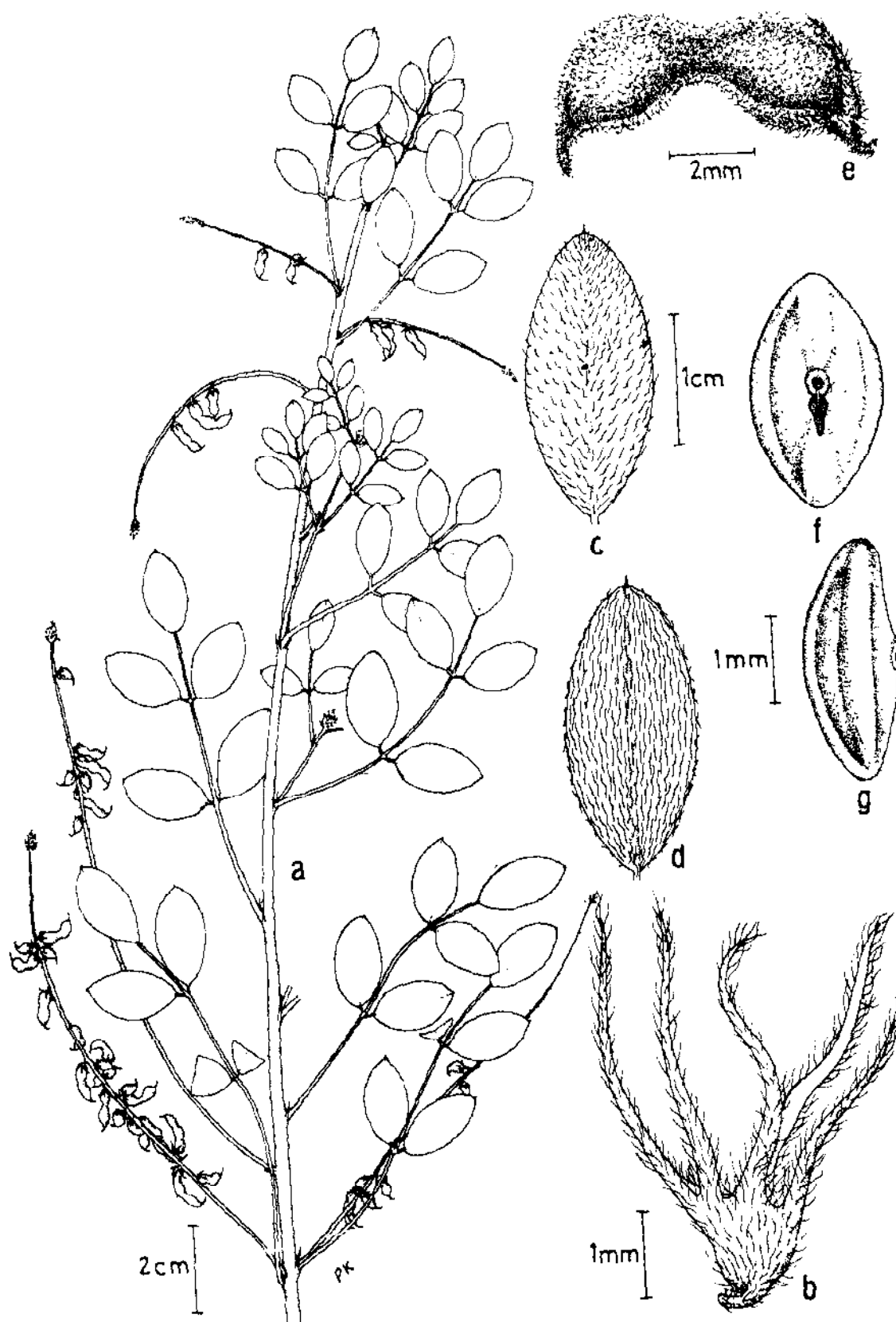


Fig. 2. *Indigofera angulosa* Edgew. : a. Habit, b. Calyx, c. Leaflet-abaxial surface, d. Leaflet-adaxial surface, e. Pod, f. Seed-hilar view, g. Seed-side view, (a-g: *Sanjappa 9257*)

- 52a. Leaflets large (15 - 25 x 5 - 10 mm); calyx densely adpressed pubescent, teeth shorter than the cup 10. *I. cedrorum*
- b. Leaflets small (5 - 15 x 3 - 5 mm); calyx sparsely pubescent, teeth equal to or longer than the cup 53
- 53a. Tall shrubs or treelets 2 - 5 m tall; leaves sessile or subsessile; anthers glabrous; pods 3 - 5 cm long spreading 27. *I. heterantha*
- b. Shrubs up to 60 cm high; leaves distinctly petiolate; Pods 1.5 - 2 cm long, reflexed-spreading 46. *I. sesquipedalis*
- 54a. Pods constricted between seeds 55
- b. Pods not constricted between seeds 56
- 55a. Leaves 3 - 5-foliolate; pods 1 - 3-seeded 1. *I. angulosa*
- b. Leaves 7 - 11-foliolate; pods 4 - 8-seeded 13. *I. constricta*
- 56a. Leaflets glabrous adaxially; pods 1 - 4-seeded, torulose 11. *I. coerulea*
- b. Leaflets pubescent on both surfaces; pods 3 or more-seeded 57
- 57a. Pods straight 58
- b. Pods curved 59
- 58a. Leaflets 9 - 13, ovate-elliptic; pods spreading; seeds foveolate-reticulate 36. *I. longiracemosa*
- b. Leaflets 11 - 19, elliptic to oblong; pods reflexed; seeds smooth 3. *I. arrecta*
- 59a. Pods 1 - 2 cm long, distinctly curved, 5 - 8-seeded 51. *I. suffruticosa*
- b. Pods more than 2 cm long, slightly curved, 8 - 12-seeded 53. *I. tinctoria*
- 60a. Pods 1 - 6-seeded; racemes subglobose to ovoid, shorter than leaves 61
- b. Pods more than 6-seeded but often mixed with less seeded pods; racemes elongated, longer than leaves 62
- 61a. Pods 1 - 2-seeded, faintly torulose in 2-seeded ones; leaves subsessile 35. *I. linnaei*
- b. Pods 3 - 6-seeded, distinctly torulose; leaves distinctly petiolate 47. *I. sessiliflora*
- 62a. Shrubs; pods curved, cylindrical, constricted between seeds, endocarp red-spotted; calyx 1 - 1.5 mm long; leaves 1 - 5-foliolate 40. *I. oblongifolia*
- b. Herbs; pods straight except the beak; subtetragonal, not constricted between seeds, endocarp not red-spotted; calyx 2.5 - 3 cm long; leaves 7 - 11-foliolate rarely mixed with 5-seeded ones 49. *I. spicata*

1. *Indigofera angulosa* Edgew. in Jour. Asiat. Soc. Bengal 21: 168. 1852; Baker in Hook. f., Fl. Brit. India 2: 97. 1876; Duthie, Fl. Upp. Gang. Pl. 1: 252. 1903 (*Repr.* 1: 232. 1960); Sanjappa in Jour. Econ. Tax. Bot. 5: 1028. 1984. *I. subulata* Vahl ex Poiret var. *angulosa* Edgew. in Jour. Asiat. Soc. Bengal 21: 31,168.1852. Fig. 2, Map 1.

Undershrub, 1 - 2 m high; branches spreading; biramous hairs grey, adpressed. Leaves 2.5 - 4 cm long including 5 - 12 mm long petiole; stipules 1.5 - 2.5 mm long, subulate, adpressed pubescent outside; stipellae minute; petioles 1 - 2 mm long; leaflets 3 - 5, 8 - 25 x 6 - 15 mm, elliptic to obovate, rounded to obtuse at base, retuse or rounded at apex, adpressed pubescent on both surfaces, biramous hairs with unequal arms above and with equal arms beneath.

Racemes 5 - 15 cm long, shortly peduncled, axillary, laxely many-flowered. Flowers pinkish, 5 mm long; bracts 1 - 1.5 mm long, subulate, adpressed hairy outside, caducous. Calyx ca 4.5 mm long, adpressed pubescent outside, lobes ca 3.5 mm long, setaceous; tube ca 1 mm long. Standard 4 - 4.5 x 2.5 mm, obovate, rounded, mucronulate at apex, strigulose without; wing petals ca 4 mm long, glabrous; keel petals 3.5 - 4 mm long, strigulose outside towards the tip, lateral spur ca 0.4 mm long. Staminal sheath ca 4 mm long. Ovary ca 2.5 mm long, linear, 3 - 5-ovuled. Pods 10 - 15 mm long, somewhat deflexed-spreading, subtetragonous, curved, constricted between seeds, abruptly beaked, strigose. Seeds 1 - 4, ca 3 x 1.5 mm, keeled on sides, yellowish-brown, smooth.

Type: India: Madhya Pradesh, Banda Dist., ('Bundelkhund') Kurthal Hills, Edgeworth 2014 (K, holo!).

Fls.: Aug. - Sept.; *Frts.:* Oct. - Nov.

Distrib.: INDIA: Gujarat, Madhya Pradesh, Maharashtra and Rajasthan; endemic.

Habitat: Dry gravelly/rocky soils on hill slopes as an undergrowth.

Exsicc.: Rajasthan : Mowabir, 16 Oct. 1887, *J.F. Duthie* 6633 (DD, CAL); on slopes of hills along Abu Road to Mt. Abu, 10 Nov. 1982 *M. Sanjappa* 9528; Gujarat: Derol Jagir, near Khedbrahma, 20 Oct. 1961 *S.J. Bedi* 786 - 791 (BARO).

Chr. No.: $n = 16$ & $2n = 32$ (Sanjappa & Bhatt, *Taxon* 26: 266. 1977).

2. *Indigofera argentea* Burm. f., *Fl. Ind.* 171. 1768, non Linn. 1771; T. Cooke, *Fl. Pres. Bombay* 1: 317. 1902 (*Repr.* 1: 338. 1967); Bhandari, *Fl. Ind. Desert* 115. 1978. *I. semitrijuga* var. *tetrasperma* DC., *Prodr.* 2: 230. 1825. *I. semitrijuga* auct. non Forsskal 1775: Aitch., *Cat. Punjab Sind Pl.* 41. 1869; Baker in Hook. f., *Fl. Brit. India* 2: 98. 1876. *I. burmannii* Boiss., *Fl. Orient.* 2: 189. 1872. Fig. 3, Map 1.

Undershrub or herb, 30 - 60 cm high, diffusely branched; branches many, angular, when young, terete and striate when mature; densely canescent, biramous hairs adpressed, grey, mixed with multicellular gland-tipped hairs. Leaves 1.5 - 3.5 cm long including 8 - 10 mm long petiole; stipules 2 - 2.5 mm long, subulate to setaceous, pubescent outside, ciliate with gland-tipped hairs; rachis obscurely canaliculate above, canescent; leaflets 3 - 9, opposite, 3.5 - 5 x 2 - 3.5 mm, orbicular or obovate, rounded at base, obtuse or rounded to emarginate and mucronulate at apex, adpressed pubescent on both surfaces, gland-tipped hairy along margin and lower surface; stipellae minute; petiolules

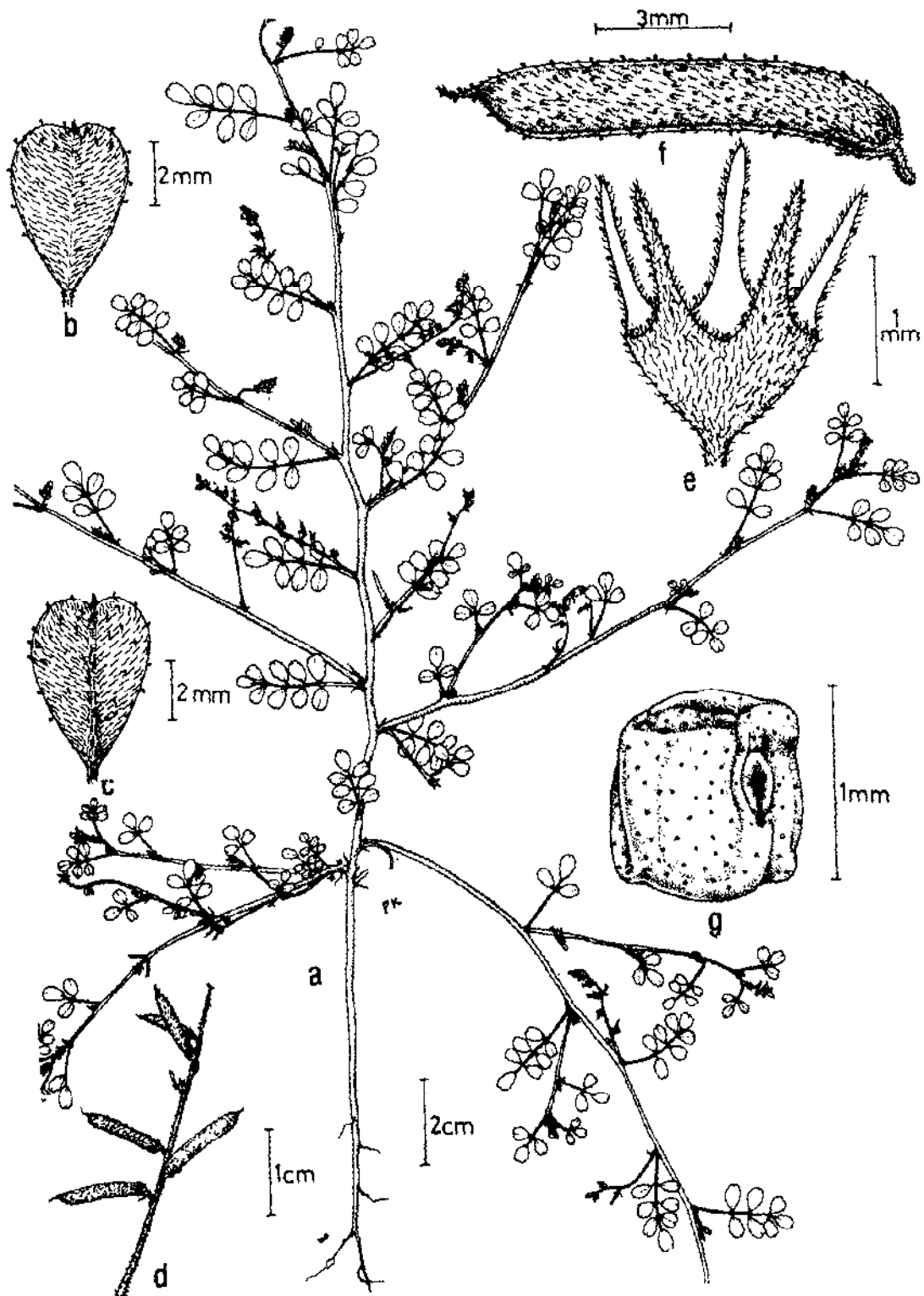


Fig. 3. *Indigofera argentea* Burm. f. : a. Habit, b. Leaflet-adaxial surface, c. Leaflet-abaxial surface, d. Inflorescence, e. Calyx, f. Pod, g. Seed, (a-c: G.P. Roy 2011; d., f-g: Wadhwa 5167)

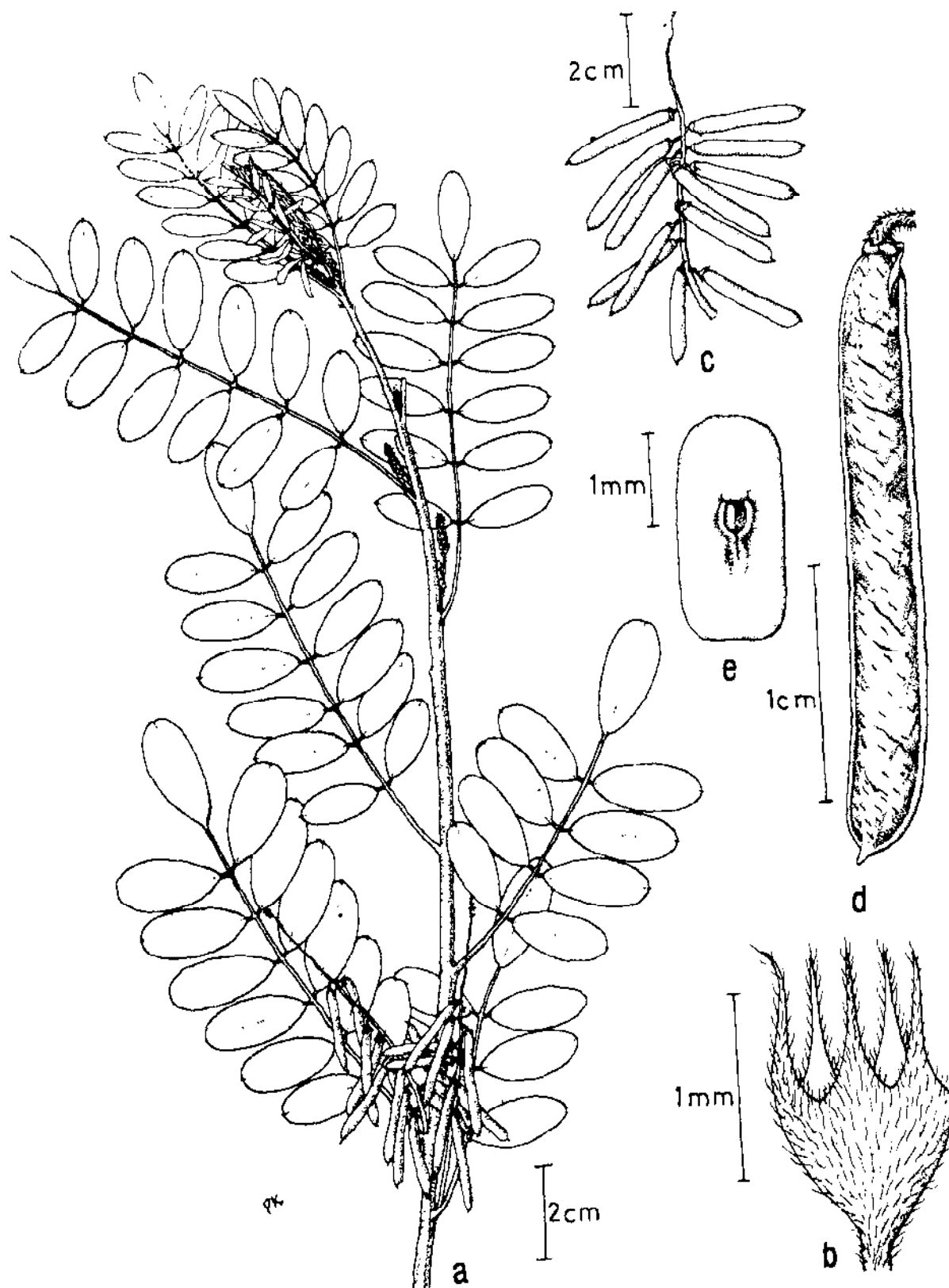


Fig. 4. *Indigofera arrecta* Hochst. ex A. Rich. : a. Habit, b. Calyx, c. Infructescence, d. Pod, e. Seed-hilar view (a-b: A.S. Rao 85449; c-e: Prain 6)

ca 1 mm long. Racemes 1.5 - 3 cm long including 5 - 8 mm long peduncle, axillary, up to 12-flowered. Flowers pink, ca 5 mm long; bracts ca 1 mm long, subulate, pubescent, caducous; pedicels ca 1 mm long. Calyx 1.5 - 2 mm long, adpressed grey pubescent outside, ciliate with gland-tipped hairs along margins, tube ca 0.5 mm long. Standard 4.5 - 5 x 4 mm, obovate or orbicular, strigulose outside, gland-tipped hairs present; wing petals ca 4 mm long, glabrous; keel petals ca 4.5 mm long, strigulose, lateral spur minute. Staminal sheath ca 4.5 mm long. Ovary ca 2.5 mm long, sparsely hairy, 4 - 8-ovuled. Pods 8 - 10 x 2 - 3 mm spreading, linear or slightly curved, faintly torulose, shortly apiculate, adpressed grey pubescent and gland-tipped hairy, upper suture broad; endocarp red-spotted on septum. Seeds generally 4 - 6-seeded, sometimes 8, 1 - 1.5 mm across, orbicular or ovoid, reddish-brown, smooth.

Type: Persia, *Herb. Burmann f.* (G, photo !)

Fls.: Aug. - Dec.; *Frts.:* Dec. - Feb.

Distrib.: INDIA: Gujarat and Rajasthan; PAKISTAN, YEMEN, OMAN, SAUDI ARABIA, CHAD, EGYPT, ERITREA, IRAN, LIBYA, MAURITANIA, NIGERIA, SOMALILAND, SUDAN.

Habitat: Confined to sand dunes of deserts.

Exsicc.: Rajasthan : Jaisalmer Dist., Mohangarh, 29 Aug. 1964, *B.M. Wadhwa* 5081; near Gomnewala, 67 m, 3 March 1978, *B.V. Shetty* 61112; Jodhpur Dist., on sand dunes rear Osian, 19 Nov. 1982, *M. Sanjappa* 9530; Gujarat: Kutch, Mandvi, *K.S. Rao* 395, 886 (BARO).

Chr. No.: $n = 8$ & $2n = 16$ (Ramanathan, *Curr. Sci.* 24: 17. 1955).

3. *Indigofera arrecta* Hochst. ex A. Rich., *Tent. Fl. Abyss.* 1: 184. 1847; Haines, *Bot. Bihar Orissa* 3: 239. 1922 (*Repr.* 2: 250. 1961); Bahadur *et al.* in *Jour. Bombay Nat. Hist. Soc.* 70: 497. 1973; Raizada, *Suppl. Fl. Upp. Gang. Pl.* 53. 1976. Fig. 4.

Local names: Nil (Hindi, Beng.); Neeligida (Kan.); Bengal indigo, Java indigo, Natal indigo (Eng.).

Stout, woody herb or undershrub, 1 - 2 m high; stems and branches ridged, striate, sparsely strigulose, biramous hairs minute with equal arms densely adpressed. Leaves 7 - 12 cm long, petiole and rachis canaliculate above, adpressed strigulose; stipules ca 3 mm long, subulate to triangular, pubescent, caducous; petiolules ca 1.5 mm long; stipellae minute; leaflets 7 - 17, 1.8 - 3 x 0.6 - 1.3 cm, oblong to obovate-oblong, cuneate to rounded at base, rounded

and apiculate at apex, sparsely strigulose to adpressed pubescent on both surfaces, sometimes glabrous above, drying blackish. Racemes 4 - 7.5 cm long, axillary, sessile or subsessile, many-flowered. Flowers pale pink to scarlet red, 5 - 6 mm long; bracts ca 1 mm long, lanceolate, caducous. Calyx ca 1 mm long, brown strigulose outside, lobes triangular. Standard 3 - 4 x 2.5 mm, obovate, mucronate at apex, brown strigulose outside; wing petals ca 2.5 mm long, ciliate; keel petals 3 - 4 mm long, brown strigulose outside, lateral spur ca 0.4 mm long. Staminal sheath ca 4 mm long. Ovary ca 3 mm long, linear, glabrous, 4 8-ovuled. Pods 18 - 23 x 3 - 4 mm, deflexed, straight, subcylindric to somewhat tetragonal, obscurely torulose, abruptly apiculate, thinly adpressed pubescent; sutures thick, valves faintly angular, often obliquely cracking in mature fruits; endocarp red-spotted. Seeds 4 - 8, ca 1.5 x 1 mm, oblong, cylindric, smooth.

Type: N. Ethiopia, 1837, *Schimper* 349 & 1923 (P, photo ! K!).

Fls.: Aug. - Oct.; *Frts.:* Oct. - Dec.

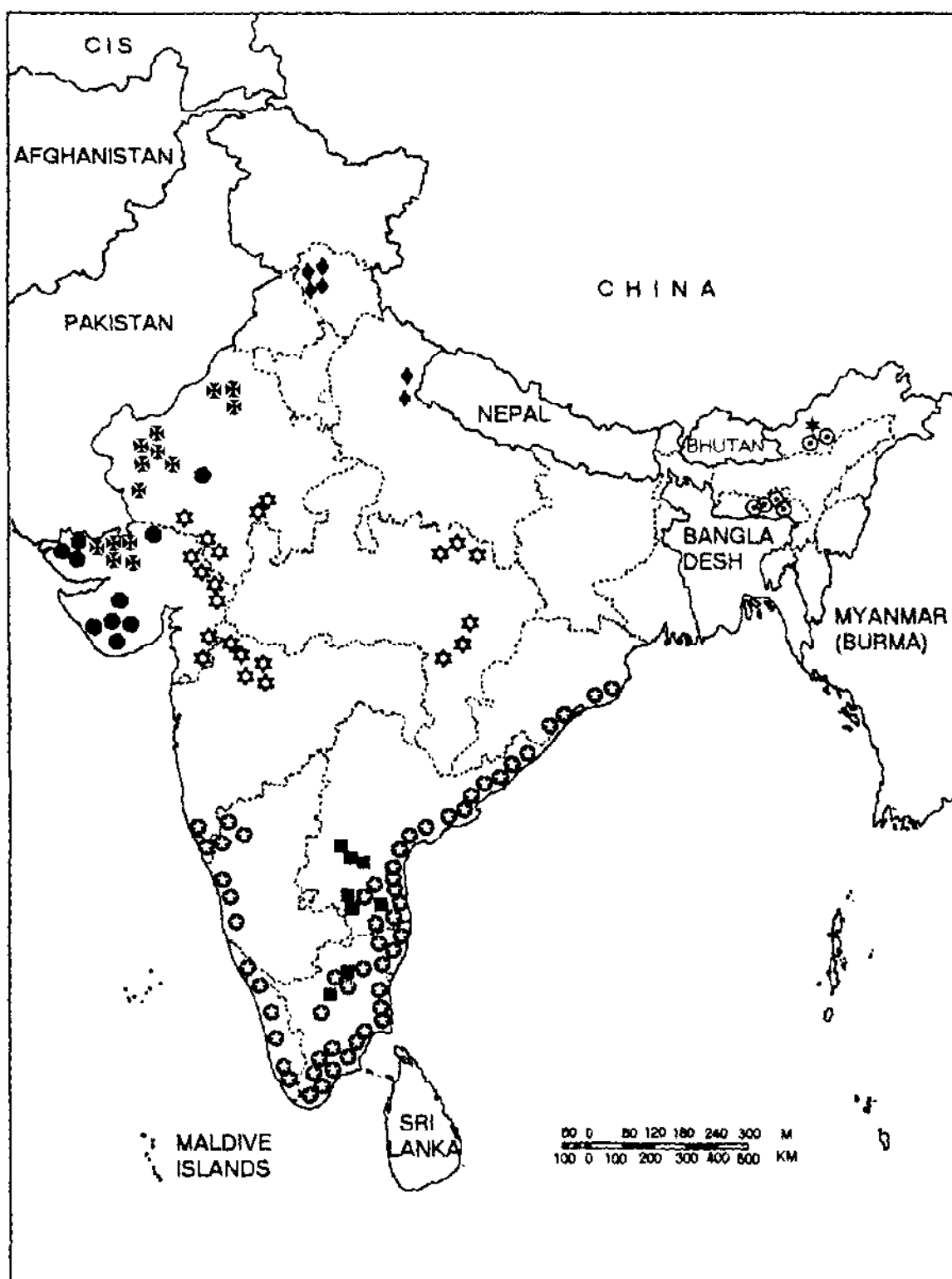
Distrib.: INDIA: Andaman & Nicobar Islands, Bihar, Karnataka, Uttar Pradesh and West Bengal; SAUDI ARABIA, CAMEROON, CONGO, ERITREA, GAMBIA, NORTH YEMEN, SUDAN, S. AFRICA, TROPICAL AFRICA. Introduced in S.E. Asia including India.

Uses: Once cultivated in Bihar and Bengal as one of the major Indigo producing species. Presently the species is cultivated as a green manure plant in coffee estates in Karnataka.

Exsicc.: Bihar: Darbanga Dist., Dalsing Sarai, Aug. 1900, *D. Prain* s.n.; Karnataka: Madikeri Dist ('Coorg' Dist.), 3 miles W. of Kutta in forest clearings, 1 Nov. 1963. *A.S. Rao* 95440; Uttar Pradesh: Azamgarh, 14 Feb. 1901, *D. Martin* s.n.

Chr. No.: 2n = 16 (Frahm-Leliveld, *Euphytica* 2: 47. 1953) 2n = 16 + 2B (Sanjappa & Bhatt, *Taxon* 26: 266. 1977).

4. *Indigofera aspalathoides* Vahl ex DC., *Prodr.* 2: 231. 1825; Wight & Arn., *Prodr.* 199. 1834; Wight, *Icon. Pl. Ind. Orient.* t. 332. 1840; Dalz. & Gibs., *Bombay Fl.* 58. 1861; Drury, *Handb. Indian Fl.* 1: 277. 1864; Baker in Hook. f., *Fl. Brit. India* 2: 94. 1876; Gamble, *Fl. Pres. Madras* 309. 1918 (*Repr.* 1: 218. 1967); Britto in Matthew, *Fl. Tamil Nadu Carn.* 1: 414. 1983; Saldanha & G. Singh in Saldanha, *Fl. Karnataka* 1: 468. 1984. *Aspalathus indicus* Linn., *Sp. Pl.* 1001. 1753 non *Indigofera indica* Mill. 1768, nec Lam. 1789. *Manneli* Rheed., *Hort. Malab.* 9: 69, t. 37. 1689. *Indigofera aspalathifolia* Roxb., *Fl. Ind.* 3: 371. 1832, nom. illeg. (incl. type of *I. aspalathoides* DC. 1825). Fig. 5, Map 1.



Map 1. *Indigofera angulosa* Edgew. (☆); *I. argentea* Burm. f. (✱); *I. aspalathoides* Vahl ex DC. (⊙); *I. barberi* Gamble (■); *I. bracteata* var. *bracteata* (*), var. *khasiana* Sanjappa (⊙); *I. cedrorum* Dunn (◆); *I. coerulea* var. *monosperma* (Santapau) Santapau (●).



Fig. 5. *Indigofera aspalathoides* Vahl ex DC. : a. Habit, b. Leaf, c. Pod, d. Seed-hilar view, e. Calyx (a-b, e: *Sebastine* 5469; c: *N.C. Nair* 60842; d. *A.R.K. Sastry* 7797).

Local names: Neela, Shiva malli(Kan.); Wiry indigo (Eng.), Manneli (Mal.); Rataknama, Sivanimba, Shevaniarba (Sans.); Shivanarivembu, Iraivanavembu (Tam.).

Erect, copiously branched, undershrub, 30 - 40 cm high; stems and branches rigid, spreading, terete, internodes very short, white canascent when young, glabrous or sparsely hairy and reddish when mature. Leaves digitate, sessile; stipules 0.8 - 1.1 mm long, setaceous, glabrous; stipellae ca 1 mm long, setaceous, glabrous; petiolules ca 1 mm long, brown; leaflets 1 - 6, fleshy, 3 - 5 x 0.5 - 2 mm, linear or obovate-oblong, cuneate at base, obtuse or rounded at apex, minutely apiculate with a tubular gland, glabrous above, sparsely adpressed hairy beneath; Flowers dark pink, 3 - 4 mm long, solitary or sometimes paired, axillary; pedicels 4 - 6 mm long, erecto-patent, jointed, glabrescent; bracts minute, caducous. Calyx 1.5 - 2 mm long, thinly pubescent outside; lobes 1 - 1.5 mm long, subulate with a tubular gland on the midrib at tip outside; standard 3.5 - 4 x 1 - 1.5 mm, elliptic, strigulose outside; wings ca 3 mm long, glabrous; keels 3 - 3.5 mm long, strigulose without, lateral spur ca 0.3 mm long. Ovary 1.5 - 2 mm long, linear, glabrous; 5 - 8-ovuled. Pods 12 - 18 x 1 - 2 mm, longer than pedicels, linear, straight, subcylindric or flattened, apiculate, faintly torulose, sparsely adpressed hairy; endocarp spotted. Seeds 3 - 6(- 8), ca 1 x 1 mm, cubical or subcylindric, truncate at both ends, reddish-brown, smooth.

Type: Sri Lanka, Herb. *De Candolle* 2: 231. 95 (G-DC, seen on microfiche).

Fls. & Frts.: June - Dec.

Distrib.: INDIA: Andhra Pradesh, Karnataka, Kerala, Orissa and Tamil Nadu; SRI LANKA.

Habitat: Common on sandy coastal areas.

Exsicc.: Andhra Pradesh: Visakhapatnam, on hills near Bhimalipatnam, 15 Nov. 1970, *B.K. Vijay Kumar* 1106; Kerala: Travancore, Shencottai to Aryankav, 9 Sept. 1913, *Calder & Ramaswamy* 755; Tamil Nadu: Tirunelveli Dist. (Tinnevelly'), Sivanaperi, 225 m, 17 Nov. 1962, *J. Joseph* 15114; Kalkad, 28 Dec. 1980, *M. Sanjappa* 735.

Chr. No.: $2n = 32$ (Singh & Roy, *Nucleus* 13: 42. 1970), $2n = 16$ (Sanjappa & Dasgupta, *Indian Jour. Bot.* 6: 62. 1983).

Uses: The decoction of leaves, flowers and tender shoots is employed in leprosy and cancerous affections.

Pollen: 3-zonocolporate, spheroidal, rarely subprolate, 37 - 40 x 30 - 36 μ m, rugulate, perforate (Ferguson & Strachan, *Pollen et Spores* 24: 171 - 210. 1982).

Notes: This species was erroneously recorded from Darjeeling, West Bengal (K.K.N. Nair in *Jour. Indian Bot. Soc.* 60: 182 - 183. 1981) based on a collection probably made from Orissa as this is a coastal species especially on sandy soils but also found on other types of soils in interior parts towards southern most tip of peninsular India.

5. *Indigofera astragalina* DC., *Prodr.* 2: 228. 1825; Gillett in *Kew Bull.* 14: 290. 1960; *I. hirsuta* auct. non Linn. 1735; Baker in *Hook. f., Fl. Brit. India* 2: 98. 1876, *p.p.*; Roxb., *Fl. Ind.* 3: 376. 1832; Wight & Arn., *Prodr.* 204. 1834; Dalz. & Gibs., *Fl. Bombay* 60. 1861, *p.p.*; Drury, *Handb. Indian Fl.* 1: 281. 1864, *p.p.*; Collett, *Fl. Simlensis* 121. 1902; T. Cooke, *Fl. Pres. Bombay* 1: 319. 1902 (*Repr.* 1: 339. 1958) *p.p.*; Prain, *Bengal Pl.* 1: 432. 1903, *p.p.*; (*Repr.* 1: 310. 1967); Duthie, *Fl. Upp. Gang. Pl.* 1: 254. 1903 (*Repr.* 1: 234. 1960) *p.p.*; Bamber, *Pl. Punjab* 254. 1916; Gamble, *Fl. Pres. Madras* 312. 1918 (*Repr.* 1: 221. 1957); Haines, *Bot. Bihar Orissa* 2: 239. 1922 (*Repr.* 2: 250. 1961) *p.p.*; Saldanha & G. Singh in Saldanha, *Fl. Karnataka* 1: 468. 1984; R.S. Rao, *Fl. Goa etc.* 1: 122. 1985; Grierson & Long, *Fl. Bhutan* 1: 663. 1987. **Fig. 6.**

Local name: Dagadia (Hindi).

Annual, erect herb, 1 - 1.5 m high; stems and branches angular when young, terete and reddish when mature, biamous hairs stiffy, usually white, sometimes brownish. Leaves 8 - 15 cm long including 2 - 3 cm long petioles; stipules 1 - 1.6 cm long, linear to filiform, brown plumose; rachis prolonged beyond lateral leaflets, hirsute; petiolules 2 - 3 mm long, stipellae 2 - 3 mm long, brown pilose; leaflets 7 - 9, sometimes up to 15, opposite, 1 - 4 x 1 - 2 cm, obovate, elliptic or elliptic-oblong, mucronate at apex, pilose on both surfaces, hairs brownish on midrib and along margins, green above, pale beneath. Racemes 8 - 20 cm long including 1 - 2.5 cm long peduncle; rachis hirsute, densely many-flowered. Flowers light pink to brick red; pedicels 2 - 3 mm long, pilose, reflexed in fruits; bracts 3 - 4 mm long pilose, caducous. Calyx 3.5 - 4 mm long, plumose; lobes linear, setaceous, divided almost to the base. Standard 3 - 4.5 x 2.5 mm, elliptic or obovate, obtuse or retuse at apex, pubescent outside; wing petals 3 - 3.5 mm long, ciliate; keel petals 3 - 4.5 mm long, pubescent outside, lateral spur ca 0.4 mm long. Staminal sheath ca 4 mm long. Ovary 1 - 2 mm long, glabrous, 5 - 6-ovuled. Pods 10 - 19 x 3 - 3.5 mm, straight, reflexed, subquadrangular, abruptly short apiculate, hirsute, up to 6-seeded; endocarp spotted. Seeds 3 - 6, 2 - 5 x 1.5 mm, tetragonus, strongly pitted, brown.

Type: Senegal, Perrottet 143 (G, photo !).

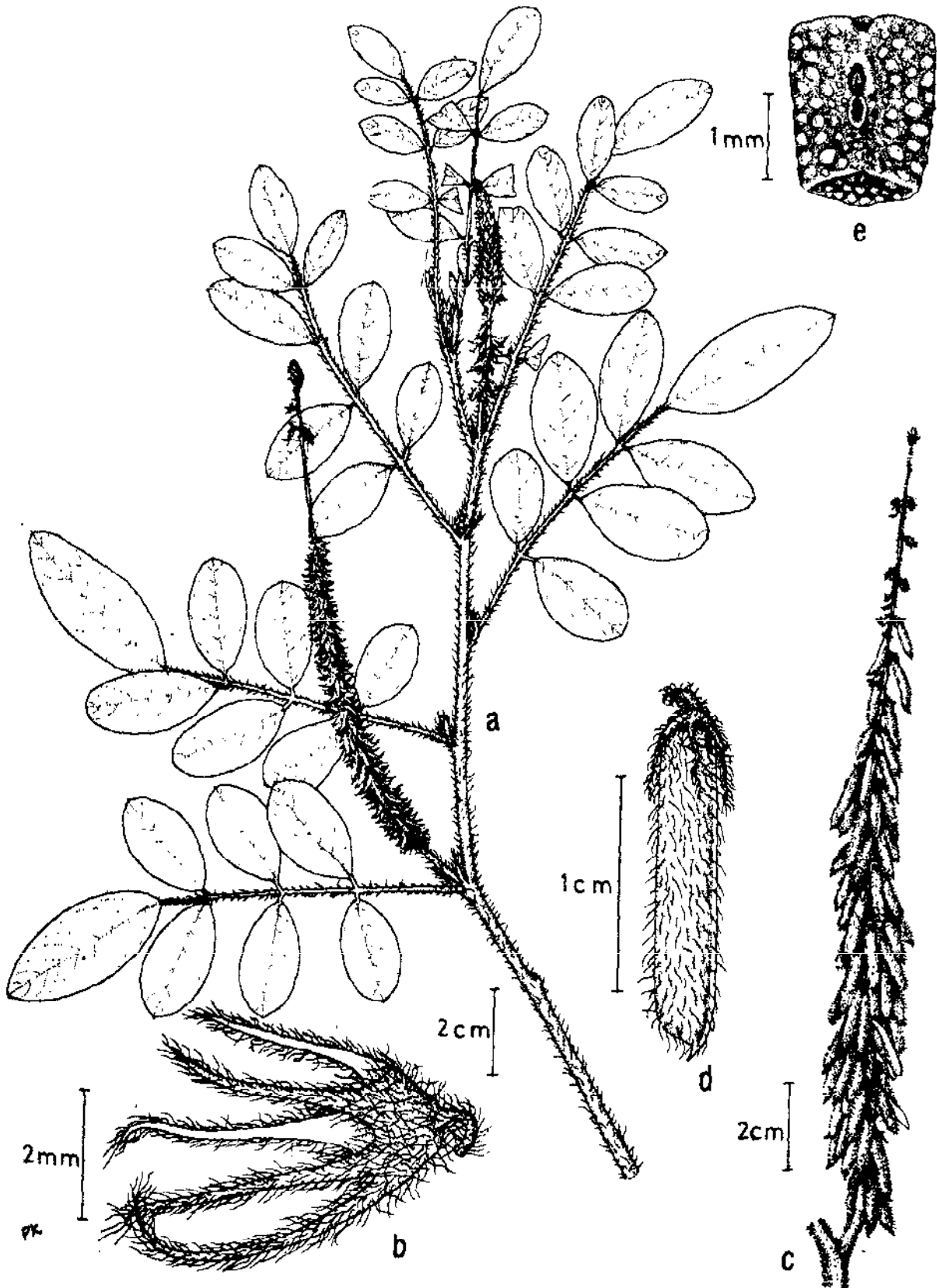


Fig. 6. *Indigofera astragalina* DC. : a. Habit, b. Calyx, c. Infructescence, d. Pod, e. Seed-hilar view, (a-b: *Narayanaswamy* 624; c-e: *R.S. Rao* 92602).

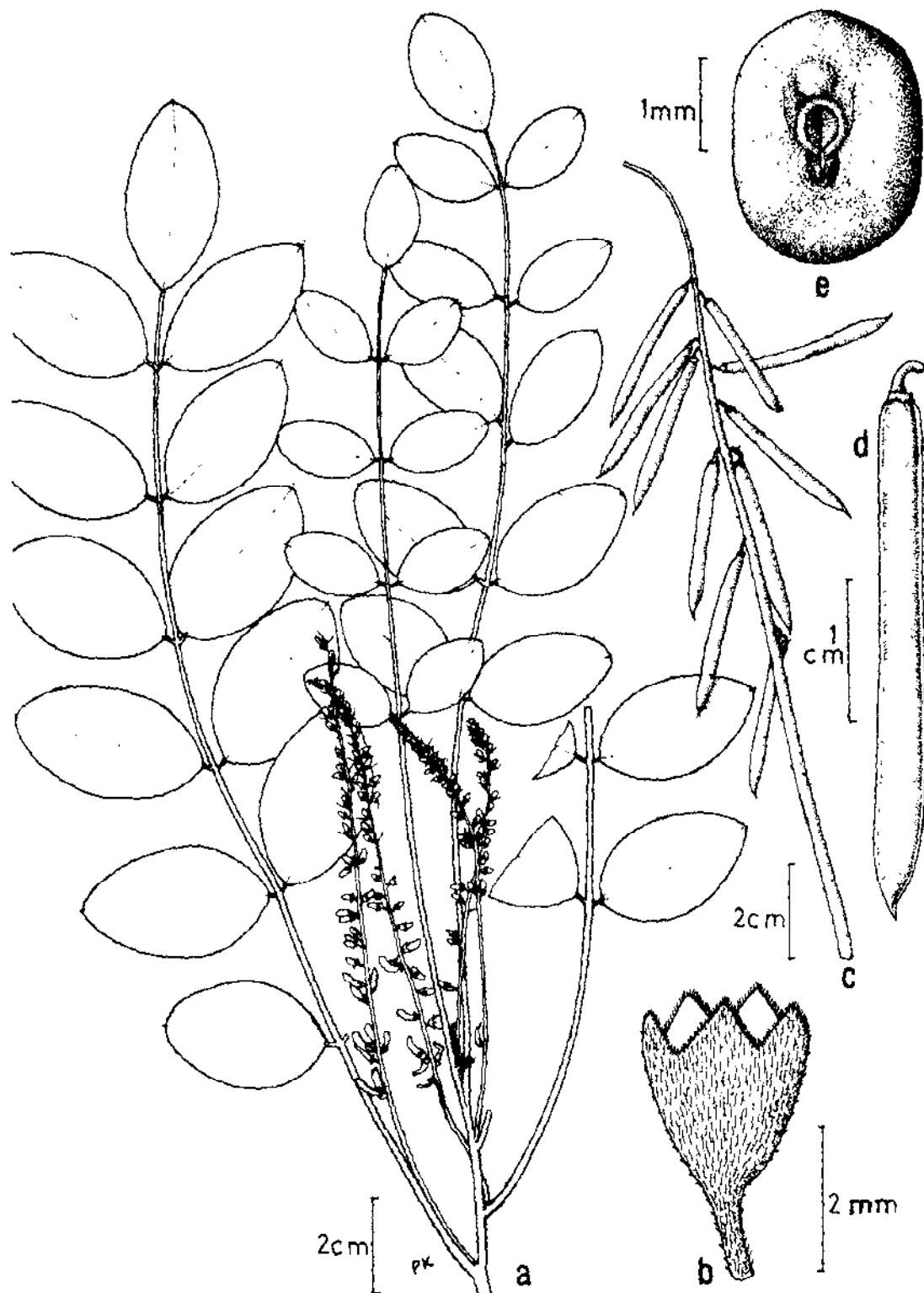


Fig. 7. *Indigofera atropurpurea* Buch.-Ham. ex Hornem. : a. Habit, b. Calyx, c. Infructescence, d. Pod, e. Seed (a-b: *Inayat* 24340; c-e: *Lace* 5517).

Fls.: Aug. - Oct.; *Frts.*: Oct. - Nov.

Distrib.: INDIA (throughout up to 900 m in Sikkim); PAKISTAN, AUSTRALIA, CHINA, S.E. ASIA, S.AFRICA, TROPICAL AFRICA, introduced in West Indies.

Exsicc.: Andhra Pradesh: Kurnool Dist., Chelama, 340 m, 16 Oct. 1964, *J.L. Ellis* 22033; Bihar: Hazaribagh, 150 m, 16 Oct. 1873, *C.B. Clarke* 21376; Karnataka: Bangalore Dist., Bannerghatta, 15 Dec. 1980, *M. Sanjappa* 725.

Chr. No.: $2n = 16$ (Frahm-Leliveld, *Act. Bot. Neerl.* 9: 286. 1960), $n = 8$ (Sanjappa & Bhatt, *Jour. Cytol. Genet.* 14: 60. 1979).

Pollen: 3-zonocolporate, spheroidal, rarely subprolate, $37 - 40 \times 30 - 36 \mu\text{m}$, rugulate, perforate (Ferguson & Strachan, *Pollen et spores* 24: 171 - 210. 1982).

Notes: In almost all Indian floras this species was merged with its closely allied *I. hirsuta* Linn. until Gillett (1960) exclusively discussed the differences to retain them as separate species. Gillett's (*op. cit*) view is accepted here after studying all the Indian materials. So far no intermediates between the species are recorded in India.

6. *Indigofera atropurpurea* Buch.-Ham. ex Hornem., *Hort. Reg. Bot. Hafn. Suppl.* 152. 1819; D. Don, *Prodr.* 224. Feb. 1825; DC., *Prodr.* 2: 225. Nov. 1825; Roxb., *Fl. Ind.* 3: 381. 1832; Wight, *Icon. Pl. Ind. Orient.* t. 369. 1840; Baker in Hook. f., *Fl. Brit. India* 2: 101. 1876, p.p.; Collett, *Fl. Simlensis*, 122. 1902; Brandis, *Indian Trees* 217. 1906; Bamber, *Pl. Punjab* 99. 1916; Parker, *For. Fl. Punjab* 132. 1918; Osmaston, *For. Fl. Kumaon* 152. 1927; Kanjilal *et al.*, *Fl. Assam* 2: 20. 1938; Babu, *Herb. Fl. Dehra Dun* 143. 1977; Grierson & Long, *Fl. Bhutan* 1: 667. 1987. Fig. 7.

Local names: Bankati, Kala, Sakena, Sakana (Hindi), Kathi, Gorkatri (Kashm.).

Shrub, 2 - 3 m high; stems and branches erect, biamous hairs adpressed with equal arms. Leaves 12 - 24 cm long; stipules ca 5 mm long, narrowly triangular, caducous; rachis 10 - 20 cm long including 2 - 4 cm long petioles; stipellae 1 - 1.5 mm long, linear; petiolules 2 - 3 mm long; leaflets (9 -) 11 - 17, opposite, 3 - 5 x 1.5 - 3.5 cm, obovate, sometimes elliptic, obtuse to rounded at base, acute to rounded apex, rarely retuse and mucronate, adpressed pubescent on both surfaces, green above, pale beneath, venation distinctly reticulate, lateral nerves 9 - 11 pairs, alternate. Racemes 10 - 20 cm long including 2 - 4 cm long angular peduncle, many-flowered, often bear flowers near to the base of rachis. Flowers purplish-red, 6 - 10 mm long; bracts 3 - 6 x 1 - 1.5 mm,

triangular, subsistent; pedicels ca 1.5 mm long. Calyx 3 - 4 mm long, obliquely campanulate, cup ca 1.5 mm long, teeth 1 - 1.5 mm long, deltoid. Standard 8 - 9 x 5 - 6 mm, elliptic, dark purple glabrous; wing petals 6 - 8 x 2 - 2.5 mm, oblong, pink, ciliate along margins, keel petals 8 - 8.5 x 2 - 2.5 mm, purple, ciliate along upper margins, lateral spur 1 - 1.2 mm long. Staminal sheath 6 - 7 mm long; anthers ca 0.5 mm long. Ovary ca 5 mm long, linear, glabrous, 9 - 11-ovuled; style ca 3 mm long, glabrous. Pods 30 - 45 x 4 mm, straight, spreading or deflexed cylindric, abruptly short beaked, glabrous, dehiscent, 6 - 10-seeded. Seeds 2.5 x 2 - 2.5 mm, cylindric, rounded at both ends, smooth, dark brown.

Type: Cultivated in the Botanic garden at Copenhagen, *Hornemann s.n.* (C, photo !).

Fls.: July - Sept.; *Frts.:* Oct. - Dec.

Distrib.: INDIA: Arunachal Pradesh, Himachal Pradesh, Jammu & Kashmir, Manipur, Meghalaya, Nagaland, Punjab, Tripura and Uttar Pradesh; NEPAL, BHUTAN, BANGLADESH, MYANMAR, CHINA, VIETNAM.

Habitat: Slopes of valleys at altitudes ranging from 300 to 2000 m.

Exsicc.: Meghalaya: Khasia Hills, 2000 - 5000 ft., *J.D. Hooker & T. Thomson s.n.*; Nagaland: Naga Hills, Mao, 5800 ft., 26 Oct. 1885, *C.B. Clarke* 41196 A; Uttar Pradesh: Kumaon, Sarju Valley, Shaina, 31 July 1900, *Inayat* 24340.

Notes: Although this species was first named and published without description by Roxburgh (1814) in his *Hortus Bengalensis*, it was validated by Hornemann in 1819, who described it from a plant cultivated in the Botanic garden of Copenhagen. Subsequently Roxburgh also published *I. atropurpurea* in his *Flora Indica* (1832).

de Kort and Thijsse (*Blumea* 30: 111.1984) included Sri Lanka in the distribution of *I. atropurpurea*. It does not grow wild in Sri Lanka but was introduced in Perdeniya garden (see Moon *A catalogue of the indigenous and exotic plants growing in Ceylon*. Colombo 54. 1824).

Chr. No.: 2n = 16 (Mehra & Dhawan, *Taxon* 20: 793. 1971).

7. *Indigofera barberi* Gamble *Fl. Pres. Madras* 306, 309. 1918 & in *Bull. Misc. Inform. Kew* 1919: 222. 1919; Naidu & Rao in *Indian For.* 95: 620. 1969; Britto in Matthew, *Fl. Tamil Nadu Carn.* 1: 415. 1983; Ahmed. & Nayar, *Endem. Pl. Indian Reg.* 99. 1987. *I. trifoliata* Linn. subsp. *trifoliata*; de Kort & Thijsse in *Blumea* 30: 137. 1984, p.p. Fig. 8, Map 1.

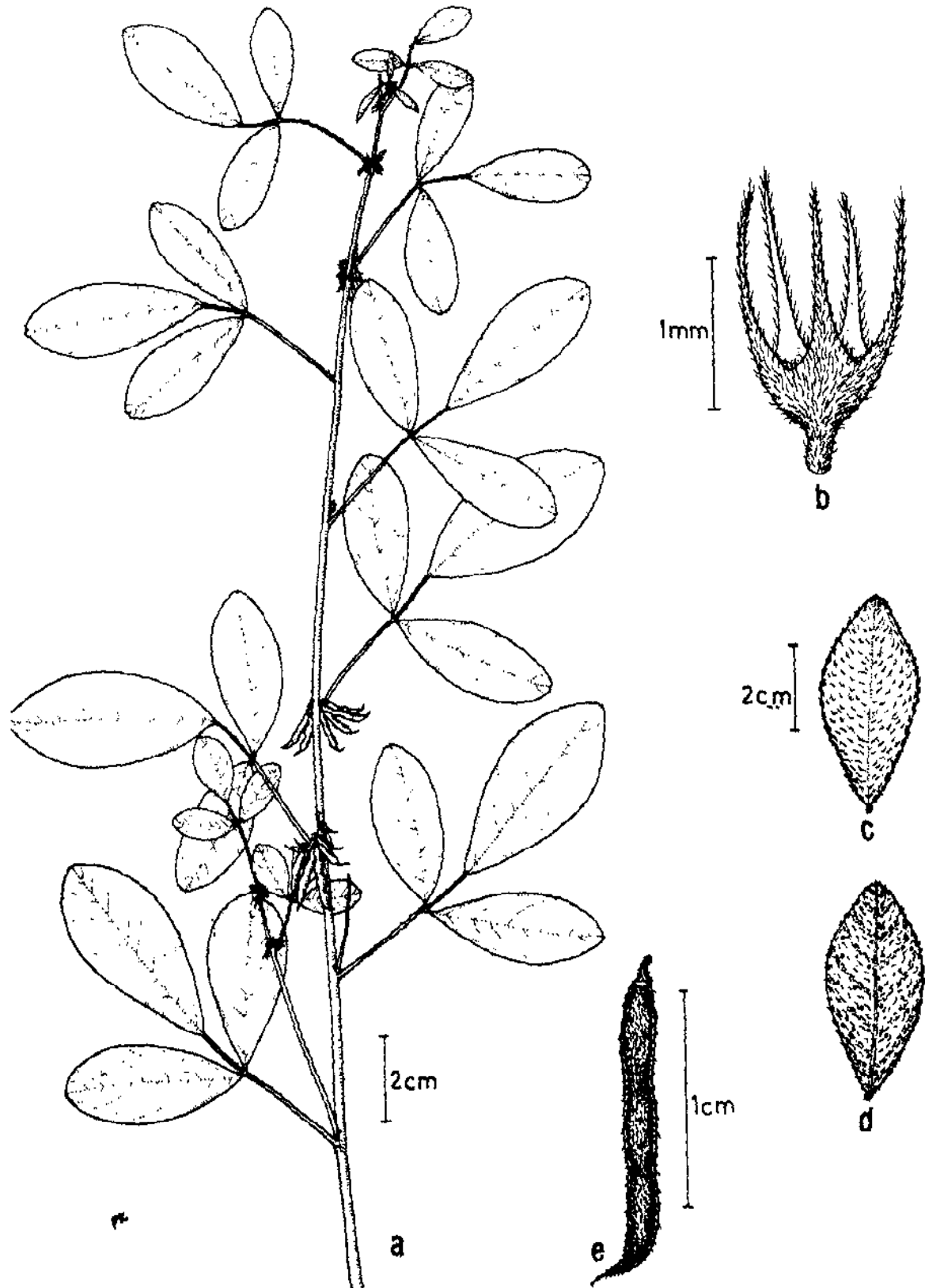


Fig. 8. *Indigofera barberi* Gamble : a. Habit, b. Calyx, c. Leaflet-adaxial surface, d. Leaflet-abaxial surface, e. Pod (a-d: *Ellis 32470*).

Local name : Sinnichedi (Tam.)

Erect herb or undershrub, 30 - 120 cm high; branches slender, angular, ascendingly appressed canascent. Leaves pinnately trifoliolate, 3 - 8 cm long including 1.5 - 2.5 cm long petiole; stipules 2 - 3 mm long, subulate, caducous; stipellae ca 1 mm long, setaceous; petiolules 1.5 - 2 mm long; leaflets 2 - 5.5 x 1 - 2.5 cm, obovate or elliptic to elliptic-lanceolate, obtuse at base, obtuse to rounded and mucronate at apex, adpressed strigose on both surfaces, sparsely brown gland-dotted beneath. Racemes 5 - 7 mm long, axillary; rachis strigose, glandular, 10 - 15-flowered. Flowers solomon red, 3 - 3.5 mm long; bracts 2 - 2.5 mm, subulate, pubescent, caducous; pedicels ca 1 mm long, glandular. Calyx ca 2 mm long, strigose and gland-dotted outside, cup ca 0.5 mm long, teeth 1 - 1.5 mm long, triangular. Standard 2.5 - 3 x 1 - 1.5 mm, elliptic or ovate, obtuse to acute at apex, strigose and gland-dotted on the back; wing petals 2 - 2.5 mm long, glabrous, upper auricle prominent; keel petals 2.5 - 3 mm long, strigulose and gland-dotted outside towards tip, lateral spur ca 1 mm long, hyaline. Ovary ca 2 mm long, linear with a few hairs on dorsal side, 4 - 5-ovuled; style ca 1 mm long, sparsely covered with glands. Pods 10 - 20 x 3 - 4 mm, linear or slightly upcurved, moniliform, adpressed strigose, sparsely covered with glands, 2 - 4-seeded. Seeds 1 - 1.5 x 1 mm, subcylindric, brown, smooth.

Type: India: Tamil Nadu, S. Arcot Dist., Melpat, 28 Sept. 1899, *C.A. Barber* 1076 (K, lecto ! MH isolecto !). Lectotype selected here.

Fls.: Sept. - Oct.; *Frts.*: Oct. - Dec.

Distrib.: INDIA: Andhra Pradesh and Tamil Nadu; endemic.

Habitat: Open areas of deciduous forests along slopes of hills and in scrub jungles, on rocky soils at altitudes ranging from 300 to 700 m.

Exsicc.: Andhra Pradesh: Kurnool Dist, Nallamalais, near Bairani falls Diguvametta, 325 m, 10 Nov. 1969, *J.L. Ellis* 32470; Chittoor Dist., Talakona Forest, 9 Sept. 1971, *B.K. Vijay kumar* 622; Cuddapah, locality? 19 Oct. 1938, *E.K. Krishnan s.n.* (DD).

Chr. No.: $2n = 16$ (Pritchard & Gould, Div. Trop. Past. Tech. Pap. 2, CSIRO, Australia: 18. 1964 & Sanjappa & Dasgupta, Indian Jour. Bot. 6: 62. 1983).

Note: de Kort and Thijssse (1984) have merged *I. barberi* Gamble under *I. trifoliata* L. subsp. *trifoliata* without assigning any reason. *I. barberi* differs greatly from *I. trifoliata* in habit, leaves, flowers and pods. Therefore, it is treated here as a distinct species.

8. *Indigofera bracteata* Graham ex Baker in Hook. f., Fl. Brit. India 2: 100. 1876; Ohashi in Hara, Fl. E. Himal. 65. 1975; Sanjappa in Jour. Bombay Nat. Hist. Soc. 81: 448. 1984; Grierson & Long, Fl. Bhutan 1: 667. 1987.

KEY TO THE VARIETIES

- 1a. Leaflets hairy adaxially; pods 2 - 2.5 cm long, sutures, obscurely winged, valves smooth
8.1. var. *bracteata*
- b. Leaflets glabrous adaxially; pods 3 - 3.5 cm long, sutures prominently winged, rugulose
8.2. var. *khasiana*

8.1. var. *bracteata*

Map 1.

Type: Graham in Wallich, Cat. No. 5477 (CAL, lecto ! K-W isolecto !).

Fls.: July - Nov.; *Frts.*: Nov. - Dec.

Distrib.: INDIA: Arunachal Pradesh; NEPAL, BHUTAN, CHINA.

Excicc.: Arunachal Pradesh: Jumbesi-Singhone, 10,000 ft., 1 June 1958, R.S. Rao 17211.

Undershrub, 30 - 90 cm high; stems and branches slender, prostrate or trailing, glabrous. Leaves 4 - 10 cm long; 3 - 5 x 1 - 1.2 mm, membranous, lanceolate, acuminate, glabrous, persistent; rachis 4 - 7 cm long including 1.5 - 2.5 cm long petiole. Stipellae 2 - 2.5 mm long, linear, acuminate, persistent; petiolules 1 - 1.5 mm long, glabrous; leaflets 5 - 7, opposite, 1.2 - 2.8 x 0.6 - 1 cm, elliptic or obovate, cuneate at base, obtuse to rounded or rarely retuse and mucronate at apex, sparsely adpressed pubescent on both surfaces. Racemes 8 - 13 cm long including 3 - 5 cm long, glabrous peduncles, many-flowered. Flowers violet-purple, 8 - 10 mm long; bracts prominent, 4 - 4.5 x 2 - 2.2 mm, ovate, cuspidate, reticulately veined, ciliate along margins; pedicels 2 - 3 mm long, glabrous. Calyx 1 - 1.5 mm long, adpressed strigose outside; cup ca 1 mm long, teeth short, deltoid, ciliate along margins. Standard 7 - 9 x 4 - 5 mm, elliptic, rounded at base, acute and mucronate at apex, densely strigose outside; wing petals 6 - 8 mm long, glabrous; keel petals 7 - 9 mm long, densely strigose outside, lateral spur 1.5 - 2 mm long. Staminal sheath 7 - 8 mm long; anthers 1 - 1.5 mm long. Ovary 4.5 - 6 mm long, glabrous. Pods 30 - 35 x 2 - 3 mm, spreading, glabrous, linear, cylindric, obscurely torulose, apiculate, sutures broad with or without obscure wings, valves smooth or rugulose 7 - 10-seeded; endocarp smooth. Seeds ca 2 x 1.5 mm, cylindric, truncate at both ends, smooth, brown.

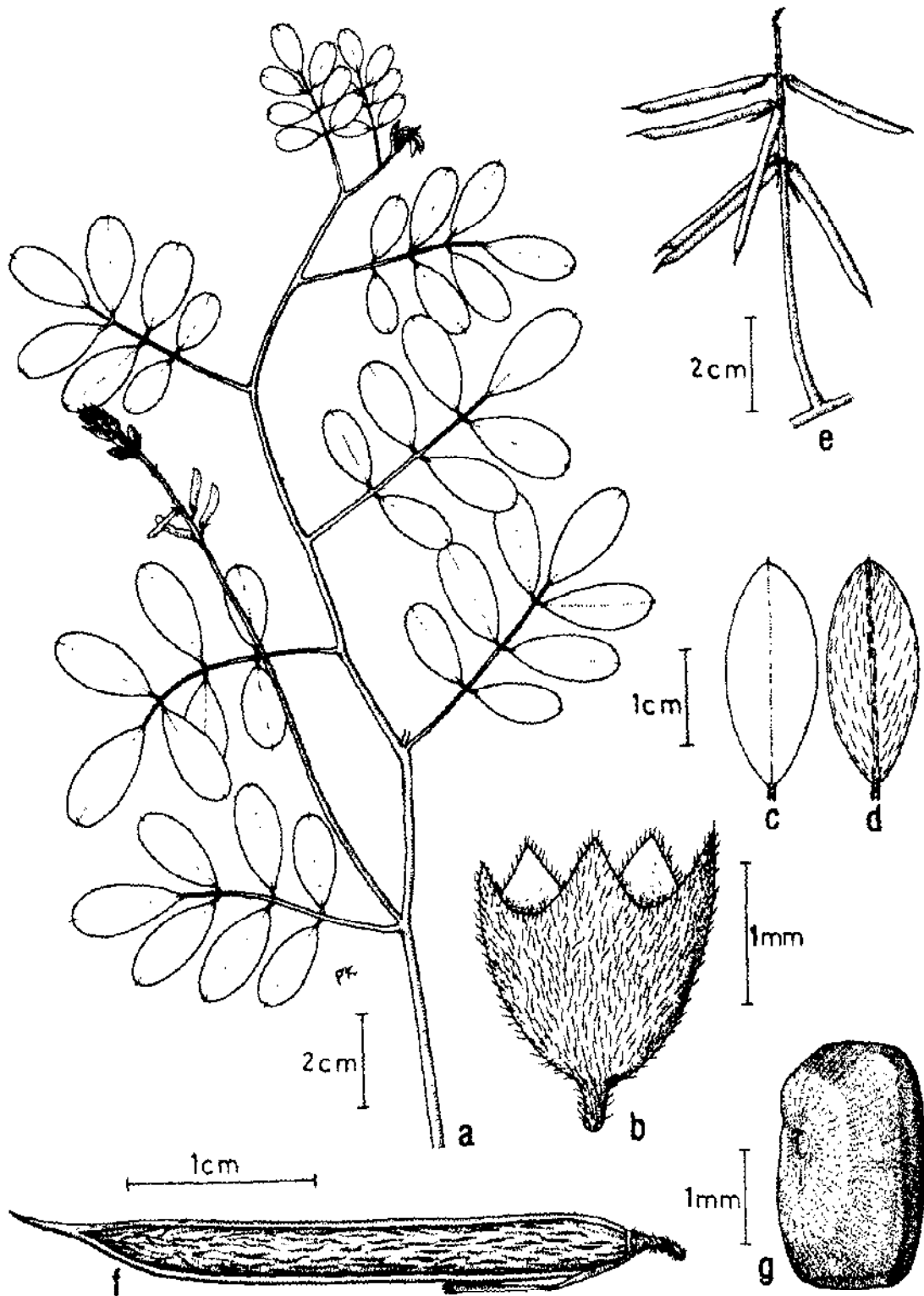


Fig. 9. *Indigofera bracteata* Graham ex Baker var. *khasiana* Sanjappa : a. Habit, b. Calyx, c. Leaflet-adaxial surface, d. Leaflet-abaxial surface, e. Infructescence, f. Pod, g. Seed-hilar view (a-d: Kingdon-ward 9; e-g: C.B. Clarke 15310).

8.2. var. *khasiana* Sanjappa in Jour. Bombay Nat. Hist. Soc. 81: 449. 1984.
 Indigofera bracteata Graham ex Baker in Hook. f., Fl. Brit. India 2: 100. 1876,
 p.p. Fig. 9, Map 1.

Differs from var. *bracteata* by its adaxilly glabrous leaflets, more than 3 cm long pods with a spinate apex, prominently winged sutures and rugulose valves.

Type: India: Meghalaya, Khasi Hills 5000 - 6000 ft., *J.D. Hooker & T. Thomson s.n.* (holo CAL, MH, iso!).

Fls.: July - Nov.; *Frts.:* Nov. - Dec.

Distrib.: INDIA: Arunachal Pradesh and Meghalaya; endemic.

Exsicc.: Meghalaya : Khasia hills, Rambari, 4000 ft., 10 Nov. 1871, *C.B. Clarke* 15310 D; Laitlyngot, 6000 ft., 17 Dec. 1946, *F. Kingdon-Ward s.n.*; Elephant falls, Shillong, 9 Oct. 1965, *H. Deka* 35591 (ASSAM).

Chr. No.: $n = 8$ (Sharma, Res. Bull. Calcutta Univ. Cytol. Lab. 2: 1 - 50. 1970).

Notes: Baker (1876) cited *T. Thomson s.n.*, Kashmir, 5000 - 6000 ft., as an exstipellate form of *I. bracteata*. This specimen belongs to *I. heterantha* Wallich ex Brandis, a common species of W Himalaya. Further *Baker* (op. cit.) mentions that the number of leaflets to be 7 - 17 but they are never more than 7 in all the specimens cited by him except in the erroneously identified 'Kashmir specimen' which has 13 leaflets per leaf.

9. *Indigofera cassioides* Rottler ex DC., Prodr. 2: 225. 1825; Ali, Bot. Notis. 111: 569. 1958 & in Nasir & Ali, Fl. W. Pakistan 100: 83. 1977; Nair, Fl. Bashahr Himal. 81. 1977; Gandhi in Saldanha & Nicolson, Fl. Hassan Dist. 257. 1976; Britto in Matthew, Fl. Tamil Nadu Carn. 1: 416. 1983. *I. leptostachya* DC., Prodr. 2: 225. 1825. *I. violacea* Roxb., Fl. Ind. 3: 380. 1832. *I. elliptica* Roxb., Fl. Ind. 3: 380. 1832. *I. arborea* Roxb., Fl. Ind. 3: 381. 1832; Wight, Icon. Pl. Ind. Orient. t. 368. 1840; Prain, Bengal Pl. 1: 433. 1903 (*Repr.* 1: 310. 1963); Haines, For. Fl. Chota Nagpur 341. 1910. *I. pulchella* Roxb., Fl. Ind. 3: 382. 1832; Wight & Arn., Prodr. 203. 1834; Wight, Icon. Pl. Ind. Orient. t. 367. 1840; Dalz. & Gibs., Bombay Fl. 60. 1861; Drury, Handb. Indian Fl. 1: 280. 1864; Beddome, Fl. Sylv. 85. 1869; Baker in Hook. f., Fl. Brit. India 2: 101. 1876; Talbot, Syst. List Trees Bombay 67. 1894; T. Cooke, Fl. Pres. Bombay 1: 320. 1902 (*Repr.* 1: 341. 1967); Collett, Fl. Simlensis, 123. 1902; Duthie, Fl. Upp. Gang. Pl. 1: 256. 1903 (*Repr.* 1: 236. 1960); Talbot, For. Fl. Bombay 382. 1909; Parker, For. Fl. Punjab 132. 1918; Gamble, Fl. Pres. Madras 313. 1918 (*Repr.* 1: 221. 1967); Osmaston, For. Fl. Kumaon 151. 1927; Fyson, Fl. S. Indian Hill. Stat. 1: 156. 1932; Kanjilal *et al.*,

Fl. Assam 2: 20. 1938; Santapau, Fl. Purandhar 39. 1957; Ali, Bot. Notis. Ill: 570. 1958. *I. purpurascens* Roxb., Fl. Ind. 3: 383. 1832; *I. pulchella* var. *purpurascens* (Roxb.) Haines, Bot. Bihar Orissa 3: 240. 1922 (*Repr.* 2: 251. 1961) *I. gibsoni* Graham, Cat. Bombay Pl. 46. 1839. *I. byansghatensis* S. Biswas in Indian Jour. For. 6: 318. 1983, syn. nov. **Figs. 10 & 11.**

Local names: Jirul, Jirahul, Hutar, Utar(Bih.); Girghol, Hakna, Kathu, Kathi, Sakena, Sakina (Hindi); Masaligida, Gogge (Kan.); Hikpi (Lepcha); Manali (Mal.); Baroli, Chimnati, Nardi (Mar.); Sagina, Sekene (Nep.); Gibri (Or.); Narinchi (Tam.); Siralli (Tel.); Giral, Giralı (Urdu).

Shrub, 1 - 5 m high; branches erect, angular, biramous hairs adpressed with equal arms. Leaves 8 - 22 cm long including 5 - 10 mm long petioles; pinnate; stipules 3 - 5 x 0.5 - 1 mm, narrowly triangular to linear, caducous; rachis 7 - 21 cm long; stipellae 1 - 1.5 mm long, linear, persistent; petiolules 1 - 2 mm long, leaflets (7 -)11 - 21(- 35), opposite, subopposite rarely a few alternate, 1 - 2.8 x 0.5 - 2 cm, ovate-elliptic, elliptic to obovate or oblong, obtuse to rounded at base, obtuse to emarginate and mucronate at apex, sparsely adpressed pubescent on both surfaces, distinctly reticulate with veins prominent below. Racemes 5 - 20(- 35) cm long, showy, often with sterile bracts at base of rachis, many-flowered. Flowers pink or pinkish-purple, 8 - 18 mm long; bracts (sterile and fertile) 3 - 10 x 1.5 - 3.5 mm, somewhat boat-shaped to broadly ovate, acuminate or caudate, densely adpressed pubescent outside, caducous; pedicels ca 1 mm long. Calyx ca 5 mm long, adpressed grey pubescent outside, cup 2 - 5 mm long, teeth ca 0.7 mm long, triangular. Standard 5 - 12 x 3 - 6 mm, ovate or obovate, glabrous, finely ciliate along upper margins; wing petals 4 - 10 x 1.5 - 2 mm, oblong, glabrous; keel petals 5 - 10 x 2 - 3 mm, glabrous, ciliate along upper margins, lateral spur ca 2 mm long. Staminal sheath 4 - 10 long; anthers ca 1 mm long with a tuft hairs at base and tip of connective. Ovary 8 - 10 mm long, linear, glabrous, 7 - 12-ovuled; style ca 2 mm long, glabrous. Pods 2.5 - 4 x 0.3 - 0.5 mm, spreading or descending, linear, subcylindric, beaked, glabrous, 7 - 12-seeded, dehiscent. Seeds 1.5 - 2 x 1 mm, ovoid, dark brown, smooth.

Type: India: Mount Nilgerry, 1823, *Leschenault* 31 (G-DC, holo, seen on microfiche).

Fls.: Oct. - May; *Frts.:* Nov. - May.

Distrib.: INDIA: Throughout on hills; SRI LANKA, PAKISTAN, NEPAL, BHUTAN, MYANMAR, CHINA, THAILAND, LAOS.

Habitat: Slopes of dry hills in deciduous forests, Savannahs, and scrub forests between 100 and 1200 m.

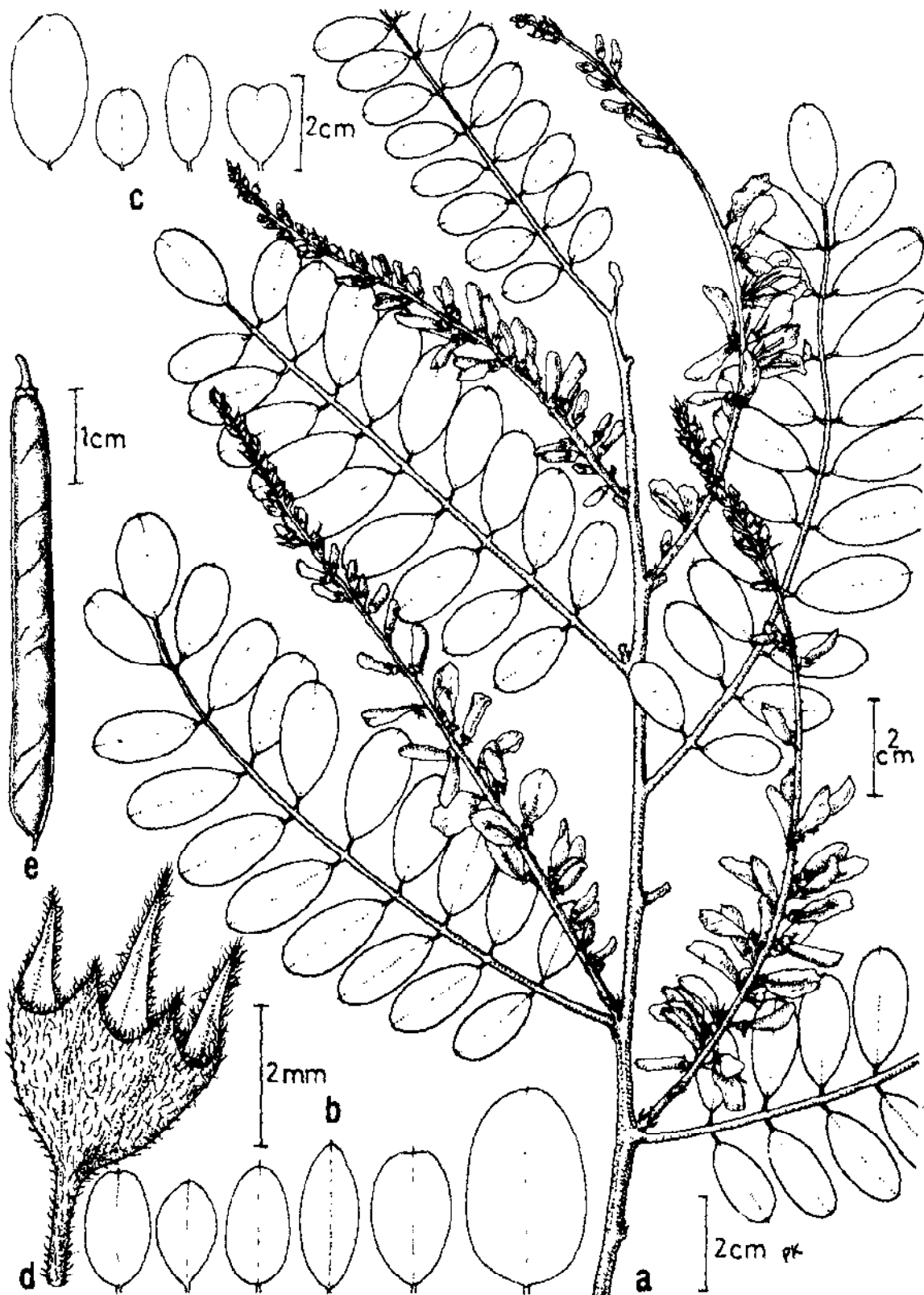


Fig. 10. *Indigofera cassioides* Rottler ex DC. (racemes with sterile bracts at base): a Habit, b & c. Leaflets, d. Calyx, e. Pod (a, d: *Brandis s.n.*; b-c: from different collections; e. *Sanjappa 9510*).

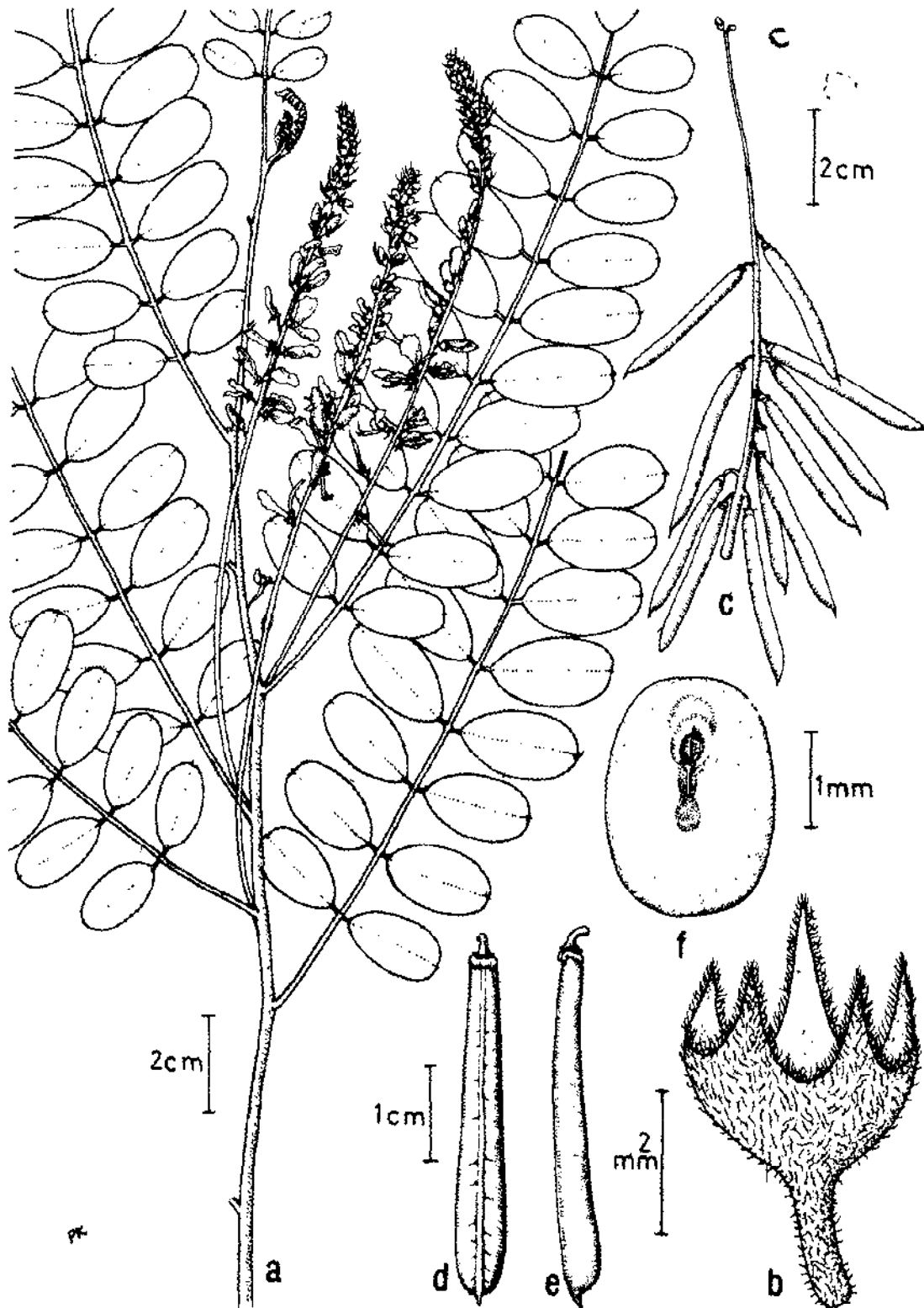


Fig. 11. *Indigofera cassioides* Rottler ex DC. (racemes without sterile bracts at base): a. Habit, b. Calyx, c. Infructescence, d. Pod-dorsal view, e. Pod-side view, f. Seed (a-b: Reddi 101124; c. Raju 100; d-f: Sanjappa 9522).

Exsicc.: Andhra Pradesh: Chittoor Dist., Japalathirtham, 1100 m, 3 March 1959, *K. Subramanyam* 7863 (CAL, MH); Karnataka: Belgaum Dist., Belgaum-Khanapur, 700 m, 26 Oct. 1978, *C.J. Saldanha & P. Prakash* 3645; Madhya Pradesh: Khandwara Dist., Amla to Hewra, 20 Dec. 1888, *J.F. Duthie* 8253; Uttar Pradesh: Garhwal, Byansghat, *Osmaston* 245 (Holotype of *I. byansghatensis* S. Biswas, DD).

Chr. No.: $2n = 16$ sub *I. pulchella* Roxb. (Patil, Curr. Sci. 27: 140. 1958); $n = 8$ (Bir & Kumari, Nucleus 20: 94 - 98. 1977).

Pollen: 3-zonocolporoidate, prolate-spheroidal, subprolate, 37×34 ($33 - 41 \times 26 - 34$) μm , faint OL (Tiwari & Nair, Jour. Palynol. 15: 49 - 73. 1979) 3-zonocolporoidate, prolate spheroidal, 32×29 ($30 - 34 \times 26 - 32$) μm granulate (Vishnu-Mittre & Sharma, Pollen et Spores 4: 5 - 45. 1962) sub *I. pulchella*. 3-zonocolporate, spheroidal, rarely subprolate 31×28.5 ($23 - 40 \times 23 - 36$) μm , perforate (Ferguson & Strachan, & Pollen et Spores 24: 171 - 210. 1982.)

Notes: This species shows great variation in size of leaflets, racemes, flowers and fruits that lead Roxburgh (1832) to describe five species and recently one by Biswas (1983). Ali (1958) after studying the types of all the species involved under *I. cassioides*, concluded that they fall into two groups viz., those with sterile bracts ('scales') at the base of racemes and those without sterile bracts. In Roxburgh's *Flora Indica* drawings sterile bracts are drawn only in two of the four racemes on the plates of *I. purpurescens* and *I. elliptica*. On a critical examination of specimens along with field studies in different parts of India, it was found that the racemes with and without sterile bracts on the same plant or even branches are of common occurrence. However, there are a good number of collections from Maharashtra and Rajasthan (Mt. Abu) which have racemes without sterile bracts. Apart from the absence of sterile bracts no other correlative character is observed in these specimens. Therefore, all the above mentioned taxa are treated as conspecific and thus support de Kort and Thijse's (1984) view of merging even *I. pulchella* Roxb., which Ali (1958) considered as a doubtful synonym of *I. atropurpurea* Buch.-Ham. ex Hornem. In general, this species exhibits reduction in size of different parts of the plant during dry season like majority of *Indigofera* species in India.

10. *Indigofera cedrorum* Dunn in Kew Bull. 1920: 377. 1920; Parker, For. Fl. Punjab 132. 1924; Ali in Bot. Notis. 111: 571. 1958; Sanjappa in Jour. Econ. Tax. Bot. 5: 1030. 1984. *I. cassioides* Rottler ex DC. var. *mussooriensis* S. Biswas in Indian Jour. For. 6: 320. 1983, syn. nov. **Fig. 12, Map1.**

Shrub, 1 - 2 m high; branches woody, straight, biramous hairs adpressed with equal arms. Leaves 2.5 - 8 cm long including 8 - 12 mm long petiole; stipules 2 - 3 x 0.4 mm, narrowly triangular, adpressed hairy outside, caducous; rachis

1 - 6 cm long, canaliculate above; stipellae ca 0.5 mm long, narrowly triangular; petiolules ca 1 mm long; leaflets 5 - 23, opposite to subopposite, 5 - 25 x 3 - 10 mm, elliptic to obovate, obtuse at base, usually rounded, sometimes emarginate and mucronate at apex, adpressed strigose on both surfaces. Racemes 3.5 - 6 cm long including 5 - 10 mm long peduncle; rachis angular adpressed strigose, many-flowered. Flowers purplish to bluish-pink, 12 - 15 mm long; bracts ca 1 mm long, hairy outside, caducous; pedicels ca 1.3 mm long, hairy. Calyx ca 3 mm long, adpressed hairy outside; cup ca 1.5 mm long; teeth 1 - 1.5 x 0.6 mm, triangular, lowest tooth the longest. Standard 12 - 15 x 7 mm, narrowly obovate, rounded to obtuse at apex, adpressed white pubescent outside especially towards the tip and middle; wing petals ca 11 x 0.4 mm, glabrous, ciliate along margin; keel petals 12 - 15 x 0.5 mm, adpressed pubescent outside towards the tip. Staminal sheath 12 - 14 mm long; anthers ca 1 mm long, hairy at base. Ovary ca 8 mm long, linear, glabrous, up to 8-ovuled; style 4 - 5 mm long, glabrous. Pods ca 55 x 6 mm, linear, spreading, cylindrical, sharply pointed, finely adpressed pubescent, 6 - 8-seeded, endocarp faintly spotted. Seeds ca 2 x 1 mm, cylindrical, smooth, brownish.

Type: India: Himachal Pradesh, Chamba (state), Ravi valley, Chitrari, 6000 ft., 2 May 1920, *Parker 2* (K, holo !).

Fls.: May - June ; *Frts.:* May - July.

Distrib.: INDIA: Himachal Pradesh, Uttar Pradesh; endemic.

Habitat: Exposed slopes of the valleys and in pine forests from 1200 to 2500 m.

Exsicc. Himachal Pradesh: Chamba, between Tisa and Kulel, 4500 ft., 2 Sept 1896, *G.A. Gamble* 18452 (DD, K); Road to Parte, Upper Chenab, 8000', 30 June 1981, *Ex Herb. Lace* 429 (DD); Uttar Pradesh: Almora Dist., Binsar, 2250 m, 10 Oct., 1975, *J.N. Vohra* 58047 (BSD).

Note: Dunn (1920) while describing this species distinguished it from *I. cassioides* (*I. pulchella* Roxb.) but *I. cedronum* is more allied to *I. heterantha* Wallich ex Brandis and differs from it in having larger and less number leaflets, larger flowers and glabrous pods.

11. *Indigofera coerulea* Roxb., Fl. Ind. 3: 377. 1832; Wight & Arn., Prodr. 203. 1834; Wight, Icon. Pl. Ind. Orient. t. 365. 1840; Dalz. & Gibs., Bombay Fl. 59. 1861; Drury, Handb. Indian Fl. 1: 280. 1864; Ali in Bot. Notis. 111: 553. 1958; Nair & Koshy in Jour. Bombay Nat. Hist. Soc. 60: 333. 1963; Sharma *et al.* in Biol. Mem. 2: 43. 1977; Bhandari, Fl. Indian Desert 116. 1978; Britto in Matthew, Fl. Tamil Nadu Carn. 1: 415. 1983.

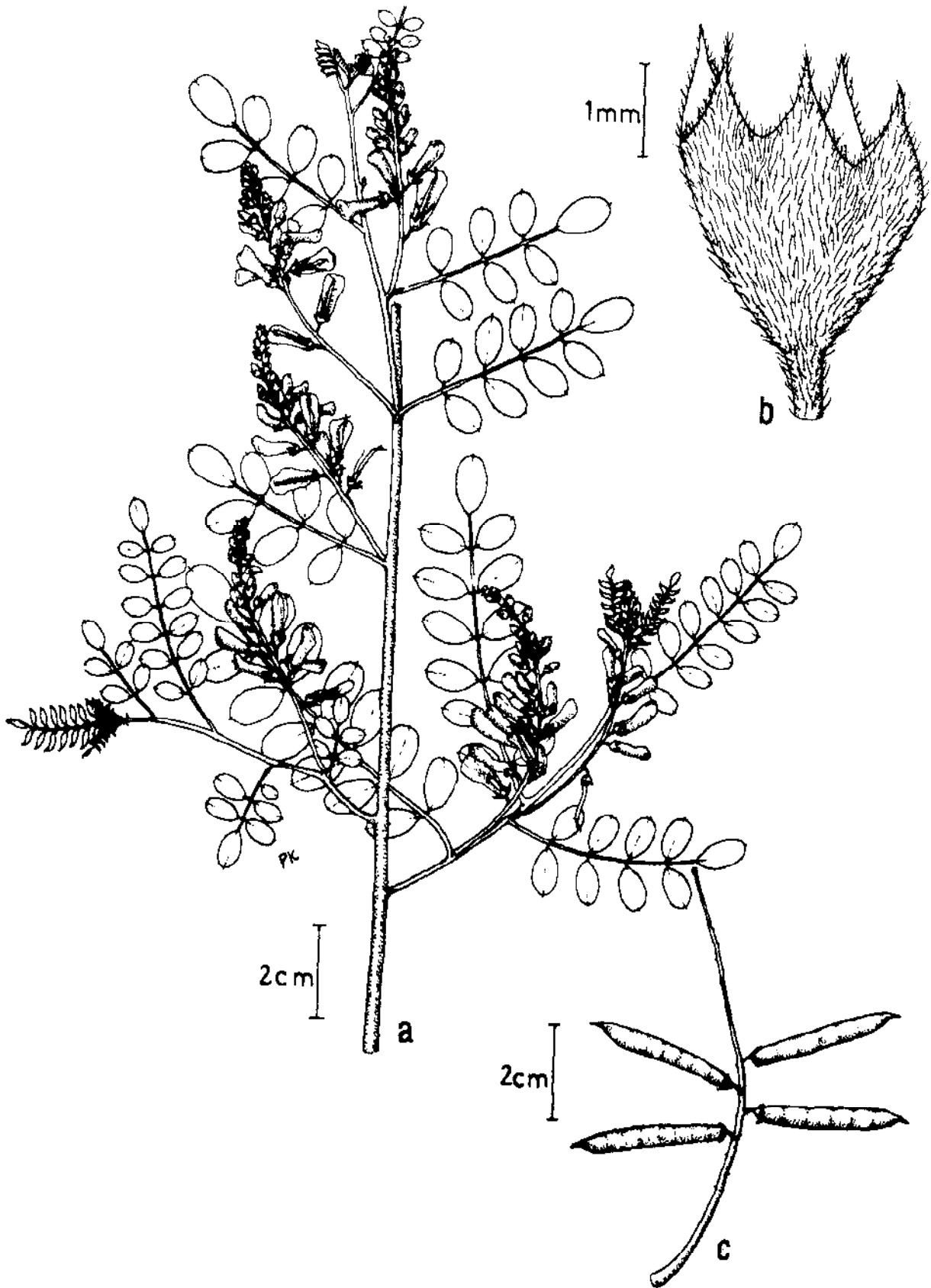


Fig. 12. *Indigofera cedrorum* Dunn : a. Habit, b. Calyx, c. Infructescence (a-b: Rogers s.n.; c: Parker 2, K).

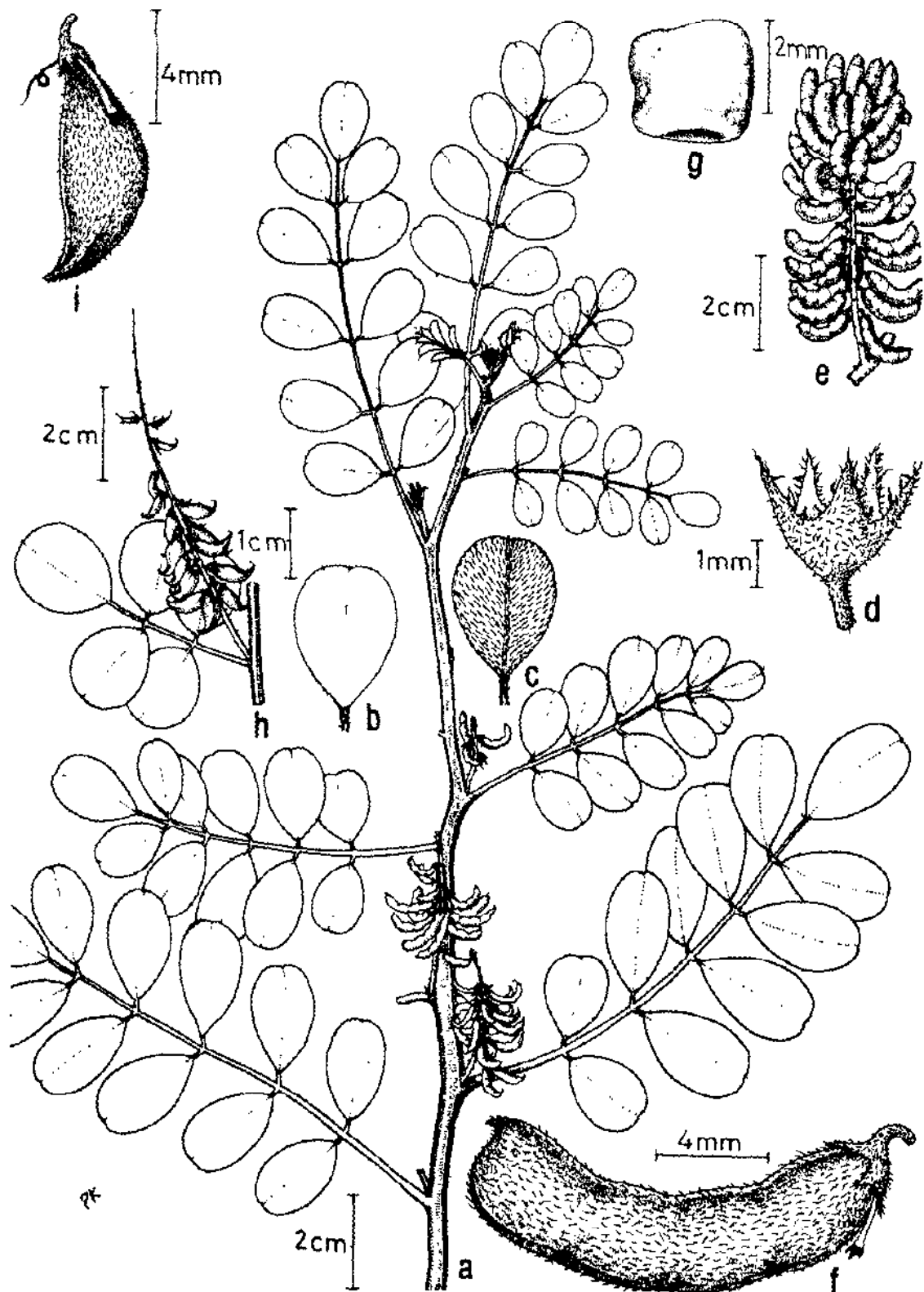


Fig. 13. *Indigofera coerulea* Roxb. var. *coerulea* (a-g): a. Habit, b. Leaflet-adaxial surface, c. Leaflet-abaxial surface, d. Calyx, e. Infructescence, f. Pod, g. Seed .var. *monosperma* (Santapau) Santapau (h-i): h. Fruiting twig, i. Pod: (a-d: *Subramanyam* 404; e-g: *Talbot* 1700; h-i: *Shetty* 1976).

KEY TO THE VARIETIES

- 1a. Pods 1 - 4-seeded 11.1. var. *coerulea*
 b. Pods always 1-seeded 11.2. var. *monosperma*

11.1. var. *coerulea*

I. argentea auct. non Burm. f. 1768: Baker in Hook. f., Fl. Brit. India 2: 98. 1876, p.p.; Brandis, Indian Trees 218. 1906. *I. articulata* auct. non. Gouan 1773: Prain & Baker f. in Jour. Bot. 40: 141. 1902; Prain, Bengal Pl. 1: 432. 1903 (*Repr.* 1: 310. 1963) as var. *houer*; Duthie, Fl. Upp. Gang. Pl. 1: 254. 1903 (*Repr.* 1: 234. 1960); Gamble, Fl. Pres. Madras 312. 1918 (*Repr.* 1: 220. 1967); Duthie, Fl. Upp. Gang. Pl. 254. 1903 (*Repr.* 1: 234. 1960); Haines, Bot. Bihar Orissa 3: 240. 1922 (*Repr.* 2: 251. 1961). *I. houer* auct. non Forsskal 1775: T. Cooke, Fl. Pres. Bombay 1: 318. 1902 (*Repr.* 1: 338. 1967); Talbot, For. Fl. Bombay 381. 1909.

Fig. 13 a - g .

Local names: Surat indigo (Eng.), Surmai, Surmai nil (Hindi); Karu nili (Kan., Mar.); Nil (Raj.) Kalaklitaka (Sans.); Aramuri, Iruppumuri, Katu averi (Tam.); Karu nili, Konda nili, Pedda nili (Tel.).

Shrub, 90 - 150 cm high; stems and branches woody, angular, biamous hairs adpressed white mixed with reddish-brown pearl bodies. Leaves 3 - 7.5 cm long including 1.5 - 2 cm long petioles; stipules ca 2 x 1 mm, subulate, free or connate along inner margin at base, adpressed canescent, caducous; rachis 5 - 8 cm long, adpressed canescent; leaflets 5 - 11, rarely 3, opposite, 2 - 2.7 x 1.5 - 2.5 cm, obovate or obcordate, cuneate at base, obtuse to retuse and mucronate at apex, glabrous above, adpressed pubescent beneath; stipellae ca 1 mm long, canescent, caducous; petiolule 1 - 1.5 mm long. Racemes 6 - 8 cm long, erect, axillary, sessile; rachis white canescent, densely many-flowered to the base. Flowers reddish yellow, ca 4 mm long; bracts 1 - 1.5 x 0.5 mm, ovate, acuminate, pubescent, caducous; pedicels ca 1 mm long. Calyx ca 1.5 mm long, adpressed canescent, cup ca 1 x 1 mm, teeth ca 0.5 mm long, triangular, margined with reddish-brown pearl bodies. Standard 3 - 3.5 x 2.5 - 3 mm, ovate-orbicular, rounded at base, obtuse at apex, densely adpressed pubescent outside, covered with pearl bodies at base beneath; keel petals 3 x 1.5 - 2 mm, densely adpressed pubescent outside; lateral spur 1 - 1.5 mm long. Staminal sheath 2.5 - 3 mm long; anthers ca 1 mm long with a tuft hairs on dorsal side, ovary ca 3 mm long, linear with a few hairs on dorsal side, 3 - 4-ovuled; style ca 1 mm long, glabrous. Pods 5 - 15 x 2 - 2.5 mm, divaricate, falcate, torulose, abruptly short apiculate, adpressed canescent, (1 - 2 -) 3 - 4-seeded; endocarp reddish-brown, smooth. Seeds 1.5 - 2 x 1.5 - 2 mm, smooth, truncate at both ends, reddish-brown.

Type: Roxburgh, Fl. Ind. Icon 388 (ined. CAL ! K !).

Fls.: July - Sept.; *Frts.*: Aug. - Oct.

Distrib.: INDIA: Andaman & Nicobar Islands, Andhra Pradesh, Bihar, Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan, Sikkim (cultivated), Tamil Nadu and Uttar Pradesh; SRI LANKA (?), PAKISTAN, ETHIOPIA, ERITREA, SOMALILAND, SUDAN, WEST ASIA.

Habitat: Wastelands, agricultural fields, road sides and arid areas up to 900 m.

Exsicc.: Andhra Pradesh: Nalagonda Dist. Nagarjuna Sagar, 14 Dec. 1959, K.M. Sebastine 9773; Karnataka: Dharwar Dist; Dumbal, June 1910, W.A. Talbot 1700; Rajasthan: Jodhpur Dist., Dichiyak, 29 Aug. 1977, A.N. Singh 4437.

Chr. No.: $2n = 16$ (Singh & Roy, Nucleus 13: 42. 1970); $n = 8$ (Sanjappa, Taxon 32: 668. 1983).

Pollen: 3-zonocolporoidate, prolate-spheroidal, spheroidal, 24×23 ($24 \times 22 - 24$) μm , granulate, (Vishnu-Mittre & Sharma, Pollen et Spores 4: 5 - 45. 1962).

Notes: For a long time this species was confused with *I. articulata* Gouan. *I. coerulea* differs from it in number of leaflets, breadth of the suture and shape of the fruit segment as already pointed out by Gillett (1958).

11.2. var. *monosperma* (Santapau) Santapau, Fl. Saurashtra 165. 1965; Sanjappa in Jour. Econ. Tax. Bot. 5: 1030. 1984; Ahmed. & Nayar, Endem. Pl. Indian Reg. 99. 1987. *I. articulata* Gouan var. *monosperma* Santapau in Proc. Nat. Inst. Sci. India 24: 132. 1958. **Fig. 13 h - i, Map 1.**

Erect shrub, 1 - 1.5 m high. Differs from var. *coerulea* at once by its pods which are 1-seeded, very rarely 2-seeded.

Type: India: Gujarat, Dwaraka, near sea shore, 16 Oct. 1953, H. Santapau 16771 (BLAT, holo!).

Fls.: May - Oct. ; *Frts.*: Aug. - Jan.

Distrib.: INDIA: Gujarat & Rajasthan; endemic.

Habitat: On sea coasts, sandy arid lands.

Exsicc.: Gujarat: Dwaraka, 17 Nov. 1953, J.C. Dhruwa 123; Dwaraka, along railway line 22 Aug. 1952, H. Santapau 14680 (BLAT); Kutch, Bhadreswar, 22

Oct. 1972, K.S. Rao 1128 (BARO); Rajasthan: Pali, 31 Aug. 1975, B.V. Shetty 1976 (CAL, BSJO).

Chr. No.: n = 8 (Sanjappa, Taxon 32: 668. 1983).

Uses: Twigs are used as 'tooth brushes' and is preferred over more commonly used *Acacia nilotica* (Linn.) Delile subsp. *indica* (Benth.) Brenan or *Azadirachta indica* Linn. twigs.

Notes: Santapau (*op. cit.*) in his description mentioned that the flowers are ebracteate and petals glabrous except for standard. All specimens known so far under the variety showed bracteate flowers and petals glabrous except for keel petals.

12. *Indigofera colutea* (Burm. f.) Merr. in Philippine Jour. Sci. 19: 355. 1921; Ali, Bot. Notis. 111: 548. 1958; Santapau, Fl. Saurashtra 131. 1962; Chavan & Oza, Fl. Pavagadh 76. 1965; Britto in Matthew, Fl. Tamil Nadu Carn. 1: 418. 1983; de Kort & Thijssse in Blumea 30: 115. 1984. *Galega colutea* Burm. f., Fl. Ind. 172. 1768. *Indigofera viscosa* Lam., Encyc. 3: 249. 1789; DC., Prodr. 2: 227. 1824; Roxb., Fl. Ind. 3: 337. 1832; Wight & Arn., Prodr. 200. 1834; Wight, Icon. Pl. Ind. Orient. t. 404. 1840; Drury, Handb. Indian Fl. 1: 278. 1864; Baker in Hook. f., Fl. Brit. India 2: 95. 1876; T. Cooke, Fl. Pres. Bombay 1: 317. 1902 (*Repr.* 1: 337. 1967); Prain, Bengal Pl. 1: 432. 1903 (*Repr.* 1: 310. 1963); Duthie, Fl. Upp. Gang. Pl. 1: 251. 1903 (*Repr.* 1: 231. 1960); Gamble, Fl. Pres. Madras 311. 1918 (*Repr.* 1: 220. 1967); Kanjilal *et al.*, Fl. Assam 2: 22. 1938; Ramaswamy & Razi, Fl. Bangalore Dist. 270. 1973. *I. laterita* Willd., Sp. Pl. 3: 1233. 1803. *Tephrosia colutea* (Burm. f.) Pers., Syn. Pl. 2: 329. 1807. *Indigofera glutinosa* Perrier ex DC. Prodr. 2: 227. 1825. Fig. 14.

Local names: Antu kogge (Kan.), Nai kadugu (Tam.).

Annual, erect herb or subshrub, 10 - 80 cm high; branches terete, biramous hairs adpressed with equal arms, mixed with erect; multicellular gland-tipped hairs. Leaves 10 - 35 mm long including 5 - 12 mm long petiole; stipules 5 - 8 mm long, filiform to linear, spreading, gland-tipped hairy, caducous; rachis up to 3 cm long, pubescent; stipellae absent; petiolules ca 0.5 mm long; leaflets (5 -) 7 - 11(- 15), opposite, 3 - 5.5 x 2 - 5 mm, elliptic to obovate, obtuse at base, obtuse to rounded and mucronate at apex, pale green above, glaucous beneath, medifixed hairs slender, spreading sideways above and stout, densely adpressed, almost parallel to margin beneath, gland-tipped hairy along the margins and midrib. Racemes 3 - 6 cm long; rachis gland-tipped hairy, (5 -) 8 - 12(- 15)-flowered. Flowers pinkish-red, ca 4.5 mm long; bracts ca 1 mm long, narrowly triangular; pedicels ca 1 mm long. Calyx 3 - 3.5 mm long, deeply divided, cup less than 1 mm long. teeth 2.5 - 3 mm long, linear, setaceous,

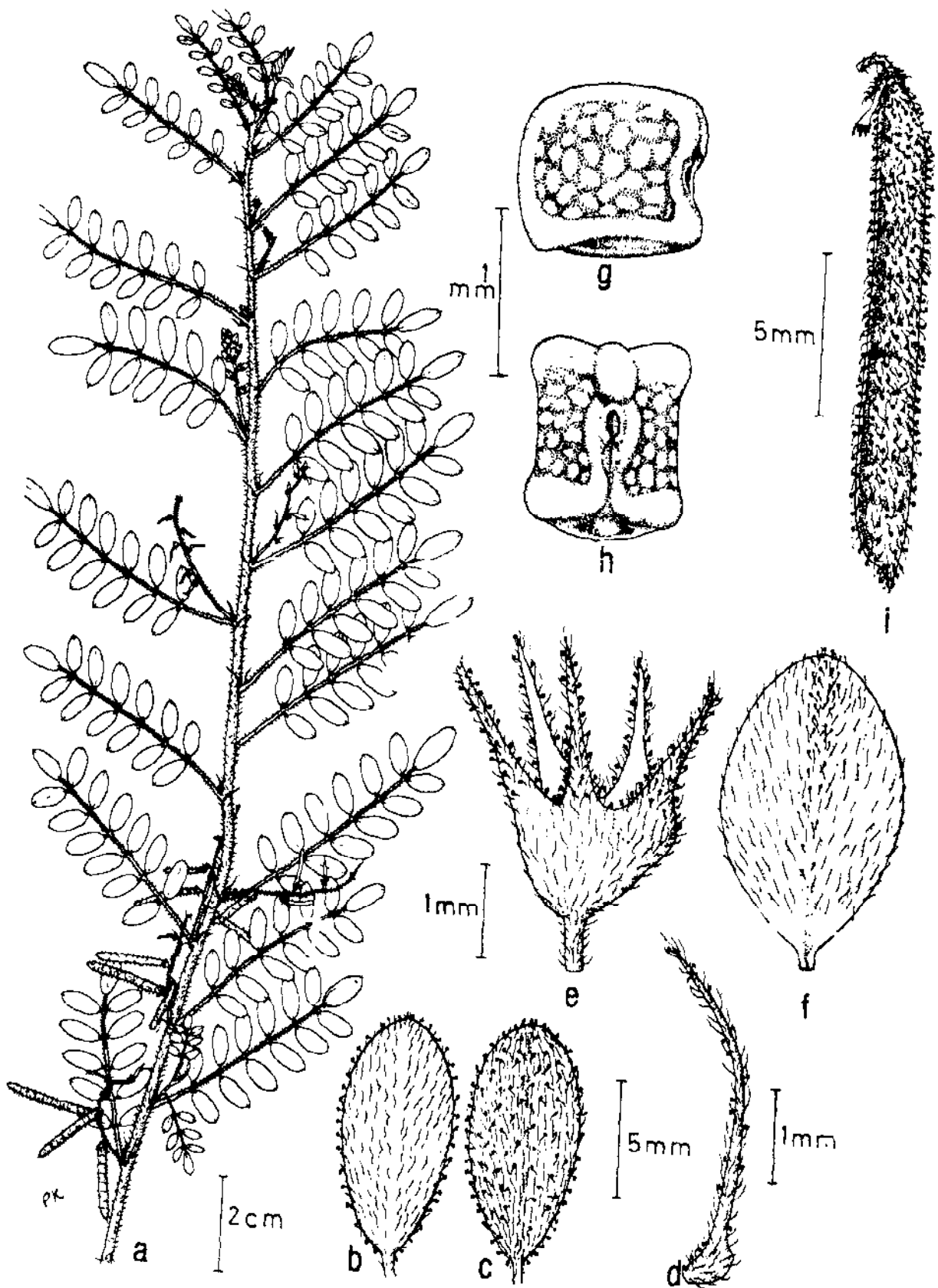


Fig. 14. *Indigofera colutea* (Burm. f.) Merr. : a. Habit, b. Leaflet-adaxial surface, c. Leaflet-abaxial surface, d. Stipule, e. Calyx, f. Standard-abaxial surface, g. Seed-hilar view, h. Seed-side view, i. Pod (a-f: V.J. Nair 57124; g-i: Gamble 17768).

gland-tipped hairy outside the cup and along the margin of teeth. Standard 4 - 4.5 x 2 - 2.5 mm, obovate, rounded at apex, adpressed strigose, gland-tipped hairy along midrib; wing petals 3.5 - 4 mm long, glabrous; keel petals 3.5 - 4 x 1 - 1.5 mm long, sparsely adpressed strigose, short ciliate along margins; lateral spur less than 1 mm long. Ovary ca 3 mm long, linear, glabrous or sparsely strigose mixed with gland-tipped hairs, 8 - 12-ovuled; style 1 - 1.3 mm long curved. Pods spreading (nearly perpendicular to rachis), 15 - 25 x 1 - 1.5 mm, linear, subcylindric, shortly apiculate, faintly torulose, densely covered with adpressed medifixed and erect gland-tipped hairs, 5 - 12-seeded, sutures thick, endocarp reddish-brown spotted. Seeds 1 - 1.2 x 1 mm, cubical, truncate at both ends, faintly foveolate-reticulate on sides and ends, reddish-brown or brown.

Type: India: Herb. Sloane, Vol. 95, fol. 185 (BM ! Pluk. Phyt. t. 166, f. 3. 1691).

Fls.: July - Nov.; *Frts.:* Aug. - Dec.

Distrib.: INDIA: almost throughout plains and hills; AFRICA, AUSTRALIA, NEW ZELAND, PAKISTAN, SRI LANKA, CHINA, MYANMAR, INDONESIA, THAILAND, VIETNAM, NEW GUINEA, WEST ASIA.

Habitat: Cultivated fields, dry open areas in scrub jungles, waste lands up to 1000 m.

Exsicc.: Andhra Pradesh: Godavari Dist., Chidur, 29 Sept. 1902, C.A. Barber 4960; Kerala: Travancore, near Mekkarai, 16 Sept. 1913, C.C. Calder & M.S. Ramaswamy 637; Tamil Nadu: Madurai Dist., on way to Sornagar falls, 400 m, K. Subramanyam 8181.

Chr. No.: $2n = 16$ sub *I. viscosa* Lam. (Hagerup, Hereditas 16: 23. 1932).

Notes: There are more than 12 synonyms under this species, only those relevant to Indian floras are given here.

13. *Indigofera constricta* (Thwaites) Trimen, Cat. Ceylon Pl. 23. 1885 & Handb. Fl. Ceylon 2: 221. 1894; Talbot, Syst. List Trees Bombay 67. 1894 & For. Fl. Bombay 381. 1909; T. Cooke, Fl. Pres. Bombay 1: 319. 1902 (*Repr.* 1: 340. 1967); Brandis, Indian Trees. 218. 1906; Gamble, Fl. Pres. Madras 312. 1918 (*Repr.* 1: 221. 1967); Santapau, Fl. Saurashtra 132. 1962; Saldanha & G. Singh in Saldanha, Fl. Karnataka 1: 470. 1984; R.S. Rao, Fl. Goa etc. 1: 123. 1985. *I. flaccida* Koenig ex Roxb. var. *constricta* Thwaites, Enum. Pl. Zeyl. 411. 1864; Baker in Hook. f., Fl. Brit. India 2: 99. 1876 (in a note under *I. tinctoria* Linn.)

Fig. 15, Map 2.

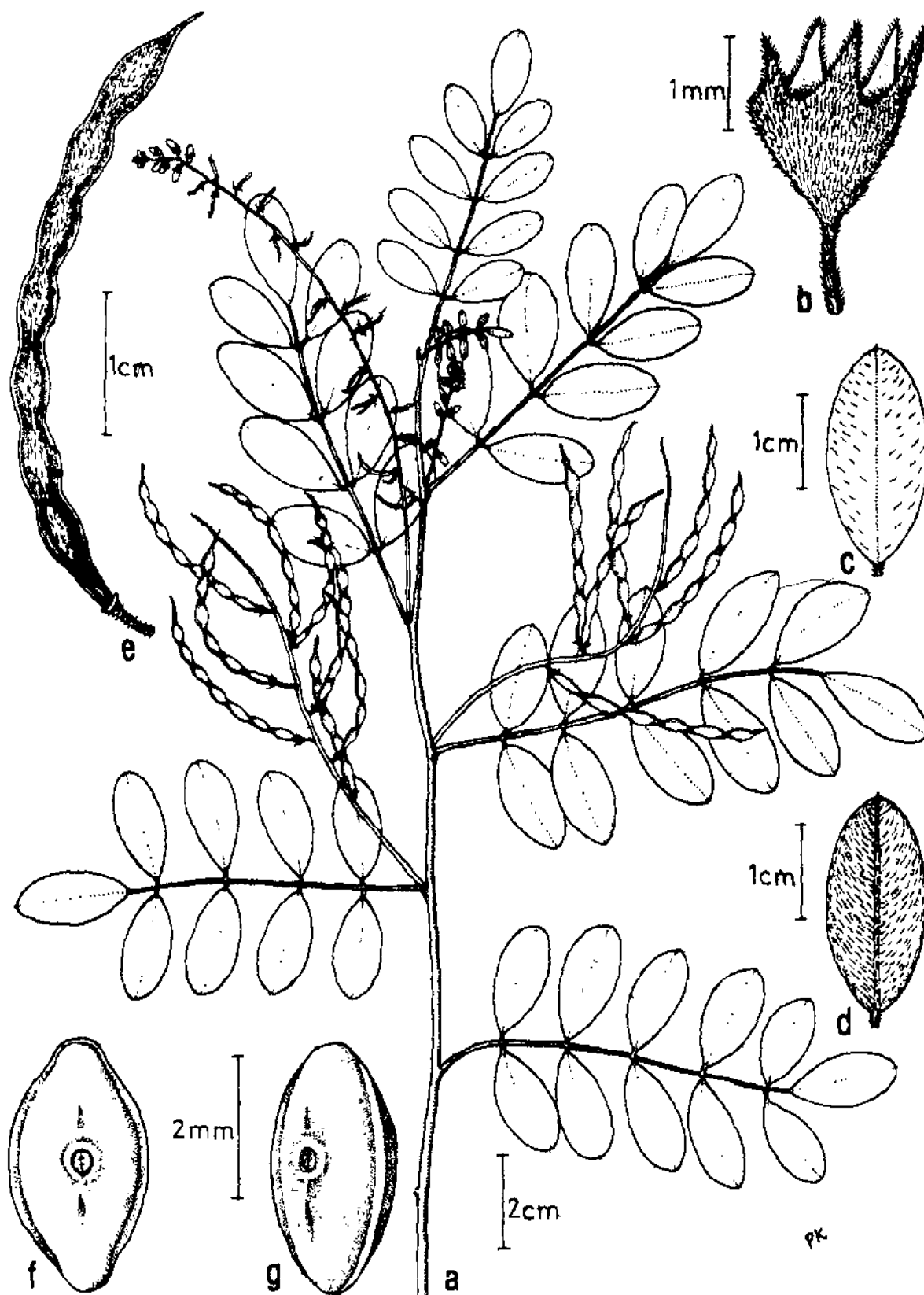
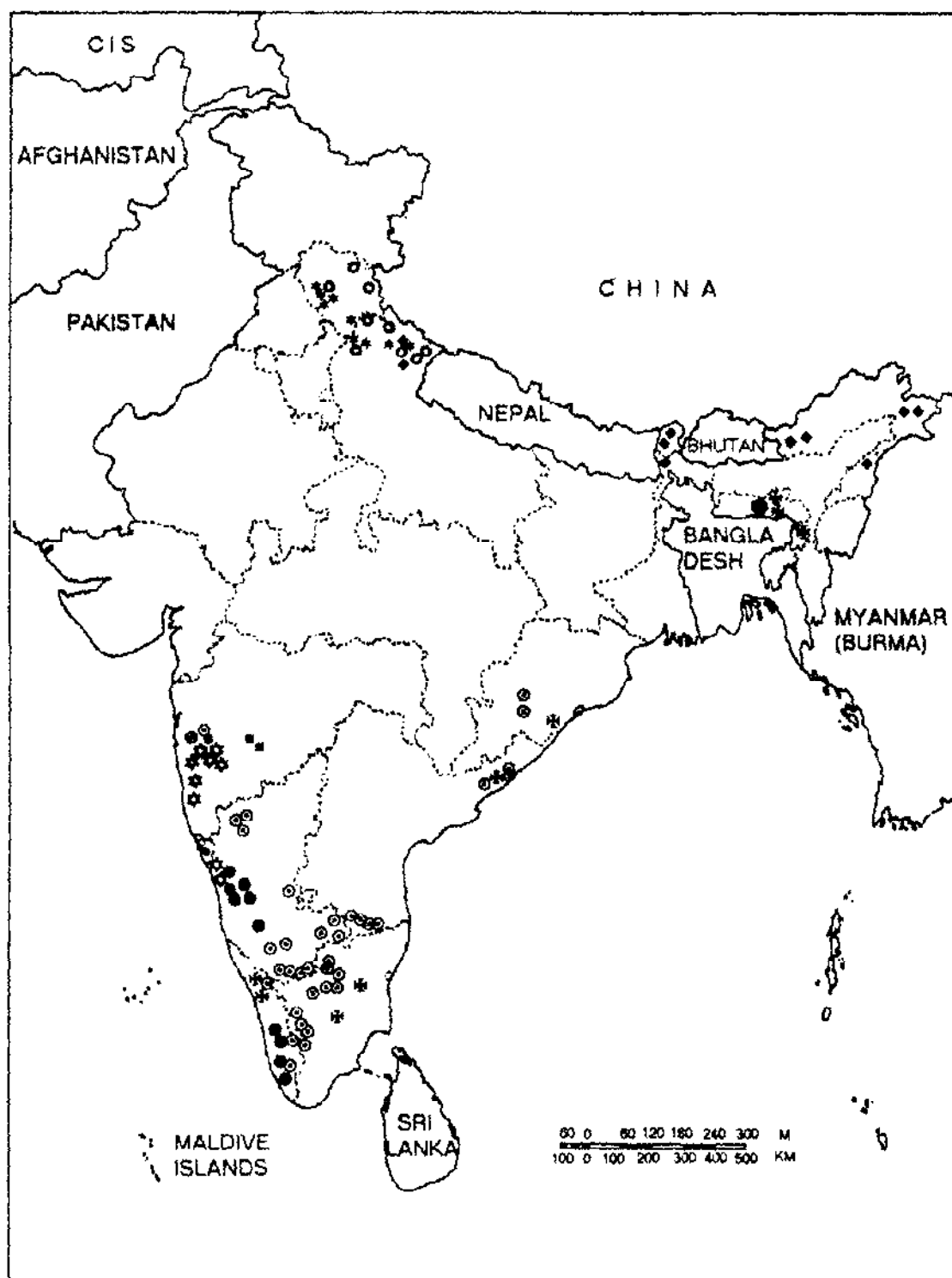


Fig. 15. *Indigofera constricta* (Thwaites) Trimén : a. Habit, b. Calyx, c. Leaflet-adaxial surface, d. Leaflet-abaxial surface, e. Pod, f. Seed-hilar view, g. Seed-side view (a, c-g: Talbot 320; b. Raghavan 97429).



Map 2. *Indigofera constricta* (Thwaites) Trimen (●); *I. cylindracea* Graham ex Baker (◆); *I. dalzellii* T. Cooke (☆); *I. deccanensis* Sanjappa (■); *I. dosua* var. *simlensis* (Ali) Sanjappa (*); *I. emmae* de Kort & Thijssse (⊙); *I. galegoides* DC. (✱); *I. gangetica* Sanjappa (⊖); *I. wightii* Graham ex Wight & Arn. (⊙).

Erect shrub, 60 - 120 cm high; branches divaricate, obscurely angular, scabrous, biramous hairs adpressed with equal arms. Leaves 7 - 12 cm long including 1.5 mm long petiole; stipules less than 1 mm long, triangular, scabrous, caducous; rachis 5 - 9 cm long; stipellae absent; petioles ca 1.5 mm long; leaflets 7 - 11, opposite, soon deciduous, 2 - 2.7 x 1 - 1.2 cm, elliptic, obtuse to rounded at base, rounded to rarely emarginate and mucronate at apex, dark green above, glaucous beneath, scabrous on both surfaces. Racemes 5 - 10 cm long, axillary; rachis angular, scabrous, many-flowered. Flowers pink, 6 - 8 mm long; bracts ca 1 mm long, triangular, hairy outside, caducous; pedicels ca 1.5 mm long. Calyx ca 1.5 mm long, scabrous outside, cup less than 1 mm long, teeth ca 1 mm long, triangular, acute. Standard 5 - 6.5 x 3 - 4 mm, elliptic to obovate, obtuse to rounded at apex, strigose outside; wing petals 4.5 - 6 x 1.5 mm, ciliate along margins; keel petals 5 - 6.5 x 1.5 - 2 mm, strigose outside, lateral spur 1.5 - 2 mm long. Staminal sheath 5.5 - 6 mm long; anthers ca 2 mm long with a tuft of hairs at base. Ovary 3.5 - 4.5 mm long, linear, strigulose, 6 - 8-ovuled; style 1 - 1.5 mm long, curved, glabrous. Pods 30 - 55 x 3 - 4 mm, spreading, lax, curved, subtetragonous, distinctly constricted between seeds, scabrous, (4 -)6 - 8-seeded. Seeds ca 2 x 1 mm, ellipsoid, subtetragonous, rounded at both ends, reddish-brown, smooth.

Type: Sri Lanka: Matelle East, *Thwaites* C.P. 3811 (K, holo ! CAL iso !).

Fls.: Sept. - Nov.; *Frs.:* Oct. - Dec.

Distrib.: INDIA: Goa, Gujarat(?), Karnataka and Kerala; SRI LANKA.

Habitat: Exposed slopes of hills and as an undergrowth in moist deciduous forests, from 850 - 1200 m.

Exsicc.: Karnataka: Uttara Kannada Dist. (North Canara Dist.), Wudde Ghat, 15 Feb. 1883, *W.A. Talbot* 320 (CAL, BSI, DD); Kerala: Eranakulam Dist., Kavalay, 200 m, Nov. 1910, *A. Meebold* 12326; Quilon Dist., Palapalli to Muzihar Power House, Ranni R.F., 250 m, 22 Nov. 1974, *Chandrabose* 49159 (CAL, MH); Nilakkal-Palapally, 950 m, 3 Sept. 1977, *N.C. Nair* 50859 (CAL, MH).

Pollen: 3-zonocolporoidate, oblate-spheroidal, 30 x 30 μ m, granulate (*Vishnu-Mittre & Sharma, Pollen et Spores* 4: 5 - 45. 1962).

Notes: This species is reported to occur from Nepal (*Anonymous, Fl. Langtang* 81. 1976) but it is highly unlikely that the species grows in an altogether different habitat with a long gap between Western Ghats and foot hills of Himalayas. So far the species is not collected anywhere in between.

14. *Indigofera cordifolia* Heyne ex Roth, Nov. Pl. Sp. 357. 1821; DC., Prodr. 2: 222. 1825; Wight & Arn., Prodr. 199. 1834; Dalz. & Gibs., Bombay Fl. 58: 1861; Drury, Handb. Indian Fl. 1: 276. 1864; Aitch., Cat. Pl. Punjab Sind 40. 1869; Baker in Hook. f., Fl. Brit. India 2: 93. 1876; T. Cooke, Fl. Pres. Bombay 1: 311. 1902 (*Repr.* 1: 331. 1967); Prain, Bengal Pl. 1: 431. 1903 (*Repr.* 1: 309. 1963); Duthie, Fl. Upp. Gang. Pl. 1: 250. 1903 (*Repr.* 1: 230. 1960); Bamber, Pl. Punjab 224. 1916; Gamble, Fl. Pres. Madras 309. 1918 (*Repr.* 1: 218. 1967); Haines, Bot. Bihar Orissa 3: 237. 1922 (*Repr.* 2: 248. 1961); Kanjilal *et al.*, Fl. Assam 2: 23. 1938; Ali, Bot. Notis. 111: 545. 1958; Santapau, Fl. Saurashtra 125. 1962; Bhandari, Fl. Indian Desert 117. 1978; Britto in Matthew, Fl. Tamil Nadu Carn. 1: 418. 1983; Saldanha & G. Singh in Saldanha, Fl. Karnataka 1: 470. 1984; R.S.Rao, Fl. Goa etc. 1: 123. 1985. Fig. 16.

Local names: Gokhru (Hindi), Bekria, Bodaga, Godadi bechka (Mar.), Bekaria, Bekario, Vekriyavas (Raj.), Papara alumu (Tel.).

Annual, prostrate, sometimes diffuse or erect herb, 5 - 35 cm high; stems adpressed or spreading pubescent, biramous hairs with arms unequal. Leaves simple; stipules 1 - 2 x 0.5 mm, narrowly triangular, caudate, spreading pubescent with ciliate margins; petioles ca 1 mm long, pilose; lamina (4 -)5 - 10(- 15) x 3 - 5 mm, ovate to ovate-cordate, acute or obtuse at apex, densely adpressed hairy on both surfaces. Racemes 2 - 4 mm long, axillary, globose, 1 - 15-flowered. Flowers pale pink to bright pink, 3 - 3.5 mm long; bracts 1.5 - 2 x 0.5 mm, narrowly triangular, acuminate, ciliate; pedicels less than 1 mm long. Calyx 2.5 - 3 mm long, densely pilose, cup less than 1 mm, teeth 2 - 2.5 mm long, linear, acuminate. Standard 2.5 - 3 x 1 - 1.5 mm, spathulate, rounded at apex, pilose on the back; wing petals ca 2.5 mm long, glabrous; keel petals ca 2.5 x 0.5 mm, glabrous except for upper auricle, lateral spur ca 0.4 mm long. Staminal sheath ca 2.5 mm long; anthers less than 1 mm long, pilose. Ovary ca 1 mm long, pilose, 1 - 3-ovuled; style ca 2 mm long, pilose. Pods 2 - 5 x 1 - 1.5 mm, globose to cylindric-oblong, straight, scabrous to densely pilose, apiculate, 1 - 2-seeded, rarely 3, torulose when 2 - 3-seeded; endocarp reddish-brown spotted. Seeds ca 1 x 1 mm, globose, foveolate, yellowish-brown.

Type: India: *Heyne s.n.* (B,L !).

Fls.: July - Sept.; *Frts.:* Sept. - Nov.

Distrib.: INDIA: Andhra Pradesh, Bihar, Delhi, Goa, Gujarat, Haryana, Karnataka, Kerala, Lakshadweep, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh and West Bengal; PAKISTAN, AFGHANISTAN, OMAN, CAPE VERDE ISLANDS, MAURITIANA, NIGER, SUDAN, ERITREA, ETHIOPIA, SOCOTRA, INDONESIA, AUSTRALIA.

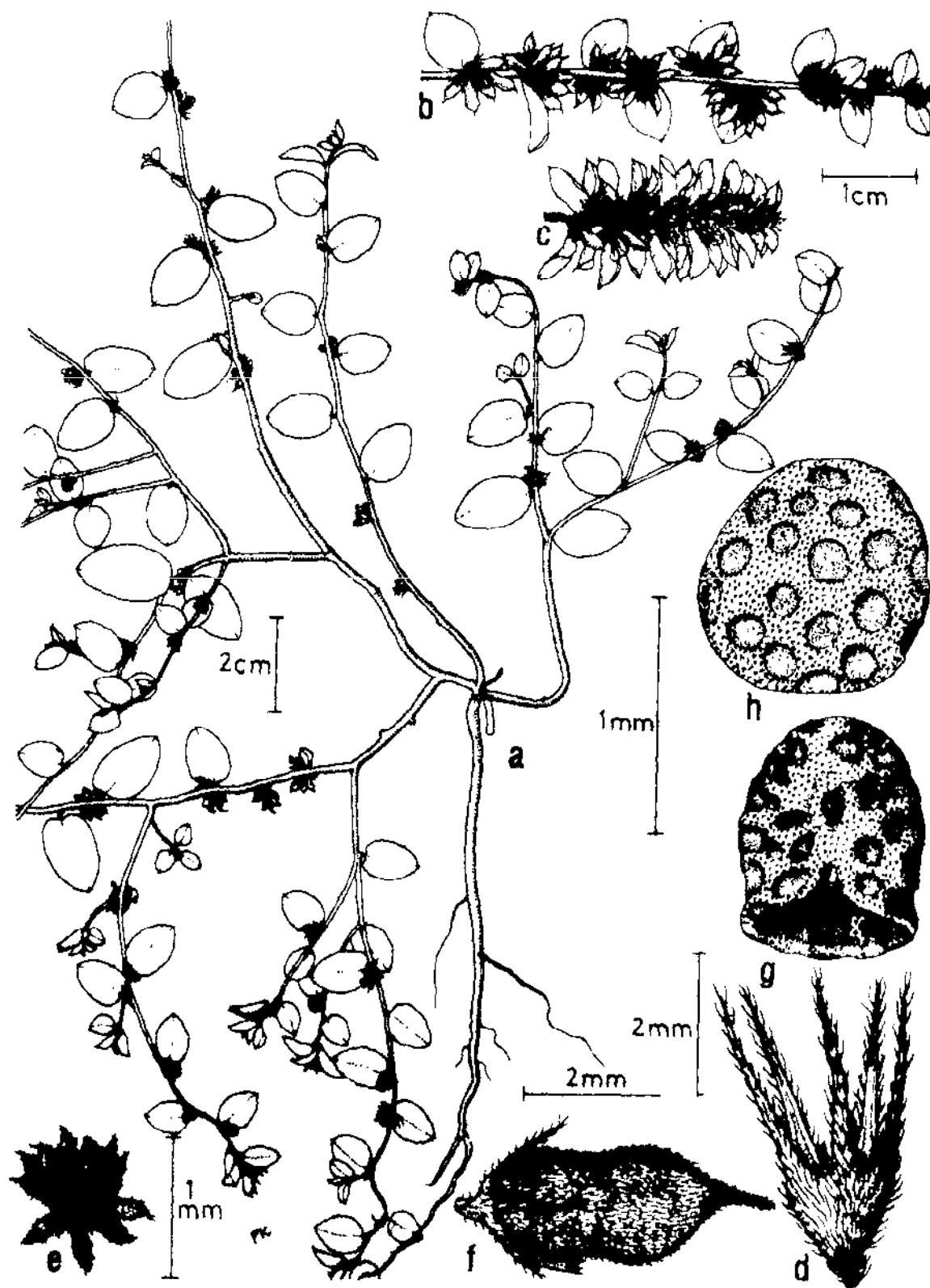


Fig. 16. *Indigofera cordifolia* Heyne ex Roth : a. Habit, b. Fruiting branch with long internodes, c. Fruiting branch with short internodes, d. Calyx, e. Infructescence, f. Pod, g. Seed-hilar view, h. Seed-side view (a: G.P. Roy 2004; b, d-h: Tiwari 774; c: A.N. Singh 5769).

Habitat: Cultivated fields, waste lands, road sides, open areas in scrub forests, beaches, exposed hills up to 1000 m.

Exsicc.: Andhra Pradesh: Medak Dist., Pethakutta, Narsapur, 727 m, 26 Sept. 1958, *K.M. Sebastine* 6774; Gujarat: Kutch, Kargaria R.F., 22 Sept. 1960, *C.R. Rao* 2028; Lakshadweep Islands: Kavaratty Island, 4 Dec. 1960, *B.M. Wadhwa* 6860; Maharashtra: Aurangabad Dist., Fardapur hills and plains, 17 Oct. 1982, *M. Sanjappa* 9504; Rajasthan: Jaisalmer Dist., Pokoran, Salam Sagar Dam, 29 Sept. 1973 *G.L. Tiwari* 657.

Chr. No.: $n = 8$, $2n = 16$ (Ramanathan, *Curr. Sci.* 24: 17. 1955 and Bhatt & Sanjappa, *Taxon* 25: 495. 1976); $n = 14$ (Bir & Sindhu, *Nucleus* 10: 47. 1967).

Pollen: 3-zonocolporate, brevicolpate, subprolate, 25×33 ($24 - 26 \times 30 - 36$) μm (Vishnu-Mittre & Sharma, *Pollen et Spores* 4: 5 - 45. 1962).

Uses: The seeds of this species are somewhat unpleasant to taste and are used as food in times of famine especially in Rajasthan, Gujarat, Maharashtra and Madhya Pradesh. The seeds are ground into flour and made into bread either alone or with other cheap cereals (Watt, *Dict. Econ. Prod. India* 1: 386. 1890 and Bhandari, *Econ. Bot.* 28: 77. 1974).

Notes: In fully exposed habitats this species tend to have prostrate branches with very short internodes (fig. 16c), smaller leaves and hard, densely hairy pods, while the plants growing in shaded habitats and among grasses and other herbaceous species show diffuse to erect branches with elongated internodes, comparatively larger leaves and less hairy pods. Several populations with prostrate habit from arid areas of Maharashtra, Gujarat and Rajasthan showed generally 1-seeded, rarely 1 - 2-seeded pods.

15. *Indigofera cylindracea* Graham ex Baker in Hook. f., *Fl. Brit. India* 2: 99. 1876; Osmaston, *For. Fl. Kumaon* 151. 1927; Ali, *Bot. Notis.* 111: 568. 1958; Grierson & Long in *Notes R.B.G. Edinburgh* 37: 245. 1979 & *Fl. Bhutan* 1: 666. 1987. *I. heterantha* Wallich ex Brandis var. *longipedicellata* Thoth. in *Indian For.* 96: 13. 1970. Fig. 17, Map 2.

Shrub, 1 - 2 m high; branches erect or ascending, woody, striate, sparsely adpressed brownish pubescent, often the biramous hair somewhat spreading with unequal arms. Leaves 4 - 6 cm long including 5 - 10 mm long petiole; stipules 2 - 4 x 1 - 1.5 mm, narrowly triangular, adpressed brownish pubescent outside; rachis 3 - 4 cm long, canaliculate above, brownish pubescent; stipellae ca 1 mm long, hairy, persistent; petiolules ca 1 mm long, hairy; leaflets (9 -) 11 - 13(- 19), opposite, 8 - 15 x 3 - 5 mm, elliptic to oblong or elliptic-oblong, rarely obovate, cuneate at base, obtuse to rounded and mucronate at apex, sparsely

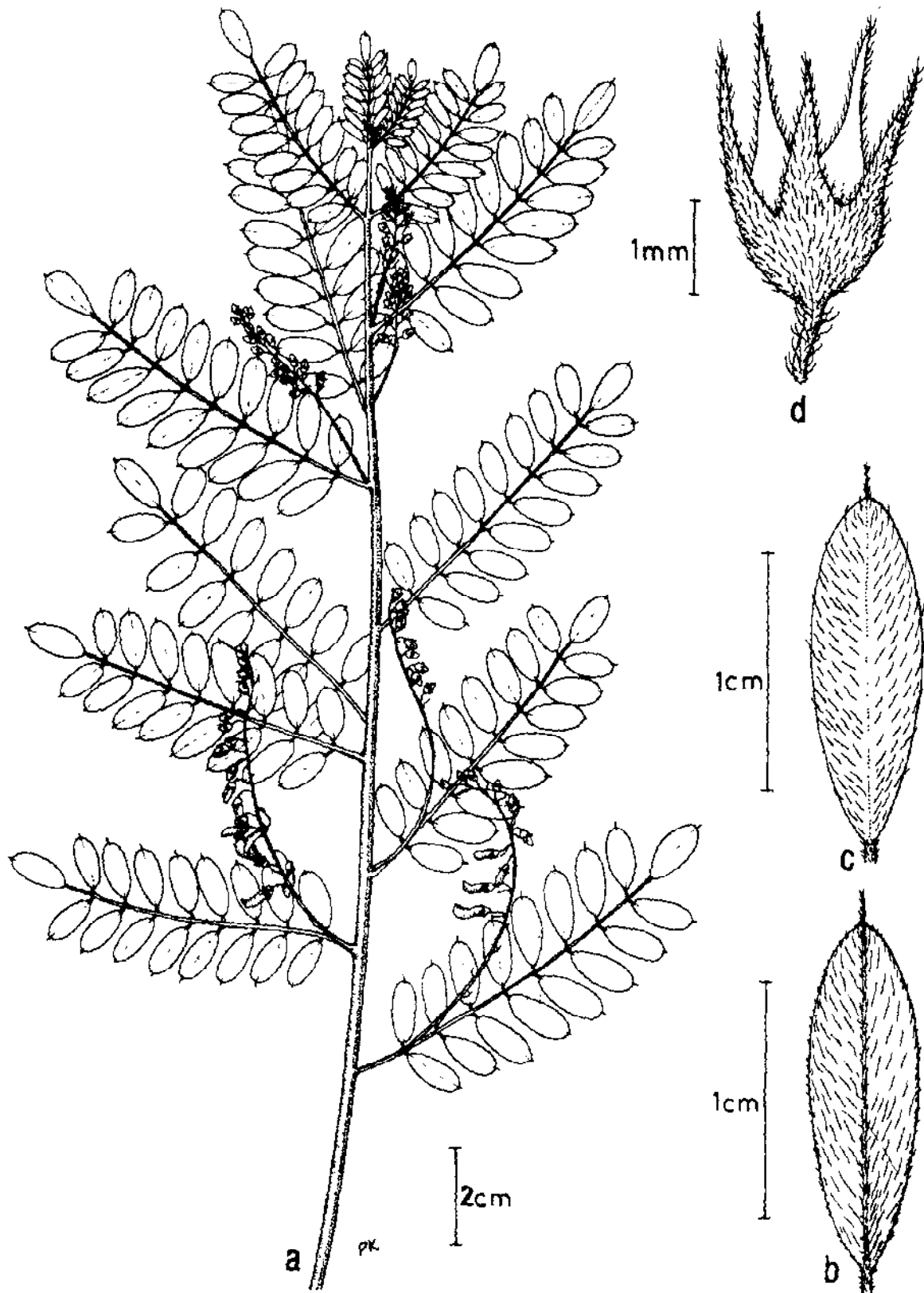


Fig. 17. *Indigofera cylindracea* Wallich ex Baker : a. Habit, b. Leaflet-abaxial surface, c. Leaflet-adaxial surface, d. Calyx (a-d: Gale & Koko 5732, DD).

minute adpressed white hairy with unequal arms above and with equal arms beneath, hairs brownish on midrib and margins. Racemes 5 - 8 cm long including 1.5 cm long peduncle; rachis striate, spreading brownish hairy, laxly many-flowered; bracts 1.5 - 2 x 0.5 - 1 mm, narrowly triangular, brownish pubescent outside, caducous; pedicels 4 - 6 mm long, brownish pubescent, elongating up to ca 1 cm in fruits. Flowers pink, 8-10 mm long. Calyx adpressed brown hairy outside, cup ca 1.8 mm long, teeth 0.5 - 0.8 mm long, triangular to narrowly lanceolate. Standard 7 - 9 x 4 - 6 mm, obovate, mucronate at apex, strigose on the back, strongly reflexed; wing petals 6.5 - 8 x 2 - 3.5 mm, glabrous; keel petals 7 - 9 x 2.5 - 4 mm, adpressed white hairy, lateral spur 1 - 1.5 mm long. Staminal sheath 7 - 8 mm long; anthers ca 0.8 mm long. Ovary 4 - 5 mm long, linear, glabrous, up to 10-ovuled; style 3 - 4 mm long, glabrous. Pods 40 - 50 x 3 - 5 mm, spreading, straight, cylindric, beaked, glabrous, 8 - 10-seeded. Seeds ca 1.5 x 1 mm, cylindric, rounded at both ends, smooth, reddish-brown.

Type: Nepal, 1821, Wallich, Cat. No. 5482(K-W, holo ! CAL iso !).

Fls.: June - Aug. ; *Frts.:* Aug. - Nov.

Distrib.: INDIA: Uttar Pradesh, West Bengal(Darjeeling Dist.), Sikkim, Arunachal Pradesh and Nagaland; NEPAL, BHUTAN, CHINA, MYANMAR.

Habitat: Open areas on slopes of valleys, banks of rivers at altitudes ranging from 1500 - 2500 m.

Exsicc.: Nagaland: Naga Hills, Palebudge, June 1886, *D. Prain s.n.*; 2000 ft, 28 July 1935, *N.L. Bor* 6338 (DD); Uttar Pradesh: Naini Tal, 7000 ft., 24 July 1923. *A.E. Osmaston* 1231 (DD); Almora Dist, near Dindīhar, 2100 m, 29 Jul. 1923, *R.N. Parker* 2116 (DD, K).

16. *Indigofera dalzellii* T. Cooke, Fl. Pres. Bombay 1: 311. 1902 (*Repr.* 1: 331. 1967); Sanjappa in Jour. Econ. Tax. Bot. 5: 1031. 1984; Saldanha & G. Singh in Saldanha, Fl. Karnataka 1: 470. 1984; R.S. Rao, Fl. Goa etc. 1: 124. 1985; Ahmed. & Nayar, Endem. Pl. Indian Reg. 99. 1987. *I. triquetra* Dalz. in Hook., Kew Jour. 2: 36. 1850 non E. Meyer 1836; Dalz. & Gibs., Bombay Fl. 58: 1861; Drury, Handb. Indian Fl. 1: 282. 1864; Baker in Hook. f., Fl. Brit. India 2: 93. 1876.

Fig. 18, Map 2.

Perennial herb; root-stock stout, woody, branching from the tip; stems and branches prostrate with ascending tips, acutely triquetrous, pinkish, biramous hairs with equal arms adpressed. Leaves simple; stipules 3 - 4 x 1.5 - 2 mm, linear, cuspidate, adpressed pubescent outside, persistent; petioles 0.5 - 1.5 mm long; lamina 8 - 35 x 4 - 8 mm, elliptic, elliptic-oblong, obtuse to subacute at

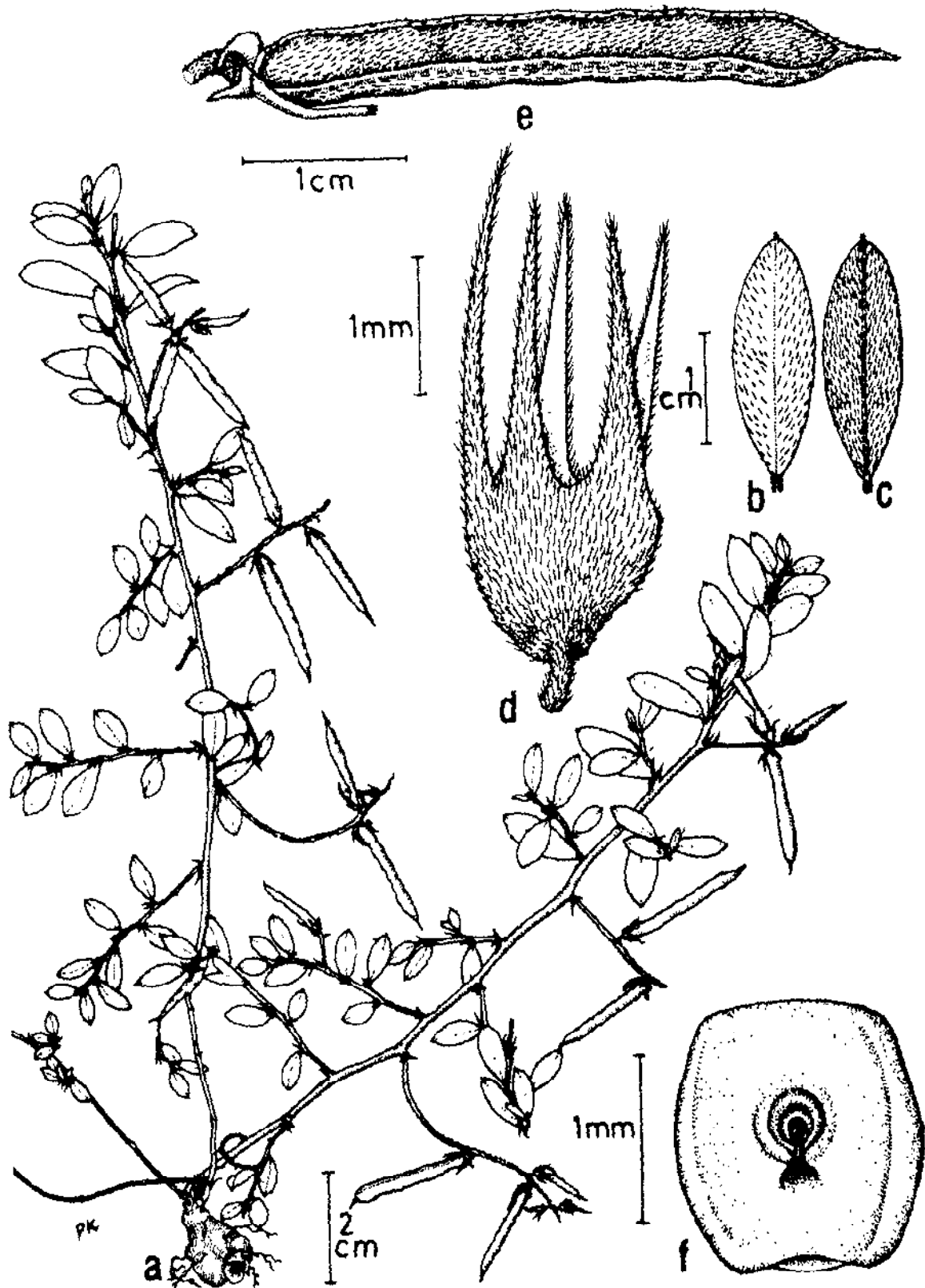


Fig. 18. *Indigofera dalzelli* T. Cooke : a. Habit, b. Leaflet adaxial surface, c. Leaflet-abaxial surface, d. Calyx, e. Pod, f. Seed-hilar view (a-f: *Sanjappa* 9512).

base and apex, mucronate, biramous hairs adpressed beneath with equal arms, subglabrous above. Racemes 2.5 - 5 cm long including 6 - 20 mm long peduncle; rachis acutely triquetrous, sparsely adpressed pubescent. Flowers purple to pinkish-purple, 6 - 10 mm long; bracts 2.5 - 3 x 1 - 1.5 mm, linear, cuspidate, adpressed pubescent, caducous; pedicels 2 - 3 mm long, deflexed in fruits. Calyx ca 5 mm long, persistent, cup ca 1 mm long, teeth 3 - 4 mm long, linear-setaceous, acute. Standard 5 - 7.5 x 4 - 6.5 mm, broadly ovate or nearly orbicular, rounded and mucronate at apex, sparsely adpressed pubescent outside; wing petals 4 - 6 x 1 - 3 mm, oblong, sparsely hairy towards the tip; keel petals 5 - 7 x 2 - 4 mm, hairy towards the tip, lateral spur 1 - 1.5 mm long. Staminal sheath 4 - 7 mm long; anthers 1 - 1.5 mm long, glabrous. Ovary 3 - 5 mm long, linear, glabrous, 6 - 8-ovuled; style 2 - 3 mm long, glabrous. Pods 10 - 18 x 3 - 4 mm, spreading, linear, tetragonous, beak 2 - 3 mm long, sparsely strigose sutures shortly winged, (2 -)4 - 5(- 7)-seeded. Seeds 1 - 1.5 x 1 mm, subtetragonous, truncate at both ends, smooth, reddish-brown.

Type: India: Maharashtra, Malwan, *N.A. Dalzell s.n.* (K, holo !).

Fls.: July - Sept.; *Frts.:* Nov. - Dec.

Distrib.: INDIA: Western Ghats of Goa, Karnataka and Maharashtra; endemic.

Habitat: Rocky substrata among grasses and on plateaux between 300 - 1400 m.

Exsicc.: Goa: Marmagoa, 15 Oct. 1891, *W.A. Talbot* 2590. Karnataka: Uttara Kannada Dist., Coompta, 1 Sept. 1883, *W.A. Talbot* 605; Maharashtra: Satara Dist., Panchagani, 25 Aug. 1802, *Raojee s.n.*; 24 Oct. 1982, *M. Sanjappa* 9512;

Chr. No.: $2n = 16$ (Sanjappa & Dasgupta, *Indian Jour. Bot.* 6: 62. 1983).

Notes: Nair and Koshi (*Jour. Bombay Nat. Hist. Soc.* 60: 330. 1963) have recorded this species from Rajasthan but so far no specimen of this species from Rajasthan could be traced in any of the known herbaria.

17. *Indigofera deccanensis* Sanjappa in *Jour. Econ. Tax. Bot.* 4: 582. 1983; Ahmed. & Nayar, *Endem. Pl. Indian Reg.* 99. 1987. *I. torulosa* W. Khan in *Indian For.* 108: 516. 1982 non E. Meyer 1836. Fig. 19, Map 2.

Shrub, 50 - 90 cm high; branches spreading, angular, biramous hairs spreading with unequal arms. Leaves trifoliolate, 3 - 4 cm long including 6 - 10 mm long petiole; stipules ca 1.5 x 0.5 mm, narrowly triangular, grey hairy

outside; stipellae absent; petiolules 1 - 3 mm long, pubescent; leaflets 10 - 25 x 6 - 10 mm, obovate, sometimes elliptic, obtuse at base, obtuse to rounded and mucronate at apex, strigose on both surfaces, medifixed hairs adpressed with equal arms on lower surface and with unequal arms on upper surface. Racemes 1.5 - 4.5 cm long, sessile, axillary; rachis angular, strigose, 8 - 10-flowered. Flowers pink or pale pink, 5 - 6 mm long; bracts ca 0.5 mm long, triangular, caducous; pedicels less than 1 mm long. Calyx scabrous, cup ca 0.5 mm long, teeth 1 - 1.5 mm long, triangular. Standard 4.5 - 5.5 x 2 - 3 mm, ovate, mucronate, strigose on the back; wing petals 4 - 5 x 1.5 - 2 mm, glabrous; keel petals 4.5 - 5 x 1.5 - 2.5 mm, strigose outside, lateral spur ca 0.5 mm long. Staminal sheath 4 - 5 mm long; anthers ca 0.6 mm long. Ovary ca 4 mm long, sparsely hairy, 3 - 5-ovuled; style 1.5 - 2 mm long, glabrous. Pods 10 - 35 x 1.5 - 3.5 mm, spreading, straight, subtetragonous, distinctly torulose, beak ca 1 mm long, (1 -)2 - 5-seeded, valves spreading hairy. Seeds 1 - 1.5 x 1 mm, subtetragonous, ellipsoid, rounded at both ends, yellowish-brown.

Type: India: Maharashtra, Beed district, Sautada, *Wadood Khan* 539 A (Herb. Botany Dept. Maharashtra Univ., Aurangabad, Maharashtra, holo ! CAL, iso !).

Fls.: Aug. - Sept. ; *Frts.:* Sept - Dec.

Distrib.: INDIA: Maharashtra; endemic.

Habitat: Slopes of hills and banks of rivers between 500 - 800 m.

Exsicc.: Maharashtra: Beed Dist., Sautada, bank of Penganga river, *Wadood Khan* 539B-D (Herb. Botany Dept., Marathwada Univ., Aurangabad, Maharashtra); Poona Dist., Katraj, Aug. 1956, *G.S. Puri* 2906 (BSI)

Notes: This species is allied to *I. trita* L.f. var. *trita* and *I. angulosa* Edgew.; it differs from the former in having spreading tomentum on branches, leaves and pods, 2 - 5-seeded, torulose pods and from the latter in having trifoliolate leaves, spreading tomentum on branches, leaves and pods, shorter racemes, straight and less constricted pods.

18. *Indigofera dosua* Buch.-Ham. ex D. Don, Prodr. 244. Feb. 1825; DC., Prodr. 2: 225. Nov. 1825; Baker in Hook. f., Fl. Brit. India 2: 102. 1876 *excl. var. tomentose* Baker; Collett, Fl. Simlensis 123. 1902; Prain & Baker f. in Jour. Bot. 40: 143. 1902; Brandis, Indian Trees 218. 1906; Bamber, Pl. Punjab 100. 1916; Parker, For. Fl. Punjab 132. 1918; Osmaston, For. Fl. Kumaon 151. 1927; Ali in Bot. Notis. 111: 562. 1958; de Kort & Thijssse in Blumea 30: 117. 1984, p.p.; Sanjappa in Reinwardtia 10: 221. 1985. *I. polyphylla* DC., Prodr. 2: 227. Nov. 1825. *I. virgata* Roxb., Fl. Ind. 3: 383. 1832.

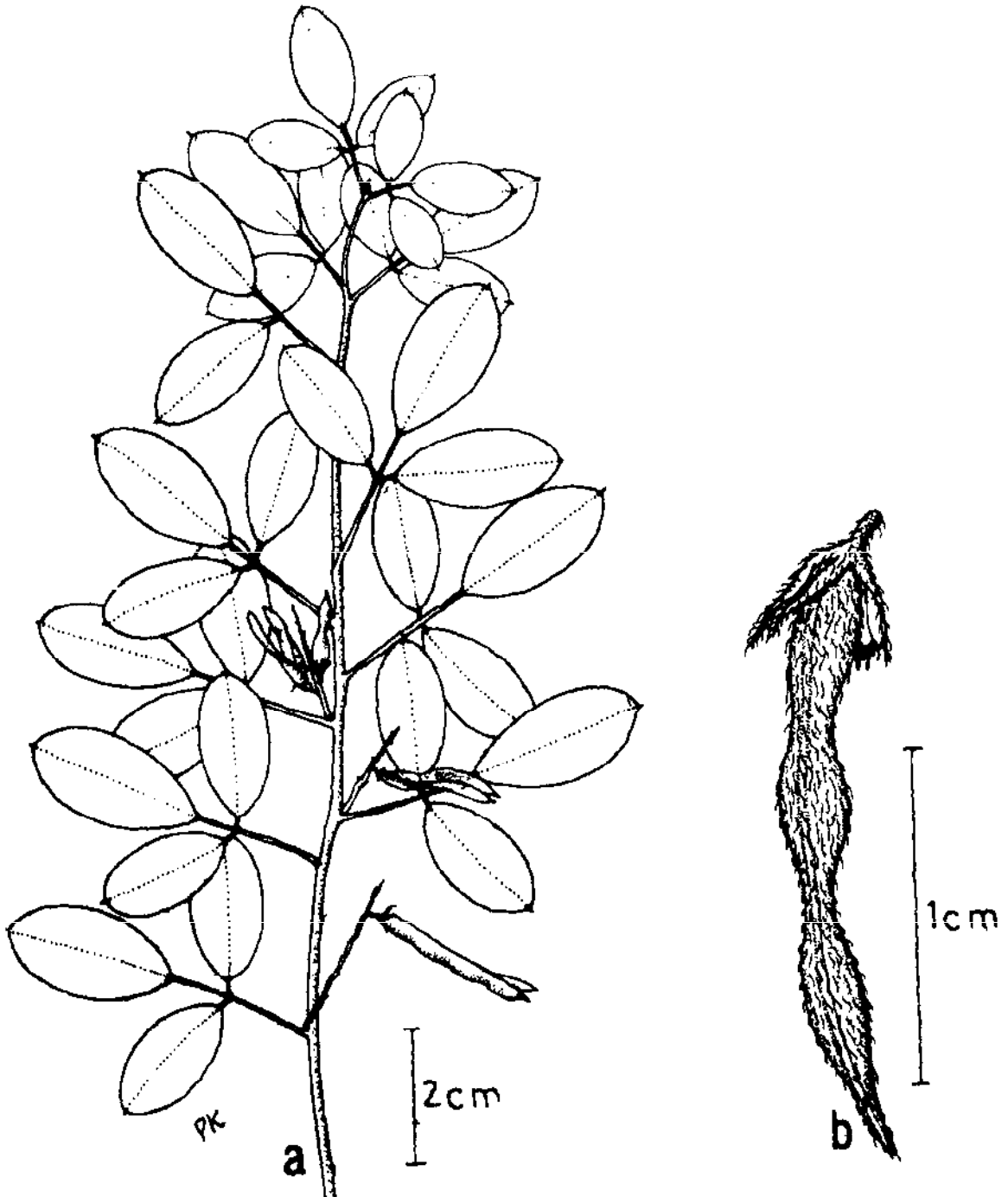


Fig. 19. *Indigofera deccanensis* Sanjappa : a. Habit, b. Pod (a-b: *Wadood Khan* 539).

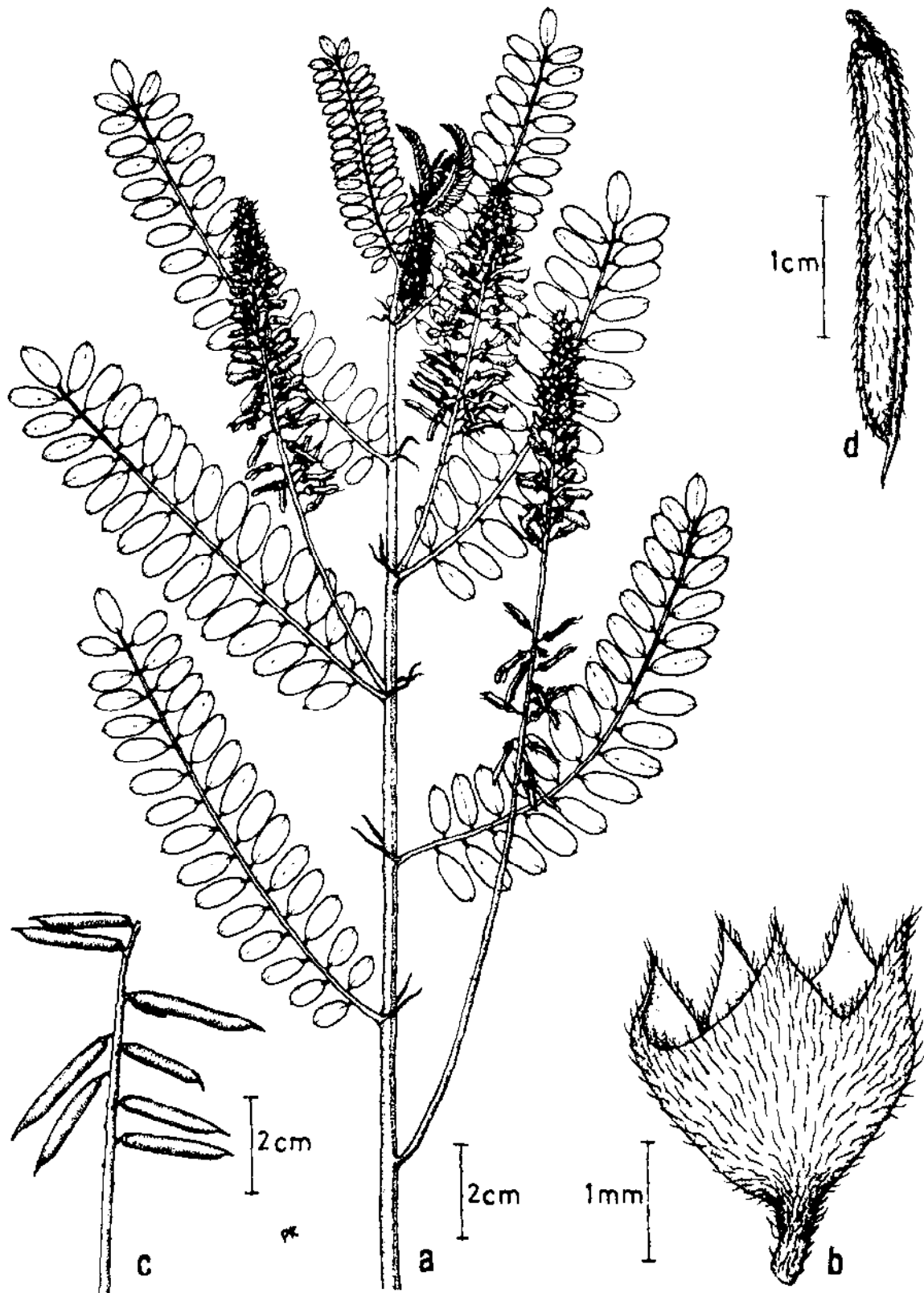


Fig. 20. *Indigofera dosua* Buch.-Ham. ex D. Don var. *dosua* : a. Habit, b. Calyx, c. Infructescence, d. Pod (a-b: *Gamble* 24239; c-d: *B.D. Naithani* 42246).

KEY TO THE VARIETIES

- 1a. Racemes longer than leaves 18.1. var. *dosua*
 b. Racemes shorter than leaves 18.2 var. *simlensis*

18.1. var. *dosua***Fig. 20.**

Local names: Theot, Kathewat, Kati (Hindi), Jhenti, Shagali, Mattu, Kas-keri (Punj.), Chiringi jhar, Dusi swan (Nep.).

Shrub, 0.5 - 3 m, high; stems and branches woody, erect striate, biramous hairs rusty brown initially turning grey, spreading with very unequal arms. Leaves 4 - 12 cm long, sessile; stipules 7 - 10 x 0.5 - 1 mm, linear to narrowly triangular, spreading white hairy outside; rachis 3 - 10.5 cm long, spreading hairy; stipellae absent; petiolules ca 1 mm long, hairy, leaflets 13 - 41, opposite, sometimes a few alternate, 7 - 15 x 4 - 6 mm, elliptic to elliptic-oblong or oblong, rounded or cuneate at base, obtuse to rounded and mucronate at apex, finely adpressed pubescent on both surfaces, hairs spreading along margins. Racemes 6 - 18 cm long, axillary; rachis striate, spreading grey pubescent, many-flowered. Flowers pink, 8 - 10 mm long; bracts 8 - 10 x 0.5 mm, linear to narrowly triangular, spreading white pubescent outside; pedicels ca 3 mm long. Calyx ca 3 mm long, adpressed white pubescent outside; cup ca 2 mm long, teeth ca 1 mm long, triangular. Standard 8 - 10 x 4 - 4.5 mm, elliptic to broadly oblong, mucronate at apex, hairs adpressed rusty brown turning white on the back; wing petals 8 - 9 x 1 - 2.5 mm, oblong, glabrous, ciliate along margins; keel petals 8 - 9 x 2.5 - 3 mm, acute, adpressed hairy on the back, ciliate along margins. Staminal sheath ca 10 mm long; anthers 0.6 - 0.8 mm long, hairy at the base. Ovary ca 5 mm long, linear, white hairy, 6 - 10-ovuled; style ca 4 mm long. Pods 30 - 45 x 3 - 4 mm, linear, deflexed- spreading, quadrangular with rounded valves, apiculate with upcurved tip, adpressed white pubescent, 6 - 10-seeded, sutures broad (2 - 2.5 mm). Seeds 1.5 - 2 x 1.5 - 2 mm, smooth, dark-brown.

Type: Nepal, Suemba, *Buchnan-Hamilton s.n.* (BM, holo !).

Fls.: May - July; *Frts.:* July - Sept.

Distrib.: INDIA: Arunachal Pradesh, Himachal Pradesh, Jammu & Kashmir, Meghalaya and Uttar Pradesh; NEPAL, BHUTAN, CHINA, MYANMAR, THAILAND, LAOS, VIETNAM.

Habitat: Valleys lined with evergreen forests, grasslands, disturbed areas on slopes of valleys between 1500 - 2800 m.

Exsicc.: Himachal Pradesh: Tehra Dalhousie, 16 June 1918, *E.B. Punjal* 1991; Charaog, Simla, 6000 ft., 30 May 1877, *J.S. Gamble* 4302B; Uttar Pradesh: On way to Jamunotri, 5000 ft., 20 June 1953, *S.N. Mitra* 9424; Kumaon, Shimla, Nainital, 22 July 1900, *Inayat* 24341; Jakhmolla, 1500 m, 21 Oct. 1970, *B.D. Naithani* 42246 (BSD).

Chr. No.: $2n = 16$ (Sampath & Ramanathan, *Curr. Sci.* 18: 408. 1949); $2n = 48$ (Frahm-Leliveld, *Act. Bot. Neerl.* 9: 286 - 293. 1962).

Pollen: 3-zonocolporoidate, subprolate, 33×26 ($30 - 36 \times 24 - 28$) μm , granulate (Vishnu-Mittre & Sharma, *Pollen et Spores* 4: 5 - 45. 1962).

18.2. var. *simlensis* (Ali) Sanjappa, *Legum. India* 188. 1992. *I. simlensis* Ali in *Bot. Notis.* 111: 561. 1958; Sanjappa in *Jour. Econ. Tax. Bot.* 5: 1035. 1984.

Fig. 21, Map 2.

Differs from var. *dosua* in having racemes shorter than leaves.

Type: India: Himachal Pradesh, Ry-S'Hills, Jutogh, *H.H. Rich* 347 (K, holo!).

Fls. & Frts.: May - Sept.

Distrib.: INDIA: Himachal Pradesh and Uttar Pradesh; endemic.

Habitat: Slopes of the valleys of N.W. Himalayas between 800 and 2500 m.

Exsicc: Himachal Pradesh: Between Musround and Chamba, 3 - 5000 ft., 5 Sept. 1896, *G.A. Gammie* 18520 (DD, K); near Simla, 7000 ft., July 1918, *R.N. Parker s.n.* (DD); Uttar Pradesh: Mussoorie, Murray's Spring forest, 6200 ft., 22 Sept. 1961, *H.O. Saxsena* 2262 (DD).

19. *Indigofera emmae* de Kort & Thijssse in *Blumea* 30: 130. 1984. *I. meghalayensis* Sanjappa in *Reinwardtia* 10: 227. 1985, *syn. nov.* **Fig. 22, Map 2.**

Shrub, 1 - 2.5 m high; branches erect, rusty brown tomentose, hairs adpressed with equal arms. Leaves ca 2.5 cm long including ca 5 mm long petiole; stipules 3 - 3.5 x 1 mm, narrowly triangular, rusty brown pubescent outside; rachis 1 - 1.5 cm long, canaliculate above, rusty brown tomentose; stipellae 1 - 1.5 cm long, narrowly triangular; petiolules 1.5 mm long; leaflets (5 -) 7 - 9, opposite, 5 - 8 x 3 - 4 mm, elliptic or oblong, obtuse to rounded at base and apex, adpressed brown and white hairy on both surfaces. Racemes 4 - 5 cm long including 1 - 1.2 cm long peduncle, axillary; rachis adpressed rusty brown tomentose, many-flowered; bracts 2 - 2.5 x 0.5 mm, narrowly triangular, brown

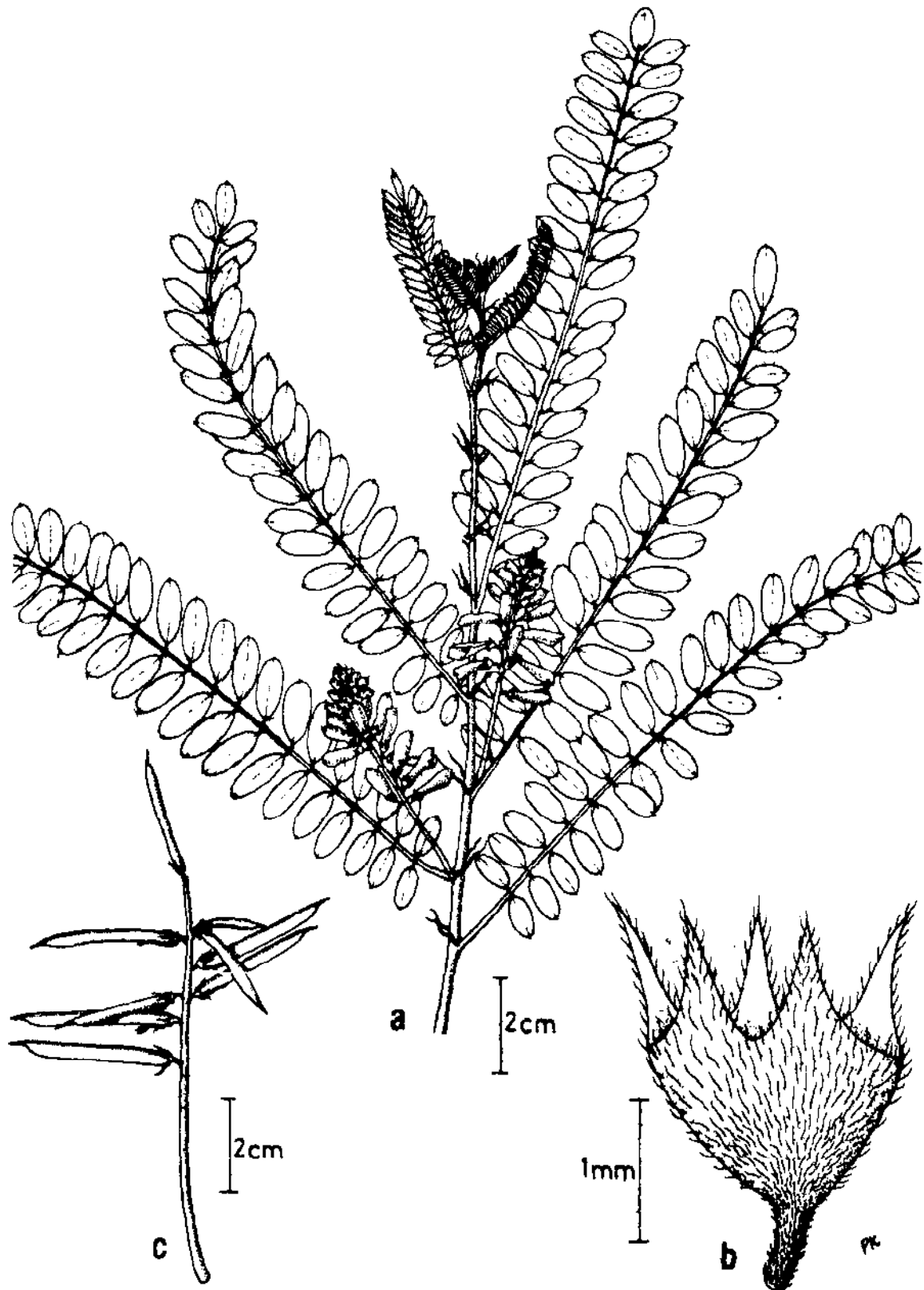


Fig. 21. *Indigofera dosua* var. *similensis* (Ali) Sanjappa : a. Habit, b. Calyx, c. Infructescence (a: C.M. Arora 41351; c: Ellis & Sanjappa s.n.).

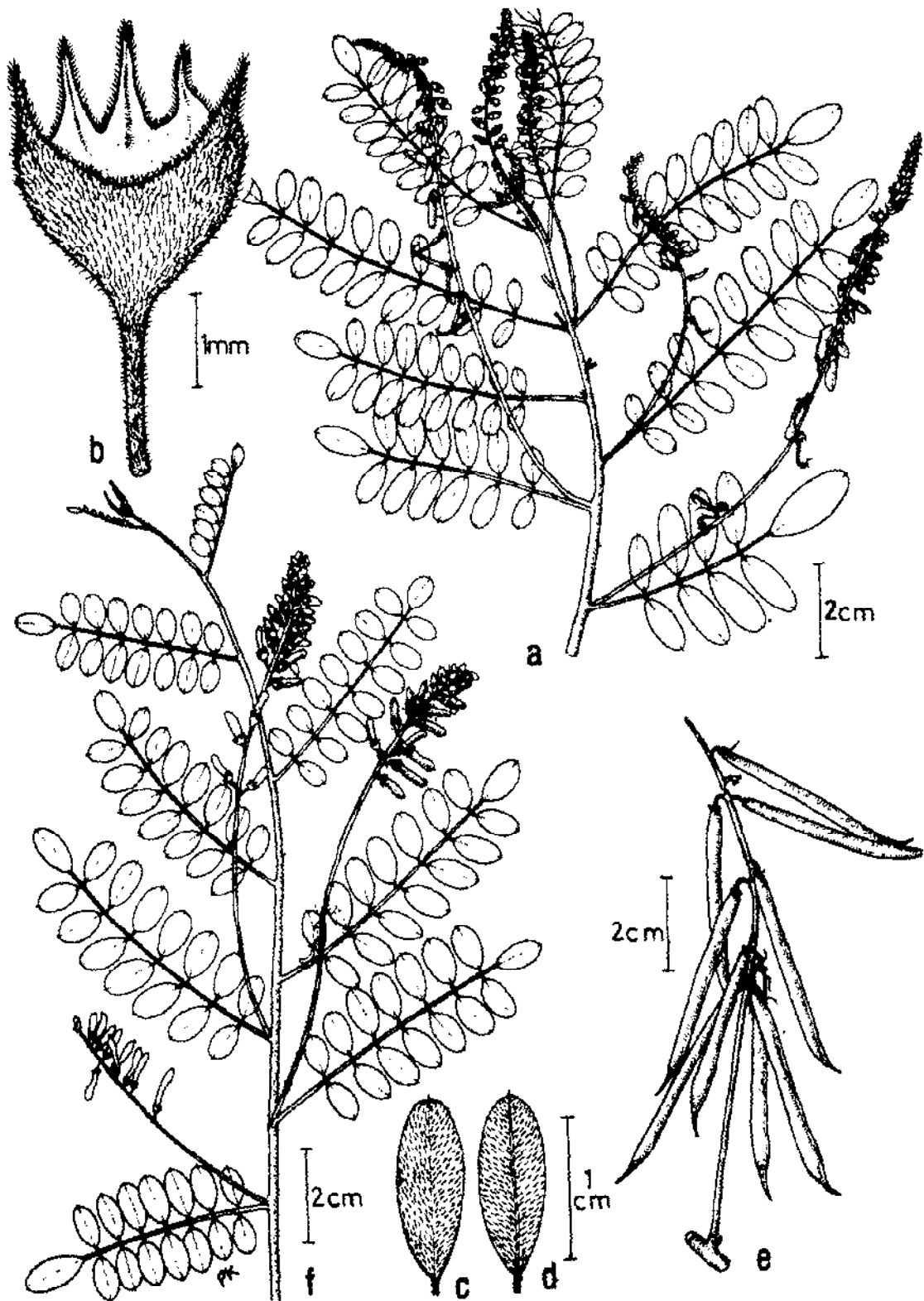


Fig. 22. *Indigofera exiles* Grierson & Long (a-e): a. Habit, b. Calyx, c. Leaflet-adaxial surface, d. Leaflet-abaxial surface, e. Infructescence, f. *Indigofera pseudoreticulata* Grierson & Long-Habit: (a-d: Sanjappa 18350; e. J.D. Hooker s.n.; f. Ludlow, Sheriff & Hicks 21393, E).

strigose outside, caducous; pedicels ca 2 mm long, strigose. Calyx adpressed rusty brown tomentose outside, cup ca 1 mm long, teeth 1.5 - 2 x 0.5 mm, narrowly triangular. Standard 6 - 7 x 3 - 4 mm, elliptic to obovate, acute and mucronate at apex, adpressed brown strigulose on the back; wing petals 5 x 2 - 2.5 mm, glabrous, ciliate along margins; keel petals 6 - 7 x 2.5 - 3.5 mm, adpressed brown strigulose outside, ciliate along margins; lateral spur 0.5 - 1 mm long. Staminal sheath 6 - 6.5 mm long; anthers ca 0.5 mm long. Ovary 4 - 4.5 mm, linear, glabrous, 8 - 10-ovuled; style 2 - 3 mm long, glabrous. Young pods spreading, straight, adpressed brown pubescent, mature pods not seen.

Type: Burma, Chin Hills, *Dickson* 8536 (L, lecto ! A !).

Fls. & Frts.: April - May.

Distrib.: INDIA: Meghalaya; MYANMAR, THAILAND.

Habitat: Exposed hill slopes between 2000 and 2500 m.

Exsicc.: India: Meghalaya, Khasi and Jaintia hills (Shillong), Smit, 26 April 1944, *N.L. Bor* 18168 (DD, holotype of *I. meghalayensis* Sanjappa).

20. *Indigofera exilis* Grierson & Long in Notes R.B.G. Edinburgh 37: 342. 1979 & Fl. Bhutan 1: 665. 1987. *I. leptostachya* auct. non DC. 1825; Baker in Hook. f., Fl. Brit. India 2: 100. 1876; Kanjilal *et al.*, Fl. Assam 2: 19. 1938.

Fig. 22a - e, Map 3.

Shrub, 2 - 4 m high; branches erect, grooved, densely adpressed pubescent, biramous hairs with equal arms. Leaves 6 - 15 cm long including 1.5 - 2.2 cm long petiole; stipules 3 - 4 x 0.3 mm, narrowly triangular, pubescent outside; rachis 5 - 8 cm long, canaliculate above, adpressed fine hairy; stipellae ca 1 mm long, triangular; petiolules 1 - 1.5 mm long, hairy, leaflets 13 - 23, opposite, 10 - 22 x 5 - 10 mm, elliptic to elliptic-oblong, sometimes obovate or oblanceolate, cuneate to obtuse at base, obtuse to rounded and mucronate at apex, minutely adpressed pubescent on both surfaces, sparsely so beneath, green above, pale beneath, venation reticulate. Racemes 6 - 20 cm long including 8 - 15 mm long peduncle, axillary, grooved, minutely adpressed pubescent, many-flowered; bracts 1 - 1.5 mm long, narrowly triangular to linear hairy outside caducous; pedicels 1.5 - 2 mm long, slender, hairy. Flowers pinkish, ca 10 mm long. Calyx adpressed brown hairy outside, cup ca 1.5 mm long, teeth 0.5 - 0.8 mm long, deltoid or triangular. Standard 6 - 7 x 3 - 4 mm, elliptic-oblong or obovate, adpressed brown hairy on the back; wing petals 5.5 - 6 x 2 mm, glabrous; keel petals 6 - 7 x 2.5 - 3 mm, adpressed brown hairy towards upper margin, lateral spur ca 0.5 mm long. Staminal sheath ca 6 mm long; anthers ca 0.5 mm long. Ovary 4 - 5 mm long, linear, glabrous, 8 - 10-ovuled; style ca 2 mm long,

glabrous. Pods 25 - 35 x 2 - 3 mm, deflexed-spreading, straight, subcylindric, tip curved, glabrous, 6 - 10-seeded. Seeds ca 2 x 1.2 mm, cylindric, smooth, brown.

Type: India: Sikkim, Lachen & Lachung, 6-8000 ft., J.D. Hooker. s.n. (K, holo !)

Fls.: June - Aug. ; *Frts.:* Sept. - Nov.

Distrib.: INDIA: Arunachal Pradesh, Himachal Pradesh, Sikkim, Meghalaya and Uttar Pradesh; NEPAL, BHUTAN.

Habitat: Among grasses and other shrubs on slopes in valleys at altitudes ranging from 1400 to 3000 m.

Exsicc.: Himachal Pradesh: Simla, 8000 ft. Oct. 1907, A. Meebold 4945. Meghalaya: Khasia Hills, 4 - 5000 ft., July 1876, G. Mann 482 (CAL, ASSAM); Sikkim: Lachung, 9000 ft., 15 Oct., 1922, G.H. Cave 1973; At 30 km point between Chungthang and Lachung, 1800 m, 8 July 1986, M. Sanjappa 18322.

21. *Indigofera galegoides* DC., Prodr. 2: 225. 1825; Baker in Hook. f., Fl. Brit. India 2: 100. 1876; Trimen, Syst. Cat. Fl. Pl. Fern. Ceylon 23. 1885 & Handb. Fl. Ceylon 2: 28. 1894; Gamble, Fl. Pres. Madras 313. 1918 (*Repr.* 1: 221. 1967); Alston in Trimen, Handb. Fl. Ceylon 6, Suppl: 73. 1931; de Kort & Thijssse in Blumea 30: 118. 1984. *I. uncinata* Roxb., Fl. Ind. 3: 382. 1832. *I. finlaysoniana* Graham ex Ridley, Fl. Malay Pen. 1: 581. 1922. **Fig. 23, Map 2.**

Shrub, 1 - 3 m high; branches erect, angular, biramous hairs adpressed with equal arms, glabrous with age. Leaves 12 - 25 cm long including 1.5 - 2 cm long petiole; stipules 2.5 - 3.5 x 0.5 - 1 mm, adnate at base, narrowly triangular, deciduous; rachis 8 - 20 mm long, flat above; stipellae ca 1 mm long, triangular, with a tuft of pearl bodies between stipellae of opposite leaflets; petiolules ca 2 mm long, adpressed pubescent; leaflets (11 -) 15 - 25, opposite, 20 - 30 x 3 - 17 mm, obovate, sometimes elliptic to oblong, cuneate to rounded at base, acute to rounded and mucronate at apex, sparsely and minutely adpressed pubescent on both surfaces. Racemes 5 - 12 cm long including 0 - 8 mm long peduncle, axillary; rachis minutely brown pubescent, compactly many-flowered. Flowers pale red, 6 - 8 mm long; bracts ca 2 x 1 mm, narrowly triangular, caducous; pedicels ca 2 mm long, densely adpressed pubescent. Calyx minutely adpressed pubescent outside, cup 1 - 1.5 mm long, teeth 0.5 - 1 mm long, deltoid. Standard 5 - 7.5 x 3 - 5 mm, elliptic to obovate, obtuse and mucronate at apex, adpressed pubescent outside; wing petals 4 - 6.5 x 1.5 mm, glabrous, ciliate along upper margins; keel petals 5 - 7.5 x 2.5 mm, sparsely pubescent towards tip, ciliate along margins, lateral spur ca 1 mm long. Staminal sheath 4 - 7 mm long; anthers

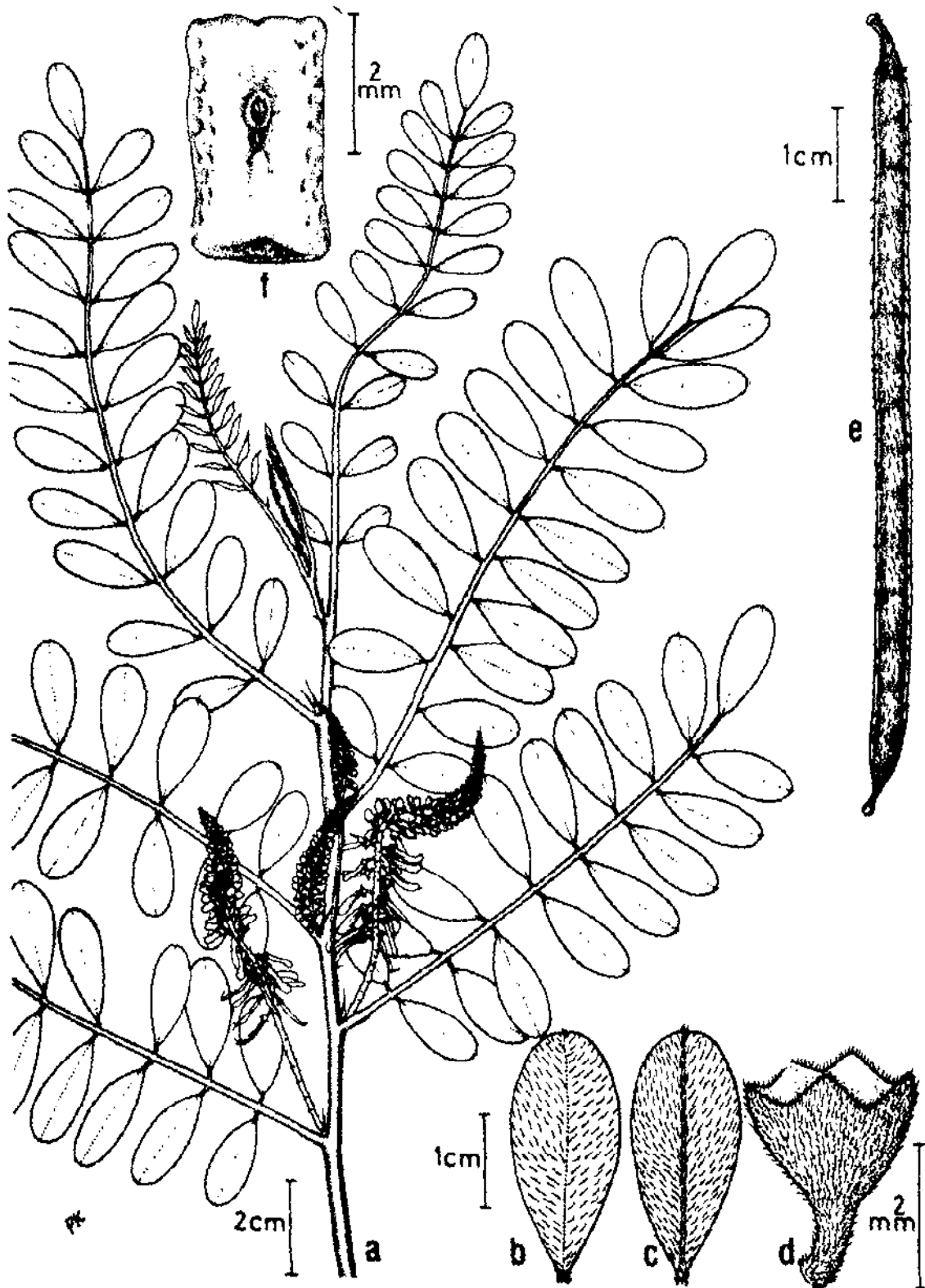


Fig. 23. *Indigofera galeoides* DC. : a. Habit, b. Leaflet-adaxial surface, c. Leaflet-abaxial surface, d. Calyx, e. Pod, f. Seed-hilar view (a-d: A.T. Gage s.n.; e-f: Mokim 63)

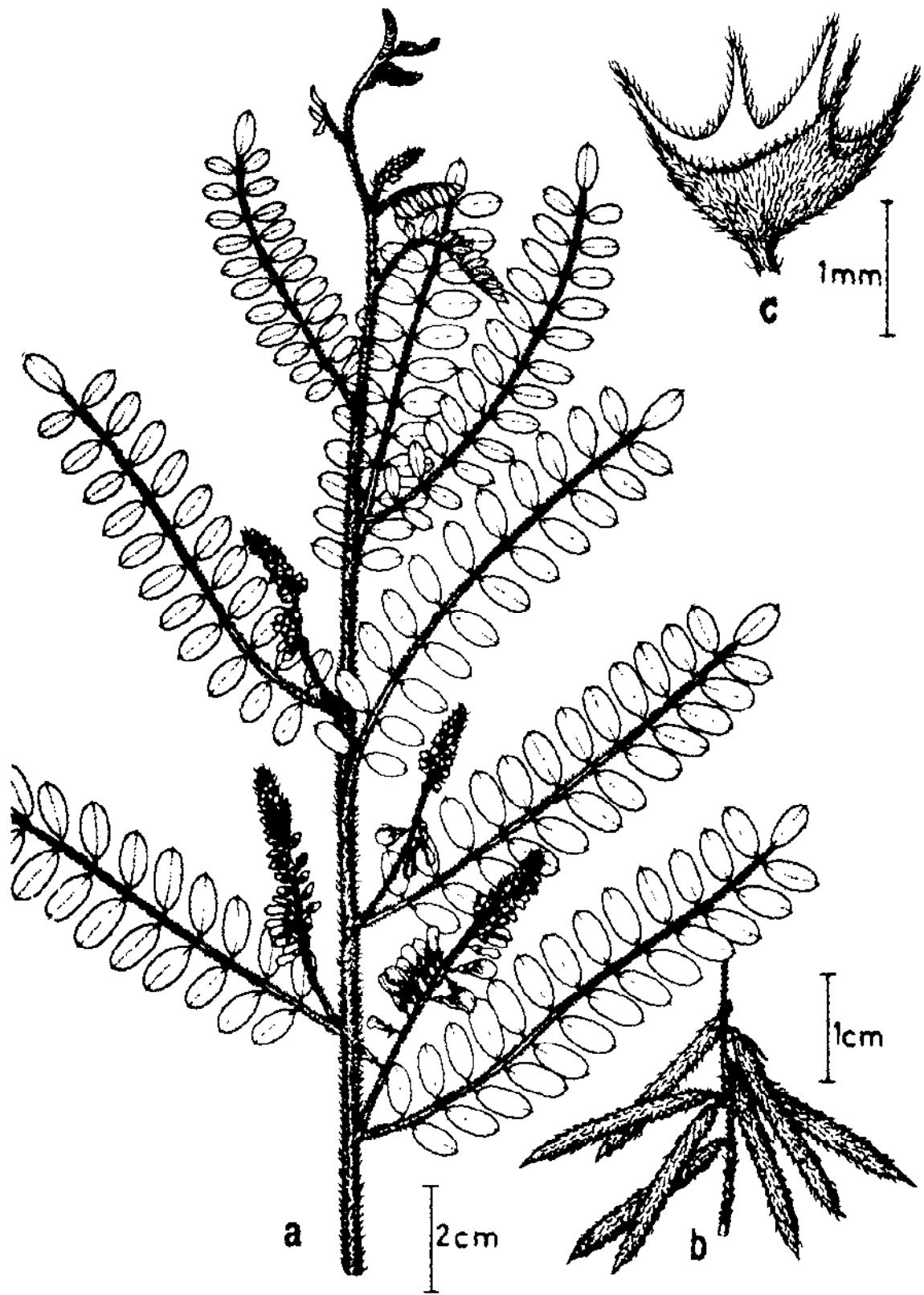


Fig. 24. *Indigofera gangetica* Sanjappa : a. Habit, b. Infructescence, c. Calyx:
(a,c: Wall. Cat. No. 5480c-CAL; b: King s.n.).

ca 1 mm long. Ovary ca 6 mm long, linear, glabrous, 15 - 18-ovuled. Pods 6 - 7.5 x 0.3 cm, fastigately grouped with their apices pointing in the direction of apex of peduncle, straight, cylindrical, rarely subtetragonous, beak 4 - 8 mm long, sparsely minute adpressed hairy, 15 - 18-seeded; endocarp red-spotted. Seeds 2.5 - 3 x 1.5 mm, rectangular or squarish, faintly pitted, reddish-brown.

Type: Sri Lanka, 1823, *Leschenault s.n.* (G-DC, seen on microfiche).

Fls.: Aug. - Nov.; *Frts.:* Nov. - March.

Distrib.: INDIA: Andhra Pradesh, Assam, Kerala, Meghalaya, Orissa and Tamil Nadu; SRI LANKA, BANGLADESH, CHINA, MYANMAR, THAILAND, LAOS, CAMBODIA, VIETNAM, TAIWAN, SINGAPORE, MALAYSIA, INDONESIA, PHILIPPINES.

Habitat: Open deciduous forests at altitudes ranging from 190 - 1000 m.

Exsicc.: Assam: Badarpur-Cachar, 12 Aug. 1903, *A.T. Gage s.n.*; Meghalaya: Khasia Hills, *J.D. Hooker & T. Thomson s.n.*; Kerala: Iddukki Dist. Tekkadi forests, 190 m, 6 Dec. 1912, *C.E.C. Fischer 3519*; North Malabar (Cannanore Dist.), Mananthody, *C.A. Barber 1785*.

22. *Indigofera gangetica* Sanjappa in Bull. Bot. Surv. India. 28: 225. 1988.
Fig. 24.

Shrub, 2 - 2.5 m high; branches erect to ascending, densely spreading pubescent, biramous hairs with very unequal arms. Leaves ca 8 cm long including ca 1 cm long petiole; stipules 5 - 6 x 1 - 1.5 mm, narrowly triangular, pubescent outside; rachis 5 - 7 cm long, canaliculate above, spreading pubescent; stipellae ca 1 mm long, narrowly triangular; petiolules ca 1 mm long, hairy; leaflets 21 - 25, opposite, 10 - 12 x 4 - 5 mm, elliptic to oblong, rounded at both ends, mucronate, spreading pubescent on both surfaces. Racemes 4 - 5 cm long including 8 - 12 mm long peduncle; rachis spreading pubescent, compactly many-flowered; bracts ca 2 x 0.5 mm, narrowly triangular, pubescent outside, caducous. Flowers pink, 5 - 6 mm long. Calyx spreading pubescent outside, cup ca 1 mm long, teeth ca 1 x 0.5 mm, narrowly triangular. Standard 5 - 5.5 x 3 - 3.5 mm, elliptic to elliptic-oblong, mucronate, densely spreading pubescent on the back; wing petals 4.5 - 5 x 1.5 mm, glabrous, ciliate along margins; keel petals 5 - 5.5 x 2 - 2.5 mm, spreading pubescent outside, lateral spur ca 0.5 mm long. Staminal sheath ca 5 mm long; anthers ca 0.5 mm long. Ovary ca 3.5 mm long, linear, glabrous, 5 - 8-ovuled; style ca 2 mm long, glabrous. Pods 18 - 24 x 3 - 4 mm, spreading, straight, subcylindrical, densely spreading tomentose. Seeds ca 1.2 x 0.8 mm, cylindric, smooth, shiny, brown.

Type: India: Kumaon, Wallich, Cat. No. 5480C *ex parte* (CAL, holo ! CAL, K-W, iso !).

Fls.: May - July; *Frts.:* July - Sept.

Distrib.: INDIA: Himachal Pradesh and Uttar Pradesh; endemic.

Habitat: Open slopes in valleys and as an undergrowth in Psuga forests at altitudes ranging from 1400 - 3000 m.

Exsicc.: Himachal Pradesh: Rampur, 1400 m, 14 June 1962, *N.C. Nair* 22666 (CAL, BSD); Jeori, 1550 m, 25 May 1962, *N.C. Nair* 21824 (CAL, BSD); Uttar Pradesh: Tehri Garhwal, Mayra, 1600 m, 22 July 1964, *U.C. Bhattacharyya* 33629 (CAL, BSD).

23. *Indigofera glabra* Linn., Sp. Pl. 751. 1753; DC., Prodr. 2: 229. 1825; Drury, Handb. Indian Fl. 1: 277. 1864; Prain & Baker f. in Jour. Bot. 40: 136. 1902; T. Cooke, Fl. Pres. Bombay 1: 316. 1902 (*Repr.* 1: 337. 1967) Prain, Bengal Pl. 1: 432. 1903 (*Repr.* 1: 3110. 1963); Duthie, Fl. Upp. Gang. Pl. 1: 251. 1903 (*Repr.* 1: 231. 1960); Gamble, Fl. Pres. Madras 311. 1918 (*Repr.* 1: 219. 1967) Ali in Bot. Notis. 111: 573. 1958; Ramaswamy & Razi, Fl. Bangalore Dist. 266. 1973. *I. pentaphylla* Murray, Syst. Veg. ed. 13: 564. 1774; DC., Prodr. 2: 230. 1825; Wight & Arn., Prodr. 200. 1834; Wight, Icon. Pl. Ind. Orient t. 385. 1840; Baker in Hook. f., Fl. Brit. India 2: 95. 1876; Haines, Bot. Bihar-Orissa 3: 238. 1922 (*Repr.* 2: 249. 1961); Kanjilal *et al.*, Fl. Assam 2: 22. 1938. *I. fragrans* Retz., Obs. Bot. 4: 29. 1786; DC., Prodr. 2: 229. 1825; Roxb., Fl. Ind. 3: 375. 1832.

Fig. 25.

Local name: Neeli balli (Kan.).

Herb, 15 - 35 cm high; stems prostrate to ascending, slender, pinkish or yellowish-green, biramous hairs spreading with very unequal arms. Leaves 3 - 5 cm long including 3 - 4 mm long petiole; stipules 5 - 8 x 1 - 2 mm, narrowly triangular to linear-setaceous, cuspidate, connate at base, scarious, dichotomously pink veined, ciliate along margins and midrib; rachis 2 - 3 cm long; stipellae 1 - 1.5 mm long; petiolules ca 1 mm long; leaflets (3 -) 5, rarely 7, opposite, 10 - 12 x 6 - 10 mm, obovate to elliptic, obtuse to rounded at base, obtuse to retuse at apex, biramous hairs adpressed with equal arms on both surfaces; young leaflets gland-tipped at apex. Racemes 3 - 3.5 cm long including 1 - 2 cm long peduncle; three-fourths of peduncle pilose, upper part of peduncle and flower bearing part of rachis glabrous with reddish glandular eruptions, distantly (1-) 3 - 8-flowered. Flowers pink to bright red, 3 - 3.5 mm long; bracts 1.5 - 2.5 x 1 mm, ovate, caudate, ciliate along midrib and margin, caducous; pedicels ca 1 mm long, hairy. Calyx pilose outside, cup 0.5 - 0.8 mm long, teeth

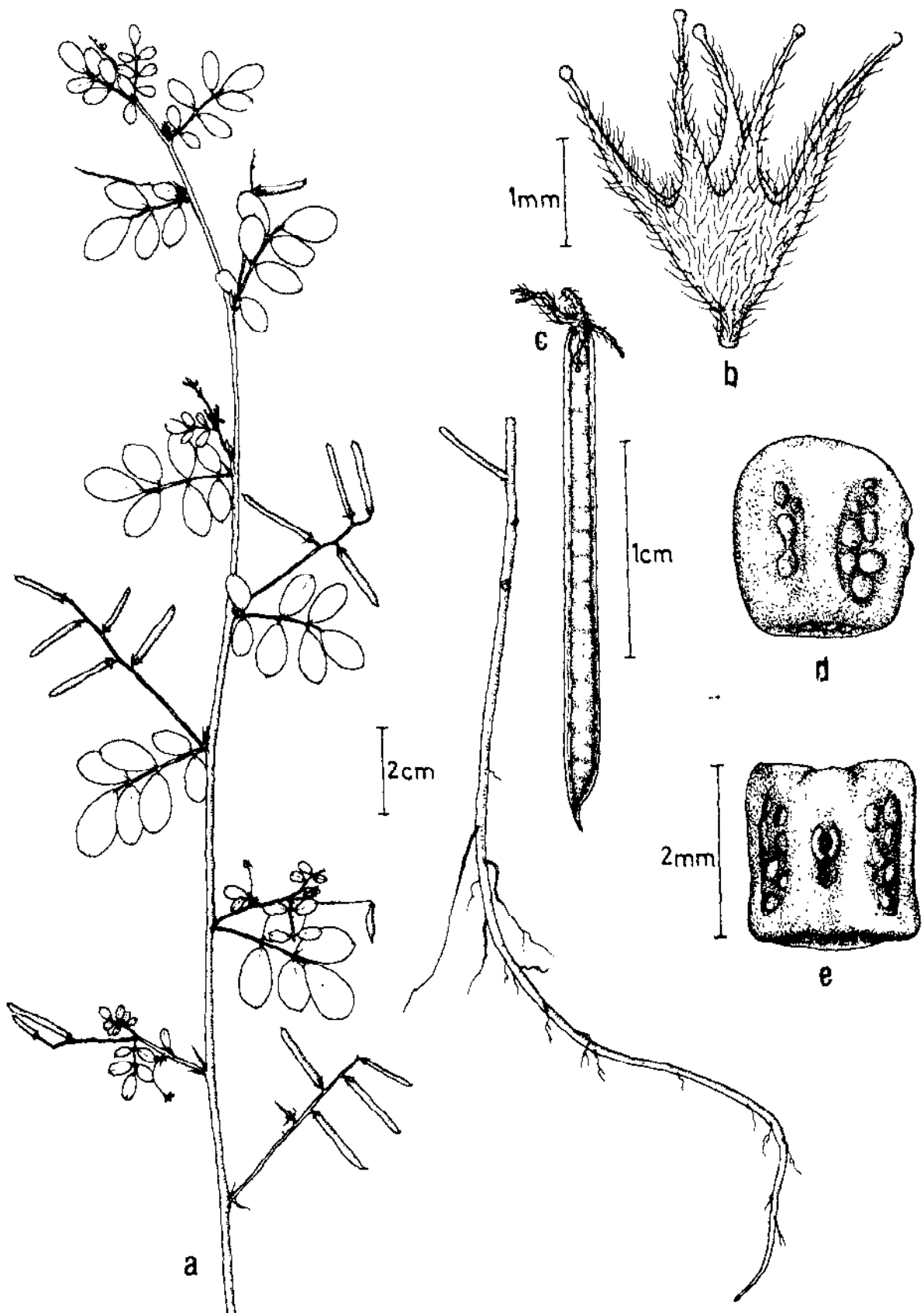


Fig. 25. *Indigofera glabra* Linn. : a. Habit, b. Calyx, c. Pod, d. Seed-side view, e. Seed-hilar view (a-b: *Gamble* 13681; c: *Sanjappa* 726; d-e: *V. Kumar* 705).

ca 2.5 mm long, gland-tipped. Standard 2.5 - 3 x 1.5 - 2 mm, ovate-orbicular, obtuse at apex, sparsely hairy outside; wing petals 2 - 2.5 x 0.8 mm, glabrous; keel petals 2.5 - 3 x 0.5 - 1 mm, sparsely hairy towards tip, ciliate along margins, lateral spur minute. Staminal sheath 2.5 - 3 mm long; anthers ca 0.8 mm long. Ovary 1.5 - 2 mm long, linear, up to 12-ovuled; style glabrous. Pods 20 - 30 x 1.5 - 2 mm, spreading, straight, cylindric, beaked, faintly torulose, glabrous, dehiscent, 10 - 12-seeded; sutures obscurely winged; endocarp red-spotted. Seeds 2 - 2.5 x 1 - 1.5 mm, cylindric, truncate at both ends, granular or foveolate on truncated ends, reddish-brown.

Type: Sri Lanka, *Herb. Hermann*, vol. 3, f. 27 (BM!).

Fls.: Aug. - Oct.; *Frts.:* Oct. - Dec.

Distrib.: INDIA: Andhra Pradesh, Bihar, Goa, Gujarat, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Rajasthan, Tamil Nadu, West Bengal; SRI LANKA, MYANMAR, THAILAND, VIETNAM.

Habitat: Fallow lands, open grassy grounds and scrub forests up to 1000 m.

Exsicc.: Andhra Pradesh: Nallamalais, Digavametta, 320 m, 17 Nov. 1969, J.L. Ellis 32441; Top of the hills, Nagarjunakonda valley, 100 m, 27 Nov. 1961, K. Thothathri s.n.; Karnataka: Bangalore Dist., Bannerghatta Hills, 15 Dec. 1980, M. Sanjappa 726.

Chr. No.: $2n = 16$ (Singh & Roy, *Nucleus* 13: 44. 1970); $n = 8$ sub *I. pentaphylla* Murray (Bir & Kumari, *Nucleus* 20: 94 - 98. 1977).

24. *Indigofera glandulosa* Wendl., Bot. Boeb. 55. 1798; de Kort & Thijssse in Blumea 30: 110. 1984; Sanjappa in Bull. Bot. Surv. India 26: 40. 1985. *I. glandulosa* Roxb. ex Willd., Sp. Pl. 3: 1227. 1803; DC., Prodr. 2: 223. 1825; Roxb., Fl. Ind. 3: 372. 1832; Wight & Arn., Prodr. 199. 1834; Wight, Icon. Pl. Ind. Orient. t. 330. 1840; Dalz. & Gibs., Bombay Fl. 58. 1861; Drury, Handb. Indian Fl. 1: 276. 1864; Baker in Hook. f., Fl. Brit. India 2: 94. 1876; T. Cooke, Fl. Pres. Bombay 1: 311. 1902 (*Repr.* 1: 332. 1967); Prain, Bengal Pl. 431. 1903 (*Repr.* 1: 309. 1963); Duthie, Fl. Upp. Gang. Pl. 1: 250. 1903 (*Repr.* 1: 230. 1960); Gamble, Fl. Pres. Madras 309. 1918 (*Repr.* 1: 218. 1967); Haines, Bot. Bihar Orissa 3: 237. 1922 (*Repr.* 2: 248. 1961); Santapau, Fl. Purandhar 38. 1957; Babu, Herb. Fl. Dehra Dun 144. 1977; R.S. Rao, Fl. Goa etc. 1: 124. 1985.

KEY TO THE VARIETIES

- 1a. Pods usually oblong, 2-seeded, often mixed with subglobose, 1-seeded pods 24.1. var. glandulosa
 b. Pods always subglobose, 1-seeded 24.2. var. sykesii

24.1. var. glandulosa**Fig. 26a - g.**

Local names: Befari (Eng.), Urdawan (Hindi), Barbade, Jhunjri, Vekhariyo, Gavacha malamandi, Zungri (Mar.), Vekhariyo, Barapatulu, Boomidapu, Barapatnam, Baragadam (Tel.).

Shrub, 10 - 65 cm high; stems erect, biramous hairs adpressed to spreading with unequal arms. Leaves pinnately trifoliolate, stipules 2 - 3 x 0.2 mm, narrowly triangular, pubescent outside, deciduous; leaflets 3, 10 - 25 x 5 - 10 mm, terminal slightly larger, obovate, cuneate at base, rounded to retuse and mucronate at apex, adpressed pubescent on both surfaces, gland-dotted beneath; stipellae absent; petiolules 1 - 1.5 mm long. Racemes 5 - 8 mm long, axillary, sessile, globose; bracts ca 1 mm long, narrowly triangular, caducous; pedicels ca 1 mm long. Flowers pink, 2.5 - 3 mm long. Calyx adpressed pubescent outside, cup ca 1 mm long, teeth 1 - 1.5 mm long, narrowly triangular. Standard 2.5 - 3 x 1 - 1.5 mm, elliptic to obovate, rounded to obtuse at apex, adpressed pubescent and gland-dotted on the back; wing petals 2 - 2.5 x 0.8 mm, glabrous; keel petals 2.5 - 3 x 1 mm, pubescent and gland-dotted on the back, lateral spur ca 0.3 mm long. Staminal sheath 2 - 3 mm long; anthers ca 0.5 mm long. Ovary ca 1 mm long, sparsely hairy, 1 - 2-ovuled, tip of ovary and style covered with flask-shaped glands. Pods 3 - 5 x 3 - 3.5 mm, descending, oblong, abruptly apiculate, faintly torulose when 2-seeded, sutures broad, extending into fringed wings, biramous hairs spreading with one arm reduced, covered with glands at the tip, dehiscent, 1 - 2-seeded. Seeds ca 2 x 2 mm, spherical, smooth, dark-brown, sometimes mottled.

Type: *Herb. Wendland* (Hannover, destroyed) but most probably a duplicate of the Roxburgh collection. (B, photo ! L).

Fls.: July - Oct. ; *Frts.:* Sept. - Nov.

Distrib.: INDIA: Throughout plains of India and Andaman & Nicobar Islands; INDONESIA, MALAYSIA, AUSTRALIA.

Habitat: Cultivated fields as a weed, fallow lands, roadsides from sea level to 1200 m.

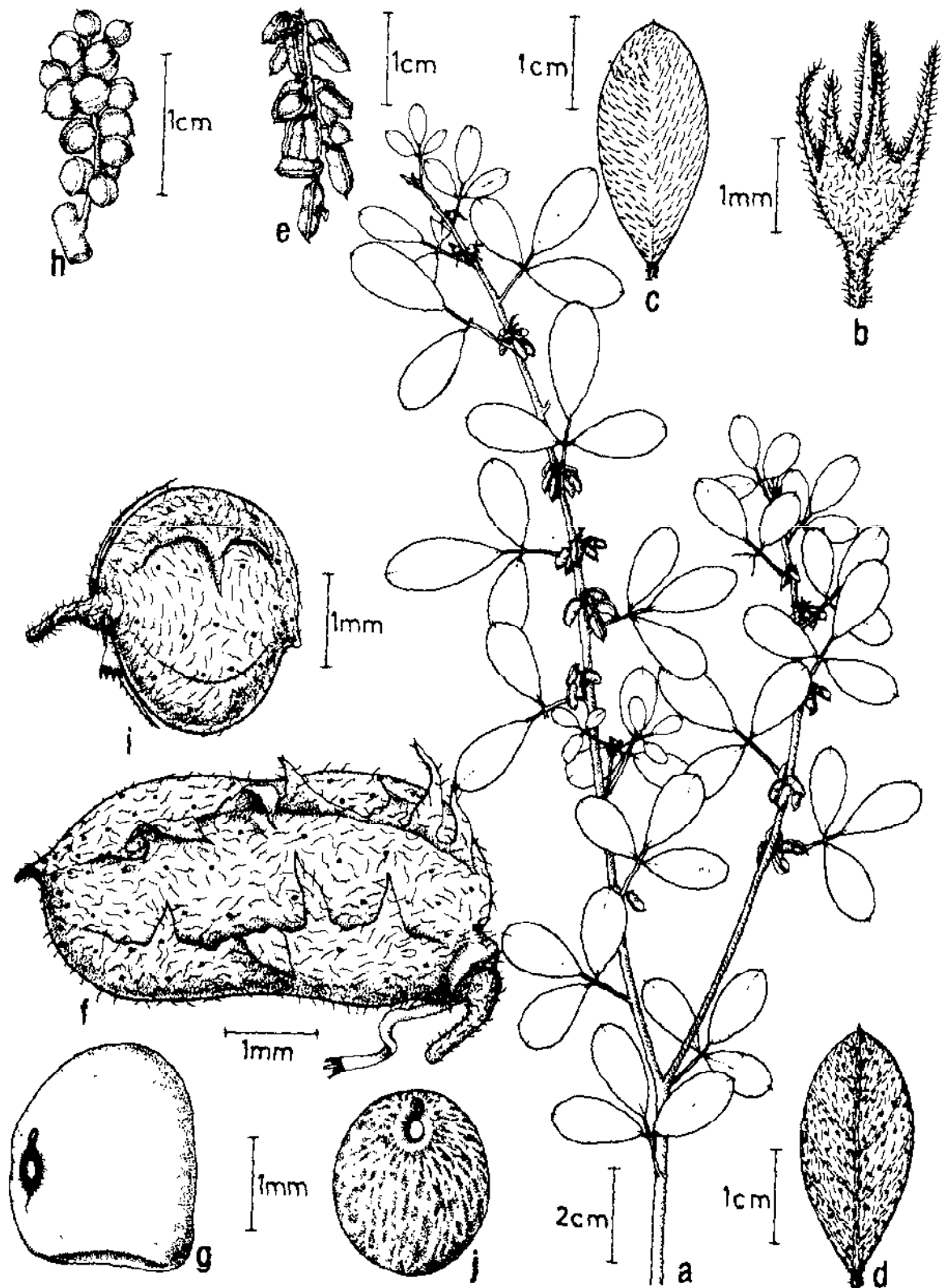
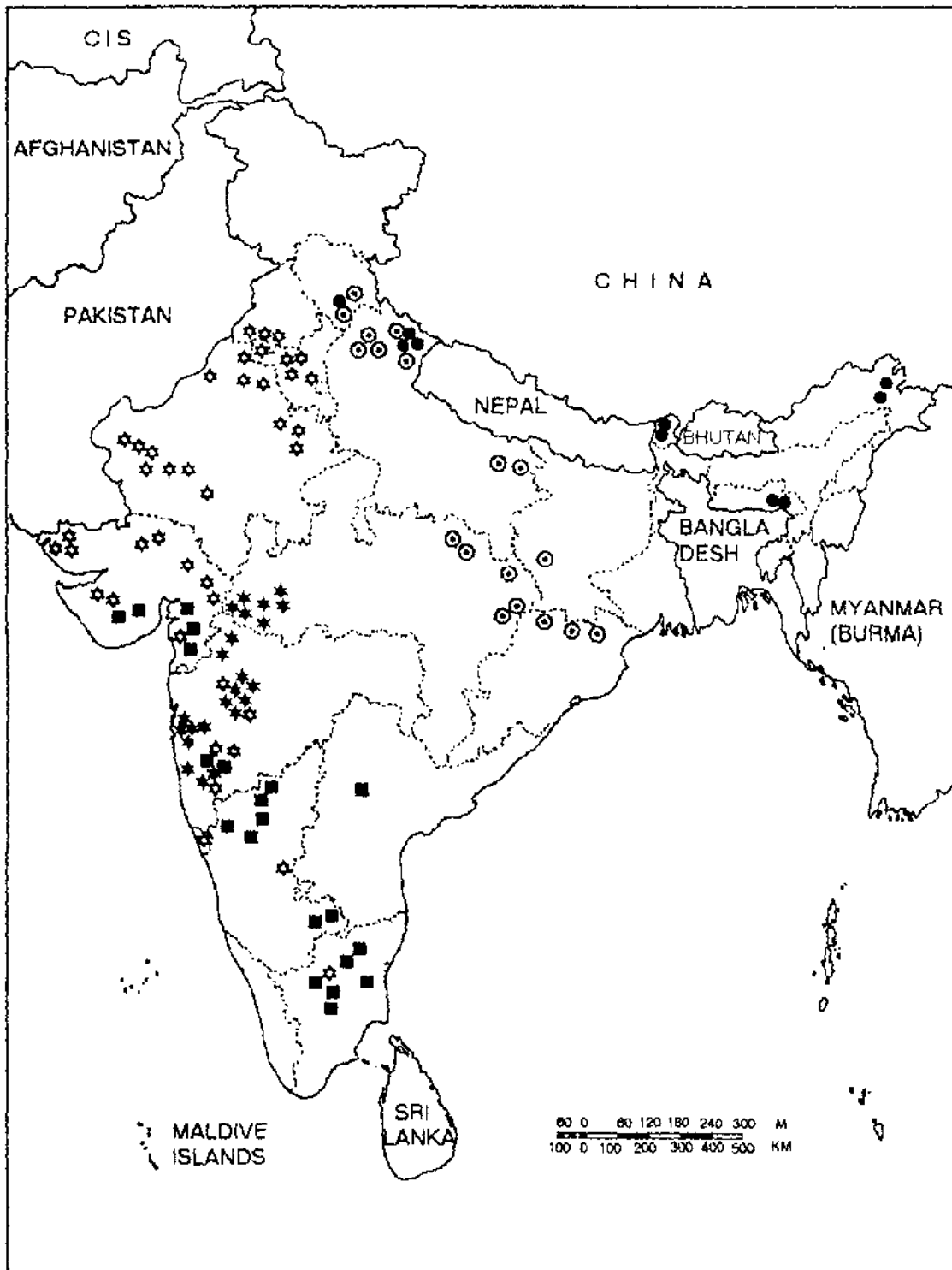


Fig. 26. *Indigofera glandulosa* Wendl. (a-g) var. *glandulosa* : a. Habit, b. Calyx, c. Leaflet-adaxial surface, d. Leaflet-abaxial surface, e. Infructescence, f. Pod, g. Seed-side view, (h-j) var. *sykesii* Griffith ex Baker, h. Infracrescence, i. Pod, j. Seed-hilar view : (a-d: *Wadhwa & Verma* 7544; e-g: *A.K. Mukherjee* 10566; h-j: *A.R.K. Sastry* 71369).



Map 3. *Indigofera exiles* Grierson & Long (●); *I. glandulosa* var. *sykesii* Griffith ex Baker (*); *I. hamiltonii* Graham ex Duthie & Prain (⊙); *I. hochstetteri* Baker (☆); *I. karnatakana* Sanjappa (■)

Exsicc.: Andhra Pradesh: Godavari Dist., Opposite Ippur, 11 Dec. 1902, C.A. Barber 5314; Karnataka: Shimoga, 2000 - 3000 ft., Oct. 1908, A. Meebold 9664; Madhya Pradesh: Near Hoshingabad, 300 m, 28 Sept. 1960, J. Joseph 11040; Andaman & Nicobar Islands, Port Blair, Corbyn's cove, 31 Oct. 1973, N.P. Balakrishnan 550 (CAL, PBL).

Chr. No.: $2n = 16$ (Bhatt, Nucleus 17: 34. 1974); $n = 8$ (Bir & Kumari, Taxon 22: 459. 1973).

Notes: The epithet *glandulosa* was attributed to either Willdenow (1803) or Roxburgh (1832) by all the workers until de Kort and Thijssse (1984) discovered that the same epithet was first validly published by Wendland (1798) for the same species (perhaps based on a material he received from Roxburgh). Therefore, his name takes priority over Willdenow's publication and authority of *I. glandulosa* should be attributed to Wendland.

24.2. var. *sykesii* Griffith ex Baker in Hook. f., Fl. Brit. India 2: 94. 1876; Sanjappa in Jour. Econ. Tax. Bot. 5: 1031. 1984; Ahmed. & Nayar, Endem. Pl. Indian Reg. 99. 1987. *I. glandulosa* Roxb. ex Willd. var. *sykesii* Baker ex V. Kumar & Ramayya in Curr. Sci. 52: 429. 1983 'sykessi'. *I. monosperma* Blatt. in Jour. Asiat. Soc. Bengal 24: 341. 1930; Sanjappa in Jour. Econ. Tax. Bot. 5: 1034. 1984, syn.nov. Fig. 26 h-j, Map 3.

Differs from var. *glandulosa* in having 1-seeded pods, very rarely when 2-seeded, pods are globose with one end of seeds truncate.

Type: India: Poona, 6 Oct. 1826, *Herb. Griffith* 1454 (K holo!).

Fls. & Frts.: Similar to var. *glandulosa*.

Distrib.: INDIA: Maharashtra and Madhya Pradesh; endemic.

Habitat: Agricultural fields, fallow lands, open grassy slopes of hills.

Exsicc.: Madhya Pradesh: Indore Dist., Mandu, 19 Sept. 1964, C.M. Arora 5965 (CAL, BSA), Maharashtra: Aurangabad Dist., Mahismal, 750 m, 21 Sept. 1978, D.S. Pokle 3180; Bombay, between Labe Deali & Andheri, 25 Dec. 1953, Kaul and Party 5936 (LWG); Satara Dist., 7th km point from Wai to Panchgani, 24 Oct. 1982, M. Sanjappa 9513.

Chr. No.: $n = 8$ (Sanjappa, Taxon 32: 668. 1983).

Notes: According to de Kort and Thijssse (1984) this taxon does not demand a separate rank due to the absence of correlating characters along with less

number of seeds. On the contrary, this taxon definitely deserves a varietal rank as it has 1 - 2-seeded, globose pods and the seeds are truncate at one end when 2-seeded.

Without understanding that this variety has already been validated by Baker (1876), Vijay kumar and Ramayya (1983) needlessly redescribed it, stating that "Baker (1876)...diognised it from the typical (type) variety by the characters of the pod".

Blatter (1930) described *Indigofera monosperma* based on a collection of Hallberg from Bombay Island(Matunga). Presently the type is not traceable. As the protologue of *I. monosperma* completely agrees with the description of *I. glandulosa* var. *sykesii* and it is therefore reduced here as a synonym of the latter. Incidentally the distribution of *I. monosperma* also falls within the natural geographic range of var. *sykesii*

25. *Indigofera hamiltonii* Graham ex Duthie & Prain in Ann. R. B. G. Calcutta 9(1): 22, t. 29. 1901; Duthie, Fl. Upp. Gang. Pl. 1: 253. 1903 (*Repr.* 1: 233. 1960); Brandis, Indian Trees 217. 1906; Osmaston, For. Fl. Kumaon 150. 1927; Ali in Bot. Notis. 111: 573. 1958 & in Nasir & Ali, Fl. W. Pakistan 100: 85. 1977; Sanjappa in Jour. Econ. Tax. Bot. 5: 1032. 1984. *I. atropurpurea* auct. non Buch.-Ham. ex Hornem. 1819: Baker in Hook. f., Fl. Brit. India 2: 101. 1876, p.p. Fig.27 , Map 3.

Shrub, burnt down annually by the forest fire, root-stock woody; branches 10 -25 cm high, unburnt plants grow up to 70 cm high; biramous hairs adpressed with equal arms. Leaves 2.5 - 6.5 cm long including 1 - 1.5 cm long petiole; stipules 2 - 4 x 1 - 1.5 mm, narrowly triangular, adpressed hairy outside, deciduous; rachis 5 - 20 mm long, adpressed pubescent; stipellae 1 - 1.5 x 0.5 mm, narrowly triangular, pubescent outside, pearl bodies present between stipellae of 2 opposite leaflets; petiolules 1.5 - 2 mm long; leaflets 3 - 5, rarely 11 - 13 in unburnt plants, opposite, 15 - 25 x 8 - 15 mm, obovate, sometimes oblong, cuneate to rounded at base rounded to emarginate and mucronate at apex, adpressed pubescent on both surfaces, biramous hairs slender and short above, long and stout with equal arms beneath. Racemes 10 - 35 cm long including 1 - 5 cm long peduncles, simple, rarely branched; rachis angular, adpressed pubescent, many-flowered; racemes arising directly from leaf axils on stunted and burnt down root-stock and from leaf axils of erect branches in unburnt plants. Flowers pinkish-purple, ca 10 mm long; bracts 1 - 2.5 x 1 mm, triangular, outside, caducous; pedicels ca 2 mm long. Calyx adpressed hairy outside, cup ca 2 mm long, teeth ca 1 mm long, deltoid. Standard 6 - 9 x 3 - 4.5 mm, obovate to elliptic, rounded to obtuse at apex, glabrous; wing petals 5.5 - 8 x 2 - 2.5 mm, glabrous; keel petals 6 - 9 x 2 - 3 mm, glabrous, lateral spur ca 1 mm long. Staminal sheath 5 - 8 mm long, anthers 0.8 - 1 mm long. Ovary 4 - 6

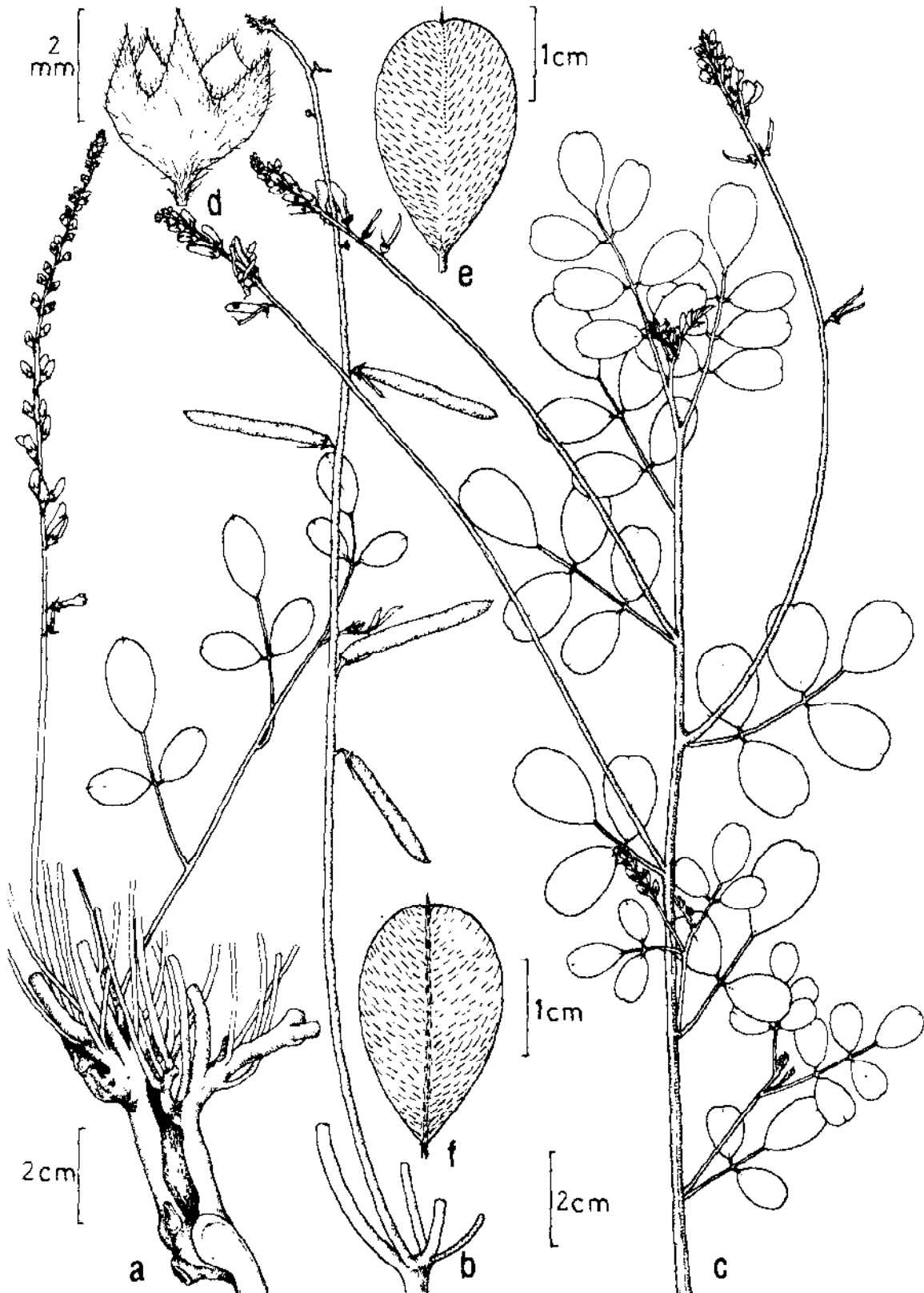


Fig. 27. *Indigofera hamiltonii* Graham ex Duthie & Prain : a. Habit (burnt form), b. Fruiting twig, c. Habit (unburnt form), d. Calyx, e. Leaflet-adaxial surface, f. Leaflet-abaxial surface (a: *Inayat* 21518; b: *Harsukh* 21519; c-f: *Inayat* 21520).

mm long, linear, glabrous, ca 12-ovuled; style 2 - 3 mm long, glabrous. Pods 25 - 35 x 3 - 5 mm, spreading, linear, subcylindric, beak ca 1 mm long, glabrous, 9 - 12-seeded. Seeds ca 1.5 x 1.5 mm, orbicular, smooth, dark brown.

Type: India: Uttar Pradesh, Gorakhpur, *Hamilton* in *Wallich Cat. No. 5465* (CAL, lecto). lectotype designated here.

Fls.: Feb. - April; *Frts.:* March - April.

Distrib.: INDIA: Bihar, Himachal Pradesh, Madhya Pradesh, Orissa and Uttar Pradesh; endemic.

Habitat: Grassy areas on exposed hills, rocky sandstone hills from 400 to 1500 m.

Exsicc.: Uttar Pradesh: Gorakhpur, 10 Apr. 1898, *Harkush* 21518, 21519; Baharaich (Oudh), 15 April 1900, *Inayat* 23622; Philbit Dist. Mustafabad, 25 June 1902, *Inayat* 25389 (DD); Himachal Pradesh: Kangra Dist., Nurur, Rocky sandstone hills, 600 m, 27 April 1939, *R.N. Parker* 3448 (DD).

Notes: This species is allied to *Indigofera atropurpurea* Buch.-Ham. ex Hornem. but differs from it in having plants of 30 - 70 cm high, 3 - 5-foliolate (7 - 11-foliolate in unburnt plants), racemes arising from woody root stock (axillary in unburnt plants). This species is so far known to occur up to an altitude of 1500 m and flowers during February - April, while, *I. atropurpurea* occurs between 1000 m and 2000 m and flowers during August - September.

26. *Indigofera hebeptala* Benth. ex Baker in Hook. f., *Fl. Brit. India* 2: 101. 1876; *Collett. Fl. Simlensis* 123. 1902; *Brandis, Indian Trees* 217. 1906; *Bamber, Pl. Punjab* 99. 1916; *Parker, For. Fl. Punjab* 99. 1918; *Ali in Bot. Notis.* 111: 572. 1958; *Singh & Kachroo, For. Fl. Srinagar* 135. 1976; *Nair, Fl. Bashahr Himal.* 80. 1977; *Ohashi in Hara et al., Enum. Fl. Pl. Nepal* 2: 123. 1979.

KEY TO THE VARIETIES

- | | |
|---|-----------------------------|
| 1a. Leaflets pubescent on both surfaces | 26.1. var. hebeptala |
| b. Leaflets glabrous on adaxial surface | 26.2. var. glabra |

26.1. var. hebeptala

Fig. 28a - b, d - g.

Shrub, 1 - 2 m high; branches erect, woody, angular, pubescent when young, biramous hairs adpressed with equal arms. Leaves 8 - 12 cm long including 2.8 - 5 cm long petiole; stipules ca 3 x 1.5 mm, narrowly triangular to lanceolate, sparsely pubescent outside, caducous; rachis 5 - 9 cm long, canaliculate above,

sparsely pubescent; stipellae 1 - 1.5 x 0.5 mm, narrowly triangular, sparsely pubescent; petiolules 2 - 3 mm long; leaflets (5-)7 - 9, opposite, (1.2 -)2.5 - 6.5 x (1 -)1.5 - 3.5 cm, obovate to elliptic-oblong, rarely orbicular, rounded to obtuse at base, rounded to emarginate and mucronate at apex, biramous hairs sparsely adpressed pubescent with equal arms on both surfaces, venation reticulate. Racemes 10 - 16 cm long including 3 - 3.5 cm long peduncles, axillary, rachis angular, sparsely pubescent, many-flowered; bracts 4 - 6 x 1.5 - 3 mm, boat-shaped, cuspidate at apex, sparsely pubescent outside, caducous, always enclose buds; pedicels ca 2 mm long. Flowers purple or crimson red, 8 - 10 mm long. Calyx obliquely campanulate, adpressed pubescent outside, cup ca 1 mm long, teeth 1 - 1.5 mm long, triangular. Standard 6 - 9 x 3 - 5 mm, elliptic to obovate, obtuse to rounded and mucronate at apex, sparsely strigose on the back, dark crimson; wing petals 5 - 7 x 2 - 2.5 mm, ciliate along margins, pink; keel petals 6 - 8 x 2 - 3 mm, ciliate along margins, pink, lateral spur ca 1 mm long. Staminal sheath ca 9 mm long; anthers ca 1 mm long. Ovary ca 6 mm long, linear, glabrous, ovules 8 - 10; style ca 3 mm long, glabrous. Pods ca 50 x 4 mm, spreading, linear, cylindric, glabrous, 8 - 10-seeded. Seeds ca 2 x 1 mm cylindric, smooth, dark brown, shiny.

Type: India: Sikkim, Lachen, 7000 ft. *J.D. Hooker* (K, lecto !).

Fls.: May - Aug.; *Frts.*: Aug. - Oct.

Distrib.: INDIA: Jammu & Kashmir (Kashmir), Himachal Pradesh, Uttar Pradesh and Sikkim; PAKISTAN, NEPAL.

Habitat: Undergrowth in forests of Himalayas between 1500 and 3000 m.

Exsicc.: Himachal Pradesh: Bashahr, below Diram, 950 m, 22 July 1891, *J.H. Lace* 987; Jammu & Kashmir: Gulmarg, 6000 ft., 30 Sept. 1893, *Aitchison* 98; Anantnag Dist., Lidder Valley, above Palgam, 8 - 9000 ft., 4 Aug. 1893, *J.F. Duthie* 13474.

Pollen: 3-zonocolporate, subprolate, 34 x 29 (32 - 36 x 28 - 30) μm (*Vishnu-Mittre & Sharma, Pollen et Spores* 4: 5 - 45. 1962); 3-zonocolporate, prolate-spheroidal to subprolate, 36 x 29 (33 - 39 x 26 - 33) μm , granulate, faint OL (*Tewari & Nair, Jour. Palynol.* 15: 49 - 73. 1979).

Notes: In general this variety shows an increase in size of the leaflets from base to the tip of leaves.

26.2. var. *glabra* Ali in *Bot. Notis.* 111: 572. 1958 & in Nasir & Ali, *Fl. W. Pakistan* 100: 84. 1977. *I. hebepetela* Benth. ex Baker forma *glabra* (Ali) Ohashi in Hara *et al.*, *Enum. Fl. Pl. Nepal* 2: 123. 1979. Fig. 28c.

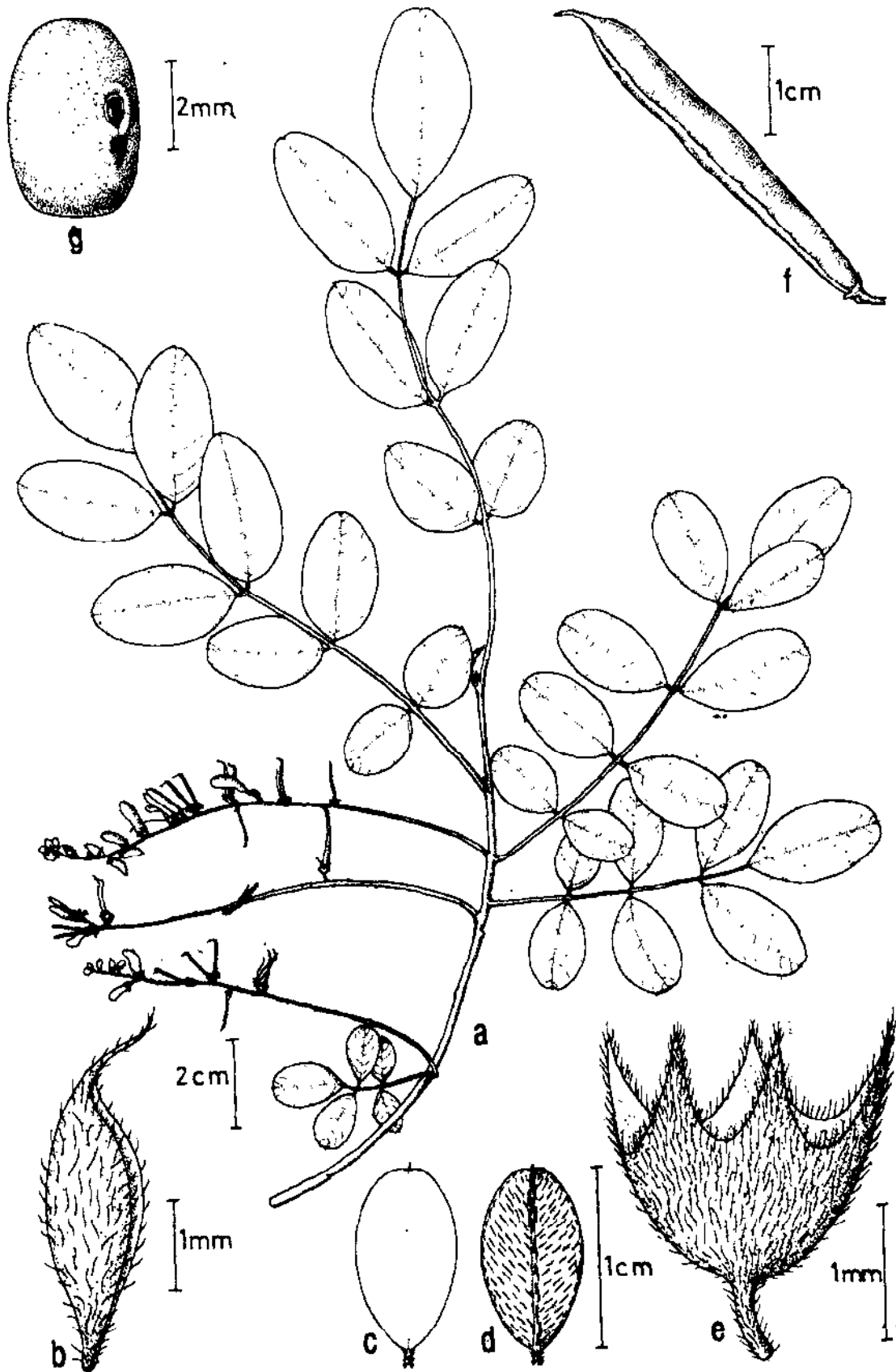


Fig. 28. *Indigofera hebetata* Benth. ex Baker : a. Habit, b. Bract, c. Leaflet-adaxial surface (in var. *glabra* Ali), d. Leaflet-abaxial surface, e. Calyx, f. Pod, g. Seed-side view (a-e: *M.A. Rau* 15807; f-g: *Gamble* 27099).

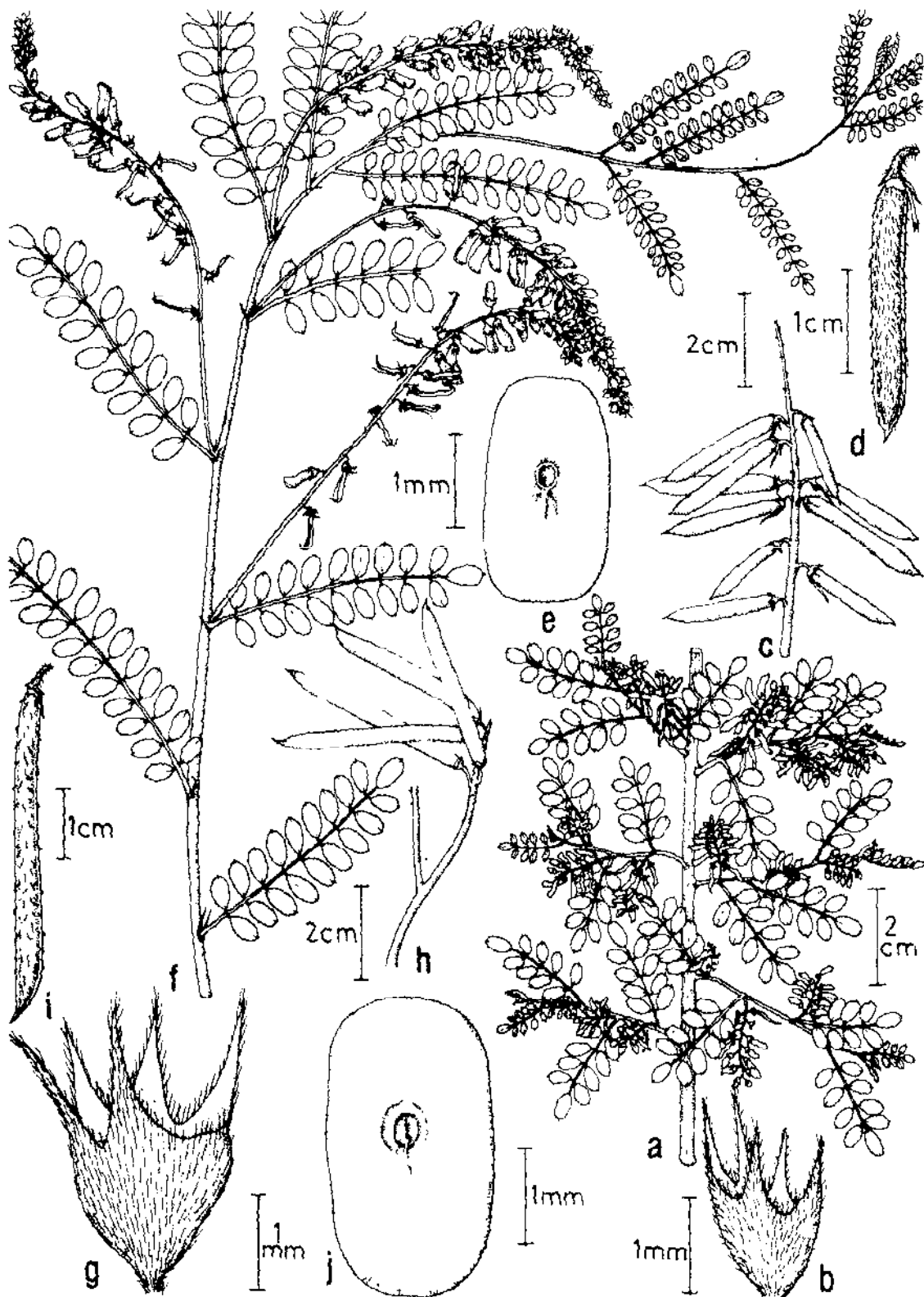


Fig. 29. *Indigofera heterantha* Wallich ex Brandis (a-j) : a. Habit, b. Calyx, c. Infractescence, d. Pod, e. Seed-hilar view, f-j. Plants with longer inflorescences : f. Habit, g. Calyx, h. Infructescence, i. Pod, j. Seed-hilar view (a-b: *Wall. Cat. No. 5480b*- CAL; c-d: *N.C. Nair 34142*; e. *J.D. Hooker & Thomson s.n.*-CAL, f-g: *Ellis 9583*; h-j: *Ellis 9584*).

Differs from var. *hebepetala* in having adaxially glabrous leaflets.

Type: India: Himachal Pradesh, Jaunsar, Bajamara, 7500 ft., June 1898, J.S. Gamble 20799 (K, holo ! CAL !).

Fls.: May - Aug.; *Frts.*: Aug. - Oct.

Distrib.: same as var. *hebepetala* and BHUTAN.

Habitat: Same as var. *hebepetala*

Exsicc.: Himachal Pradesh: Chamba Dist., Kujiar, 7000 ft., C.B. Clarke 24052; Simla, Mashobra woods, 7500 ft., J.S. Gamble 43; Sikkim: 6 - 8000 ft., T. Thomson s.n.; Uttar Pradesh: Tehri Garhwal, Shanchetti, 2000 m, 17 June 1961, M.A. Rau 15807.

Notes: This variety differs from the typical one (var. *hebepetala*) by its glabrous adaxial surface of leaflets and is treated as distinct in this work as both the varieties grow in identical habitats retaining their varietal differences. They can be easily distinguished both in field and herbarium.

27. *Indigofera heterantha* Wallich ex Brandis, For. Fl. N.W. C. India 135. 1874; Ali in Bot. Notis. 111: 556. 1958 & in Nasir & Ali, Fl. W. Pakistan 100: 82. 1977; Sapru & Dhar, Fl. Ladakh 73. 1975; Ohashi in Hara, Fl. E. Himal. 65. 1975; Nair, Fl. Bashahr Himal. 80. 1977; Singh & Kachroo, For. Fl. Srinagar 138. 1976. *I. gerardiana* Wallich ex Baker in Hook. f., Fl. Brit. India 2: 100. 1876; Collett, Fl. Simlensis 122. 1902; Brandis, Indian Trees 218. 1906; Bamber, Pl. Punjab 99. 1916; Parker, For. Fl. Punjab 131. 1918; Osmaston, For. Fl. Kumaon 151. 1927. *I. gerardiana* Wallich ex Baker var. *heterantha* Wallich ex Baker in Hook. f., Fl. Brit. India 2: 100. 1876, p.p.; Strachey, Cat. Pl. Kumaon 42. 1906; Osmaston, For. Fl. Kumaon 151. 1927; Kanjilal *et al.*, Fl. Assam 2: 19. 1938. *I. rubroviolacea* Dunn in Kew Bull 1922: 117. 1922. *I. heterantha* Wallich ex Brandis var. *gerardiana* (Wallich ex Baker) Ali in Nasir & Ali, Fl. W. Pakistan 100: 83. 1977. *I. himalayensis* Ali var. *retusa* S. Biswas in Indian Jour. For. 6: 322. 1983, syn. nov. Fig. 29.

Shrub or small tree, 0.5 - 5 m high; stem 5 - 20 cm in diameter, lenticellate; branches spreading, densely adpressed white pubescent when young, biramous hairs white, adpressed with equal arms. Leaves 3 - 12 cm long including 4 - 6 mm long petiole; stipules 3 - 5 x 0.5 mm, narrowly triangular to linear, pubescent; rachis 3 - 8 cm long; stipellae less than 1 mm long; petiolules 0.5 - 1 mm long, pubescent; leaflets 5 - 35, opposite or subopposite, 3 - 15 x 2 - 8 mm, elliptic, ovate, obovate to oblong, rarely lanceolate, obtuse to cuneate at base, rounded to retuse and mucronate at apex, adpressed pubescent on both surfaces.

Racemes 2 - 12 cm long including 5 - 14 cm long peduncle, axillary; rachis 1.5 - 9 cm long, angular, adpressed pubescent, 8 - many-flowered. Flowers pink to purplish-pink, 4 - 8 mm long; bracts 2 - 4 x 0.5 mm, narrowly triangular, pubescent, caducous; pedicels up to 1 mm long. Calyx adpressed pubescent outside, cup 1 - 2 mm long, teeth 1.5 - 2 mm long, narrowly triangular. Standard 4 - 7 x 2.5 - 4.5 mm, elliptic to obovate, mucronate at apex, adpressed strigose on the back; wing petals 3 - 5 x 1.5 - 2 mm, glabrous; keel petals 4 - 7 x 1.5 - 3.5 mm, adpressed pubescent outside. Staminal sheath 4.5 - 6.5 mm long; anthers ca 0.6 mm long. Ovary 2.5 - 4 mm long, linear, glabrous or sometimes with a few hairs, 6 - 12-ovuled; style 2 - 3 mm long, glabrous. Pods 15 - 50 x 4 mm, spreading, straight, cylindric, densely adpressed hairy when young, sparsely when mature, 6 - 12-seeded. Seeds 1 - 2.2 x 0.8 - 1.2 mm, cylindric, rounded at both ends, smooth, reddish-brown.

Type: India: Kumaon, Wallich, Cat. No. 5480A (K-W, lecto ! CAL ! BM !).

Fls.: May - Aug.; *Frts.:* June - Sept.

Distrib.: INDIA: Himalayas from Kashmir to Sikkim; AFGHANISTAN, PAKISTAN, NEPAL, BHUTAN, CHINA.

Habitat: Slopes of valleys especially among grasses and shrubs between 1000 and 3000 m.

Exsicc.: Jammu & Kashmir: Gulmarg, 8 - 9000 ft., 26 June 1893, *J.F. Duthie* 13021; Bach Pass, 9500 ft., 19 Aug. 1962, *J.N. Vohra & B.M. Wadhwa* 551; Pehalgam-Chandanwadi Road, 3000 m, 23 Aug. 1983; *J.L. Ellis* 9584; Uttar Pradesh: Kumaon, Champarat, 1700 m, 4 Jun. 1960, *T. A. Rao* 11547; Himal. Bor. Occ., 4000 ft., *T. Thomson s.n.*

Pollen: 3-zonocolporate, spheroidal, rarely prolate, 32 x 24 μ m sub *I. gerardiana* Graham ex Wallich (Nair, Pollen grains of Western Himalayan plants, 20 - 21. 1965).

Chr. No.: 2n = 48 (Sanjappa & Bhatt, Taxon 26: 266. 1977.)

Notes: *I. heterantha* is the most commonest shrub or small tree in Central and Western Himalayas and is also one of the most highly variable species of *Indigofera* in India. In dry exposed situations the size of the plant and all its parts are much reduced while, in open grassy slopes of valleys close to rivers which are undisturbed by any biotic interference it grows gregariously and attain a height of ca 5 m. Such situations are observed in Mandakini valley of Garhwal Himalaya. It is rather very difficult to recognise the variations ex-

hibited by this species, perhaps a biosystematic study of various populations from different habitats may help in better understanding of the species.

28. *Indigofera himalayensis* Ali in Bot. Notis. 111: 574. 1958; Singh & Kachroo, For. Fl. Srinagar 138. 1976; Sanjappa in Jour. Econ. Tax. Bot. 5: 1033. 1984. Fig. 30, Map 4.

Local name: Kâtha (Hindi).

Shrub, 60 - 120 m high, branches erect, sparsely pubescent to nearly glabrous, biramous hairs adpressed with equal arms. Leaves 3.5 - 5 cm long including 5 - 10 mm long petiole; stipules 2.5 - 3.5 x 1 mm, narrowly triangular, sparsely adpressed pubescent outside, projecting downwards opposite leaf; rachis 2 - 4 cm long, canaliculate above, sparsely adpressed pubescent; stipellae 1 - 1.5 mm long, narrowly triangular, pubescent outside; petiolules ca 1 mm long, sparsely pubescent; leaflets 7 - 11, opposite to subopposite, 10 - 25 x 5 - 10 mm, elliptic to elliptic-oblong, obtuse to rounded at base and apex, mucronate, sparsely pubescent on both surfaces, biramous hairs slender and adpressed, above, stout beneath, brown on midrib and margins. Racemes 4 - 8 cm long including 5 - 15 mm long peduncle; rachis sparsely adpressed pubescent, many-flowered; bracts 1.5 - 2 mm long, narrowly triangular, caducous; pedicels ca 2 mm long. Flowers pink, 10 - 12 mm long. Calyx sparsely adpressed pubescent outside, cup ca 1 mm long, teeth 1.5 - 2 x 0.5 mm, narrowly triangular, lower tooth the longest. Standard ca 10 x 4 - 5 mm, elliptic to obovate, sparsely adpressed strigose towards tip; wing petals 8 - 9 x 1.5 mm, glabrous, ciliate along margins towards tip; keel petals 9 - 10 x 2.5 mm, adpressed strigose towards tip, ciliate along margins, lateral spur ca 0.5 mm long. Staminal sheath ca 9 mm long; anthers ca 1 mm long. Ovary ca 8 mm long, linear, glabrous, up to 10-ovuled; style ca 2 mm long, glabrous. Pods spreading, glabrous, dehiscent. Seeds ca 4 x 2 - 3 mm, cylindric, reddish-brown.

Type: India: Punjab, Chenab valley, 9000 ft., 1852, *T. Thomson s.n.* (K, holotype!).

Fls.: May - July; *Frts.:* Aug. - Oct.

Distrib.: INDIA: Himachal Pradesh, Jammu & Kashmir and Punjab; AFGANISTAN, PAKISTAN.

Habitat: On slopes of mountains in valleys up to 3000 m.

Exsicc.: Jammu & Kashmir: Locality?, 6 - 8000 ft., *T. Thomson s.n.*; Himachal Pradesh: *Manali, Lahul, 8 May 1941, N.L. Bor 14083 (DD)*; *Pilga, Parbatti valley, 9000 ft., Kulu, 27 May 1934, C.E. Parkinson 3978 (DD)*.

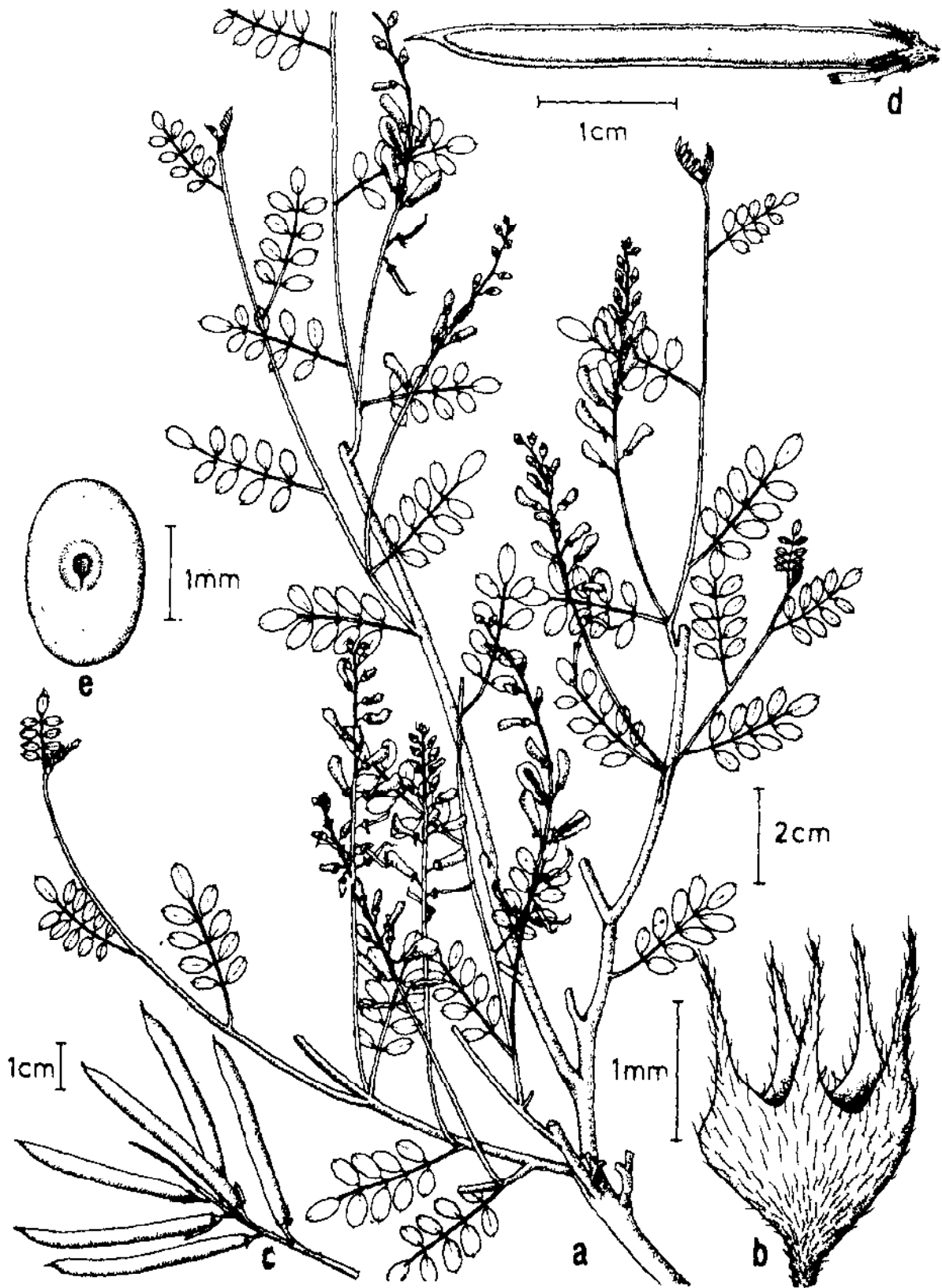


Fig. 30. *Indigofera himalayensis* Ali : a. Habit, b. Calyx, c. Infructescence, d. Pod, e. Seed-hilar view (a-b: *Harriss* 16072; c-e: *Inayat* 19314).

29. *Indigofera hirsuta* Linn., Sp. Pl. 751. 1753; DC., Prodr. 2: 228. 1825; Roxb., Fl. Ind. 3: 376. 1832; Wight & Arn., Prodr. 204. 1834; Dalz. & Gibs., Bombay Fl. 60. 1861; Drury, Handb. Indian Fl. 1: 281. 1864; Baker in Hook. f., Fl. Brit. India 2: 98. 1876, p.p.; Collett, Fl. Simlensis 121. 1902; T Cooke, Fl. Pres. Bombay 319. 1902 (*Repr.* 1: 339. 1967) p.p.; Prain, Bengal Pl. 1: 432. 1903 (*Repr.* 1: 310. 1963); Duthie, Fl. Upp. Gang. Pl. 1: 254. 1903 (*Repr.* 1: 234. 1960); Bamber, Pl. Punjab 254. 1916, p.p.; Gamble, Fl. Pres. Madras 312. 1918 (*Repr.* 1: 221. 1967) p.p.; Haines Bot. Bihar Orissa 3: 239. 1922 (*Repr.* 2: 250. 1961), p.p.; Gillett in Kew Bull. Add. Ser. 1: 109. 1958; de Kort & Thijssse in Blumea 30: 120. 1984, p.p. *Kattu-tagera* Rheede, Hort. Malab. 9: 55, t. 30. 1689. *I. ferruginea* Schum. & Thonn., Beskr. Guinn. Pl. 370. 1829. *I. fusca* G. Don, Gen. Syst. 2: 211. 1832. Fig. 31.

Local names: Hairy indigo (Eng.), Penni vempali (Tel.), Chota sirphonka (Hindi)

Erect, annual herb, 50 - 120 cm high; stems and branches angular becoming striate, stiffy or hirsute, brown or white pilose, biramous hairs densely spreading with very unequal arms, appearing simple with one arm almost completely reduced. Leaves (4 -) 5 - 7(- 11) cm long including 5 - 10 mm long petiole; stipules 10 - 15 mm long, filiform to linear-setaceous, brown plumose; rachis prolonged beyond lateral leaflets, pilose, 3 - 8 cm long; stipellae 2 - 2.5 mm long, filiform, brown plumose; petiolules 1.5 - 3 mm long; leaflets 5 - 7, rarely 3, opposite, (10 -) 15 - 35 x 7 - 10(- 15) mm, terminal leaflets slightly longer, elliptic to obovate, sometimes elliptic-oblong, cuneate to obtuse at base, rounded and mucronate at apex, adpressed pubescent on both the surfaces. Racemes (8 -) 10 - 20(- 34) cm long including 4.5 - 6.5 cm long peduncle; rachis pilose, many-flowered. Flowers pink to pale pink, 4 - 6 mm long. Bracts 2 - 5 mm long, linear to filiform, plumose, caducous; pedicels 2 - 2.5 mm long, reflexed in fruits. Calyx brown hirsute outside, cup ca 1.5 mm long, teeth 3.5 - 6 x 0.5 - 1 mm, linear, plumose. Standard 3.5 - 5 x 2.5 - 4 mm, obovate, rounded and mucronate at apex, adpressed hairy on the back; wing petals 3.5 - 4.5 x 1 - 1.5 mm, glabrous, ciliate along upper margins; keel petals 3.5 - 5 x 1.5 - 2 mm, hairy outside towards the tip, ciliate along margins, lateral spur ca 0.5 mm. Staminal sheath 3 - 4.5 mm long; anthers ca 0.5 mm long. Ovary 2 - 3 mm long, glabrous, up to 9-ovuled; style 1.5 - 2.5 mm long, glabrous. Pods 15 - 20 x 1.5 - 2.5 mm, straight, reflexed, subquadrangular with angles obtuse, mucronate, rusty brown spreading hirsute hairy, 5 - 7(- 9)-seeded; endocarp prominently red-spotted. Seeds ca 1.2 x 1.2 mm, squarish, stony, strongly pitted.

Type: Sri Lanka, Hermann, Vol. 1, fol. 60, No. 172(BM, holo !).

Fls.: Aug. - Oct.; *Frts.:* Sept. - Dec.

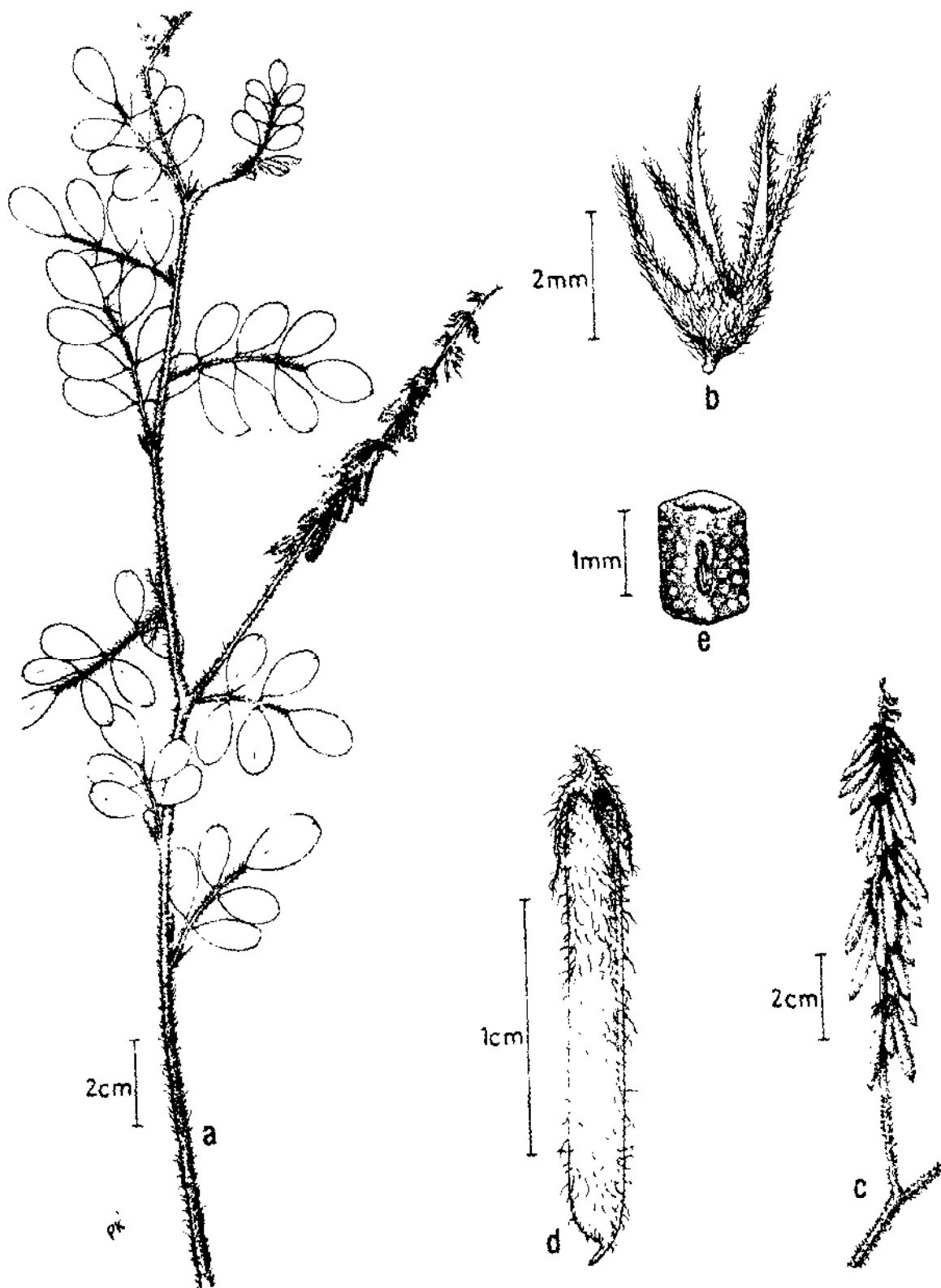


Fig. 31. *Indigofera hirsuta* Linn. : a. Habit, b. Calyx, c. Infructescence, d. Pod, e. Seed-hilar view (a-b: *Sedgwick & Bell 6732*; c-e: *Helper s.n.*).

Distrib.: INDIA: Assam, Goa, Karnataka, Kerala, Tamil Nadu and West Bengal; SRI LANKA, BANGLADESH, VIETNAM, TAIWAN, SINGAPORE, INDONESIA, NEW GUINEA, PHILLIPPINES, AUSTRALIA, TROPICAL AFRICA, MADAGASCAR; Introduced into Tropical America.

Habitat: Wastelands, disturbed forests, as a weed in and near cultivated fields from sea level to 1500 m.

Exsicc.: Goa: Bali-sarguem, 18 Sept. 1965, *J. Cherian* 106243; Karnataka: Uttara Kannada Dist. ('North Canara' Dist.) Sejawad grassland, Oct. 1919, *L.J. Sedgewick & T.R.D. Bell* 6732; Kerala: Palghat Dist. Olavakot, 75 m, 17 Oct. 1963, *J. Joseph* 17762; Meghalaya: Nongpoh, 15 Nov. 1959, *H. Deka* 17191.

Chr. No.: $2n = 16$ (Frahm-Leliveld, *Euphytica* 2: 46-48. 1953), $n = 8$ (Bir & Kumari, *Nucleus* 20: 94 - 98. 1977).

Notes: In this species the hairs on young pods are initially white turning brown as the pods mature. Browning of hairs starts from dorsal to ventral side. Usually hairs are dark brown on younger branches and racemes.

30. *Indigofera hochstetteri* Baker in Oliver, *Fl. Trop. Africa* 2: 101. 1871; Gillett in *Kew Bull. Add. Ser.* 13: 1958; Ali in *Bot. Notis.* 111: 552. 1958 & in Nasir & Ali, *Fl. W. Pakistan* 100: 76. 1977; Santapau, *Fl. Saurashtra* 126. 1962; Mahesh., *Fl. Delhi* 118. 1963; Bhandari, *Fl. Indian Desert* 117. 1978; R.S. Rao, *Fl. Goa etc.* 1: 124. 1985. *I. omithopodioides* Jaub. & Spach, *Ill. Pl. Orient.* 5: t. 480. 1856. *I. anabaptista* Steudel ex Baker in Hook. f., *Fl. Brit. India* 2: 102. 1876; T. Cooke, *Fl. Pres. Bombay* 1: 313. 1902 (*Repr.* 1: 334. 1967); Duthie, *Fl. Upp. Gang. Pl.* 1: 251. 1903 (*Repr.* 1: 231. 1960); Bamber, *Pl. Punjab* 254. 1916; Gamble, *Fl. Pres. Madras* 313. 1918 *in nota* (*Repr.* 1: 221. 1967). **Fig. 32, Map 3.**

Local name: Bethigali (Guj.).

Annual herb, 5 - 25 cm high; branches diffuse or prostrate, ascending towards tips, 10 - 40 cm long, biramous hairs adpressed with unequal arms. Leaves 2 - 5 cm long including 1 - 2 cm long petiole; stipules 3 - 5 x 1 - 1.5 mm, linear, filiform, hairy outside; rachis 8 - 12 mm long; stipellae ca 1 mm long, filiform; petiolules ca 1 mm long; leaflets 3 - 5, opposite, 15 - 25 x 5 - 8 mm, oblanceolate to elliptic, rarely obovate, cuneate to obtuse at base, rounded to emarginate and mucronate at apex, biramous hairs adpressed with equal arms on both surfaces. Racemes 1 - 2 cm long including 7 - 8 mm long peduncle, 8 - 20-flowered. Flowers pink, 3 - 4 mm long. Bracts 2 x 1 mm, hairy outside, pedicels 1 - 1.5 mm long, hairy. Calyx spreading pubescent, cup ca 0.8 mm long, teeth 2 - 2.5 x 0.5 mm, linear. Standard 3 - 3.5 x 2 - 2.5 mm, obovate, obtuse and mucronate at apex, adpressed hairy on the back; wing petals 2.5 - 3 x 0.5 mm,

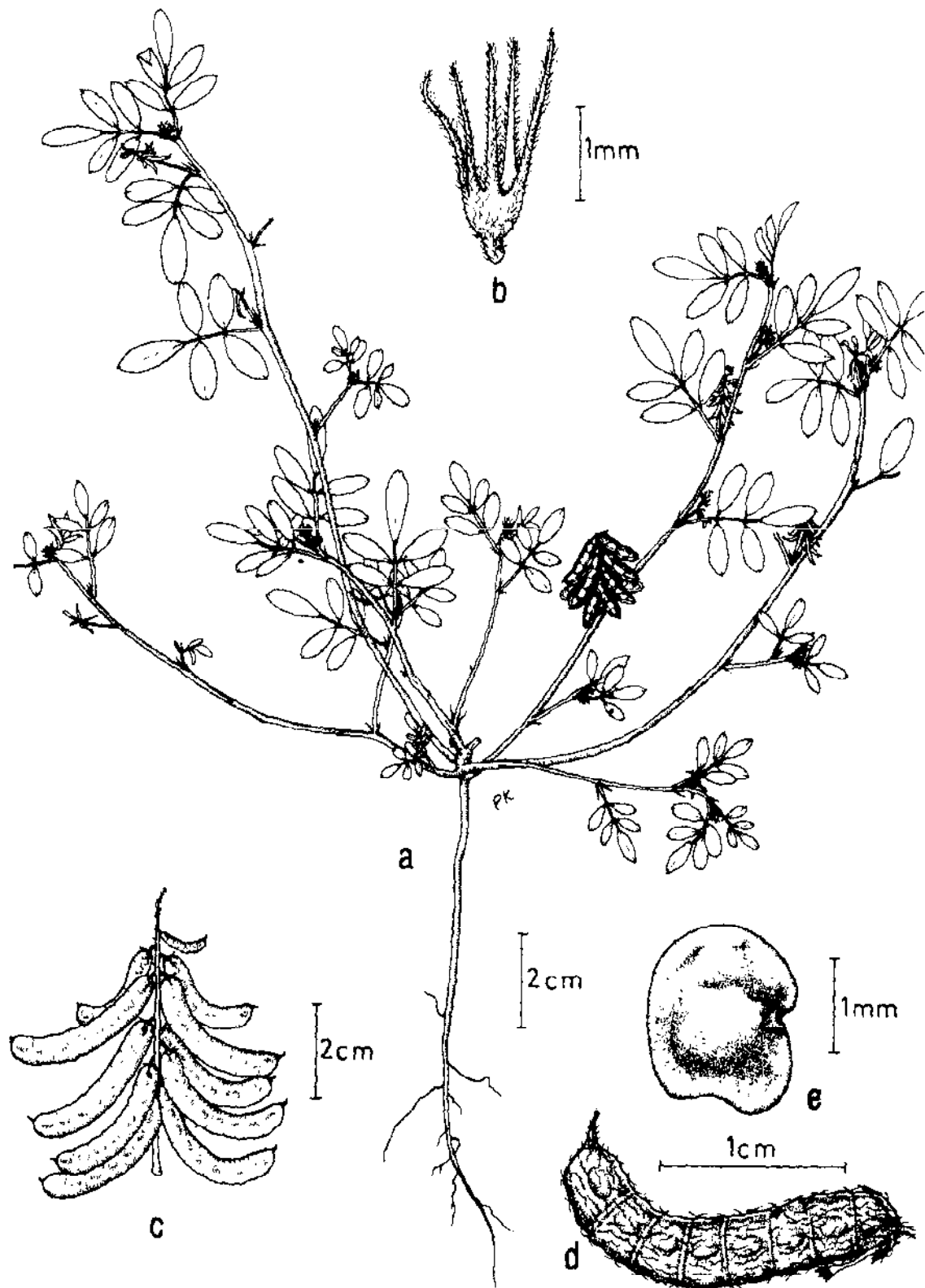


Fig. 32. *Indigofera hochstetteri* Baker : a. Habit, b. Calyx, c. Infructescence, d. Pod, e. Seed-side view (a-b: G.P. Roy 2659; c-e: A.N. Singh 3105).

glabrous; keel petals 3 3.5 x 1 1.5 mm, densely hairy outside, ciliate along margins, lateral spur ca 0.5 mm long. Staminal sheath 2.5 - 3 mm long; anthers ca 0.5 mm long. Ovary 1.5 - 2 cm long, linear, sparsely hairy on dorsal side, (3-)5-9-ovuled; style 1 - 1.5 mm long, glabrous. Pods 8 - 15 x 3 - 4 mm, reflexed, flat, papery, curved, abruptly apiculate, valves with raised longitudinal ridge in the middle, faintly reticulately veined with prominent transverse ridges between the seeds, sparsely adpressed hairy, (3-)5-9-seeded. Seeds ca 1.5 x 1 - 1.5 mm, broadly kidney-shaped, flat, raised in the middle, thin towards margin, smooth, reddish-brown to yellowish.

Type: Yemen, *Herb. Schimper* 769 (K!).

Fls.: Aug. - Nov.; *Frts.:* Sept. - Dec.

Distrib.: INDIA: Goa, Gujarat, Haryana, Karnataka, Madhya Pradesh, Maharashtra, Punjab, Rajasthan and Tamil Nadu; AFGHANISTAN, PAKISTAN, YEMEN, SAUDI ARABIA, OMAN, SOMALI REPUBLIC, ETHIOPIA, ERITREA, SUDAN, NIGERIA, KENYA, UGANDA, CONGO, TANGANYIKA.

Habitat: Cultivated fields, fallow lands, river-beds, sandy soils between 200 and 1000 m.

Exsicc.: Gujarat: Kutch, *Dr. Stoliczka s.n.*; Maharashtra: Poona Dist., Poona-Ghorpuri rail road, 20 Oct. 1970, *B.K. Vijay Kumar* 1283; Punjab: Locality? 10 Sept. 1874, *C.B. Clarke* 22229; Rajasthan: Barmer Dist., cultivated fields near Sheo, 20 Nov. 1973, *G.L. Tiwari* 882.

Chr. No.: $2n = 16$ (Frahm-Leliveld, *Act. Bot. Neerl.* 11: 201 - 208. 1962), $2n = 32$ (Bhatt, *Nucleus* 17: 34. 1974); $n = 8$ (Bir & Kumari, *Nucleus* 20: 94 - 98. 1977) $n = 16$ (Sanjappa & Bhatt, *Jour. Cytol. Genet.* 14: 59. 1979).

Pollen: 3-zonocolporate, spheroidal to subprolate, 30×30 ($28 - 31 \times 25 - 27$) μm , perforate to psilate (Ferguson & Strachan, *Pollen et Spores* 24: 171 - 210. 1982).

31. *Indigofera karnatakana* Sanjappa in *Taxon* 32: 120. 1983. *I. tenuifolia* Rottler ex Wight & Arn., *Prodr.* 200. 1834 non Lam. 1789; Dalz. & Gibs., *Bombay Fl.* 58. 1861; Drury, *Handb. Indian Fl.* 1: 278. 1864; Baker in Hook. f., *Fl. Brit. India* 2: 95. 1876; Trimen, *Handb. Fl. Ceylon* 2: 24. 1894; T. Cooke, *Fl. Pres. Bombay* 1: 316. 1902(*Repr.* 1: 337. 1967); Gamble, *Fl. Pres. Madras* 311. 1918(*Repr.* 1: 220. 1967); Ali in *Bot. Notis.* 111: 562. 1958 & in Nasir & Ali, *Fl. W. Pakistan* 100: 79. 1977; Santapau, *Fl. Saurashtra* 129. 1961; Ramaswamy &

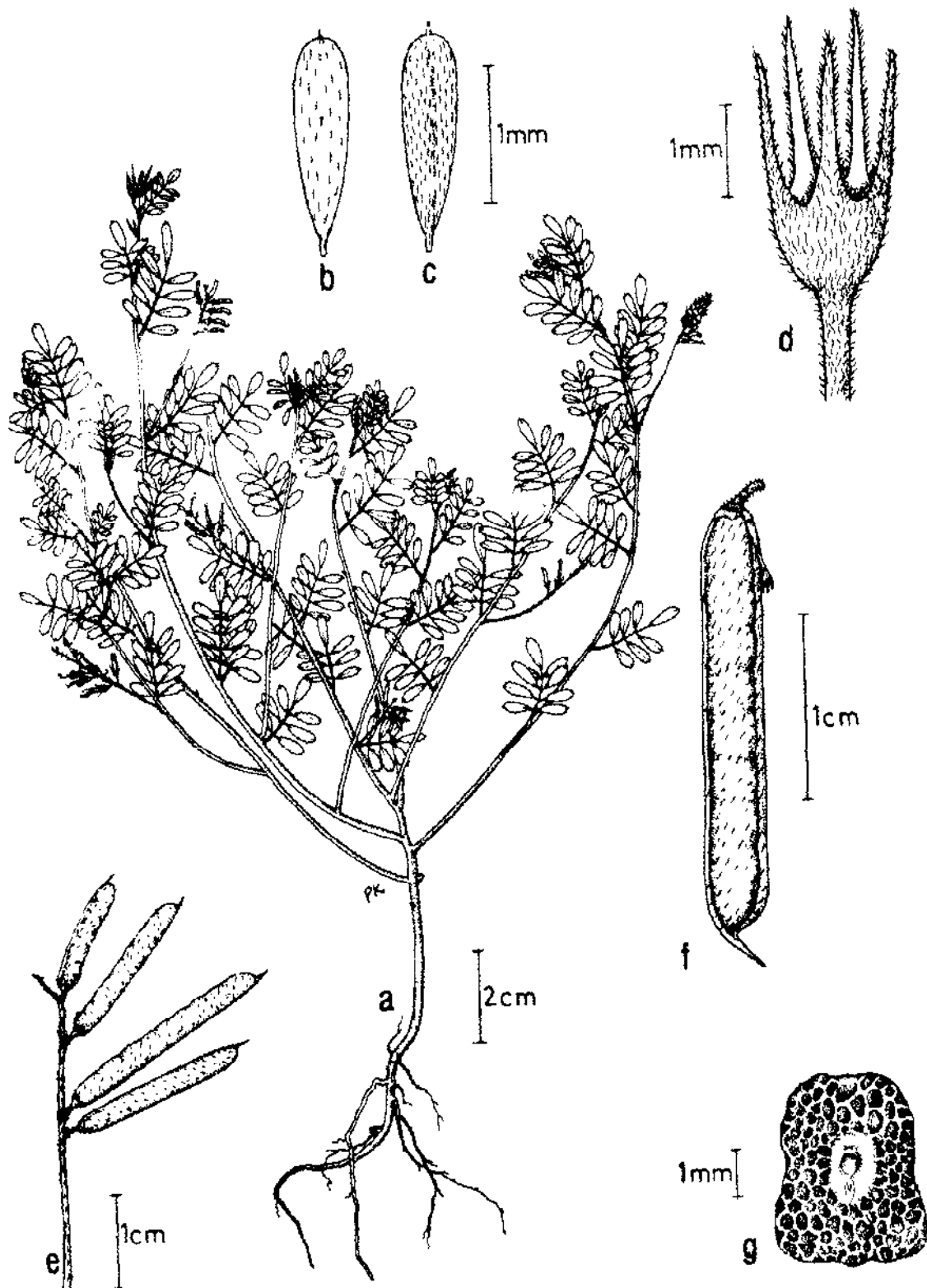


Fig. 33. *Indigofera karnatakana* Sanjappa : a. Habit, b. Leaflet-adaxial surface, c. Leaflet-abaxial surface, d. Calyx, e. Infructescence, f. Pod, g. Seed-hilar view (a: *Matthew & Venugopal* 17316; b-g: *V.Kumar* 1286).

Razi, Fl. Bangalore Dist. 268. 1973; Saldanha & G. Singh in Saldanha, Fl. Karnataka 1: 474. 1984. Fig. 33, Map 3.

Annual herb, 15 - 25 cm high; stems and branches slender, ascending, sparsely adpressed pubescent. Leaves 2 - 2.5 cm long including 3 - 5 mm long petiole; stipules 1 - 2.5 mm long, narrowly triangular to subulate, sparsely adpressed pubescent outside, margined with pearl bodies; rachis 5 - 15 mm long, canaliculate above; stipellae ca 0.6 mm long, triangular; petiolules ca 1 mm long; leaflets (3-)5 - 9, opposite, top 3 leaflets arising from a common point, 5 - 10 x 2 - 3 mm, linear-oblong to linear-obovate, sometimes oblanceolate, cuneate to rounded at base, obtuse and mucronate at apex, sparsely adpressed pubescent on both surfaces. Racemes 2 - 3 cm long including 1 - 1.8 cm long peduncle, axillary; rachis sparsely pubescent up to 8-flowered. Flowers pink to bright red, 5 mm long; bracts ca 1 mm long, triangular, pubescent outside, ciliate with pearl bodies, caducous; pedicels 1 - 1.2 mm long. Calyx adpressed pubescent outside, ciliate with stout pearl bodies, cup ca 0.5 mm long, teeth ca 1.5 mm long, narrowly triangular. Standard 4 - 4.5 x 2 - 2.5 mm, ovate to elliptic, obtuse at apex, strigose outside; wing petals 3 - 3.5 x 1 mm, glabrous; keel petals 3.5 - 4 x 1.5 mm, adpressed strigose toward margin, ciliate, lateral spur ca 0.8 mm long. Staminal sheath ca 3.5 mm long; anthers ca 0.8 mm long. Ovary ca 2.5 mm long, linear, glabrous, 8 - 10-ovuled; style ca 1.5 mm long, glabrous. Pods 20 - 25 x 3 - 4 mm, spreading, linear, cylindric, abruptly short beaked, faintly torulose, sparsely adpressed pubescent, 5 - 10-seeded; endocarp red-spotted. Seeds ca 2 x 1 mm, cylindric, truncate at both ends, foveolate-reticulate, dark brown.

Type: India, Mysore, 1871, *Wight 864* (E, lecto ! MH !).

Fls.: Aug. - Oct.; *Frts.:* Oct. - Jan.

Distrib.: INDIA: Andhra Pradesh, Gujarat, Karnataka, Maharashtra and Tamil Nadu; SRI LANKA, PAKISTAN.

Habitat: Slopes of hills in scrub forests, fallow lands among grasses, rarely in cultivated fields between 400 and 1000 m.

Exsicc.: Karnataka: Belgaum Dist., Ukkad forest, 27 Oct. 1970, *B.K. Vijay Kumar 128*; Bangalore Dist., Bannerghatta National Park, 12 Aug. 1978, *C.J. Saldanha 2153*; Tamil Nadu: Madurai Dist., Alagar hills, 1100 ft., 9 Nov. 1911, *C.E.C. Fischer 3172*; Dharmapuri Dist., Denkanikotta, Devarabetta, 1000 m, 10 Sept. 1978, *K.M. Matthew & N. Venugopal 17316*.

Chr. No.: $2n = 16$ sub *I. tenuifolia* Wight & Arn. (Singh & Roy, *Nucleus* 13: 44. 1970); $n = 8$ (Sanjappa, *Taxon* 32: 668. 1983).

32. *Indigofera karuppiana* Pallithanam in Jour. Bombay Nat. Hist. Soc. 73: 239. 1976; Sanjappa in Jour. Econ. Tax. Bot. 5: 1033. 1984; Ahmed. & Nayar, Endem. Pl. Indian Reg. 99. 1987. *I. vestita* Baker in Hook. f., Fl. Brit. India 2: 96. 1876 non Harvey 1862; Gamble, Fl. Pres. Madras 310. 1918 (*Repr.* 1: 219. 1967); Sharma *et al.* in Biol. Mem. 2: 44. 1977; Vajravelu in Nair & Henry, Stat. Fl. Anal. Tamil Nadu 1: 219. 198. *I. trifoliata* Linn. subsp. *trifoliata* : de Kort & Thijsse in Blumea 30: 137. 1984, p.p. Fig. 34, Map 4.

Shrub, 20 - 50 cm high; stems erect densely tomentose biramous hairs spreading with unequal arms. Leaves digitately trifoliolate; stipules 2 - 2.5 x 1.5 mm, narrowly triangular, pubescent outside; stipellae absent; petiolules 1.5 mm long; leaflets 1.5 - 4 x 0.5 - 1 cm, narrowly obovate, cuneate to obtuse at base, rounded and mucronate at apex, densely spreading pubescent on both surfaces, dark brown gland-dotted beneath; Racemes 5 - 10 mm long, axillary; rachis densely spreading pubescent, 10 - 16-flowered. Flowers deep red, 4.5 mm long; bracts ca 0.8 mm long, triangular; pedicels ca 1 - 1.5 mm long. Calyx densely pubescent and gland-dotted outside, cup ca 1 mm long, teeth 2.5 - 3 x 0.5 mm, narrowly triangular. Standard 3.5 - 4 x 1.5 - 2 mm, elliptic to obovate, rounded and mucronate at apex, adpressed pubescent and gland-dotted on the back; wing petals 3 - 4 x 1 mm, glabrous; keel petals 3.5 - 4 x 1.5 mm, densely pubescent and gland-dotted outside, lateral spur ca 1 mm long. Staminal sheath ca 3.5 mm long; anthers ca 0.8 mm long. Ovary ca 2 mm long, glabrous, 6 - 10-ovuled; style ca 1.5 mm long, with glands around the base. Pods 8 - 12 x 1.5 - 2 mm, reflexed, straight, flat, abruptly apiculate, spreading pubescent, gland-dotted towards the tip, 6 - 10-seeded; sutures obscurely winged. Seeds ca 1.5 x 1 - 1.5 mm, truncate to rounded at ends, reddish-brown, shiny.

Type : Peninsular India, Pulney Hills, *Wight* 670 (K, holo !).

Fls.: Sept. - Dec.; *Frts.*: Oct. - Dec.

Distrib.: INDIA: Karnataka, Kerala and Tamil Nadu; endemic.

Habitat: Dry hill slopes and tops in scrub forests between 900 and 1400 m.

Exsicc.: Karnataka: Mysore Dist., Bandipur, 3000 ft., Oct. 1910, *A. Meebold* 11551; Kerala: Palghat Dist., Attapady valley, Tekuponnai, 2600 ft., 21 Oct. 1910, *C.E.C. Fischer* 2342; Tamil Nadu: Dimbam, 3700 ft., 16 Nov. 1905, *C.E.C. Fischer* 599; Coimbatore Dist., Marudhamalai on eastern slopes, 6 Dec. 1980, *M. Sanjappa* 703.

Chr. No.: 2n = 16 (Sanjappa & Dasgupta, Indian Jour. Bot. 6: 62. 1983).

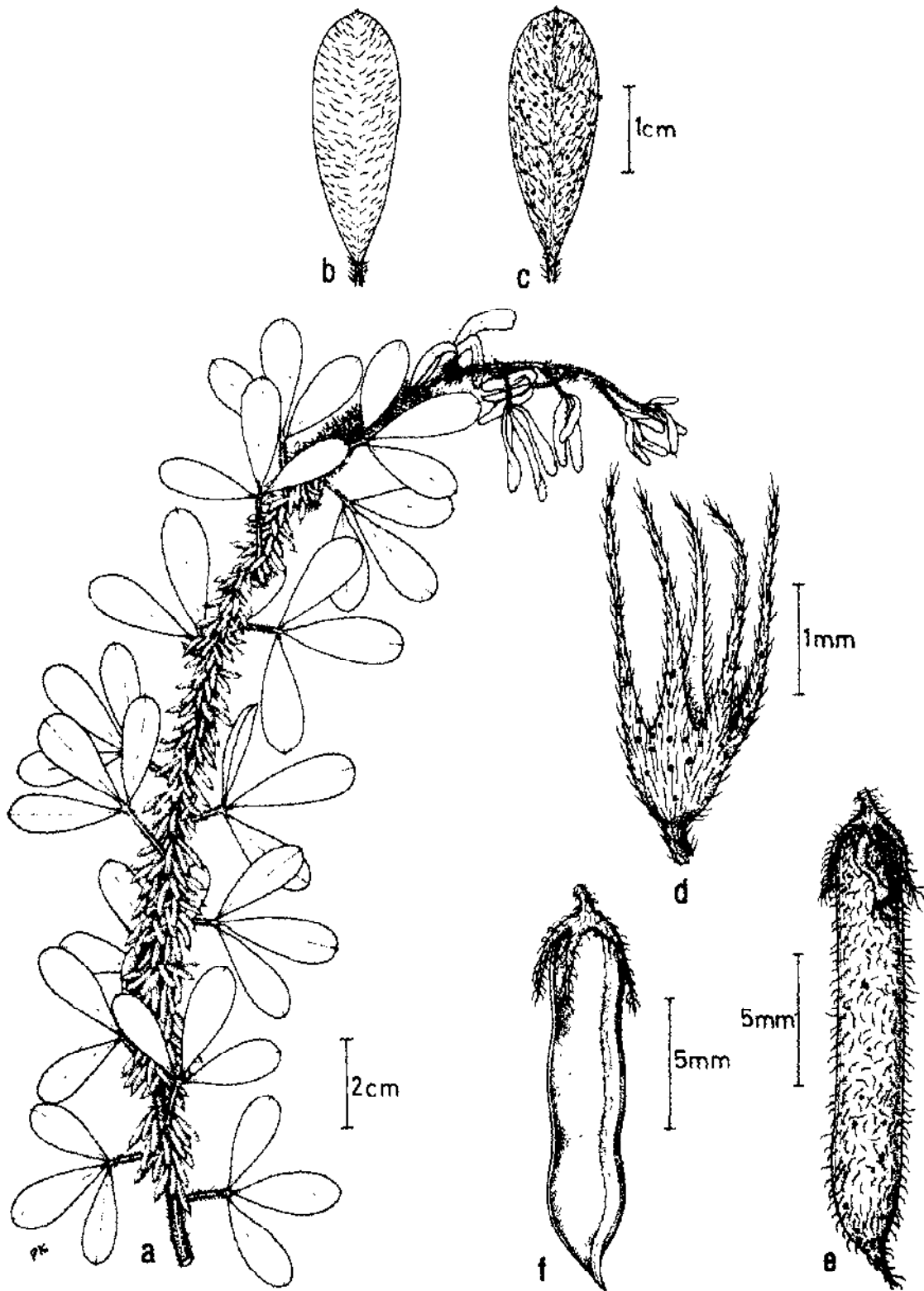
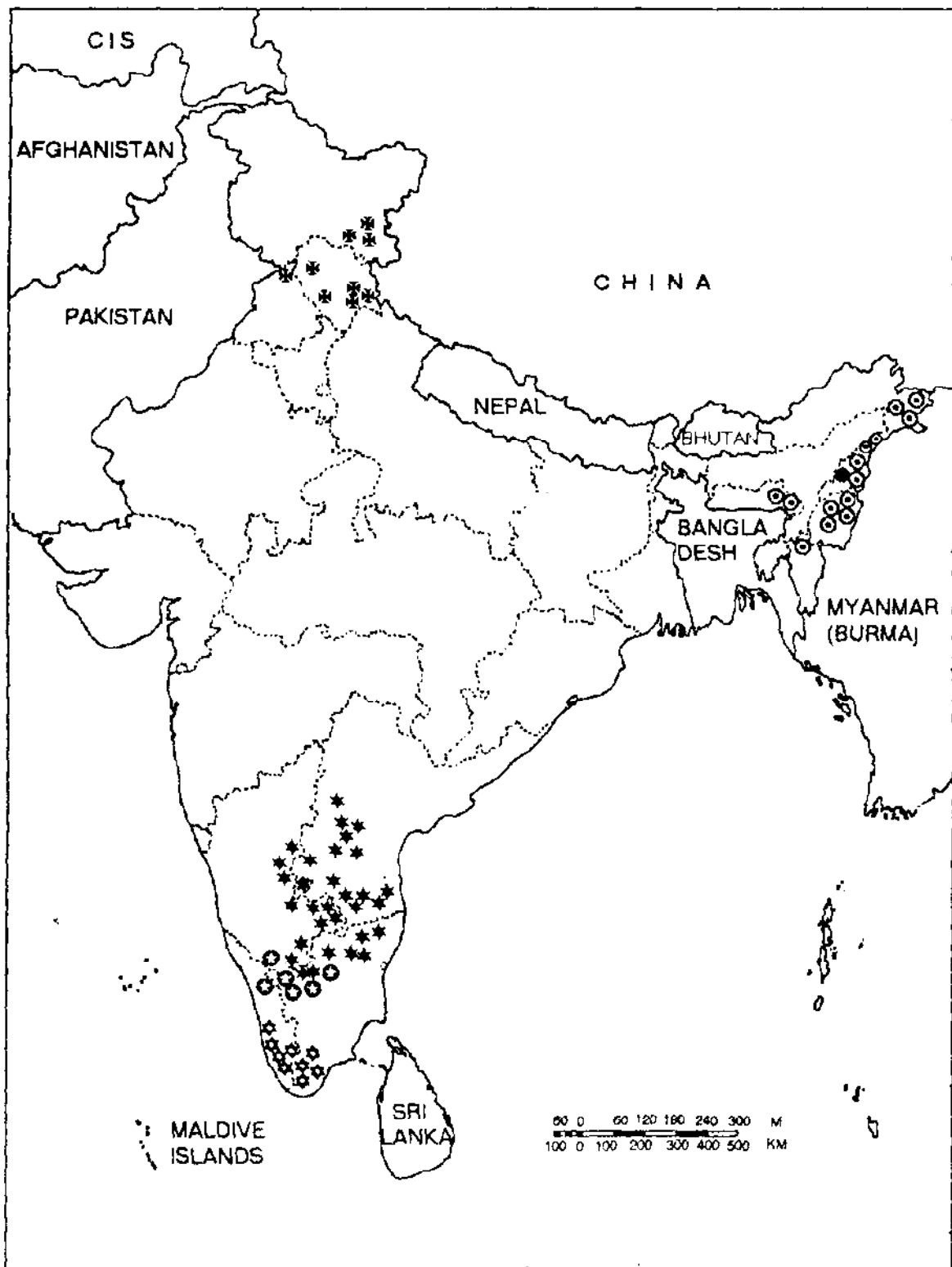


Fig. 34. *Indigofera karuppiana* Pallithanam : a. Habit, b. Leaflet-adaxial surface, c. Leaflet-abaxial surface, d. Calyx, e. Pod with hairs, f. Pod with hairs removed (a-f: Sanjappa 703).



Map 4. *Indigofera himalayensis* Ali (✱); *I. karuppiana* Pallithanam (●); *I. lacei* Craib (●); *I. longiracemosa* Boivin ex Baill. (☆); *I. mysorensis* Rottler ex DC. (★); *I. nigrescens* Kurz ex King & Prain (⊙).

Notes: de Kort and Thijssse (1984) reduced this species as a synonym under *I. trifoliata* considering it as local variant with dense indumentum and also suspected it to be a polypoid. It differ from *I. trifoliata* in indumentum and pod characters and is so far recorded only from slopes of dry hills.

33. *Indigofera lacei* Craib in Kew Bull. 1910. 382. 1910 & Fl. Siam Enum. 1: 378. 1931; de Kort & Thijssse in Blumea 30: 122. 1984; Sanjappa in Bull. Bot. Surv. India 26: 38. 1984, p.p. **Fig. 35, Map 4.**

Shrub, 2 m high; branches erect, woody, grooved with edges acute, densely tomentose when young, biramous hairs white or brown, spreading with unequal arms. Leaves 7 - 12 cm long including 5 - 7 mm long petiole; stipules 5 - 10 x 0.5 - 1 mm, linear to setaceous, free lateral, sometimes interpetiolar, pubescent outside, persistent; rachis 5 - 10 cm long, densely tomentose; stipellae 1 - 1.5 mm long, narrowly triangular; petiolules 1 - 1.5 mm long; leaflets 21 - 31, opposite, 10 - 16 x 4 - 6.4 mm, elliptic to elliptic-oblong sometimes obovate, cuneate to rounded at base, obtuse to rounded and mucronate at apex, sparsely adpressed pubescent on both surfaces. Racemes 10 - 15 cm long including 1.2 - 2 cm long peduncle; rachis striate, adpressed hairy, many-flowered. Flowers reddish-purple, 8 - 10 mm long; bracts 1 - 1.5 x 0.5 mm, linear to narrowly triangular, pubescent outside, caducous; pedicels 2 - 4 mm long, hairy. Calyx sparsely adpressed pubescent, outside, cup ca 1.5 mm long, teeth 0.5 - 1 mm long, triangular. Standard 6.5 - 8 x 5 - 6 mm, obovate to elliptic, mucronate, adpressed hairy on the back; wing petals 6 - 7 x 2 - 2.5 mm, ciliate along margins; keel petals 6 - 7 x 2.5 - 3 mm, adpressed hairy outside towards tip, ciliate along margins, lateral spur ca 0.5 mm long. Staminal sheath 6.5 - 7 mm long; anthers ca 0.5 mm long. Ovary 5 - 5.5 mm long, linear glabrous, 6 - 10-ovuled; style 1 - 1.5 mm long, glabrous. Pods 30 - 35 x 2.5 - 3 mm, ascending, straight, subcylindrical, beaked, glabrous, dehiscent, 6 - 10-seeded; exocarp separating in mature pods. Seeds 1.5 - 2 x 1.5 mm, cylindric, rounded at ends, smooth, shiny, dark brown.

Type: Burma, Maymyo plateau, 3500 ft., *J.H. Lace* 4268 (K, holo!).

Fls. & Frts.: Sept. - Feb.

Distrib.: INDIA: Nagaland; MYANMAR, THAILAND.

Habitat: Open forests, especially in valleys at ca 2100 m.

Exsicc.: Nagaland: Kohima, Naga Hills, 7000 ft. 29 Aug. 1937, *N.L. Bor* 16138 (ASSAM).

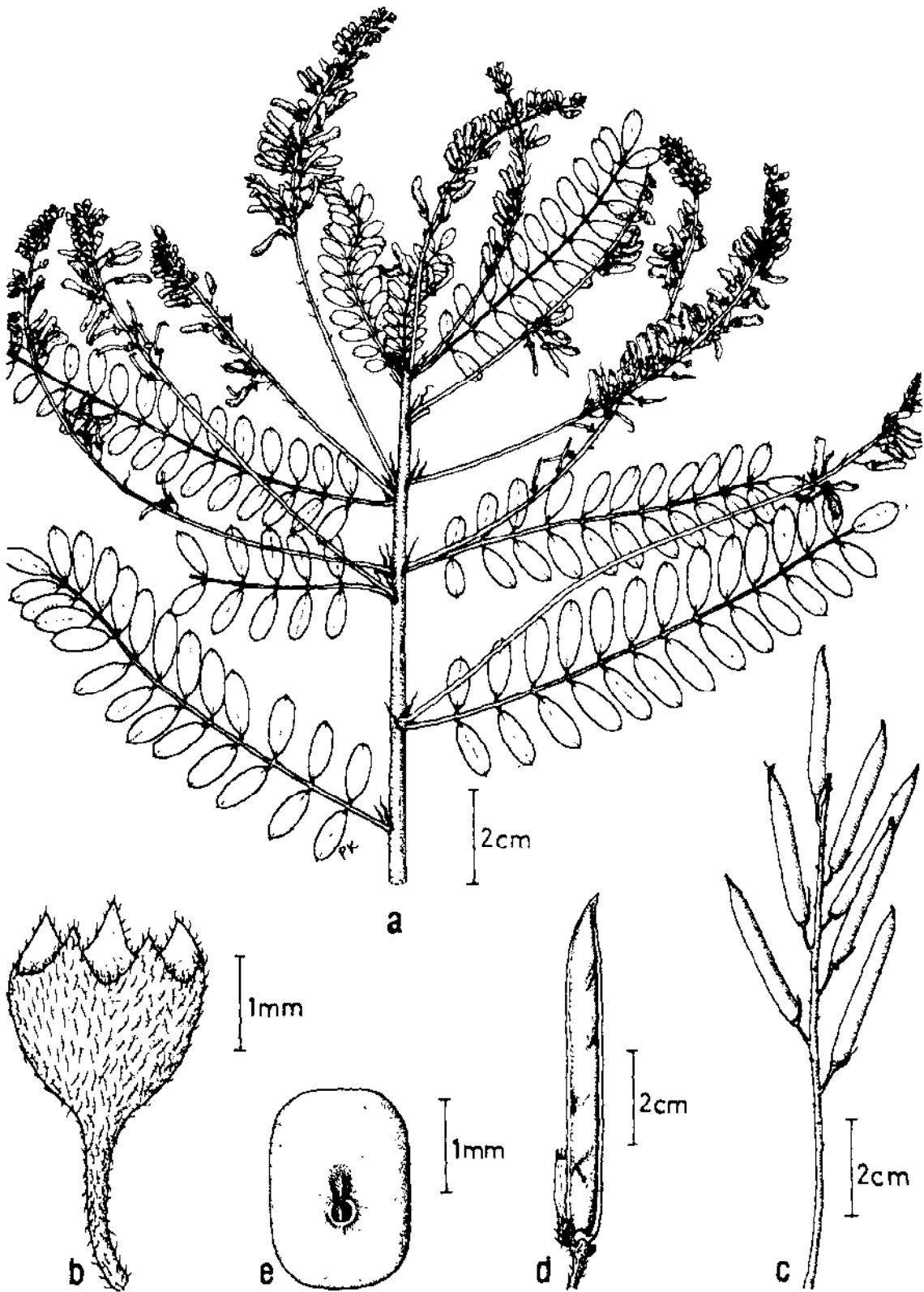


Fig. 35. *Indigofera lacei* Craib : a. Habit, b. Calyx, c. Infructescence, d. Pod, e. Seed-hilar view (a-b: *Khan* 202; c-e: *Mokim* 1162).

34. *Indigofera linifolia* (Linn. f.) Retz., Obs. Bot. 4: 29. 1786 & 6: 33, t. 2. 1791; DC., Prodr. 2: 222. 1825; Roxb., Pl. Corom. t. 196. 1805 & Fl. Ind. 2: 370. 1832; Wight & Arn., Prodr. 198. 1834; Wight, Icon. Pl. Ind. Orient. t. 313. 1840; Dalz. & Gibs., Bombay Fl. 58. 1861; Drury, Handb. Indian Fl. 1: 276. 1864; Stewart, Punjab Pl. 70. 1869; Baker in Hook. f., Fl. Brit. India 2: 92. 1876; T. Cooke, Fl. Pres. Bombay 1: 310. 1902 (*Repr.* 1: 330. 1967); Prain, Bengal Pl. 1: 431. 1903; (*Repr.* 1: 309. 1963); Duthie, Fl. Upp. Gang. Pl. 1: 249. 1903 (*Repr.* 1: 229. 1960); Bamber, Pl. Punjab 545. 1916; Gamble, Fl. Pres. Madras 309. 1918 (*Repr.* 1: 218. 1967); Haines, Bot. Bihar Orissa 3: 237. 1922 (*Repr.* 2: 248. 1961); Kanjilal *et al.*, Fl. Assam 2: 23. 1938; Santapau, Fl. Saurashtra 124. 1962; Bhandari, Fl. Indian Desert 118. 1978; de Kort & Thijsse in Blumea 30: 123. 1984; R.S. Rao, Fl. Goa etc. 1: 124. 1985. *Hedysarum linifolium* Linn. f., Suppl. 331. 1781. *Sphaeridiophorum linifolium* (Linn. f.) Desv. in Jour. Bot. 3: 125, t.6, f.35.1813. *Indigofera roxburghii* Tausch in Flora 14: 671. 1831. *Sphaeridiophorum abyssinicum* Jaub. & Spach, Ill. Pl. Orient. t. 494. 1857. *Indigofera linifolia* (Linn. f.) Retz. var. *campbelli* Wight ex Baker in Hook. f., Fl. Brit. India 2: 92. 1876. Fig. 36.

Local names: Bhangra (Beng.), Jinkigali, Nahanigali (Guj.), Ratanjot, Ratnamala, Torki (Hindi), Bhangro, Torki, Pandarphalli (Mar.), Sidio, Bakereya, Bhurbhura (Raj.).

Prostrate or erect, annual herb, 10 - 50 cm high; branches angular or sometimes compressed, biramous hairs silvery, adpressed with equal arms. Leaves simple, (5 -)10 - 50 x 4 - 5 mm long including 1.5 - 3 mm petiole; stipules 1.5 - 2 mm long, narrowly triangular, pubescent outside, adnate to petiole at base; lamina highly variable in size and shape, 5 - 40(- 55) x 3 - 5 mm, linear, elliptic, obovate or orbicular, cuneate at base, acute to rounded and sometimes emarginate at apex, biramous hairs perpendicular to midrib on upper surfaces, obscurely veined. Racemes 5 - 15 mm long, subsessile or sessile; axillary, rachis angular, pubescent, (1 - 2 -)5 - 20-flowered. Flowers salmon red or pinkish-red, 3 - 4 mm long; bracts 1 - 1.5 x 0.5 mm, triangular, caducous; pedicels less than 1 mm long. Calyx adpressed hairy outside, cup ca 1 mm long, teeth 1 - 1.5 mm long, narrowly triangular. Standard 3 - 3.5 x 1.5 - 2 mm, elliptic to ovate, hairy on the back; wing petals 2.5 - 3 x 1 - 1.5 mm, glabrous; keel petals 3 - 3.5 x 1 - 1.5 mm, glabrous, lateral spur ca 0.5 mm long. Staminal sheath ca 3 mm long; anthers ca 0.3 mm long. Ovary ca 1 mm, globose, glabrous initially, becoming densely hairy, 1-ovuled. Pods 2 - 3 x 1 - 1.5 mm, globose, beaked, adpressed white silky, somewhat keeled along the line of dehiscence, 1-seeded; endocarp blackish-brown, shiny. Seeds ca 1 x 1 mm globose, minutely tuberculate, sometimes mottled, dark brown.

Type: Ind. Orient., Linnaeus 921.5 (LINN, seen on microfiche).

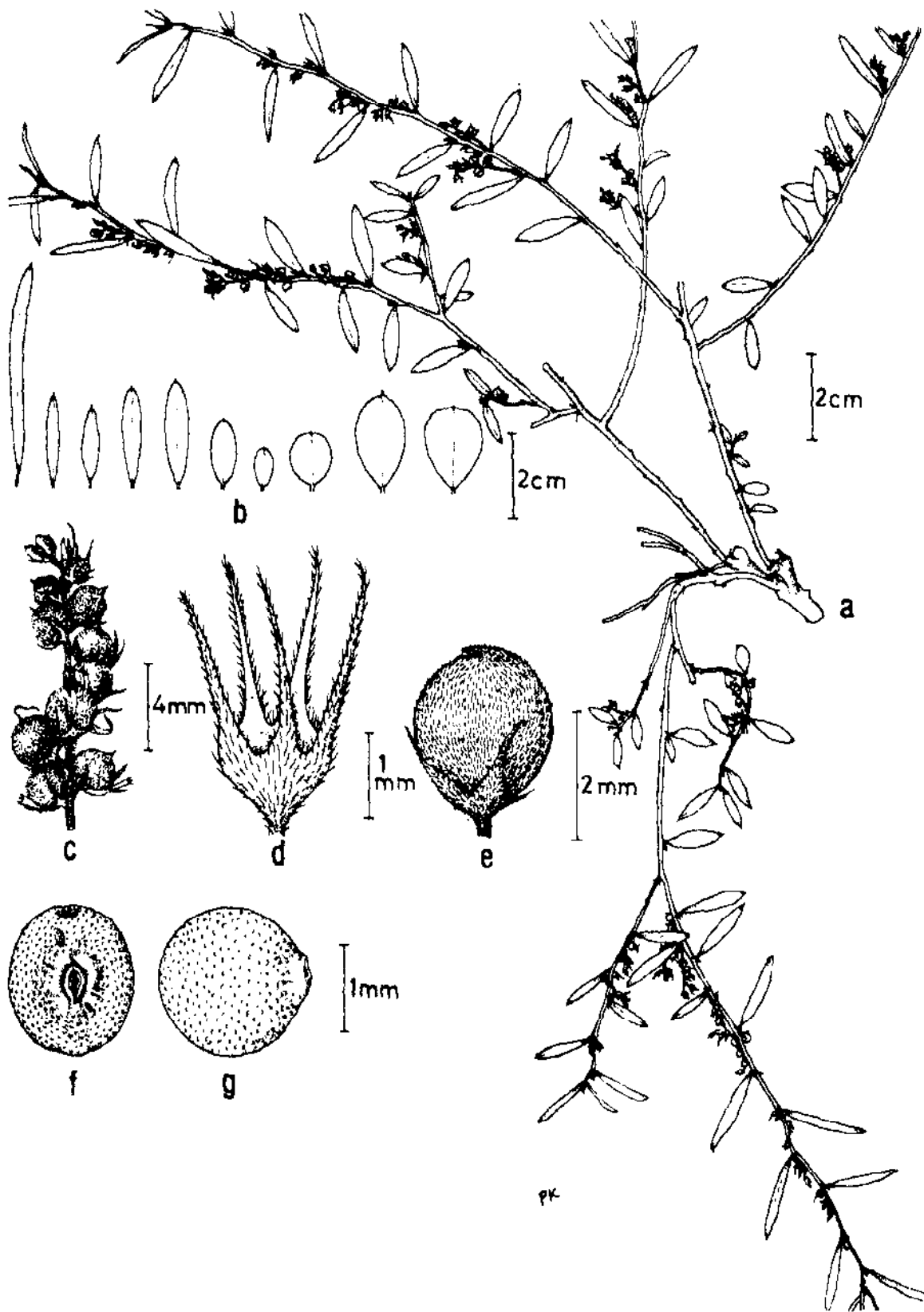


Fig. 36. *Indigofera linifolia* (Linn. f.) Retz. : a. Habit, b. Leaf-range in variability, c. Inflorescence, d. Calyx, e. Pod, f. Seed-hilar view, g. Seed-side view (a: C.M. Arora 6014; b. from different collections, c-g: Sanjappa 9516).

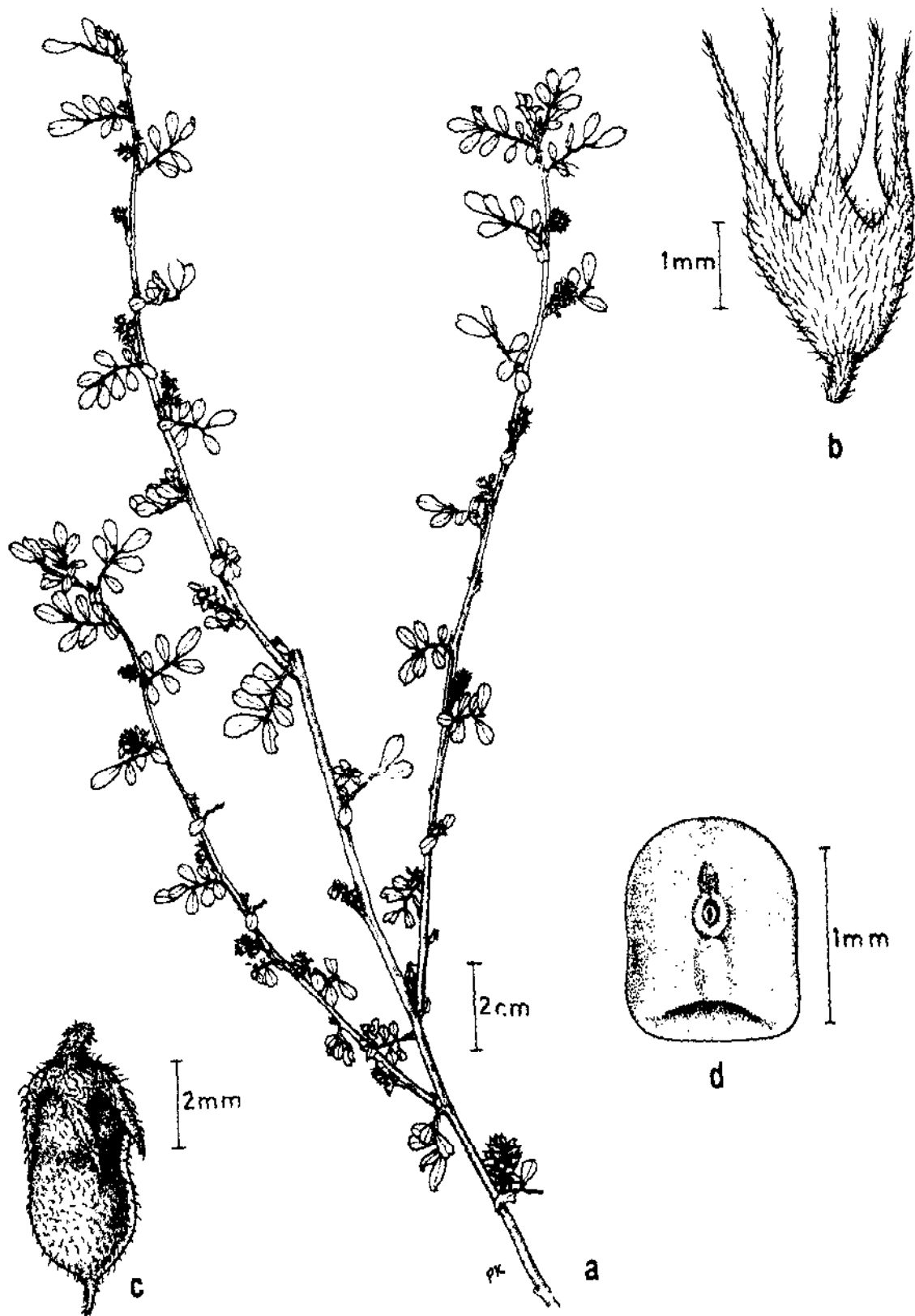


Fig. 37. *Indigofera linnaei* Ali : a. Habit, b. Calyx, c. Pod, d. Seed-hilar view (a-b: *Sebastine* 1445; c-d: *V.J. Nair* 57132).

Fls.: Aug. - Dec.; *Frts.*: Sept. - Feb.

Distrib.: INDIA: Throughout up to 1500 m; PAKISTAN, BANGLA DESH, ETHIOPIA, ERITREA, SUDAN, SRILANKA, NEPAL, BHUTAN, CHINA, MYANMAR, TAIWAN, MALESIA, INDO - CHINA, NEW GUINEA, AUSTRALIA, WEST ASIA.

Habitat: Fallow lands, cultivated fields, roadsides, beaches, open grassy areas in deciduous and scrub forests from sea level to 1500 m.

Exsicc.: Andhra Pradesh: Kurnool dist., Nallamalais C.E.C. Fischer 4672; Medak Dist., on way from Pegarikunta to Narsapur, 713 m, 23 Sept. 1958, K.M. Sebastine 6643; Palavaram agency, on way to Papikonda R.F., 700 m, 26 Sept. 1962, D.C.S. Raju 463; Bihar: Champaran Dist., Naurangia, 12 Sept. 1965, R.N. Banerjee 426; Karnataka: Dharwar, 25 Oct. 1889, W.A. Talbot 2027; Rajasthan: Barmer Dist., Samadari, 16 Oct. 1978, B.V. Shetty 2188.

Chr. No.: $n = 8$, $2n = 16$ (Bir & Sidhu, Nucleus 10: 47. 1967) $2n = 16$ sub *I.linifolia* (Linn. f.) Retz. var. *campbelli* (Bhatt & Sanjappa, Nucleus 18: 172. 1975). $n = 8$ (Sanjappa & Bhatt, Jour. Cytol. Genet. 14: 59. 1979).

Pollen: 3-zonocolporate, suboblate, 32×40 ($30 - 34 \times 38 - 42$) μm , microperforate, (Ferguson & Strachan, Pollen et Spores 24: 171 - 210. 1982).

Uses: The seeds are rich in nitrogen and the flour is baked into bread. (Bhandari, Econ. Bot. 28: 77. 1974).

Notes: Populations of this species from different habitats vary greatly in leaf size, shape and in number of flowers per raceme. The extreme forms of these variations tend to appear distinct. Baker's variety *campbelli* is based on one such extreme form. The plants from comparatively high rainfall areas have broader leaves with sparse pubescence and those from low rainfall areas or arid areas have narrower and linear leaves with dense pubescence.

35. Indigofera linnaei Ali in Bot. Notis. 111: 549. 1958 & in Nasir & Ali, Fl. W. Pakistan 100: 75. 1977; Santapau, Fl. Saurashtra 1: 126. 1962; Chavan & Oza, Fl. Pavagadh 75. 1965; Babu, Herb. Fl. Dehra Dun, 144. 1977; Bhandari, Fl. Indian Desert 118. 1978; Britto in Matthew, Fl. Tamil Nadu Carn. 1: 421. 1983; de Kort & Thijssse in Blumea 30: 125. 1984; R.S. Rao, Fl. Goa etc. 1: 124. 1985. *Hedysarum prostratum* Linn., Mant. Pl. 1: 102. 1767 non *Indigofera prostrata* Willd. *I. enneaphylla* Linn., Mant. Pl. 2: 272. 1771 *nom. illeg.* & Mant. Pl. 2: App. 571. 1771; DC., Prodr. 2: 229. 1825; Roxb., Fl. Ind. 3: 376. 1832; Wight & Arn., Prodr. 199. 1834; Wight, Icon. Pl. Ind. Orient. t. 403. 1840; Dalz. & Gibs., Bombay Fl. 58. 1861; Drury, Handb. Indian Fl. 1: 277. 1864; Baker in Hook. f.,

Fl. Brit. India 2: 94. 1876; Collett, Fl. Simlensis 121. 1902; T. Cooke, Fl. Pres. Bombay 1: 312. 1902 (*Repr.* 1: 333. 1967); Prain, Bengal Pl. 1: 432. 1903 (*Repr.* 1: 310. 1963); Duthie, Fl. Upp. Gang. Pl. 1: 250. 1903 (*Repr.* 1: 230. 1960); Bamber, Pl. Punjab 556. 1916; Gamble, Fl. Pres. Madras 309. 1918 (*Repr.* 1: 218. 1967); Haines, Bot. Bihar Orissa 3: 238. 1922 (*Repr.* 2: 249. 1961). **Fig. 37.**

Local names: Fatakiya, Bhonyagali (Guj.), Latahai (Hindi), Kennegilu (Kan.), Cherru-pullate (Mal.) Bhuiguli, Bhingule (Mar.), Pita saga (Or.), Vasuka (Sans.), Sheppunerunji (Tam.), Yerra Palleru, Chalapachchi, Cheragadam (Tel.).

Prostrate herb; tap root stout woody; branches prostrate or ascending with support, 20 - 60 cm long, purplish or yellowish-green, strigose, biramous hairs adpressed with equal arms. Leaves (1 -)3 - 3.5 cm long, sessile or stipules 5 - 7 x 1.5 - 2 mm, triangular, caudate, scarious, sparsely pubescent; rachis (1 -)2 - 2.8 cm long; stpellae 0.5 - 0.8 mm long, narrowly triangular; petiolules ca 0.5 mm long; leaflets (5 -)7 - 9(- 11), alternate, 5 - 16 x 2 - 5 mm, ovate to obovate, cuneate to obtuse at base, rounded to truncate or rarely emarginate and mucronate at apex adpressed pubescent on both surfaces. Racemes 5 - 25 mm long, sessile, axillary, globose to ovoid; rachis silvery pubescent, 10 -20-flowered. Flowers pink or bright red, 3 - 4 mm long; bracts 1.5 - 2.5 x 1 mm, triangular, caducous; pedicels 0.5 - 1 mm long. Calyx hairy outside, cup 0.8 - 1.5 mm long, teeth 2.5 - 3.5 x 0.3 - 0.5 mm. Standard 3 - 4 x 1.5 - 2 mm, ovate to spatulate, rounded and mucronate at apex, strigose on the back; wing petals 3 - 4 x 1 - 2 mm, glabrous, shortly ciliate along margins. Staminal sheath 3 - 4 mm long; anthers ca 0.5 mm long. Ovary 2 - 3 mm long, glabrous or very sparsely hairy, 1 - 4-ovuled; style 1 - 2 mm long, glabrous. Pods 3 - 8 x 1.5 - 2 mm, spreading, straight, somewhat globose to oblong, beaked, strigose, (1 -)2 - 3(- 4)-seeded; endocarp red-spotted. Seeds ca 1 x 1 mm, cylindric, truncate at one or both ends, dark green to light brown, sometimes mottled.

Type: India: Coromandel, Sloane vol. 95, f. 186 (BM!).

Fls. & Frts.: Throughout the year especially near wet places.

Distrib.: INDIA: Throughout plains and hills of India; SRI LANKA, PAKISTAN, NEPAL, BANGLADESH, CHINA, MYANMAR, THAILAND, VIETNAM, INDONESIA, NEW GUINEA, AUSTRALIA.

Habitat: Road sides, wastelands, fallow lands, grasslands. Altitude sea level to 500 m.

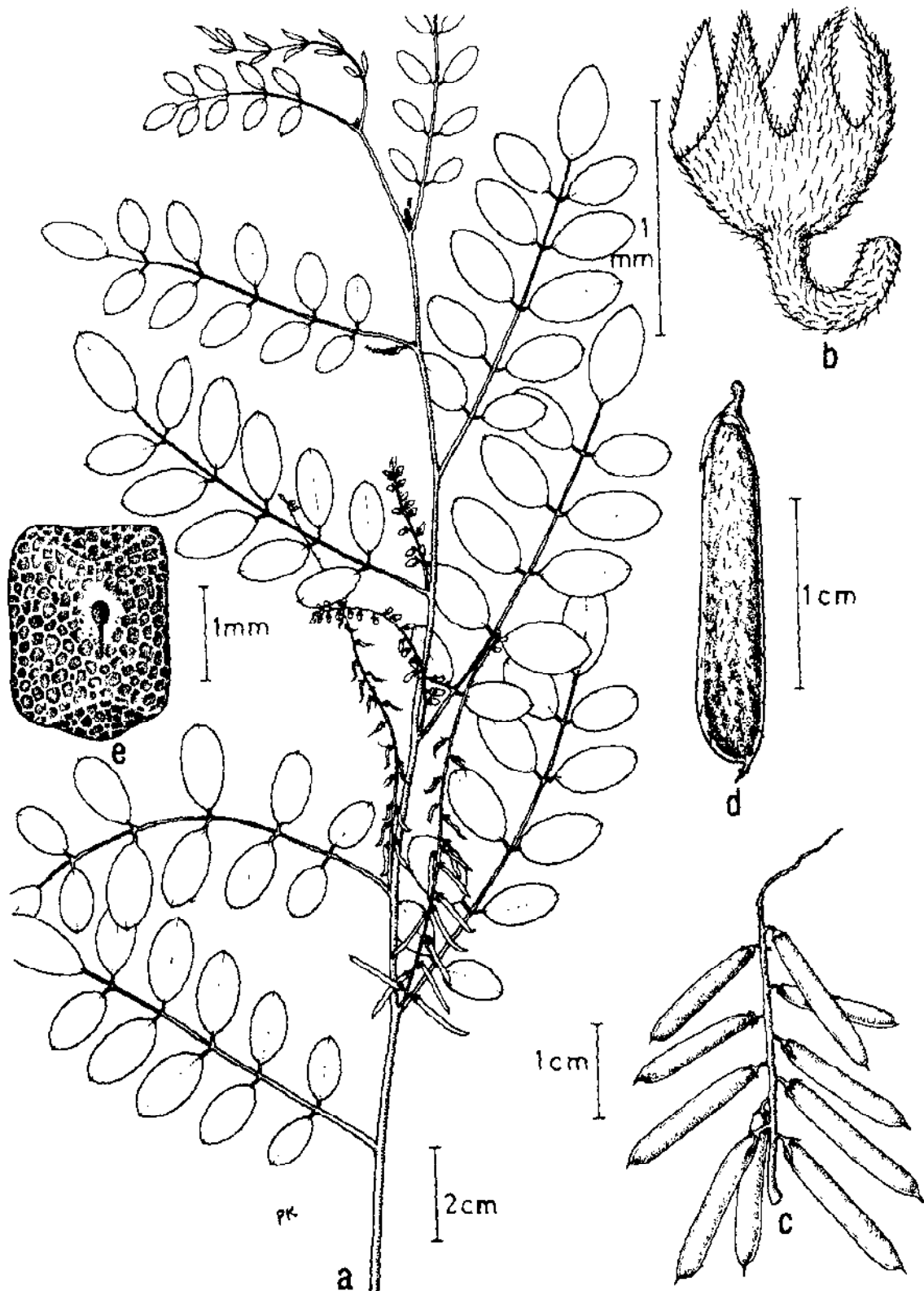


Fig. 38. *Indigofera longiracemose* Boivin ex Baill. : a. Habit, b. Calyx, c. Pod, d. Infructescence, e. Seed-hilar view (a-b: *N.C. Nair* 50711; c-e: *Lawson* 304).

Exsicc.: Andhra Pradesh: Nalagonda Dist., Vijaypuri, 110 m, 17 Dec. 1959, *K.M. Sebastine* 9832; Bihar: Chota Nagpur, Hazaribagh Dist., Ramgarh, 150 m, 27 Sept. 1874, *C.B. Clarke* 24979; Diu Island, 22 Nov. 1962, *T.A. Rao* 1978; Rajasthan: Pali Dist., Rajpura Dam near Sadri, 17 Nov. 1974, *B.V. Shetty* 1501; Tamil Nadu: Coimbatore Dist., Marudhamalai, 6 Dec. 1980, *M. Sanjappa* 705.

Chr. No.: $n=8$ & $2n=16$ sub *I. enneaphylla* (Ramanathan, *Curr. Sci.* 24: 17. 1955).

Pollen: 3-zonocolporate, oblate-spheroidal, 27×28 ($26 - 28 \times 26 - 30$) μm , granulate (Vishnu Mittre & Sharma, *Pollen et Spores* 2: 5 - 45. 1962); 3-zonocolporate, spheroidal to subprolate 31×28.5 ($33 - 37 \times 24 - 31$) μm , striate-rugulate, (Ferguson & Strachan, *Pollen et Spores* 24: 171 - 210. 1982).

Notes: White-flowered forms were recorded from Gujarat. In white-flowered plants the branches, leaf rachis and peduncles were found to be whitish-green. In the common pink flowered plants they are pinkish.

36. *Indigofera longiracemosa* Boivin ex Baill. in *Bull. Soc. Linn. Paris* 1: 399. 1883; Prain & Baker f. in *Jour. Bot.* 40: 144. 1902; Gamble, *Fl. Pres. Madras* 312. 1918 (*Repr.* 1: 220. 1967); Gillett in *Kew Bull. Add. Ser.* 1: 105. 1558 & in Milne-Redhead & Polhill, *Fl. Trop. E. Africa, Legum.* 3, Pap. 1: 307. 1971; Britto in Matthew, *Fl. Tamil Nadu Carn.* 1: 422. 1983. **Fig. 38, Map 4.**

Local name: Neela amari (Mal.).

Undershrub, 50 - 150 cm high; branches erect, woody, reddish, sparsely strigulose, biramous hairs adpressed with equal arms. Leaves 5 - 9 cm long including 1 - 1.5 cm long petioles; stipules 2 - 2.5 x 0.8 - 1 mm, narrowly triangular to subulate, hairy outside; rachis 4 - 8 cm long, canaliculate, above, prolonged beyond lateral leaflets, adpressed hairy; stipellae ca 1 x 0.5 mm, triangular; petiolules 1 - 1.5 mm long, brown hairy; leaflets (5 -) 7 - 11, opposite, 9 - 17 x 6 - 10 mm, ovate-elliptic to elliptic, sometimes orbicular to obovate, obtuse to rounded at base, rounded to rarely emarginate and mucronate at apex, sparsely strigulose, biramous hairs brown, adpressed on both the surfaces; drying bluish black. Racemes 1.5 - 8 cm long, sessile, axillary, rachis sparsely 8 - many-flowered laxly. Flowers pink, ca 4.5 mm long; bracts 1.5 - 2 x 0.5 mm, narrowly triangular, very caducous; pedicels 1 - 1.5 mm long, strongly reflexed in fruits. Calyx adpressed brown strigulose, cup ca 0.8 mm long, teeth ca 1.2 mm long, triangular, ciliate along margins with thick, brown pearl bodies. Standard 4 - 4.5 x 3 - 3.5 mm, broadly ovate to nearly orbicular, rounded and mucronate at apex, densely brown strigulose outside; wing petals 3.5 - 4 x 1 mm, glabrous; keel petals 4 - 4.5 x 1.5 mm, densely brown strigulose outside, lateral spur ca 0.5 mm long. Staminal sheath 4 - 4.5 mm long; anthers ca 0.5 mm long. Ovary 3 - 4 mm

long, linear, glabrous or sparsely hairy towards the tip, 5 - 6-ovuled; style ca 1 mm long, glabrous. Pods 10 - 20 x 3 - 4 mm, spreading or descending, cylindrical to subcylindrical abruptly apiculate, sparsely adpressed brown hairy when young, glabrous with age, 3 - 6-seeded; endocarp strongly red-spotted. Seeds 1.5 - 2 x 1 - 1.5 mm, cylindrical, truncate at both the ends, reticulately-foveolate, reddish-brown.

Type: Madagascar, Nossi Be I., *Boivin* 2214 bis (P, holo *n.v.*).

Fls.: Aug. - Nov.; *Frts.:* Nov. - Jan.

Distrib.: INDIA: Kerala and Tamil Nadu; MADAGASCAR, KENYA, ZANZIBAR.

Habitat: Near cultivated fields, waste lands, coastal areas from sea level to 100 m.

Exsicc.: Kerala: Trivandrum, *C.A. Barber* 1075; Kallar, 1 Sept. 1913, *Calder & Ramaswami* 443; Tamil Nadu: Nagercoil, 20 Dec. 1893, *M.A. Lawson* 304; Tirunelveli Dist., Kalkadu, 275 m, 7 March 1963, *J. Joseph* (CAL, MH).

37. *Indigofera mysorensis* Rottler ex DC., Prodr. 2: 222. 1825; Wight & Arn., Prodr. 202. 1834; Drury, Handb. Indian Fl. 1: 279. 1864; Baker in Hook. f., Fl. Brit. India 2: 102. 1876; Gamble, Fl. Pres. Madras 313. 1918 (*Repr.* 1: 221. 1967); Ramaswamy & Razi, Fl. Bangalore Dist. 267. 1973; Sharma *et al.*, in Biol. Mem. 2: 43. 1977; Britto in Matthew, Fl. Tamil Nadu Carn. 1: 422. 1983; Sanjappa in Jour. Econ. Tax. Bot. 5: 1034. 1984; Saldanha & G. Singh in Saldanha, Fl. Karnataka 1: 472. 1984; Ahmed. & Nayar, Endem. Pl. Indian Reg. 99. 1987.

Fig. 39, Map 4.

Local names: Mysore panicked indigo (Eng.), Kempu gogge (Kan.), Adivi chenaga, Bapanga (Tel.).

Shrub, 60 - 120 m high, copiously branched; branches erect, striate, pinkish, biramous hairs densely spreading with unequal arms. Leaves 5 - 6 cm long, sessile; stipules ca 3 x 1 mm, filiform to linear, pilose outside, caducous; rachis 3 - 4 cm long, pilose; stipellae ca 2 x 0.5 mm, triangular with a tuft of pearl bodies between stipellae of opposite leaflets; petiolules ca 0.8 mm long; leaflets (9 -) 13 - 23, opposite, 6 - 10 x 3 - 5 mm, elliptic, obtuse to rounded at base, obtuse at apex, mucronate with a resinous gland below the tip on midrib beneath, pilose, biramous hairs long and slender with unequal arms above, short with equal arms. Flowers solitary, axillary, confined to terminal branches, often in pseudopanicles by reduction of leaves and leaflets. Flowers pinkish red, ca 6 mm long; bracts elliptic, obtuse at base and apex, mucronate with a gland

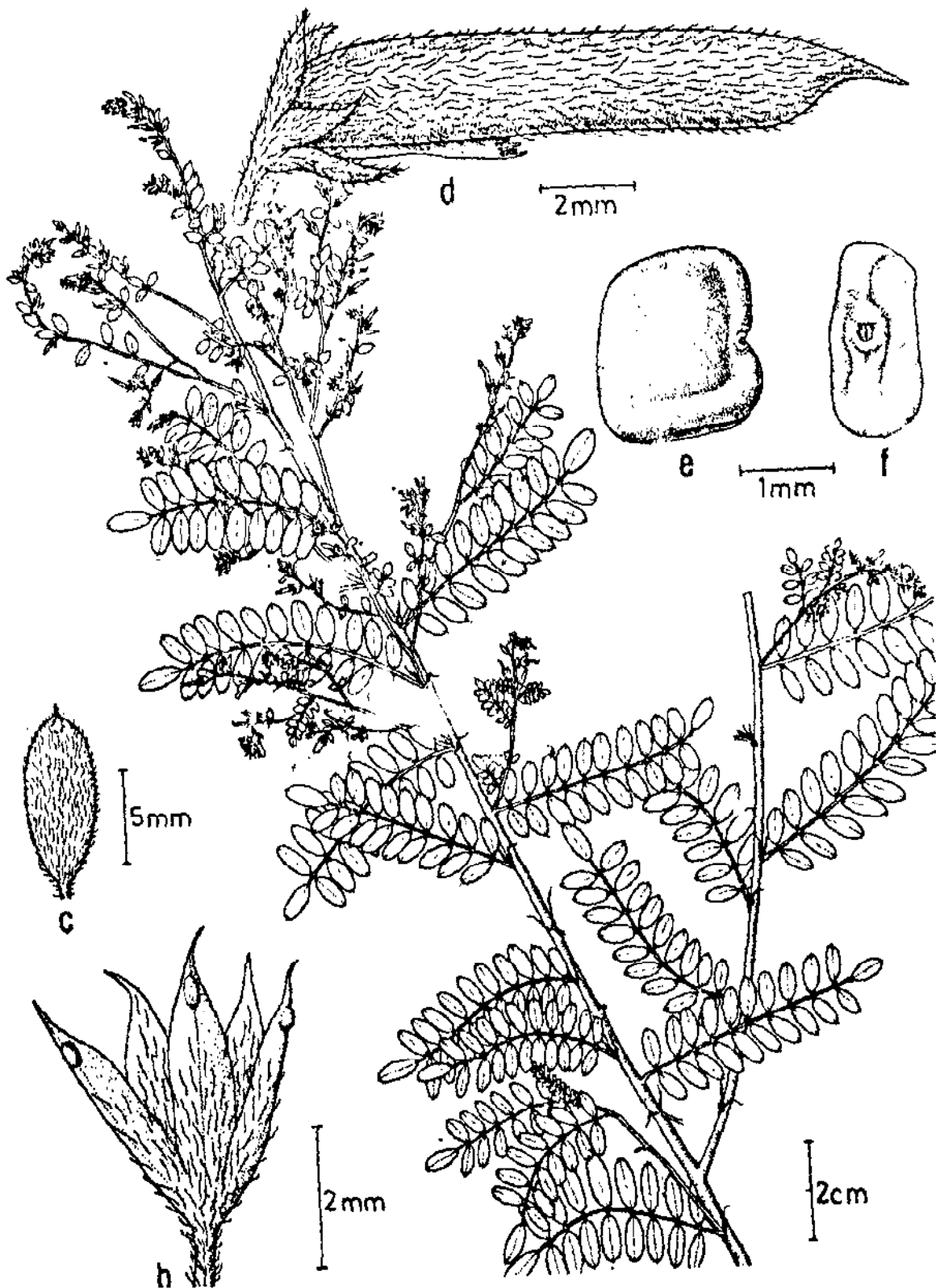


Fig. 39. *Indigofera mysorensis* Rottler ex DC. : a. Habit, b. Calyx (lobes showing glands towards tip), c. Leaflet-abaxial surface showing gland towards tip, d. Pod, e. Seed-side view, f. Seed-hilar view (a-c: V.Kumar 623; d-f: Sanjappa 728).

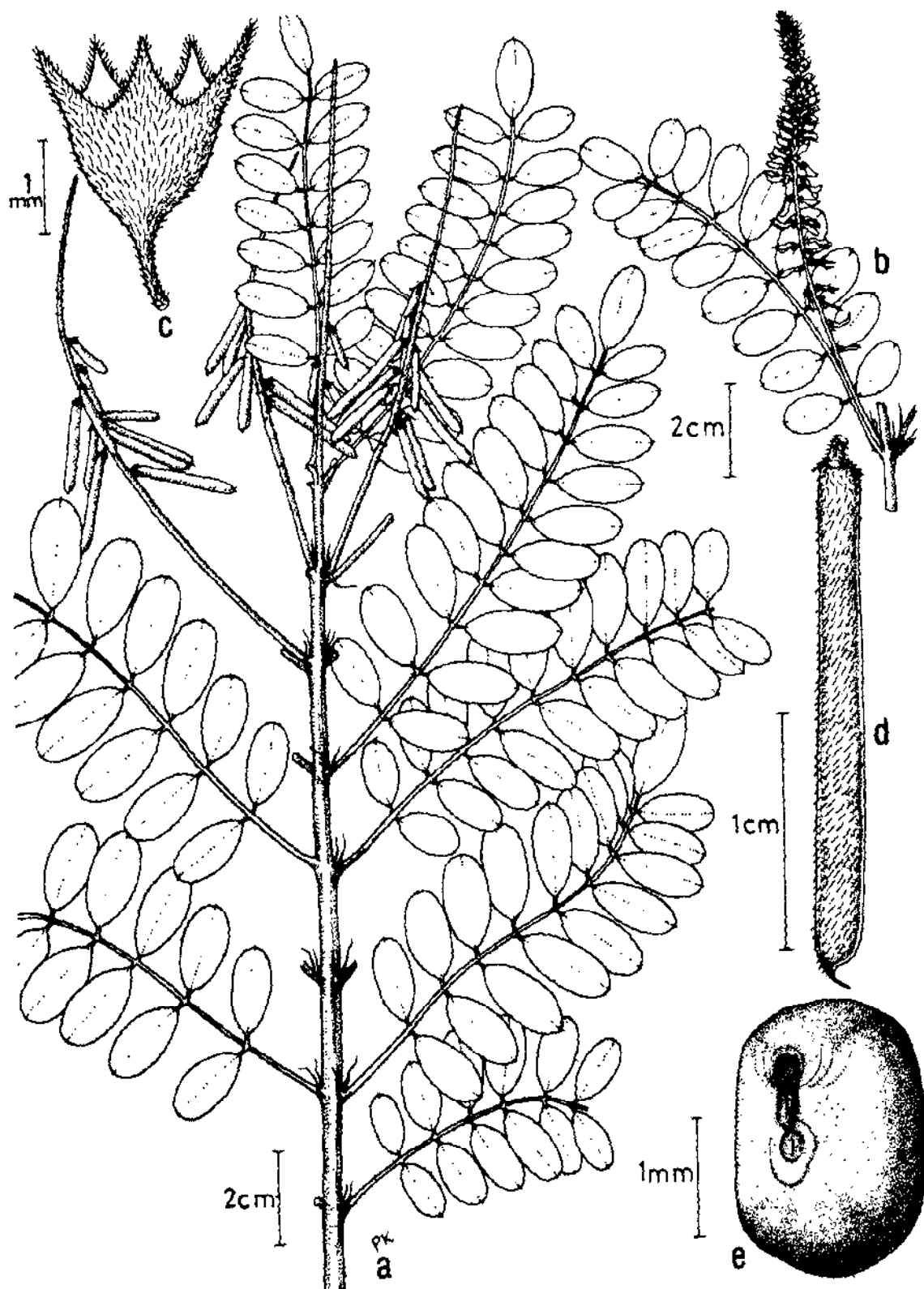


Fig. 40. *Indigofera nigrescens* Kurz ex King & Prain : a. Habit, b. Flowering twig, c. Calyx, d. Pod, e. Seed-hilar view (a, d: C.B. Clarke 5848; b-c: Khan 203; e: Joseph 48603).

below the tip on midrib beneath, adpressed pilose on both surfaces; pedicels 1 - 1.5 mm long, pilose. Calyx pilose outside as well as inside, cup ca 1 mm long, teeth 3 - 3.5 x 0.5 mm, triangular, resinous gland present below the tip outside. Standard 4.5 - 6 x 2.5 - 3 mm, elliptic, acute and mucronate at apex, sparsely strigulose outside; wing petals 4 - 5.5 x 1.5 - 2 mm, glabrous; keel petals 4.5 - 6 x 2.5 - 3 mm, sparsely strigulose outside, lateral spur ca 1 mm long. Staminal sheath 4.5 - 6 mm long; anthers ca 0.8 mm long. Ovary ca 3 mm long, linear, sparsely hairy, 3 - 4-ovuled; style ca 2 mm long, glabrous. Pods (7 -) 10 - 12 x 2.5 mm, spreading, straight, subcylindrical to somewhat compressed, shortly apiculate, adpressed pilose, 3 - 4-seeded; endocarp diffusely spotted. Seeds ca 2 x 2 mm, nearly flat to cylindrical, truncate at both ends, smooth, shiny, reddish.

Type: Ind. Orient., Mysore, *Rottler s.n. Herb. De Candolle* 2: 222(G-DC, seen on microfische).

Fls.: Sept. - Dec.; *Frts.:* Dec. - Mar.

Distrib.: INDIA: Andhra Pradesh, Karnataka and Tamil Nadu; endemic.

Habitat: Open and disturbed areas on dry hills.

Exsicc.: Andhra Pradesh: Chittoor Dist., on road sides of Thirumalai-Tirupati hills, 500 m, 11 Oct., 1958, *K. Subramanyam* 6865; Cuddapah Dist., Bala-palli, Feb. 1883, *J.S. Gamble* 11016; Nellore Dist., Udaigiri Durgam, 280 m, 28 Aug. 1917, *C.E.C. Fischer* 4145; Karnataka: Bangalore Dist., on Bannerghatt hills, 15 Dec. 1980, *M. Sanjappa* 728.

Chr. No.: $2n = 16$ (Sanjappa & Dasgupta, *Indian Jour. Bot.* 6: 62. 1983).

Pollen: 3-zonocolporoidate, prolate-sphaeroidal, 33 x 30 (30 - 36 x 28 - 32) μm , granulate (Vishnu-Mittre & Sharma, *Pollen et Spores* 3: 5 - 45. 1962).

Notes: *I. mysorensis* is one of the first aggressive coloniser in deforested areas in dry deciduous forests on hills. This species can be easily recognised by its pinkish stems and branches, dark brown sticky glands below the apices of leaves and calyx, often these glands exude brown sticky liquid staining the leaves.

38. *Indigofera nigrescens* Kurz ex King & Prain in *Jour. Asiat. Soc. Bengal* 67: 286. 1898; Brandis, *Indian Trees* 218. 1906; Kanjilal *et al.*, *Fl. Assam.* 2: 21. 1938; de Kort & Thijssse in *Blumea* 30: 127. 1984; Sanjappa in *Reinwardtia* 10: 231. 1985.

Fig. 40, Map 4.

Shrub or treelet 2 - 5 m tall; branches erect, striate, blackish brown strigose, biramous hairs adpressed with equal arms. Leaves 7 - 12 cm long including 1 - 2 cm long petiole, alternate to subopposite; stipules 6 - 8 x 0.8 - 1 mm, linear to narrowly triangular, adpressed brown strigose outside with bluish spots; rachis 6 - 10 cm long; stipellae ca 1 x 0.5 mm, triangular, hairy; petiolules 1.5 - 2 mm long; leaflets 17 - 21, opposite, 15 - 21 x 6 - 21 mm, elliptic to elliptic to elliptic-oblong, cuneate to obtuse at base, obtuse to rounded and mucronate at apex, sparsely adpressed hairy on both surfaces, midrib prominent beneath, lateral nerves diffuse. Racemes 10 - 15 cm long including 2 - 3.5 cm long peduncle; rachis angular, adpressed brown pubescent, many-flowered; Flowers deep magenta coloured, 5 - 6 mm long; bracts 2.5 - 4 x 0.5 mm, narrowly triangular, brown pubescent outside with bluish spots, caducous; pedicels 1 - 1.5 mm long. Calyx adpressed brown pubescent outside with bluish spots, cup ca 3 mm long, teeth 1.5 - 2 x 0.5 - 0.8 mm, triangular. Standard ca 5.5 x 3.5 mm, elliptic to orbicular, densely adpressed hairy on the back with a tuft of white hairs near the base beneath; wing petals ca 4.5 x 1 mm, glabrous, ciliate along margins; keel petals ca 5.5 x 2.5 mm, adpressed brown hairy outside towards the tip, ciliate along margins, lateral spur ca 0.6 mm long. Staminal sheath 4 - 5 mm long; anthers ca 0.5 mm long. Ovary ca 3 mm long, linear, glabrous, 6 - 9-ovuled; style 2 mm long, glabrous. Pods 20 - 28 x 2 - 2.5 mm, spreading to descending, linear, cylindrical, abruptly short apiculate, adpressed short brown hairy, 6 - 9-seeded. Seeds 1.5 - 2 x 1 mm, cylindric, rounded at both ends, smooth, shiny, reddish-brown.

Type: Upper Burma, Maymyo, Oct. 1888, *B. Khan* 203 (CAL, lecto!).

Fls.: June - Oct.; *Frts.:* Oct. - Dec.

Distrib.: INDIA: Arunachal Pradesh, Manipur, Meghalaya and Nagaland; NEPAL, CHINA, MYANMAR, THAILAND, VIETNAM, TAIWAN, INDONESIA (Java), PHILIPPINES.

Habitat: Undergrowth in forests between 600 and 1500 m.

Exsicc.: Assam, Lasami, 4500 ft., 27 Aug. 1942, *N.L. Bor* 15912; Meghalaya: Khasia & Jaintia hills, Rait Kawang, 4200 ft., 29 Oct. 1915, *U. Kanjilal* 6163 (BSIS); Arunachal Pradesh: Lohit Dist., Paya-Nava, 17 Nov., 1957, *R.S. Rao* 10675; Nagaland: Sarpung in Naga hills, 5000 ft., Dec. 1907, *A. Meebold* 7273.

39. *Indigofera nummulariifolia* (Linn.) Livera ex Alston in Trimen, Handb. Fl. Ceylon 6, Suppl.: 72. 1931; Ramaswamy & Razi, Fl. Bangalore Dist. 265. 1973, 'nummularifolium'. *Hedysarum nummulariifolium* Linn., Sp. Pl. 746. 1753; *H. rotundifolium* Vahl, Symb. Bot. 2: 81. 1761. *Onobrychis rotundifolia* (Vahl) Desv. in Jour. Bot. 3: 80. 1814; DC., Prodr. 2: 348. 1825; *Indigofera*

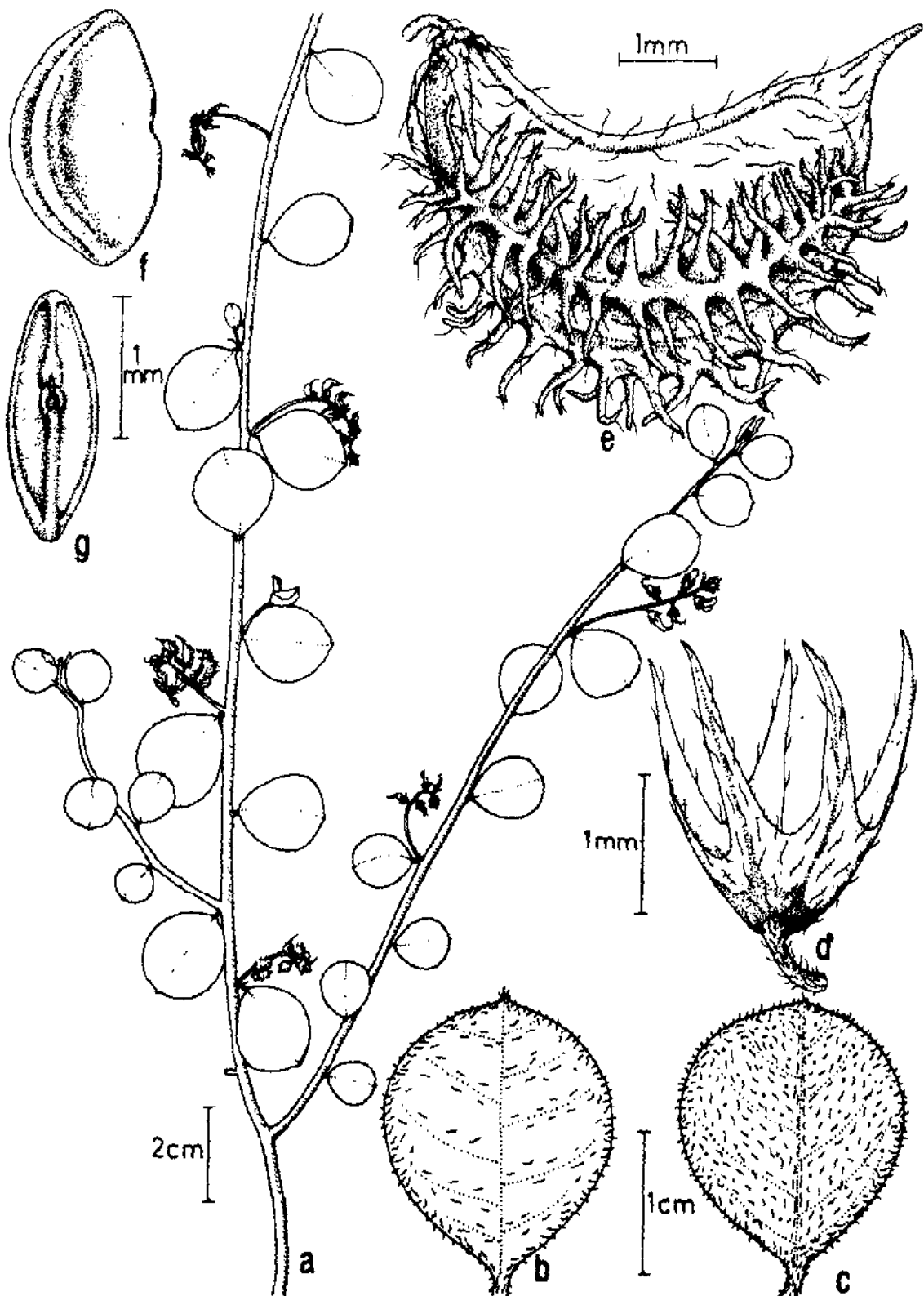
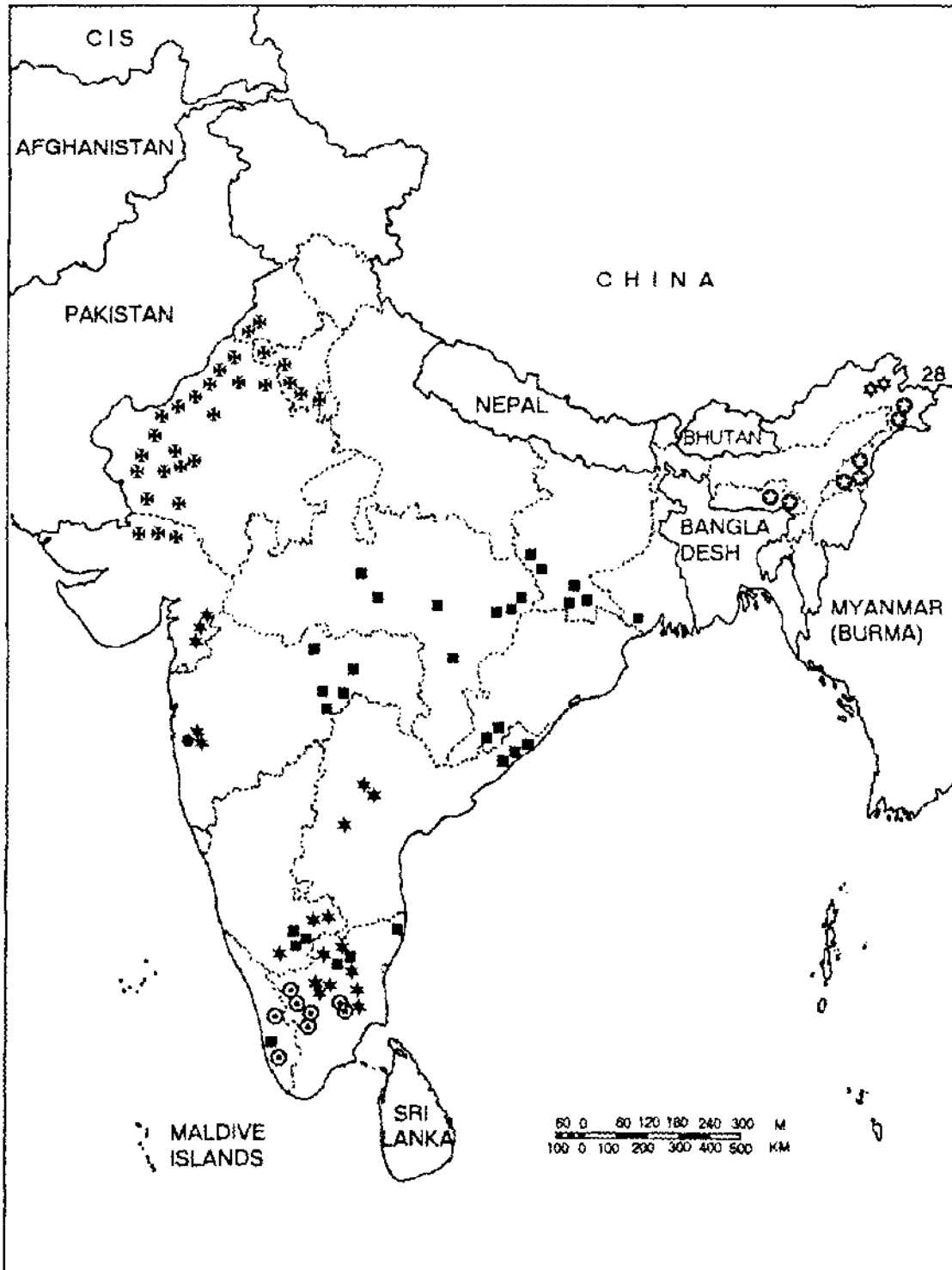


Fig. 41. *Indigofera nummularifolia* (Linn.) Livera ex Alston : a. Habit, b. Leaf-adaxial surface, c. Leaf-abaxial surface, d. Calyx, e. Pod, f. Seed-side view, g. Seed-hilar view (a-e: Stocks, Law etc. s.n.; f-g: Cleghorn s.n.).



Map 5. *Indigofera nummulariifolia* (Linn.) Livera ex Alston (■); *I. parviflora* Heyne ex Wight & Arn. (★); *I. pedicellata* Wight & Arn. (⊙); *I. pseudoreticulata* Grierson & Long (★); *I. santapau* Sanjappa (●); *I. sesquipedalis* C.B. Clarke ex Sanjappa (⊙); *I. sessiliflora* DC. (★).

echinata Willd., Sp. Pl. 3: 1222. 1802; DC., Prodr. 2: 222. 1825; Roxb., Fl. Ind. 3: 370. 1832; Wight & Arn., Prodr. 198. 1834; Wight, Icon. Pl. Ind. Orient. t. 316. 1840; Dalz. & Gibs., Bombay Fl. 57. 1861; Drury, Handb. Indian Fl. 1: 276. 1864; Baker in Hook. f., Fl. Brit. India 2: 92. 1876; T. Cooke, Fl. Pres. Bombay 1: 310. 1902 (*Repr.* 1: 330. 1967); Prain, Bengal Pl. 1: 431. 1903 (*Repr.* 1: 309. 1963); Gamble, Fl. Pres. Madras 308. 1918 (*Repr.* 1: 218. 1967); Haines, Bot. Bihar Orissa 2: 237. 1922 (*Repr.* 1: 248. 1961). *Hedysarum erinaceum* Poiret in Lam., Encycl. 6(2): 398. 1806. *H. cuneifolium* Roth, Nov. Pl. Sp. 357. 1821. *Onobrychis cuneifolium* (Roth) DC., Prodr. 2: 348. 1825. *Acanthonotus echinata* (Willd.) Benth. in Hook. f., Fl. Niger 293. 1849. Fig. 41, Map 5.

Local name: Nalla palleru (Tel.).

Annual, prostrate or diffuse herb; branches usually flattened, reddish or greenish, sparsely adpressed biramous hairy, sometimes rooting at nodes. Leaves simple; stipules 1.8 - 2.8 x 0.5 - 0.7 mm, subulate to narrowly triangular, hairy; petioles 1.5 - 3.2 mm long, pulvinate; leaf blades 1 - 3 x 1 - 2.5 cm, broadly ovate or obovate, acute to rounded at base and apex, mucronulate, sparsely adpressed on both surfaces especially along margin and veins, the hairs along set at right angles to it and larger than others, minutely gland-dotted beneath. Racemes 3.5 - 5.5 cm long including 1 - 1.8 cm long peduncle, 10 - 15-flowered. Flowers pink, 4 - 4.5 mm long; bracts 1 - 1.5 mm long, narrowly triangular; pedicels ca 1 mm long, reflexed in fruits. Calyx 2 - 2.5 mm long, teeth 1.5 - 2 mm long, narrowly triangular. Standard ca 3 x 1.5 mm, broadly ovate, strigose on the back; wing petals ca 2.5 mm long, glabrous; keel petals ca 3.5 mm long, glabrous, lateral spur short. Staminal sheath 2 - 2.5 mm long. Ovary 2 - 2.5 mm long with a few hairs on dorsal side, 2-ovuled, only one develops into seed; style up to 1 mm long, glabrous. Pod 5 - 7 x 3 - 4 mm, falcate, triquetrous, echinate on the two lower angles with stiff hooked spines, brown, 1-seeded; endocarp smooth. Seeds 1.5 - 1.8 x 0.5 - 1 mm, smooth, reddish-brown.

Type: Sri Lanka, *Hermann* vol. 3, fol. 10(BM!).

Fls.: Aug. - Oct.; *Frts.:* Oct. - Dec.

Distrib.: INDIA: Andhra Pradesh, Bihar, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Tamil Nadu and West Bengal; SRI LANKA, THAILAND, CHINA, CAMBODIA, S. VIETNAM, MADAGASCAR, TROPICAL AFRICA.

Habitat: Generally on loamy soils on fully exposed dry areas. Also recorded from moist borders of rice fields.

Exsicc.: Bihar: Basia, Lohardung, 200 m, 10 Sept. 1883, C.B. Clarke 34107 D-H; Karnataka: Bangalore Dist., Bannerhatta hills, 15 Dec. 1980, M. Sanjappa 729; Orissa: Ganjam Dist., Chatrapur, Dec. 1889, J.S. Gamble 21588; Tamil Nadu: Chingleput Dist., Tirupporur R.F., 1 Feb. 1976, A.N. Henry 47146.

Chr. No.: $2n = 16$ (Frahm-Leliveld, Act. Bot. Neerl. 9: 286. 1960); $n = 8$ sub *I. echinata* (Bir & Kumari, Taxon 24: 515. 1975).

Use: The young shoots of this species are relished by cattle.

Notes: Gillett (1958) remarked that the leaves of *I. nummulariifolia* are usually adpressed strigose adaxially in Africa and glabrous in India. In India both the conditions are observed.

Pollen: 3-zonocolporate, spheroidal or subprolate, 27×31 ($22 - 33 \times 25 - 37$) μm , finely striate-rugulate (Ferguson & Strachan, Pollen et Spores 24: 171 - 210. 1982).

40. *Indifofera oblongifolia* Forsskal, Fl. Aegypt.-Arab. 137. 1775; Duthie, Fl. Upp. Gang. Pl. 1: 253. 1903 (*Repr.* 1: 233. 1960); Gamble, Fl. Pres. Madras 322. 1918 (*Repr.* 1: 219. 1967); Santapau, Fl. Saurashtra 127. 1962; Mahesh., Fl. Delhi 117. 1963; Bhandari, Fl. Indian Desert 119. 1978; de Kort & Thijsse in Blumea 30: 129. 1984; R.S. Rao, Fl. Goa etc. 1: 125. 1985. *I. paucifolia* Delile, Fl. Egypt. 107, t. 37, f. 2. 1813; DC., Prodr. 2: 224. 1825; Wight & Arn., Prodr. 201. 1834; Wight, Icon. Pl. Ind. Orient. t. 331. 1840; Dalz. & Gibs., Bombay Fl. 59. 1861; Drury, Handb. Indian Fl. 1: 279. 1864; Baker in Hook. f., Fl. Brit. India 2: 97. 1876; T. Cooke, Fl. Pres. Bombay 1: 313. 1902 (*Repr.* 1: 334. 1967); Brandis, Indian Trees 218. 1906; Talbot, For. Fl. Bombay 380. 1909; Parker, For. Fl. Punjab 130. 1918. *I. argentea* auct. non Burm. f. 1768, nec Linn. 1771: Buch.-Ham. ex Roxb., Fl. Ind. 3: 374. 1832. Fig. 42.

Local names: Jhil, Zil, Ziladi, Zildo (Guj.), Goila (Raj.), Jhilla, Maridupatraka, Raktapala, Sujhilla (Sans.), Kattukkaruchammanti (Tam.).

Shrub, 60 - 150 cm high; branches stout, purplish to ash-grey, biramous hairs adpressed with both equally and unequal arms. Leaves 3 - 5 cm long including 2 - 3 mm long petioles, sometimes sessile; stipules 2.5 - 5 x 1 - 2 mm, narrowly triangular, connate along inner margins at base, scabrous outside; rachis 1 - 3 cm long; stipellae ca 1 mm long; petiolules 1 - 2 mm long; leaflets 1 - 5, alternate, 10 - 30 x 3 - 6 mm, linear to elliptic, narrowly lanceolate or obovate, cuneate to obtuse at base, acute to obtuse and mucronate at apex, scabrous on both surfaces, midrib prominent beneath. Racemes 3 - 8 cm long, subsessile or shortly peduncled, rachis pink, scabrous, many-flowered. Flowers reddish-pink, 4.5 mm long; bracts 1 - 1.5 x 1 mm, triangular, hairy outside, caducous;

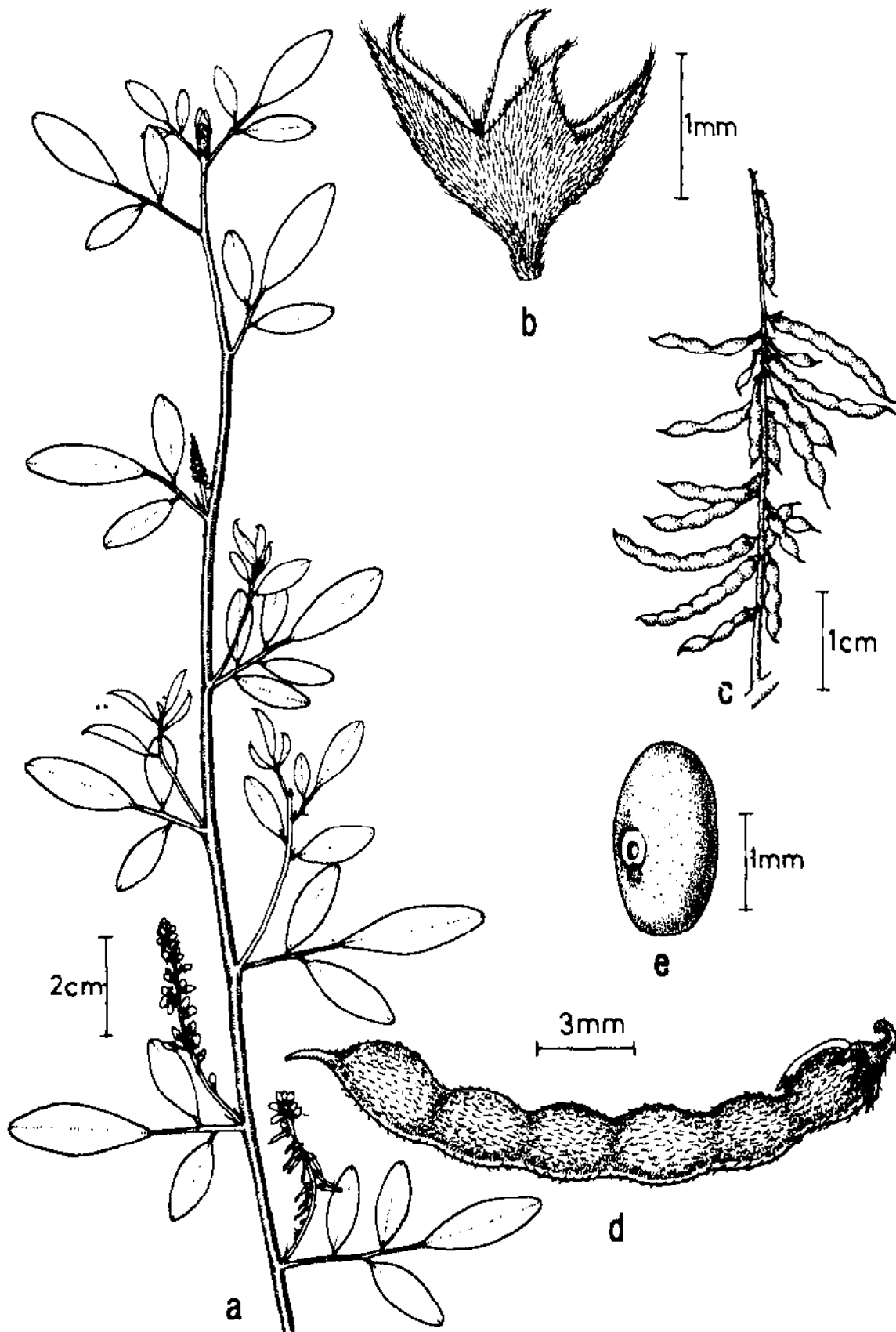


Fig. 42. *Indigofera oblongifolia* Forsskal : a. Habit, b. Calyx, c. Infructescence, d. Pod, e. Seed-hilar view (a: *N.C. Nair* 16345; b-e: *Tiwari* 993).

pedicels 1 - 1.5 mm long. Calyx scabrous outside, cup ca 1 mm long, teeth 1 - 1.5 mm x 0.5 mm, narrowly triangular. Standard 4.5 - 5 x 3 - 4 mm, obovate to orbicular, scabrous on the back; wing petals 3.5 - 4.5 x 1 mm, glabrous, furrow ca 1 mm long, thick, fleshy; keel petals 4 - 4.5 x 1.5 - 2 mm, scabrous towards the tip, ciliate along margins, lateral spur ca 0.5 mm long. Staminal sheath 4 - 4.5 mm long; anthers ca 0.5 mm long. Ovary 2.5 - 3 mm long, linear, glabrous or with few hairs, 6 - 9-ovuled; style 1 - 1.5 mm long, glabrous. Pods lax, reflexed, cylindrical, curved upwards, constricted between seeds, abruptly apiculate, pinkish, (1 - 5)6 - 8 (- 9)-seeded; endocarp usually smooth, sometimes faintly spotted, cracking in mature pods. Seeds ca 2 x 1 mm, cylindric, rounded at both ends, smooth, shiny, yellow to reddish-brown.

Type: Egypt, Arabia, *Forsskal s.n.* (C, photo!).

Fls.: Throughout the year; *Frts.:* Sept. - Dec.

Distrib.: INDIA: Andhra Pradesh, Delhi, Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Punjab, Rajasthan, Tamil Nadu and Uttar Pradesh; SRI LANKA, PAKISTAN, MIDDLE EAST, WEST ASIA, TROPICAL AFRICA, introduced in Indonesia (Java).

Habitat: Sandy coasts, arid fallow lands, road sides up to 1500 m.

Exsicc.: Andhra Pradesh: Chitoor Dist., Mamadur, 55 m, 14 March 1918, *C.E.C. Fischer* 4285; Gujarat: Dwaraka, 11 Oct. 1961, *T.A. Rao* 326; Karnataka: Dharwar Dist., Khupur hills, 2 Sept. 1889, *W.A. Talbot* 1970. Rajasthan: Jodhpur Dist., Luni River bed, 29 Sept. 1973, *G.L. Tiwari* 650; Tamil Nadu: Krusadai Island, 25 Dec. 1960, *T.A. Rao* 617.

Chr. No.: $2n = 16$ (*Frahm-Leliveld*, *Genetica* 37: 48. 1966) $n = 8$ (*Sanjappa & Bhatt*, *Jour. Cytol. Genet.* 14: 60. 1979); $2n = 14$ (*Baquar et al.*, *Bot. Notis.* 119: 26. 1966).

Pollen: 3-zonocolporate or colporoidate, subprolate, 27×23 ($26 - 28 \times 22 - 24$) μm , (*Vishnu-Mittre & Sharma*, *Pollen et Spores* 4: 5 - 45. 1962, sub *I. paucifolia* Delile).

Notes: White flowered plants are recorded from Krusadi Island off the coast of Tamil Nadu.

41. *Indigofera parviflora* Heyne ex Wight & Arn., *Prodr.* 201. 1834; Drury, *Handb. Indian Fl.* 1: 279. 1864; Baker in Hook. f., *Fl. Brit. India* 2: 97. 1876 excl. syn. *I. linearis* Guillemann & Perrottet, 1832; T. Cooke, *Fl. Pres. Bombay* 1: 317. 1902 (*Repr.* 1: 338. 1967); Gamble, *Fl. Pres. Madras* 311. 1918 (*Repr.* 1: 220.

1967); Ramaswamy & Razi, Fl. Bangalore Dist. 267. 1973; Sharma *et al.* in Biol. Mem. 2: 43. 1977; R.S. Rao, Fl. Goa etc. 1: 125. 1985. *Anila parviflora* (Heyne ex Wight & Arn.) O. Kuntze, Rev. Gen. Pl. 2: 939. 1891. **Fig.43, Map 5.**

Annual herb, 20 - 60 cm high; stems and branches erect, strigose, biramous hairs adpressed with equal arms. Leaves 5 - 8 cm long including 1 - 2 cm long petiole; stipules 1 - 1.5 x 0.5 mm, narrowly triangular to somewhat linear, partly adnate to petiole at base, strigulose outside; rachis 3 - 5 cm long, prolonged beyond lateral leaflets, scabrous; leaflets (3 -) 5 - 7 (-9), opposite, rarely subopposite, 20 - 30 x 2.5 - 3 mm, linear, sometimes oblanceolate to elliptic, obtuse to acute at base and apex, mucronate, generally glabrous above, rarely sparsely hairy, sparsely adpressed strigose beneath. Racemes 1 - 2.5 cm long, sessile; rachis adpressed strigose, many-flowered. Flowers pink, 5 - 5.5 mm long; bracts 1 - 1.2 x 0.5 mm, triangular to lanceolate, caducous; pedicels ca 1 mm long. Calyx strigose outside, cup 0.5 - 1 mm long, teeth 1 - 1.5 x 0.5 mm, triangular. Standard 5 - 5.5 x 2.5 - 3 mm, obovate, glabrous; wing petals 4.5 - 5 x 1.5 mm, glabrous; keel petals 5 - 5.5 x 2 mm, distinctly produced into caudate tip, glabrous, lateral spur absent, rarely if present obscure. Staminal sheath 5 mm long; anthers ca 0.4 mm long. Ovary 2 - 3 mm long, glabrous; style 2 - 2.5 mm long, glabrous. Pods 30 - 40 x 3 - 4 mm, reflexed, subcylindric, upcurved towards tip, somewhat flattened, strigulose, 8 - 14-seeded. Seeds ca 2 x 1.5 mm, cubical, truncate at ends, minutely tuberculate, sometimes mottled, shiny, reddish-brown.

Type: India, Heyne in Wallich, Cat. No. 5457 (K-W, lecto ! CAL !).

Fls.: Sept. - Nov.; *Frts.:* Oct. - Dec.

Distrib.: INDIA: Andhra Pradesh, Gujarat, Karnataka, Maharashtra and Tamil Nadu; SRI LANKA, AUSTRALIA, YEMEN, CONGO, SUDAN, ERITREA, ETHIOPIA, MOZAMBIQUE, S.W. & S. AFRICA.

Habitat: Cultivated fields, disturbed soils on dry slopes and foot hills between 250 and 1000 m.

Exsicc.: Andhra Pradesh: On slopes of Nagarjunakonda valley, 29 Nov. 1961, *K. Thothathri* 9846; Karnataka: Mysore, near tank, 6 Sept. 1893, *W.A. Talbot* 3066; Maharashtra: Shivaji Fort, Junnar, 21 Oct. 1970, *B.K. Vijay Kumar* 1282; Tamil Nadu: Coimbatore Dist., Bailur, 340 m, 23 Nov. 1905, *C.E.C. Fischer* 751.

Chr. No: $2n = 14$ (Hagerup, Hereditas 16: 19 - 40. 1932); $2n = 16$ (Sanjappa, Taxon 27: 390. 1978); $n = 8$ (Sanjappa & Dasgupta, Indian Jour. Bot. 6: 62. 1983).

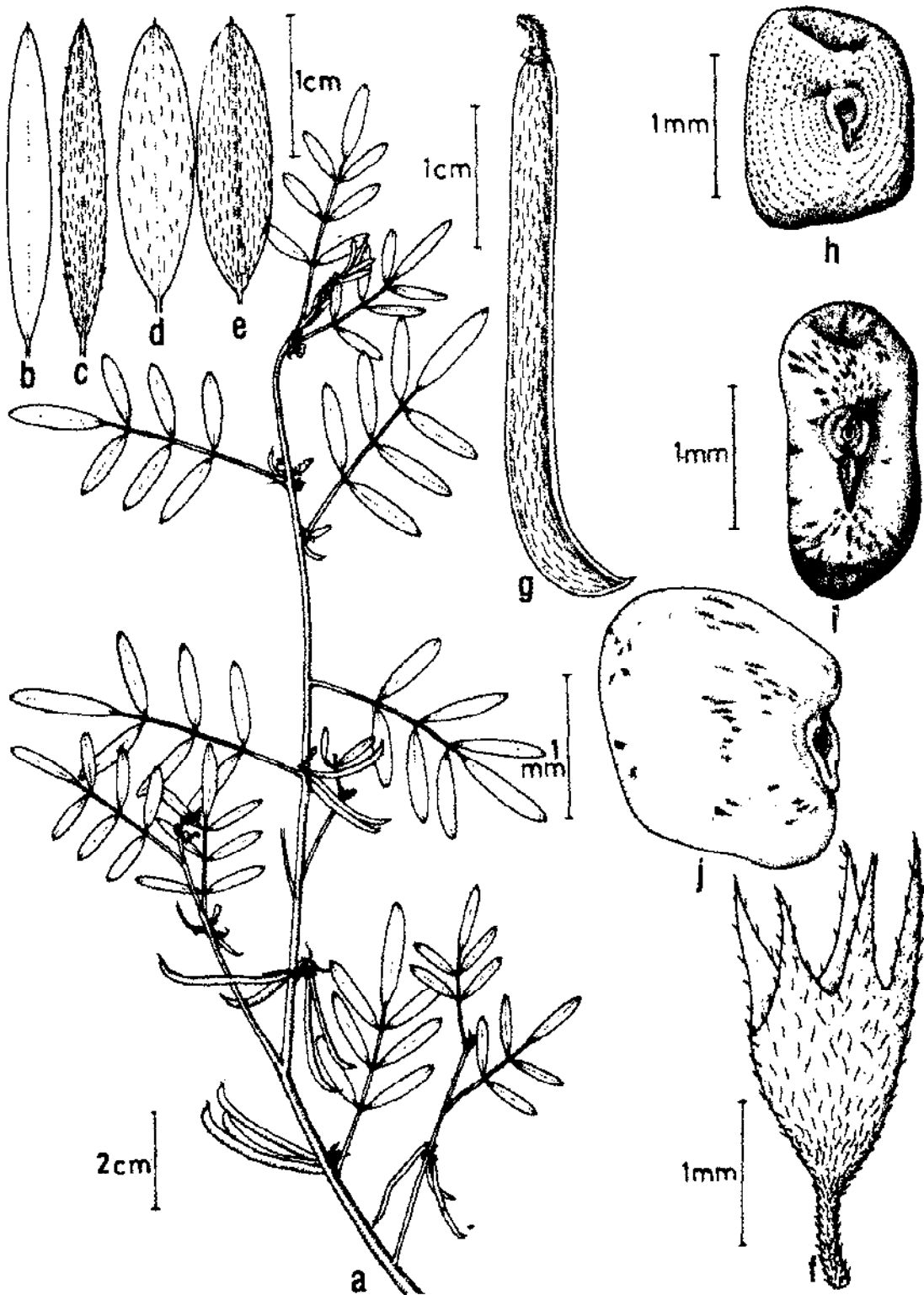


Fig. 43. *Indigofera parviflora* Heyne ex Wight & Arn. : a. Habit, b & d. Leaflet-adaxial surface, c & e. Leaflet-abaxial surface, f. Calyx, g. Pod, h. & i. Seed-hilar view, j. Seed-side view (a: Heyne s.n. K; b-c: Talbot 3060; d-e: V.Kumar 1282; f: K. Subramanyan 1820; g: Wight s.n.; i-j: Hemadri 104327, BSI).

Pollen: 3-zonocolporate, spheroidal, 28 x 25 (25 - 30 x 20 - 33) μm , psilate to rugulate (Ferguson & Strachan, *Pollen et Spores* 24: 171 - 210. 1982).

42. *Indigofera pedicellata* Wight & Arn., *Prodr.* 200. 1834; Wight, *Icon. Pl. Ind. Orient.* t. 983. 1845 & *Spicil. Neilgherr.* 1: 46, t. 56. 1846; Drury, *Handb. Indian Fl.* 1: 278. 1864; Baker in *Hook. f., Fl. Brit. India* 2: 94. 1876; Gamble, *Fl. Madras* 310. 1918 (*Repr.* 1: 218. 1967); Fyson, *Fl. S. Indian Hill Stat.* 1: 155. 1932; Sharma *et al.* in *Biol. Mem.* 2: 43. 1977; Britto in Matthew, *Fl. Tamil Nadu Carn.* 1: 426. 1983; Sanjappa in *Jour. Econ. Tax. Bot.* 5: 1035. 1984 & in *Taiwania* 29: 111. 1984; Ahmed. & Nayar, *Endem. Pl. Indian Reg.* 99. 1987. *I. trifoliata* auct. non Linn. 1756: Haung & Ohashi in Li *et al.*, *Fl. Taiwan* 3: 309. 1977.
Fig. 44, Map 5.

Herb, 25 - 35 cm high; branches slender, trailing, sometimes erect, woody, biramous hairs brown, adpressed with equal arms, gland-dotted on younger parts. Leaves digitately trifoliolate, 1.5 - 3 cm long including 5 - 8 mm long petioles; petioles pubescent, sparsely gland-dotted; stipellae ca 1 mm long; petiolules ca 1 mm long; leaflets 12 - 25 x 5 - 10 mm, obovate, sometimes lanceolate to elliptic, obtuse at base, obtuse to acute and mucronate at apex, sparsely adpressed pubescent on both surfaces, copiously brown gland-dotted beneath. Racemes 1 - 2.5 cm long including ca 5 mm long peduncle, axillary, corymbose; rachis hairy, gland-dotted. Flowers brick-red, ca 5 mm long; bracts 1 - 1.3 x 0.5 mm, narrowly triangular, persistent; pedicels 5 - 8 mm long, pubescent and gland-dotted. Calyx adpressed pubescent, copiously brown gland-dotted outside, cup ca 0.5 mm long, pubescent, teeth ca 1 - 1.5 x 0.5 mm, narrowly triangular. Standard 4 - 4.5 x 3 - 3.5 mm, ovate-orbicular, adpressed brown pubescent and gland-dotted on the back; wing petals ca 4 x 1.5 mm, glabrous; keel petals 4 - 4.5 x 2 - 2.5 mm, brown pubescent and copiously gland-dotted outside; lateral spur 0.8 - 1 mm long. Staminal sheath ca 4.5 mm long, anthers ca 0.5 mm long. Ovary 1 - 1.5 mm long, linear, glabrous or with a few hairs; style ca 2 mm long, copiously beset with glands. Pods 15 - 25 x 2 - 3 mm, spreading, linear, subcylindric, shortly apiculate, sparsely pubescent, beset with glands towards the tip; 5 - 6-seeded. Seeds ca 1.5 x 1 mm, rectangular, rounded at both ends, smooth, reddish-brown.

Type: India, Nilghirries, Wight 868 (E, holo ! K !).

Fls.: July - Oct.; *Frts.*: Sept.-Nov.

Distrib.: INDIA: Tamil Nadu and Kerala hill tops; TAIWAN (Pingtung).

Habitat: Grass lands, as an undergrowth on exposed hill slopes between 750 and 2500 m.

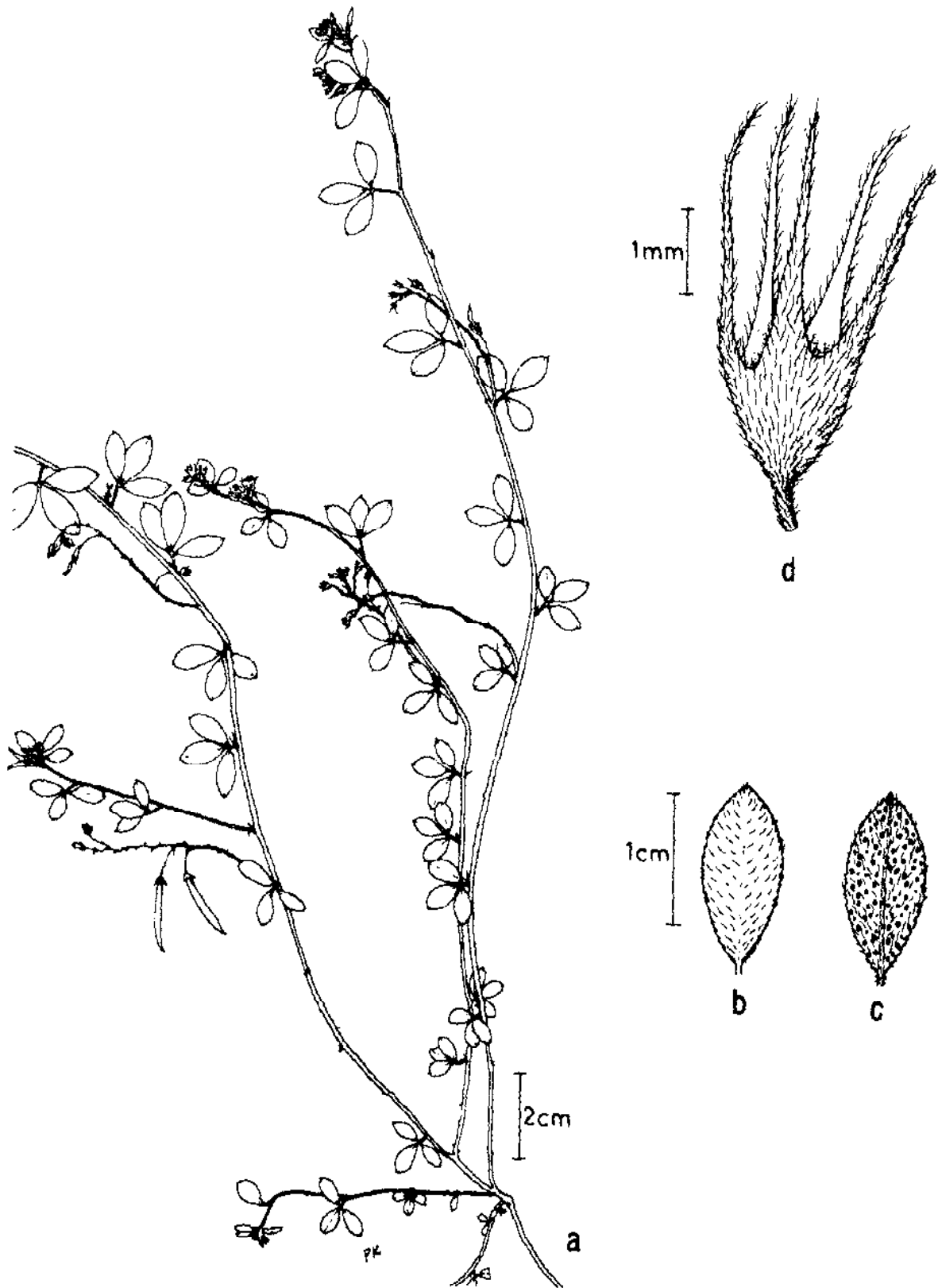


Fig. 44. *Indigofera pedicellata* Wight & Arn. : a. Habit, b. Leaflet-adaxial surface, c. Leaflet-abaxial surface, d. Calyx (a-d: *Lawson s.n.*).

Exsicc.: Tamil Nadu: Salem Dist., Shevaroy hills, ca 1470 m, 17 Aug. 1965, A.V.N. Rao 26922; Nilgiris, Kolakambri, 1900 m, Sept. 1835, J.S. Gamble 16830; Kodaikanal, 750 m, 28 Oct. 1956, P.C. Nanda 686; Madurai Dist., high wavy mountains, May 1917, E. Blatter 279 (BLAT).

Chr. No.: n = 8 (Sanjappa & Dasgupta, Indian Jour. Bot. 6: 62. 1983).

Pollen: 3-zonocolporate, subprolate, 28.8 x 26 (25 - 33 x 22 - 29) μ m, reticulate (Vasanthi, Inst. Fr. Pondichery Trav. Sect. Sci. Tech. 15: 25. 1976).

43. *Indigofera prostrata* Willd., Sp. Pl. 3: 1226. 1802; Gamble, Fl. Pres. Madras 310. 1918 (*Repr.* 1: 219. 1967) Santapau, Fl. Khandala 3: 55. 1967; Gandhi in Saldanha & Nicolson, Fl. Hassan Dist. 257. 1976; Sharma *et al.* in Biol. Mem. 2: 43. 1977; Britto in Matthew, Fl. Tamil Nadu Carn. 1: 427. 1983; R.S. Rao, Fl. Goa etc. 1: 125. 1985. *I. trifoliata* auct. non Linn. 1756: Wight & Arn., Prodr. 201. 1834, p.p.; Baker in Hook. f., Fl. Brit. India 2: 96. 1876, p.p.; Saldanha & G. Singh in Saldanha, Fl. Karnataka 1: 473. 1984, p.p. de Kort & Thijssse in Blumea 30: 137. 1984, p.p. Fig. 53f - h.

Herb, up to 30 cm high; roots much branched, covered with nodules; branches slender, prostrate to ascending, biramous hairs grey adpressed with equal arms. Leaves digitately trifoliolate; stipules ca 1.5 x 1 mm, narrowly triangular, adherent at base; petioles 5 - 8 mm long, canaliculate above, pubescent; stipellae absent; petiolules ca 1 mm long; leaflets 10 - 18 x 5 - 9.5 mm, obovate or oblanceolate, sometimes elliptic, adpressed pubescent on both surfaces, brown gland-dotted beneath. Racemes 3 - 5 mm long, axillary, sessile, globose; rachis pubescent, gland-dotted, 4 - 10-flowered. Flowers pink, ca 3 mm long; bracts ca 1 mm, triangular, caducous; pedicels ca 1 mm long. Calyx adpressed pubescent outside, cup ca 0.5 mm long, teeth ca 1.5 mm long, narrowly triangular. Standard ca 3 x 2 mm, elliptic, sometimes obovate, adpressed hairy and copiously gland-dotted on the back; wing petals ca 2.5 x 1 mm, glabrous; keel petals ca 2.5 x 1.5 mm, adpressed hairy and copiously gland-dotted on the back, lateral spur ca 0.8 mm long. Staminal sheath ca 2.5 mm long; anthers ca 0.5 mm long. Ovary ca 2 mm long, linear, glabrous, up to 8-ovuled; style ca 1 mm long, glabrous, beset with glands at the base. Pods 15 - 20 x 1 - 1.5 mm, descending, straight, filiform, subcylindric, torulose, shortly apiculate, 5 - 8-seeded, sutures obscurely winged, sparsely adpressed pubescent and glanduliferous towards the tip. Seeds 1 - 1.5 x 0.8 mm, rounded at both ends, shiny, brown.

Type: Ind. Or., *Herb. Willdenow* -13888(B-WILLD, photo!).

Fls.: Aug. - Jan.; *Frts.*: Sept. - Jan.

Distrib.: INDIA: Andhra Pradesh, Goa, Gujarat, Karnataka, Kerala, Maharashtra and Tamil Nadu; endemic.

Habitat: Cultivated fields, wastelands, grasslands between 50 and 1300 m.

Exsicc.: Andhra Pradesh: Kurnool Dist., Nallamalais, way to Velgode, 650 m, 27 Oct. 1964, *J.L. Ellis* 22225; Goa: Angidev Island, 24 Sept. 1965, *J. Cherian* 106629; Karnataka: Uttara Kannada Dist. ('North Canara' Dist.), Yellapore, 30 Oct. 1882, *W.A. Talbot* 31; Kerala: Palghat Dist., Mukkali forest, 200 m, 18 Oct. 1965, *E. Vajravelu* 26291; Maharashtra: Satara Dist., Wai to Panchgani Road, between 7th and 8th Km point, 24 Oct. 1982, *M. Sanjappa* 9518.

Notes: Ali (1958) and de Kort & Thijsse (1984) have reduced this species as a synonym of *I. trifoliata*, while Gamble (1918) and Santapau (1953) have treated it as a distinct species and distinguished it from *I. trifoliata* in having slender, trailing branches, almost filiform, deflexed pods. In addition to these distinguishing characters, *I. prostrata* differs from *I. trifoliata* in diffuse-prostrate habit, obscurely winged and constantly 5 - 8-seeded pods, while *I. trifoliata* has stout, erect branches, larger leaflets and flowers and prominently winged, 8 - 12-seeded pods.

44. *Indigofera pseudoreticulata* Grierson & Long in Notes R.B.G. Edinburgh 37: 345. 1979 & Fl. Bhutan 1: 666. 1987. **Fig. 22f, Map 5.**

Trailing or prostrate shrub, 30 - 60 cm high; branches slender, prostrate to ascending, 10 - 50 cm long, biramous hairs adpressed with equal arms. Leaves 2.5 - 6 cm long including 3 - 10 mm long petiole; stipules 1.5 - 3.5 x 1 - 1.5 mm, narrowly triangular, pubescent outside; rachis 1 - 4 cm long, canaliculate above, adpressed brown pubescent; stipellae ca 1 mm long, narrowly triangular; petiolules ca 1 mm long, pubescent; leaflets 9 - 15, opposite, 5 - 12 x 3 - 8 mm, elliptic, sometimes ovate, obtuse to rounded at base, obtuse to acute and mucronate at apex, adpressed white pubescent above, adpressed white and brown hairy beneath, brown hairs prominent on midrib and margin; venation reticulate. Racemes 6 - 13 cm long including 3 - 8 cm long peduncle, axillary; rachis striate, adpressed dark brown pubescent, many-flowered. Flowers purple or mauve, 8 - 10 mm long; bracts 1.5 - 2 x 0.5 - 1 mm, triangular, adpressed brown pubescent, subpersistent; pedicels 1.5 - 2 mm long, pubescent. Calyx adpressed brown pubescent outside, cup 0.5 - 1 mm long, teeth 1 - 1.2 mm long, triangular. Standard 7 - 8 x 4 - 5 mm, obovate, mucronate, adpressed hairy on the back; wing petals 6.5 - 7.5 x 3 mm, glabrous; keel petals 7 - 8 x 3 - 3.5 mm, adpressed hairy towards the tip, lateral spur ca 0.5 mm long. Staminal sheath 6.5 - 7 mm long; anthers ca 0.6 mm long. Ovary 3.5 - 3.5 mm long, linear, glabrous, 8 - 10-ovuled; style 2.5 - 3.5 mm long, glabrous. Pods not seen.

Type: Bhutan, Julu & Denchung, 2285 m, 5 Aug. 1959, *Ludlow, Sheriff & Hicks* 21393 (E, holo ! BM, iso !).

Fls.: July - Aug.

Distrib.: INDIA: Arunachal Pradesh; NEPAL, BHUTAN.

Habitat: Exposed slopes in valleys between 2300 and 3200 m.

Exsicc.: Arunachal Pradesh: Kameng F.D., 10000 - 15000 ft., 17 Aug. 1958, *M. Ramunny* 16620 (CAL, ASSAM); Selari forest, 2000 m, 15 Sept. 1964, *J. Joseph* 39987 (ASSAM).

45. *Indigofera santapau* Sanjappa in Bull. Bot. Surv. India 25: 120. 1985; Ahmed. & Nayar, Endem. Pl. Indian Reg. 99. 1987. **Fig. 5cf, Map 5.**

Herb, 15 - 35 cm high; branches slender, reddish, biramous hairs adpressed with short, equal arms. Leaves pinnately trifoliolate; stipules 2.5 - 3 x 1 mm, narrowly triangular, hairy; petioles 1 - 2 cm long, somewhat canaliculate above, hairy; stipulae absent; petiolules ca 2 mm long, hairy; leaflets 2.5 - 4 x 1.2 - 1.8 cm, obovate to obovate-oblong, cuneate at base rounded and mucronate at apex, sparsely adpressed pubescent on both surfaces, sparsely brown gland-dotted beneath. Racemes 4 - 8 mm long, axillary, sessile; rachis pubescent, 6 - 12-flowered. Flowers solomon red, ca 5 mm long; bracts ca 1 x 0.4 mm, triangular, caducous; pedicels 1 - 1.5 mm long. Calyx adpressed pubescent and gland-dotted outside, cup ca 0.5 mm long, teeth ca 1.5 mm long, narrowly triangular. Standard ca 4 x 2.5 mm, obovate, mucronate, adpressed strigose and gland-dotted on the back; wing petals ca 2.5 x 1 mm, glabrous; keel petals 4 x 1.5 mm, adpressed strigose and gland-dotted outside, lateral spur ca 0.6 mm long. Staminal sheath 3 - 3.5 mm long; anthers ca 0.5 mm long. Ovary 1.5 - 2 mm long, sparsely hairy, 4-ovuled; style 1 - 1.5 mm long, glabrous, beset with glands at base. Pods 10 - 20 x 2.5 - 3 mm, deflexed, straight, subcylindric, shallowly constricted between seeds, shortly apiculate, biramous hairs densely spreading with unequal arms, beset with glands towards the tip, 4-seeded; sutures obscurely winged. Seeds ca 1.5 x 1 mm, rounded at ends, smooth, shiny, reddish-brown.,

Type: India: Maharashtra, Pune Dist., Vazirghad-Purandhar, 9 Oct. 1950 *H. Santapau* 11397 (BLAT, holo).

Fls.: Aug. - Oct.; *Frts.:* Sept. - Nov.

Distrib.: INDIA: Maharastra; endemic.

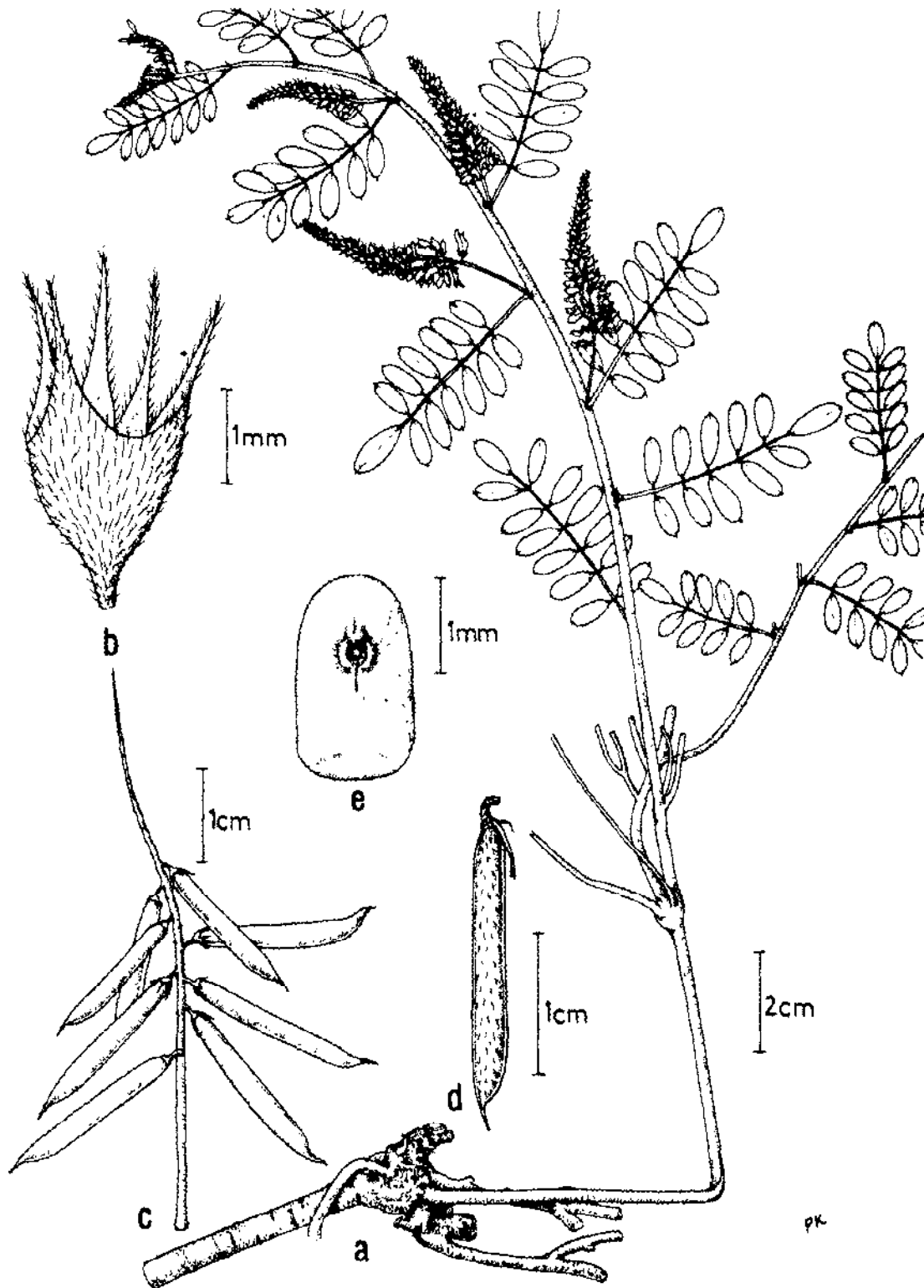


Fig. 45. *Indigofera sesquipedalis* C.B. Clarke ex Sanjappa : a. Habit, b. Calyx, c. Infructescence, d. Pod, e. Seed-hilar view (a-b: Collett s.n.; c-e: C.B. Clarke 18598).

Habitat: Exposed hill slopes at an altitude of ca 1500 m.

Exsicc.: So far known by type collections only.

46. *Indigofera sesquipetalis* C.B. Clarke ex Sanjappa in Jour. Bombay Nat. Hist. Soc. 81: 445. 1984 & in Jour. Econ. Tax. Bot. 5: 1135. 1984.

Fig. 46, Map 5.

Shrub, 60 - 100 cm high; root stock stout, woody; branches angular, biramous hairs adpressed with equal arms. Leaves 2.5 - 3 cm long including 6 - 10 mm long petiole; stipules 1 - 1.5 x 0.8 mm, triangular, hairy outside; rachis 1.5 - 2.5 cm long, canaliculate above, hairy; stipellae ca 1 mm long; petiolules ca 1 mm long; leaflets (5 -) 7 - 11 (- 17), opposite, 5 - 7 x 2 - 3 mm, obovate or elliptic, obtuse at base and apex, mucro ca 1 mm long, sparsely adpressed pubescent above, and densely so beneath. Racemes 2.5 - 3 cm long including ca 5 mm long peduncle, axillary; rachis angular, pubescent, many-flowered. Flowers deep purple, ca 4.5 mm long; bracts 1.2 - 2 x 0.8 mm, narrowly triangular, caducous; pedicels ca 1 mm long. Calyx adpressed pubescent outside, cup ca 0.5 mm long, teeth ca 1.5 mm long, triangular. Standard 3.5 - 4 x 2.5 mm, elliptic to ovate, mucronate, adpressed hairy on the back; wing petals ca 3.5 x 1 mm, short ciliate along margins; keel petals ca 4 x 2 mm, hairy outside towards tip, ciliate along margins, lateral spur ca 0.4 mm long. Staminal sheath 3 - 3.5 mm long; anthers ca 0.5 mm long, hairy at base. Ovary 1.5 - 2 mm long, linear, glabrous; style ca 1.5 mm long, glabrous. Pods 15 - 20 x 2 - 2.5 mm, deflexed, linear, cylindrical, sometimes faintly torulose, abruptly apiculate, 5 - 8-seeded. Seeds 2 - 2.5 x 1.5 mm, cylindrical, rounded at both ends, smooth, shiny, reddish-brown.

Type: INDIA: Meghalaya, Shillong, 5000 ft., 1 June, 1885, *C.B. Clarke* 38232 (CAL, holo).

Fls.: May - Aug.; *Frts.:* Aug. - Dec.

Distrib.: INDIA: Arunachal Pradesh, Meghalaya and Nagaland; endemic.

Habitat: Undergrowth in forests, hill slopes between 600 and 1500 m.

Exsicc.: Meghalaya: Shillong, Maophlong, 5500 ft., 18 Oct. 1872, *C.B. Clarke* 18598B; Laitlyngkat, 5 - 6000 ft., 6 Dec. 1946, *F. Kingdon-Ward* 2; Woodlands, New colony, 4 June, *R.K. Raivaid* 18184; Cherrah valley; 6000 ft., 1878, *Gallatly* 217; Shillong to Cherrapunji between 14th & 15th mile, 2 June, 1958, *R.S. Rao* 2671.

47. *Indigofera sessiliflora* DC., Prodr. 2: 228. 1825; Gillett in Kew Bull. Add. Ser. 1: 36. 1958; Ali in Bot. Notis. 111: 549. 1958 & in Nasir & Ali, Fl. W. Pakistan 100: 74. 1977; Raizada & Sharma in Indian For. 88: 360. 1962; Chavan & Oza, Fl. Pavagadh 76. 1965. *I. tribuloides* Boiss., Fl. Orient. 2: 189. 1872. *I. trigonelloides* auct. non Jaub. & Spach. 1857: Baker in Hook. f., Fl. Brit. India 2: 94. 1876; T. Cooke, Fl. Pres. Bombay 1: 312. 1902 (*Repr.* 1: 332. 1967).
Fig. 46, Map 5.

Local names: Bekar, Bekario (Raj.).

Herb, 5 - 20 cm high; branches prostrate or ascending angular, white canescent, biramous hairs adpressed with equal arms. Leaves 2 - 3 cm long including 8 - 10 mm long petiole; stipules 3 - 4 x 1 - 1.5 mm, narrowly triangular, pubescent outside; rachis 1 - 2 cm long, canescent; stipellae absent; petiolules ca 1 mm long; leaflets 3 - 7, alternate, 5 - 12 x 3 - 5 mm, obovate to narrowly elliptic, cuneate to obtuse at base, rounded and mucronate at apex, adpressed white canescent on both surfaces. Racemes ca 8 mm long, sessile, axillary, globose to slightly elongated, more than 20-flowered. Flowers reddish-pink ca 5 mm long; bracts ca 1 mm long, caducous; pedicels ca 1 mm long. Calyx adpressed hairy outside, cup ca 0.5 mm long, teeth 2.5 x 0.5 mm, narrowly triangular. Corolla included; standard 3.5 - 4.5 x 1.5 - 2 mm, obovate, rounded and mucronate at apex, adpressed strigose on the back towards tip; wing petals 2.5 - 3.5 x 0.5 - 1 mm, glabrous; keel petals 3.5 - 4.5 x 1 - 2 mm, glabrous, lateral spur ca 0.5 mm long. Staminal sheath ca 4 mm long; anthers ca 0.5 mm long. Ovary ca 2 mm long, linear, glabrous, up to 6-ovuled; style 1 - 1.5 mm long, glabrous. Pods 4 - 10 x 2 - 2.5 mm, spreading, straight, torulose, apiculate, adpressed white canescent, 2 - 6-seeded, rarely 1. Seeds ca 1 x 1 mm, globose, sometimes truncate at one or both ends, smooth, shiny, reddish-brown.

Type: Senegal, 1825, *Perrottet* 183 (P, holo ! BM ! iso).

Fls.: July - Nov.; *Frts.:* Aug. - Nov.

Distrib.: INDIA; Gujarat, Haryana, Punjab and Rajasthan; AFGANIS-TAN, PAKISTAN, SAUDI ARABIA, YEMEN, SENEGAL, MAURITIA-NA, SUDAN, NIGERIA, ERITREA.

Habitat: Deserts especially near sand dunes, river banks and exposed river beds, saline sandy soils between 100 and 400 m.

Exsicc.: Punjab: Hissar, 30 July 1961 *N.C. Nair* 16182; Rajasthan: Jaisalmer Dist., Phalsund, 22 Aug. 1964, *B.M. Wadhwa & D.M. Verma* 4760; Jodhpur Dist., near Kharda Randhir village, 25 Oct. 1972 *B.V. Shetty* 209; near Osian,

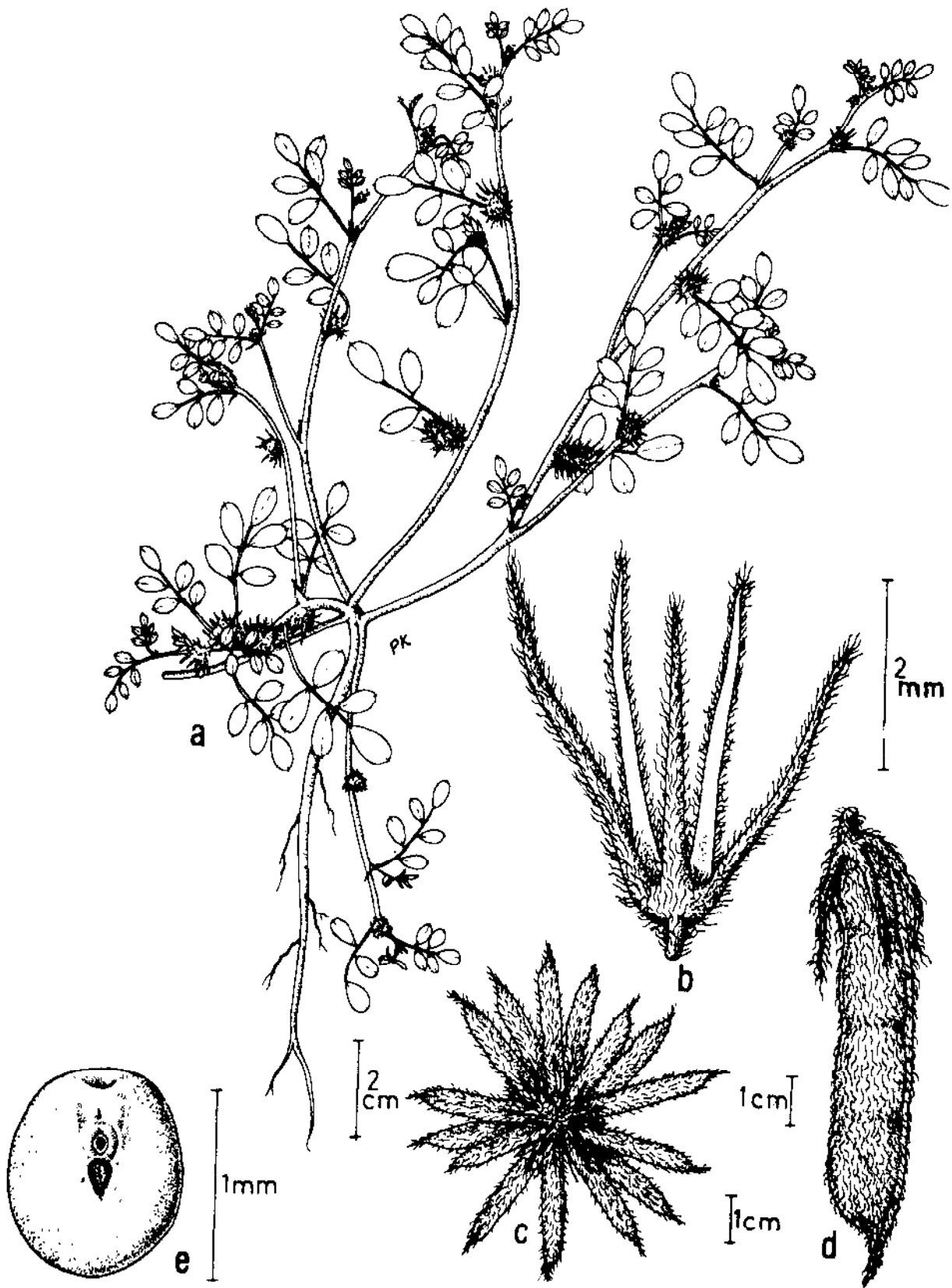


Fig. 46. *Indigofera sessiliflora* DC.: a. Habit, b. Calyx, c. Infructescence, d. Pod, e. Seed-hilar view (a-b: Shetty 3370; c-e: Shetty 2327).

on plains at the foot of sand dunes, 19 Nov. 1982, *M. Sanjappa* 9531; Churu Dist., Bhanipura, 225 m., 26 March 1976, *G.P. Roy* 2625.

Chr. No.: $2n = 32$ (Hagerup, *Hereditas* 16: 19 - 40. 1932); $n = 8$, $2n = 16$ sub *I. trigonelloides* (Ramanathan, *Curr. Sci.* 24: 17. 1955).

Notes: Baker (1876) and T. Cooke (1902) had confused this species for *I. trigonelloides* Jaub. & Spach - a species confined to Southern region of Africa. As correctly pointed out by Gillett (1958) and Ali (1958), the Indian specimens belong to *I. sessiliflora* DC.

48. *Indigofera silvestrii* Pamp. in *Nuov. G. Bot. Ital.* 17: 397. 1910; Craib in *Notes R.B.G. Edinburgh* 8: 68. 1913; Ali in *Bot. Notis* 111: 567. 1958; Sanjappa in *Bull. Bot. Surv. India* 26: 39. 1985, p.p. *I. bungeana* auct. non Walp. 1839; Pavolini in *Nuov. G. Bot. Ital.* 15: 1908, p.p.

KEY TO THE VARIETIES

- | | |
|--|------------------------------|
| 1a. Leaflets 3 - 9, glabrous above | 48.1. var. <i>silvestrii</i> |
| b. Leaflets always 5 - 7, pubescent on both surfaces | 48.2. var. <i>alii</i> |

48.1. var. *silvestrii*

Map 6.

Shrub, 60 - 100 cm high; branches erect, striate, biramous hairs white, adpressed with equal arms. Leaves 2 - 2.5 cm long including 5 - 10 mm long petiole; stipules ca 1.5 x 0.6 mm, narrowly triangular, adpressed pubescent outside; rachis 1 - 2 cm long; stipellae ca 1 mm long, only one between pairs of leaflet, hairy, persistent; petiolules ca 1 mm long; leaflets (3-)5-7(-9), opposite, rarely subopposite, 10 - 15 x 3 - 5 mm, elliptic to obovate, obtuse at base, obtuse to rounded and mucronate at apex, pubescent to glabrous and brown above, green and adpressed pubescent beneath. Racemes 3 - 4.5 cm long including 5 - 10 mm long peduncle; rachis adpressed white pubescent, many-flowered. Flowers pinkish-red, ca 5 mm long; bracts 1 - 1.5 x 0.5 mm, narrowly triangular, hairy outside, caducous; pedicels ca 1 mm long. Calyx adpressed pubescent outside, cup 0.5 - 1 mm long, teeth 2 - 2.5 x 1 mm, narrowly triangular. Standard 4.5 - 5 x 3 - 3.5 mm, obovate, rounded, mucronate, adpressed hairy on the back; wing petals ca 4 x 2.5 mm, glabrous; keel petals 4 - 4.5 x 2.5 - 3 mm, sparsely hairy towards the upper half, lateral spur ca 0.5 mm long. Staminal sheath 4 - 4.5 mm long; anthers ca 0.5 mm long. Ovary 2.5 - 3 mm long, linear, glabrous; style 1 - 1.5 mm long, with few hair on dorsal side. Pods 2.5 - 3 x 2 - 4 mm, deflexed, straight, pointed, adpressed pubescent, 8 - 10-seeded. Seeds ca 1 x 1 mm, cubical, smooth, reddish-brown.

Type: China: Hupeh, interior of Siyang Yang, 100 m, C. *Silvestri* 1091 (FI, holo photo!).

Fls.: June - Aug. ; *Frts.:* Aug. - Oct.

Distrib.: INDIA: Himachal Pradesh; BHUTAN, CHINA.

Exsicc.: Himachal Pradesh: Kangra Dist., Kulu, Thirthan valley, 28 Sept. 1936, R.N. *Parker* 33672 (DD, K); Banjar, 1410 m., 1 June 1933, R.N. *Parker* 3272 (DD, K); Kulu valley, Bhuintar, 7 June 1950, S.K. *Jain* & R.C. *Bhardwaj s.n.* (DD).

48.2. var. *alii* Sanjappa, var. nov.

Map 6.

I. silvestrii auct. non Pamp. 1910: Sanjappa in Bull. Bot. Surv. India 26: 39. 1985, p.p.

A var. *silvestrii* foliolis 5 - 7, utrinque pubescentae.

Type: India: Nagaland, Naga Hills, 1935, N.L. *Bor* 6314 (ASSAM, holo; DD, iso).

Fls.: June - Aug.

Distrib.: INDIA: Nagaland; BHUTAN, CHINA (Yunnan).

Habitat: Valleys between 2000 and 2550 m.

Exsicc.: Bhutan: Paro valley, 2550 m., 18 Aug. 1963, N.P. *Balakrishnan* 1236; Locality ? *Ramesh Bedi* 71649; 21 Jun 1971, *Ramesh Bedi* 3205 (DD); China: Yunnan, Mc/L/D51 (K).

Notes: Ali (*op. cit.*) visualised this variety based on a specimen from China represented in Kew (cited above) but did not publish it for want of more material. With the accumulation of more material it is now clear that they deserve a varietal status and is described here.

49. *Indigofera spicata* Forsskal, Fl. Aegypt.-Arab. 138. 1775; Gillett in Fl. W. Trop. Africa ed. 2, 1: 542. 1958 & in Kew Bull. Add. Ser. 1: 119. 1959; Ramaswamy & Razi Fl. Bangalore Dist. 268. 1973; Gandhi in Saldanha & Nicolson, Fl. Hassan Dist. 258. 1976; Britto in Matthew, Fl. Tamil Nadu Carn. 1: 427. 1983; de Kort & Thijsse in Blumea 30: 132. 1984. *I. hendecaphylla* Jacq., Icon. Pl. Rar. t. 570. 1781 93 & Coll. Bot. 2: 358. 1788; T. Cooke, Fl. Pres. Bombay 1: 314. 1902 (*Repr.* 1: 334. 1967). *I. anceps* Vahl ex Poiret in Lam.,

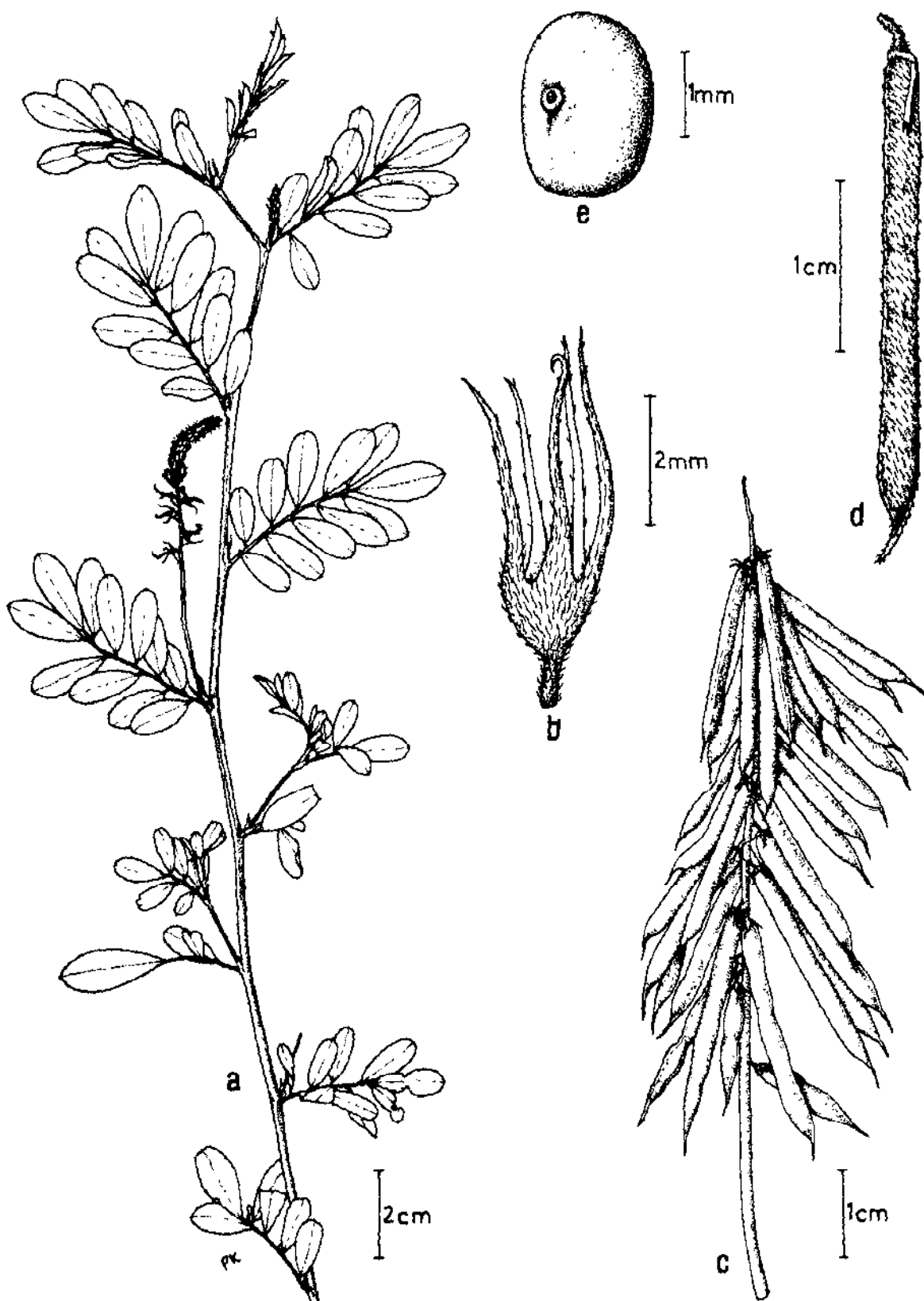
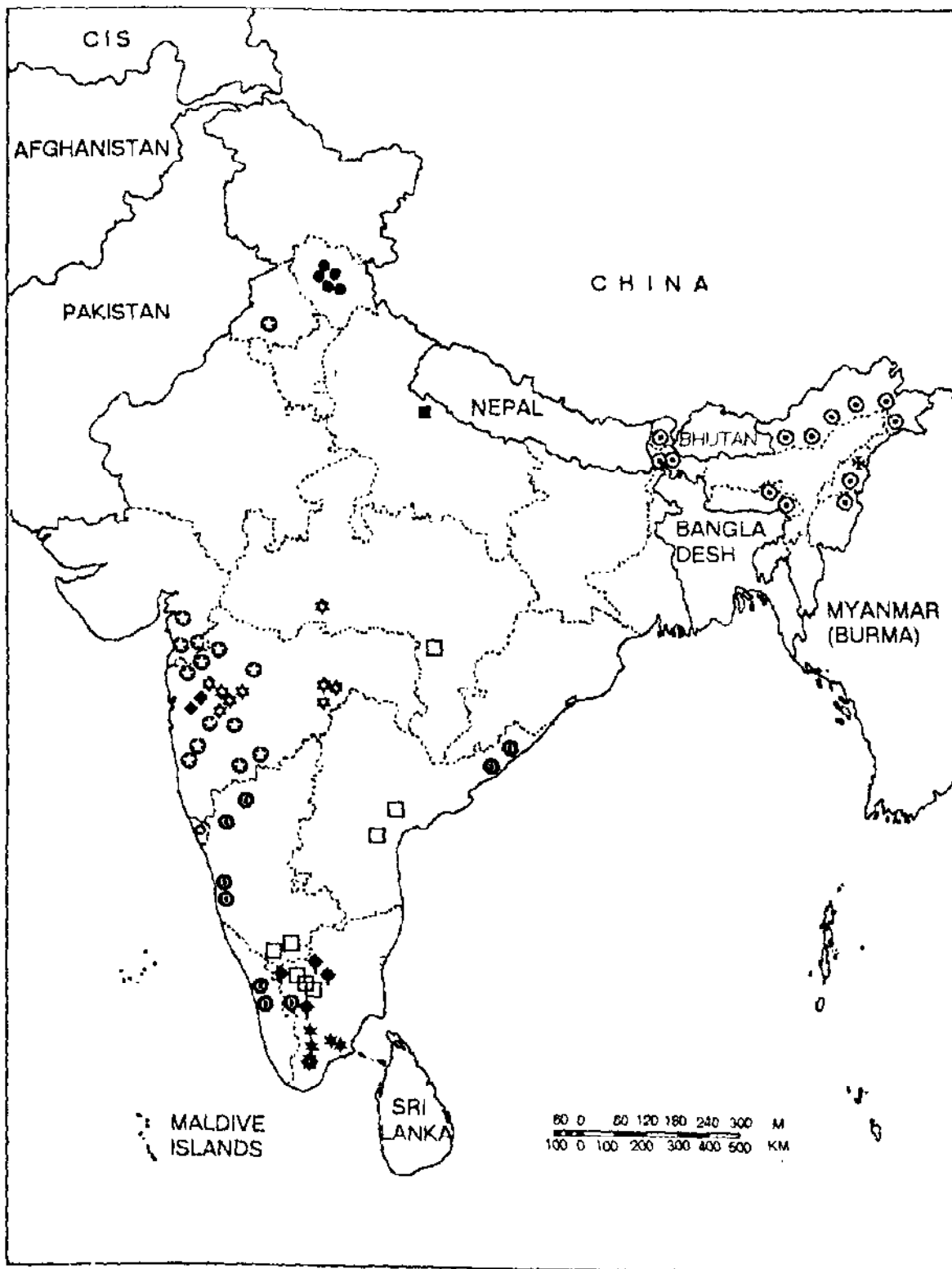


Fig. 47. *Indigofera spicata* Forsskal : a. Habit, b. Calyx, c. Infructescence, d. Pod, e. Seed (a-c: *Vivekananthan* 20356; c-d: *Sanjappa* 727; e: *C.B. Clarke* 11242B).



Map 6. *Indigofera silvestrii* Pamp. var. *silvestrii* (●), var. *alii* Sanjappa (✱); *I. stachyodes* Lindley (⊙); *I. thothathrii* Sanjappa (■); *I. tirunelvelica* Sanjappa (★); *I. trifoliata* var. *duthici* (Drumm. ex Naik) Sanjappa (☆); *I. trita* var. *mafficii* (Chiov.) Ali (◐), var. *marginulata* (Graham ex Wight & Arn.) Sanjappa (◑), var. *purandharensis* Sanjappa (◈), var. *scabra* (Roth) Ali (◑); *I. uniflora* Buch.-Ham. ex Roxb. (◑); *I. vicioides* Jaub. & Spach (☆).

Encycl. Suppl. 3: 147. 1813. *I. endecaphylla* Jacq. sensu Lam., Encycl. Suppl. 3: 147. 1813; Baker in Hook. f., Fl. Brit. India 2: 98. 1876; Prain, Bengal Pl. 1: 432. 1903 (*Repr.* 1: 310. 1963); Gamble, Fl. Pres. Madras 311. 1918 (*Repr.* 1: 220. 1967); Haines, Bot. Bihar Orissa 3: 238. 1922 (*Repr.* 2: 249. 1961); Fyson, Fl. S. Indian Hill Stat. 1: 156. 1932. *I. kleinii* Wight & Arn., Prodr. 204. 1834; Dalz. & Gibs., Bombay Fl. 60. 1861. Fig. 47.

Local name: Mala mandi (Kan.)

Herb; stems and branches prostrate or ascending, 40 - 65 cm long often rooting at nodes, pinkish or yellowish-green, angular or striate, often flattened, adpressed strigulose, biramous hairs with equally long arms. Leaves 5 - 6 cm long including 1 - 2 mm long petiole; stipules intrapetiolar, 5 - 10 x 2 - 3 mm, narrowly triangular, broadly scarious at base, narrowed into a caudate apex, adpressed strigulose outside, glabrescent along margins; rachis 3 - 4 cm long, canaliculate above, produced beyond the lateral leaflets, strigulose; leaflets (5 -)7 - 11, alternate, (5 -)10 - 30 x 2 - 5 mm, obovate or cuneate-oblong, rounded and mucronate at apex, sparsely strigulose beneath, glabrous above or rarely with a few hairs. Racemes 5 - 8 cm long including 2.5 - 3 cm long peduncle, axillary, many-flowered. Flowers pink or reddish-pink, 4 - 5 mm long; bracts 1.5 - 2 x 0.5 - 1 mm, ovate, caudate at apex, hairy outside, caducous; pedicels ca 1 mm long. Calyx finely adpressed strigulose outside, cup ca 0.5 mm long, teeth ca 3 x 1 mm narrowly triangular. Standard 4.5 - 5 x 3 - 3.5 mm, obovate to broadly ovate, rounded and mucronate at apex, sparsely strigulose on the back towards tip in buds, sometimes glabrous in open flowers; wing petals 4 - 4.5 x 1 - 1.5 mm, glabrous, ciliate along margins; keel petals 4.5 - 5 x 2 - 2.5 mm, sparsely strigulose outside, ciliate along margins, lateral spur 1 - 1.5 mm long. Staminal sheath 4 - 4.5 mm long; anthers ca 0.5 mm long. Ovary 2.5 - 3 mm long, linear, glabrous, up to 12-ovuled; style 2 mm long, glabrous. Pods 18 - 25 x 2 - 2.5 mm, reflexed, straight, or slightly curved, inwards near tip, somewhat quadrangular, beak 2 - 3 mm long, strigulose, (6 -)8 - 10(- 12)-seeded; endocarp generally not spotted, sometimes finely spotted. Seeds 2 - 2.5 x 1 - 1.5 mm, cylindric to subglobular, rounded at both ends, smooth, reddish-brown or yellow.

Type: Yemen, Bolgose, *Forsskal s.n.* (C, holo photo !).

Fls.: May - Oct.; *Frts.:* Oct. - Dec.

Distrib.: INDIA: Andhra Pradesh, Bihar, Gujarat, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Orissa, Tamil Nadu and West Bengal; SRI LANKA, MYANMAR, CHINA, THAILAND, VIETNAM, CAMBODIA, TAIWAN, MALESIA, YEMEN, MADAGASCAR, MAURITIUS, TROPICAL AND S. AFIRCA.

Habitat: Cultivated fields, disturbed waste places, coffee and tea plantations, roadsides from sea level to 2000 m.

Exsicc.: Andhra Pradesh: Visakhapatnam Dist., Araku valley, near stream, 975 m., 28 Aug. 1960, *N.P. Balakrishnan* 10730; Karnataka: Bangalore Dist., Bannerghatt National Park, 15 Dec. 1980, *M. Sanjappa* 727; Kerala: Kottayam Dist., Vandiperiar to Pambanar, 1000 m, 22 Sept. 1964, *K. Vivekananthan* 20356; Tamil Nadu: Nilgiri Dist., Benne forest, 1200 m, July 1960, *K. Subramanyam* 10468.

Chr. No.: $2n = 32$ sub *I. endecaphylla* (Frahm-leliveld, *Euphytica* 2: 46 - 48. 1953); $2n = 16$ (Sanjappa & Bhatt, *Taxon* 26: 266. 1977). $2n = 16, 32$ (Pritchard & Gould, *Div. Trop. Pastures Tech. Pap. 2*, CSIRO, Australia 1 - 18. 1964); $2n = 36$ (Kishore, *Indian Jour. Pl. Genet. Breed.* 11:217. 1951).

50. *Indigofera stachyodes* Lindley, *Bot. Reg.* 14: t. 14. 1843; Ohashi in Hara, *Fl. E. Himal. Ist Report* 158. 1966; Babu, *Herb. Fl. Dehra Dun* 146. 1977; Sharma *et al.* in *Biol. Mem.* 2: 43. 1977; Sanjappa in *Reinwardtia* 10: 237. 1985. *I. dosua* auct. non Buch.-Ham. ex D. Don 1825: de Kort & Thijssse in *Blumea* 30: 1984, p.p. *I. dosua* Buch.-Ham. ex D. Don var. *tomentosa* Baker in *Hook. f., Fl. Brit. India* 2: 102. 1876; Kanjilal *et al.*, *Fl. Assam* 2: 21. 1938; Thoth. in *Rec. Bot. Surv. India* 20: 76. 1973; Ohashi in Hara, *Fl. E. Himal. IIIrd Report* 65. 1975. Fig. 48, Map 6.

Local name: Long spiked indigo (Eng.)

Shrub or treelet, 1.5 - 3.5 (- 5) m high; branches erect, angular, velvety, biramous hairs spreading with very unequal arms. Leaves 10 - 18 x (- 24) cm long, sessile; young leaves, terminal and axillary buds densely velvety with golden yellow hairs; stipules project opposite to leaf clasping stem, 13 - 20 x 3.5 - 4 mm, linear-setaceous, densely spreading hairy outside, persistent; rachis 8 - 15 cm long, densely velvety with grey and golden yellow hairs; stipellae absent; petiolules ca 1 mm long; leaflets (25 -) 31 - 49 (- 59), opposite, 20 - 35 x 3 - 8 mm, linear, rounded at base, rounded to obtuse and mucronate at apex, sometimes margins revolute, densely white pubescent beneath, golden yellow pubescent above especially along margins and midrib. Racemes 10 - 15 cm long including 1 - 2.5 cm long peduncle, axillary; rachis velvety, compactly many-flowered. Flowers pink, 1 - 1.2 cm long; bracts ca 10 x 3 - 5 mm, narrowly triangular, velvety outside, caducous; pedicels 1 - 1.5 mm long. Calyx velvety outside, cup ca 1 mm long, teeth 1 - 1.5 x 0.5 mm, triangular. Standard 6 - 10 x 5 - 6 mm, elliptic, densely brown strigose on the back; wing petals 5.5 - 9 x 2 - 3 mm, glabrous, ciliate along margins; keel 6 - 9.5 x 2.5 - 3.5 mm, densely strigose outside towards tip, ciliate along margins, lateral spur 1 - 1.5 mm long; ovary 3.5 - 7 mm long, glabrous or with few hairs on dorsal side; style 2 - 3 mm long,

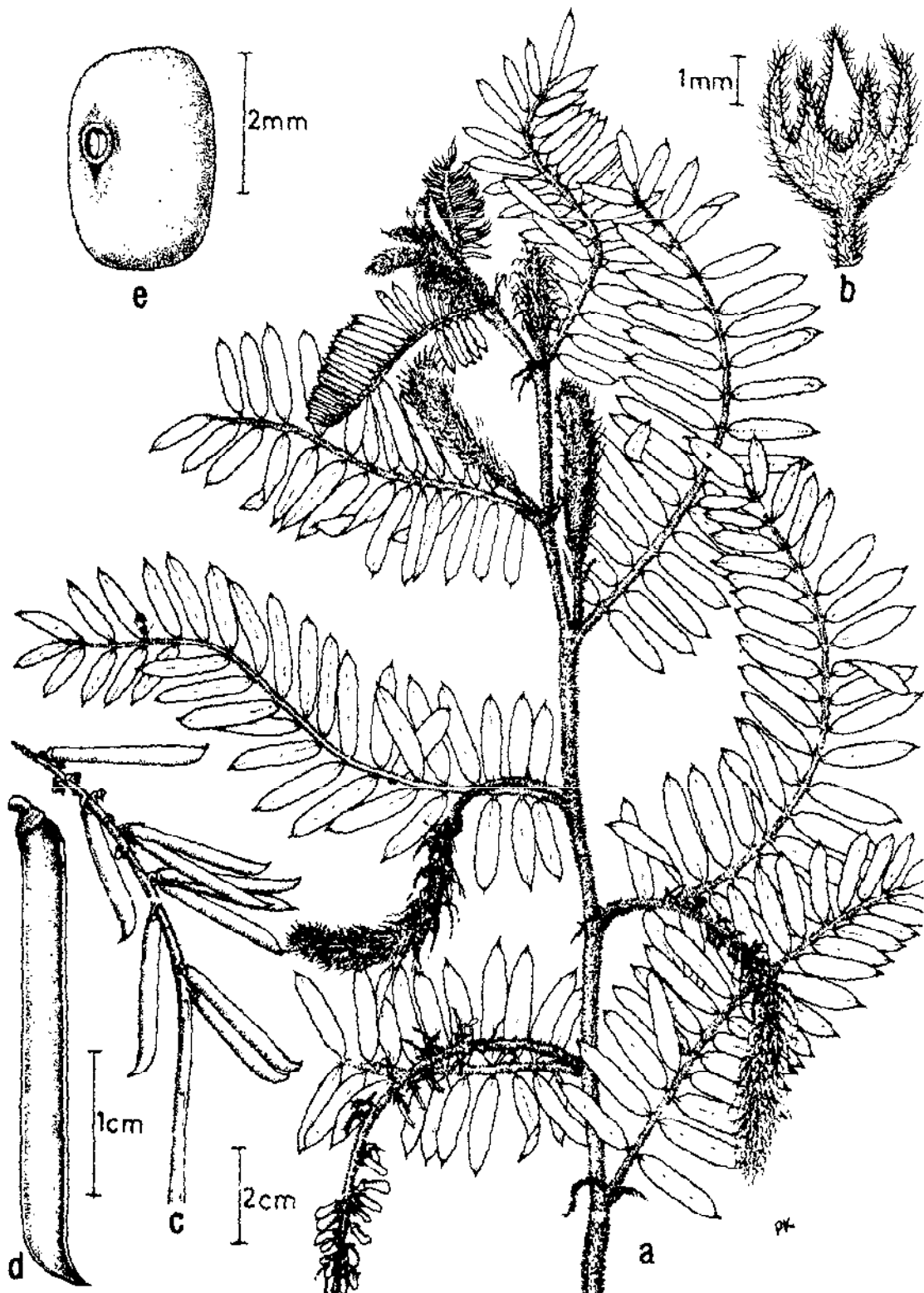


Fig. 48. *Indigofera stachyodes* Lindley : a. Habit, b. Calyx, c. Infructescence, d. Pod, e. Seed-side view (a-e: *R.N. Banerjee* 7031).

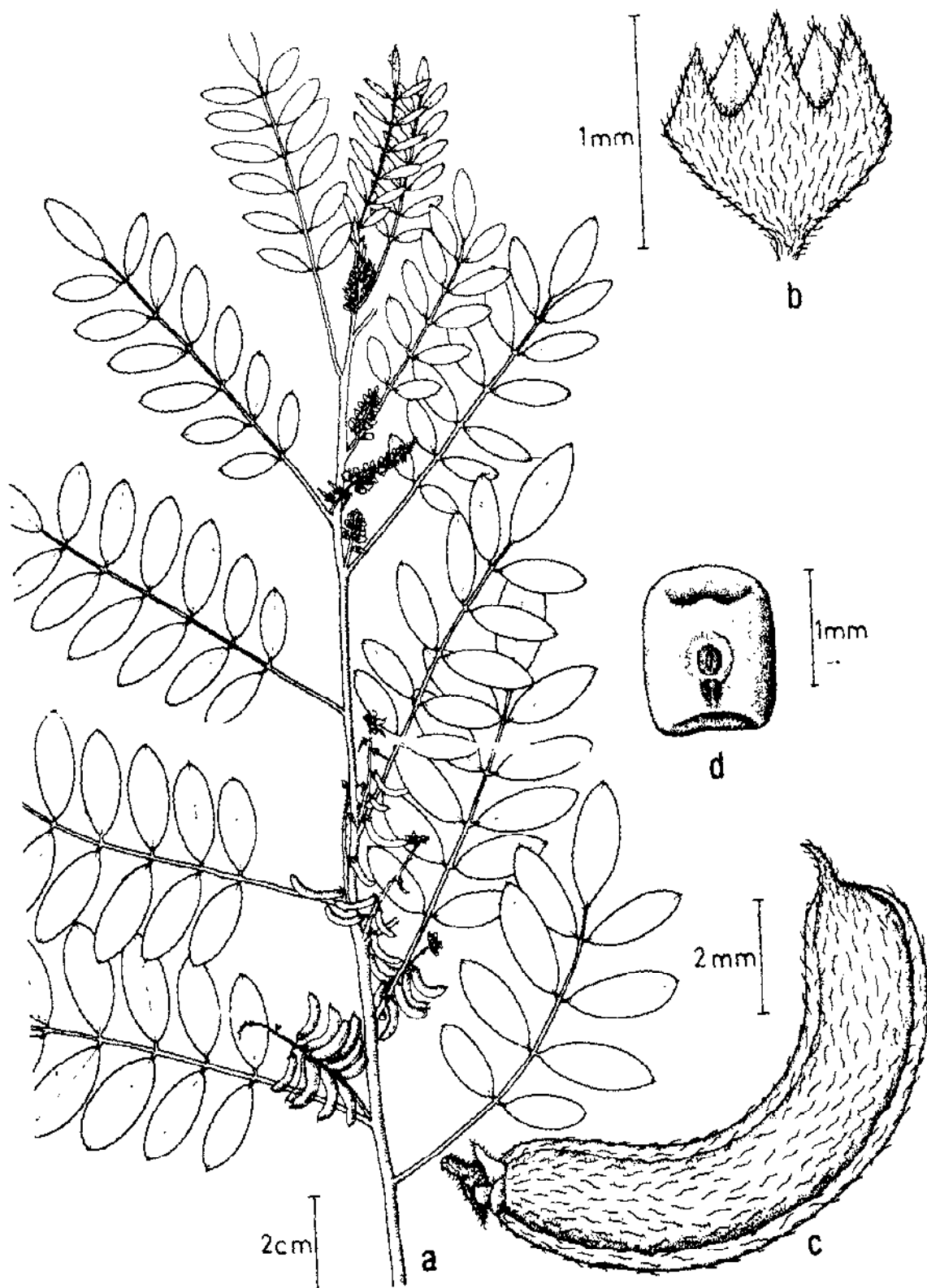


Fig. 49. *Indigofera suffruticosa* Mill. : a. Habit, b. Calyx, c. Seed-hilar view, d. Pod (a-b: *Lace s.n.*; c-d: *King's collection s.n.*).

glabrous. Pods 20 - 38 x 2.5 - 3.5 mm, deflexed, straight, cylindrical, curved, tip spine-pointed, densely reddish-brown and white hairy, up to 10-seeded; endocarp red-spotted. Seeds ca 2 x 1 mm, cylindric, rounded at both ends, smooth, often pitted near micropyle, reddish-brown.

Type: Lindley, Bot. Reg. 14: t. 14. 1843.

Fls.: March - Sept.; *Frts.:* Sept. - Dec.

Distrib.: INDIA: Arunachal Pradesh, Manipur, Meghalaya, Sikkim and West Bengal, introduced in Coffee and Tea Estates of Tamil Nadu and Andhra Pradesh; NEPAL, BHUTAN, MYANMAR, CHINA, THAILAND, VIETNAM, CAMBODIA.

Habitat: Deforested and exposed hills slopes, evergreen forests, road sides, culverts between 650 and 3000 m.

Exsicc.: Arunachal Pradesh: Subansiri, Petepol, 28 Sept. 1959, *G. Panigrahi* 19682; Meghalaya: Khasi & Jaintia hills, Nongstain area, 21 June 1958, *G. Panigrahi* 16560; Sikkim: Mangan, 4000 ft., 11 Sept. 1968, *N.C. Majumdar & R.N. Banerjee* 391; Gangtok on way to Mangan, July 1986, 2000 m, *M. Sanjappa* 9536.

Pollen: 3-zonocolporate, sphaeroidal, rarely subprolate, 29.8 x 25.1 (25.31 x 24 - 27) μm , rugulate (Ferguson & Strachan, Pollen et Spores 24: 171 - 210. 1982).

Notes: This species is either merged with its closely allied *I. dosua* Buch.-Ham. ex D. Don or treated as a distinct species and less often as a variety of it. Here it is treated as a distinct species since it differs from *I. dosua* in habit (a tall shrub or treelet), in having velvety pubescence, long linear leaflets often with recurved margins, more or less cylindrical and reflexed pods often with red-spotted endocarp.

51. *Indigofera suffruticosa* Mill., Gard. Dict. ed. 8: No. 2. 1768; Prain & Baker f. in Jour. Bot. 40: 138. 1902; Gillett in Kew Bull. Add. Ser. 1: 105. 1958; de Kort & Thijssse in Blumea 30: 134. 1984 (subsp. *suffruticosa*); Sanjappa in Reinwardtia 10: 237. 1985. *I. anil* L., Mant. Pl. 2: 272. 1771; DC., Prodr. 2: 225. 1825; Brandis, Indian Trees 218. 1906; Kanjilal *et al.*, Fl. Assam 2: 23. 1938. *I. tinctoria* L. var. *polyphylla* DC., Prodr. 2: 225. 1825. Fig.49.

Local names: Vilaiti-nil (Hindi), Seeme neeli (Kan.); Vishashodhini (Sans.), Shimaiyavari (Tam.); Shuna neeli (Tel.).

Shrub, 50 - 150 cm high; branches erect, striate, biamous hairs finely adpressed with equal arms. Leaves 5 - 7.5 cm long including ca 1.5 cm long petiole; stipules 1.5 - 3 x 1 - 1.5 mm, narrowly triangular; rachis 4 - 6 cm long, canaliculate above, adpressed pubescent; stipellae ca 1 mm long, linear; petioles 1.5 - 2 mm long; leaflets 11 - 13, opposite, 10 - 20 x 5 - 6 mm, obovate to narrowly elliptic, obtuse to cuneate at base, obtuse to rounded and mucronate at apex, adpressed pubescent beneath, sparsely so above. Racemes 2 - 2.5 cm long, axillary, sessile. Flowers pinkish or red, 3.5 - 4.5 mm long; bracts 1 - 1.5 mm long, triangular, caducous; pedicels ca 1 mm long. Calyx adpressed pubescent outside, cup ca 0.5 mm long, teeth ca 1 mm long, triangular. Standard 3 - 4 x 2 - 2.5 mm, obovate, mucronate, adpressed strigose on the back; wing petals 2.5 - 3.5 x 1 mm, glabrous, ciliate along margins; keel petals 3 - 4 x 1.5 - 2 mm, adpressed strigose outside, lateral spur ca 0.5 mm long. Staminal sheath 3 - 4 mm long; anthers ca 0.5 mm long. Ovary ca 3 mm long, linear with few hairs towards dorsal side, up to 6-ovuled; style 1 - 1.5 mm long, glabrous. Pods 10 - 15 x 2.5 - 3 mm, deflexed, subcylindrical, distinctly curved upwards, adpressed pubescent, 4 - 5-seeded; sutures broad; endocarp red-spotted. Seeds ca 2 x 1 mm, cylindric, truncate at both ends, smooth, reddish-brown.

Type: Jamaica, *Unknown Collector s.n.* Herb. Miller (BM!).

Fls.: Aug. - Dec.; *Frts.:* Nov. - Jan.

Distrib.: INDIA: Assam, Bihar, Manipur, Mizoram, West Bengal and Andaman & Nicobar Islands; Pantropical except Tropical E. Africa.

Habitat: Waste lands, cultivated fields, beaches from sea level to 1000 m.

Exsicc.: Andaman & Nicobar Islands: S. Andaman, Wimberlygunj, 25 m, 10 Nov. 1963, *N.P. Balakrishnan* 1350; Assam: Sibsagar Dist., Ahotguri, 280 ft., 3 Nov. 1911, *U. Kanjilal* 1708; Bihar: Dalsing Sarai, 6 Nov. 1902, *H.M. Leahe s.n.*; Mizoram: Lushai Hills, Leng, 3000 ft., 9 Dec. 1902, *J.E. Leslie* 314.

Chr. No.: $2n = 32$ (Kawakami, Bot. Mag. (Tokyo) 44: 319 - 328. 1930); $2n = 12$ (Senn, Bibl. Genet. 12: 175 - 345. 1938); $2n = 16$ (Fraham-Leliveld, Rev. Cytol. Biol. Veg. 18: 278. 1957).

Pollen: 3-zonocolporate, subprolate, 30×23.5 ($29 - 31 \times 23 - 24$) μm , (Heusser, Pollen and Spores of Chile, 1 - 167, Univ. Arizona Press. USA).

Notes: Introduced in India as dye (indigo) yielding plant.

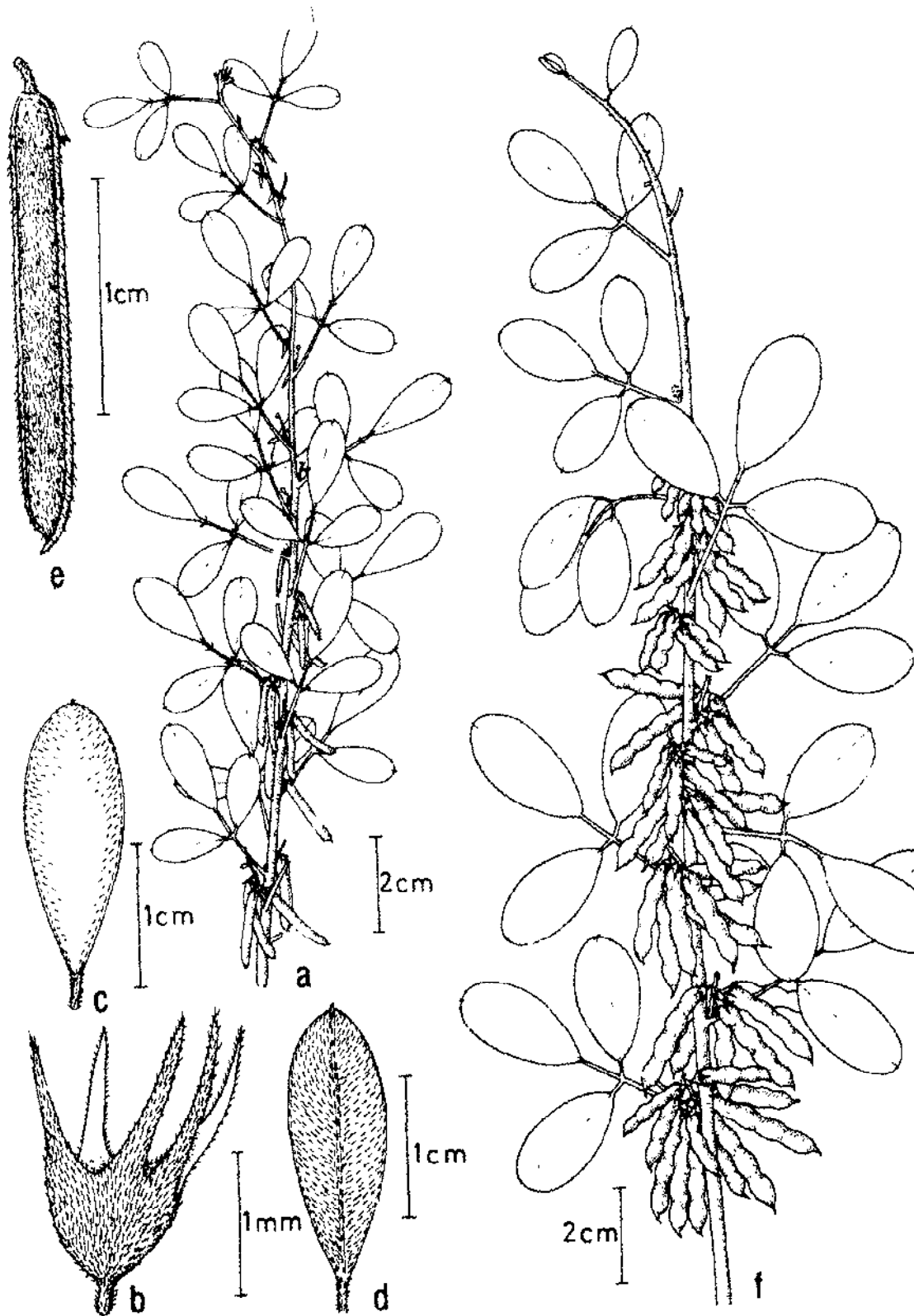


Fig. 50. *Indigofera thothathrii* Sanjappa (a-e) : a. Habit, b. Calyx, c. Leaflet-abaxial surface, d. Leaflet-adaxial surface, e. Pod, f. *Indigofera santapau* Sanjappa - Habit (a-e: *Pirson* 1412; f: *Santapau* 11397).

**52. *Indigofera thothathrii* Sanjappa in Jour. Japan. Bot. 50: 272. 1984.
Fig. 50 a - e, Map 6.**

Shrub, 40 - 60 cm high; branches erect, striate, pubescent hairs adpressed with equal arms. Leaves pinnately trifoliolate, 3 - 5.5 cm long; stipules 1 - 2 x 0.5 - 1 mm, narrowly triangular, pubescent outside; petioles 1 - 2 cm long, canaliculate above, pubescent; stipellae 1 - 1.5 mm long, triangular, persistent; rachis produced up to 6 mm beyond lateral leaflets; leaflets 20 - 25 x 8 - 18 mm, obovate to obovate-oblong, cuneate to obtuse at base, rounded and mucronate at apex, sparsely adpressed pubescent and brown above, somewhat densely so and pale brown beneath. Racemes 5 - 10 mm long, axillary, sessile, globose, 6 - 8-flowered. Flowers yellowish-pink, ca 4 mm long; bracts ca 1.5 x 0.5 mm, narrowly triangular, caducous; pedicels ca 1 mm long, hairy. Calyx adpressed puberulous outside, cup ca 0.5 mm long, teeth ca 1.5 x 0.5 mm, narrowly triangular. Standard ca 3.5 x 2.5 mm long, ovate, obtuse and mucronate at apex, sparsely puberulous on the back; wing petals ca 3 x 1 mm, glabrous; keel petals ca 3.5 x 1.5 - 2 mm, puberulous outside, lateral spur ca 0.5 mm long. Staminal sheath 3 - 4 mm long; anthers ca 0.6 mm long. Ovary 2.5 - 3 mm long, linear, hairy on the dorsal side, up to 8-ovuled; style 1 - 1.5 mm long, glabrous. Pods 18 - 25 x 1.5 - 3 mm, pendant along side rachis, linear, subcylindrical, apiculate, slightly curved at apex, densely short adpressed white pubescent, gland-dotted when young towards the tip; sutures narrow, obscurely winged, 6 - 8-seeded; endocarp spotted. Seeds ca 2 x 1 mm, cylindric, truncate at ends, smooth or obscurely foveolate.

Type: India, Uttar Pradesh, Bhabhara Dist., Nishanagara, near Forest Rest House, 11 Sept. 1956, *H. Pirson* 1412 (BLAT, holo; CAL, iso).

Fls. & Frts.: Sept. - Nov.

Distrib.: INDIA: Assam and Uttar Pradesh; endemic.

Exsicc.: (In addition to type collections) Upper Assam, *Jenkins* 47 (K).

53. *Indigofera tinctoria* Linn., Sp. Pl. 751. 1753; DC., Prodr. 2: 224. 1825; Roxb., Fl. Ind. 3: 379. 1832; Wight & Arn., Prodr. 202. 1834; Wight, Icon. Pl. Ind. Orient. t. 365. 1840; Dalz. & Gibs., Bombay Fl. 59. 1861; Drury, Handb. Indian Fl. 1: 280. 1864; Stewart, Punjab Pl. 70. 1869; Baker in Hook. f., Fl. Brit. India 2: 99. 1876; Collett, Fl. Simlensis 121. 1902; T. Cooke, Fl. Pres. Bombay 1: 318. 1902 (*Repr.* 1: 339. 1967) Prain, Bengal Pl. 1: 432. 1903 (*Repr.* 1: 310. 1963); Duthie, Fl. Upp. Gang. Pl. 1: 254. 1903 (*Repr.* 1: 235. 1960) incl. forma 1 - 3; Brandis, Indian Trees 218. 1906; Talbot, For. Fl. Bombay 381. 1909; Bamber, Pl. Punjab 98. 1916; Parker, For. Fl. Punjab 131. 1918; Gamble, Fl. Pres. Madras 1: 312. 1918 (*Repr.* 1: 220. 1967); Haines, Bot. Bihar Orissa 2:

239. 1922 (*Repr.* 2: 250. 1961); Santapau, Fl. Saurashtra 131. 1961; Bhandari, Fl. Indian Desert 120. 1978; Britto in Matthew, Fl. Tamil Nadu Carn. 1: 428. 1983; de Kort & Thijssse in Blumea 30: 136. 1984; R.S. Rao, Fl. Goa etc. 1: 125. 1985. *Ameri* Rheede, Hort. Malab. 1:101-102, t. 54. 1678. *I. houer* Forsskal, Fl. Aegypt.-Arab. 137. 1775 non *sensu* T. Cooke 1902; *I. indica* Lam., Encycl. 3: 245. 1789. *I. sumatrana* Gaertn., Fruct. Sem. Pl. 2: 317. t. 148. 1791; Prain, Bengal Pl. 1: 432. 1903 (*Repr.* 1: 310. 1963); Gamble, Fl. Pres. Madras 312. 1918 (*Repr.* 1: 220. 1967); Haines, Bot. Bihar Orissa 2: 240. 1922 (*Repr.* 2: 251. 1961). *I. anil* Linn. var. *orthocarpa* DC., Prodr. 2: 225. *I. tinctoria* Linn. var. *macrocarpa* DC., Prodr. 2: 224. 1825; Prain & Baker f. in Jour. Bot. 40: 64. 1902. *I. tinctoria* Linn. var. *brachycarpa* DC., Prodr. 2: 225. 1825; Prain & Baker f., in Jour. Bot. 40: 67. 1902. *I. orthocarpa* (DC.) Berg. & Schmidt. in Darstell. & Beschreib. office Gew. 4: 30d. 1863, non Persl. 1844, nom. illegit. *I. bergii* Vatke, App. Ind. Sem. Berol. 3. 1876. Fig. 51.

Local names: Rangapat (Asm.), Nil (Beng. & Punj.), Bengal indigo, Common indigo, Indigo of commerce (Eng.), Gali, Nil, Gudi (Guj.), Nil (Hindi), Ajara, Olle neeli, Niligida (Kan.), Amari (Mal.), Anileria (Port.), Nili, Nilini, Tuli, Kala, Dola, Nilika, Sripali, Tutha, Gramina, Ranjani (Sans.), Nilam, Avarai (Tam.), Neeli mandu, Nili (Tel.).

Undershrub or shrub, 30 - 150 cm high; branches erect, strigose, biramous hairs adpressed with equal arms. Leaves 4 - 9.5 cm long including 8 - 15 mm long petiole; stipules 1.5 - 2.5 x 0.5 mm, narrowly triangular, pubescent outside; rachis 3 - 4.5 cm long, canaliculate above, strigose; stipellae 0.5 - 0.7 mm long, narrowly triangular; petiolules ca 1 mm long, pubescent; leaflets (5 -) 7 - 13, opposite, 10 - 21 x 6 - 12 mm, elliptic to obovate or obovate-oblong, cuneate to obtuse at base, obtuse to rounded or emarginate and mucronate at apex, glabrous or with few adpressed hairs above, adpressed fine hairy beneath. Racemes (1.5 -) 2 - 5 cm long, sessile or with 2 - 4 mm long peduncle; rachis striate, adpressed brown hairy, many-flowered. Flowers pink or brick-red, 4 - 5 mm long; bracts ca 1 mm long, narrowly triangular, caducous; pedicels 1.5 - 2 mm long, dark brown hairy. Calyx adpressed hairy outside, cup up to 1 mm long teeth 0.5 - 0.8 mm long, triangular. Standard 4 - 4.5 x 3 - 3.5 mm, broadly ovate, rounded at apex, adpressed brown hairy on the back, greenish-purple; wing petals 3.5 - 4 x 1 - 1.2 mm, glabrous, ciliate, pink; keel petals 4 - 4.5 x 1.5 - 2 mm, adpressed hairy towards tip, greenish-pink, lateral spur ca 0.5 mm long. Staminal sheath 3.5 - 4 mm long; anthers ca 0.5 mm long. Ovary 2.5 mm long, linear, 6 - 12-ovuled, glabrous; style 1 - 1.5 mm long, glabrous. Pods 20 - 35 x 2 - 3 mm, descending, straight or slightly curved, sometimes torulose (especially when young), glabrous or with few short, adpressed hairs, 6 - 12-seeded; endocarp red-spotted. Seeds ca 2 x 1 mm finely pitted, shiny, yellowish to reddish-brown.

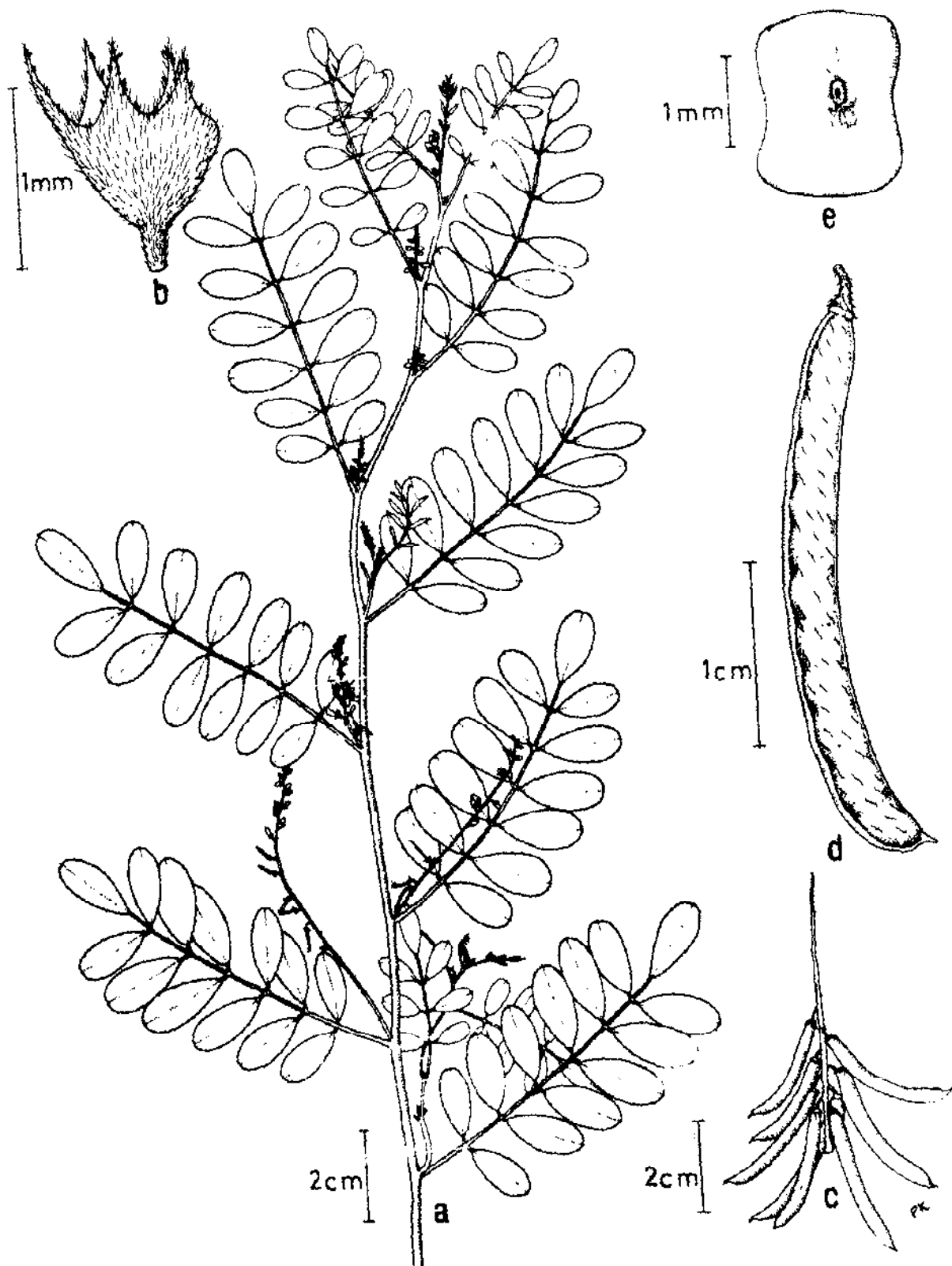


Fig. 51. *Indigofera tinctoria* Linn. : a. Habit, b. Calyx, c. Infructescence, d. Pod, e. Seed-hilar view (a-b: *A.N. Singh* 4301; c-e: *Gollen* 2).

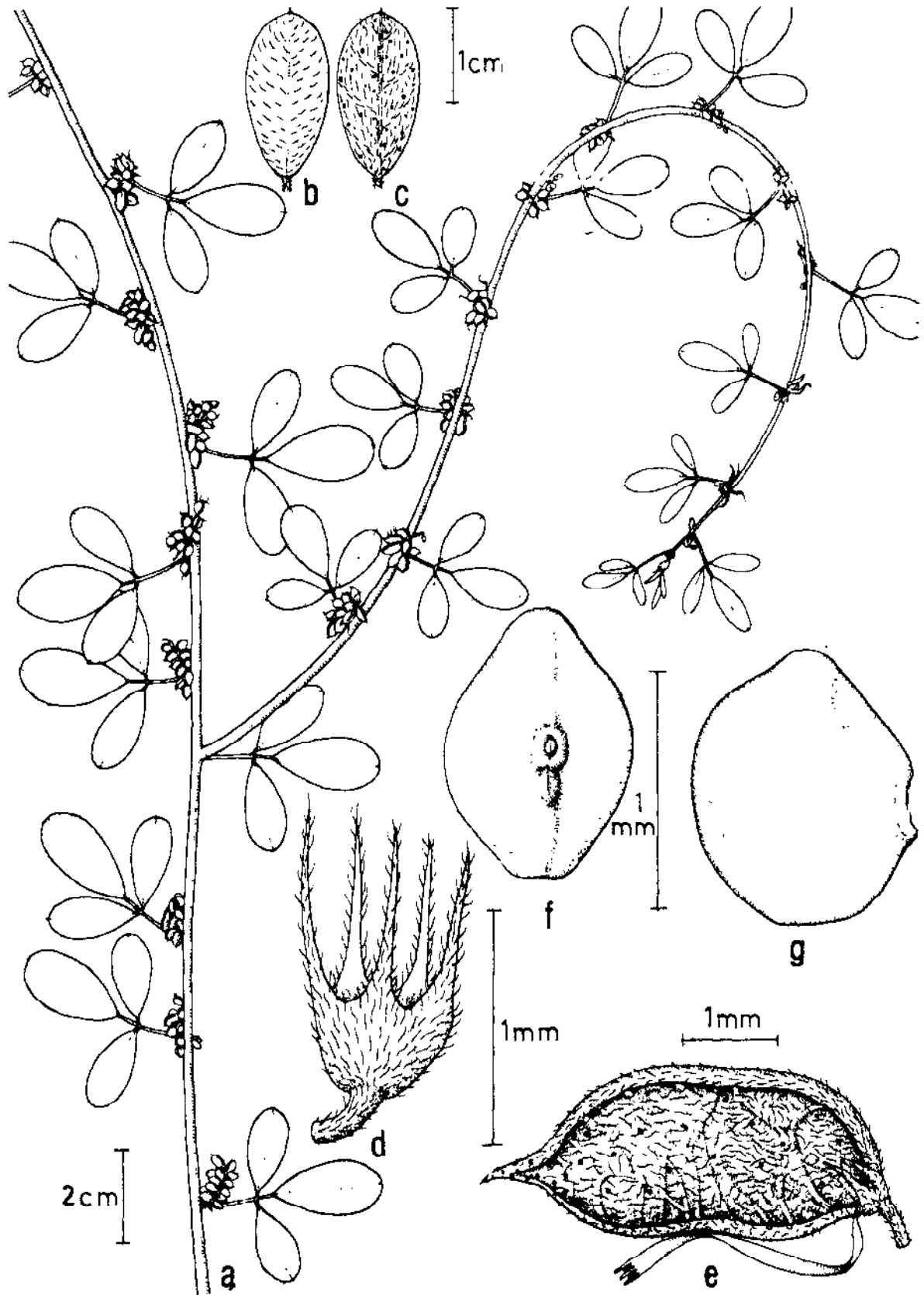


Fig. 52. *Indigofera tirunelvelica* Sanjappa : a. Habit, b. Leaflet-adaxial surface, c. Leaflet-abaxial surface, d. Calyx, e. Pod, f. Seed-hilar view, g. Seed-side view (a-e: Sanjappa 717; f-g: Hooper & Ramaswamy 39230).

Type: Sri Lanka, Hermann vol. 3, fol. 20 (BM!).

Fls.: Aug. - Feb.; *Frts.:* Nov. - March.

Distrib.: INDIA: Throughout the plains and hills; pantropical (not recorded in Bhutan).

Habitat: Cultivated fields, waste lands, banks of ponds and rivers, disturbed scrub forests, coastal areas, along railway lines, road sides from sea level to 1000 m.

Exsicc.: Andaman & Nicobar Islands: North Nicobar, Kamorta, in forest clearings near jetty, 2 May 1977 *N. Bhargava* 5042; Tamil Nadu: Ramanathapuram Dist., Mathukulathur, Sarjalkudi, 90 m, 7 Dec. 1977, *N.C. Nair* 53157; S. Arcot Dist., Parigam R.F., 300 m, 7 Sept. 1977, *K. Ramamurthy* 50663; Coimbatore Dist., way to Kuridimalai, in cultivated fields, 6 Dec. 1980, *M. Sanjappa* 714.

Chr. No.: $2n = 16$ (Ramanathan, *Curr. Sci.* 19: 155. 1950); $n = 8$ (Bir & Kumari, *Nucleus* 20: 94 - 98. 1977).

Pollen: 3-zonocolporate, oblate-spheroidal, 25×27 ($24 - 26 \times 26 - 28$) μm , granulate, (Vishnu-Mittre & Sharma, *Pollen et Spores* 4: 5- 45. 1962).

Notes: Corolla pinkish to brick-red but appear greenish due to adpressed brownish-green hairs especially on standard and keel petals.

Formerly this species was cultivated on a large scale in different parts of India especially in Peninsular India for commercial production of Indigo. This species shows considerable variation in height, size of leaves and leaflets, length of the inflorescence and pods, especially so in cultivation. Although 2-3 varieties or forma were recognised under this species by earlier workers based on characters mentioned above, they vary considerably with all types of intermediate forms. In view of the continuous variations of all the key characters used for distinguishing different forms it seems best to treat them as a single species. Gillett (1958) has rightly stated that '... confusion seems now too great for any attempt at infraspecific classification by ordinary taxonomic methods, without cultivation and breeding to succeed'.

This species although occurring in wild throughout India, is generally not found far from human habitations.

54. *Indigofera tirunelvelica* Sanjappa in *Jour. Bombay Nat. Hist. Soc.* 79: 647. 1983; Ahmed. & Nayar, *Endem. Pl. Indian Reg.* 99. 1987. **Fig. 52, Map 6.**

Annual herb, 30 - 60 cm high; branches erect, biramous hairs adpressed with equal arms. Leaves pinnately trifoliolate 3.5 - 4 cm long; stipules 0.8 - 1.2 x 0.5 mm, narrowly triangular, adpressed hairy; petioles 1 - 1.3 cm long, slender, canaliculate above, pubescent; stipellae absent; petiolules ca 1 mm long, pubescent; leaflets (10-) 15 - 20 (- 25) x (5-) 10 - 15 mm, obovate to narrowly elliptic, cuneate to obtuse at base, rounded and mucronate at apex, biramous hairs adpressed with equal arms on both surfaces, brown punctate gland-dotted beneath. Racemes 5 - 10 mm long, axillary, sessile; rachis hairy and brown gland-dotted, up to 20-flowered. Flowers pinkish, ca 5 mm long; bracts 1 - 1.5 x 0.5 mm, ovate, acute, hairy outside, caducous; pedicels ca 1 mm long, hairy, gland-dotted. Calyx adpressed hairy and densely brown gland-dotted outside, cup ca 0.5 mm long, teeth 1 - 1.5 x 0.5 mm, narrowly triangular. Standard 4 - 5 x 1.5 - 2.5 mm, narrowly elliptic, sometimes obovate, mucronate, adpressed strigose and gland-dotted on the back; wing petals 3 - 4.5 x 1 - 1.5 mm, glabrous; keel petals 3.5 - 4.5 x 1.5 - 2 mm, adpressed strigose and gland-dotted outside, lateral spur 1 - 1.5 mm long. Staminal sheath 3.5 - 4 mm long, anthers ca 0.5 mm long. Ovary 1 - 1.5 mm long, glabrous, 1 - 2-ovuled; style ca 1.5 mm long, glabrous, glandular towards base. Pods 3 - 6 x 2 - 2.5 mm, oblong, flattened, sharply beaked, faintly torulose, 1 - 2-seeded; upper suture broad; valves prominently veined, adpressed hairy, glandular. Seeds ca 1 x 1 mm, ellipsoid, rounded at one or both ends, reddish-brown, smooth.

Type: India, Tamil Nadu, Tirunelveli Dist., along the road side between Kalkad and Sengalteri, 300 m, Dec. 18, 1980, *M. Sanjappa* 717A (CAL, holo, 717B-C, iso).

Fls.: Oct. - Dec.; *Frts.:* Nov. - March.

Distrib.: INDIA: Tamil Nadu (Tirunelveli and Ramanathapuram Dists.); endemic.

Habitat: Road sides, disturbed and exposed areas in deciduous forests between 300 and 450 m.

Exsicc.: Tamil Nadu: Tirunelveli Dist., Kalkad to Sengalteri, 1000 ft., Feb. 1913, *Hooper & Ramaswami* 39230; near Tiger Falls, on way to Mancholai, 333 m, 4 March 1959, *K.M. Sebastine* 5520 (CAL, MH); locality? *R. Wight s.n.* (Kew Distrib. no. 651).

Chr. No.: n = 8 (Sanjappa, Taxon 32: 668. 1983).

55. *Indigofera trifoliata* Linn., Cent. Pl. 2: 29. 1756 & Amoen. Acad. 4: 327. 1759; D. Don, Prodr. 225. 1825; DC., Prodr. 2: 223. 1825; Wight & Arn., Prodr. 201. 1834; Wight, Icon. Pl. Ind. Orient. t. 314. 1840; Dalz. & Gibs., Bombay Fl.

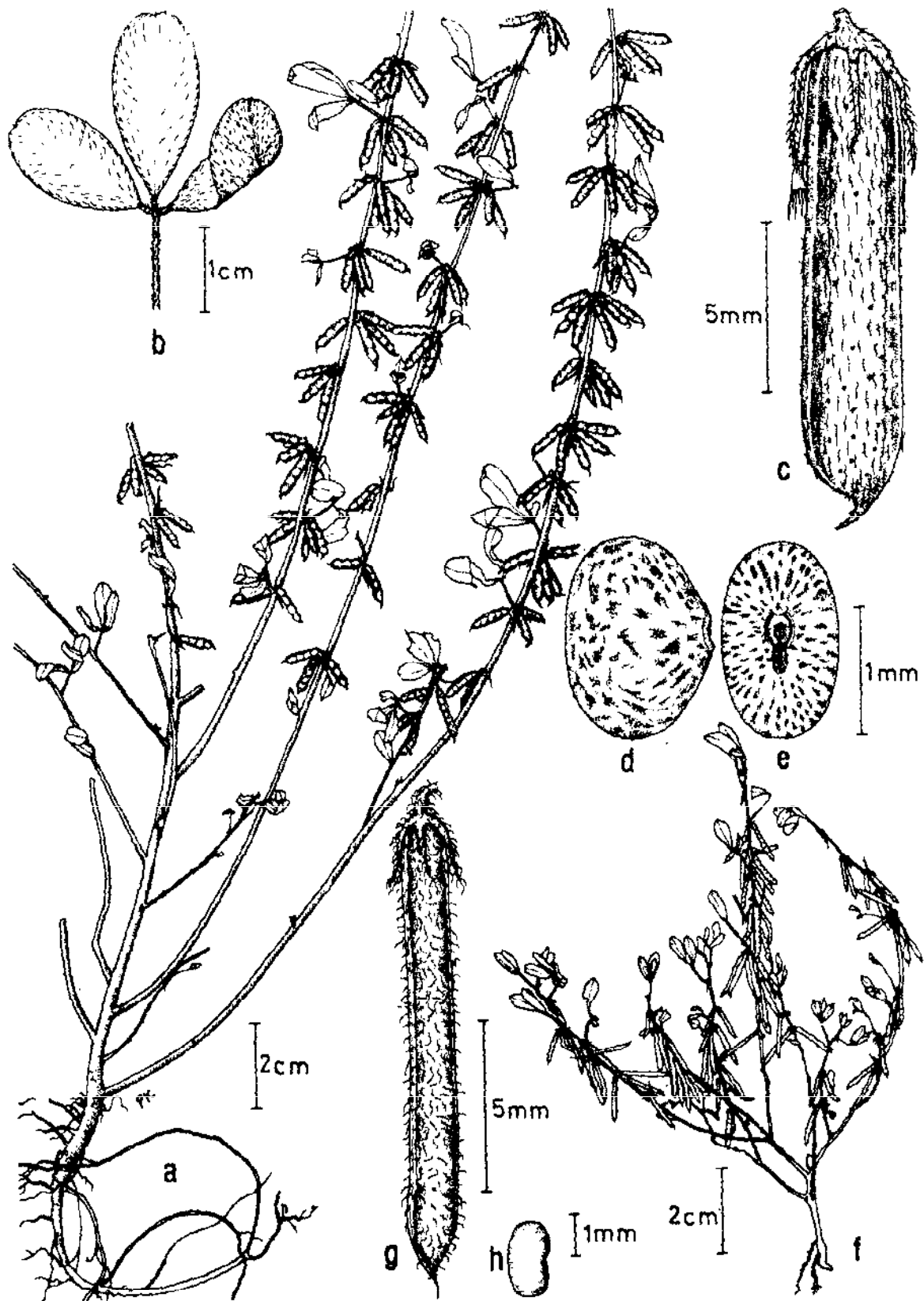


Fig. 53. *Indigofera trifollata* Linn. (a-e) : a. Habit, b. Leaf, c. Pod, d. Seed-side view, e. Seed-bilar view. *Indigofera prostrata* Willd. (f-h) : f. Habit, g. Pod, h. Seed (a-e: U.R. Kamble s.n.; f-h: V.Kumar 1287).

59. 1861; Drury, Handb. Indian Fl. 1: 278. 1864; Baker in Hook. f., Fl. Brit. India 2: 96. 1876, p.p.: Collett, Fl. Simlensis 121. 1902; T. Cooke, Fl. Pres. Bombay, 1: 314. 1902 (*Repr.* 1: 335. 1967); Prain, Bengal Pl. 1: 431. 1903 (*Repr.* 1: 309. 1963); Duthie, Fl. Upp. Gang. Pl. 1: 251. 1903 (*Repr.* 1: 232. 1960); Bamber, Pl. Punjab 556. 1916; Gamble, Fl. Pres. Madras 310. 1918 (*Repr.* 1: 219. 1967); Haines, Bot. Bihar Orissa 3: 237. 1922 (*Repr.* 2: 248. 1961); Kanjilal *et al.*, Fl. Assam 2: 22. 1938; Santapau, Fl. Saurashtra 128. 1962; Gandhi in Saldanha & Nicolson, Fl. Hassan Dist. 258. 1976; Britto in Matthew, Fl. Tamil Nadu Carn. 1: 428. 1983; de Kort & Thijssse in Blumea 30: 137. 1984, p.p.; R.S. Rao, Fl. Goa etc. 1: 126. 1985. *I. multicaulis* DC., Prodr. 2: 223. 1825. *I. trifoliata* Linn. var. *multicaulis* (DC.) Miq., Fl. Ind. Bat. 1, 1: 313. 1855; Gamble, Fl. Pres. Madras 310. 1918 (*Repr.* 1: 219. 1967); *I. peregrina* DC., 2: 224. 1825 - *Lotus peregrinus* auct. non Linn. 1753: Burm. f., Fl. Ind. 173. 1768. *I. moluccana* DC., Prodr. 2: 223. 1825.

KEY TO THE VARIETIES

- | | |
|--|------------------------------|
| 1a. Pods 15 - 20 mm long, 5 - 7-seeded | 55.1. var. trifoliata |
| b. Pods 8 - 12 mm long, 1 - 4-seeded | 55.2. var. duthiel |

55.1. var. trifoliata

Fig. 53 a - e.

Local names: Ratimethi (Guj.), Janglimeti (Hindi), Diwalee, Lalmeti (Mar.), Baragadamu (Tel.).

Annual herb or subshrub, 20 - 75 cm high; branches erect or ascending, biramous hairs adpressed with both equally and unequal arms. Leaves digitately trifoliolate; stipules 1 - 1.2 mm long, narrowly triangular, adnate to petiole, hairy outside; petioles 8 - 12 mm long, canaliculate above, hairy; stipellae absent; petiolules 1 - 1.5 mm long, terminal petiolule ca 2 mm long; leaflets 10 - 30 x 8 - 12 mm, obovate to obovate-oblong, sometimes linear, cuneate to obtuse at base, rounded to obtuse, sometimes emarginate at apex, biramous hairs slender, with unequal arms above, stout with equal arms beneath, brownish-orange gland-dotted beneath. Racemes 5 - 8 mm long, globose or slightly elongated; rachis pubescent, 6 - 20-flowered. Flowers pink or red, ca 5 - 6 mm long; bracts ca 0.6 mm long, hairy outside, caducous; pedicels ca 1 mm long, hairy. Calyx adpressed pubescent outside, cup 0.8 - 1.2 mm long, teeth 1 - 2.5 x 0.5 - 1 mm, narrowly triangular. Standard 4 - 6 x 3 - 5 mm, obovate, sometimes elliptic to somewhat orbicular, densely brown hairy and gland-dotted on the back; wing petals 3.5 - 5 x 1.2 mm, glabrous, ciliate along margins; keel petals 3.5 - 5.5 x 2 - 3 mm, densely brown hairy and gland-dotted outside, lateral spur 1 - 1.6 mm long. Staminal sheath 3.5 - 5 mm long, linear, glabrous or with few hairs on dorsal side, covered with glands towards tip, up to 7-ovuled; style 2 - 4 mm long, glabrous, glandular. Pods 10 - 20 x 2 - 4 mm, descending linear, tetragonous, apiculate, 5 - 7-seeded; sutures broadly winged (1 - 2.5 mm broad), sparsely

adpressed white pubescent; endocarp smooth. Seeds 1 - 2 x 1 1.5 mm, ellipsoid, rounded, shiny, reddish-brown, sometimes mottled.

Type: India, Herb. Linnaeus 923.3 (LINN!).

Fls.: Aug. - Dec.; *Frts.:* Oct. - Feb

Distrib.: INDIA: Throughout; SRI LANKA, PAKISTAN, NEPAL, BHUTAN, BANGLADESH, MYANMAR, CHINA, THAILAND, VIETNAM, TAIWAN, MALESIA, NEW GUINEA, AUSTRALIA.

Habitat: Road sides, cultivated fields, fallow lands, river banks and beds and hill slopes up to 1800 m.

Exsicc.: Andhra Pradesh: Kurnool Dist., Nallamalais, Sunnipenta colony, 450 m., 21 Oct. 1964, *J.L. Ellis* 22123; Ranga Reddy Dist., Hyderabad, Osmania University Campus, 15 Sept. 1971, *B.K. Vijayakumar* 613; Karnataka: Shimoga, 2 - 300 m, Oct. 1908, *A. Meebold* 9663; Maharashtra: Aurangabad Dist., Chowk, in cultivated fields, 21 Oct. 1982, *M. Sanjappa* 9507; Rajasthan: Bhilwar, on way to Bijolia, 30 Sept. 1978, *A.N. Singh* 6071.

Chr. No.: 2n = 16 (Bhatt & Sanjappa, *Nucleus* 18: 174. 1975); n = 8 (Bir & Kumari, *Taxon* 22: 459. 1973).

Pollen: 3-zonocolporate, oblate-spheroidal, 35 x 31 (34 - 36 x 24 - 38) μ m, granulate (Vishnu-Mittre & Sharma, *Pollen et Spores* 4: 5 - 45. 1962).

55.2. var. duthiei (Drumm. ex Naik) Sanjappa, *Legum. India* 196. 1992. *I. duthiei* Drumm. ex Naik in *Proc. Indian Acad. Sci.* 61: 227. 1970; Sanjappa in *Jour. Econ. Tax. Bot.* 5: 1035. 1984. **Map 6.**

Differs from var. *trifoliata* in having 1 - 4-seeded and narrowly winged pods.

Type: India, Maharashtra, 16 km North of Osmanabad, Ramling forest, 16 Oct. 1966, V.N. Naik 1319 (BSI holo!).

Fls.: Aug. - Oct.; *Frts.:* Oct. - Dec.

Distrib.: INDIA: Madhya Pradesh and Maharashtra; endemic.

Habitat: Cultivated fields (as a weed), fallow lands, wastelands and road sides.

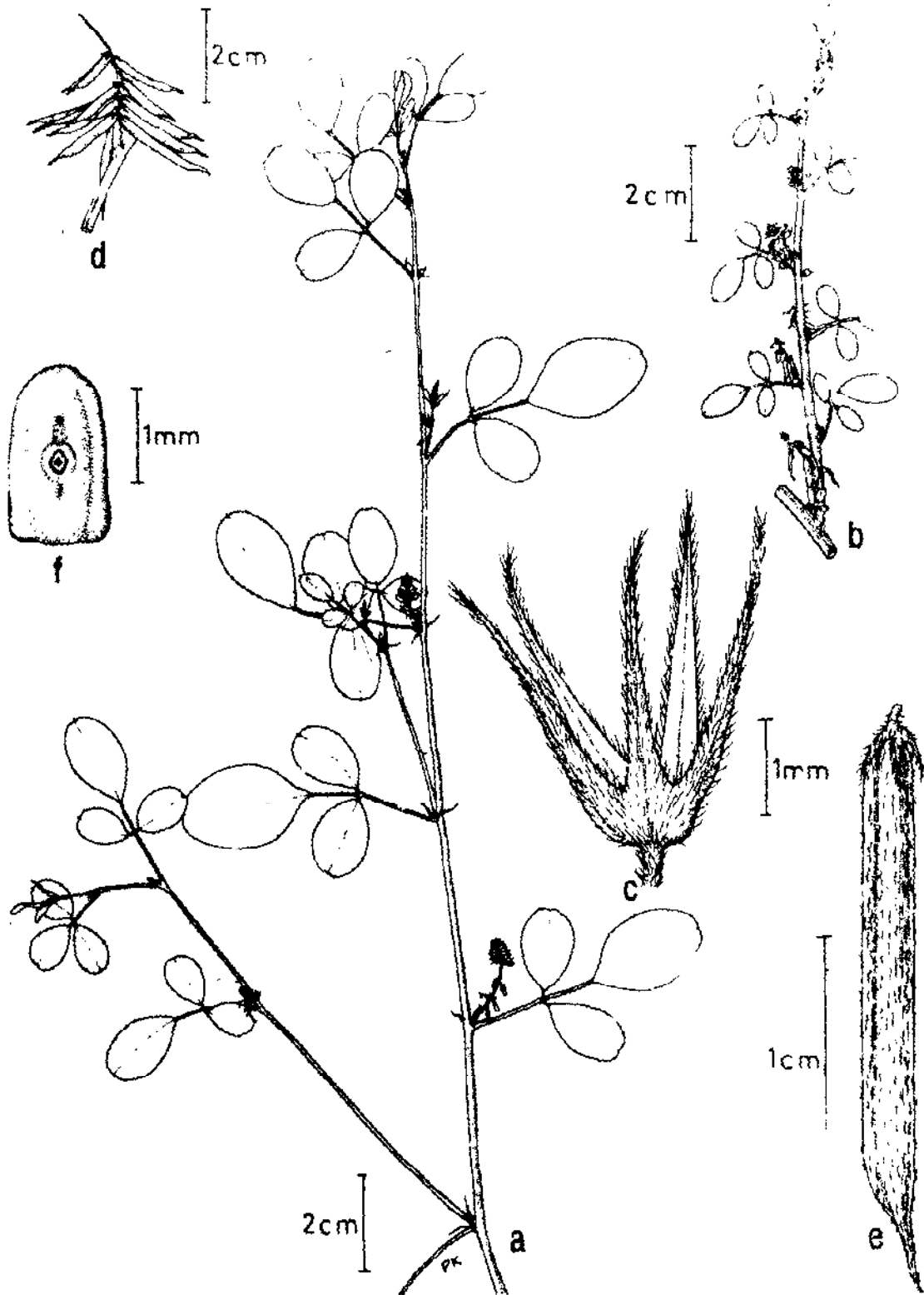


Fig. 54. *Indigofera trita* Linn. f. var. *trita* : a. Habit (large leaflet form), b. Habit (small leaflet form), c. Calyx, d. Infructescence, e. Pod, f. Seed-hilar view (a,c: Guinet 628; b,d-f: Pannar 8720).

Exsicc.: Madhya Pradesh, Betul Dist., Chinchoda 28 Jan. 1891, *J.F. Duthie* 10354; Maharashtra: Chanda Dist., Silori, 1 Dec. 1889, *J.F. Duthie* 9422; Aurangabad Dist., Khuldabad, 4 Nov. 1961, R.S. Rao 71367 (CAL, BSI); Mhaismal, 750 m, 21 Sept. 1978, *D.S. Pokle* 3177 (Herb., Bot. Dept., Marathwada Univ., Aurangabad, Maharashtra).

Chr. No.: $2n = 16$ sub *I. duthiei* (Sanjappa & Bhatt, *Taxon* 25: 495. 1976).

56. *Indigofera trita* Linn. f., *Suppl.* 335. 1781; D. Don, *Prodr.* 245. 1825; DC., *Prodr.* 2: 232. 1825; Roxb., *Fl. Ind.* 3: 37. 1832; Wight & Arn., *Prodr.* 203. 1834; Wight, *Icon. Pl. Ind. Orient.* t. 315 & t. 386. 1840; Dalz. & Gibs., *Bombay Fl.* 60. 1861; Drury, *Handb. Indian Fl.* 1: 281. 1864; Baker in Hook. f., *Fl. Brit. India* 2: 96. 1876; T. Cooke, *Fl. Pres. Bombay* 1: 315. 1902 (*Repr.* 1: 335. 1967); Prain, *Bengal Pl.* 1: 432. 1903 (*Repr.* 1: 309. 1963); Duthie, *Fl. Upp. Gang. Pl.* 1: 252. 1903 (*Repr.* 1: 232. 1960); Bamber, *Pl. Punjab* 92. 1916; Gamble, *Fl. Pres. Madras* 310. 1918 (*Repr.* 1: 219. 1967); Haines, *Bot. Bihar Orissa* 3: 238. 1922 (*Repr.* 1: 249. 1961); Kanjilal *et al.*, *Fl. Assam* 2: 22. 1938; Gillett in *Kew Bull. Add. Ser.* 1: 101. 1958; Mahesh., *Fl. Delhi* 118. 1963; Santapau, *Fl. Saurashtra* 128. 1968; Gandhi in Saldanha & Nicolson, *Fl. Hassan Dist.*, 258. 1976; Shah, *Fl. Gujarat state* 1: 225. 1978; Britto in Matthew, *Fl. Tamil Nadu Carn.* 1: 428. 1983; de Kort & Thijsse in *Blumea* 30: 139. 1984; R.S. Rao, *Fl. Goa etc.* 126. 1985. *I. hedysaroides* Lam., *Encycl.* 3: 250. 1789. *I. canescens* Lam., *Encycl.* 3: 251. 1789. *I. cinerea* Willd., *Sp. Pl.* 3: 1225. 1802. *I. arcuata* Willd., *Sp. Pl.* 3: 1228. 1802. *I. rigida* Willd., *Enum. Hort. Berol.* 2: 780. 1809. *I. leschenaultii* DC., *Prodr.* 2: 223. 1825.

KEY TO THE VARIETIES

- | | |
|---|----------------------------------|
| 1a. Leaves 3-foliolate | 2 |
| b. Leaves 5 - 7-foliolate often basal leaves 3-foliolate | 4 |
| 2a. Racemes shorter (less than 4.5 cm) than the subtending leaf | 56.1. var. <i>trita</i> |
| b. Racemes longer (more than 4.5 cm) than the subtending leaf | 3 |
| 3a. Pods narrow (ca 1 mm), lax, spreading | 56.2. var. <i>muffell</i> |
| b. Pods broad (more than 2 mm), compact, deflexed | 56.4. var. <i>purandharensis</i> |
| 4a. Pods 2 - 3 cm long, straight, spreading | 56.3. var. <i>marginulata</i> |
| b. Pods more than 3 cm long, curved, drooping | 56.5. var. <i>scabra</i> |

56.1. var. *trita*

Fig. 54.

Local names: Vikharia (Guj.), Tore menti (Kan.), Kandaram, Punalmurangi, Saubanjam (Tam.), Nakanaru, Verri neeli (Tel.).

Erect, woody herb or shrublet, 30 - 200 cm high; branches erect to horizontal, pinkish to light green, coarsely strigose, biramous hairs short, white, ad-

pressed with equal arms. Leaves pinnately trifoliolate; stipules 1 - 2 x 0.3 - 0.5 mm, narrowly triangular, hairy outside; petioles 1 - 2.5 cm long, canaliculate above, hairy; rachis 5 - 12 mm long; stipellae absent; petiolules 1 - 1.5 mm long; leaflets 3, very rarely 5, opposite, (8 -) 10 - 35 (- 45) x (5 -) 8 - 20 (- 30) mm, elliptic sometimes obovate, obtuse to cuneate or rounded at base, obtuse to rounded or sometimes emarginate and mucronate at apex, adpressed pubescent on both surfaces, sometimes glabrous above especially when the leaflets are small. Racemes 1.5 - 4.5 mm long, sessile, axillary; rachis striate, adpressed strigose, 15 - 30-flowered, flowers always sterile towards tip. Flowers pink to brick red, 4 - 5 mm long; bracts 1 - 1.5 mm long, narrowly triangular, caducous; pedicels up to 1.2 mm long. Calyx adpressed white pubescent, cup 0.5 - 1 mm long, teeth 1 - 1.5 x 0.5 mm, narrowly triangular. Standard 3.5 - 4.5 x 3 - 4 mm, orbicular, sometimes broadly obovate, rounded and mucronate at apex, adpressed strigose on the back; wing petals 3 - 4 x 1 mm, glabrous, ciliate along margins; keel petals 3 - 4 x 1 - 1.5 mm, adpressed strigose outside towards the tip, ciliate along margins, lateral spur ca 0.6 mm long. Staminal sheath 3 - 4 mm long; anthers ca 0.5 mm long. Ovary ca 3 mm long, linear, glabrous, up to 10-ovuled; style 1 - 1.5 mm long, glabrous. Pods 15 - 30 x 1.5 - 2.5 mm, deflexed to spreading (perpendicular to the axis), straight, subtetragonous sharply beaked, strigose, ash-grey to pinkish, 6 - 10-seeded. Seeds ca 2 x 1.5 mm, subtetragonous, yellow, dark-brown, smooth.

Type: India, Herb. Linnaeus 923.9 (LINN!).

Fls. & Frts.: Almost throughout the year.

Distrib. INDIA: Throughout; PAKISTAN, SRI LANKA, BANGLADESH, MYANMAR, MALESIA, AUSTRALIA, WEST ASIA.

Habitat: Dry wastelands, road sides, scrub forests sea level to 200 m.

Exsicc.: Andhra Pradesh: Cuddapah, 400 ft., Feb. 1883, *J.S. Gamble* 11202; Kerala: Travancore, Makara, 5 Sept. 1913, *M. Rama Rao* 1627; Madhya Pradesh: Indore dist., Mhow, Choral, 27 Aug. 1864, *C.M. Arora* 5590; Maharashtra: Thane Dist., near Kelvadi, 1 Nov. 1968, *K.V. Billore* 115444; Rajasthan: Bhilwara Dist., on way to Bijola, 1 Oct. 1978, *A.N. Singh* 6099; Tamil Nadu: Coimbatore Dist., cultivated fields at the foot hills of Kuradimalai, 7 Dec. 1980, *M. Sanjappa* 711.

Chr. No.: $2n = 16$ (Frahm-Leliveld, Act. Bot. Neerl. 9: 19. 1960); $n = 8$ (Sareen & Singh, Taxon 24: 504. 1975).

Pollen: 3-zonocolporate, sphaeroidal rarely subprolate, $21 \times 24 \mu\text{m}$, (Nair, Pollen grains of Western Himalayan plants, 20 - 21. 1965).

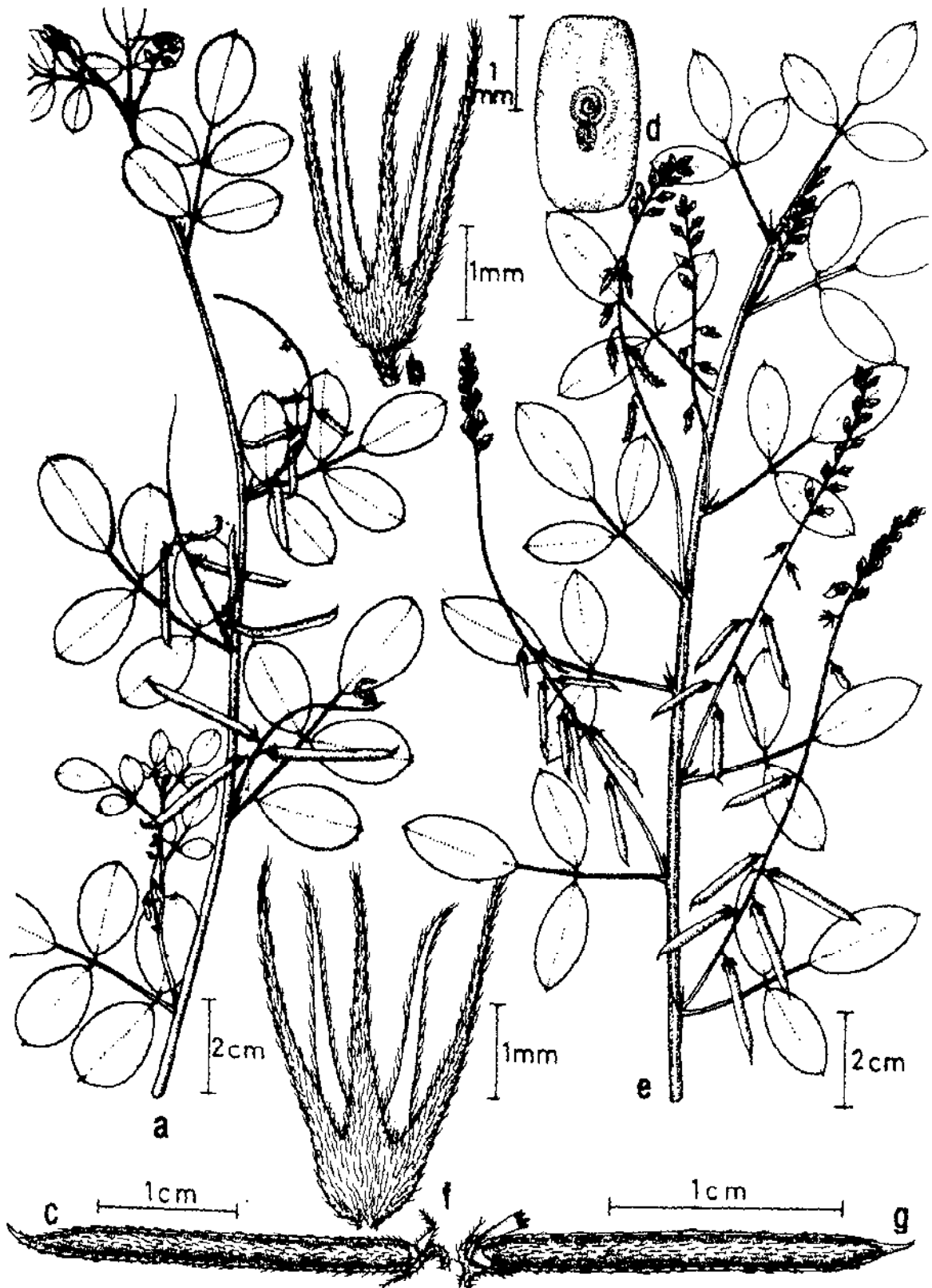


Fig. 55. *Indigofera trita* Linn. f. var. *marginulata* (Graham ex Wight & Arn.) Sanjappa(a-d) : a. Habit, b. Calyx, c. Pod, d. Seed-hilar view. var. *maffei* (Chiov.) Ali(e-g) : e. Habit, f. Calyx, g. Pod (c-d: Chandrabose 53402; e-f: Santapau 20080, DD; g: Saxton 2635).

Notes: Ali (1958) based on statistical analysis of 3 common and variable characters in *I. trita* and its closely related *I. subulata* grouped them into 5 taxa i.e. 2 subspecies viz. *trita* and *subulata* with 4 varieties viz. *trita*, *maffei* (Chiov.) Ali (under subsp. *trita*), *subulata* (Vahl ex Poiret) Ali and *scabra* (Roth) Ali (under subsp. *subulata*). These subspecies were subsequently merged (Gillett, *op. cit.* and Ali, *op. cit.*) and recognised only varieties under *I. trita* de Kort & Thijsse (1984) resurrected both the subspecies proposed by Ali and added a third one by elevating var. *scabra* (Roth) Ali to the subspecies status. They did not recognise any variety under them. Recently, Sanjappa (*op. cit.*) merged all the subspecies based on a statistical analysis of 3 characters viz. length of the inflorescence, number of leaflets and condition of the pods (as suggested by Ali *op. cit.*) and recognised 5 varieties viz. var. *trita*, *maffei*, *marginulata*, *purandharensis* and *scabra* for Indian region which is followed here.

The variety *trita* shows variations in height of the plants, size of the leaflets and pods. The plants growing in arid localities and coastal areas exhibit stunted growth, reduced size of leaflets often with glabrous upper surface, with only 2 - 4 pods per peduncle developing from basal flowers and often the rachis tip become hard and spiny.

56.2. var. *maffei* (Chiov.) Ali in Bot. Notis, 111: 559. 1958 & in Nasir & Ali, Fl. W. Pakistan 100: 79. 1977; Gillett in Milne-Redhead & Polhill, Fl. Trop. E. Africa 3: 304. 1971; Nair in Rec. Bot. Surv. India 21: 90. 1978; Shah, Fl. Gujarat State 1: 225. 1978; Sanjappa in Bull. Bot. Surv. India 26: 116. 1985. *I. maffei* Chiov. in Att. Ist. Bot. Pavia ser. 4, 7: 128. t. 5. 1936. *I. subulata* Vahl ex Poiret var. *maffei* (Chiov.) Gillett in Kew Bull. Add. Ser. 1: 101. 1958. *I. marginulata* auct. non Graham ex Wight & Arn. 1834; Baker in Hook. f., Fl. Brit. India 2: 97. 1876, p.p. excl. spec. cit. Wight; T. Cooke, Fl. Pres. Bombay 1: 316. 1902 (*Repr.* 1: 336. 1967). *I. oreophila* Santapau & Panthaki in Jour. Bombay Nat. Hist. Soc. 54: 221. 1956; Santapau, Fl. Purandhar 39. 1957. *I. trita* Linn. f. subsp. *subulata* auct. non (Vahl ex Poiret) Ali 1958: de Kort & Thijsse in Blumea 30: 139. 1984, p.p. Fig. 55 e - g, Map 6.

Differs from var. *trita* in having more than 4.5 cm long, distinctly pedunculate racemes, narrow and spreading pods and from var. *purandharensis* Sanjappa in having membranous leaves, pods that are broad (2 mm), compact and deflexed.

Type: Somalia, Genale, Pollacci & Maffei 124 (FI, holo photo !).

Fls.: Aug.-Nov.; *Frts.:* Oct. - Jan.

Distrib.: INDIA: Goa, Gujarat, Maharashtra and Punjab; PAKISTAN, ETHIOPIA, ERITREA, KENYA, MOZAMBIQUE, TANGANYIKA, SOMALI REPUBLIC, SUDAN, UGANDA.

Habitat: Open areas in deciduous forests, road sides, hill slopes from 30 to 100 m.

Exsicc.: Gujarat: Dangs forest, 23 Oct. 1919, *R.H. Dastur* 141; Waghai to Pimpri, 23 Sept. 1955, *D.P. Panthaki* 2350 (Holotype of *I. oreophila* Santapau & Panthaki, BLAT); Santapau 19985, 20081 (BLAT, DD).

Chr. No.: n = 8 (Sanjappa, Taxon 32: 669. 1983).

Pollen: 3-zonocolporate, suboblate, 25 x 29 (24 - 26 x 28 - 30) μm , granulate (Vishnu-Mittre & Sharma, Pollen et Spores 4: 5 45. 1962 sub *I. oreophila* Santapau & Panthaki)

56.3. var. marginulata (Graham ex Wight & Arn.) Sanjappa in Bull. Bot. Surv. India 26: 118. 1985; Ahmed. & Nayar, Endem. Pl. Indian Reg. 99. 1987. *I. marginulata* Graham ex Wight & Arn., Prodr. 204. 1834; Drury, Handb. Indian Fl. 1: 281. 1864; Baker in Hook. f., Fl. Brit. India 2: 97. 1876, p.p. excl. spec. cit. Stocks; Gamble, Fl. Pres. Madras 311. 1918 (*Repr.* 1: 220. 1967); Sanjappa in Jour. Econ. Tax. Bot. 5: 1034. 1984. **Fig. 55 a - d, Map 6.**

Differs from var. *trita* in having generally 5-foliolate leaves (except for 3-foliolate basal leaves on branches), more than 4.5 cm long racemes, spreading pods with rounded valves, and from var. *scabra* in having shorter racemes, shorter, straight and spreading pods.

Type: Penin. India, Wallich, Cat. No. 5467 (K-W, Lecto ! CAL !) Lectotype selected here.

Fls.: Sept. - Nov. ; *Frts.:* Nov. - Feb.

Distrib.: INDIA: Tamil Nadu; endemic.

Habitat: Slopes of hills in scrub forests between 300 and 900 m.

Exsicc.: Tamil Nadu: Nilgiri Dist., Kallar, 2000 ft., *J.S. Gamble* 16993; Madurai Dist., on way to Sirumalai, 27 Feb. 1978, *M. Chandrabose* 53402; Ramnad Dist., Aynarkoli forest, 425 m, 13 March 1970, *E. Vajravelu* 33709; Coimbatore Dist., Marudhamalai, 325 m, Dec. 1980, *M. Sanjappa* 702.

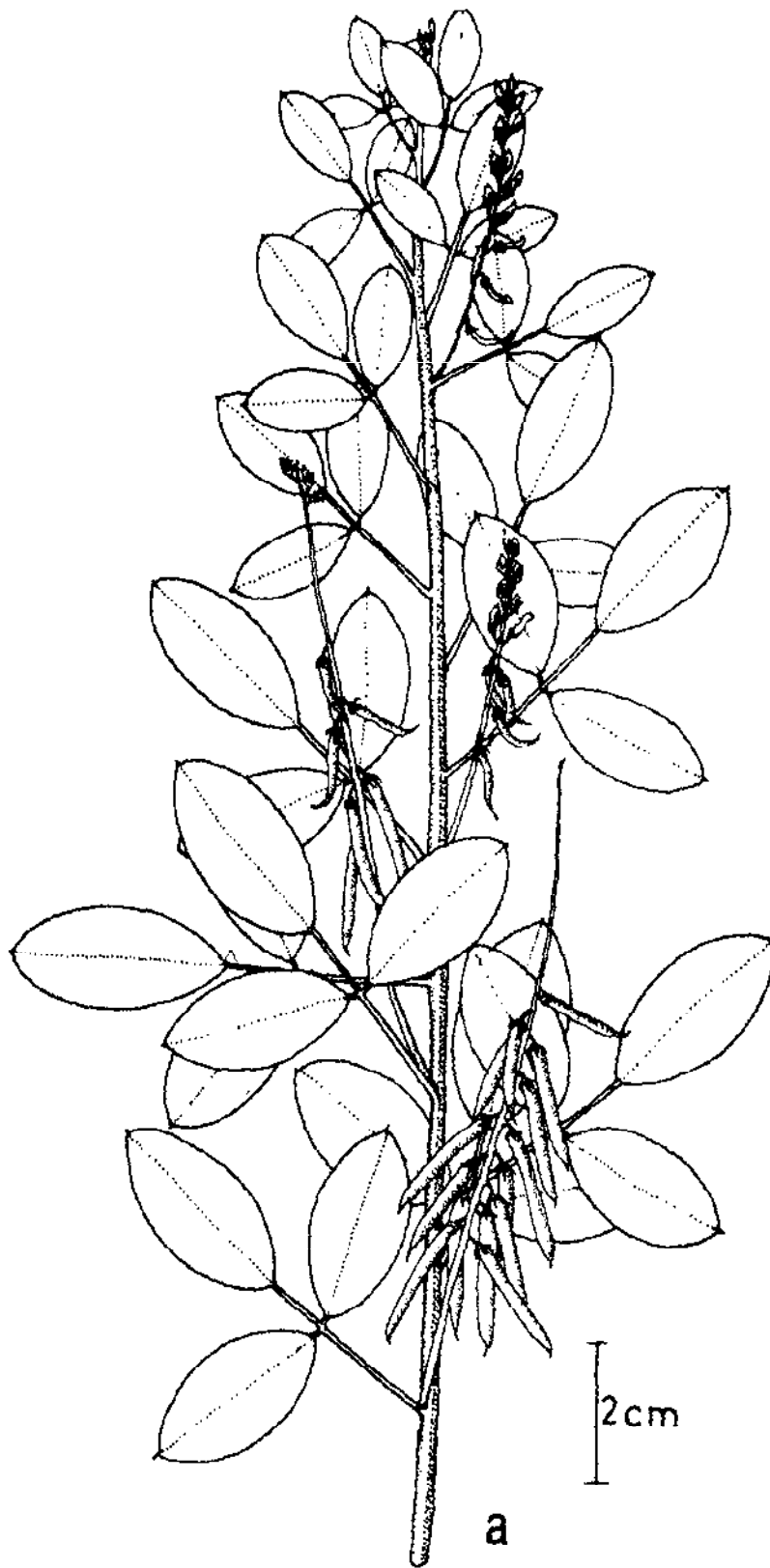


Fig. 56. *Indigofera trita* Linn. f. var. *purandharensis* Sanjappa : a. Habit
(*Santapau* 11399, 8326, BLAT).

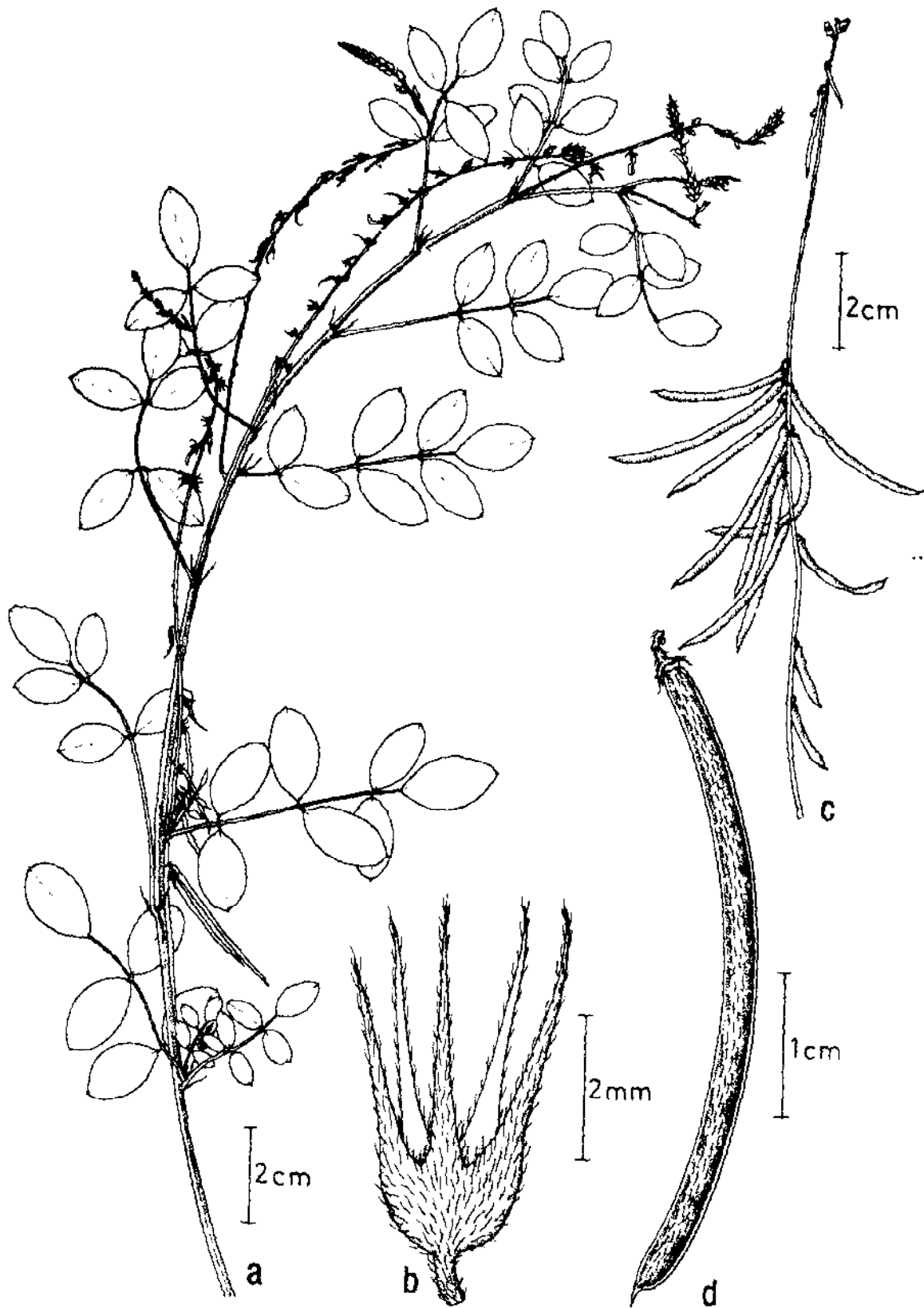


Fig. 57. *Indigofera trita* Linn. f. var. *scabra* (Roth) Ali : a. Habit, b. Calyx, c. Infructescence, d. Pod (a-b: *Sebastine* 15336; c-d: *Vajravelu* 22462).

56.4. var. purandharensis Sanjappa in Bull. Bot. Surv. India 26: 117. 1985.
Fig. 56, Map 6.

Differs from var. *trita* in having longer racemes and flowers, shorter, broader, compact and deflexed pods.

Type: India, Maharashtra, Poona Dist., Purandhar, 9 Oct. 1950, *H. Santapau* 11398 (BLAT, holo).

Fls.: Aug. - Nov.; *Frts.:* Oct. - Nov.

Distrib.: INDIA: Maharashtra; endemic.

Habitat: Slopes of dry hills between 800 and 900 m.

Exsicc.: Maharashtra: Poona Dist., Purandhar, Sept. 1945, *H. Santapau* 8368 (BLAT); Vazirghad, 13 Oct. 1957, *H. Santapau* 22021 (BLAT); 13 Oct. 1957, *G.L. Shah* 9259, 9260 (BLAT); slopes of Vazirghad, 29 Dec. 1945, *H. Santapau* 8326, 8327 (BLAT).

56.5. var. scabra (Roth) Ali in Bot. Notis. 111: 558. 1958; Gillett in Milne-Redhead & Polhill, Fl. Trop. E. Africa 3: 304. 1971; Sanjappa in Bull. Bot. Surv. India 26: 118. 1985. *I. scabra* Roth, Nov. Pl. Sp. 359. 1821; DC., Prodr. 2: 229. 1825. *I. subulata* Vahl ex Poiret var. *scabra* (Roth) Meikle in Kew Bull. 5: 553. 1951; Gillett in Fl. W. Trop. Africa ed. 1: 541. 1958 & Kew Bull. Add. Ser. 1: 100. 1958. *I. trita* Linn. f. subsp. *subulata* (Vahl ex Poiret) Ali var. *scabra* (Roth) Ali in Bot. Notis. 111: 558. 1958. *I. mucronata* Sprengel ex DC., Prodr. 2: 227. 1825. *I. flaccida* Koenig ex Roxb., Fl. Ind. 3: 375. 1832; Wight & Arn., Prodr. 204. 1834; Wight, Icon. Pl. Ind. Orient. t. 387. 1840; Drury, Handb. Indian Fl. 1: 281. 1864. *I. subulata* auct. non Vahl ex Poiret 1789: Baker in Hook. f., Fl. Brit. India 2: 96. 1876 excl. syn. *I. thoningii* Schum.; Duthie, Fl. Upp. Gang. Pl. 1: 252. 1903 (*Repr.* 1: 232. 1960); Gamble, Fl. Pres. Madras 311. 1918 (*Repr.* 1: 219. 1967); *I. trita* Linn. f. subsp. *scabra* (Roth) de Kort & Thijssse in Blumea 30: 140. 1984, p.p. Fig. 57, Map 6.

Differs from var. *trita* in having long, 5 - 7-foliolate leaves, 5 - 15 cm long racemes, 3 - 4 cm long curved and descending pods.

Type: Ind. Or., Madras, Heyne in Wallich, Cat. No. 5475 (K-W, holo ! CAL !).

Fls.: Sept. - Oct.; *Frts.:* Oct. - Jan.

Distrib.: INDIA: Andhra Pradesh, Karnataka, Madhya Pradesh and Tamil Nadu; SRI LANKA, THAILAND, LAOS, NEW GUINEA, MADAGASCAR, TROPICAL and S.AFRICA, TROPICAL AMERICA .

Habitat: Slopes of hills in scrub forests, waste lands and fringes of deciduous forests up to 1000 m.

Exsicc.: Andhra Pradesh: The Kistna Uplands, 1 Nov. 1902, C.A. Barber 4624, 4626, 4576; Tamil Nadu: Madurai Dist., Algar Koil R.F., 167 m, 18 Sept. 1957, K. Subramanyam 4252; Coimbatore Dist., Marudamalai, 325 m, 6 Dec. 1980, M. Sanjappa 701; Nilagiri Dist., Kotagiri, Mamaram, 766 m, 6 June 1957, K. Subramanyam 1981.

Chr. No.: $2n = 16$, 32 sub *I. subulata* Vahl ex Poiret (Frahm-Leliveld, *Genetica* 37: 407. 1966); $n = 8$ sub *I. subulata* Vahl ex Poiret (Bhatt, *Jour. Cytol. Genet.* 14: 59. 1979).

Notes: This variety is reported to occur in Upper Gangetic Plain (vide Duthie *op. cit.*) but so far no specimen could be examined from this region.

57. *Indigofera uniflora* Buch.-Ham. ex Roxb., Fl. Ind. 3: 374. 1832; Wight & Arn., Prodr. 199. 1834; Wight, Icon. Pl. Ind. Orient. t. 333. 1840; Drury Handb. Indian Fl. 1: 277. 1864; Baker in Hook. f., Fl. Brit. India 2: 94. 1876; T. Cooke, Fl. Pres. Bombay 1: 312. 1902 (*Repr.* 1: 333. 1967); Gamble, Fl. Pres. Madras 309. 1918 (*Repr.* 1: 218. 1967); Saldanha & G. Singh in Saldanha, Fl. Karnataka 1: 475. 1984; Ahmed. & Nayar, *Endem. Pl. Indian Reg.* 100. 1987. *Tsjovanna-Manneli* Rheede, Hort. Malab. 9: t. 68. 1689. *I. aspalathoides* auct non Vahl ex DC. 1825; Dalz. & Gibs., Bombay Fl. 58. 1861; T. Cooke, Fl. Pres. Bombay 1: 312. 1902 (*Repr.* 1: 333. 1967). **Fig. 58, Map 6.**

Prostrate herb; tap root stout, woody often red-spotted; branches slender, terete, biramous hairs adpressed with equal arms. Leaves pinnate, rarely digitate, sessile or subsessile, stipules 1 - 1.5 x 0.5 mm, narrowly triangular, with few hairs outside; rachis 0 - 5 mm long; stipellae absent; petiolules ca 1 mm long; leaflets 3 - 7, opposite, increase in size from base to tip, 4 - 8 x 1 - 2 mm, linear, oblanceolate, cuneate at base, acute or obtuse at apex, midrib tipped with a tubular gland beneath, sparsely adpressed hairy on both surfaces, often glabrous on upper surface. Flowers pink, solitary; bracts 1 - 3 per pedicel at joint, 0.5 - 1 mm long, glabrous, one of them always longer than others; pedicels 7 - 10 mm long, filiform, jointed, sparsely hairy. Calyx sparsely adpressed hairy outside, cup ca 0.5 mm long, teeth 0.5 - 1 mm long, narrowly triangular, tubular gland-tipped on midrib outside. Standard 3.5 - 4 x 2.5 - 3 mm, ovate or broadly elliptic, mucronate at apex, adpressed hairy on the back; wing petals 2.5 - 3 x 1.5 mm, glabrous, ciliate along upper margins; keel petals 3.5 - 4 x 2.5 mm,

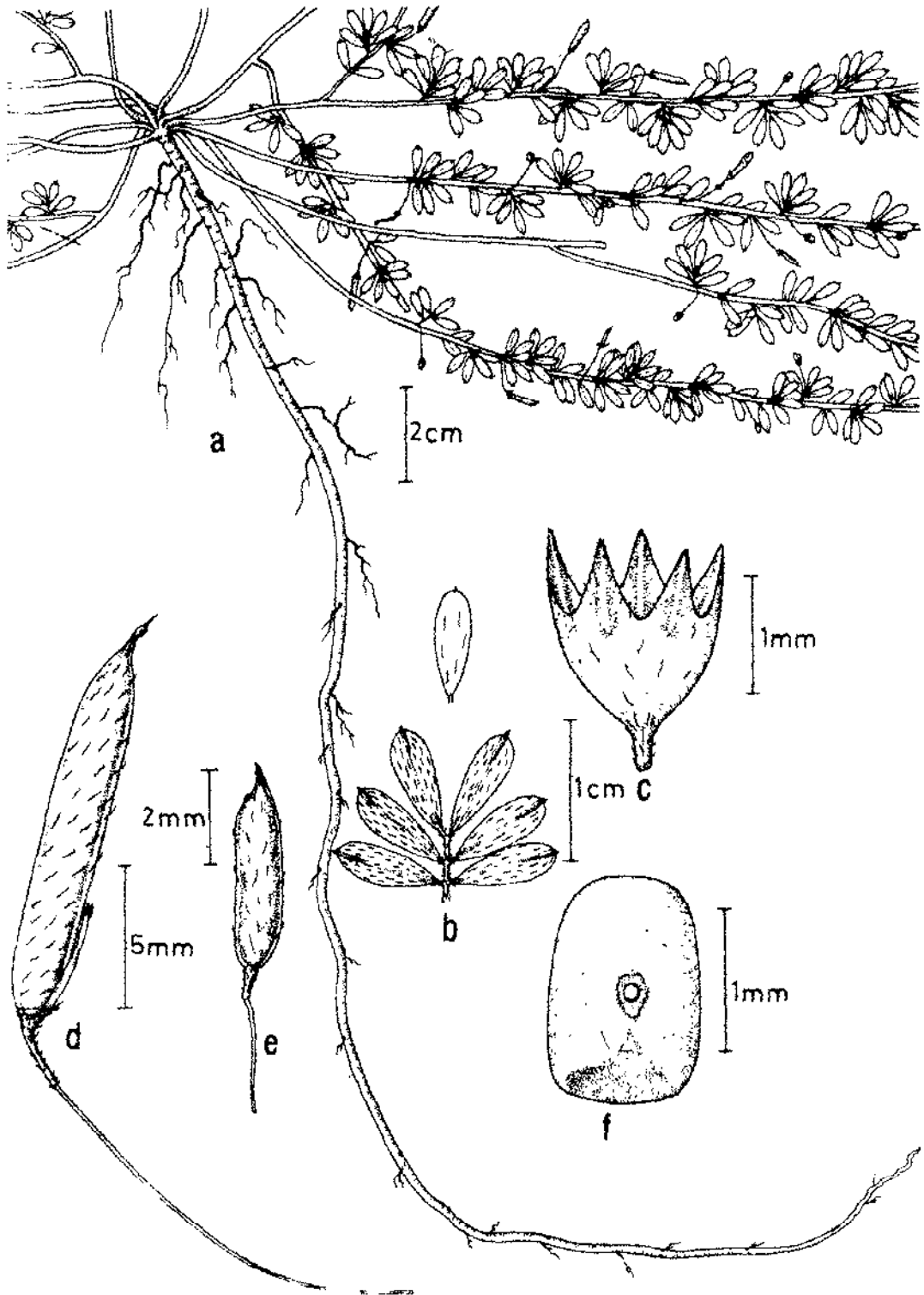


Fig. 58. *Indigofera uniflora* Buch.-Ham, ex Roxb. : a. Habit, b. Leaf with detached leaflet showing adaxial surface, c. Calyx, d&e. Pod, f. Seed-hilar view (a,c: T.A. Rao 10105; b: Ramamurthy 47681; d,f: Saldhana & Sreenath 4955; e: Vajravelu 48817).

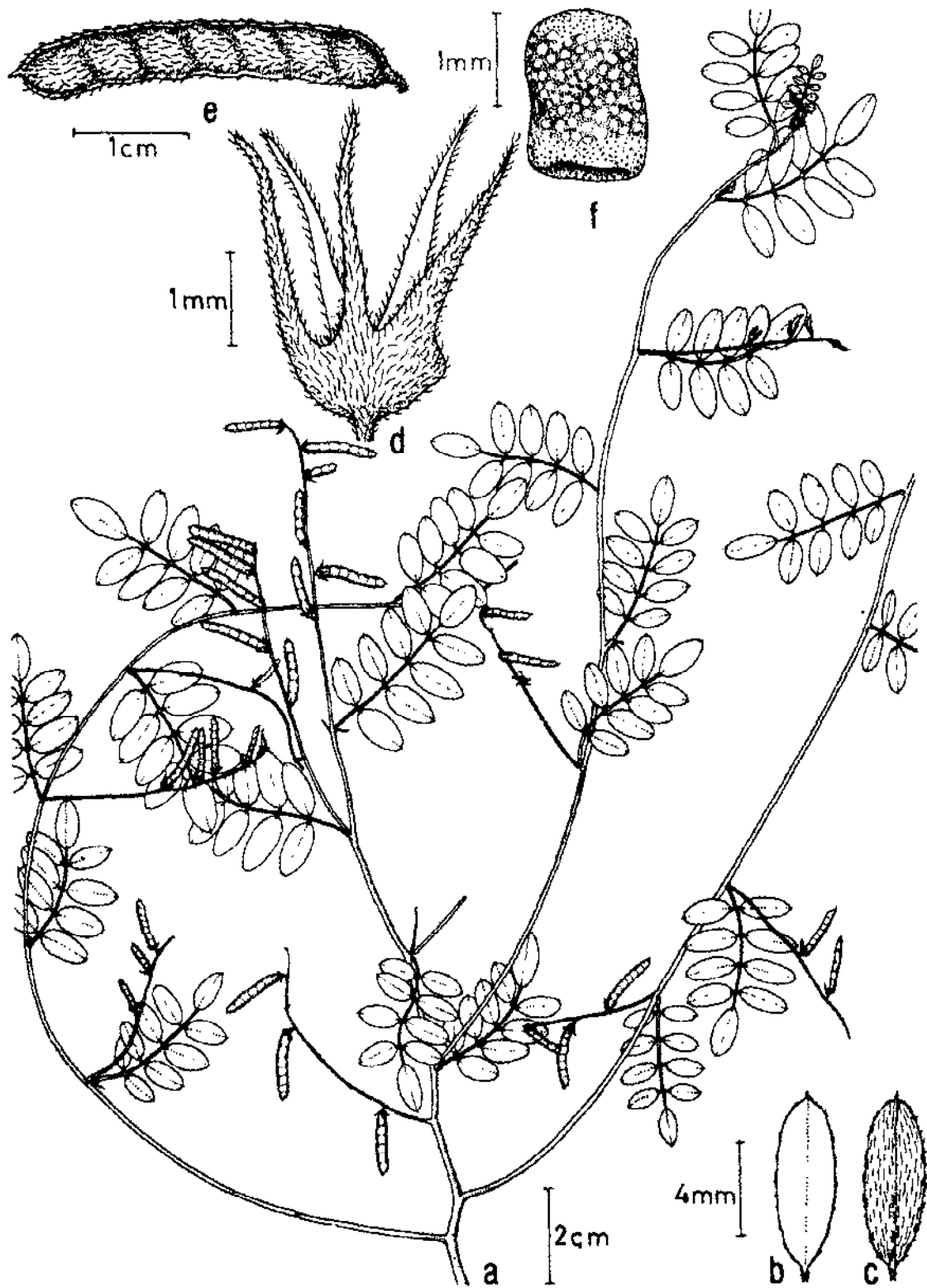


Fig. 59. *Indigofera vicioides* Jaub. & Spach : a. Habit, b. Leaflet-adaxial surface, c. Leaflet-abaxial surface, d. Calyx, e. Pod, f. Seed-side view (a-c: Sanjappa 720; f: Hooper & Ramaswamy 38388).

sparsely hairy outside, densely ciliate along margins, lateral spur ca 0.5 mm long. Staminal sheath ca 4 mm long; anthers 0.4 mm long. Ovary 1 - 1.5 mm long, linear, with few hairs on dorsal side, up to 7-ovuled; style 3 - 3.8 mm long, glabrous. Pods 10 - 12 x 2 - 3 mm, straight, longer or equal to pedicel, subcylindrical, shortly apiculate, faintly torulose, sparsely hairy or glabrous, (1 -) 3 - 7-seeded. Seeds ca 1 x 1 mm, cubical, truncate at both ends, smooth, shiny, yellowish-brown to reddish-brown.

Type: India: Roxburgh, Fl. Ind. Icon. t. 1625 (ined. CAL ! K!).

Fls.: July - March; *Frts.:* Sept. - March.

Distrib.: INDIA: Andhra Pradesh, Karnataka, Kerala, Maharashtra(?) and Tamil Nadu; endemic.

Habitat: Sandy beaches, coastal plains, interior on elevated plateaus up to 800 m.

Exsicc.: Karnataka: Dakshina Kannada Dist. ('South Canara' Dist.), Mangalore, 25 Nov. 1972, T.A. Rao 10105; Belgaum Dist., Ukkad Forest, 27 Oct. 1970, B.K. Vijaykumar 1285; Kerala: Palghat Dist., Hill near Malampuzha, 100 m, 16 Oct. 1963, J. Joseph 17793; Tamil Nadu: Viramandanpalayam, 950 ft., 14 Oct. 1905, C.E.C. Fischer 456; Anamalais, 2200 ft., Dec. 1916 Fyson, 3307 (PCM).

Chr. No.: n = 8 (Sanjappa & Dasgupta, Indian Jour. Bot. 6: 62. 1983).

58. *Indigofera vicioides* Jaub. & Spach, Ill. Pl. Orient. 5: t. 481. 1856; Baker in Oliver, Fl. Trop. Africa 2: 81. 1871; Gillett in Kew Bull. Add. Ser. 1: 73. 1958; Sreemadhavan in Sci. Cult. 33: 407. 1967. **Fig. 59, Map 6.**

Annual, spreading herb, 20 - 40 cm high; branches ascending, slender, strigose to pilose, biramous hairs adpressed with equal arms. Leaves 2.5 - 3 cm long including 4 - 5 mm long petiole; stipules 2.5 - 3 x 1 - 2 mm, narrowly triangular, spreading adpressed pubescent outside, shortly adnate to petiole; rachis 1.5 - 2 cm long, canaliculate above, pilose to strigulose, prolonged beyond lateral leaflets; stipellae absent; petiolules 1 - 1.5 mm long, strigulose; leaflets 7 - 11, opposite, 5 - 15 x 2.5 - 5 mm, elliptic-oblong, obtuse at both ends, mucronate at apex, glabrous above, adpressed pubescent beneath. Racemes 3 - 5 cm long including 1.5 - 2 cm long peduncle, axillary; rachis 1.5 - 3 cm long, strigulose to pilose, 5 - 8-flowered. Flowers brick-red, 4 - 4.5 mm long; bracts 1 - 1.5 x 1 mm, lanceolate, hairy outside, caducous; pedicels 1.5 - 2 mm long, pubescent. Calyx adpressed pubescent outside, cup ca 1 mm long, teeth ca 2 x 0.5 mm, narrowly triangular. Standard 3.5 - 4 x 2 - 2.5 mm, ovate, obtuse and

mucronate at apex, adpressed hairy on the back; wing petals 3 - 3.5 x 1.5 mm, glabrous; keel petals 3 - 4 x 2 mm, adpressed pubescent outside, lateral spur ca 1 mm long. Staminal sheath 3 - 3.5 mm long; anthers ca 0.5 mm long. Ovary 2.5 - 3 mm long, linear, glabrous, up to 7-ovuled; style 1 - 1.5 mm long, glabrous. Pods 10 - 15 x 1.5 - 3 mm, spreading, linear, cylindrical to subcylindrical, apiculate, slightly torulose, obliquely depressed between seeds, pubescent, biramous hairs densely spreading with unequal arms; endocarp faintly red-spotted. Seeds 5 - 7, ca 1.5 x 1 mm, cylindric, truncate at both the ends, faintly punctate on ends, reticulate-rugose on faces, dark-brown.

Type: Ethiopia, Dscha Dscha, July 1853, *Schimper s.n.* (P, holo photo !).

Fls.: Oct. - Dec.; *Frts.:* Dec. - Feb.

Distrib.: INDIA: Tamil Nadu; CONGO, ERITREA, ETHIOPIA, MOZAMBIQUE, RHODESIA, BOTSWANA, S.W. & S. AFRICA.

Habitat: Grass lands, open areas in deciduous and scrub forests from 300 to 1000 m.

Exsicc.: Tamil Nadu: Tirunelveli Dist., on way from Kalkad to Sengalteri, 333 m, 18 Dec. 1980, *M. Sanjappa* 720; Naterikal, 1000 m, 12 Feb. 1913, *Hooper & Ramaswami* 38388; Kalkad R.F., 300 m, 12 Nov. 1962, *J. Joseph* 15252 (CAL, MH); Coimbatore Dist., Boluvampatti R.F., Konnimalai Hills, *Sreemadhavan* 348, 844, & 969 (MH).

Chr. No.: $2n = 16$ (Frahm-Leliveld, *Genetica* 37: 407 - 426. 1966); $n = 8$ (Sanjappa, *Taxon* 32: 669. 1983).

Notes: This species is allied to *I. kamatakana* but differs from it in having adaxially glabrous leaflets, 5 - 8-flowered racemes, shorter and densely spreading pubescent pods.

Gillett (1958) distinguished a variety viz., *rogersii* (R.E. Fries) Gillett under this species in Africa and indicated that both the varieties vary greatly especially in S. Africa. The Indian specimens belong to var. *vicioides*.

59. *Indigofera wightii* Graham ex Wight & Arn., *Prodr.* 202. 1834; Dalz. & Gibs., *Bombay Fl.* 59. 1861; Drury, *Handb. Indian Fl.* 1: 279. 1864; Baker in Hook. f., *Fl. Brit. India* 2: 99. 1876; Talbot, *Syst. List Trees Bombay* 67. 1894; Trimen, *Handb. Fl. Ceylon* 2: 27. 1894; T. Cooke, *Fl. Pres. Bombay* 1: 319. 1902 (*Repr.* 1: 340. 1967); Brandis, *Indian Trees* 218. 1906; Gamble, *Fl. Pres. Madras* 313. 1918 (*Repr.* 1: 221. 1967); Gandhi in Saldanha & Nicolson, *Fl. Hassan Dist.* 258. 1976; Sharma *et al.* in *Biol. Mem.* 2: 44. 1977; Britto in Matthew, *Fl. Tamil*

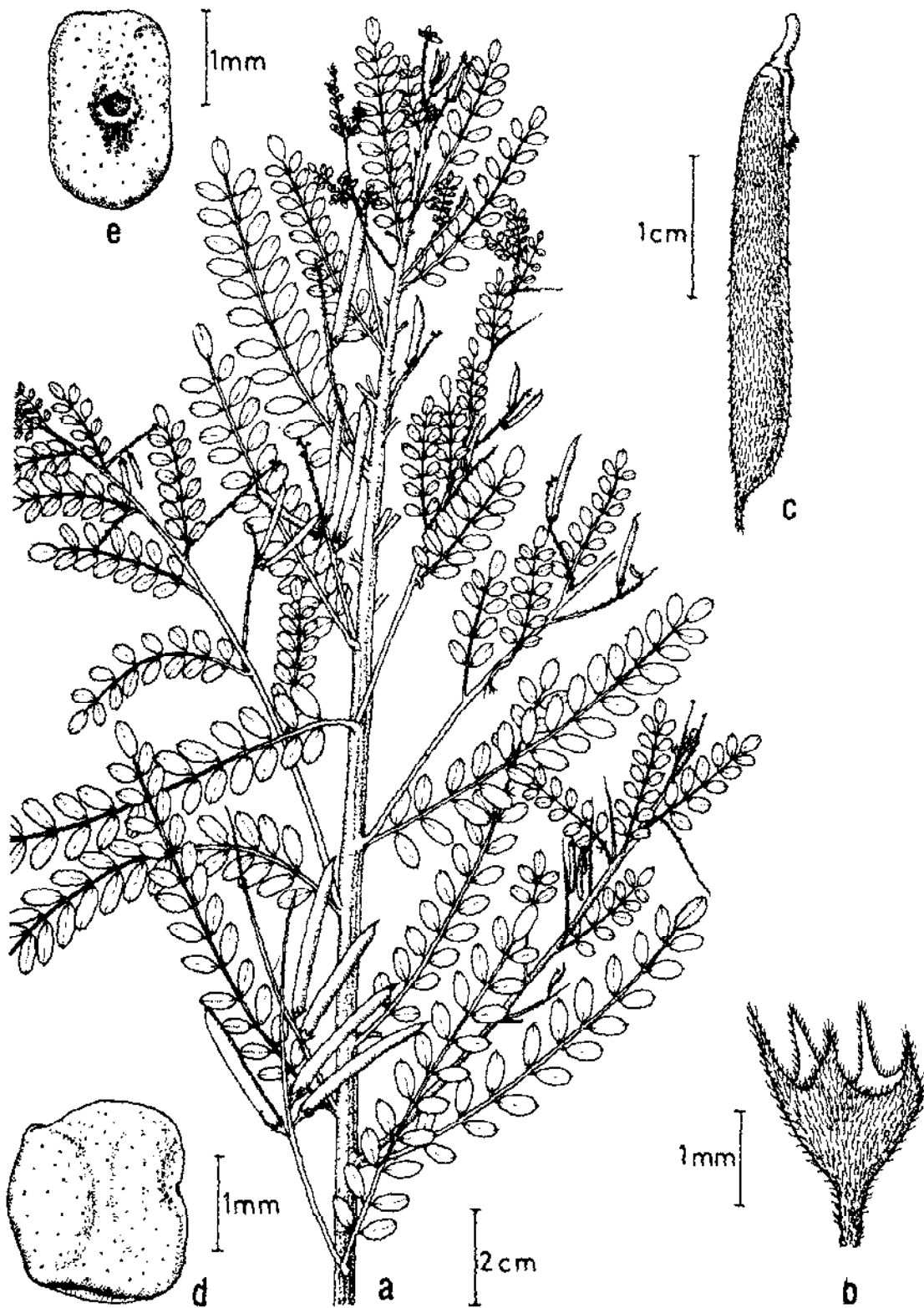


Fig. 60. *Indigofera wightii* Graham ex Wight & Arn. : a. Habit, b. Calyx, c. Pod, d. Seed-side view, e. Seed-hilar view (a-b: *Ellis* 20415; c: *Sanjappa* 715; d-e: *N.C. Nair* 61005).

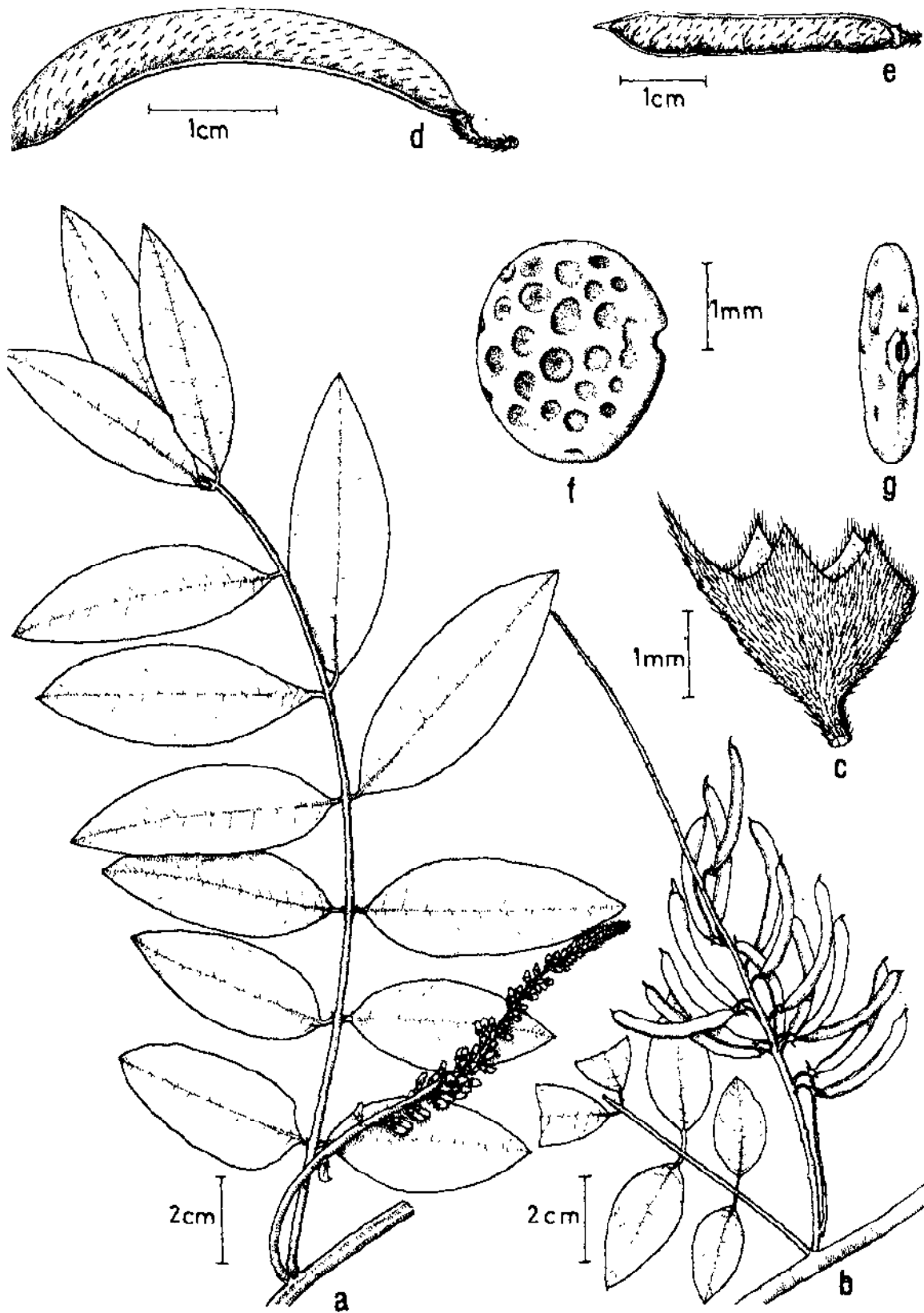


Fig. 61. *Indigofera zollingeriana* Miq. : a. Flowering twig, b. Fruiting twig, c. Calyx, d&e. Pod, f. Seed-side view, g. Seed-hilar view (a,c: *Ramachandran* 52299; b,d: *Mohanan* 54809; e-g: *Sikdar* 175).

Nadu Carn. 1: 430. 1983; de Kort & Thijssse in Blumea 30: 141. 1984. *I. inamoena*
Thwaites, Enum. Pl. Zeyl. 83. 1859. **Fig. 60, Map 2.**

Shrub, 60 - 150 m high; branches stiff, erect, striate, biramous hairs silvery white, short, adpressed with equal arms. Leaves 8 - 10 cm long including 1 - 1.2 cm long petiole; stipules 1.5 - 2.5 x 0.5 - 1 mm, triangular, adpressed pubescent outside; rachis 6 - 8 cm long, canaliculate above, adpressed pubescent; stipellae 1 - 1.5 x 0.5 mm, triangular with a tuft of pearl bodies between the stipellae of opposite leaflets; petiolules ca 1 mm long, pubescent; leaflets (9 -) 13 - 29, opposite, 10 - 15 x 5 - 8 mm, elliptic, rarely obovate, obtuse at base, rounded to emarginate and mucronate at apex, midrib prominent beneath ending in a tubular gland. Racemes 3 - 3.5(- 6) cm long, axillary, sessile; rachis striate, adpressed pubescent, compactly many-flowered. Flowers red, 6 mm long; bracts ca 1 mm long triangular, pubescent outside, caducous; pedicels ca 1 mm long pubescent. Calyx adpressed silvery white pubescent outside, cup 0.5 - 0.8 mm long, teeth 1 - 1.2 x 0.5 mm, narrowly triangular. Standard 5.5 - 6 x 3 - 4 mm, elliptic, obtuse and mucronate at apex, adpressed white hairy on the back; wing petals 4.5 - 5 x 1.5 - 2 mm, glabrous; keel petals 5.5 - 6 x 2.5 - 3 mm, adpressed pubescent outside, ciliate along margins, lateral spur ca 0.8 mm long. Staminal sheath 5 - 5.5 mm long; anthers ca 0.6 mm long. Ovary ca 4 mm long, linear, with few hairs on dorsal side, 10 - 12-ovuled; style 2 - 2.5 mm long, glabrous. Pods 20 - 35 x 3 - 4 mm, ascending, rarely to spreading, straight, subcylindrical, beak 1 - 1.5 mm long, adpressed white pubescent, 8 - 12-seeded; suture thick; endocarp diffusely red-spotted. Seeds 1 - 1.5 x 1 - 1.5 mm, cubical, truncate at ends, finely pitted, shiny, reddish-brown.

Type: Penin. India, Graham in Wallich, Cat. No. 5458 (K-W, lecto ! CAL !) Lectotype selected here.

Fls.: Aug. - March; *Frts.:* Jan. - July.

Distrib.: INDIA: Andhra Pradesh, Karnataka, Kerala, Maharashtra, Orissa and Tamil Nadu; SRI LANKA, MYANMAR, THAILAND, CHINA, INDO-CHINA.

Habitat: Hill slopes, exposed areas in dry and moist deciduous forests, grass lands from 200 to 900 m.

Exsicc.: Andhra Pradesh: Visakhapatnam Dist., Chintapalle, 825 m, 28 Aug. 1966, *G.V. Subba Rao* 28135; Karnataka: Kyatedevaragudi, 21 April 1962, *A.S. Rao* 80199; Kerala: Calicut Dist., Pavagad-Kerala border, 15 Aug. 1964, *J.L. Ellis* 20415; Tamil Nadu: Coimbatore Dist., Anamalai hills, 300 m, Sept. 1884, *J.S. Gamble* 14601; Marudhamalai, 350 m, 6 Dec. 1980, *M. Sanjappa* 704.

Chr. No.: n = 8 (Sanjappa & Dasgupta, Indian Jour. Bot. 6: 62. 1983).

Pollen: 3-zonocolporate or colporoidate, prolate-spheroidal, $32 \times 30 \mu\text{m}$, granulate (Vishnu-Mittre & Sharma, *Pollen et Spores* 4: 5 - 45. 1962).

60. *Indigofera zollingeriana* Miq., *Fl. Ind. Bat.* 1, 1:310. 1855; Merr., *Enum. Borneo* 302. 1921 & *Enum. Philippine Fl. Pl.* 2: 276. 1923; Craib, *Fl. Siam Enum.* 1: 383. 1928; Verdc., *Man. New Guinea Legum.* 357. 1979; de Kort & Thijsse in *Blumea* 30: 142. 1984. *I. teysmannii* Miq., *Fl. Ind. Bat.* 1, 1: 1083. 1855; Saldanha & G. Singh in *Saldanha, Fl. Karnataka* 1: 474. 1984. *I. benthamiana* Hance in *Ann. Sci. Nat. Bot.* 4, 18: 219. 1862; Ravi in *Jour. Bombay Nat. Hist. Soc.* 73: 242. 1976

Fig. 61.

Tree, 5 - 8 m high; trunk up to 40 cm in diameter, bark grey; branches horizontal, biramous hairs adpressed with equal arms. Leaves 15 - 30 cm long including 1.5 - 3 cm long petiole; stipules 5 - 6 x 2 mm, narrowly triangular, pubescent outside; rachis 12 - 25 cm long, canaliculate above, sparsely hairy; stipellae 1 - 1.5 mm long, triangular with a tuft of pearl bodies between the stipellae of opposite leaflets; petiolules 2 - 3 mm long, pubescent; leaflets 1 - 19, opposite, 3 - 6.5 x 1.4 - 2.8 cm, elliptic, rarely ovate, obtuse to rounded at base, acute and mucronate at apex, sparsely adpressed pubescent on both surfaces. Racemes 10 - 20 cm long including 1 - 1.5 cm long peduncle, axillary, erect; rachis striate, adpressed dark brown pubescent, many-flowered. Flowers deep violet-purple, 5 - 8 mm long; bracts 2 - 2.5 x 1 mm, narrowly triangular, brown pubescent outside, caducous; pedicels 2 - 3 mm long, pubescent. Calyx adpressed brown hairy outside, cup ca 1 mm long, teeth ca 0.5 x 0.5 mm, deltoid. Standard 5 - 7 x 5 - 5.5 mm, ovate, adpressed brown pubescent on the back; wing petals 4.5 - 6 x 3 mm, glabrous, ciliate along margins; keel petals 5 - 7 x 3 - 4.5 mm, adpressed brown hairy towards the tip outside, lateral spur ca 0.5 mm long. Staminal sheath 4.5 - 6.5 mm long; anthers ca 1 mm long. Ovary 5 - 7 mm long, glabrous, up to 16-ovuled; style glabrous. Pods 30 - 40 x 3 - 5 mm, spreading, straight or curved upwards, cylindrical, beak 3 - 5 mm long, sparsely adpressed pubescent; up to 16-seeded with seeds arranged like a pile of coins; sutures thick; endocarp red-spotted; exocarp gets separated in mature pods. Seeds ca 2 x 2 mm, discoid, shallowly foveolate, brown.

Type: Java, Zollinger 2390 (P, holo BM ! BD, U).

Fls.: May - Sept.; *Frts.*: Aug. - Jan.

Distrib.: Cultivated in INDIA: Andhra Pradesh, Gujarat, Karnataka, Kerala, Tamil Nadu, West Bengal and Andaman & Nicobar Islands; CHINA, THAILAND, LAOS, VIETNAM, TAIWAN, MALESIA, cultivated in Bhutan.

Habitat: Cultivated in Coffee and Tea plantations and Coconut grooves.

Exsicc.: Karnataka: Merkera Dist. ('Coorg' Dist.), Kalgundi Sampaje Road, 30 Sept. 1961, *A.S. Rao* 74386 (CAL, BSI); Kerala: Trivandrum Dist., near Nilmel, 125 m, 12 May 1978, *M. Mohanan* 54809 (CAL, MH); Bon accord Estate, 850 m, 22 May 1979, *M. Mohanan* 63212 (CAL, MH)*; Cannanore Dist., Tolpatty, 825 m, 22 Nov. 1977, *V.S. Ramachandran* 52299; West Bengal: Hoogly Dist., Chinswara, *S. Sen* s.n.

Chr. No.: $2n = 32$ sub *I. teysmannii* (Atchison, Amer. Jour. Bot. 38: 544. 1951).

Notes: This species was introduced as a shade plant in Coffee and Tea Estates. Grows as an escape in some parts of Kerala.

Post script notes

1. Schrire (Bothalia 22: 165-170) based on cladistic study of the tribe Indigofereae in Africa and Madagascar resurrected the genera *Microcharis* Benth. and *Indigastrum* Jaub. & Spach, which were previously considered as part of *Indigofera* Linn. therefore, *Indigofera parviflora* Heyne ex Wight & Arn. (p. 63) should now be correctly treated as *Indigastrum parviflorum* (Heyne ex Wight & Arn.) Schrire. The Indian specimens belong to the typical subspecies and variety *parviflorum*.

2. Du Puy, Labat and Schrire (Kew Bull. 48: 727-723. 1993) divided *Indigofera spicata* sensu lato into *I. spicata* Forsskal and *I. hendecaphylla* Jacq. based on leaflet shape (obovate-cuneate in *I. spicata*, narrowly elliptic in *I. hendecaphylla*), length of the staminal sheath (ca 3 mm in *I. spicata*, 4-4.5 mm in *I. hendecaphylla*) and relative lengths of staminal sheath and calyx (calyx as long as staminal sheath in *I. spicata*, half to two-thirds the length of staminal sheath in *I. hendecaphylla*). They are of the opinion that *I. spicata* is confined to Africa, Madagascar, Mascarenes and Yemen and *I. hendecaphylla* is most wide spread in Africa and extend into S.E. Asia, Indo-China, Japan and Pacific.

The Indian specimens agree with the characters of *I. hendecaphylla* except for leaflet shape which is variable.

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