



The Genus *Desmodium* Desv. (Fabaceae) in Gujarat, India

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ABSTRACT: The genus *Desmodium* Desv. (Fabaceae) is revised in Gujarat, India. A total of 13 species are recognized. The present investigation is an attempt to make a comprehensive account having details on updated botanical names and choosing of specific morphological characters for accurate and easy identification. Artificial identification key was reframed so as to identify currently recognized *Desmodium* species in Gujarat.

Keywords: *Desmodium*, Identification, Gujarat

INTRODUCTION

The genus *Desmodium* Desv., commonly known as tick clover or beggarweed, contains about 280 species: mostly in subtropical and tropical regions. Many of its members play an important role in sustainable agriculture, forestry and forage production (Gu *et al.*, 2007). For example, *Desmodium intortum* and *Desmodium heterocarpon* have been used for forages and

shading plants in the fields, which can also suppress the growth of weeds (Khan *et al.*, 2001). Moreover, the various *Desmodium* species have served in folk medicine as febrifuges, remedies for dysentery and liver diseases and have been used in poultice and other decoctions to treat acne, ulcers, catarrh, abscesses and eye diseases (Allen and Allen, 1981). In India, about 50-60 *Desmodium* species are found.

Table1: List of *Desmodium* species recorded for the Flora of Gujarat in major taxonomic works.

Publication	No. of <i>Desmodium</i> species
Patel (1971)	6
Shah (1978)	14
Raghavan <i>et. al</i> (1981)	15
Present record	13

In Hooker's "Flora of British India" (1879, 1999 (reprint)), 49 species of *Desmodium* were recorded. Cooke in his "Flora of the Presidency of Bombay" (1958 (reprint)) reported 14 species in *Desmodium*. Since the notes on distribution for many of the species recorded therein are generalized for the whole of Bombay Presidency (that includes present Maharashtra also), it does not give clear picture about the number of species occurring in the present Gujarat alone. In Gujarat *Desmodium* is represented with 13 species. Patel (1971) recognized 6 *Desmodium* species in Gujarat while compiling the Forest Flora of Gujarat State. Shah (1978) in his "Flora of Gujarat State" provided the first comprehensive account of *Desmodium* in Gujarat recording 14 species. Latter on Raghvan *et. al.* (1981) listed 15 *Desmodium* species in their checklist of the plants of Gujarat.

The Flora account was a great contribution at the time of publication and it now needs to be updated for two reasons: 1) Flora of Gujarat state

have become more than 35 years old and today it may not give details on the distribution range of each species; 2) continuing taxonomic work has radically altered the generic concept and botanical names for many species. Although there are several publications dealing with *Desmodium* genus, there is no single reference summarizing all the species currently recognized in the Gujarat. The purpose of this publication is to make available an updated list of *Desmodium* species examined thus far in Gujarat and reframed the identification keys to avoid the difficulty in identification of *Desmodium* species.

MATERIALS AND METHODS

First of all a provisional list of *Desmodium* species recorded for Gujarat flora was made. All the listed species were tested for their accepted botanical names with the help of literature published as well as two websites namely www.plantlist.org and www.tropicos.org.

Detailed morphological characters of each species were recorded and feed to computer by using Microsoft Excel. These characters were filtered at various steps by selecting different morphological characters to prepare the artificial bracketed identification key exclusively for this genus. Detailed description as well as flowering fruiting season and range of distribution were given in result section for each species.

RESULTS

Gujarat is a state in western India. It has an area of 75,686 sq mi (196,077 km²) with a coastline of 1,600 km, most of which lays on the Kathiawad peninsula and a population in excess of 50 million. The state is bordered by Rajasthan to the north, Maharashtra to the south, Madhya Pradesh to the east and the Arabian Sea as well as the Pakistani province of Sindh on the west.

The genus *Desmodium* is represented with 13 species in Gujarat. All the species are growing in wild, of these only one species namely *D. oojeinense* (Roxb.) H. Ohashi is tree while rests of the species are small herbs, undershrubs or shrubs or climber. As illustrated in table 1, Shah (1978) and Raghavan *et. al* (1981) has recorded more species than the present record but eventually botanical names of species were altered and a total of six species were shifted to some other genera. However, *D. oojeinense* (Roxb.) H. Ohashi was earlier recorded as *Ougeinia oojeinensis* (Roxb.) Hochr. in published Floras. Following is the list of species earlier recorded under *Desmodium* genus for Gujarat flora but with altered botanical names they are now recognized as depicted below:

1. *Desmodium motorium* (Houtt.) Merr. is synonym *Codariocalyx motorius* (Houtt.) H. Ohashi
2. *Desmodium repandum* (Vahl) DC. is synonym of *Hylodesmum repandum* (Vahl) H. Ohashi & R.R. Mill
3. *Desmodium rotundifolium* Baker is synonym *Desmodiastrum racemosum* var. *rotundifolium* (Baker) A. Pramanik & Thoth.
4. *Desmodium triangulare* (Retz.) Merr. is synonym *Dendrolobium triangulare* (Retz.) Schindl.
5. *Desmodium triquetrum* (L.) DC. is synonym *Tadehagi triquetrum* (L.) H. Ohashi
6. *Desmodium umbellatum* (L.) DC. is synonym *Dendrolobium umbellatum* (L.) Benth.

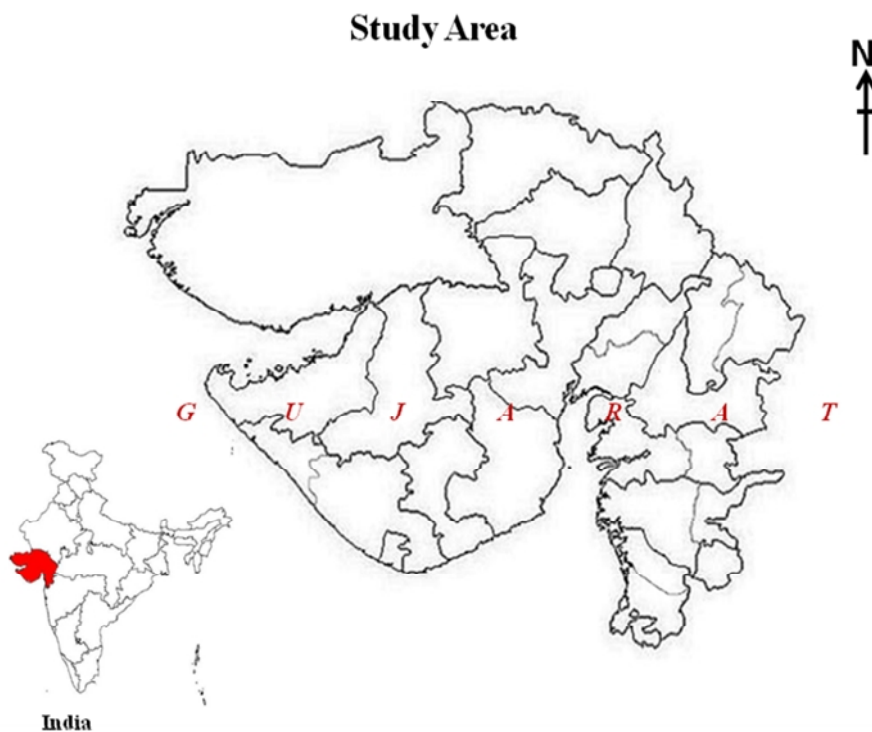


Fig. 1. Map of study area.

DESMODIUM Desv. J. Bot. Agric. 1: 122.
1813, nom. cons.

Mostly herbs, subshrubs, shrubs and rarely climbers or trees. Leaves pinnately 3-foliolate or 1-foliolate by reduction of lateral leaflets, stipulate, stipellate. Flowers usually smaller, in racemes or panicles, axillary or terminal, rarely solitary or binate in leaf axils. Bracts persistent or early deciduous; bracteoles present or absent. Calyx campanulate, 4- or 5-lobed, bilabiate; upper 2 lobes connate for all or most of length, entire or 2-toothed at apex, lower lobes free, longest. Corolla white, green-white, pink, purple, or violet; standard elliptic or obovate to nearly

orbicular; wings \pm adherent to keel, wholly clawed. Stamens mostly diadelphous (9+1), rarely monadelphous. Ovary usually sessile, (1)2-many-ovuled. Legume usually stipitate or sometimes sessile, well-exserted from the calyx, compressed, usually indehiscent, transversely segmented, upper (adaxial) suture slightly constricted or straight, lower (abaxial) one constricted; articles mostly ellipsoidal to quadrangular, 1-seeded, membranous or leathery, almost flat or more rarely inflated. Seeds oblong, reniform or subquadrangular, compressed; aril not developed.

1.	Trees.....	<i>D. oojeinense</i>
+	Herbs, shrubs and undershrubs or climbers.....	2
2.	Leaves 1-foliolate and 3-foliolate mixed.....	<i>D. alysicarpoides</i>
+	Leaves either 1-foliolate or 3-foliolate.....	3
3.	1-foliolate.....	4
+	3-foliolate.....	6
4.	Leaflets orbicular to broadly obovate, reniform, or compressed rhombic.....	<i>D. renifolium</i>
+	Leaflets not as above, longer than wide.....	5
5.	Branches terete; leaflets yellow-brown velutinous on both surfaces; flowers crowded on peduncles; joints of pods as long as broad.....	<i>D. velutinum</i>
+	Branches angled; leaflets adaxially glabrous, abaxially pubescent or villous; flowers lax, scattered on peduncles; joints of pods longer than broad.....	<i>D. gangeticum</i>
6.	Stipules foliaceous, auriculate.....	7
+	Stipules not foliaceous.....	8
7.	Climbers.....	<i>D. scorpiurus</i>
+	Erect subshrubs or diffuse viscidly-pubescent herbs.....	<i>D. dichotomum</i>
8.	Herbs; leaflets usually shorter than 2.5 cm.....	9
+	Shrubs or undershrubs; leaflets usually longer than 2.5 cm	10
9.	Leaves 0.5-5.0 cm long; pods twisted.....	<i>D. neomexicanum</i>
+	Leaves 0.4-1.2 cm long; pods never twisted.....	<i>D. triflorum</i>
10.	Flowers white, or tinged pink, in axillary umbels; branches triquetrous.....	<i>D. triangulare</i> <i>var. congestum</i>
+	Flowers bright purple, seldom white, usually in elongated racemes, if flowers 1-3 in axillary fascicles.....	11
11.	Pods deeply constricted between seeds; joints dehiscent ...	<i>D. heterocarpon</i>
+	Pods scarcely constricted between seeds; joints indehiscent.....	12
12.	Lower surface of leaflets obscurely pilose; pods half-rhomboidal.....	<i>D. dolabriforme</i>
+	Lower surface of leaflets clothed with adpressed minute hairs; pods not as above.....	<i>D. laxiflorum</i>

1. *Desmodium alysicarpoides* Meeuwen in Reinward. 6:246. 1962; Shah in Fl. Guj. State 1:206. 1978. *Alysicarpus parviflorus* Dalz. in Hk. Kew. Journ. Bot. 3:211. 1850. *Desmodium parviflorus* (Dalz.) Baker in Hk. f. FBI 2:172. 1876

An erect, much branched herb, fulvous-hairy. Leaflets 3, 0.6-1.5×0.3-1.4 cm, appressed-hairy beneath. Racemes terminal and axillary, 2.3-10.2 cm long, lax. Pods 0.7-1.3 cm long, falcate, lower suture slightly indented, 3-5-jointed, glabrescent. Fls & Frs: August-December.

Only once reported from Vyara forest in South Gujarat.

2. *Desmodium dichotomum* (Willd.) DC. Prodr. 2:336. 1825; Shah in Fl. Guj. State 1:206. 1978; Meeuwen in Reinward. 6:248. 1962. *Hedysarum dichotomum* Willd. Sp. Pl. 3: 1180. 1802; *Desmodium diffusum* (Willd.) Candolle (Nov 1825), not Candolle (Jan 1825); *H. diffusum* Willd. (1801), not (Candolle) Roxb. (1832).

PANDARIYO SAMERVO

Subshrubs or diffuse viscidly-pubescent herbs, 20-100 cm tall. Leaves 3-foliolate, sometimes 1-foliolate near base of stem; leaflets 1.4-9.0×0.8-4.9 cm, elliptic or ovate to broadly elliptic or broadly ovate, abaxially densely adpressed hairy, adaxially with sparse adpressed hairs, intermixed with sparse hooked hairs; petiole 1.5-3.5 cm, hairy. Racemes lax, terminal or axillary or usually panicles, 2.0-15cm, 2- or 3- flowered at each node. Pedicel 2-5 mm. Calyx 4-lobed, as long as tube; upper lobes 2-toothed. Corolla purple to violet, 3 mm; standard obovate or broadly obovate, base shortly clawed; wings and keel wholly shortly clawed at base. Ovary densely pubescent, 5- or 6-ovuled. Pods 1.2-2.0 cm long, linear, 3-6-jointed, covered with hooked hairs. Fls & Frs: July-December. $2n=22$.

Common, throughout as a weed in cultivated fields, along road sides and railway lines and in forest undergrowth.

3. *Desmodium dolabriforme* Benth. ; F.B.I. ii. 165.

An undershrub with short erect stem. Leaves 3-foliolate, crowded on an erect stem a few inches high, leaflets membranous, both surfaces green, lower obscurely pilose, stipules small, lanceolate, persistent, petioles 2.5-4.0 cm long. Racemes simple, lax, long peduncled, terminal, 5.0-8.0 cm long. Pedicels finely pubescent; calyx turbinate, lower tooth lanceolate, as long as the tube. Pods jointed, joint solitary, half-rhomboid, three times as long as broad, narrowed gradually from the middle to the tip and stalk.

Listed by Raghavan *et. al* (1981).

4. *Desmodium gangeticum* (L.) DC.; Shah in Fl. Guj. State 1:206. 1978. *Hedysarum gangeticum* L. Sp. Pl. 2: 746. 1753; *Desmodium cavaleriei* H. Leveille.

SHALPARNI

90-120 cm tall undershrubs or shrubs, erect or nearly so, much branched, grey-downy in younger parts. Leaves 1-foliolate, variable in shape and size; lamina narrowly elliptic-ovate, sometimes ovate or lanceolate, 2.3-15.2×1.0-8.3 cm, abaxially sparsely gray villous, adaxially glabrous except for hairy midvein, base rounded, apex acute; petiole 1.0-2.0 cm. Racemes axillary and terminal or sometimes panicles, slender, 10-40 cm, 2-6-flowered at each node. Pedicel 2-5 mm, hairy. Calyx 2 mm, 4-lobed; lobes slightly longer than tube. Corolla white or purplish, 3-4 mm; standard obovate; wings oblong, base auriculate, shortly clawed; keel narrowly obovate, not auriculate. Ovary hairy. Pods 2.3-4.5 cm long, falcate, 4-6-jointed, compressed, clothed with hooked hairs. Fls & Frs: August-November. $2n = 22$.

Throughout in the undergrowth of forests and in shaded spots along road sides and railway lines; common.

5. *Desmodium heterocarpon* (L.) DC.; Shah in Fl. Guj. State 1:207. 1978. *Hedysarum heterocarpon* L. Sp. Pl. 747.1753. *Hedysarum polycarpon* Poir. Encycl. 6:413. 1804. *Desmodium polycarpon* (Poir.) DC. Prodr. 2:334. 1835; FBI 2:171; C 1:377

An erect or suberect, slender, 30-150 cm tall, much branched from base of stem, appressed-pubescent undershrub. Leaves 3-foliolate; terminal leaflet blade elliptic, narrowly elliptic, or broadly obovate, 1.8-5.2×1.0-2.2 cm, abaxially white adpressed pubescent, adaxially glabrous, base obtuse, apex rounded or obtuse, emarginate, mucronate; petiole 1.0-2.0 cm, slightly pubescent. Racemes terminal or axillary, 2.4-7.2 cm; rachis with white, spreading, hooked hairs or yellowish or white, straight, appressed hairs, densely flowered. Pedicel 3-4 mm. Calyx 1.5-2 mm, 4-lobed; upper lobes slightly 2-toothed at apex. Corolla purple, purplered, or white, 5 mm; standard obovate-oblong, shortly clawed; wings obovate, auriculate, clawed; keel extremely curved, apex obtuse. Pods 1.0-1.6 cm × 0.3-0.4 cm, linear-oblong, densely pubescent, 5-8 jointed articles quadrate. Fls & Frs: October-December. $2n = 22$.

So far from south Gujarat (Surat and Dangs district), very rare.

6. *Desmodium laxiflorum* DC.; Shah in Fl. Guj. State 1:207. 1978. *Desmodium macrophyllum* Desv.; *D. recurvatum* (Roxb.) Graham ex Wight & Arnott; *Hedysarum recurvatum* Roxb.

An erect undershrub, 40–90 cm tall. Young branchlets with adpressed and minute hooked hairs. Leaves 3-foliolate, leaflets 5.8-11.2×2.4-6.5 cm, ovate-elliptic or obovate, membranous, glabrous above, pubescent beneath, terminal leaflet largest, apex shortly acuminate; petiole 1.5–4.0 cm. Racemes 15-19 cm long, axillary and terminal, rachis pubescent intermixed with minute hooked hairs, 2–7-flowered, fascicled. Pedicel 5–10 mm, densely hairy as rachis. Calyx densely villous; upper lobes entire or nearly so at apex. Corolla white to violet, 4–7 mm; standard broadly obovate or orbicular; wings auriculate and clawed; keel clawed. Pods 0.5-0.8 cm long, falcate, linear, pubescent; hairs viscid, hooked, articles oblong. Fls & Frs: August-December. *2n* = 22.

Throughout Gujarat (except Kachchh district), in the undergrowth of forests; occasional.

7. *Desmodium neomexicanum* A. Gray, Pl. Wright 1:53. 1852; Shah in Fl. Guj. State 1:208. 1978; Chavan, Sabnis & Bedi in kew Bull. 17:265. 1963.

Erect or suerect, slender, hairy herbs, 30-90 cm tall. Leaves 3-foliolate, leaflets 0.5-5×0.4-1.2 cm, terminal largest, all membranous, ovate or ovate-lanceolate, nearly glabrous but for ciliate margins. Racemes terminal and axillary, 8.0-15 cm long. Pods 0.5-2.3 cm long, 2-4-jointed; joints flat, hairy, ciliate on margins. Seeds 0.2-0.3 cm long, smooth, glabrous, pinkish-brown, grooved at one end. Fls & Frs: October-December.

Throughout, scattered in shaded spots or in undergrowth of forests; occasional.

8. *Desmodium oojeinense* (Roxb.) H. Ohashi. *Ougeinia oojeinensis* (Roxb.) Hochr. in Bull. Soc. Bot. Geneve 13-14:15. 1909; Shah in Fl. Guj. State 1:234. 1978. *Dalbergia oojeinensis* Roxb. Hort. Beng. 53. 1814 (nomen) & Fl. Ind. 3: 220. 1832. *Ougeinia dalbergioides* Bth. Pl. Jungh. 216. 1851-1855; FBI 2:161.

TANACHH

A deciduous tree, 9-16 m tall, with black or dark-brown bark. Leaves 3-foliolate, leaflets 6.6-18×4.5-15 cm, coriaceous, glabrous, broadly ovate or suborbicular. Flowers numerous, in fascicled racemes. Pods 4.0-6.0 × 0.6-1.2 cm, flat, reticulately veined. Fls & Frs: February-April.

In deciduous forests; not common.

9. *Desmodium renifolium* (L.) Schindl. Repert. Spec. Nov. Regni Veg. 22: 262. 1926. *Hedysarum renifolium* L., Syst. Nat., ed. 10, 2:1169. 1759; *Desmodium reniforme* Candolle; *H. reniforme* L. nom. illeg. superfl.

MANO-PANDARIYO

A slender herb with wiry stems, 30–50 cm tall, much branched, often glabrous. Leaves 1-foliolate, leaflets reniform or compressed rhombic, often broader than long, 1.5–3.5×2.5–5 cm, , both ends truncate or base broadly cuneate or apex emarginated, glabrous, petiole 1.0–2.0 cm. Flowers in 5.0–15 cm long, laxly flowered terminal racemes, 2–5-flowered at each node. Pedicel 2–8 mm, elongated to 1.3 cm at fruiting. Calyx 4-lobed; lobes triangular, as long as tube. Corolla white to pale yellow or purple, 5 mm; standard obovate, base broadly shortly clawed, apex slightly emarginate; wings narrowly oblong, long clawed; keel narrowly elliptic, long clawed. Stamens monadelphous, 3.2–4.2 mm. Ovary adpressed puberulent. Pods 1.5-1.8 cm long, glabrous, upper suture straight, lower one slightly indented. Fls & Frs: September-November. Saurashtra (Barda hills.)

10. *Desmodium scorpiurus* (Sw.) Desv. in J. Bot. Agric. 1: 122 (1813). Verdcourt in Man. New Guinea Leg.: 407, fig. 94G (1979). Lock, Leg. Afr. Check-list: 247 (1989). *Hedysarum scorpiurus* Sw. Nov. Gen. Sp. Pl. Prodr.: 107. 1788.

Spreading ascending or diffuse herb with hooked hairy stems. Leaves 3-foliolate, leaflets 0.5-4.5 × 0.2-1.8 cm, elliptic or less often round or oblong, base obtuse, apex obtuse-rounded or emarginate, both surfaces adpressed hairy, lateral veins 4 or 5, petiole 0.3-2.8 cm long, stipules 4 × 3 mm, often amplexicaul at the base. Flowers 5 mm long in laxly flowered, terminal and axillary racemes. Pedicel 3-7 mm long. Calyx campanulate, 2.5 mm long. Corolla pink or pale purple; standard obovate; wings oblong, clawed; keel obliquely obovate, long clawed. Ovary linear, style curved. Pods linear, slender, 2-5 cm long, 3–8-jointed, constricted between articles; articles 4-6 × 1.5-2 mm, narrowly oblong-elliptic to linear-oblong, hooked hairy and with a raised reticulation of ribs. Seeds pale buff, oblong-ellipsoid. Fls & Frs.: October-May.

Frequent in open dry places, naturalized in Gujarat. A native of West Indies and Mexico to Peru now naturalised in West Africa, Asia, Taiwan and Malesia. Recently reported as new report to Gujarat state Flora (Patel, 2013).

11. *Desmodium triangulare* var. *congestum* (Prain) Santapau in Kew Bull. 1948:276. 1948. *Desmodium cephalotes* Wall. ex Baker in Hk. f. FBI 2:161. 1876. *Desmodium cephalotes* Wall. ex Baker var. *congestum* in Journ. As. Soc. Bengal 66:389. 1898; c: 1:375.

An erect shrub or undershrub, 90-150 cm tall; stem and branches sericeo-pubescent in younger parts. Leaves 3-foliolate, leaflets 4.0-8.6×2.2-4.2 cm, elliptic oblong, obovate-oblong or lanceolate, argento-silky-pubescent beneath. Pods 1.0-3.0 cm long, brown, slightly falcate, pubescent, constricted between seeds. Fls & Frs: September-December.

Mostly found along river banks in forest undergrowth in South Gujarat region.

12. *Desmodium triflorum* (L.) DC. Prodr. 2: 334. 1825; FBI 2:173. *Hedysarum triflorum* L. Sp. Pl. 749. 1753.

Prostrate or trailing, slender, glabrous or sparsely hairy herbs, rooting at nodes. Leaves 3-foliolate, leaflets 0.4-1.2 × 0.3-0.8 cm, membranous, sessile or subsessile, obovate, glabrous or sparsely hairy beneath, base cuneate, apex truncate, slightly emarginated, petiole 5 mm. Flowers solitary or 2 or 3 in leaf axils. Pedicel 3-8 mm, elongated to 1.3 cm at fruiting. Calyx densely villous, 5-parted; lobes narrowly lanceolate, longer than tube. Corolla purple-red, nearly as long as calyx; standard obcordate, base attenuate, long clawed; wings elliptic, shortly clawed; keel slightly falcate, longer than wings, curved, long clawed. Stamens diadelphous. Pods 0.5-1.8 cm long, 4-6 jointed, laterally compressed, falcate, appressed hairy, somewhat woody. Seeds subquadrate, greenish-brown, smooth, glabrous. Fls & Frs: Throughout the year. $2n = 22$.

Throughout, gregarious in moist ground.

13. *Desmodium velutinum* (Willd.) DC. Prodr. 2:328. 1825. *Hedysarum velutinum* Willd. Sp. Pl. 3:1174. 1802. *Hedysarum latifolium* Roxb. Hort. Beng 57. 1814 (noem) ex Ker. Bot. Reg. 5. Pl. 355 & Descr. 1819. *Desmodium latifolium* (Roxb. ex Ker.) DC. Prodr. 2:328. 1825; FBI2:168 (excl. *D. virgatum* Zoll.).

Undershrubs, 60 to 120 cm tall, fulvous-pubescent. Leaves 1-foliolate, rarely intermixed with 3-foliolate leaves; leaflets 4.5-13.6 × 2.8-10.6 cm, broadly ovate or suborbicular, scabridly hairy above, densely so beneath, fulvous-ciliate on margins, petiole 1.5-1.8 cm, densely yellow velutinous.

Inflorescences terminal and axillary, racemose or paniculate, 10-30 cm long, terminal ones often broadly paniculate, 2-5-flowered at each node; bracts subulate or lanceolate, 2.5-12 × 0.3-0.7 mm. Pedicel 1.5 mm. Calyx 2-3 mm, 4-lobed. Corolla purple or pink, 3-5 mm; standard obovate-orbicular; wings narrowly elliptic, auriculate; keel narrow, not auriculate. Pods 1.2-2.5 cm long, 3-6 jointed, densely pubescent, apiculate. Fls & Frs: August-November. $2n = 22$.

Occasional in the forest undergrowth, rarely along river banks and road sides in the Central and South Gujarat.

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