

Revision of the genus *Desmodium* Desv. (Fabaceae) in peer panjal range of Jammu, Jammu and Kashmir

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Abstract

The genus *Desmodium* Desv. (Fabaceae) is revised in Jammu and Kashmir State of India. During this revision we have collected about 12 species of the genus from different regions of the Peer Panjal range and other regions of Jammu province. The details description, taxonomical details photograph plates were provided in the manuscript for proper identification.

Keywords: *Desmodium* Desv., fabaceae, peer panjal

Introduction

The *Desmodium* Desv., genus belongs to family Fabaceae commonly called as beggarweed or tick clover consists of about 280 species distributed most often in subtropical and tropical areas. Numbers of species from this genus are highly important for sustainable agriculture, forage and forestry productions. (Gu *et al.*, 2007) ^[1]. The species are a good source of forage; besides this these are also used as ethnomedicinal usages for different ailments chiefly as a tonic for dysentery febrifuges, as remedy for liver diseases, decoctions of the members of this genus are used to treat ulcers, acne, abscesses and eye diseases (Allen and Allen, 1981) ^[2]. In Hooker's "Flora of British India" (1879, 1999 reprint) ^[3], 49 species of *Desmodium* were recorded. While in Jammu and Kashmir about 13 species of *Desmodium* were documented (Dar and Khuroo 2019) ^[4]. In the present study we have collected about 12 species the genus from the Peer Panjal range of Jammu province from different areas of subtropical and few from lower temperate region of the lesser Himalayas. Ohashi (2021) ^[5], found that the genus *Desmodium* is the core genus of tribe Desmodieae of family Fabaceae. It consists of about 350-450 species, the genus is actually identified by its trifoliate leaves pattern with a few species and in shows unifoliate or sometime both types of leaves on same plant, presence of stipels and straight to hooked or curved haris present on the pods (Ohashi 1973, Ohashi *et al.*, 2018a) ^{[6][7]}.

Material and Methods

Study Area: The Peer Panjal Himalaya of lesser Himalaya having various forms of habitats for floral diversity and comprised of twin districts Rajouri and Poonch enormously rich in biodiversity. Rajouri district was carved out of Poonch district in 1968. It shares a long border from Sunderbani to Bhimbergali with Pakistan-occupied Kashmir (PoK) in the west. It is bounded by Udhampur district in the east and by Jammu in the southeast. The northern part of the district consists of hilly terrain. The geographical area of the district is 2,630 sq. km. It comprises six tehsils, namely, Thanamandi, Rajouri, Budhal, Kalakote Sunderbani, and Nowshera. Poonch town, the headquarters of the district by the same name, is situated at a distance of 246 km.

northwest of Jammu. The studied area comprised of subtropical and temperate regions of the Jammu province.



Fig 1: Map of the study area

Methodology

From last two years in different regions of the Jammu province especially in the Peer Panjal region, we have collected the members of the genus *Desmodium* from different habitats throughout the year. The specimens were identified using different available literature, online and offline floras (Hooker, 1872-97) ^[8], Stewart, (1972) ^[9], Patel and Patel, (2013) ^[10]; Dar, *et al.*, (2019) ^[4]; [https://efloraIndia.gov.in.](https://efloraIndia.gov.in) ^[11]; [http://www.plantsoftheworldonline.org.](http://www.plantsoftheworldonline.org) ^[12], and *eflorachina* ^[13] etc. The taxonomic details, photographs and other necessary details are provided in the manuscript.

Results

During the present study we have observed 12 species of the *Desmodium* genus from the Peer Panjal region of Jammu province. The description of the species along with photo plates was provided in the manuscript.

1. *Desmodium benthamii* N.P. Balakr. (Syn: *Desmodium benthamii* H. Ohashi; *Desmodium brachystachyum* Benth.; *Meibomia brachystachya* (Benth.) Kuntze; *Nicolsonia brachystachya* (Benth.) Schindl.).

Slender undershrub, to 48 cm tall, branchlets appressed hairy, slightly angular, stipules linear, to 0.5 cm long. Leaves simple, alternate, glabrous, above, white silky pubescent below, turning brown on dry, 20.5-38 × 1.5-2.8 cm, leaves in upper region near flowering axis small, petiole, 1.2-2 cm long, ovate to obovate, apex obtuse, emarginate, margin entire, base cordate. Flowers in axillary/terminal/racemes, to 5 cm long, bracts ovate, flower purple, calyx 0.2 cm long, clothed with dense white hairs, corolla exerted, purple. Pod sessile, 0.3-0.5 cm long, articles 1-2 as long as broad, hairy.

Flowering and Fruiting: Aug. to Oct.

Specimen examined: Barsala area of Koternka

2. *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.

Shrubs or subshrubs, erect or prostrate, 30-150 cm tall, much branched from base of stem. Leaves 3-foliolate; petiole 1-2 cm, slightly pubescent; terminal leaflet blade elliptic, narrowly elliptic, or broadly obovate, 2.5-6 × 1.3-3 cm, abaxially white adpressed pubescent, adaxially glabrous, base obtuse, apex rounded or obtuse, emarginate, mucronate. Racemes terminal or axillary, 2.5-7 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, purple-red, or white, ca. 5 mm; standard obovate-oblong, shortly clawed; wings obovate, auriculate, clawed; keel extremely curved, apex obtuse. Infructescence crowded. Legume erect, narrowly oblong, 1.2-2 cm × 2.5-3 mm, upper suture shallowly undulate, both sutures hooked hairy, 4-7-jointed; articles quadrate.

Flowering Jul-Oct, Fruiting: Oct-Dec.

Specimen examined: Barsala area of Koternka

3. *Desmodium heterophyllum* (Willdenow) Candolle, Prodr. 2: 334. 1825.

Herbs, prostrate or ascending, 10-70 cm tall. Young parts spreading pubescent. Leaves 3-foliolate, often intermixed with 1-foliolate leaves on lower part; petiole 0.5-1.5 cm; terminal leaflet blade broadly elliptic or broadly elliptic-obovate, 1-3 × 0.8-1.5 cm, base obtuse, apex rounded or nearly truncate, often emarginate. Flowers solitary or binate in leaf axils or 2 or 3 scattered on rachis. Pedicel 1-2.5 cm. Calyx 5-parted; upper 2 lobes deeply incised near base, villous and minutely hooked hairy. Corolla purple-red to white, ca. 5 mm; standard broadly obovate; wings obovate or narrowly elliptic, shortly auriculate; keel slightly curved, shortly clawed. Stamens diadelphous. Ovary adpressed pubescent. Legume narrowly oblong, straight or curved, 1.2-1.8 cm × ca. 3 mm, lower suture deeply undulate, upper suture straight, 3-5-jointed, flat; articles broadly oblong or quadrate, 3.5-4 mm, glabrescent, reticulate veined.

Flowering Apr-Aug, Fruiting: Aug-Sep.

Specimen examined: Barsala area of Koternka

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.

Shrubs, erect or nearly so, to 1 m tall, much branched, pilose. Leaves 1-foliolate, variable in shape and size; petiole

1-2 cm; blade narrowly elliptic-ovate, sometimes ovate or lanceolate, 3-13 × 2-7 cm, abaxially sparsely gray villous, adaxially glabrous except for hairy midvein, base rounded, apex acute. Racemes terminal and axillary or sometimes panicles, 10-30 cm, 2-6-flowered at each node. Pedicel 2-5 mm, hairy. Calyx ca. 2 mm, 4-lobed; lobes slightly longer than tube. Corolla green-white, 3-4 mm; standard obovate; wings oblong, base auriculate, shortly clawed; keel narrowly obovate, not auriculate. Ovary hairy. Legume linear, slightly curved, 1.2-2 × ca. 0.25 cm, lower suture deeply undulate, upper suture slightly constricted between seeds, hooked pubescent, 6-8-jointed.

Flowering Apr-Aug, Fruiting: Aug-Sep.

Specimen examined: Tarkassi area of Koternka

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

Subshrubs or shrubs, erect, 30-120 cm tall. Young branchlets with adpressed and minute hooked hairs. Leaves 3-foliolate; petiole 1.5-4 cm; terminal leaflet blade ovate or ovate-elliptic, 9-19 × 3-8 cm, abaxially densely yellow sericeous, adaxially sparsely adpressed hairy, lateral veins 9-12, apex shortly acuminate. Racemes terminal and axillary, often 2 axillary, to 28 cm; 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. Legume linear, 2-6 cm, with dense, minute, hooked hairs, 4-12-jointed, both sutures nearly not constricted between articles; articles oblong.

Flowering Aug-Oct, fruiting Oct-Nov.

Specimen examined: Panihad of Koternka tehsil

6. *Desmodium triflorum* (L.) DC. Prodr. 2: 334.1825; FBI 2:173. *Hedysarum triflorum* L. Sp. Pl. 749. 1753

Herbs, perennial, prostrate, 10-50 cm tall, spreading pubescent. Leaves 3-foliolate; petiole ca. 5 mm; terminal leaflet blade obcordate, obtriangular, or obovate, 2.5-10 × 2.5-10 mm, base cuneate, apex truncate, slightly emarginate. 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. Legume narrowly oblong, slightly falcate, flat, 5-12 × ca. 2.5 mm, lower suture undulate, upper suture straight, 3-5-jointed; articles nearly quadrate, with short, hooked hairs, reticulate veined.

Flowering and Fruiting: Jun-Oct.

Specimen examined: Barsala near dargah Masoom Shah

7. *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.).

Shrubs or subshrubs, to 150 cm tall. Young branches densely yellow-brown velutinous and shortly hooked hairy. Leaves 1-foliolate, rarely intermixed with 3-foliolate leaves; petiole 1.5-1.8 cm, densely yellow velutinous; blade ovate, ovate-lanceolate, triangular-ovate, or broadly ovate, 4-17 ×

2.5-11.5 cm, both surfaces yellow velutinous, indumentum denser and longer abaxially. Inflorescences terminal and axillary, racemose or paniculate, 4-10 cm, terminal ones often broadly paniculate, to 20 cm, 2-5-flowered at each node; bracts subulate or lanceolate, 2.5-12 × 0.3-0.7 mm. Pedicel ca. 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. Legume narrowly oblong, 1-2 cm × 2-3 mm, lower suture incised between seeds, upper suture nearly straight, with dense yellow straight hairs intermixed with short hooked hairs, 5-7-jointed.

Flowering and Fruiting: Aug-Nov.

Specimen examined: Panihad area of Koternaka

8. *Desmodium microphyllum* (Thunberg) Candolle, Prodr. 2: 337. 1825. *Hedysarum microphyllum* Thunberg in Murray, Syst. Veg., ed. 14, 675. 1784; *Codoriocalyx microphyllus* (Thunberg) H. Ohashi; *Desmodium microphyllum* var. *longipilum* Ohwi; *D. parvifolium* Candolle; *D. parvifolium* f. *yunnanense* Pampanini.

Herbs, erect or prostrate, perennial, nearly glabrous. Leaves 3- or sometimes 1-foliolate; petiole 2-3 mm, when 1-foliolate 3-10 mm; leaflet blade narrowly obovate-elliptic or narrowly elliptic and 1-1.2 cm × 4-6 mm, or obovate to elliptic and 2-6 × 1.5-4 mm, both ends rounded. Racemes terminal or axillary, yellow-brown spreading pubescent, 6-10-flowered. Pedicel 5-8 mm. Calyx 5-parted; lobes linear-lanceolate, 3-4 × as long as tube. Corolla pink, nearly as long as calyx; standard obovate or obovate-orbicular, below middle attenuate, shortly clawed; wings obovate, auriculate and clawed; keel narrowly elliptic, longer than wings. Stamens diadelphous. Ovary pubescent. Legume ca. 12 × 3 mm, both surfaces shallowly dentiform, (2 or)3- or 4(or 5)-jointed; articles nearly orbicular, flat, minutely uncinately hairy and ciliate or glabrescent, reticulate veined.

Flowering May-Sep, fruiting Sep-Nov.

Specimen examined: Chambitrar area of Koternaka Tehsil

9. *Desmodium concinnum* Candolle, Ann. Sci. Nat. (Paris). 4: 101. 1825. *Desmodium barbigerum* H. Léveillé.

Shrubs, 80-150 cm tall. Young branches adpressed pubescent. Leaves 3-foliolate; petiole 0.8-1.3 cm, densely gray hairy; terminal leaflet blade elliptic or obovate, 4-9 × 1.5-3 cm, both surfaces adpressed pubescent, base cuneate, apex acute to obtuse-rounded, mucronate. Racemes terminal and axillary, 20-35 cm; rachis gray puberulent and hooked hairy, 2-4-flowered at each node. Pedicel ca. 1 cm, hooked hairy. Calyx 2-3.5 mm; lobes nearly equal. Corolla purple to violet; standard broadly obovate or orbicular, 5.5-7 × 5-6 mm, clawed; wings broadly obovate, 4.5-6 × ca. 3 mm, long clawed. Ovary hairy, 5- or 6-ovuled. Legume narrowly oblong, 4-6-jointed, lower suture deeply constricted near upper suture, upper suture thickened and nearly straight or slightly undulate, sparsely minutely hooked hairy.

Flowering, Sep-Oct, fruiting, Oct.

Specimen examined: Ponda Naka of Rajouri district.

10. *Desmodium elegans* Candolle, Ann. Sci. Nat. (Paris). 4: 100. 1825

Shrubs, much branched, 1-2 m tall. Branches glabrescent. Leaves 3-foliolate; petiole 2-4 cm; leaflet blade variable in

shape and size, nearly ovate, ovate-lanceolate, ovate-elliptic, broadly ovate, rhombic, or orbicular-rhombic, 2-7 × 1.2-5 cm, base obliquely obtuse or cuneate, margin entire or shallowly undulate, apex usually acute to acuminate. Inflorescences 5-20 cm or longer, terminal ones mostly paniculate, axillary ones mostly racemose, often 2- or 3-flowered at each node. Calyx 3-4 mm, 4-lobed; lower calyx lobes longer or shorter than tube. Corolla purple or purple-red, 0.9-1.7 cm; standard broadly elliptic or obovate, base cuneate, apex slightly emarginate; wings and keel clawed, wings auriculate at base. Stamens 0.7-1.3 cm. Legume flat, linear, 3-5 × 0.4-0.5 cm, hairy, lower suture crenate, upper suture nearly straight, 4-6-jointed.

Flowering and Fruiting June – Oct.

Specimen examined: Koternaka of Rajouri district

11. *Desmodium confertum* DC., Ann. Sci. Nat. (Paris) 4:101. 1825 Jan (Prodr. 2:335. 1825 Nov) (Syn: *Desmodium dioicum* (D. Don) DC.; *Hedysarum dioicum* D. Don; *Meibomia conferta* (DC.) Kuntze).

Branch terete, finally downy when young, petiole about 3 cm, leaflets subcoraciuous, glabrous above, distinctly reticulate-venose pale minutely hairy below, end one obovate or oblong, obtuse or acute up to 15.5 cm long. Raceme copious, short, dense, axillary or terminal, the later panicked often subsecund, bract 1.3 cm long, lanceolate, scarios; pedicel ascending. Calyx 1 cm turbinate, subglabrous, lower teeth lanceolate as long as tube; upper deltoid. Corolla 3 to 4 times the calyx. Pod 3 - 3.5 cm long 1 cm broad and 3 to 4 joint with halfway constriction.

Flowering and fruiting: July- Aug.

Specimen examined. Sabzi Darhal of Rajouri District.

12. *Desmodium multiflorum* DC. (Syn: *Desmodium angulatum* DC.; *Desmodium dubium* Lind.; *Desmodium floribundum* (D. Don) Sweet; *Desmodium floribundum* (D. Don) G. Don; *Desmodium mairei* Pamp.; *Desmodium nepalense* H. Ohashi; *Desmodium sambuense* (D. Don) DC.; *Dollinera sambuensis* (D. Don) Walp.; *Hedysarum floribundum* D. Don; *Hedysarum sambuense* D. Don; *Hedysarum suembum* Buch.-Ham. ex D. Don; *Meibomia floribunda* (D. Don) Kuntze; *Ototropis sambuensis* (D. Don) Nees).

Shrubs, erect, 1-2 m tall, yellow to white pubescent, becoming glabrescent. Leaves 3-foliolate; petiole 1.5-4 cm, densely tomentose; terminal leaflet blade elliptic or obovate, 5-10 × 3-6 cm, base cuneate or nearly rounded, apex obtuse or acute, mucronate. Inflorescences to 18 cm, terminal ones mostly paniculate, axillary ones mostly racemose; peduncle with dense antrorse sericeous and minute hooked hairs, often 2-flowered at each node. Pedicel ca. 5 mm. Calyx ca. 4.5 mm, densely hooked hairy; lobes ca. as long as tube. Corolla purple; standard elliptic, 0.8-1.4 cm, clawed; claw obovate, 8-11 mm; wings narrowly elliptic, 0.8-1.4 cm, clawed; keel 7-10 mm, long clawed, not auriculate at base. Stamens monadelphous. Legume 1.5-2.4 cm, lower suture crenate, upper suture nearly straight or slightly undulate, 4-7-jointed; articles obovate, 3-4 × ca. 3 mm, densely adpressed brown sericeous.

Flowering and Fruiting: Jul-Sep, fr. Aug-Oct.

Specimen examined: Chambitrar village of Rajouri district.

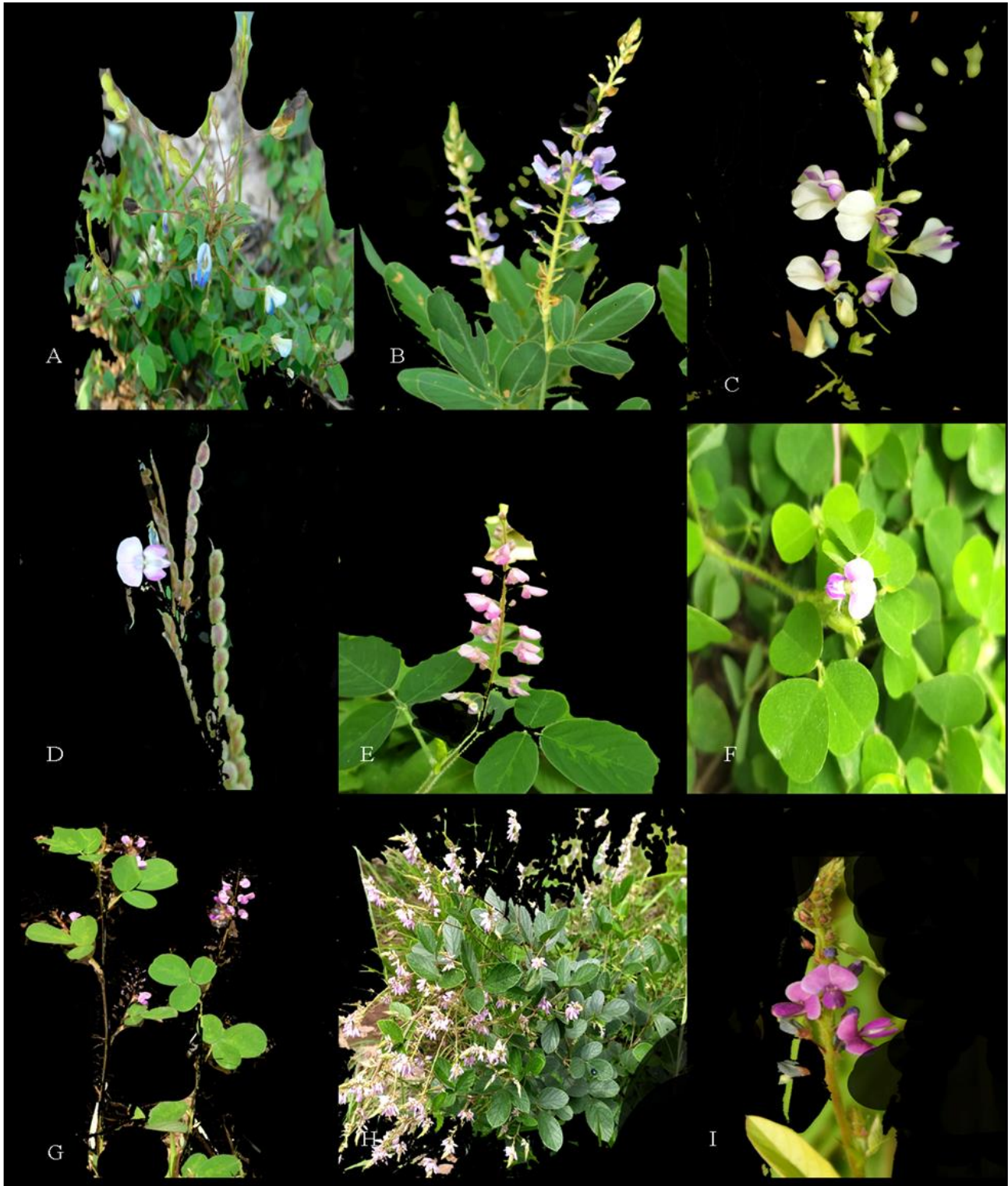


Fig 2: Desmodium species (A-I). A. *Desmodium microphyllum* B. *Desmodium concinnum* C. *Desmodium laxiflorum* D. *Desmodium gangeticum* E. *Desmodium heterocarpon* F. *Desmodium triflorum* G. *Desmodium multiflorum* H. *Desmodium confertum* I. *Desmodium benthamii*

Conclusion

The present revision of the genus comprises of 12 species are conducted for the very first time in this region of lesser Himalayas of Jammu province. This documentary will provide a platform for the upcoming researches for their research works in the Jammu and Kashmir state and especially in the Peer Panjal range. Almost all the members are important from ecological ethnomedicinal utilization to sustainable agriculture point of view.

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