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Taxonomic Study of Endemic Species of *Astragalus* L. (Fabaceae) of India

Lal Babu Chaudhary[1, 2], Kumar Kamal Anand[1] and Ravi Srivastava[1]

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ABSTRACT: The goal of the study is to provide a comprehensive taxonomic account of 12 endemic species of *Astragalus* occurring in India. The north-west Himalayan region harbors more endemic species (11 spp.) than eastern Himalaya where only two species have been noticed from Sikkim. Jammu & Kashmir with seven species occupies first position in the list of endemic species. Five species are strictly confined to Jammu & Kashmir, while two species to Uttaranchal and one species to Sikkim. Only one species (*A. tenuicaulis*) is found in both the Himalayas, otherwise the elements of both the Himalayas are quite distinct from each other. Most of the endemic species of *Astragalus* have been observed quite rare in the nature except *A. uttaranchalensis*. In the present investigation, *A. turgidus*, a newly described species from Jammu & Kashmir, has been found conspecific to *A. kashmirensis*. For each species nomenclature, description, distribution, phenology, taxonomic notes, list of the investigated materials, distribution map and figures are given. A new combination *A. falconeri* var. *pilosus* (Ali) Chaudhary has been proposed based on *A. hoffmeisteri* var. *pilosus* Ali. A new endemic species *A. nainitalensis* from Kumaon Himalaya has also been described here along with illustrations.

KEY WORDS: ***Astragalus*, Endemism, Fabaceae, India, new combination, new species.**

INTRODUCTION

Astragalus L., as the largest genus in angiosperm in the world, comprises about 3000 species and 245 sections, distributed primarily in cold arid and semiarid mountainous region of the Northern Hemisphere and South America. The genus is most diversified in the Irano-Turkish region of southwestern Asia (ca. 1500 spp.), the Sino-Himalayan Plateau of south central Asia (ca. 500 spp.), the Great Basin and Colorado Plateau of western North America (ca. 400-450 spp.) and the Andes in South America (ca. 100 spp.). In addition, many *Astragalus* species are distributed in Mediterranean climatic region along the pacific coasts of North and South America and in southern Europe and northern Africa (Polhill, 1981; Podlech, 1986, 1998; Zarre and Podlech, 1997; Wojciechowski et al., 1999; Kazempour Osaloo et al., 2003; Lock and Schrire, 2005).

In the recent years more emphasis has been given on the study of RET (rare, endangered and threatened) species at world wide for the conservation point of view of the biodiversity. The present investigation is the outcome of a revisionary study of Indian *Astragalus* carried out by the senior author recently (unpublished) based on the specimens housed at BSD, BSHC, DD, CAL, CDRI, K (partially), LBG, LWG and loan specimens received from BM and P and field study. In India, the genus has about 90 species, primarily distributed in the temperate and alpine regions of the Himalayas with maximum diversity in the cold deserts of Lahul-Spiti (Himachal Pradesh) and Leh & Ladakh (Jammu & Kashmir). The north-west Himalaya from Uttaranchal to Jammu & Kashmir contains largest number of species (ca. 75 spp.) than eastern Himalayan regions (ca. 16 spp.). Most of the species of *Astragalus* occurring from Afghanistan to Bhutan are endemic to the Himalayan regions. However, the microclimate plays important role in the distribution of the species of *Astragalus* and thus many species are found as narrow endemics, often in the marginal habitats. The critical study of the genus reveals that out of ca. 90 species occurring in India, 12 species are strictly confined to the present political boundary of India including a new species described in this work. Chaudhary and Rao (2002), however, have recorded 14 endemic species from India from which a few have been transferred to another genera (*A.*

1. National Botanical Research Institute, Rana Pratap Marg, Lucknow – 226 001, India.
2. Corresponding author. Email: dr_lbchaudhary@rediffmail.com

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aegacanthoides Parker, *A. zemuensis* W. W. Smith), many have become synonyms with other species (*A. badrinathensis* Sharma et al., *A. bakeri* Ali, *A. kashmirensis var. falconeri Baker*, *A. ladakhensis* Rao & Balodi, *A. turgidus* Rao & Balodi) and some have been discovered from other countries (*A. gilgitensis* Ali, *A. khasianus*. *A. pindreensis*) (Podlech, 1988, 1999b; Kumar and Sane, 2003; Chaudhary and Khan, 2005a, b; Chaudhary, 2006b, c; Chaudhary and Srivastava, 2007).

In India, the north-west Himalaya from Jammu & Kashmir to Uttaranchal harbors more endemic species of *Astragalus* (11 spp.) than Eastern Himalaya where only two species (i. e. *A. lachungensis* Chaudhary and *A. tenuicaulis* Benth. ex Bunge) have been noticed from Sikkim. Jammu & Kashmir province with seven species occupies first place in the list of endemic species. Five species are strictly confined to Jammu & Kashmir (*A. falconeri* var. *pilosus* (Ali) Chaudhary, *A. isabellae* Dunn, *A. kashmirensis* Bunge, *A. maxwellii* Royle ex Benth. and *A. sherriffii* Podlech) while two to Uttaranchal (*A. uttaranchalensis* Chaudhary & Khan and *A. nainitalensis* Chaudhary) and one to Sikkim (*A. lachungensis* Chaudhary). Four species, namely *A. drasianus* Chowdhery et al., *A. oxyodon* Baker, *A. tenuicaulis* Benth. ex Bunge and *A. trichocarpus* Grah. ex Benth. occur in more than one Indian province, but in very scattered populations. The elements of endemic species of *Astragalus* of north-west Himalaya and east Himalaya are quite different from each other, however, *A. tenuicaulis* Benth. ex Bunge occurs in both the Himalayas. The extensive field studies carried out by authors in the recent years during 2001 to 2006 reveal that majority of the endemic species have become rare and threatened in the nature and need to be protected and conserved. However, only *A. uttaranchalensis* Chaudhary & Khan, a newly described species from Uttaranchal has been noticed commonly growing in scattered populations between Gangotri to Gaumukh in Garhwal Himalaya.

Further, the examination of type materials of *A. turgidus* Rao & Balodi has revealed that it is conspecific to *A. kashmirensis* Bunge, hence treated here as a synonym. A new combination *A. falconeri* var. *pilosus* (Ali) Chaudhary has been proposed based on *A. hoffmeisteri* var. *pilosus* Ali. In addition, a new endemic species *A. nainitalensis* Chaudhary has also been described along with illustrations from Kumaon Himalaya (Uttaranchal) based on a previously collected material housed at CAL.

TAXONOMIC TREATMENTS

1. *Astragalus drasianus* Chowdhery et al. in Bull. Bot. Surv. India 34: 209, f. 1. 1997; Chaudhary & Khan in Phytotaxonomy 4: 58, f. 2. 2004; Kumar & Sane, Legum. South Asia: Checkl. 227. 2003.

Perennial herbs, almost stemless. Stipules 14-15 x 4 mm, membranous, narrowly lanceolate, adnate to petiole at base, glabrous or with some hairs along margins towards tip, faintly veined. Leaves 19-25 cm long, imparipinnate; petioles 5-8 cm long, rachis neither terete nor stiff, sparsely pilose with spreading, long, white hairs; leaflets 45-55, 9-10 x 3-4 mm, alternate to opposite, oblong, oblong-elliptic, narrowly ovate or narrowly obovate, obtuse at tip, glabrous, long hairs found only on midrib. Inflorescence axillary, raceme, ca. 5-flowered; peduncle 5-10 mm long, glabrous. Bracts ca. 8 mm long, longer than pedicels, persistent, linear, membranous, thinly ciliate along margins. Flowers ca. 20 mm long; pedicels ca. 6 mm long, glabrous. Calyx 10-12 mm long, tubular, glabrous or very thinly ciliate along the margins of lobes with long, white hairs, tube ca. 7 mm long, lobes linear, lower one ca. 4 mm long, upper one ca. 3 mm long. Standard ca. 20 x 6 mm, obovate, obtuse at apex, narrow towards base, claw not distinct; wing petals 18-20 mm long, shorter than standard, lamina ca. 9 x 3 mm, oblong, obtuse at tip, upper auricle ca. 1.5 x 1 mm, lateral pockets present, claw ca. 11 mm long; keel petals ca. 15 mm long, shorter than standard and wing petals, lamina ca. 5 x 4 mm, claw ca. 10 mm long. Vexillary filament ca. 16 mm long; staminal sheath ca. 15 mm long. Ovary ca. 5 mm long, glabrous, ca. 11-ovuled, stipitate, stipe ca. 2 mm long; style ca. 10 mm long, incurved towards apex; stigma capitate, glabrous. Pods 22-28 x 10 mm (including ca. 5 mm long apical beak), subsessile, turgid, oblong or oblong–elliptic, prominently veined, glabrous or sometimes only with a few thin, long, white, spreading hairs, bilocular.

Holotype: Jammu & Kashmir, Ladakh, Dras, *H. J. Chowdhery & B. P. Uniyal 85804 A* (CAL not traceable); iso *85804 B* (BSD not traceable).

Distribution: India (Jammu & Kashmir, Himachal Pradesh). Fig. 1.

Phenology: June - August.

Figure reference: Chowdhery et al. (1997), Chaudhary and Khan (2004).

Notes: This species was described by Chowdhery et al. (1997) from Jammu & Kashmir based on single collection (type specimens). In the present study, the

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type specimens were not traced either at CAL or BSD. However, the identification of the species has been confirmed through protologue and illustrations provided in the original publication. Recently Chaudhary and Khan (2004) reported the species from a new locality in Himachal Pradesh. Further collection of the species especially from the type locality study and are required to establish the relationship with its closely allied species *A. rhizanthus* Royle ex Benth.

A. drasianus resembles with *A. rhizanthus* Royle ex Benth. and *A. concinnus* Benth. ex Bunge (not found in India) but differs from former by glabrous or nearly glabrous, membranous and faintly veined stipules (vs. hairy, thick and prominently veined) and glabrous leaflets, pedicels, calyx, ovary and pods (vs. hairy) and from latter by keel petals shorter than standard and wing petals (vs. longer than standard and wing petals) .

Specimens examined: Himachal Pradesh, Panji village, Bashahr, 7 June 1962, *N. C. Nair* 22537 (BSD). Jammu & Kashmir, Ladakh, Dras, 10500 ft., 31 May 1941, *Ludlow & Sherriff 8334* (BM), Dras valley, 24 June 1901, *J. F. Duthie 25584* (K).

2. *Astragalus falconeri* Bunge var**. *pilosus*** (Ali) Chaudhary comb. nov. Figs. 2 & 11A

A. hoffmeisteri var. pilosus Ali in Kew Bull. 1958 (2): 304. 1958; in Biologia 7: 15. 1961 & in Nasir & Ali, Fl. W. Pakistan 100: 132. 1977; Sanjappa, Legum. India 89. 1992.

Perennial herbs, decumbent, spreading, tufted; stem terete, finely striate, tomentose with white, spreading hairs in younger portions, glabrescent in older portion. Stipules 3-5 x 2-3 mm, foliaceous, free, thick, broadly ovate, acuminate at tip, ciliate with white spreading hairs along margins, glabrescent to sparsely pilose on both sides. Leaves 2-6 cm long, imparipinnate; petioles minute to 5 mm long; rachis ca. 4.5 cm long, pilose with white spreading hairs; leaflets 17-19, 4 x 2 mm, subsessile, subopposite to alternate, obovate, cuneate at base, entire along margins, retuse, truncate or obtuse at apex, sparsely to moderately pilose with white, spreading hairs below, glabrous above. Inflorescence (2.5-) 6-13 cm long, longer than subtending leaves, axillary, peduncled raceme, few to many-flowered, laxed; peduncles 5.5-7 cm long, pilose with white, spreading hairs. Bracts 1.5-2 mm long, almost equal to or slightly shorter than pedicels, membranous, persistent, linear-lanceolate, pilose. Bracteoles minute, situated at the base of calyx, membranous, ciliate. Flowers 11-13 mm long, bluish-pink; pedicels 1.5-2.5 mm long, pubescent with white, spreading hairs. Calyx ca. 5 mm long, campanulate, persistent, oblique at mouth, tube 3 mm long, glabrous to glabrescent outside, glabrous inside, lobes subequal, sparsely pilose both sides, ciliate along margins, linear-lanceolate, upper one 1.5 mm long, lower one 2 mm long. Standard 11-13 mm long, deflexed, lamina 9-11 x 8 mm, broadly elliptic, retuse at apex, claw 2 mm long; wing petals ca. 9.5 mm long, slightly shorter than standard & keel petals, lamina 6.5 x 2.5 mm, oblong, subobtuse at tip, upper auricle ca. 1 mm long, claw ca. 3 mm long; keel petals 11 -13 mm long, equal to standard, lamina 8-10 x 4.5 mm, abruptly incurved, upper auricle ca. 1 mm long, claw ca. 3 mm long. Vexillary filament ca. 8 mm long; staminal sheath ca. 7 mm long, upper free filaments 2.5-3.5 mm long, alternately shorter and longer. Ovary 4 mm long, linear, thinly hairy only along upper suture, stipitae (stipe 3 mm long); style 4.5 mm long, abruptly incurved; stigma penicillate. Pods ca. 14-16 x 4 mm, stipitate, oblong, straight or slightly curved, pointed at both ends, turgid with inwardly pushed lower suture, faintly veined, glabrous, partially bilocular, stipe 5-7 mm long, longer than calyx. Seeds ca. 3 x 2 mm, oblong-reniform, brown, smooth, glabrous.

Holotype: Karakorum, 10,500 ft., 6 August 1876, *C. B. Clarke 30111A* (K!: photo CAL!, LWG!).

Distribution: India (Jammu & Kashmir: Kargil, Baltistan, Gilgit, Karakorum). Fig. 1.

Phenology: June - August.

Notes: This variety was described by Ali (1958) under *A. hoffmeisteri* (*A. hoffmeisteri* var. *pilosus* Ali) chiefly based on minutely pilose young pods. Wenninger (1991) reduced *A. hoffmeisteri* var. *pilosus* under *A. falconeri* as a synonym. In the present study it has been observed that although *A. hoffmeisteri* var. *pilosus* resembles with *A. falconeri* in gross morphology, however, it distinctly differs in having leaflets glabrous above (vs hairy both sides), ovary and young pods thinly hairy only along upper suture (vs hairy throughout) and pods glabrous (vs hairy) and treated here as a variety under *A. falconeri* with forming a new combination.

Specimens examined: Jammu & Kashmir, Baltistan, Hushe nallah, Khane, 9,500 ft., 18 June 1828, *F. Ludlow 361 pp*.–specimen marked as B (BM).

3. *Astragalus isabellae* Dunn in Kew Bull. 1924: 384. 1924; Wenninger in Mitt. Bot. Staatss. Munchen 30: 73, f. 6 e-f, 21 a-c. 1991; Kumar & Sane, Legum. South Asia: Checkl. 231. 2003; Chaudhary & Khan in Pandey et al., Pl. Taxo.: Adv. & Relv. 387, f. 1. 2005. Fig. 3

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A. concretus sensu Ali in Biologia 7: 36. 1961 pp. & in Nasir & Ali, Fl. W. Pakistan 100: 175, f. 17 L. 1977 pp.; Sanjappa, Legum. India 86. 1992 pp.

Erect herbs, 30-80 cm high, stem terete, smooth, hollow, thinly to moderately pubescent with adpressed, white, minute hairs in extreme lower portion, glabrescent to glabrous in upper portion with adpressed, white or mixed white and black hairs especially at nodal region. Stipules 17 x 9-10 mm, foliaceous, membranous, encircling the stem, connate up to the middle or more at the back of petiole, free from petiole, broadly ovate with acuminate tip, glabrous to thinly pubescent towards base and densely hairy towards tip, hairs black or brown, adpressed. Leaves 9.5-18 cm long; petioles 1.6-4 cm long; rachis 6.5-12 cm long, glabrescent to glabrous; leaflets 15-19, 13-31 x 4-12 mm, narrowly oblong, oblong or narrowly ovate, cuneate at base, entire and thinly ciliate along margins, acute or subobtuse to obtuse with a minute mucro at tip, glabrescent to thinly pilose with adpressed, white hairs below, glabrous above. Inflorescence 9-23 cm long, axillary, long peduncled raceme, peduncles 5.5-17 cm long, glabrous to glabrescent with black hairs; racemes many-flowered, closed. Flowers ca. 15 mm long, white or creamy yellow; pedicels ca. 2 mm long, pubescent with black hairs. Bracts 10-14 x 2-4 mm, persistent in flowers, longer than pedicels, protruding beyond flower bud, lanceolate, membranous, with glabrous to glabrescent surface and ciliate margins and tip with spreading, black hairs. Bracteoles minute to 2.5 mm long, present or absent, quite variable, filiform to linear, membranous, thinly hairy. Calyx 9-10 mm long, tubular, oblique at mouth, tube 6 mm long, glabrescent to thinly hairy with adpressed, black hairs outside, glabrous inside, lobes hairy on both sides with black hairs, linear, unequal, dorsal one 1-2 mm long, ventral one 2-4 mm long. Standard ca. 15 mm long, almost equal to or slightly longer than wing and keel petals, lamina 12 x 5 mm, narrowly obovate, retuse at apex, claw 3 mm long; wing petals 14-15 mm long, lamina 7 x 2 mm, oblong, obtuse at tip, curved towards apex, claw 8 mm long; keel petals 14-15 mm long, lamina 6 x 3 mm, claw 9 mm long. Ovary 7-8 mm long, linear, glabrous, stipitate, stipe 4 mm long; style glabrous, incurved; stigma capitate, with some very minute projections. Pods not seen.

Lectotype: N. W. India, Kashmir, Pahlgam, narrow Nullah to Dum Patthar, 7,000 -8,000 ft., 6 September 1920, *R .R. Stewart & I. D. Stewart 5972* (K!). Syntypes: N. W. India. Kashmir: Goorai, 9,000 ft., 20 July 1876, *C. B. Clarke 29292* (K!); Sonamarg, 9,500 ft., 27 July 1922, *R. R. Stewart 7201* (K!).

Distribution: India (Jammu & Kashmir). Fig. 1.

It has not been recorded so far from outside Jammu & Kashmir. The report of its occurrence from Himachal Pradesh (India) and Pakistan as mentioned in Kumar and Sane (2003) is erroneous.

Phenology: July - September.

Habitat: On open rocky grassy hill slopes. Altitudes 2,100-4,000 m.

Figure reference: Wenninger (1991); Chaudhary and Khan (2005b).

Notes: Ali (1961, 1977) has treated *A. isabellae* Dunn as conspecific to *A. concretus* Benth. However, Wenninger (1991) and Chaudhary and Khan (2005b) have correctly reinstated it as a correct species. It differs from *A concretus* in having much-elongated inflorescence with numerous flowers and longer calyx lobes.

Specimens examined: Jammu & Kashmir: Near Sinthan Pass, 12,000 ft., 1 July 1939, *F. Ludlow 166* (BM: photo LWG); Wardhwan, 12,000 ft., 27 July 1963, *A. Khan & A. Shah 84449* (LWG); Lidder valley, above Kainmul, 12,000 ft., 21 July 1893, *J. F. Duthie 13121* (CAL).

4. *Astragalus kashmirensis* Bunge, Mem. Acad. Sci. St.-Pet. ser. 7, 11: 30. 1868 &12: 34. 1869; Baker in Hook. f., Fl. Brit. India 2: 127. 1876; Ali in Biologia 7: 43. 1961 & in Nasir & Ali, Fl. W. Pakistan 100: 166. 1977; Sanjappa, Legum. India 85 & 90. 1992; Kumar & Sane, Legum. South Asia: Checkl. 232. 2003. Figs. 4 & 11B

A. kashmirensis var. *falconeri* Baker in Hook. f., Fl. Brit. India 2: 127. 1876.
A. turgidus Roa & Balodi in Proc. Nat. Acad. Sci. India 59 (B), 4: 475. 1989, syn. nov.

Erect or ascending, ca. 35 cm long, stem elongated, branched, villous (shaggy) with fine, long, spreading, gray (in dried herbarium specimens) hairs, internodes not much elongated, crowded and completely covered with stipules in lower portion, slightly longer than stipules in middle portion and shorter than or equal to stipules in upper portion. Stipules 8-22 x 3-10 mm, free (or slightly attached with petiole at extreme base), membranous, prominently multiveined, lanceolate with acuminate tip and densely ciliate margins, sparsely to moderately hairy outside and glabrous inside, hairs long, thin, spreading, gray. Leaves 8-14 (-30) cm long, imparipinnately compound; petioles 2-3 (- 10) cm long, hairy as stem; rachis 5-10 cm long, grooved above, hairy as stem; leaflets 33 -37, 9-15 x 5-10 mm, close, subsessile, oblong, oblong-elliptic or ovate, acute or obtuse-apiculate at apex, densely villous below and along margins, sparsely villous above.

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Inflorescence axillary, peduncled capitate raceme (head); heads compact, many-flowered; peduncles (2-) 4.5-9 cm long, villous with long, spreading, gray or mixed with few blackish-brown hairs. Bracts 8-9 x 1.5-2 mm, distinctly longer than pedicels, persistent, membranous, prominently multiveined, linear-lanceolate, densely ciliate along margins with long, spreading, gray hairs. Flowers 17-22 mm long, yellow; pedicels 3-3.5 mm long, villous with long, spreading, mixed gray and blackish-brown hairs. Calyx 11-13 mm long, tubular, tube 6-9 mm long, villous outside, glabrous inside, lobes 4.5-5 long, slightly shorter on dorsal side, linear, villous on both sides, hairs long, spreading, blackish-brown. Standard 17-22 x 8 mm, obovate with emarginate tip, claw not distinct; wing petals ca. 15.5 mm long, shorter than standard, lamina 7.5 x 3 mm, oblong with obtuse tip, upper auricle 1.2 x 1 mm long, oblong with obtuse tip, claw 8 mm long; keel petals ca. 13 mm long, lamina 5 x 3 mm, convex on lower margins but tip not incurved, upper auricle minute, claw 8 mm long. Vexillary filament ca. 11 mm long; staminal sheath ca.10 mm long, free filaments 1-2 mm long, alternately shorter and longer. Ovary ca. 4 mm long, stipitate (stipe ca. 3 mm long), very densely sericeous with gray hairs; style ca. 6 mm long, slightly incurved towards tip, hairy on dorsal margin in lower portion, glabrous in upper portion; stigma capitate, glabrous. Pods 14-20 x 6 mm, oblong, turgid, narrowed at both ends, stipitate (stipe ca. 3 mm long), completely bilocular, villous with spreading, gray, long hairs.

Lectotype: Kashmir, ex *Falconer 420* (K!: photo CAL!, LWG!; iso CAL!: photo LWG!). Syntype: Kashmir, *Jacquemont 778* (K!; P!: photo LWG!).

Distribution: India (Jammu & Kashmir). Fig. 1.

So far, it has not been reported from Pakistan as mentioned in Kumar and Sane (2003). Sanjappa (1992) has correctly treated this species as an endemic to India.

Phenology: June - September.

Habitats: In rocky fields. Altitudes 1800-3800 m.

Notes: The specific epithet of this species has been spelled in three different ways at different places: *A. kashmirensis* (Bunge, 1868), *A. caschmirensis* (Bunge, 1869) and *A. cashmirensis* (Baker, 1876). Ali (1961) has correctly pointed out that the original spelling of specific epithet *A. kashmirensis* should be accepted as correct specific epithet and the other epithets *A. caschmirensis* and *A. cashmirensis* should be rejected. In the work of Sanjappa (1992) this species has appeared at two places with different spelling in the alphabetical list of the species – on page number 85 as *A. cashmirensis* and on page number 90 as *A. kashmirensis*.

It is very closely related to *A. malacophyllus* Benth. ex Bunge from which it can be separated by its long, spreading, gray villous hairs, free stipules and many-flowered capitate raceme (head) with elongated peduncle. Although they are allied, Baker (1876) has placed them in separate subgenera - *A. kashmirensis* in subgenus *Hypoglottis* and *A. malacophyllus* in subgenus *Myobroma*.

The species is quite variable in the length of different parts of the plants and in density of the hairs. *A. turgidus* Rao & Balodi, a newly described species from Jammu & Kashmir by Rao and Balodi (1989) is conspecific to *A. kashmirensis* and treated here as a synonym.

Specimens examined: Jammu & Kashmir: Kashmir, *V. Jacquemont s. n.* (P: photo LWG); Kashmir, *Jacquemont 778* (P: photo LWG); Banihal mountains (facing upper munda), 2,300 m, 14 September 1958, *T. A. Rao 7655* (BSD - holotype of *A. turgidus*); Banihal mountain, facing Banihal valley, 1,850-3,835 m, 13 September 1958, *T. A. Rao 7583* (BSD, CAL – student herb.); Ladakh, Kargil to Panikhar, 29 July 1988, *H. J. Chowdhery & B. P. Uniyal 85902* (BSD); Tragbol, 9,000 ft., 16 September1986, *B. M. Wadhwa 83765* (BSD); Pissu Ghati, Seshnag, 3,800 m, 26 June 1959, *T. A. Rao 9712* (BSD); Apharwat, 3,800 m, 21 June 1959, *T. A. Rao 9644* (BSD, CAL – student herb: photo LWG.); Jai valley, 2,400 m, 30 May 1959, *T. A. Rao 9082* (BSD); Near Gulmarg, 8,000-9,000 ft., 13 June 1892, *J. F. Duthie s. n.* (CAL – student herb.); Gulmarg, 8,000-9,000 ft., 24 June 1892, *J. F. Duthie s. n.* (CAL); Gulmarg, 3,300 m, 4 August 1966, *N. C. Nair 37105* (BSD: photo LWG); Limbar Nullah, Kajnag rangr, 8,000-9,000 ft., 18 May 1892, *J. F. Duthie 11036* (CAL); Kashmir, 1864, *Falconer 422* (CAL).

5. *Astragalus lachungensis* Chaudhary in J. Jap. Bot. 81 (3): 168, f. 1 & 2. 2006.

Description reference: Chaudhary (2006a).

Distribution: India (North Sikkim). Fig. 1.

Phenology: August - October.

Figure reference: Chaudhary (2006a).

Ecology: Gregariously growing on rocks on the substratum of thick, moist bed of mosses on hill slope in open. Altitudes 3,300 m.

Notes: *A. lachungensis* is very close to *A. donianus*, however, distinctly differs in colour of flowers, calyx, stamens and pods (Chaudhary, 2006a).

6. *Astragalus maxwellii* Royle ex Benth. in Royle, Illust. Bot. Himal. 198. 1835; Ali in Kew Bull. 1958: 308. 1958; in Biologia 7: 45. 1961 & in Nasir & Ali, Fl. W. Pakistan 100: 181. 1977; Sanjappa, Legum. India 91. 1992; Kumar & Sane, Legum. South Asia: Checkl. 234. 2003; Chaudhary & Khan in Pandey et al., Pl. Taxo.: Adv. & Relv. 389, f. 1. 2005. Fig. 5

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Astragalus ciliolatus Benth. ex Bunge in Mem. Acad. Sci. St.-Pet. ser. 7, 11: 27. 1868 & 12: 33. 1869; Baker in Hook. f., Fl. Brit. India 2: 129. 1876.

Erect herbs, ca. 30-50 cm or more high; stem terete, hollow, sparsely pubescent with adpressed, minute, black hairs. Stipules 6-7 x 1-2 mm, free, spreading, persistent, lanceolate or deltoid to narrowly lanceolate (in upper part), ciliate with black hairs along margins, almost glabrous on both sides. Leaves 9-10 cm long; petioles 8-30 mm long; rachis 5-7 cm long, thinly hairy like stem; leaflets 9-15, 19-25 x 7-10 mm, alternate, subopposite or opposite, subsessile, oblong or narrowly ovate, obtuse, subtruncate or retuse with a very minute mucro at apex, sparsely pubescent to glabrous above, hairy with white, spreading or half spreading hairs below, mixed black and white hairs on midrib; petiolules ca.1 mm long, pubescent with half spreading black hairs. Inflorescence axillary, long peduncled raceme, racemes many-flowered, compact; peduncles (in fruitiscence) 8-11 cm long, pubescent with minute, adpressed, black and intermixed with few long white hairs; floral rachis (in fruitiscence) 1.5-3.5 cm long, more hairy than peduncle. Flowers not seen. Bracteoles 2, 1-3 mm long, persistent, situated at the top of pedicel, linear, pubescent. Calyx (in fruitiscence) ca. 9 mm long, oblique at mouth, persistent, tube 5 mm long, hairy with black and intermixed with some long, white hairs outside, lobes hairy on both sides, upper one 2 mm long, lower one 4 mm long. Standard 17-19 mm long; keel shorter than standard and wing petals, abruptly upcurved. Pods 20-25 x 6 mm, oblong-ovoid, turgid, narrowed at both ends, beaked at apex, partially bilocular, ca. 12-seeded, stipitate, densely pubescent with blackish-brown, unequal, half spreading hairs, stipe ca. 8 mm long, equal to calyx. Seeds 3.2 x 2.8 mm, oblong reniform, blackish brown, turgid, smooth, glabrous.

Holotype: Kashmir, Chandow Pass, *Maxwell s. n.* (LIV: hb. Royle).

Distribution: India (Jammu & Kashmir). Fig. 1.

Phenology: June-September.

Figure reference: Chaudhary and Khan (2005b).

Habitat: Altitudes 2,000-4,000 m.

Notes: The specimens of this species were not observed in Indian herbaria. *A. maxwellii* differs from *A. emodi* Steud. in bracts, calyx, petals ovary and pods (Chaudhary & Khan, 2004, 2006), however, sometimes it is treated as conspecific to latter (Wenninger, 1991; Kumar and Sane, 2003).

Specimens examined: Jammu & Kashmir: Nichinai, 11,500 ft., 2 September 1956, *O. Polunin 56/648* (BM); Zojila, *A. Y. Young s. n.* (BM).

7. *Astragalus nainitalensis* Chaudhary sp. nov**.**
Figs. 6 & 11C

Stipulae liberae, racemus elongatus, pedunculatus, luxus, flores nodus, alae vexillo longiores, cariana vexillo et alae breviores, legumina ovoideus, stipes calyx longiores.

Holotype: India, Uttaranchal, Kumaon, Nainital, Date of collection, Collector & collection number not known, acc. no.113884 (CAL: photo LWG).

Stem faintly striate, glabrous. Stipules 4-6 x 0.5-1 mm, free, lateral, spreading, narrowly lanceolate, ciliate along margins with long, white, spreading hairs. Leaves 8-18 cm long; petioles 1.5-3.0 cm long; rachis and petioles thinly pilose with white, adpressed hairs; leaflets 21-35, 9-24 x 5-9 mm, oblong or oblong-ovate, obtuse or cuneate at base, obtuse with a mucro at apex, glabrous above, sparsely pilose with white, adpressed hairs below; petiolules ca. 1 mm long. Inflorescence 9-12 cm long, axillary, peduncled raceme; peduncles 3.5-4.5 cm long, thinly pubescent with light brown, adpressed hairs; racemes many-flowered, lax. Bracts 1.5-2.5 mm long, deciduous, narrowly lanceolate, hairy with mixed white and brown hairs. Flowers 7-8 mm long, nodded; pedicels ca. 1 mm long, pubescent with adpressed, brown hairs. Calyx ca. 2.5 mm long, campanulate, persistent, pubescent outside, tube ca. 2 mm long, teeth minute, unequal, shorter on dorsal side, linear-triangular. Standard ca. 7 x 3 mm, obovate, retuse at apex, without distinc claw; wing petals ca. 8 m long, longer than standard, lamina 5 x 1.5 mm, upper auricle hooked, claw 3 mm long; keel petals ca. 6 mm long, shorter than standard and wing petals, lamina 3 x 2.5 mm, obovate, curved and obtuse at apex, upper auricle minute, claw 3 mm long. Vexillary filament ca. 5 mm long; staminal sheath ca. 5 mm long, obtuse at apex, upper free filaments 1-1.5 mm long, alternately shorter and longer. Ovary ca. 4 mm long, stipitate, adpressed brown hairy, stipe ca. 1.5 mm long; style ca. 1.5 mm long, abruptly incurved from base; stigma capitate, glabrous. Pods ca. 9 x 6 mm (excluding ca. 3 mm long apical narrow portion and ca. 3.5 mm long stipe), ovoid, stipitate, rounded or obtuse at base, narrow at apex, thinly pubescent, faintly veined, stipe longer than calyx.

Distribution: India (Uttaranchal-Kumaon). Fig. 1.

Notes: *A. nainitalensis* is described based on a single old collection of holotype collected from Nainital in Kumaon Himalaya. After holotype, no other collection of this species has been made from any part of India. The new species is very distinct and chiefly characterized by free stipules, lax raceme

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with nodded flowers, longer wing petals than standard, shorter keel petals than standard and wing petals and ovoid pods with longer stipe than calyx.

8. ***Astragalus oxyodon*** Baker in Hook. f. Fl. Brit. India 2: 125. 1876; Ali in Biologia 7: 39. 1961 & in Nasir & Ali, Fl. W. Pakistan 100: 178. 1977; Sanjappa, Legum. India 92. 1992 (as *A. oxydon*); Kumar & Sane, Legum. South Asia: Checkl. 236. 2003. Figs. 7 & 11D

Perennial herbs, prostrate, densely caespitose; stem slender, up to 7-20 cm long, with internodes longer than stipules, glabrescent to pubescent with white, adpressed hairs. Stipules ca. 2-2.5 x 1mm, connate at base or up to half of the length on the opposite side of petiole, free from petiole, ovate-lanceolate with acuminate tip, glabrescent. Leaves 2.5-3 cm long, imparipinnate; petioles 5-7 mm long; rachis and petioles pilose with white, adpressed hairs; leaflets 13-16, 3-4 x 1.5 mm, oblong, oblong-elliptic or narrowly obovate, cuneate at base, obtuse or retuse at apex, pilose with white, adpressed hairs below, glabrescent to thinly pilose with white, spreading hairs above. Inflorescence axillary, peduncled raceme, 2-4 flowered; peduncles 10-15 mm long, shorter than subtending leaf, very slender, pubescent with adpressed, white and mixed with few black hairs. Bracts 2-3 mm long, longer than pedicel, persistent, glabrescent. Flowers 12-14 mm long, bluish-purple; pedicels ca. 1.5 mm long, pubescent with light brownish to blackish hairs. Calyx ca. 6 mm long, persistent, campanulate-tubular, oblique at mouth, pilose or thinly pilose with light brown, adpressed hairs outside, glabrous inside, tube 2-3 mm long, lobes 3-4 mm long, usually longer than or sometimes equal to tube, linear. Standard 12-14 mm long, emarginate at apex; wing petals 9 -10 mm long, diatinctly shorter than standard and keel petals; keel petals equal to or slightly exceeding the standard. Stamens monadelphous, staminal sheath ca. 10 mm long, closed, upper free filaments ca. 3 mm long. Ovary ca. 11 mm long, hairy, stipitate, stipe ca. 2 mm long, more or less equal to calyx tube. Pods 4-7 x 2-4 mm (excluding stipe and apical beak portion), elliptic-oblong, turgid, tapring atboth ends, unilocular, pilose with white or mixed white and black, spreading hairs, stipe 1.5-2 mm long, folded, more or less equal to calyx tube.

Holotype: West Tibet, *Falconer s. n.* (K!).

Phenology: July - September.

Distribution: India (Jammu & Kashmir, Himachal Pradesh). Fig. 1.

So far not reported from Pakistan.

Notes: Baker (1876) described *A. oxyodon* from West Tibet (now refers to Jammu & Kashmir) based on a single collection (Holotype). Subsequently, Ali (1961, 1977) recorded it from Jammu & Kashmir (Burgil Pass, *Wnterbottom* –K) and Himachal Pradesh (Lahul, *Jaeschke* 40 – 2nd collection and Upper Chenab, *Baden-Powell* 98/9 – K). In Indian herbaria, no perfect specimens of the species have been observed. A few specimens from Kashmir housed at CAL (e. g. *Townsend 551*; *Meebold 1374, 1376*; *Duthie 11647, 13873*) are in very poor condition and do not belong to this species. After more than 100 years, only one collection (*P. B. Singh 1899*) with three specimens has been made from Himachal Pradesh during the recent period.

A. oxyodon is very distinct from *A. himalayanus* Klotz. and chiefly characterized by calyx teeth linear and longer than tube, keel petals equal to standard, stamens monadelphous and stipe of the pod is shorter than calyx.

Specimens examined: Himachal Pradesh, Mandi, Nargu Sanctuary, Phengadhar, 3,700 m, 23 September 1996, *P. B. Singh 1899* (LWG).

9. ***Astragalus sherriffii*** Podlech in Sendtnera 7: 190. 2001; Kumar & Sane, Legum. South Asia: Checkl. 240. 2003; Chaudhary & Srivastava in Taiwania 52: 29. 2007. Figs. 8 & 11E

Perennial herbs, procumbent to erect, up to 20 cm long, with several stems from base, stem slender, finely striate, branched, glabrate to sparsely pubescent with minute adpressed white hairs. Stipules 2-3.5 x 1-1.5 mm, free from petiole, connate in the lower portion of stem behind the petiole, almost to completely free in upper portion of stem, triangular with acute to acuminate tip and entire margins, pilose outside particularly along margins and tip with mixed black and white hairs, glabrous inside. Leaves 4-6 cm long, imparipinnately compound, petioles 0.2-2 cm long, pubescent like stem; rachis 1-2.5 cm long, channeled above, pubescent like stem; leaflets 9-11, 8-11 x 1.5- 3 mm, thick, shortly petiolulate, linear-oblong or linear-lanceolate, subobtuse to obtuse at apex, entire along margins, glabrous above, pubescent with adpressed white hairs below; petiolules ca. 1 mm long, pilose with half adpressed, white hairs. Inflorescene 5-11 cm long, longer than subtending leaf, axillary, pedunculed racemes (appear like spike due to subsessile flowers); racemes many-flowered, dense; peduncles 4.5-8 cm long, pubescent with adpressed white hairs, with mixed black and white hairs in upper portion. Bracts ca. 2 mm long, longer than pedicels, persistent, linear-lanceolate, pilose

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with black or mixed white and black hairs. Flowers 7-8 mm long, pinkish purple, nodded; pedicels less than 1 mm long, pilose with black or mixed white and black hairs. Calyx ca. 3 mm long, persistent, campanulate, oblique at mouth, pilose with black or mixed black and white hairs outside, glabrous inside except lobes, tube ca. 2 mm long, lobes 0.5-1.5 mm long, unequal, shorter on dorsal side. Standard 7-8 x 4 mm, broadly elliptic-obovate with retuse apex, claw not very distinct; wing petals ca. 6 mm long, shorter than standard, lamina 4 x 1.5 mm, oblong with obtuse tip, upper auricle minute, claw 2 mm long; keel petals 4-4.5 mm long, lamina 2 x 2 mm, obovate-triangular, subobtuse at apex, incurved in upper portion, upper auricle minute, claw 2 mm long. Staminal sheath ca. 3 mm long, truncated at apex, upper free filaments 0.5-1 mm long, gradually longer on ventral side. Ovary 2 mm long, sessile, elliopsoid, turgid, glabrous; style incurved above, 2 mm long, glabrous; stigma capitate, glabrous. Pods not seen.

Holotype: India, Jammu & Kashmir, Ladakh, Gya, 13,500 ft., 14 July 1941, *Ludlow & Sherriff 8491* (E).

Distribution: India (Jammu & Kashmir). Fig. 1.

Phenology: July - September.

Notes: Podlech (2001) has segregated *A. sherriffii* from *A. densiflorus* Kar. & Kir. and has shown its affinity with *A. lhorongensis* P. C. Li & C. C. Ni (not found in India) from which it differs in stipule, leaf and leaflet. According to him, the true *A. densiflorus* does not occur in South Asia (Kumar and Sane, 2003). He (Podlech, 1999a) has also described one another species *A. thomsonii* Podlech, which is very close to *A. sherriffii* Podlech. Also see Chaudhary & Srivastava (2007).

Podlech (2001) has observed wing petals as retuse to emarginated at apex, while in the present study only obtuse apex has been noticed in the isotype specimen.

Specimens examined: Jammu & Kashmir: Ladakh, Gya, 13,500 ft., 14 July 1941, *Ludlow & Sherriff 8491* (isotype BM).

10. *Astragalus tenuicaulis* Benth. ex Bunge in Mem. Acad. Sci. St.-Pet. ser. 7, 11: 23. 1868; & 12: 28. 1869; Baker in Hook.f., Fl. Brit. India 2: 126. 1876; Ali in Biologia 7: 41. 1961; Sanjappa, Legum. India 95. 1992. Figs. 9 & 11F

Astragalus inconspicuus Baker in Hook.f., Fl. Brit. India 2: 126. 1876.

Perennial herbs, prostrate, caespitose, up to 40 cm long; stem partially reddish, very slender, with distant internodes, almost glabrous to sparsely pubescent with white, minute, adpressed hairs. Stipules ca. 1.5 mm long, glabrous, free or connate only at base on the opposite side of the petiole, spreading, ovate-lanceolate. Leaves ca. 35-40 mm long, imparipinnately compound; petioles ca. 7 mm long; rachis thinly pubescent with minute, white, adpressed hairs; leaflets 13-15, oblong, narrowly obovate or oblong-elliptic, obtuse or retuse at apex, glabrous above, thinly hairy with minute, flat, white, adpressed hairs below. Inflorescence axillary, capitate raceme, 2-9-flowered,; peduncles 2.5-13 mm long, shorter than subtending leaf, glabrescent to thinly pubescent with minute, adpressed, white hairs. Bracts ca. 2 mm long, longer than or more or less equal to pedicel, glabrous. Flowers 7-9 mm long, purple; pedicels ca. 1-2 mm long, glagrescent to thinly pubescent with minute, adpressed, white hairs. Calyx 4-5 mm long, campanulate-tubular, splitting at maturity, glabrescent to sparsely pubescent with minute black, adpressed hairs outside, oblique at mouth, tube 3 mm long, lower lobes 1-1.5 mm long, upper lobes less than 1 mm long. Standard 7-11 mm long, longer than wing and keel petals, narrowly obovate, retuse at apex, claw not distinct; wing petals 6-10 mm long, equal to keel petals, lamina oblong, obtuse and, slightly curved towards apex, claw ca. 4 mm long. Vexillary filament ca. 7 mm long; staminal sheath ca. 6 mm long, truncate at apex, upper free filaments 1.5-2 mm long. Ovary ca. 3 mm long, hairy, subsessile; style ca. 4 mm long; stigma capitate, glabrous. Pods 7-9 x 3-4 mm, oblong, partially tinged with purple colour, sessile to subsessile (stipe less than or ca. 1 mm long), turgid, unilocular, thinly or sometimes moderately pubescent with minute, completely adpressed, generally black or sometimes gray (dirty white) or brownish hairs. Seeds 1.5 x1 mm, suborbicular reniform, turgid, yellowish or blackish-brown, smooth.

Lectotype: India, Sikkim, Lachen, Samdong, 7,000-9,000 ft., *J. D. Hooker s. n.* (P; iso: G, K!, P). Syntypes**:** Kumaon, 9,000 ft., *R. Strachey & J. E. Winterbottom* s. n. [type of *A. inconspicuus* Baker].

Distribution: India (Sikkim, Uttaranchal). Fig. 1.

Phenology: July - August (- October).

Habitat: Occasional on open hill slopes in sandy moist soil along roadsides.

Notes: In addition to its occurrence in India, Baker (1876) and Sanjappa (1992) have recorded this species from Nepal and Bhutan respectively. However, in some recent works this species has not been reported from Nepal (Press et al., 2000) and Bhutan (Grierson and Long, 1987). In consistence

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with the present investigation, Ali (1961) has also reported this species only from India.

A. tenuicaulis is very closed to *A. sikkimensis* Benth. ex Bunge, but differs by stems very slender, calyx glabrescent to sparsely pubescent with minute, black, adpressed hairs, teeth shorter (1-1.5 mm long), corolla deep purple and pods sessile to subsessile and sparsely pubescent with minute, black, adpressed hairs (Chaudhary and Khan, 2005c). However, in Kumar and Sane's work (2003) this species has been treated as synonym under *A. sikkimensis*.

Specimens examined: Sikkim, North Sikkim: Choongtong, 5,000 ft., 28 July1892, *G. A. Gammie 299* (CAL: photo LWG, CAL – student herb: photo LWG); Zema to Log-bridge, 2 October 1997, *P. Singh & S. S. Das 19906* (BSHC); Lachen, towards Thangu near Zema, 3,000 m, 12 August 2004, *L. B. chaudhary 225060* (LWG).

11. *Astragalus trichocarpus* Grah. (in Wall., Cat. 5296. 1831-32, *nom. nud*) ex Benth. in Royle, Illust. Bot. Himal. 199. 1835; Baker in Hook. f., Fl. Brit. India 2: 121. 1876; Ali in Biologia 7: 71. 1961 & in Nasir & Ali, Fl. W. Pakistan 100: 202, f. 27 A - E. 1977; Wenninger in Mitt. Bot. Staatss. Munchen 30: 88, f. 8 d-e, 23 c, 27 d-f. 1991; Sanjappa, Legum. India 96. 1992; Kumar & Sane, Legum. South Asia: Checkl. 243. 2003. Fig. 10 & 11G

Astragalus sesbanioides Royle ex Benth. in Royle, Illust. Bot. Himal. 199. 1835.
Tragacantha trichocarpa (Benth.) O. Kuntze in Revis. Gen. 2: 948. 1891.

Perennial herbs, erect, ca. 65 cm or more high, stem furrowed, pubescent with minute, white, adpressed hairs. Stipules 1-2 mm long, free, linear to narrowly triangular, ciliate along margins. Leaves 5-10 cm long, imparipinnately compound, subsessile; leaflets 21-31, 3-9 x 2 mm, subsessile, opposite to alternate, oblong, subobtuse to obtuse with a very minute mucro at apex, thinly pubescent with minute, white, adpressed hairs below, glabrous above, midrib densely pubescent. Inflorescence 10-13 cm long, almost equal to or longer than subtending leaf, axillary, peduncled raceme; racemes many-flowered, laxed; peduncles 1.5-3 cm long, glabrescent. Bracts ca. 1.5 mm long, shorter than pedicel, linear-lanceolate, pubescent outside. Flowers ca. 10 mm long, pinkish-white or lilac; pedicels ca. 2 mm long, pubescent with brown, minute, adpressed hairs. Calyx ca. 2.5 mm long, campanulate, oblique at mouth, tube glabrescent to glabrous, lobes minute, deltoid, pubescent. Standard ca. 10 x 6 mm, equal to keel petals, orbicular, emarginate at apex, prominently veined; wing petals ca. 7 mm long, shorter than keel petals, lamina 5 x 1 mm, lanceolate, claw 2-3 mm long; keel petals ca. 10 mm long. Ovary 5 mm long, densely pubescent with white hairs, stipe ca. 3 mm long, hairy; style incurved above; stigma penicillate. Pods 7-11 x 3-4 mm (excluding stipe), oblong, turgid, densely pilose with white, half spreading hairs, bilocular, ca. 4-6 seeded, stipe ca. 4 mm long, longer than calyx, hairy. Seeds 1.5-2.5 x 1.2-1.5 mm, oblong reniform, black, subturgid, smooth, shining, glabrous.

Lectotype: India, Himalaya, Sirmore, *Govan s. n.* (K-W 5926; iso: K!).

Distribution: India (Himachal Pradesh, Uttaranchal). Fig. 1.

Phenology: April - June (- August).

Habitat: In open grassy hill slopes. Altitudes 1,500-2,700 m.

Notes: Wenninger (1991) has recorded this species only from India. He has described one another subspecies *A. trichocarpus* ssp. *pseudo-hofmeisteri* (Sirj. & Rech. f.) Wenninger from Afghanistan and Pakistan.

Specimens examined: Himachal Pradesh: Simla, Chail, 15 August 1948, *K. Ram s. n.* (DD); Simla, 6,000 ft., 17 May 1877, *Gamble 4243 B* (CAL); Simla, Armandole, 6,000 ft., 22 August 1878, *J. S. Gamble 5891C* (CAL); Simla, Mahasu, 7,000 ft., 7 June 1906, *I. H. Burkill 26824* (CAL); Simla, 17 May 1877, *W. Gamble 4243C* (CAL); Manali, 6,000 ft., *N. L. Bor s. n.* (DD); Bashahr State, Bali, 2,400 m, 11 May 1928, *R. L. Parker 2823* (DD); Kotgarh to Nirt, 24 April 1891, *J. H. Lace 811* (CAL). Uttaranchal: Raniket, 6,000 ft., April 1939, *L. J. Legge 57* (K); Jaunsar Bahar, near Kinani Pani, *J. F. Duthie 1080* (DD); Jaunsar, Chakrata, 7,000 ft., April 1891, *J. S. Gamble 22857* (CAL); Deoban range, 8,000-9,000 ft., May 1887, collector ? (CAL); Tehri-Garhwal, Tons valley, 5,000-6000 ft., 4 June 1894, *J. F. Duthie 14586* (CAL, DD); Tons valley, above Maindrath, 5,000 ft., 2 May 1899, *J. F. Duthie 22538* (CAL); near Mussoorie, 1869, *G. King s. n.* (CAL); Mussoorie, June 1894, *Robson 1* (CAL); Mussoorie range, 1869, collector ? (CAL); Mussoorie, 4 April 1896, *P. W. Macknon s. n.* (CAL); Mussoorie, 6,000-7,000 ft., June 1877, *J. F. Duthie 142* (CAL); Kolegurh, *Stoliczka s. n.* (CAL); Mussoorie-Chamba, Kaddu Khal, June 2003, *S. Singh 90972* (BSD, LWG); Mussoorie, on way to Hathi Paon, 24 April 1961, *H. O. Saxena 1866* (DD).

12. *Astragalus uttaranchalensis* Chaudhary & Khan in Taiwania 51 (1): 36, f. 1 & 2. 2006.

Description reference: Chaudhary and Khan (2006).

Distribution: India (Uttaranchal). Fig. 1.

Phenology: July - September.

Figure reference: Chaudhary and Khan (2006).

Habitat: On hill slopes. Altitudes 3,200-3,500 m.

Notes: *A. uttaranchalensis* differs from *A. maxwellii* Royle ex Benth. and *A. emodi* Steud. in having stipules triangular, inflorescence shorter than

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or more or less equal to subtending leaf, racemes with about 10-20 flowers, bracts not protruded beyond flower buds and calyx teeth very minute (Chaudhary & Khan, 2006). It also differs from *A. chlorostachys* Lindl. chiefly in hairy ovary and young pods.

Additional specimens examined: Gangotri, 3,137 m, 4 September 2006, *L. B. Chaudhary, K. K. Anand , R. Srivastava 229550* (LWG); Gangotri to Chirbasa, 3,277 m, 4 September 2006, *L. B. Chaudhary, K. K. Anand, R. Srivastava 229553* (LWG); Chirbasa to Bhojbasa, 3,314 m, 4 September 2006, *L. B. Chaudhary, K. K. Anand , R. Srivastava 229549* (LWG).

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Fig. 1. Distribution maps of *Astragalus*. ●: *A. drasianus* Chowdhery et al. Δ: *A. falconeri* var. *pilosus* (Ali) Chaudhary. ♄: *A. isabellae* Dunn. O: *A. kashmirensis* Bunge. ♠: *A. lachungensis* Chaudhary. ʘ: *A. maxwellii* Royle ex Benth. ⌂: *A. nainitalensis* Chaudhary. ■: *A. oxyodon* Baker. ♯: *A. sherriffii* Podlech. ♦: *A. tenuicaulis* Benth. ex Bunge. *: *A. trichocarpus* Grah. ex Benth. ♥: *A. uttaranchalensis* Chaudhary.

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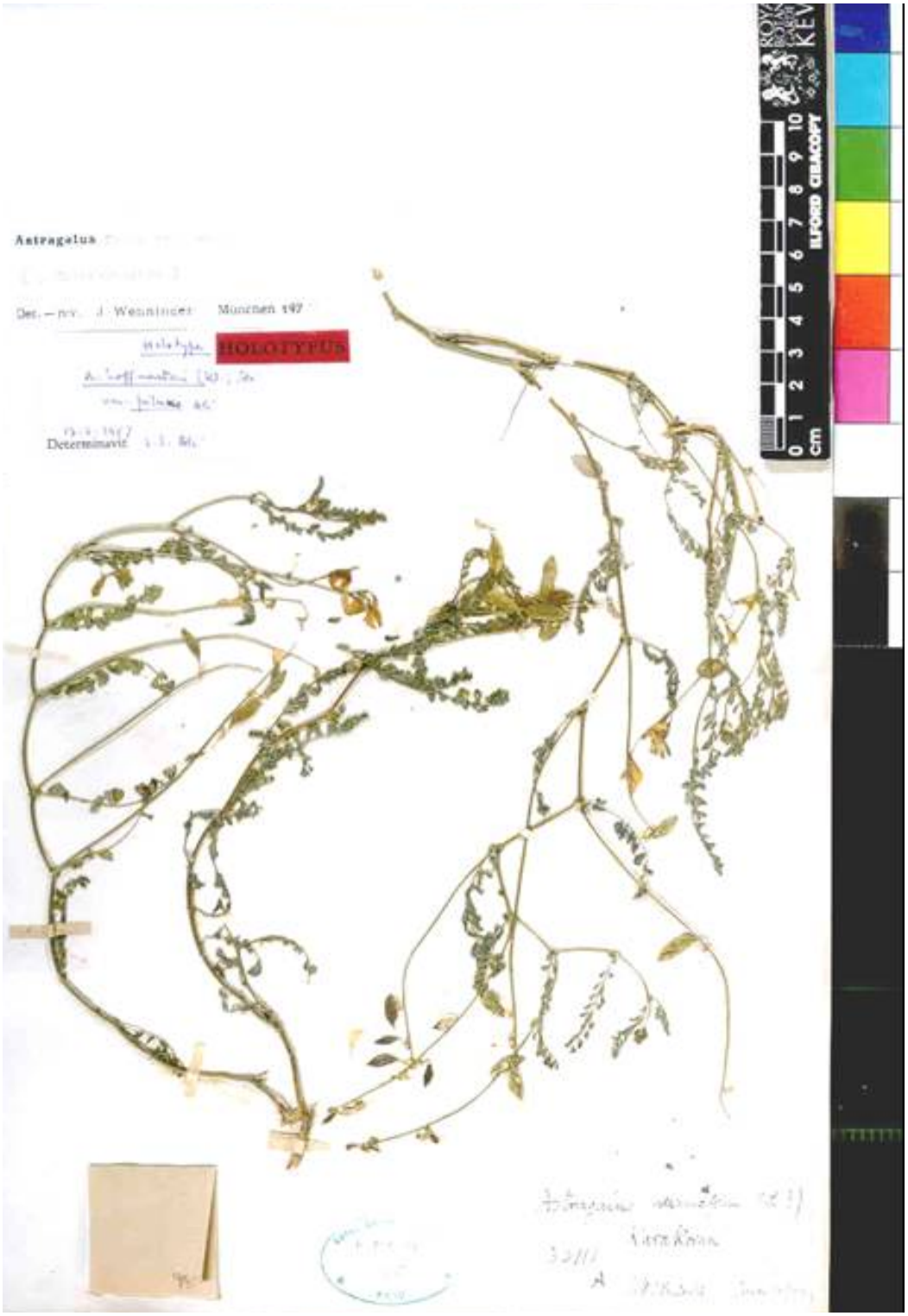


Fig. 2. *Astragalus falconeri* Bunge var. *pilosus* (Ali) Chaudhary.

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Fig. 3. *Astragalus isabellae* Dunn.

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Fig. 4. *Astragalus kashmirensis* Bunge.

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Fig. 5. *Astragalus maxwellii* Royle ex Benth.

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Fig. 6. *Astragalus nainitalensis* Chaudhary, sp. nov.

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Fig. 7. *Astragalus oxyodon* Baker.

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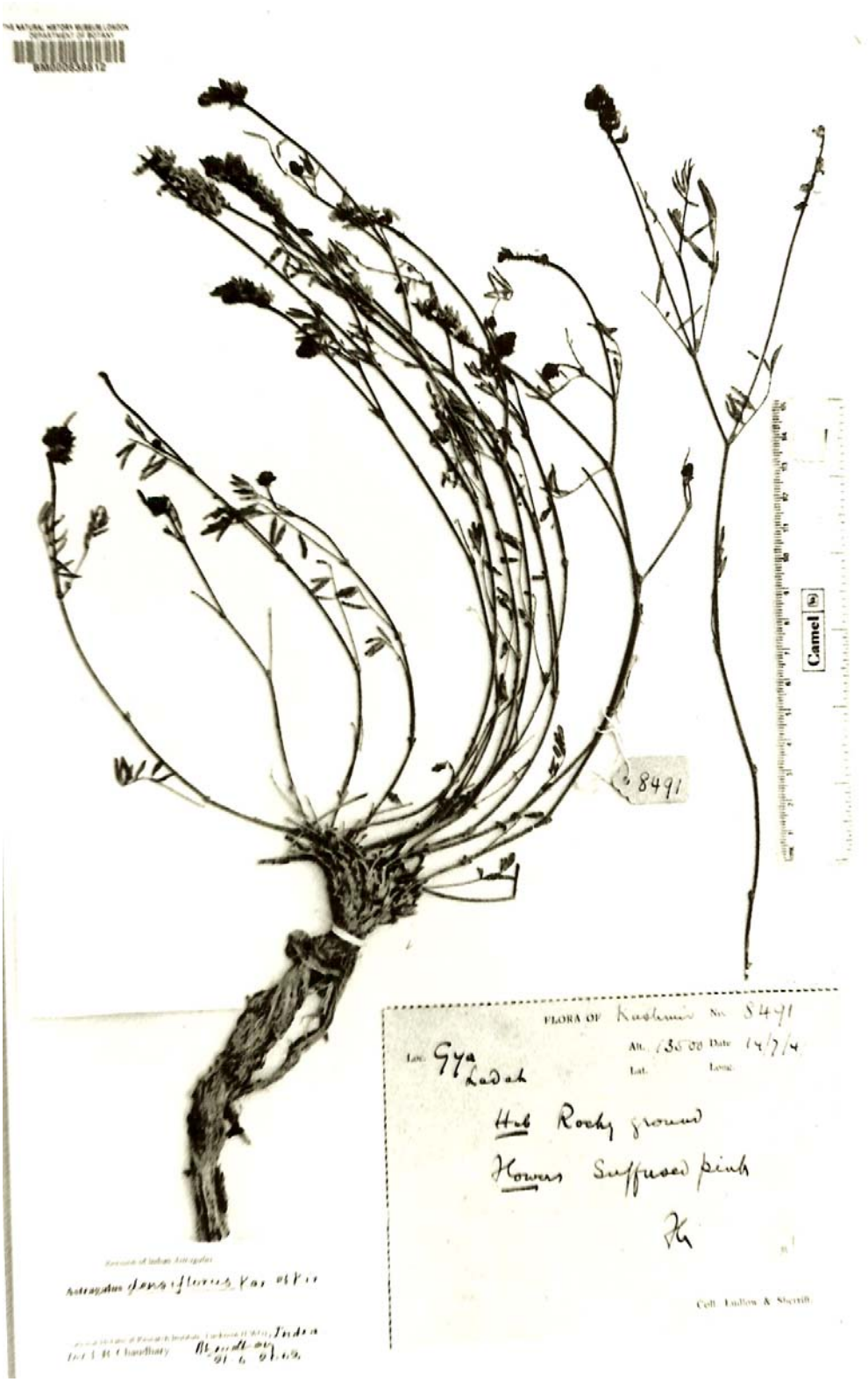


Fig. 8. *Astragalus sherriffii* Podlech.

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Fig. 9. *Astragalus tenuicaulis* Benth. ex Bunge.

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Fig. 10. *Astragalus trichocarpus* Grah. ex Benth.

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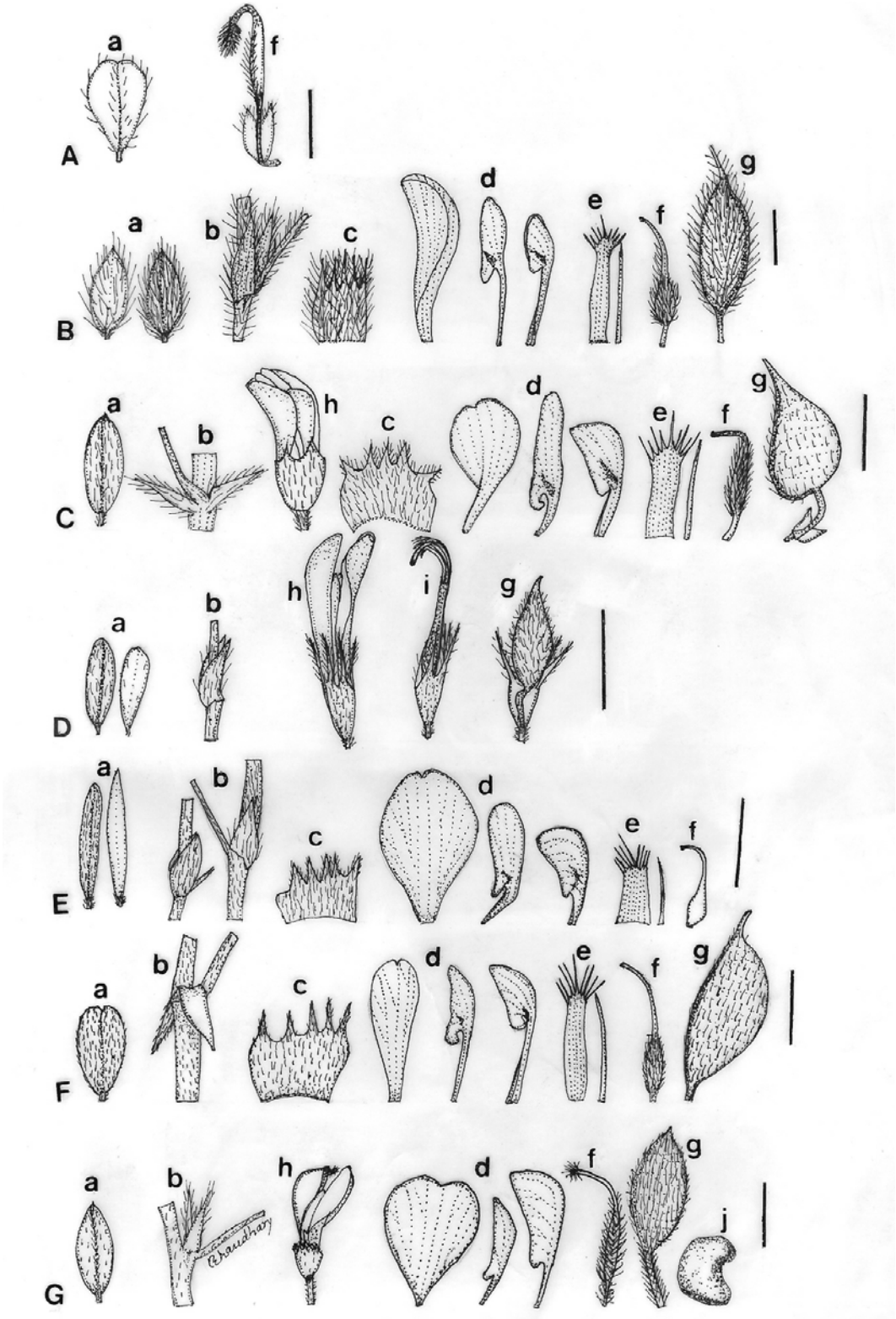


Fig. 11. A: *Astragalus falconeri* var. *pilosus* (Ali) Chaudhary. B: *A. kashmirensis* Bunge. C: *A. nainitalensis* Chaudhary. D: *A. oxyodon* Baker. E: *A. sherriffii* Podlech. F: *A. tenuicaulis* Benth. ex Bunge. G: *A. trichocarpus* Grah. ex Benth. (a. Leaflets, b. Stipules, c. Calyx, d. Petals, e. Stamens, f. Carpel, g. Pod, h. Flower, i: Flower with calyx, monadelphous closed stamens and carpel. j: Seed). Scale bar = 5 mm.

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印度產豆科紫雲英屬特有種之分類研究

Lal Babu Chaudhary[1, 2], Kumar Kamal Anand[1] and Ravi Srivastava[1]

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摘　　要

本研究針對印度產 12 個紫雲英屬(*Astragalus*)特有種提出完整的分類說明。在喜馬拉亞西北部區域總共孕育了 11 個紫雲英屬特有種，而東部喜馬拉亞區域僅在錫金發現 2 個特有種。Jammu 和 Kashmir 地區之特有種高居首位，共有 7 種。其中 5 種為 Jammu 和 Kashmir 地區所特有，有兩種分布到 Uttaranchal，另一種還分布到錫金。只有一種紫雲英(*A. tenuicaulis*)分布於東西喜馬拉亞兩個區域。其餘均明顯只分布在東部或西北部喜馬拉亞局部的範圍。除了 *Astragalus uttaranchalensis* 之外，大多數的紫雲英特有種都相當稀有。在本調查中發現最近所描述採自 Jammu 和 Kashmir 地區的新種 *A. turgidus*，和 *A. kashmirensis* 應是同一種。本文提供各個種的名稱、描述、分布、花期物候、分類註解、研究標本、分布圖和照片。本文並依據 *A. hoffmeisteri* var. *pilosus* Ali 提出新組合名 *A. falconeri* var. *pilosus* (Ali) Chaudhary。同時發表採自喜馬拉亞 Kumaon 地區的新特有種 *A. nainitalensis*。

關鍵詞：紫雲英屬、特有性、豆科、印度、新組合、新種。

1. National Botanical Research Institute, Rana Pratap Marg, Lucknow – 226 001, India.
2. Corresponding author. Email: dr_lbchaudhary@rediffmail.com

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