Taiwania, **52**(1): 25-48, 2007

Taxonomic and Distributional Notes on Some *Astragalus* L. (Fabaceae) in India

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(Manuscript received 4 August, 2006; accepted 2 November, 2006)

ABSTRACT: In this study the revised distribution records of 25 species of *Astragalus* L. in India has been provided along with correct nomenclature and taxonomic notes. In addition, the relationship, conservation status and Cibachrome photographs of the type materials for some species have also been included wherever found necessary. Based on field and herbarium studies nine species (i. e. *A. alitschuri* B. Fedtsch, *A. charguschanus* Freyn, *A. contortuplicatus* L., *A. flemingii* Ali, *A. iodotropis* Boiss. & Hohen, *A. pyrrhotrichus* Boiss., *A. subumbellatus* Klotz., *A. stocksii* Bunge, *A. zacharensis* Bunge) have been excluded, as they do not occur in the present political boundaries of India of 1971. Those species have also been discussed here which have been recently transferred from *Astragalus* to some other genera like *Ophiocarpus* (Bunge) Ikonn., *Podolotus* Benth. and *Podlechiella* Maassoumi & Kaz. Osaloo. The present investigation also reveals that about 12 species are not represented in Indian herbaria, while they have been recorded from India based on very old collections housed at different foreign herbaria. A new combination *Caragana aegacanthoides* (Parker) Chaudhary & Srivastava has been proposed based on *Astragalus aegacanthoides* Parker.

KEY WORDS: ***Astragalus*, Fabaceae, distribution, new combination, India.**

INTRODUCTION

Astragalus L. with about 2500-3000 species in the world is considered the largest and most complex genus in Angiosperm. It is distributed primarily in cold arid and semiarid mountainous regions of the Northern Hemisphere and South America. The genus is most diversified in the Irano-Turkish region of South-Western Asia, the Sino-Himalayan Plateau of South Central Asia and the Great Basin and Colorado Plateau of Western North America (Polhill, 1981; Podlech, 1986, 1998; Zarre and Podlech, 1997; Lock and Schrire, 2005).

The first systematic account of Indian *Astragalus* was presented by Baker (1876) more than 100 years ago in '*Hooker's Flora of British India*' in which he has recorded about 50 species from the present India. After the work of Baker (1876), about 70-80 species has been reported from India based on earlier reports and available collections in different herbaria (Sanjappa, 1992; Chaudhary and Rao, 2002; Kumar and Sane, 2003). In the recent years, a large number of publications have been brought out on the genus, both on regional and global basis (Gontscharov et al., 1946; Ali, 1961, 1977; Barneby, 1964; Agerer-Kirchhoff, 1976; Deml, 1972; Becht, 1978; Podlech, 1975, 1983, 1984, 1986, 1988, 1990, 1993, 1994, 1998, 1999a, 1999b, 1999c, 2001; Wenninger, 1991; Zarre and Podlech, 1994, 1997; Podlech and Xu, 2004). These publications have added several significant changes in the circumscription, nomenclature and distribution of many Indian *Astargalus*. In view of this, a taxonomic revision was carried out on the Indian *Astragalus* based on herbarium as well as field studies. About 90 species have been recorded, chiefly from the temperate to alpine zones of the Himalayas, which have the repository distribution in the cold deserts of Leh & Ladakh in Jammu & Kashmir and Lahul – Spiti in Himachal Pradesh.

The present work is a small portion of entire revision of Indian *Astragalus*. It provides comments only on those species whose distribution is either very meagre in the habitat and have been collected long back but they are not represented in the Indian herbaria or they do not occur in India or they have been shifted from *Astragalus* to some other genera. Of the total 90 species available in India, it has been observed that about 12 species namely, *A. arnoldii* Hemsl. & H. Pearson, *A. breviscapus* B. Fedtsch., *A. coluteocarpus* Boiss. ssp. *coluteocarpus*, *A. fenzelianus* E. Peter, *A. gilgitensis* Ali, *A. imitensis* Ali, *A. langtangensis* Podlech, *A. polyacanthus*

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Royle ex Benth., *A. sherriffii* Podlech, *A. tecti-mundi* Freyn ssp. *orientalis* Podlech, *A. thomsonii* Podlech and *A. yunnanensis* Franch. although reported in the previous works from India have not been observed in Indian herbaria have they neither been collected during the present investigations. These species are represented by only with a few very old collections housed at the herbaria of abroad. About 13 species have been excluded as either they do not occur in the present political boundaries of India of 1971 (e.g. *A. alitschuri* B. Fedtsch, *A. charguschanus* Freyn, *A. contortuplicatus* L., *A. flemingii* Ali, *A. iodotropis* Boiss. & Hohen, *A. pyrrhotrichus* Boiss., *A. subumbellatus* Klotz., *A. stocksii* Bunge, *A. zacharensis* Bunge) or they (*A. ophiocapus* Benth. ex Bunge, *A. hosackioides* (Royle ex Benth.) Benth. *and A. vogelii* ssp. *fatimensis* (Chiov.) Maire) have recently been transferred to other genera such as *Ophiocarpus* (Bunge) Ikonn., *Podolotus* Benth. and *Podlechiella* Maassoumi & Kaz. Osaloo. The study of *Astragalus aegacanthoides* Parker reveals that it belongs to the genus *Caragana* Lam. and therefore, a new combination *Caragana aegacanthoides* (Parker) Chaudhary & Srivastava is proposed here.

All such 25 species have been enumerated below with correct nomenclature, distribution, specimens examined and detail taxonomic notes about their occurrence in India and adjoining countries. In addition, relationship and conservation status of the species and further action to be taken for their study have also been discussed wherever found necessary. The photographs have been provided for some species for correct identification. The distribution of all the species has also been shown on the maps (Fig. 12). Based on this study we recommend that there is urgent need to relocate and recollect these species from the nature especially from the high reaches of the Himalayas to know the correct conservation status and number of *Astragalus* species in India in the present time.

TAXONOMIC TREATMENTS

1. ***Astragalus alitschuri*** B. Fedtsch. in Trudy Imp. S.- Petersburgsk. Bot. Sada 21: 317. 1903; Ali in Phyton 12: 180. 1967 & in Nasir & Ali, Fl. W. Pakistan 100: 210. 1977; Kumar & Sane, South Asia Legum.: Checkl. 222. 2003. Fig. 1

Lectotype: [Tadzhikistan] r. Alitschur, vom Tachatyr-tasch zum See Saryk, 17 July 1901, *O. A. & B. A. Fedtschenko* (LE; iso: C).

Distribution: Pakistan, Tadzhikistan (Fig. 12A).

Specimen examined: Kashmir, Ishashm, Bullahshan, Gilgit Expedition, *Giles 156* (K).

Note: This species does not occur in Indian Territory. Ali (1967) for the first time reported it from Kashmir based on single specimen *Giles 156* that probably belongs to Afghanistan/Pakistan. Later on he (Ali, 1977) recorded it from Chitral (Pakistan) and doubted its occurrence in Kashmir. Kumar & Sane (2003) have recorded it from Kashmir by citing Stewart (1972) who has recorded it based on *Giles 156*.

2. ***Astragalus arnoldii*** Hemsl. & H. Pearson in J. Linn. Soc. Bot. 35: 172. 1902; Ohba et al. in J. Jap. Bot. 70: 14, f. 1B. 1994. Fig. 2

Syntypes: Without locality, 17,500 ft., 24 June 1896, *Deasy & Pike* 810 (K!); Tibet, *Game 808* (K!); Tibet, 17,500 ft., *Thorold 12 & 37* (K!).

A. orotrephes W. W. Smith in Trans. Bot. Soc. Edinburgh 26: 178. 1913.

Holotype: ? East Himalaya, July1902, *Political Officer, Sikkim s. n.* (CAL!).

Distribution: India (Jammu & Kashmir – Ladakh), China (Tibet, Kunlun) (Fig. 12B).

Specimens examined: Jammu & Kashmir: Shakegam valley, 17,000-18,000 ft., 1 July 1926, *R. R. Clifford s. n.* (K); Ladakh, Top of Taklang Pass, 26 June 1856, collector? *1645* (BM: photo LWG).

Note: It is an interesting, less known and very rare species in the Himalayas. The species is represented in Indian herbaria by single very old collection (type of *A. orotrephes*). It has been recorded from Ladakh by Dhar and Kachroo (1983) without any taxonomic details and from W. Himalaya by Ohba et al. (1994). Chaudhary (2005) has again recorded this species from Ladakh with detail description, photograph and taxonomic notes as *A. orotrephes* W. W. Smith based on very old and unidentified collection deposited at BM. In the present investigation, the examination of type specimens revealed that *A. orotrephes* W. W. Smith is conspecific to *A. arnoldii* Hemsl. & H. Pearson.

3. ***Astragalus breviscapus*** B. Fedtsch. in Trudy Imp. St.- Petersburg 24: 234. 1905; Ali in Biologia 7: 69. 1961 & in Nasir & Ali, Fl. W. Pakistan 100: 199, f. 26 E. 1977; Sanjappa, Legum. India 85. 1992; Kumar & Sane, South Asia Legum.: Checkl. 224. 2003.

Holotype: Khr. [Mountain], Managildy to Alabugi, 6,000-7,000 ft., 4 June 1880, *A. Regel 477* (LE: photo K!).

A. oophorus Freyn in Bull. Herb. Boiss. Ser. 2, 5: 1019. 1905, *non* S. Wats, 1871.

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Distribution: India (Jammu & Kashmir – Gilgit), Pakistan, Tadzhikistan, Kirgistan, China (Fig. 12C).

Specimens examined: Jammu & Kashmir: Holshalpres Nagar, 3,100-3,250 m, 20 July 1954, *F. Schmid 1959* (BM).

Notes: It has been reported so far only from Gilgit region of Jammu & Kashmir with a few collections. In the present study, no specimens have been observed in Indian herbaria as well as in K. At K only photograph of type specimen is available. Ali (1977) has recorded this species from Kashmir and not from Pakistan. The collection of the species is needed to know the conservation status of the species especially in Indian region.

4. ***Astragalus charguschanus*** Freyn , Bull. Herb. Boiss., sér. 2, 4: 764.1905; Kumar & Sane, South Asia Legum.: Checkl. 224. 2003.

Lectotype*:* [Tadzhikistan] Pamir, in angustiis Chargush, 4,300 m, 3 September 1898, *O. Paulsen 1244* (C; iso: BRNM, LE).

A. staintonianus Ali in Candollea 17: 87. t. 13, 16. 1960; in Biologia 7: 57. 1961; in Phyton 11: 135. 1966 & in Nasir & Ali, Fl. W. Pakistan 100: 170. 1977; Sanjappa, Legum. India 94. 1992.

Holotype: Pakistan, Chitral, Khot An, 4,700 m, 12 July 1958, *J. D. A. Stainton 2874* (RAW).

Distribution: Pakistan, Afghanistan, Tadzhikistan (Fig. 12D).

Specimens examined: Kashmir: Anasarber, Pierriers, 3,900-4,900 m, 15-16 August, 1954, *F. Schmid 2265* (BM); Guzikistan borah Pass, 11,500 ft., *Giles 241*(K).

Notes: Probably this species does not occur in the present political boundaries of India. The localities from where the species has been reported now come under either Pakistan or Afghanistan. The specimens of this species from India are not available in Indian herbaria as well as in K. It differs from *A. rhizanthus* in having leaves 5-9 cm long, leaflets hairy below and glabrous above, stipules glabrous, bracts (ca. 10 mm long) quite longer than pedicle and calyx teeth (5-6 mm long) distinctly shorter than tube (9-10 mm long).

5. ***Astragalus coluteocarpus*** Boiss., Diagn. pl. or. ser. 1, 9: 65. 1849 & Fl. Or. 2: 27. 1872; Gontscharov in Komarov, Fl. U. S. S. R. 12: 32. 1946; Ali in Kew Bull. 1958: 304. 1958; in Biologia 7: 13. 1961; in Bot. Notiser 118: 87. 1965 & in Ali, Fl. W. Pakistana 100: 130. 1977; Sanjappa, Legum. India 86. 1992; Kumar & Sane, South Asia Legum.: Checkl. 225. 2003.

subsp**. *coluteocarpus***

Holotype: Afghanistan, in regno Cabulico, W. *Griffith 1064* (K: hb Hooker; iso K: (distr. No. 1515), CAL!).

Ditribution: India (Jammu & Kashmir, Himachal Pradesh), Pakistan, Afghanistan, Tadzhikistan, Ubezkistan (Fig. 12E).

Specimens examined: Jammu & Kashmir: Ladakh, Western Tibet, Dras, 11,000 ft., 1 September 1922, *R. R. Stewart 7473* (K). Himachal Pradesh: Upper Kunawar, 10,000 ft., August1852, *Thomson s.n.* (K); Kunawar, July 1844, *Munro s. n.* (K); Kunawar, 6,000-8,000 ft., *J. J. Thomson s. n.* (K).

Notes: Ali (1961, 1977) and Wenninger (1991) have reported *A. coluteocarpus* ssp. *coluteocarpus* from Jammu & Kashmir (Dras, Astor) and Himachal Pradesh (Lahul, Bushahr, upper Kunawar) in India. I have not observed any specimens of it in Indian herbaria. Some of the specimens belonging to this taxon are available at K, E, and M. All specimens of *A. coluteocarpus* available at major Indian herbaria (CAL, BSD, DD, CDRI) belong to subsp. *A. coluteocarpus* ssp. *chitralensis* Wenninger (*A. coluteocarpus* var. *galber* Ali), while Wenninger (1991) has not recorded this from India. Subspecies *coluteocarpus* differs from ssp. *chitralensis* in having leaflets pubescent on both sides while in ssp. *chitralensis* the leaflets are glabrous above and pubescent below.

6. ***Astragalus contortuplicatus*** L., Sp. Pl.: 758. 1753; Baker in Hook. f., Fl. Brit. India 2:122. 1876; Cooke, Fl. Bombay Pres. 1: 330. 1903; Ali in Biologia 7: 26. 1961 and in Nasir & Ali, Fl. W. Pakistan 100: 149, f. 17 J. 1977; Kumar & Sane, South Asia Legum.: Checkl. 226. 2003.

Syntypes: '*Astragalus acaulis*, scapo foliis breviore, leguminibus subulatis canaliculatis retortis hirsutis'. Hort. ups. 227; *Astragalus repens* siliquis undulatis'. Buxb. cent. 3. p. 22, t. 39; '*Astragalus hirsutus* procumbens, viciae foliis cordatis, siliquis incurvis'. Amm. ruth. 164; in Sibiria.

Distribution: Central Europe, Russia, Caucasus, Eastern Siberia, Central Asia, Pakistan (Punjab, Sind, Baluchistan) (Fig. 12F).

Note: The report from India is erroneous. It is a European and Siberian species, which has traveled up to the saline belt of Pakistan through migratory birds (Ali, 1977). Even Ali (1961) has doubted its occurrence in Pakistan. Cooke (1903) has reported this species from Sind (Punjab), which is now in Pakistan.

7. ***Astragalus fenzelianus*** E. Peter in Acta Horti Gothob. 12: 54. 1938; Wenninger in Mitt. Staatss. Munchen 30: 134. 1991; Kumar & Sane, South Asia Legum.: Checkl. 228. 2003.

Holotype: Tibet Or., Yeniu-schan ad lac. Kukunor, 22-23 July 1935, *Fenzel 2343* (W).

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Distribution: India (Uttaranchal ('Uttar Pradesh'), China (Fig. 12G).

Specimens examined: Eastern Himalaya: Atsa pass, 16,000-17,000ft., 27 August1924, *F. Kingdon Ward 6159* (K). Uttaranchal: North Kumaon, Martoli, 13,000 ft., January 1925, *Champion s. n.* (K).

Note: Recently Wenninger (1991) has recorded *A. fenzelianus* from India based on specimens cited above. No specimens of this species have been observed in Indian herbaria. The species is quite similar to *A. kongrensis* Benth. ex Baker which has been recently reported from Central (Nepal) and N. W. Himalayas (Uttaranchal) by Chaudhary (2006). Earlier *A. kongrensis* was known only from Eastern Himalaya and China. Also see *A. yunnanensis* Franch.

8. ***Astragalus flemingii*** Ali in Kew Bull. 1958: 311, t. 2 & 3. 1958; in Biologia 7: 56. 1961 & in Nasir & Ali, Fl. W. Pakistan 100: 168, f. 24 A – D. 1977; Podlech in Mitt. Staatss. Munchen 25: 660. 1988; Sanjappa, Legum. India 87. 1992; Kumar & Sane, South Asia Legum.: Checkl. 229. 2003. Fig. 3

Holotype: Punjab, Salt range, comm., March 1871, *J. L. Stewart 190* (K!: photo CAL!, LWG!).

A. bakuensis auct. non Bunge 1868; Baker in Hook. f., Fl. Brit. India 2: 132. 1876.

Distribution: Pakistan (Punjab), Afghanistan (Fig. 12H).

Note: Ali (1958, 1961, 1977) has treated *Astragalus flemingii* as an endemic to Punjab without mentioning the country name. From the specimens cited in his works it appears that all specimens belong to Pakistan. Except the type specimen, no other collections are available at K and Indian herbaria. However, Sanjappa (1992) has treated Punjab in India followed by Kumar and Sane (2003). Baker (1876) has also recorded this species only from Punjab. The present study based on field and herbarium study at K, CAL. DD, BSD, LWG, CDRI reveals that this species does not occur in the present political boundaries of India. Podlech (1988) has recorded the species from Pakistan and Afghanistan.

9. ***Astragalus gilgitensis*** Ali in Phyton 11: 135, f. 1 & 6. 1966 & in Nasir & Ali, Fl. W. Pakistan. 100: 183. 1977; Podlech in Mitt. Staatss. Munchen 25: 190. 1988; Sanjappa, Legum. India 88. 1992; Kumar & Sane, South Asia Legum.: Checkl. 229. 2003. Fig. 4

Holotype: Gilgit, Nomal to Naltar, 17 July1954, *R. R. Stewart 26492* (RAW; iso: K!).

Distribution: India (Jammu & Kashmir – Gilgit), Pakistan, Afghanistan (Fig. 12I).

Specimens examined: Jammu & Kashmir: Gilgit, Kattar to Nomal, 8,000 ft., 24 July 1954, *R. R. Stewart 26535* (K); Gilgit, 10,000 ft., 18 July 1954, *R. R. Stewart 26502* (K).

Notes: The species was described by Ali (1958) as an endemic to Gilgit (Jammu & Kashmir). Recently Podlech (1988) has recorded the species also from Afghanistan. *A. gilgitensis* is very close to a quite variable species *A. rhizanthus* from which it differs in having leaflets hairy on both sides and calyx teeth (9-10 mm long) more or less equal to tube. We have not observed these characters in the specimens available at Indian herbaria. Further collection of plant materials from the type locality is needed to know more about the species.

10. ***Astragalus imitensis*** Ali in Candollea 17: 90, t. 14 & 17. 1960; in Biologia 7: 79. 1961 & in Nasir & Ali, Fl. W. Pakistan 100: 211. 1977; Sanjappa, Legum. India 89. 1992; Kumar & Sane, South Asia Legum.: Checkl. 231. 2003.

Holotype: Kashmir, Imit, 2,900 m, 2-3 August 1954, *F. Schmid 2072* (G: photo K; iso: RAW)

Distribution: India (Jammu & Kashmir), Pakistan (Chitral) (Fig. 12J).

Notes: Except the Type material of *Astragalus imitensis* no other collections from India are available either at Indian herbaria or at K. Kumar and Sane (2003) have wrongly referred Srivastava et al. (1984) for the occurrence of the species in Jammu & Kashmir. Recollection of specimens form the type locality is very much needed to reconfirm the occurrence of the species in the Indian Territory.

11. ***Astragalus iodotropis*** Boiss. & Hohen. in Boiss., Diagn. pl. orient., ser. 1, 9: 100. 1849; Srivastava et al. in Indian J. Forestry 7: 335. 1984; Kumar & Sane, South Asia Legum.: Checkl. 231: 2003.

Holotype: Iran, Prov. Tehran, Asadbar, 8,000 ft., 19 July 1843, *Th. Kotschy 474* (G-BOIS; iso: G, K!).

Distribution: Northern Iran- Endemic (Fig. 12K).

Note: It occurs only in Norhtern Iran and the report from India by Srivastava et al. (1984) is erroneous. He has recorded this species without description and other taxonomic details from Ladakh.

12. ***Astragalus langtangensis*** Podlech in Sendtnera 6: 136. 1999; Kumar & Sane, South Asia Legum.: Checkl. 233. 2003. Fig. 5

Holotype: Nepal, Langtang valley, 13,000 ft., 24 June 1965, *Achilling, Sayers & Bista 380* (K!).

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Distribution: India (Uttaranchal - Kumaon), Nepal (Fig. 12L).

Notes: Recently this species was described by Podlech (1999a) under the section *Aegacantha* from Nepal and India. He has included two specimens (Uttaranchal ('Uttar Pradesh'), Kumaon: Almora, near Rilkote, Upper Johar, 11,500-12,000 ft., 5 October 1950, *Awasthi 1842* (M) and Jola, 3,500 m, *Strachey & Wnterbottom* (P)) from India. We could not notice any specimen matching with this species at Indian herbaria. Further collection of the species is needed to know the conservation status of the species. This species seems to be close to *A. zanskarensis* Benth. ex Bunge.

13. ***Astragalus polyacanthus*** Royle ex Benth. in Royle, Illust. Bot. Himal. 199. 1835; Baker in Hook. f., Fl. Brit. India 2: 134. 1876 *pro parte*; Parker, For. Fl. Punjab 142. 1924; Ali in Biologia 7: 68. 1961 & in Nasir & Ali, Fl. W. Pakistan 100: 193. 1977; Deml in Boissiera 21: 142. 1972; Sanjappa, Legum. India 93. 1992; Kumar & Sane, South Asia Legum.: Checkl. 237. 2003. Fig. 6

Lectotype: India, Soognum in Kunawar, *J.F. Royle s. n.* (LIV; iso: K!).

A. daltonianus Bunge in Mem. Acad. Sci. St.-Pet. ser. 7. 11: 44. 1868 & 12: 69. 1869.
A. scariosus Benth. ex Bunge. in Mem. Acad. Sci. St.-Pet. ser. 7. 11: 44. 1868 & 12: 71. 1869.
A. tenuispinus Bunge in Mem. Acad. Sci. St.-Pet. ser. 7. 11: 44. 1868 & 2: 70. 1869.

Distribution: India (Jammu & Kashmir, Himachal Pradesh), Nepal, Afghanistan (Fig. 12M).

Specimen examined: Jammu & Kashmir: Dras, 30 March 1922, *R. R. Stewart 7402* (K). Himachal Pradesh: Kunawar, 1835, *Royle s. n.* (K).

Notes: Baker (1876) has mixed up at least 4 species (i. e. *A. psilocentrus*, *A. cicerifolium*, *A. grahamianus*, *A. multiceps*) under *A. polycanthus*. It is represented in India by only 1 or 2 specimens housed at K. Probably it does not occur in Pakistan (Ali, 1961 & 1977). Further collection of specimens is necessary to know the conservation status of the species. However, the available data suggest that the species is very rare at least in Indian region.

14. ***Astragalus pyrrhotrichus*** Boiss., Diagn. Pl. Or. Nov. ser. 1(9): 73. 1849 & Fl. Or. 2 133. 1872; Baker in Hook. f., Fl. Brit. India 2:133. 1876; Blatter, Beautf. Fl. Kashmir 92. 1928; Ali in Biologia 7: 53. 1961 & in Nasir & Ali, Fl. W. Pakistan 100: 168. 1977; Podlech in Mitt. Bot. Staatss. Munchen 25: 451. 1988; Sanjappa, Legum. India 93. 1992; Kumar & Sane, South Asia Legum.: Checkl. 238. 2003. Fig. 7

Holotype: in regno Cabulico, *W. Griffith* in hb. *Hooker 1066* = journ. no. 84 (K: hb. Hooker!).

Distribution: Pakistan, Afghanistan (Fig. 12N).

Notes: Most probably this species does not occur in the present political boundaries of India. However, Ali (1961, 1977) has reported this species from India (Punjab) based on the specimen 'Punjab (Flora Pentapotamica), Gurdaspur Dist., Sunderchahri, February 1880, *J. R. Drumond 891* (K)', which occurrence seems doubtful in India. Podlech (1988) has correctly included this specimen under Pakistan and recorded this species only from Pakistan and Afghanistan. Except this, no other collections from India are available at K and Indian herbaria. Some more specimens from Punjab are available at K, but all belong to Pakistan.

15. ***Astragalus sherriffii*** Podlech in Sendtnera 7: 190. 2001; Kumar & Sane, South Asia Legum.: Checkl. 240. 2003.

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

Distribution: India (Jammu & Kashmir) – Endemic (Fig. 12O).

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

Notes: Recently *A. sherriffii* was described by Podlech (2001) based on single collection of holotype. We also observed same specimen at BM and initially identified as *A. densiflorus* Kar. & Kir. Kumar and Sane (2003) have mentioned that according to Podlech (world authority on *Astragalus*) the occurrence of *A. densiflorus* in South Asia has been misinterpreted. The true *A. densiflorus* occurs only in kazakhstan, Kirgiztan and China. Podlech (1999a) has also segregated one another species *A. thomsonii* Podlech from *A. densiflorus*. The distinction between *A. thomsonii* and *A. sherriffii* is very meagre, however, they have been placed in different sections. The collection and study on more plants are highly required to ascertain the correct identity of these species. Also see *A. thomsonii*.

16. ***Astragalus subumbellatus*** Klotz. in Klotz. & Garcke, Bot. Ergebn. Reise Wad. 159, t. 3. 1862; Baker in Hook. f., Fl. Brit. India 2:119. 1876, *pp*; Ali in Kew Bull. 1958: 305. 1958; in Biologia 7: 17. 1961 and in Nasir & Ali, Fl. W. Pakistan 100: 132. 1977.

Iconotype: Tafel 3, Bot. Ergeb. Waldem. Reise in connection with the fragment in P: hb. Bunge) Type: Himalaya, *Hoffmeister* (B, destroyed; Fragm: P).

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Distribution: Pakistan, Afghanistan (Fig. 12P).

Note: Most probably *A. subumbellatus* does not belong to India. It is very close *to A. scorpiurus* Bunge and differentiated chiefly based on number of ovules in each ovary (Ali, 1958). In *A. subumlellatus* the number of ovules varies from 6 - 8 while in *A. scorpiurus* 12 - 24. Based on this character all Indian specimens housed at CAL, LWG, DD, BSD, BM come under A. *scorpiurus.* Baker (1876) has treated them conspecific. Surprisingly, Ali (1961, 1977) has not recorded these species from India and he has mentioned that Baker's (1876) *A. subumbellatus* is different from *A. subumbellatus* Klotz. However, Sanjappa (1992) has recorded both species from India. Further studies on a large number of specimens are required to assess these species from India.

17. ***Astragalus stocksii*** Bunge in Mém. Acad. Imp. Sci. Saint Pétersbourg 11 (16): 6. 1868 & l.c. 15 (1): 4. 1869; Cooke, Fl. Bombay Pres. 1: 330. 1903; Ali in Biologia 7: 72. 1961 & in Nasir & Ali, Fl. W. Pakistan 100: 203, f. 27 K - Q. 1977; Kumar & Sane, South Asia Legum.: Checkl. 241. 2003.

Lectotype: Beludschistan, *J. E. Stocks 723* (K!; iso: G-BOIS, P: fragm.)

Distribution: Pakistan, Afghanistan, Iran (Fig. 12Q).

Note: The report from India (Punjab) by Kumar and Sane (2003) is erroneous. Cooke (1903) recorded this species from Sind, which now falls under the political boundary of Pakistan.

18. ***Astragalus tecti-mundi*** Freyn ssp. ***orientalis*** Podlech in Sendtnera 7: 178. 2001; Kumar & Sane, South Asia Legum.: Checkl. 242. 2003. Fig. 8

Holotype: Pakistan, Hunza- and Nagar-Gebiet, Daintar, 3,300-3,900 m, 1959, *F. Lobbichler 115* (M; iso: MSB).

Distribution: India (Jammu & Kashmir, Himachal Prasesh, Punjab), Pakistan, China (Fig. 12R).

Specimens examined: Punjab: Hoshiarpur, June, 1881, *Duthie 148* (K); N. W. India, *Strachey & Winterbottom 1842* (K). Himachal Pradesh: Lahul, September1869, Coll.? *s. n.* (K); Lahul, Rangcha Galli, 14,500 ft., 8 July 1941, *N. L. Bor 14500* (K); Kulu-Lahual, near Pasparag, 6 July 1888, *Drummond 23484* (K) . Jammu & Kashmir: Karakoram range, Shallihuru maraine,13,000 ft., *W.M.Conway 135* (K); Rungdum, 4 km NW of Zuildo, 4,130 m, 1980, *Southampton University 145* (K); Khardung La above Leh, *Heyde s. n.* (K); Zanskar, NW of Pensi-la, 3,650-4,270 m, *Stolizka s. n.* (K); Zanskar, Suru-Siriwang, 1 September 1912, *R. R. Stewart 290* (K); Baltistan, Astor Dist., Ahane Rama, 3,360 m, 5 July 1946, *R. R. Stewart 22906* (K).

Notes: Recently Podlech (2001) has described this subspecies based on several collections made from Jammu & Kashmir (Gilgit, Baltistan, Ladakh, Zanskar) and Himachal Pradesh (Lahul). He has differentiated *A. tecti-mundi* ssp. *orientalis* from *A. tecti-mundi* ssp. *tecti-mindi* by leaves 5-7 pairs (vs. 4-5 pairs) and the lower leaflets sparsely to loosely appressed to subappressed pilose below (vs. glabrous or subglabrous). Since these characters have been found variable and these two subspecies are connected with intermediate forms, all specimens available at Indian herbaria have been identified as *A. tectri-mundi* ssp. *tecti-mundi*, at least for the time being. The more number of specimens and study of species in the fields are required to decide the correct status of these two subspecies.

19. ***Astragalus thomsonii*** Podlech in Sendtnera 6: 140. 1999; Kumar & Sane, South Asia Legum.: Checkl. 242. 2003. Fig. 9

Holotype: Tibet occ., reg. alpina, 12-15,000 ft., *T. Thomson s. n.* (sub *A. densifloro*) (MSB; iso: K!, M, W).

Distribution: India (Jammu & Kashmir, Himachal Pradesh), Tibet (Fig. 12S).

Specimens examined: Jammu & Kashmir: Ladakh, Sassr, near border of Nubra, 1852, *Thomson s. n.* (K); Tibet Occ., Sassar pass, 15,000 ft., 13 August 1848, *Thomso s. n.* (K); Zanskar, 12,000 ft., 28 June 1848, *Thomson s. n.* (K); Zanskar, 14,000 ft., 1852, *Thomsons. n.* (K). Himachal Pradesh: Lahul, *Jaeschke 39* of 2 nd collection (K).

Note: Recently Podlech (1999a) has described *A. thomsonii* based on above specimens made from Ladakh and Zanskar (Jammu & Kashmir) and Lahul (Himachal Pradesh). These specimens had been identified as *A. densiflorus* Kar. & Kir. by Baker (1876) and Ali (1961, 1977). According to Podlech (see Kumar and Sane, 2003) the original *A. densiflorus* does not belong to South Asia. *A. thomsonii* comes very closed to *A. sherriffii* Podlech. The collections identified as *A. densiflorus* at Indian herbaria match with *A. thomsonii*. Also see *A. sherriffii*.

20. ***Astragalus yunnanensis*** Franch., Pl. Delav. 162. 1889; Wenninger in Mitt. Staatss. Munchen 30:146. 1991; Kumar & Sane, South Asia Legum.: Checkl. 244. 2003.

Lectotype: Yunnan, mt. Li-kiang, 4,000 m, 9 July 1884, *P. J. M. Delava s. n.* (P; iso: K!, MSB, P).

Distribution: India (Uttaranchal), Nepal, China (Fig. 12T).

Specimens examined: Uttaranchal: Kumaon, Nipchang valley, Darma, 4,365 m, 31 August 1888, *Duthie 2814* (K).

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Notes: Wenninger (1991) for the first time recorded this species from India (Uttaranchal - Kumaon) in the section *Skythropos* Simpson. He (Wenninger, 1991) has also recorded one another species *A. fenzelianus* E. Peter from Kumaon in the same section. *A. yunnanensis* and *A. fenzelianus* are very close to *A. kongrensis* Benth. ex Baker which was single representative in the section *Skythropos* from India (Sikkim). Recently Chaudhary (2006) observed *A. kongrensis* variable and for the first time reported it from Nepal and Uttaranchal in India from the same regions from where Wenninger (1991) has recorded *A. yunnanensis* and *A. fenzelianus*. The further collection of more materials and study on these species are needed to establish the relationship between them.

21. ***Astragalus zacharensis*** Bunge in Mém. Acad. Imp. Sci. Saint Pétersbourg 11 (16): 23. 1868 & l.c. 15 (1): 67. 1869; Stewart, Fl. W. Pakistan 398. 1972.

Isotype: *Mongolia chinensis*, 1850, *Turczaninov s. n.* (K!, OXF, P).

Phaca brachycarpa Turcz. in Bull. Soc. Imp. Naturalistes Moscou 5: 185. 1868.

Distribution: China (Fig. 12U).

Specimens examined: Only Isotype specimen has been studied.

Notes: This species is only known by its type specimen housed at K. Stewart (1972) has recorded this species from Nubra Valley (Clifford). However, there is no representation of this species from Nubra valley in India. Except Stewart's work (1972), this species has not appeared in any subsequent publications (Ali, 1977; Sanjappa, 1992; Chaudhary and Rao, 2002; Kumar and Sane, 2003).

22. ***Caragana aegacanthoides*** (Parker) Chaudhary & Srivastava, *com. nov. Astragalus aegacanthoides* Parker in Indian For. 1923: 78, t. 5. 1923; Osmaston, For. Fl. Kumaun 158. 1927; Ali in Biologia 7 (1 & 2): 61. 1961; Sanjappa, Legum. India 84. 1992; Kumar & Sane, South Asia Legum.: Checkl. 221. 2003. Fig. 10

Lectotype: India, N. Kumaon, Byans, Kali valley, 11,000 – 15,000 ft., 27 May 1913, *Lyall s. n.* (K!; iso: DD).

Distribution: India (Uttaranchal – Kumaon), S. Tibet (Fig. 12V).

Specimens examined: Uttaranchal: Kumaon: Almora, Nabi, in open forest of Blue pines forming tuft, 30 cm tall, 3,150 m,13 july 1923, *Parker 2089* (K); between Garbyang and Nabi, 3,150 m, 15 July 1927, *Parker 2087*(K); Nipchang valley, 11,000-14,000 ft., 31 August 1884, *Duthie 2806* (K).

Note: Kumar and Sane (2003) by referring their personal communication with D. Podlech have mentioned that *Astragalus aegacanthoides* belongs to *Caragana*. One of us (SKS) examined the type specimen at K and confirmed the statement of Kumar and Sane (2003). Based on our observations a new combination has been proposed. Earlier this species was treated as an endemic to India (Sanjappa, 1992), however, it also occurs in China (S. Tibet) as also observed by Ali (1961). Except the type specimen at DD, this species is not represented in any Indian herbaria and further collection is required to know the correct status of the species.

23. ***Ophiocarpus aitchisonii*** (Baker) Podlech in Sendtnera 2: 162 . 1994; Kumar & Sane, South Asia Legum.: Checkl. 252. 2003.

Astragalus ophiocarpus Benth. ex Bunge in Mem. Acad. Sci. St.-Pet. ser. 7, 11: 10. 1868 & 12: 6. 1869; Boissier, Fl. Or. 2: 224. 1872; Baker in Hook. f., Fl. Brit. India 2: 122. 1876; Gontscharov & Popv in Komarov, Fl. U. R. S. S. 12: 285. 1946; Ali in Biologia 7: 30. 1961 & in Nasir & Ali, Fl. W. Pakistan 100: 153. 1977; Sanjappa, Legum. India 92. 1992.
A. aitchisonii Baker in Hook. f., Fl. Brit. India 2: 121. 1876.

Type: Pakistan, Rawal Pindee plants, R. P. & Hussod, 8 April 1871, 24 April 1871, *J. E. Aitchison 381* & *1041* (CAL!).

Distribution: India (Jammu & Kashmir, Punjab), Pakistan, Northern Eurasia, West Asia (Fig. 12W).

Specimen examined: Punjab: Muktesar, 17. 3. 1966, *N. C. Nair 36527* (BSD).

Note: Podlech (1994) has segregated *Astragalus ophiocarpus* from *Astragalus* and placed under the monotypic genus *Ophiocarpus* (Bunge) Ikonn. However, Kazempour Osaloo et al. (2003) based on molecular data find this species to be well supported within *Astragalus.*

24. ***Podolotus hosackioides*** Royle ex Benth. in Royle, Illust. Bot. Himal. 198. 1835; Rechinger, Fl. Iranica 157: 346. 1984; Kumar & Sane, South Asia Legum.: Checkl. 293. 2003. Fig. 11

Holotype: Mussoorie, *Royle s. n.* (K!)

Astragalus hosackioides (Royle ex Benth.), Benth. in Benth. & Hook. f., Gen. Pl. 1: 507. 1865; Baker in Hook. f., Fl. Brit. India 2: 123. 1876; Ali in Kew Bull. 1958: 378. 1958; in Biologia 7: 21. 1961 & in Nasir & Ali, Fl. W. Pakistan 100: 185, f. 17 E. 1977; Sanjappa, Legum. India 89. 1992.
Kerstania nuristanica Rech. f. in Biol. Skr. Dan. Vid. Selsk. 9 (3): 19. 1957.

Distribution: India (Jammu & Kashmir, Himachal Pradesh, Uttaranchal), Pakistan, Afghanistan, Iran (Fig. 12X).

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Specimens examined: Uttaranchal: Kumaon, Nainatal, 7,000 ft. February1900, *Strachey* & *Winterbottom s. n.* (K). Himachal Pradesh: Shimla, Shah, 8,000 ft., 12 September 1886, *Collett 157* (K). Jammu & Kashmir: Kumhani valley, Kheltangi, 8 May 1894, *Harsukh 14982* (K).

Notes: Recently *A. hosackioides* has been reshifted to *Podolotus*. The specimens of this species are not available in Indian herbaria. Collection of the specimens is highly required for further investigation and to know the conservation status of the species.

25. ***Podlechiella vogelii*** (webb) Maassoumi & Kaz. ssp. ***fatimensis*** (Chiov.) Maassoumi & Kaz. Osaloo in Plant Syst. Evol. 242: 22. 2003.

Astragalus fatmensis Chiov. in Annuario Reale Ist. Bot. Roma 8: 95. 1903.
A. vogelii (Webb) Maassoumi & Kaz. Osaloo ssp. *fatimensis* (Chiov.) Maire in Mém. Soc. Hist. Nat. Afr. Nord 3: 126. 1933; Kumar & Sane, South Asia Legum.: Checkl. 244. 2003.

Lectotype: Arabia, El Gidon, January 1825, *C. G. Ehrenberg s. n.* (P; iso: BR, C, K!, L, LE, MSB, P).

A. arabicus auct. non Kotschy, 1866; Bunge in Mém. Acad. Imp. Sci. Saint Pétersbourg 11 (16): 9. 1868 & l.c. 15 (1): 6. 1869.
A. prolixus auct. non Sieb. ex Bunge, 1868; Baker in Hook. f., Fl. Brit. India 2: 121. 1876; Cooke, Fl. Pres. Bombay 1: 329. 1903.
A. fatmensis Hochst. ex Blatter in Rec. Bot. Surv. India 8 (1): 156. 1921; Ali in Biologia 7: 79. 1961 & in Nasir & Ali, Fl. W. Pakistan 100: 209. 1977; Sanjappa, Legum. India 87. 1992.

Distribution: India (Punjab), Pakistan, Arabia, Eritrea, Ethiopia.

Specimens examined: Punjab: Without locality, 1,000 ft., *T. Thomson s. n.* (BM: photo LWG).

Note: Recently Kazempour Osaloo et al. (2003) have excluded *Astragalus vogelii* from *Astragalus* and placed it in a new genus *Podlechiella* Maassoumi & Kaz. Osaloo based on molecular characters. It is considered a very rare species (Cooke, 1903). The species is not represented in Indian herbaria. Only one very old collection from Punjab housed at BM has been examined here. Ali (1961) recorded it from Punjab (Ludhiana) based on *Drumond*'s collections deposited at K. In recent time, the species has not been collected from Indian region. There is no record of occurrence of the species from Gujarat and Rajasthan.

ACKNOWLEDGEMENTS

The senior author is grateful to the Director, National Botanical Research Institute, Lucknow for providing facilities and Department of Science and Technology, Government of India, New Delhi for the financial support (SP/SO/A-74/98). One of us (SKS) is thankful to the Keeper of the Herbarium, Royal Botanic Gardens, Kew (K) for the herbarium and library facilities. Thanks are also due to the directors and curators of the following herbaria for allowing the opportunity to study and loaning the specimens for executing this work from time to time: BM, BSD, BSHC, CAL, CDRI, DD, LBG and P. Mr. Kumar Kamal Anand is acknowledged for providing assistance in computer work.

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Fig. 1. *Astragalus alitschuri* B. Fedtsch.

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Fig. 2. *Astragalus arnoldii* Hemsl. & Pearson.

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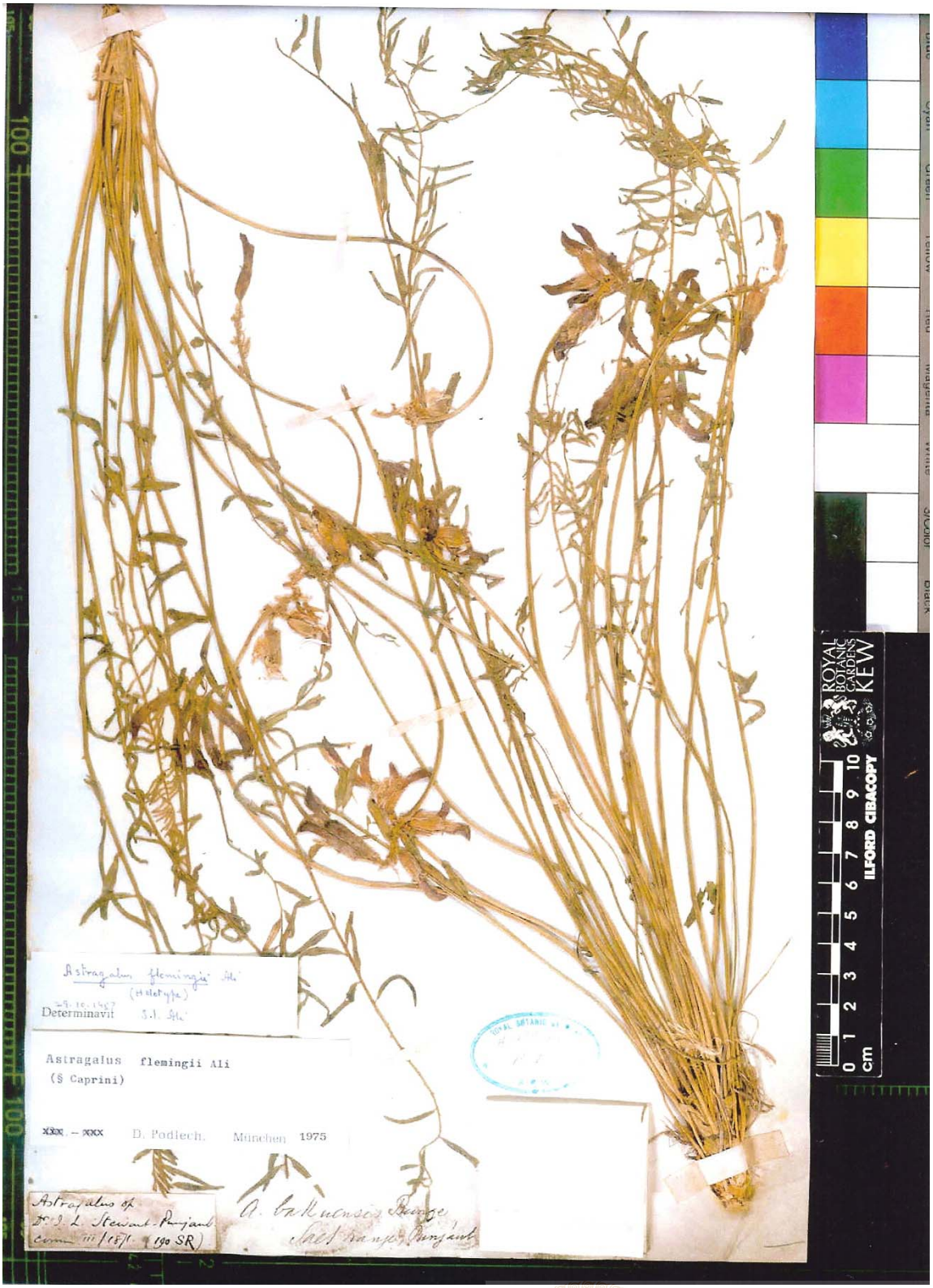


Fig. 3. *Astragalus flemingii* Ali.

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Fig. 4. *Astragalus gilgitensis* Ali.

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Fig. 5. *Astragalus langtangensis* Podlech.

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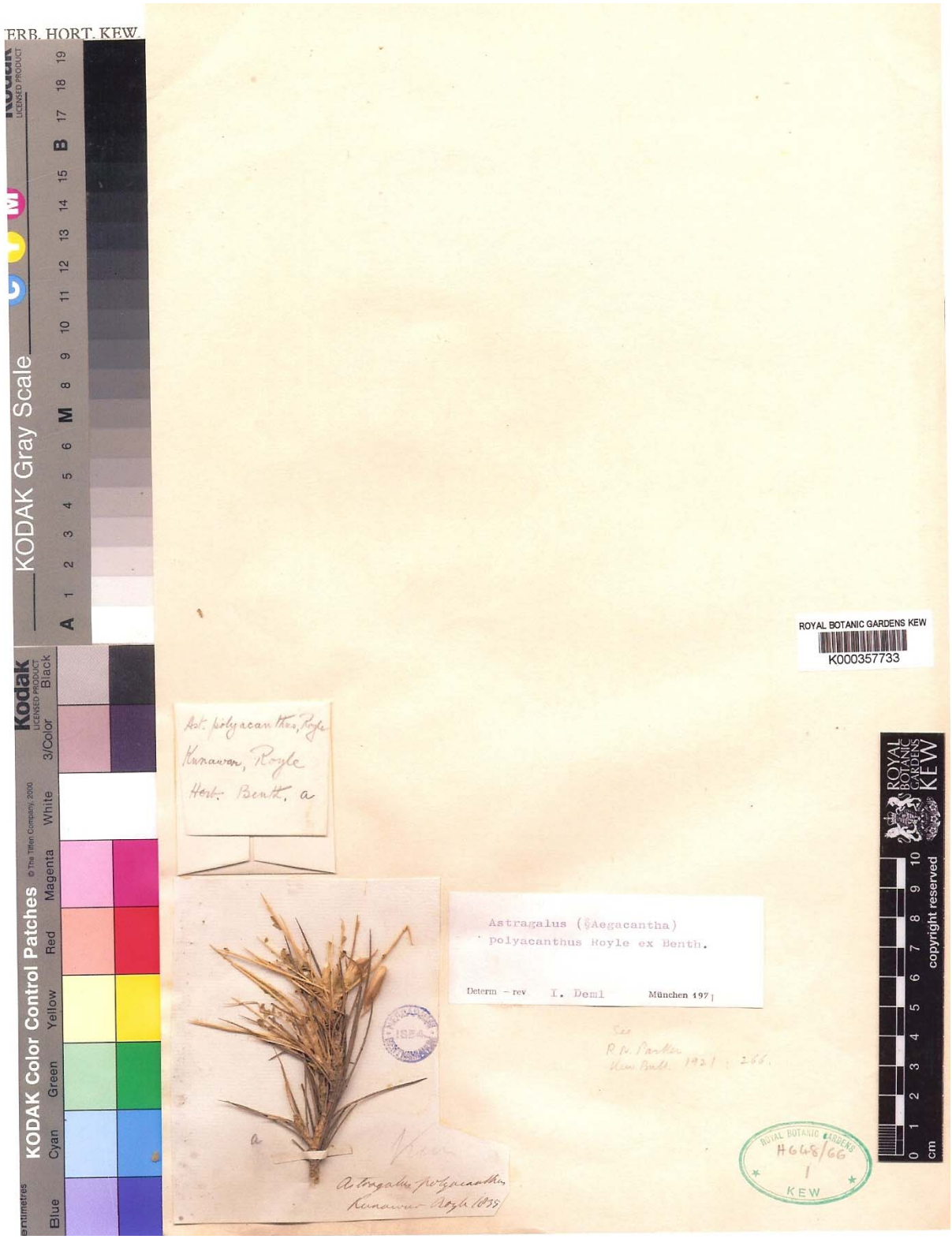


Fig. 6. *Astragalus polycanthus* Royle ex Benth.

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Fig. 7. *Astragalus pyrrhotrichus* Boiss.

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Fig. 8. *Astragalus tecti-mundi* Freyn ssp. orientalis Podlech.

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Fig. 9. *Astragalus thomsonii* Podlech.

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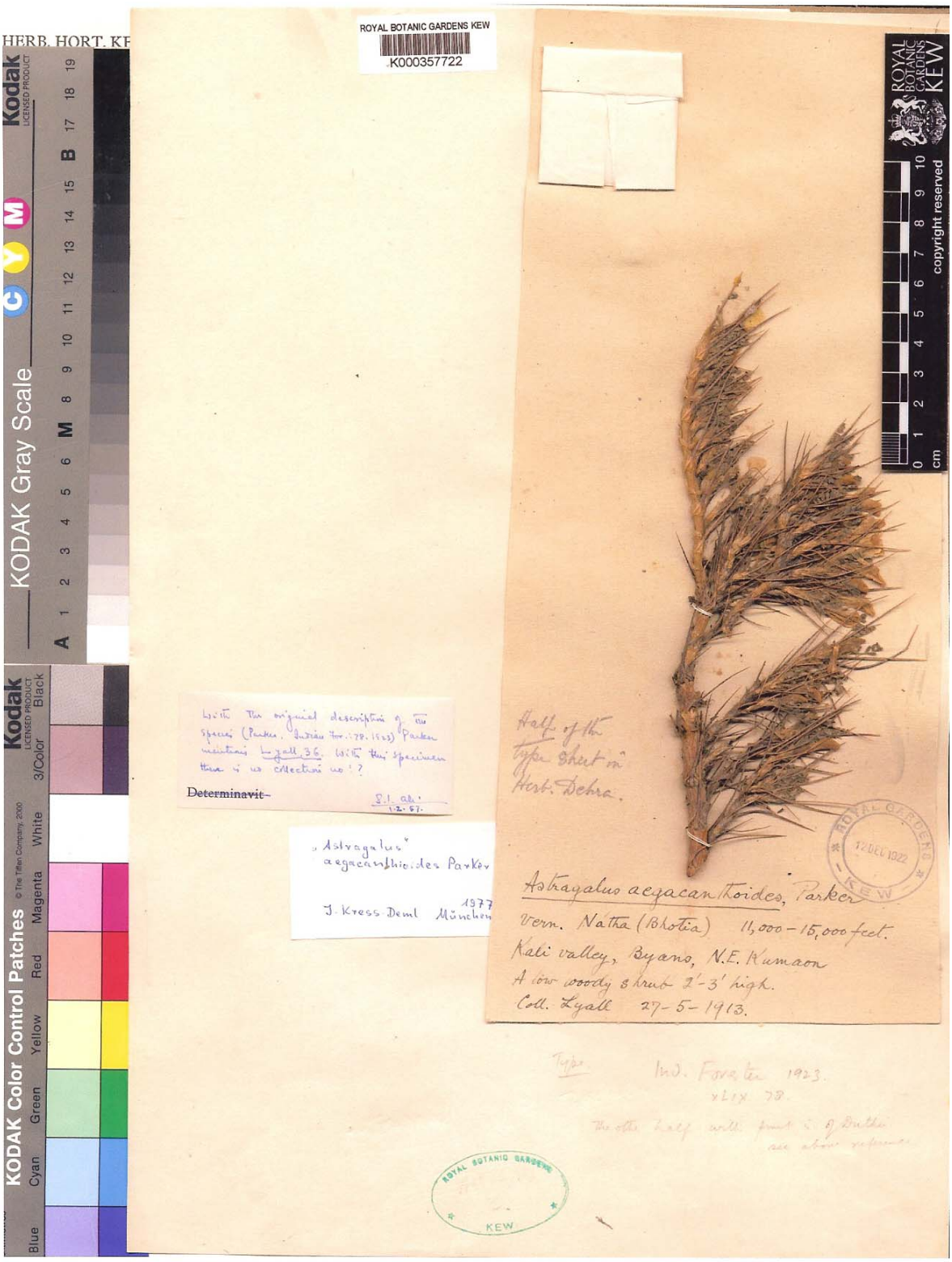


Fig. 10. *Caragana aegacanthoides* (Parker) Chaudhary & Srivastava.

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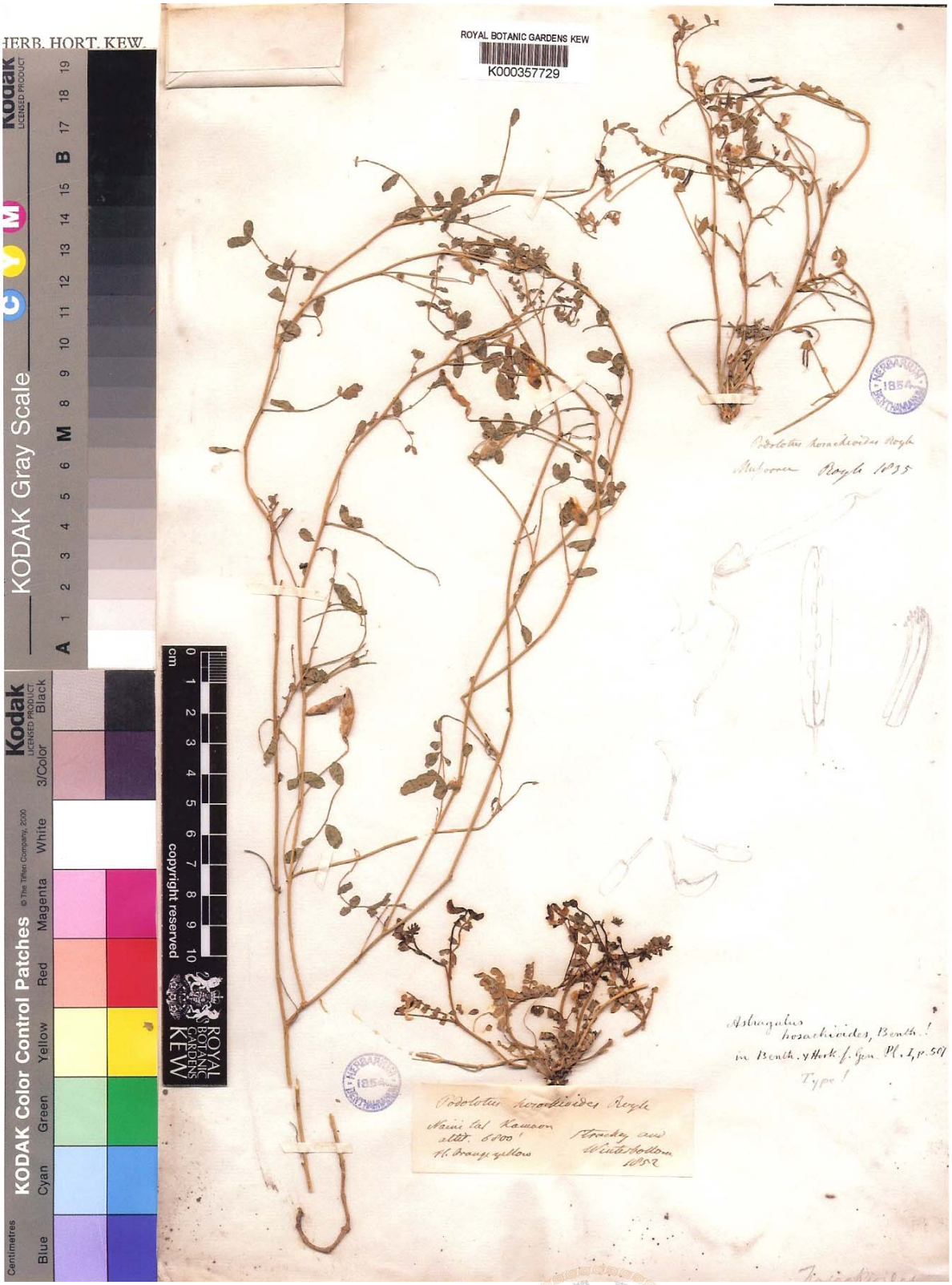


Fig. 11. *Podolotus hosackioides* Royle ex Benth.

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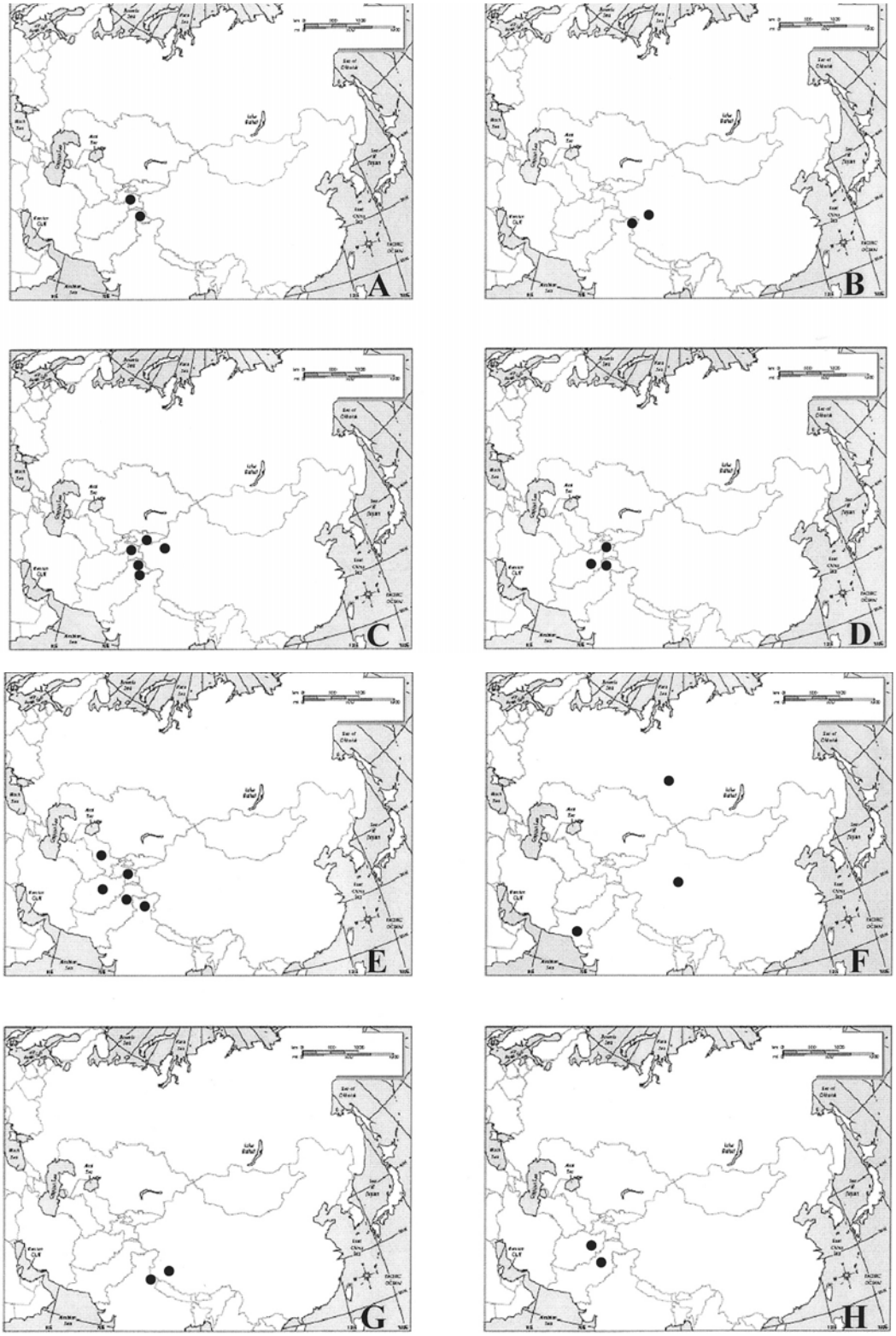


Fig. 12. Distribution maps. A: *Astragalus alitschuri* B. Fedtsch. B: *A. arnoldii* Hemsl. & Pearson. C: *A. breviscapus* B. Fedtsch. D: *A. charguschanus* Freyn. E: *A. coluteocarpus* Boiss. ssp. *coluteocarpus*. F: *A. contortuplicatus* L. G: *A. fenzelianus* E. Peter. H: *A. flemingii* Ali.

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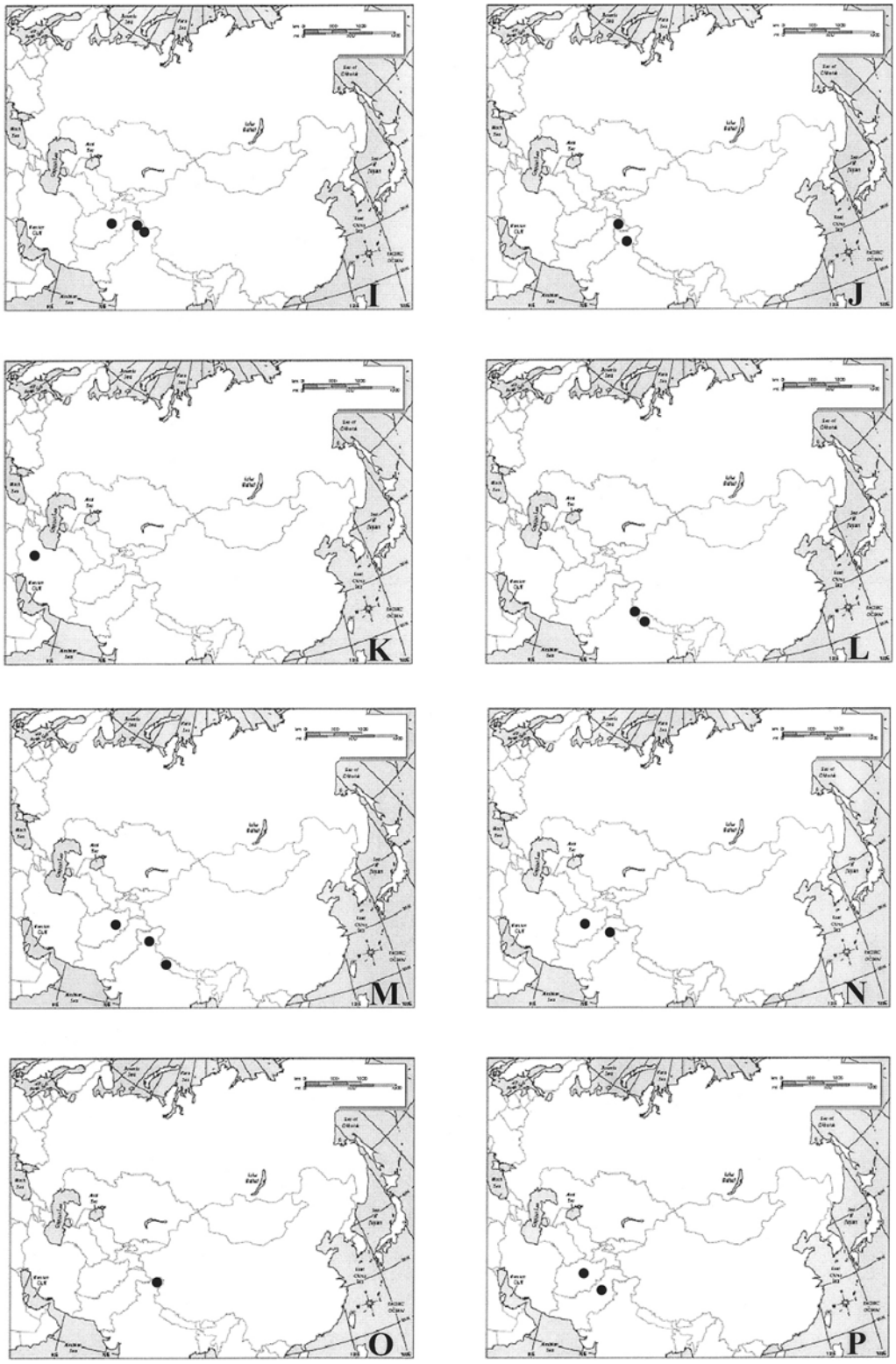


Fig. 12. Continued. I: *A. gilgitensis* Ali. J: *A. imitensis* Ali. K: *A. iodotropis* Boiss. & Hohen. L: *A. langtangensis* Podlech. M: *A. polycanthus* Royle ex Benth. N: *A. pyrrhotrichus* Boiss. O: *A. sherriffii* Podlech. P: *A. subumbellatus* Klotz.

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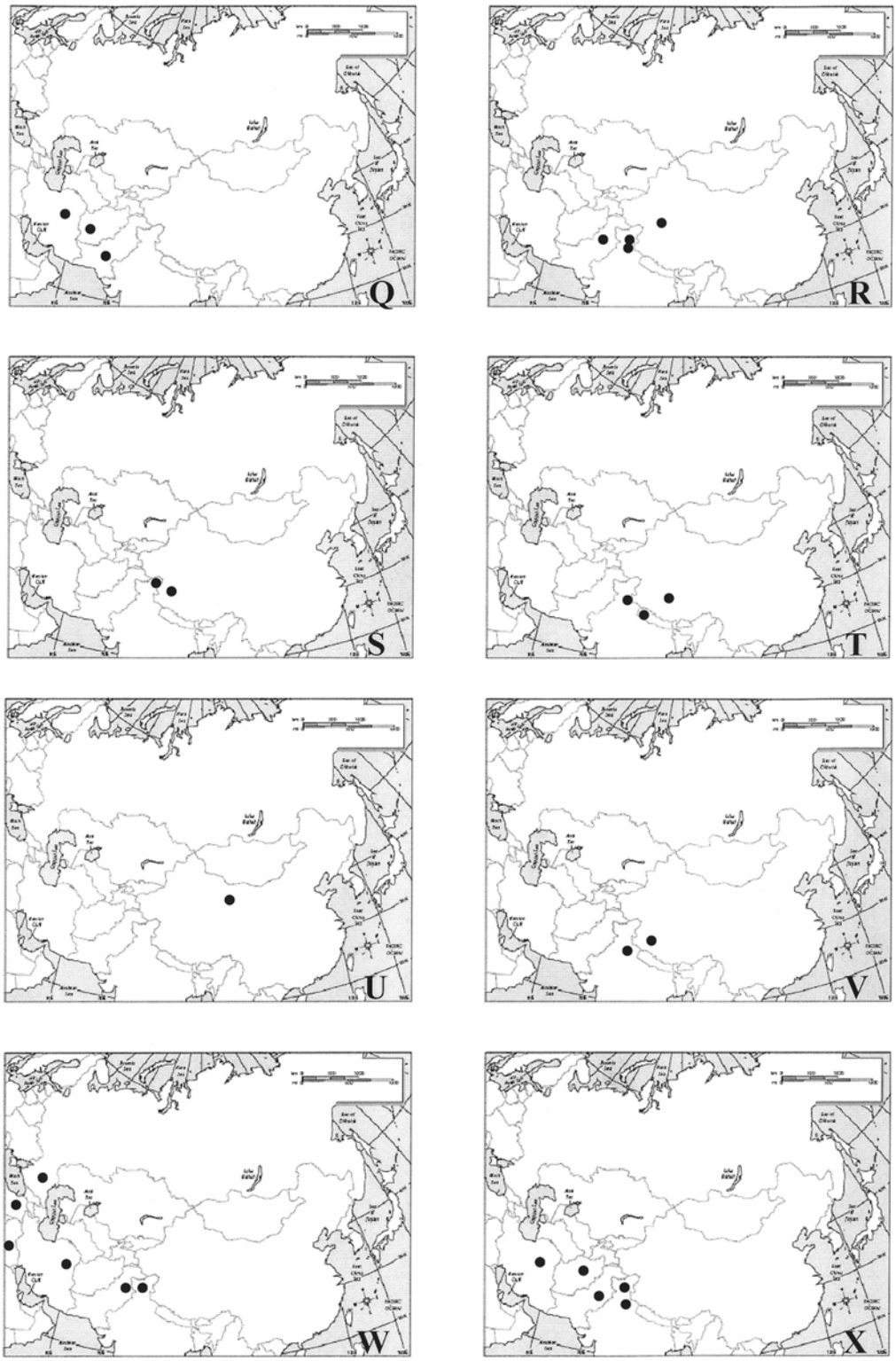


Fig. 12. Continued. Q: *A. stocksii* Bunge. R: *A. tecti-mundi* Freyn ssp. *orientalis* Podlech. S: *A. thomsonii* Podlech. T: *A. yunnanensis* Franch. U: *A. zacharensis* Bunge. V: *Caragana aegacanthoides* (Parker) Chaudhary & Srivastava. W: *Ophiocarpus aitchisonii* (Baker) Podlech. X: *Podolotus hosackioides* Royle ex Benth.

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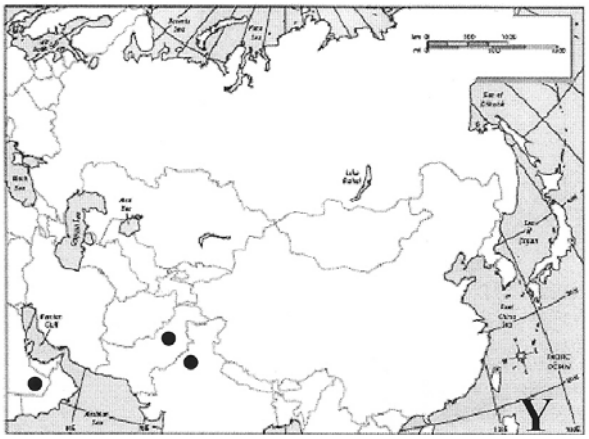


Fig. 12. Continued. Y: *Podlechiella vogelii* (webb) Maassoumi & Kaz. ssp. *fatimensis* (Chiov.) Maassoumi & Kaz. Osaloo.

一些印度紫雲英屬 (豆科) 植物的分類與分布觀察

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(收稿日期：2006 年 8 月 4 日；接受日期：2006 年 11 月 2 日)

摘　　要

本研究提供 25 種印度產紫雲英屬植物的正確地理分布、正確的學名與分類的觀察紀錄。此外也包括一些模式植物的關係、保育狀況和照片。根據田野與標本館的研究顯示，以下九種植物自從 1971 年都沒有出現在印度的領土內，所以被排除 (i.e. *A. alitschuri* B. Fedtsch, *A. charguschanus* Freyn, *A. contortuplicatus* L., *A. flemingii* Ali, *A. iodotropis* Boiss. & Hohen, *A. pyrrhotrichus* Boiss., *A. subumbellatus* Klotz., *A. stocksii* Bunge, *A. zacharensis* Bunge)。一些植物雖然最近從紫雲英屬被轉移到其他屬中 (*Ophiocarpus*、*Podolotus*、*Podlechiella*) 也被納入討論。本研究也顯示，約有 12 種被收藏在不同的國外標本館，然而在印度的標本館卻沒有被紀錄到。依據 *Astragalus aegacanthoides* Parker 提出一個新組合 *Caragana aegacanthoides* (Parker) Chaudhary & Srivastava。

關鍵詞：紫雲英屬、豆科、分布、新組合、印度。

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