Taxonomic Notes on *Hedysarum astragaloides* (Fabaceae)

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The colour of flowers in *Hedysarum astragaloides* Benth. ex Baker is light pink to red in all areas of its occurrence and not yellowish as mentioned in the protologue of the species. The new description of the species is supplied including actual colour of flowers and the characters of seeds for the first time. The distribution of the species has been reassessed and found endemic to India. Its extended distribution is reported in Himachal Pradesh from Kullu and Chamba districts. The type photograph and colour photographs of different stages of flowers are supplemented to authenticate the correct identity of the species. The conservation status by applying IUCN criteria is also provided.

**Key words:** Endemic, flower colour, *Hedysarum astragaloides*, India, IUCN category, seed morphology.

While describing *Hedysarum astragaloides*, Baker (1876) mentioned colour of flowers of the species as yellowish in the protologue. Subsequently, many workers such as Fedtschenko (1902), Ohashi and Tateishi (1975), Ali (1977), Chowdhery and Wadhwa (1984), Pramanik (1988), Aswal (1999) followed Baker’s observation (1876) and used the same colour of flowers for the species in their works. Perhaps they could not observe the species in nature as is evident from the specimens cited in their works. The specimens they have quoted are very old collections on which colour of flowers is not marked. Even the type specimens which Baker (1876) used for describing the species do not contain flowers presenting original colour and also do not have any notes on flower colour (Fig. 1). However, Aitchinson (1880) and Bamber (1915) observed pink and red flowers, respectively, in *H. astragaloides* Benth. ex Baker.

During the course of survey of the Indian legumes in the Himalaya, the authors observed light pink (white with a pinkish tinge) to red flowers (Fig. 2, A–B) in the species wherever it occurs in the wild including one of its type localities (i.e., Lahul). This also confirms the observations of Aitchinson (1880) and Bamber (1915) and suggests that in *H. astragaloides* Benth. ex Baker the colour of flowers is undoubtedly light pink to red and not yellowish as described in Baker (1876). It has been observed, the pink or red colour of flowers gradually faints after anthesis and appears to be pale yellowish white with a pinkish tinge (Fig. 2 C). Reddish-white colour has also been marked on some of the recent collections of the species housed at BSD (Nair 28417, Wadhwa 53467).
Fig. 1. Lectotype of *Hedysarum astragalooides* Benth. ex Baker (T. Thomson s.n., K).
Although, on type specimens the flower colour is not marked, Baker (1876) might have observed pale dried flowers available on the specimens that appear yellowish white.

In view of the above and to avoid further confusion, a complete and amended description of the species is provided with notes on distribution, phenology, conservation status and specimens examined. The description of seeds neither included in protologue nor in subsequent works is provided here for the first time. The shape and size of the seeds of *H. astragaloides* Benth. ex Baker match with the seeds of other species of *Hedysarum* L. The seeds in the genus are compressed and reniform in shape and vary in size from 3–6 mm in length, 3–4.5 mm in width and 1–1.5 mm in thickness (Ohashi and Tateishi 1975). The photograph of type specimen (http://apps.kew.org/herbcat/getImage.do?imageBarcode=K000901891) and colour photographs of plants exhibiting different stages of flowers are also provided to authenticate the identity of the species (Figs. 1, 2).

The species has been rightly considered endemic to India by Sanjappa (1992). Probably not found in Pakistan and Afghanistan, however, Kumar and Sane (2003) have reported the species from these areas. Although recorded from Afghanistan from Shendtoi -Kuram valley (Aitchinson 1880), the locality was not included in the recent work (Podlech 2012). Ali (1977) also did not record this species from Pakistan.

In India the species was known to occur only from Chenab valley – Kishtwar (Jammu & Kashmir) and Lahul district (Himachal Pradesh). For the first time it is reported from outside its type locality in Himachal Pradesh, from Kullu and Chamba districts, as it is not included in
the floras of these areas (Dhaliwal and Sharma 1999, Singh and Sharma 2006).


**Lectotype** (Ohashi and Tateishi 1975): 

Perennial herbs, 20–60 cm long, tufted, prostrate to erect; stems slender to robust, pubescent with appressed silky hairs. Stipules 0.6–1.2 cm long, persistent, leaf-opposed, connate throughout except tip portion, completely circling the stem except petiole base, submembranous, glabrous except margins or pilose with white silky hairs outside, glabrous inside. Leaves 8–25 cm long, alternate, imparipinnately compound; petioles 0.5–1.5 cm long; rachis grooved above, pilose with white silky hairs; leaflets 1.1–4.8 × 0.6–15 mm, 17–31, subsessile, opposite or alternate, narrowly oblong, narrowly ovate or narrowly elliptic, rounded to obtuse along margins, upper surfaces glabrous and with uniformly very minute gland-like black dots, lower surface pilose with appressed white silky hairs, lateral veins obscure on both surfaces, midrib raised and densely hair. Racemes 10–30-flowered, dense, (6–)10–25 cm long, peduncles (5–)7–15 cm long, pilose with appressed white silky hairs. Bracts 5–6 mm long, persistent, longer than pedicel, linear-triangular, scarious, white appressed hairy outside, glabrous inside. Flowers 18–20 mm long (excluding pedicel), half noded, light pink to red, turning pale yellowish white after anthesis pedicels 3–5 mm long, erect, densely white silky hairy. Bracteoles 2, unequal, 2–3 mm long, persistent, situated at base of calyx, hairy as bracts, linear. Calyx 6–7 mm long, persistent, campanulate, 5-lobed, tinged with red colour, cup 2–3 mm long, pubescent with white hairs outside, glabrous inside, lobes narrowly triangular, white hairy both sides, longer than cup, upper 3–4 mm long, lower one 4–5 mm long. Corolla glabrous; standard 15.5–16 × 6–7 mm, shorter than keel petals, backwardly deflexed, narrowly obovate to obovate, emarginated at the apex; wing petals 14–15.5 mm long, shorter than standard, clawed, lamina 11–12 × 2–3 mm, narrowly ovate, obtuse at the apex, auriculate at the base, auricle 2.5–3 mm long, claw ca. 3 mm long; keel petals 18–20 mm long, clawed, lamina narrowly obovate, 14–15 × 5–6 mm, jointed on ventral margins, slightly incurved towards apex, mucronate at apex, auriculate near base, auricle about 1 × 1 mm, claw ca. 6 mm long. Stamens diadelphous (9+1), glabrous; vexillary filament 16–17.5 mm long, free from staminal sheath, filiform, incurved towards apex; staminal sheath ca. 16.5 mm long, slit on dorsal side, truncate at apex, free filaments 2–3 mm long, alternately shorter and longer, filiform, incurved; anthers ca. 0.5 mm long, dorsifixated-varsatile. Pistils 19–21 mm long, almost sessile; ovary 4–6 mm long, (1–)2–3-ovuled, appressed pubescent; style 14–16 mm long, filiform, glabrous; stigma capitate, glabrous. Pods 1.2–3.5 cm long, stipitate, 1–2-jointed, completely compressed, winged (ca. 1 mm width), both suture with entire or unevenly dentate margins, pubescent with completely appressed white hairs; articles 12–15 × 10 mm, narrowly obovate, obovate, elliptic or broadly elliptic, prominently reticulately veined, each single-seeded; stipes 5–8 mm long, densely appressed white hairy. Seeds ca. 5–5.5 × 4 × 1 mm, reniform, compressed, brown, glabrous.

**Distribution: N. W. Himalaya.** India: Jammu & Kashmir (Chenab valley- Kishtwar); Himachal Pradesh (Chamba, Kullu, Lahul).
Endemic.

Habitat and ecology: On moist shady and grassy slopes on mountains. Altitude 2438–4267 m.

Phenology: June – July (– August).

Uses and threat: The plants are grazed by goats and other cattle. Land sliding causes major damage to the species.

Conservation status: The species has been considered as ‘Rare’ in the Red Data Book of India (Pramanik 1988). The IUCN category of the species has been evaluated here following IUCN Red List categories and criteria, version 10.1 (IUCN Standards and Petitions Subcommittee 2013) using GeoCAT tool (www.kew.org/news/geocat1.htm) to find out Extent of Occurrence (EOO) and Area of Occupancy (AOO) values. Based on our own field studies and available information the EOO (8326.89068 km²) and AOO (28.00000 km²) values were calculated (Fig. 3) which place the species under vulnerable (VU) and Endangered (EN) categories respectively as per the criteria mentioned in B1 and B2.


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References
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K. Lal², A. K. Kushwaha², L. B. Chaudhary²:
Hedysarum astragaloides (マメ科)の分類学的ノート
Hedysarum astragaloides Benth. ex Baker (マメ科)の花色は分布域の全域で明るいピンク色から赤色であり、原種記載にあるような黄色ではない。ここでは本種の実際の花色と種子の形質を初めて記載した。本種の分布域を再検討したところ、インド固有であることが分かった。その分布域はインド、ヒマチャル・プラデシュ州のクールーからチャンバ地方に拡がっている。本種の同意の便宜のためにタイプ標本の画像と花の異なるステージのカラー画像を付した。IUCNの基準にもとづいて本種の保全についても言及した。

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