

A Taxonomic Evaluation of *Lotus corniculatus* Linn. (Leguminosae-Papilionoideae) in India

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ABSTRACT: Although *Lotus corniculatus* in India is the most variable, no infraspecific taxa have been recognised under this because of the overlapping variation shown by different populations. A critical study of the collections reveals that the species varies mainly in pubescence character, shape and size of leaflets and number of flowers often within the same population. The varieties *L. corniculatus* var. *japonicus* and *L. corniculatus* var. *minor* have been reduced here as synonym under *L. corniculatus*.

KEY WORDS: *Lotus corniculatus*, Leguminosae, Taxonomy, India.

INTRODUCTION

The genus *Lotus* Linn. comprises ca. 100 species (Polhill 1981) distributed in Europe and temperate Asia, most numerous about Mediterranean region, extending to Africa, Australia and extratropical South America. In India it is represented by 3 species namely *L. corniculatus* Linn., *L. garcinii* DC. and *L. arabicus* Linn. (Baker, 1876; Shah, 1978; Singh & Singh 1982). Among them *L. corniculatus* Linn. s. lat. is the most variable and difficult species in the whole genus. Throughout its range of distribution a number of infraspecific names have been built up around it. It contains both diploid and tetraploid forms. Ball and Chrtkova-Zertova (1968) included 12 species under *L. corniculatus* Linn. in Europe. A more recent study of the genus from central and northern Europe Chrtkova-Zertova (1973) recognised *L. corniculatus* Linn. as a tetraploid species with 14 varieties.

As far as the Indian materials are concerned 3 varieties (*L. corniculatus* var. *corniculatus*, *L. corniculatus* var. *glabrous* Regel, *L. corniculatus* var. *minor* Baker) are sometimes recognised under *L. corniculatus* Linn. (Baker, 1876; Sharma & Kachroo, 1981; Kaul, 1986; Sanjappa, 1991). The variety *L. corniculatus* var. *minor* Baker was described by Baker (1876) from Sind on plants that are dwarf with fleshy leaflets (1/8 in. long) and solitary flower. Sharma and Kachroo (1981) also identified the plants of Jammu as var. *minor* Baker. But a critical study of several other plants from the same locality revealed the presence of more than one flowers and the large sized leaflets breaking all the distinction made so far.

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Further the Indian plants of *L. corniculatus* Linn. exhibits extensive variation in shape and size of leaflets. The extreme forms often tend to resemble those of variety *L. corniculatus* var. *tenuifolius* Linn. of Europe but it is impossible to segregate them as a number of intergrading specimens are very common. Ali (1977) has recognised var. *tenuifolius* Linn. from flora of West Pakistan and placed var. *minor* Baker as synonym under it, but he has clearly mentioned that Pakistani materials of var. *tenuifolius* Linn. integrate with var. *corniculatus*. Heyn (1970) however, mentioned that these two varieties are distinct in Europe.

In addition to leaflets *L. corniculatus* Linn. also varies in density and nature of pubescence based on which infraspecific taxa are recognised (i.e. var. *villosus*, var. *hirsutus*, var. *japonicus*). The glabrous form of *L. corniculatus* Linn. s. str. is often described as var. *japonicus* Regel. Kaul (1986) while working for Weed Flora of Kashmir Valley identified his specimens as var. *japonicus* Regel. This variety is reported to be a diploid with $2n=12$ while typical var. *corniculatus* as a tetraploid with $2n=24$. But recently Small *et al.* (1984) observed diploid number ($2n=12$) also in *L. corniculatus* s. str. Therefore, based on cytological data and pubescence character it is not justifiable to assign any taxonomic rank to the glabrous form. However, Ohashi and Tateishi (1974) recognised var. *japonicus* Regel from Japan based on very unstable characters such as number of flowers in an inflorescence, length of calyx lobes, pubescence of stem and leaves. They have further stated that in near future the stability of var. *japonicus* Regel as a distinct taxon will be affected if it is found growing in association with var. *corniculatus* or *tenuis* Waldst. & Kit. The glabrous to ciliate or hirsute forms of tetraploid populations show continuous transition hence it is not possible to make any sharp circumscription among these taxa, and therefore, it is necessary to reduce the variety *japonicus* Regel under variety *corniculatus*. Larsen & Zertova (1963) have also shown that the pubescence of plants, the form of calyx, the size of flowers, shape of pods, growth form, number of stems, colour and shape of leaflets are greatly variable.

The present work is based on studies of extensive collection in Botanical Survey of India, Howrah (CAL), Botanical Survey of India, Dehra Dun (BSD), Forest Research Institute, Dehra Dun (DD), National Botanical Research Institute, Lucknow (LWG). The range of morphological variations of several population were critically assessed to solve the correct taxonomy of the species as follows:

Lotus corniculatus Linn., Sp. Pl. 774. 1753; DC., Prodr. 2: 214. 1825; Baker in Oliver, Fl. Trop. Africa 2: 63. 1871; Boiss., Fl. Orient. 2: 165. 1872; Baker in Hook.f., Fl. Brit. India 2: 91. 1876; Brand in Engl., Bot. Jahrb. 25: 210. 1898; Collett, Fl. Siml. 120. 1902; Burkill in Rec. Bot. Surv. India 4: 104. 1910; Kupriyanova in Komarov, Fl. U.S.S.R. 11: 291, pl. 19 f.2.1945; Blakelock in Kew Bull. 1948: 414. 1948; Kitamura, Fl. Afghanistan 235. 1960; Banerjee in Rec. Bot. Surv. India 19: 38. 1965; Chrtkova-Zertova in Folia Geobot. Phytotax. 2: 283. 1967; Ball & Chrtkova-Zertova in Tutin *et al.*, Fl. Europaea 2: 174. 1968; Townsend in Kew Bull. 21: 441. 1968; Zandstra & Grant in Can. J. Bot. 46: 570. 1968; Heyn in Davis, Fl. Turkey 3: 203. 1974; Ohashi & Tateishi in J. Jap. Bot. 49: 73. 1974; Ali in Nasir & Ali, Fl. W. Pakistan 100: 314. 1977; Ohashi in Hara & Williams, Enum. Flow. Pl. Nepal 2: 124. 1979; Small *et al.* in Can. J. Bot. 62: 1044. 1984; Chowdhery in Chowdhery & Wadhwa, Fl. Himachal Pradesh 1: 215. 1984. Type: Described from Europe, Herb. Linn. 930/23 (Linn, Microfich !).

L. corniculatus var. *alpinus* Ser. in DC., Prodr. 2: 214. 1825; Boiss., Fl. Orient. 2: 166. 1872; Brand in Engl., Bot. Jahrb. 25: 211. 1898; Anthony in Notes R.B.G. Edinb. 18: 226. 1935; Heyn in Davis, Fl. Turkey 3: 527. 1970. (dwarf form of var. *corniculatus*). *L. alpinus* (Ser.) Schur., Enum. Pl. Transs. 160. 1866; Ball & Chrtkova-Zertova in Tutin *et al.*, Fl. Europaea 2: 175. 1968; Small *et al.* in Can. J. Bot. 62: 1044. 1984.

L. bracteatus Wall., Cat. No. 5939. 1830-32 *nom. nud.*

L. corniculatus Linn. var. *hirsutus* Koch., Syn. Fl. Germ. Helv. 178. 1836.

L. corniculatus Linn. var. *brachyodon* Boiss., Diagn. Ser. 2(2): 21. 1856 (Similar to var. *alpinus* with short calyx teeth).

L. corniculatus Linn. var. *japonicus* Regel, Ind. Sem. Hort. Petrop. 23. 1864; Brand in Engl., Bot. Jahrb. 25: 212. 1898; Ohashi in Hara, Fl. E. Himal. 3: 66. 1975 & in Hara & Williams, Enum. Flow. Pl. Nepal 2: 125. 1979; Kaul, Weed. Fl. Kashmir valley 89. 1986; Haung & Haung in Taiwania 32: 77. 1987 (glabrous form of var. *corniculatus*). *L. japonicus* (Regel) Larsen in Bot. Tidsskr. 53: 12. 1955.

L. corniculatus Linn. var. *minor* Baker in Hook. f., Fl. Brit. India 2: 91. 1876; Sharma & Kachroo, Fl. Jammu 1: 135. 1981 (dwarf form with fleshy leaflets *ca.* 3 mm long and solitary flowers).

L. rechingei Chrtkova-zertova in Folia Geobot. Phytotax. 2: 198. 1967.

Perennial herbs, prostrate, ascending or decumbent, 10-45 cm long, branching from base, glabrous to densely villous. Stipules absent. Leaves 4-29 mm long, alternate, sessile, pinnately 5-foliolate, 2 basal, 3 terminal; rachis 2-9 mm long, grooved above, glabrous to densely villous; leaflets 2-19 x 1.5-7.0 mm, ovate, obovate, narrowly obovate, oblanceolate, lanceolate or narrowly oblanceolate, cuneate or obtuse at base, entire along margin, obtuse, rounded, acute, acuminate or rarely retuse at apex, glabrous to densely villous, lateral veins obscure; petiolules *ca.* 1 mm long, glabrous to densely villous. Umbels axillary (1-)2-6-flowered; peduncles 2-11 cm long, glabrous to densely villous; bracts 3, foliaceous, 2-11 x 2-7 mm. Flowers 8-15 mm long, yellow; pedicels 3-4 mm long, glabrous to densely villous. Calyx 4-8 mm long, persistent, campanulate, 5-lobed, tube 3 mm long, glabrous to villous without, glabrous within, lobes 2-5 mm long, subequal, linear or narrowly lanceolate, acuminate, glabrous to villous. Standard 8-15 x 5-8 mm, orbicular, claw 3.0-6.0 x 1.5-3.0 mm, flattened; wings 8-13 x 3-4 mm, obovate, obtuse to rounded, curved towards apex, lateral pocket present, claw 2.5-4.0 mm long, upper auricle 0.5-1.0 x 1.0-1.5 mm; keels 9 - 14 x 3-5 mm, ovate, curved towards apex, acute, lateral pocket poorly developed, claw 2.5-4.0 mm long. Vexillary filament 6-11 mm long, finely pubescent towards base; staminal sheath 4.5-7.0 mm long; anthers uniform, alternate basifixed on long filaments, alternately versatile on short filaments. Ovary 5.0-9.0 x 0.5-1.0 mm, linear, sessile, glabrous; style 4.5-7.0 mm long, abruptly incurved above the ovary, glabrous; stigma terminal, capitate, glabrous. Pods 15-33 x 2-3 mm, linear, cylindrical, turgid, straight, abruptly apiculate, many-seeded, glabrous. Seeds 1 x 1 mm, suborbicular, blackish-brown, glabrous, smooth.

Collector's notes: Annuals or perennial tufted herbs, prostrate, decumbent, semierect or erect; rootstock woody. Flowers yellow, bright yellow or brownish. Standard petal often tinged with red colour. Pods green or dull green.

Distribution: India (Temperate Himalayas from Kashmir to Nepal), Abyssinia, Asia, Australia, Europe, Orient, Trop. Africa; introduced elsewhere.

Fl. & Fr.: (Mar.) Apr. - Oct.

Ecology: On slopes of mountains in moist places, vicinity of streams, in the irrigated fields, alpine meadows among grasses, under shade of *Quercus* & *Berberis* spp., in *Salix resa* forest. Soils sandy, alluvial, stony. Altitudes: 1400-4000 m.

Uses: It is wild and also cultivated as a forage crop. Its stem is softer and richer in carbohydrate than clover and lucerne. As a component of meadow mixture it is suitable for all soils and is appreciable for its remarkable longevity. It is good soil binder and is not affected by any serious pest or disease. The flowers and leaves of the plant contain a coloring matter which imparts an orange-yellow constitute an important source of nectar for honey bees in Britain (Anonymous, 1962).

Specimens examined :

Himachal Pradesh: Chamba, s.d., *R. Ellis 135A* (CAL), Chamba, Panji, 11 Jul 1897, *Anon. s.n.* (CAL); Panji, *Douie 18* (CAL); Chamba Valley, 24 Apr. 1959, *R. Gupta, 4* (LWG); below Kalung, 4 Aug. 1901 *T.H. Holland s.n.* (CAL); Shimla, Apr. 1886, *H. Collett 515* (CAL); Bashahr, Kalpa, 31 Aug. 1963, *N.C. Nair 30297* (BSD); Kinnaur Dist. Kalpa towards Tapri on old Indo-Tibetan Road, 2 Oct. 1971, *K.P. Janardhanan 46342* (BSD); Purbani, slopes below the F.R.H., 7 Oct. 1971, *K.P. Janardhanan 46524* (BSD); Pooh, near old P.W.D. rest house, 7 Jun. 1972, *K.P. Janardhanan 47804* (BSD); Rakcham, 27 Sep. 1964. *N.C. Nair 34340* (BSD); Sanglakanda, 22 Sep. 1964, *N.C. Nair 34163* (BSD); Roshri, 2800 m, 8 Jun. 1962, *N.C. Nair 22577* (BSD); Baspa Valley, Nagasti, 25 May 1972, *K.P. Janardhanan 47455* (BSD); Sangla, near F.R.H., 20 Sep. 1971, *K.P. Janardhanan 46027* (BSD); Chenab nala, 22 Jun. 1974, *B.M. Wadhwa 53357* (BSD); Mahsu Dist., between Kothari and Jubbal, 14 Jul. 1965, *N.C. Nair 16665* (BSD); Larot, 22 Jul. 1965, *N.C. Nair 36048* (BSD); Lahul, Koksar, 12 Sep. 1961, *N.C. Nair 16916* (BSD); Koksar, 18 Jul. 1972, *U.C. Bhattacharyya 48690* (BSD); Sissu, 27 Jun. 1958, *M.A. Rau 5932* (BSD); Koksar, 4 Aug. 1970, *U.C. Bhattacharyya 40562* (BSD); Koksar, 2 Aug. 1971, *U.C. Bhattacharyya 44930* (BSD); Koksar, 2 Sep. 1961, *N.C. Nair 16485* (BSD); near Koksar, 25 Jun. 1958, *M.A. Rau 5855* (BSD); Dadoarpho, 3530 m, 12 Sep. 1961, *N.C. Nair 16916* (BSD); Solan Dist. Barog 25 May 1986, *P.C. Pant 80753* (BSD); Chenab valley, Aug. 1880, *R. Ellis 170* (DD); U. Chenab Valley, 2 Jun. 1879, *R. Ellis 37AA* (DD); Kullu valley, Katrain to Naggar, 23 May 1954, *J.G. Srivastava & Party 60114* (LWG); Bhundar, 7 Jun. 1950, *S.K. Jain & R.C. Bardwaja s.n.* (DD); Kasol, May 1928, *C. Purkayastha s.n.* (DD); Parbati valley, 19 Jun. 1934, *Anon 4130* (DD); Aut to Panjiain, 19 May 1959, *J.G. Srivastava & party 58583* (LWG); Panjiain to Chinjwara, 20 May 1959, *J.G. Srivastava & party 59289* (LWG). **Jammu & Kashmir:** Kashmir, s.d., *T.A. Rao 14* (CAL); Shrinagar, 16 Jul. 1876, *C.B. Clarke 29119* (CAL); Kashmir, 6 Jul. 1876, *C.B. Clarke 28885* (CAL); Limbar nullah, Kajual range, 18 May 1892, *J.F. Duthie 11034* (CAL); Kashmir, s.d., *T.A. Rao 9197* (CAL); Seoj, 23 Aug. 1962, *J.N. Vohra & B.M. Wadhwa 733* (CAL); Gilgit, 1885, *G.M. Giles 43, 87* (CAL); Udampur, Sarmoli, 6 Jun. 1986, *A. Swami 803* (BSD); Ramnagar, 24 Mar. 1986, *A. Swami 555* (BSD); Hills behind panchayat, 29 May 1986, *B.P. Uniyal 80310* (BSD); Upper Munda, 3 Jun. 1959, *T.A. Rao 9197* (BSD); Shalimar garden, 23 Jul. 1962, *B. Chakrabarty s.n.*, Acc. No. 30556 (BSD); Ladakh, Sonamarg, Baltal road, 15 Jul. 1976, *B.M. Wadhwa 58501* (BSD); Panikhar, 25 Aug. 1976, *B.M. Wadhwa 59888* (BSD); Varikah, *T.A. Rao 14* (BSD); Bhadrawan, Jai, 29 May 1959, *T.A. Rao 9134* (BSD); Sunagar, 4 Jul. 1891, *G.A. Gammie s.n.* (DD); Jhelum, Rainawari, Lolab forest, Jhelum, Jul.-Aug. 1907, *Keshwanand 716* (DD); Dorus, 31 May 1958, *H.D. Thapliyal 26356* (DD); Kishanganga valley, 23 Jul. 1909, *Keshwanand s. n.* (DD); Laddar valley, 21 Jul. 1893, *J.F. Duthie 13160* (DD); Anantnag, 23 Jun. 1962, *A. Khan 95284* (LWG); Verinag, 2 Jul. 1963, *K.N. Kaul & Party 92877* (LWG); Pathankot road, 9 Aug. 1956, *G. Saran & Party 30238* (LWG); Banihal, *J. Prasad 10121* (LWG); Poonch, Girgan, 12 Jul. 1956, *B.K. Abvrol 5391* (LWG). **Uttar Pradesh:** Chamoli Dist., way to Bampa, 4 Sep. 1975, *B.D. Naithani 56052* (BSD); Jaunsar, Konain, 18 May 1939, *C.E. Parkinson 7118* (DD); N. Garhwal, Kesar Nath, 19 Oct. 1938, *K. Ram 8950* (DD); way to Jammunotri, 21 Jan. 1953, *S.N. Mitra 9455* (CAL), Garhwal, Manda Kivi Valley, Aug. 1968, *M.A. Rau 38716* (BSD); Garhwal, Rambara, 24 Sep. 1958, *M.A. Rau 8623* (BSD); Tehri Dist., Gangi, 11 Aug. 1978, *A.K. Goel 64336* (BSD); Tehri Garhwal, above Dhatiner, 9 Sep. 1955, *K.C. Sahni 21945* (DD); Tehri Garhwal, 23 Jun. 1883, *J.F. Duthie 1020* (DD); Kumaon, Kalika-Ranikhet, 18 Mar. 1961, *M.A. Rau 14282* (BSD); Pithoragarh, 10 May, 1961, *U.C. Bhattacharyya 15087* (BSD); Munsyari-Madhikot road, 30

Jun. 1982, C.L. Malhotra 62685 (BSD); Dwali, Kafni, 26 Sep. 1957, T.A. Rao 4633 (BSD); Almora-Takula, near Basauli, D. Abasthi 593 (LWG).

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評估印度產之百脈根(豆科—蝶形亞科)之分類問題

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摘 要

研究大量印度產之百脈根後認為小葉之被毛、形狀及大小之變異均出於同一族群內，因此將日本百脈根及小形百脈根之變種名稱合併於百脈根種名。

關鍵詞：百脈根，豆科，分類，印度。

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