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New synonymy in the genus *Crotalaria* L. (Fabaceae)

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ABSTRACT

Crotalaria lamelliformis P. Sivaramakrishna *et al*. and *C. gengmaensis* Z. Wei & C.Y. Yang are shown to be conspecific with *C. albida* B. Heyne ex Roth and are synonymised here. Similarly, *C. kanchiana* Gholave *et al*. found to be conspecific with *C. juncea* L. and reduced to synonym. Apart, the lectotype was designated here for the name *C. lamelliformis*.

Key words: *Crotalaria,* India, new species, new synonym and varieties.

1. INTRODUCTION

The genus *Crotalaria* L. consists more than 700 species and widespread in Old and New World countries (POWO, 2021) including India with 116 taxa (Nandikar, 2018; Rokade *et al*., 2019, 2020; Dhatchanamoorthy *et al*., 2021). Unfortunately, some of newly described taxa were considered conspecific and synonymized with the older validated names (Arigela & Singh, 2018). We present below two another erroneously described species, *Crotalaria lamelliformis* P. Sivaramakrishna *et al*. and *C. kanchiana* Gholave *et al*., which are turned out to be conspecific with previously known taxa.

Taxonomic treatment

Crotalaria albida B. Heyne ex Roth, Nov. Pl. Sp.: 333. 1821.
Type: — Without locality, *s.d*., B. Heyne, *s.n*. (L barcode L0649895 [image!] lectotype designated by Turner, 2021)

Crotalaria lamelliformis P. Sivaramakrishna, P. Yugandhar & L.J. Singh in Phytotaxa 490 (1): 72. 2021, ***syn. nov.***
Type: — (Lectotype, designated here) *Crotalaria lamelliformis* P. Sivaramakrishna *et al*., in Phytotaxa 490 (1): 77. fig. 4, 2021.

Crotalaria albida B. Heyne ex Roth var. *kangrensis* A.A. Ansari, *Crotalaria* India: 157. 2008. (Singh & Garg, 2020)
Type: — India, Himachal Pradesh, Sihunta, Kangra, 16.10.1874, C.B. Clarke, 23655B (holotype CAL0000024597! Isotype CAL0000024572!)

Crotalaria gengmaensis Z. Wei & C.Y. Yang in Acta Phytotax. Sin. 20: 479. 1982. ***syn. nov.***
Type: — Yunnan. Gengmam Xian, alt. 1670 m, Apr. 1936, C.W. Wang 72861 (holotype PE - 2301193 - 01432515, isotype PE - 2301194 - 01432516)

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Figure 1. *Crotalaria albida*; **A–E**: habit variations at different habitats.

Note: During botanical explorations at Deccan Plateau, Eastern Ghats, Indian Himalayan Range, Western Ghats, Aravalli Hills and the Thar Desert under various projects, *C. albida* has been observed and collected. Several morphological variations in the habit like, highly tufted decumbent habit to less branched erect (Fig. 1), leaf variations such as shape, size and indumentum, streaks colour on the standard petals from brownish to dark brown is observed (Fig. 2). Between 2012 and 2020, *C. albida* morphological variations were observed in the Kodaikanal Wildlife Sanctuary at elevations ranges 400–1900 m and collected specimens (*Kabeer & Ravi Kiran*

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133181, 140914) deposited at MH, Coimbatore. We observed that, size of the plant depends on the aridity, moisture levels in the soil, altitude and temperature of habitat (Fig. 1).

Figure 2. *Crotalaria albida*; **A–B**: Leaf variations; **C–F**: Streaks variations on standard petal of flower.

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Figure 3. *Crotalaria juncea*; **A–D**: Leaf variations; **E–H**: Close up of flower with streaks variations on standard petal; **I–K**: Ventral view of standard petal with colour variation; **L–M**: variations in pods.

Sivaramakrishna *et al.* (2021) described a new species *C. lamelliformis* and they were not submitted the type specimens to the Botanical Survey of India as stated in the protologue. Communication with the authors of *C. lamelliformis* revealed that, all the type specimens were spoiled and no original material available with them. It attracts the ICN (Turland *et al*., 2018) article 9.3 to designate nomenclatural type, thus we have designated the illustration from the protologue of the *C. lamelliformis* as lectotype. Furthermore, we have examined the live plants from the type locality and no plant is having the stipules, and authors of *C. lamelliformis*

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considered the indumentum on petiole base as stipules. No petiole is visible in the figures given in the protologue of the *C. lamelliformis*. The diagnosis of the *C. lamelliformis* was erroneous and it is treated here as a synonym of *C. albida*.

Ansari (2008) described *C. albida* var. *kangrensis* and stated it is differ from *C. albida* by having shorter leaves, less number of flowered inflorescence and less hairy calyx. We observed these characters are driven by edaphic factors in the varied habitats and correctly synonymized by Singh & Garg (2020). Chun-Yu (1982) described *C. gengmaensis* and stated the new species is differing from *C. albida* by having elliptic leaf blade, adaxial calyx lobes acuminate at apex and 6–8-seeded legume. These characters exactly match with *C. albida* which grows in the Eastern Ghats and Western Ghats of India. After the study of protologue and type specimens of *C. gengmaensis* and *C. albida* var. *kangrensis* it is concluded that, they are ecotypes of *C. albida*. Therefore, *C. gengmaensis* is treated here as a synonym of *C. albida.*

Crotalaria juncea L., Sp. Pl. 2: 714. 1753.
Type: — India, without locality, *s.d*., C. Linnaeus, *s.n*. (Herb. Linn. No. 895.11 [Image!], lectotype designated by Fawcett & Rendle in *Fl. Jamaica* 4: 8. 1920)

Crotalaria kanchiana Gholave, Mane, Gore, Kambale & S.P. Gaikwad in Phytotaxa 409 (4): 234. 2019. ***syn. nov.***
Type:—India, Maharashtra, Osmanabad district, Barshi-Osmanabad road, near Hatlai Devi Temple, 530 m, 18°10′50″N, 76°0′45″E, 22 November 2018, A. R. Gholave, R. N. Mane & S. P. Gaikwad 700 (holotype CAL; isotype BSI, SUK)

Notes: *Crotalaria juncea* is native to India and commonly known as Sunn hemp, Indian hemp, Madras hemp and brown hemp (Bhandari *et al*., 2016). A good number of varieties of Sunn hemp have been developed and cultivated in many tropical and subtropical regions of world. Few cultivated variants of Sunn hemp escaped from cultivation and formed the colonies around the agriculture fields and the open forest in India and it is also considered as noxious weed in the USA (Sheahan, 2012). Nannajkar *et al.* (2016) explained the effect of different varieties and spacing on the yield attributes *viz*., number of pods per plant, pod length, diameter of pod, number of seeds pod and seed weight of *C. juncea*.

Gholave *et al.* (2019) stated "*C. kanchiana* morphologically resembles with *C. juncea* but differs in having 2–6 flowered inflorescence and 2–4 seeds in a pod". They have considered few characters like length of inflorescence, size of flower bud, size of flower and seed number in the pod which are regulated by edaphic factors. After 2 years field trials, Meagher *et al.* (2017) concluded of seasonality affected the numbers of racemes, flowers, numbers of plants with seed pods and number of seed pods per plant. During plant explorations in India, We have observed several morphological variations, colour variations in standard petals in the flowers of *C. juncea* (Fig. 3) and referred the several herbarium sheets of *C. juncea* ecotypes which are extant at Botanical Survey of India herbaria. After the study of protologue, type specimens and live specimens, *C. kanchiana* is reduced as synonym of *C. juncea*.

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Ethical approval
The ethical guidelines of Botanical Survey of India for plants & plant materials are followed in the study for collection & identification. Nomenclatural advice acquired from Dr. K.N. Gandhi, Senior Nomenclatural Registrar, Harvard University Herbaria & Libraries and Dr. Mayur D. Nandikar.

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Conflicts of interests
The authors declare that there are no conflicts of interests.

Data and materials availability
All data associated with this study are present in the paper.

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