

**ALYSICARPUS RUGOSUS (WILLD.) DC., A NEWLY
NATURALIZED LEGUME SPECIES IN TAIWAN¹**

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Abstract

Alysicarpus rugosus (Willd.) DC., a legume species of the Old World Tropics, was recently found naturalized in Pingtung County of the southernmost Taiwan. The present study gives a detailed description and illustrations, determines the chromosome number, and discusses the uses and ecology of this newly recorded species. Furthermore, differences between *A. rugosus* and the other two congeneric species, namely, *A. bupleurifolius* and *A. vaginalis* known previously in Taiwan, are pointed out.

Key words: Leguminosae; *Alysicarpus rugosus*; tropical plant; taxonomy; chromosome number; ecology; *Alysicarpus bupleurifolius*; *Alysicarpus nummularifolius*; *Alysicarpus vaginalis*.

Alysicarpus Necker is a legume genus of about 25 to 30 species that are distributed in the Old World Tropics (Ohashi *et al.*, 1981). The genus is characterized by the simple to rarely 3-foliolate leaves; the racemose, papilionaceous flowers; the scarious calyx that is deeply divided, 2 upper lobes often connate almost to the apex; the diadelphous stamens; and the jointed pods. Chuang and Huang (1965) recognized three species of this genus from Taiwan, namely, *A. bupleurifolius* (L.) DC., *A. nummularifolius* (L.) DC., and *A. vaginalis* (L.) DC. In Flora of Taiwan (Huang & Ohashi, 1977), however, only two species were listed, and *A. nummularifolius* was considered to be synonymous with *A. vaginalis*. Subsequent studies on the Leguminosae of Taiwan (Ohashi *et al.*, 1984; Ohashi *et al.*, 1985) did not reveal any additional species of *Alysicarpus*. In this study we report the finding of *A. rugosus* (Willd.) DC. that is naturalized in the southernmost tip of Taiwan. The species description and illustrations (Figs. 1 and 2) below are based on both live plants and herbarium materials that were collected from Taiwan.

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Alysicarpus rugosus (Willd.) DC., Prodr. 2: 353. 1825; Benth., Fl. Austral. 2: 239. 1864; Baker *In* Oliver, Fl. Trop. Afr. 2: 171. 1871; Baker *In* Hooker, Fl. Brit. Ind. 2: 159. 1876; Trimen, Fl. Ceylon 2: 45. 1894; Sedgwick *In* J. Indian Bot. Soc. 1: 17. 1919; Léonard *In* Bull. Jard. Bot. État 24: 92, fig. 12. 1954; van Meeuwen, van Steenis & Stemmerik *In* Reinwardtia 6: 88. 1961; Schubert *In* J. Arnold Arb. 44: 296. 1963; Backer & Bakh. f., Fl. Java 1: 610. 1963; Ohashi *In* Hara, Fl. E. Himalaya 137. 1966 et *In* Hara & Williams, Enum. Fl. Pl. Nepal 2: 105. 1979; Matthew, Fl. Tamilnadu Carnatic 338. 1983. Basionym: *Hedysarum rugosum* Willd., Sp. Pl. III, 2: 1172. 1802. 皺果煉莢豆

An erect to ascending, much branched annual herb to 70 cm tall; branchlets ca. 1 mm broad toward apex, terete, strigillose below the petiole base, the trichomes in alternating lines on succeeding internodes; stipules lanceolate to deltoid, scarious, 4-11 mm long, 2-3 mm wide, gradually acuminate, glabrous; leaves simple, rarely 2-3, green, blotched with yellow-green or white along the costa, oblong to elliptic, sometimes broadly obovate, chartaceous, 1.5-4 cm long, 1-2 cm wide, acute to rounded, emarginate and mucronulate at apex, obtuse to broadly rounded or subcordate at base, glabrous above, dispersedly puberulent at margin and beneath, the costa subplane above, prominent beneath, the secondary veins prominulous above, elevated beneath, 3-5 on each side of costa, the veinlets plane to prominulous on both surfaces, forming irregular polygonal aereoles; petioles slender, with pulvini at both ends, semiterete and winged, 5-8 mm long, 0.5-1 mm broad, the distal pulvinus puberulent, the membranous wing terminating in 2 minute stipels; racemes terminal, simple to sometimes compound, up to 9.5 cm long, the flowers usually in pairs at each node, pedicellate, the pedicels slender, 2-5 mm long, minutely puberulent; peduncles subterete, 5-30 mm long, 1-2 mm broad, glabrous to somewhat scabrous; bracts 3, scarious, the central one broadly ovate, ca. 3 mm long, 4 mm wide, the lateral ones subulate to acicular, to 2 mm long; calyx connate basally, the tube ca. 1 mm long, the lobes scarious, narrowly to broadly ovate to rarely elliptic, 6-8 mm long, 1.5-3 mm wide, entire, ciliate along upper margins (glabrous at the lobe opposite the keel), 2 upper lobes connate almost to the apex; corolla papilionaceous, the standard orange-yellow, pinkish around centre, flabellate, ca. 6.5 mm long, 7.5 mm wide, the wing pinkish purple, the lower portion with yellow stripes, ca. 5.5 mm long, 2.5 mm wide, the keel pinkish purple at apex and margin, pale yellow otherwise, ca. 6 mm long, 2 mm wide; stamens 10, diadelphous, 1 free and 9 connate, the filaments of the latter forming a tube to 5 mm long; ovary linear, ca. 3 mm long, with minute glandular hairs apically; style terete; stigma capitate, ca. 3 mm long; loments included in the persistent calyx, slightly compressed, to 6 mm long, 1.5 mm wide, the joints 3-5, transversely rugose; seeds compressed, ca. 1 mm across, glabrous to somewhat scabrous.



Fig. 1. *Alysicarpus rugosus* (Willd.) DC. —a, habit; —b, part of a branch, showing the disposition of trichomes; —c, adaxial surface of leaf and petiole, noting the paler costal area and two minute stipels; —d, abaxial surface of leaf and petiole; —e, floral bracts; —f, side view of flower; —g, flower with petals removed to show the relative position of calyx, stamens, and pistil; —h, adaxial surface of calyx; —i, standard; —j, wing; —k, keel; —l, diadelphous stamens; —m, pistil; —n, pod with persistent calyx; —o, joints, noting the rugose walls; —p, seed. All from *Peng 7212* (HAST).



Fig. 2. *Alysicarpus rugosus* (Willd.) DC., showing —a. erect and much branched stems, and —b. closer view of the showy flowers and infructescences, noting scars on the inflorescence rachis left by caducous flowers. All from Peng 7212.

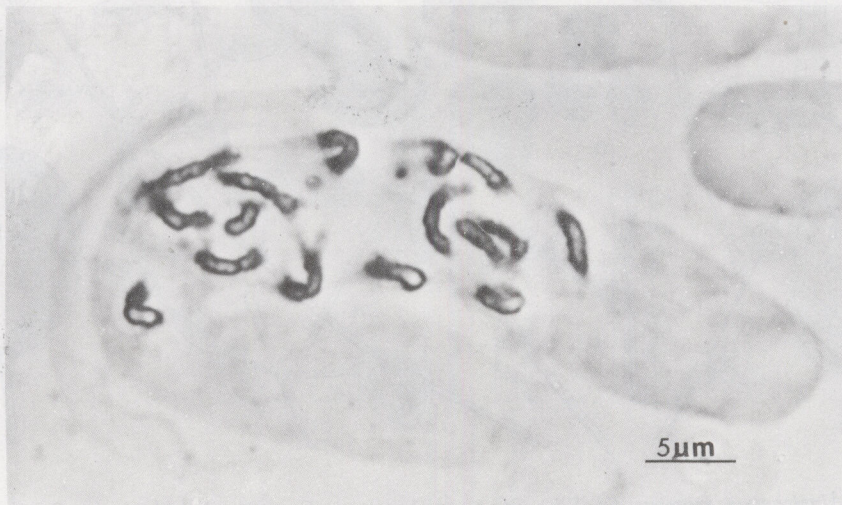


Fig. 3. Chromosomes of *Alysicarpus rugosus* (Willd.) DC., mitotic metaphase, $2n=16$, from Peng 7212.

Distribution

Tropical Africa, Madagascar, Himalaya, India, Sri Lanka, southeastern Malesia, China (Kwangtung), Australia (Queensland) (Ohashi, 1966, 1979; Matthew, 1983), and Taiwan.

Specimens Examined

Taiwan: Pingtung County: Kenting Youth Activity Center, by Chingwashih (literally, Frog Rock), August 22, 1984, *Peng 7115* (Herbarium, Academia Sinica, Taipei [HAST]); roadside, near the Kenting Forest Resort, August 23, 1984, *Peng 7212* (HAST); Kenting, September 3, 1984, *Huang 967* (HAST).

Chromosome Number

A survey of compilations of chromosome numbers (Fedorov, 1969; Moore, 1973, 1974, 1975; Goldblatt, 1981, 1984, 1985) revealed that nearly all species of *Alysicarpus* are diploids based on $X=8$. Root tips of *Peng 7212* were examined for mitosis using conventional methods (Peng *et al.*, 1986). Our somatic spread ($2n=16$; Fig. 3) confirms previous chromosome reports from India (Rao, 1954; Shetty, 1961; Bir and Sidhu, 1967; Sanjappa and Bhatt, 1976).

Uses

The leaf and root of *Alysicarpus rugosus* DC. are used medically in Tanzania and for fever, cough and thrush in South Africa (Watt and Breyer-Brandwijk, 1962). Leaves and young stems are relished by cattle. Utilization of this species as forage in mixed stands with grasses is being tested in Hengchun Station, Taiwan Livestock Research Institute, which is situated near the localities where the legume is known to occur (Fan, Chi-Nan, 1985, pers. comm.).

Ecology and Field Notes

It is commonly found by the wayside, in grazing ground, on floor of scrub jungles and exposed rocks on the hills, at plains from the coast to 1000 m elevation, in southeastern India (Matthew, 1983); locally in open, dry and waste places, or along shoulders of paved road by forest margin, in some instances co-occurring with *Alysicarpus vaginalis*. Plants flower in August and September. Clonal transplants in the experimental greenhouse of the Academia Sinica, Taipei flowered until October. Matthew (1983) noted two flowering peaks during November-March and August-September. Although the species behaves as an annual in the field, periodical cattle grazing or mowing renders it a perennial (Fan, Chi-Nan, 1986, pers. comm.).

The flowers, though diminutive, are very showy, having orange-yellow standards and pinkish-purple keels and wings contrasted with the green sepals (Fig. 2). Observations made in the experimental greenhouse suggest that the present species is self-compatible, but insect vectors were probably required to ensure fertilization. Unpollinated flowers were caducous.

Alysicarpus rugosus is characterized by the flabellate standards, the short (up to 6 mm) loments that are strongly contracted and included in the persistent calyx, and the trichomes on internode that occur along only the side of petiole base. In *A. bupleurifolius* and *A. vaginalis*, the other congeneric species previously recorded from Taiwan, however, the standards are obovate, the loments are longer (15-20 mm), slightly constricted, and much exserting the calyx, and the trichomes, when present on internodes, are evenly distributed.

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臺灣新歸化植物——皺果煉莢豆

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皺果煉莢豆 (*Alysicarpus rugosus* (Willd.) DC.) 為分佈於舊世界熱帶地區的豆科植物，最近經發現歸化於臺灣南端屏東縣墾丁一帶。本文詳細描述此新記錄種之分類性狀並附繪圖及彩色照片、報告其染色體數目、討論其用途與生育地生態環境。此外，本種和臺灣其他二種已記錄的煉莢豆——長葉煉莢豆 (*A. bupleurifolius*) 和煉莢豆 (*A. vaginalis*) 的差異亦予指出以資辨別。