

**HYBANTHUS JACQ. (VIOLACEAE), A NEW GENERIC
RECORD FOR THE FLORA OF TAIWAN¹**

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Abstract

Hybanthus enneaspermus, an attractive species of Violaceae, was collected recently from Taiwan. It represents a new record for both the species and the genus on this island, and a range extension of this species to the northeast. The present study provides a key to the genera of Violaceae in Taiwan, gives taxonomic description, discusses its ecology, habitat and medicinal uses, and determines its chromosome number.

Key words: *Hybanthus enneaspermus*; Violaceae; taxonomy; ecology; chromosome number; medicinal uses; rare species.

The most recent systematic survey of Violaceae of Taiwan (Hsieh, 1977) indicates that only a single genus, *Viola*, is represented on this island. Our recent (1984) field trip to Maopitou (literally, "Cat's nose tip"), one of the two southernmost capes of Taiwan in the Kenting National Park, however, has resulted in the finding of *Hybanthus*, a new generic record of Violaceae for our flora. Based on materials from Taiwan, *Hybanthus* can readily be distinguished from *Viola* by the following key:

- 1a. Plants somewhat woody at base, without stolons; leaves sessile or nearly so; lowest (anterior) petal at least 2 times longer than the others; sepals without basal appendages; pedicels articulate; seeds longitudinally ribbed.....*Hybanthus*
- 1b. Plants herbaceous, often with stolons; leaves long-petiolate; lowest (anterior) petal scarcely longer than the others; sepals with basal appendages; pedicels not articulate; seeds smooth*Viola*

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The genus *Hybanthus* consists of some 150 species that are widely distributed in the tropics and the subtropics (Airy Shaw, 1973), but most abundant in tropical America (Robyns, 1967). *Hybanthus enneaspermus* (L.) F. Muell., the species that we recently discovered, is a very variable and widespread species of the Old World (Robson, 1958; Tennant, 1963; Bennett, 1972). The species description and illustrations (Figs. 1 and 2) below are based exclusively on live plant materials from Taiwan, where only part of the diversity of this species is represented. For nomenclatural history as well as more detailed synonymy of this species, see Tennant (1963).

Hybanthus enneaspermus (L.) F. Muell. 鼠鞭草

Hybanthus is from the Greek *hypos* (hump-backed), and *anthos* (flower), referring to the spurred anterior petal; *enneaspermus* is from the Greek *ennea* (nine) and *sperma* (seed), referring to the capsule which contains about nine seeds.

Hybanthus enneaspermus (L.) F. Muell., Fragm. 10: 81. 1876; Tennant, Kew Bull. 16: 431. 1963; Chun, Chang, & Chen, Fl. Hainanica 1: 359. t. 183. 1964; Jacobs & Moore, Fl. Males. ser. 1, 7: 197. f. 5 & 6. 1971; Bennett, Nuytsia 1: 227. 1972. Adams in Briggs *et al.*, Fl. Austral. 8: 102. 1982. —*Viola enneasperma* L., Sp. Pl. 2: 937. 1753. —*Ionidium enneaspermum* (L.) Vent., Jard. Malm. sub. t. 27. 1803; Merr., En. Philip. 3: 106. 1923.

Viola suffruticosa L., Sp. Pl. 2: 937. 1753. —*Ionidium suffruticosum* (L.) Roem. & Schultes, Syst. Veg. 5: 394. 1819; Ging. in DC., Prodr. 1: 311. 1824; Hook. f. & Thoms in Hook. f., Fl. Brit. Ind. 1: 185. 1872. —*Hybanthus suffruticosus* (L.) Baill., Bot. Med. 2: 841. 1884; Back & Aakh. f., Fl. Java 1: 194. 1963.

Ionidium heterophyllum Vent., Jard. Malm. 1: sub. t. 27. 1803. —*Hybanthus heterophyllum* (Vent.) Baill., Bot. Med. 2: 841. 1884.

Plants diffuse or suberect, well branched with a somewhat woody base, 10–20 cm tall, subglabrous. Leaves alternate, scattered, sessile or nearly so, very narrowly lance-elliptic, 8–20 mm long, 2–3.6 mm wide, midrib distinct on both leaf surfaces, the apex acute with a mucro, margins very remotely crenulate, serrulate, or subentire, the base narrowly cuneate. Stipules in pairs, hyaline, adpressed against stems, persistent, triangular-ovate, 1–1.5 mm long, 0.4–0.5 mm wide, with a gland-tip. Flowers many, solitary in upper axils, zygomorphic; peduncles 4–13 mm long, 1-flowered; pedicels 1.5–3.5 mm long; bracteoles in pair at the the joint of peduncle and pedicel, hyaline, triangular-ovate, ca. 0.7–0.8 mm long, 0.4–0.5 mm wide, with an elongate-acuminate apex, persistent on summit of peduncle. Sepals free, somewhat succulent, lanceolate and carinate, slightly unequal, 2–3.2 mm long, 0.7–1 mm wide, green, persistent, apex narrowly acute to acuminate, margins entire, hyaline. Corolla of 5 free petals. Anterior petal 9–11 mm long, broadly spatulate, prominently clawed between laminar and basal spur; the lamina suborbicular to reniform, ca. 5.5–7 mm long, 5–9 mm wide, blue-violet, prominently 3-veined, the apex rounded to retuse,

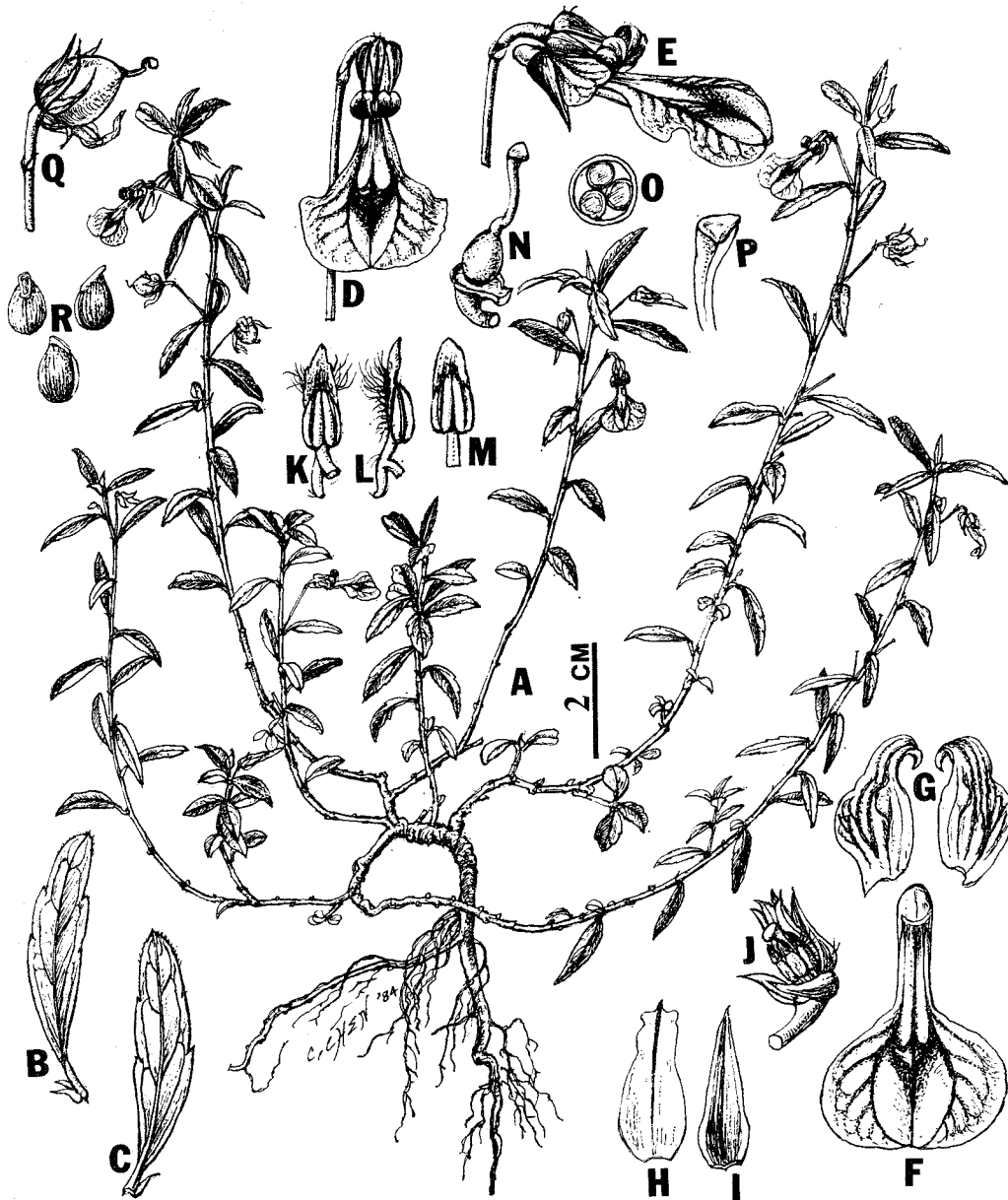


Fig. 1. *Hybanthus enneaspermus* (L.) F. Muell. A. Habit. B. Leaf, adaxial surface. C. Leaf, abaxial surface. D. Flower, front view. E. Flower, side view. F. Anterior petal. G. Inner pair of lateral petals. H. Outer lateral petal. I. Sepal. J. Flower, partly dissected to show androecium and stigma. K. Anterior stamen, adaxial view. L. Anterior stamen, lateral view. M. Posterior stamen. N. Flower, partly dissected to show pistil. O. Ovary, cross section. P. Stigma. Q. Fruit. R. Seeds. All from Peng 7167, HAST (Herbarium, Academia Sinica, Taipei).



a



b

Fig. 2-a, b. *Hybanthus enanespermus* (L.) F. Muell. in its natural habitat at Maopitou, Kenting Co., Taiwan.

with a mucro; the claw ca. 4 mm long, canaliculate, yellowish, puberulous on inner surface; spur ca. 0.5-1.5 mm long, densely puberulous on inner surface. Lateral petals of 2 dissimilar pairs: 2 outer petals oblong-lanceolate, subequal to the length of sepals, ca. 2-3 mm long, 1.2 mm wide, whitish, the midrib greenish, tinged with red at tip, the apex abruptly narrowly acuminate; 2 inner petals lanceolate-falcate, ca. 4-5 mm long, 1.2-2 mm wide, greenish at base, violet on the veins and the recurved terminal part, with a small, longitudinal wrinkle in the center of adaxial surface. Stamens 5, dimorphic, filaments ca. 0.5-0.6 mm long, green, glabrous (bearing dorsally an elongate, recurved, fleshy, nectariferous appendage ca. 0.7-0.9 mm long in each of the 2 anterior stamens); anthers connivent, erect, bilocular, ovate-oblong, ca. 0.7-1 mm long, 0.5-0.6 mm wide, yellow, introrse, dehiscent longitudinally; the terminal connective appendages ca. 0.5-0.8 mm long, 0.5-0.6 mm wide, membranous, orange, glabrous (densely white-lanate abaxially in 2 anterior stamens); connectives green, glabrous (white-lanate abaxially in 2 anterior stamens). Ovary ovoid-globose, ca. 0.85-1 mm in diameter, green, tricarpellate, unilocular; style sigmoid-clavate, ca. 1.4-1.5 mm long, white; stigma anticous, triangular, white. Capsules coriaceous, subglobose, ca. 4-5 mm in diameter, yellowish, glabrous, loculicidally and elastically 3-valvate, the valves carinate. Seeds 5-12, ovoid, ca. 1.9-2 mm long, 1.2-1.3 mm wide, yellowish, longitudinally ribbed, truncate at base, raphes white-arillate, topped by a shallow crater.

Distribution. Throughout tropical Africa, in Madagascar, Arabia, scattered in India, Sri Lanka, eastward to Indochina, S.E. China (Guangdong and Hainan), southward through the Philippines, Borneo, E. Java, New Guinea, to tropical Australia (Robson, 1958; Jacobs & Moore, 1971). Our collection represents a new record for both the genus and the species in Taiwan, and a range extension for this species to the northeast.

Specimen examined. TAIWAN: Pingtung Co.: Maopitou, Hengchun, 21°55'N-120°44'E. August 23, 1984. Peng 7167 (Herbarium, Academia Sinica, Taipei).

Habitat. On shallow soil of coastal coral cliff, often scattered in somewhat bare sites of open grasslands, with a typical monsoon climate locally. Associated with *Corchorus aestuans* L. var. *brevicaulis* (Hosok.) Liu & Lo, *Cymbopogon tortilis* (Presl) A. Camus, *Cynodon dactylon* (L.) Pers., *Eleusine indica* L., *Euphorbia garanbiensis* Hayata, *Evolvulus alsinoides* L., *Fimbristylis ovata* (Burm. f.) Kern, *Glossogyne tenuifolia* (Labill.) Cass., *Indigofera byobiensis* Hosok., *Ixeris chinensis* (Thunb.) Nakai, *Justicia procumbens* L. var. *hayatai* (Yamamoto) Ohwi, *Lepturus repens* (G. Forst.) R. Br., *Murdannia angustifolia* (N.E. Brown) Hara, *Portulaca insularis* Hosok., and *Tephrosia obovata* Merr.

Cytology. Of the some 150 species of *Hybanthus* in the world (Airy Shaw, 1973), 12 species and two additional subspecies have been studied cytologically. Two basic chromosome numbers, $X = 4$ and $X = 6$, have been established for this genus

(Bennett, 1972).

Australian populations of *Hybanthus enneaspermus* were determined as being tetraploid with $n = 8$ and $2n = 16$ (Bennett, 1972). Reports of Gupta & Srivastava (1971, as *Ionidium heterophyllum*), Sarkar, Datta, Raychodhury, & Das (1975, as *Ionidium heterophyllum*), Sanjappa (1979, as *Ionidium suffruticosum*), and Sarkar, Chakraverty, Das, Pal, & Hazara (1980), however, indicated unanimously that Indian populations of this species are octoploid with the gametic chromosome number of $n = 16$. A similar octoploid count of $2n = 32$ was reported by Mangenot & Mangent (1962) on plants from tropical Africa.

In the present study we have examined both the meiosis and mitosis of our collection from Taiwan. For meiotic observation, flower buds were squashed in FLP orcein (Jackson, 1973) after they had been fixed in a 3:1 (v:v) mixture of 95% ethanol and glacial acetic acid. Somatic chromosome counts were obtained from actively growing root tips which were pretreated for 3-4 hours in 8-hydroxyquinoline, then fixed as above for at least 10 minutes. The root tips were then hydrolyzed in 1N HCl for 5 minutes at 60°C, and squashed in the FLP orcein. Our study gives tetraploid counts of $n = 8$ (Fig. 3-a) and $2n = 16$ (Fig. 3-b) for Taiwanese population of *Hybanthus enneaspermus*, which are in agreement with those of the Australian populations. The karyotype is relatively symmetric, having mostly metacentric to submetacentric chromosomes. Somatic chromosomes are small, ranging from 1.5 to 2.5 μ in length.

It is not surprising to observe differences in chromosome ploidy level in populations of such a widespread and variable species. Many more samplings of

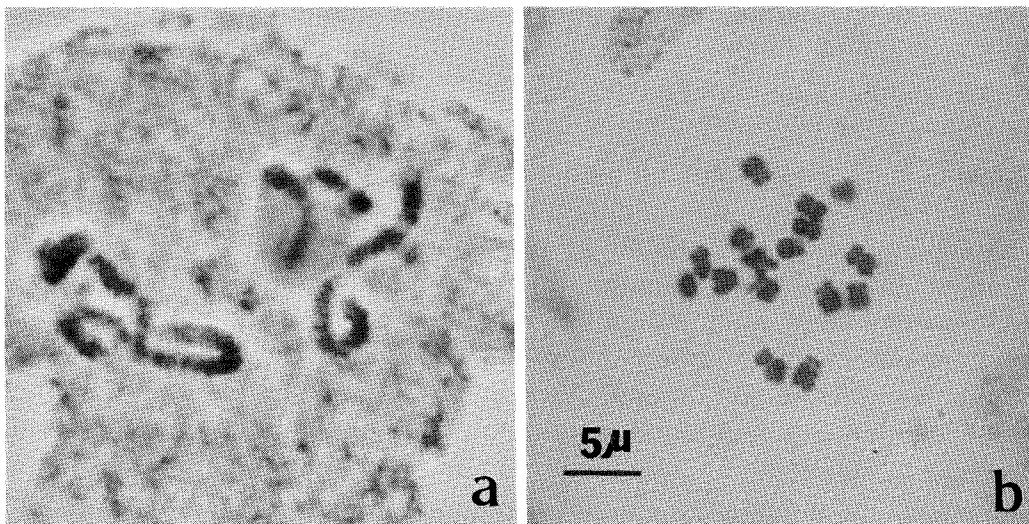


Fig. 3. Chromosomes of *Hybanthus enneaspermus* (L.) F. Muell. — a. Late pachytene, $n = 8$. — b. Mitotic metaphase, $2n = 16$. Both from Peng 7167.

populations throughout its distribution range, however, are needed to understand the cytogeography of this highly variable species.

Medicinal uses. *Hybanthus enneaspermus* is apparently a versatile herb. Roots of several species of *Hybanthus* store inulin-like fructans instead of starch (Kraus, 1879, *vide* Jacobs & Moore, 1971). Roots of *H. enneaspermus* are used in India to cure diseases of the urinary organs, and the leaves as an external application (Maiden, 1889). In association with some mild oil the tender stalks and leaves are used in India in preparing a cool liniment for the head (Raju, 1958). The plant is sold in medicine markets in S. Nigeria; it is added to food for pregnant and parturient women in order to strengthen the child and to prevent after effect (Dalziel, 1937).

Notes. In addition to Maopitou, *Hybanthus enneaspermus* is also known to occur at Fengchueisha (literally, "Wind-blown sand"), also on coral cliff, in the other southern cape, and on the summit of Tachienshan (literally, "Large, steep mountain"; elev. ca. 280 m) at the Kenting National Park (*vide* T. T. Lin & S. Y. Lu of the Taiwan Forestry Research Institute, 1958).

When in full bloom in the morning, the plant becomes highly visible because of its colorful and unique anterior petals (Fig. 2-a, b). The petals, however, wither in the afternoon at around 12-1 p. m.; without the petals, the low-lying *H. enneaspermus* is well hidden among other plants. Some local inhabitants at Maopitou say they have observed plants of this species from childhood some 30-40 years ago. *Hybanthus enneaspermus* is not a weedy species with strong dispersal mechanisms. It seems reasonable to believe that it has simply been overlooked by botanists previously, and is not of recent introduction to Taiwan.

Hybanthus enneaspermus appears to be perennial in the field, having suffruticose stem base. But plants brought back to the experimental greenhouse of the Academia Sinica, Taipei, failed to survive the cool and rainy winter of northern Taiwan. *Hybanthus enneaspermus* is undoubtedly a very rare and attractive species that adds to the beauty of Taiwan, and should be protected from being threatened. As it grows in scenic areas of Kenting National Park, which attracts numerous visitors throughout the year, care should be taken that the handsome little plants of *Hybanthus* are not casually collected or treaded over by tourists.

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臺灣新紀錄屬植物—鼠鞭草

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鼠鞭草(*Hybanthus enneaspermus* (L.) F. Muell.) 爲堇菜科 (Violaceae) 植物，分佈於非洲、澳洲以及亞洲熱帶地區，在中國產於廣東省及海南島。晚近在臺灣南部墾丁國家公園發現其族群，而爲臺灣植物新添一屬。本文除對其分類特徵及生態環境加以描述、提供檢索表以與同科之堇菜屬 (*Viola*) 加以區別外，並報導其染色體特徵及醫藥用途。鼠鞭草花形可愛、顏色艷麗，惟生長於遊客甚衆之風景區，有關機構宜加保護，以免其族群趨於式微。

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