

Cymbidium macrorhizon Lindl., a newly recorded
mycoheterotrophic orchid in Taiwan

臺灣新紀錄真菌異營性蘭科植物—大根蘭

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Abstract

Cymbidium macrorhizon Lindl., a mycoheterotrophic orchid, was recently found in southeastern Taiwan. It can be easily distinguished from other congeners by its lack of green leaves and pseudobulbs, but with large rhizomes. A description, illustration, and color photos of the plant are provided in this paper.

摘要

本文報導近期發現於台灣東南部之新紀錄真菌異營性蘭科植物—大根蘭。本種與其他蕙蘭屬成員的區別特徵為缺乏綠色葉片及假球莖，但具明顯的根莖。本文提供大根蘭的描述、手繪圖和彩色照片以供鑑定之用。

keywords : *Cymbidium*, *Cymbidium macrorhizon*, mycoheterotrophy, new record, Orchidaceae, Taiwan.

關鍵詞：蕙蘭屬、大根蘭、真菌異營性、新記錄、蘭科、臺灣

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Introduction

Cymbidium Sw. (Orchidaceae) is one of the most attractive and desirable genera of orchids in the world because of their showy and fragrant flowers. The genus consists of 52 species mainly distributed in Southeast Asia (Du Puy and Cribb 2007), of which nine species and four varieties are native to Taiwan (Su 2000). Within the genus, *Cymbidium macrorhizon* Lindl. is unique by its lack of green leaves and pseudobulbs, but with large rhizome when compared with other congeners.

Though some green parts of *C. macrorhizon* Lindl. are observed during flowering, recent studies demonstrated that this species is fully mycoheterotrophic by the measurement of natural ^{13}C and ^{15}N contents, the proxy for the level of heterotrophy (Motomua *et al.*, 2010). Recently, *C. multiradicatum* Z.J. Liu & S.C. Chen was described from China as another mycoheterotrophic *Cymbidium* species (Liu and Chen, 2004). However, this is questionable for it possesses autotrophic roots and green fruits as Du Puy and Cribb mentioned (2007).

Cymbidium macrorhizon Lindl. is widely but disjunctively distributed from Pakistan eastwards to Japan and the Ryukyus. The

species' distribution in Taiwan was not documented (e.g. Su 2000; Liu *et al.* 2006, 2009), except in the monographs of Du Puy and Cribb (1988, 2007). However, Ying (1990) questioned Du Puy and Cribb's conclusion because no voucher was cited in their publications (Du Puy and Cribb 1988, 2007).

On October, 2009, we collected an unknown orchid in southeastern Taiwan. Based on its heterotrophic and morphological traits, the newly found plant was carefully determined to be *C. macrorhizon* Lindl. As such, our discovery becomes prove that *C. macrorhizon* Lindl. exists in Taiwan. Herein, we provide a description, line drawing and color photos of the species.

Taxonomy Treatments

Cymbidium macrorhizon Lindl., *Gen. Sp. Orchid. Pl.* 162. 1833.

Yoania aberrans Finet, *Bull. Soc. Bot. France* 47: 274. 1900.

Cymbidium aberrans (Finet) Schltr., *Repert. Spec. Nov. Regni Veg. Beih.* 4: 264. 1919.

Cymbidium macrorhizon var. *aberrans* (Finet) P.J. Cribb et Du Puy, *Gen. Cymbidium*, ed. 2: 330. 2007.

大根蘭 Figs. 1-3

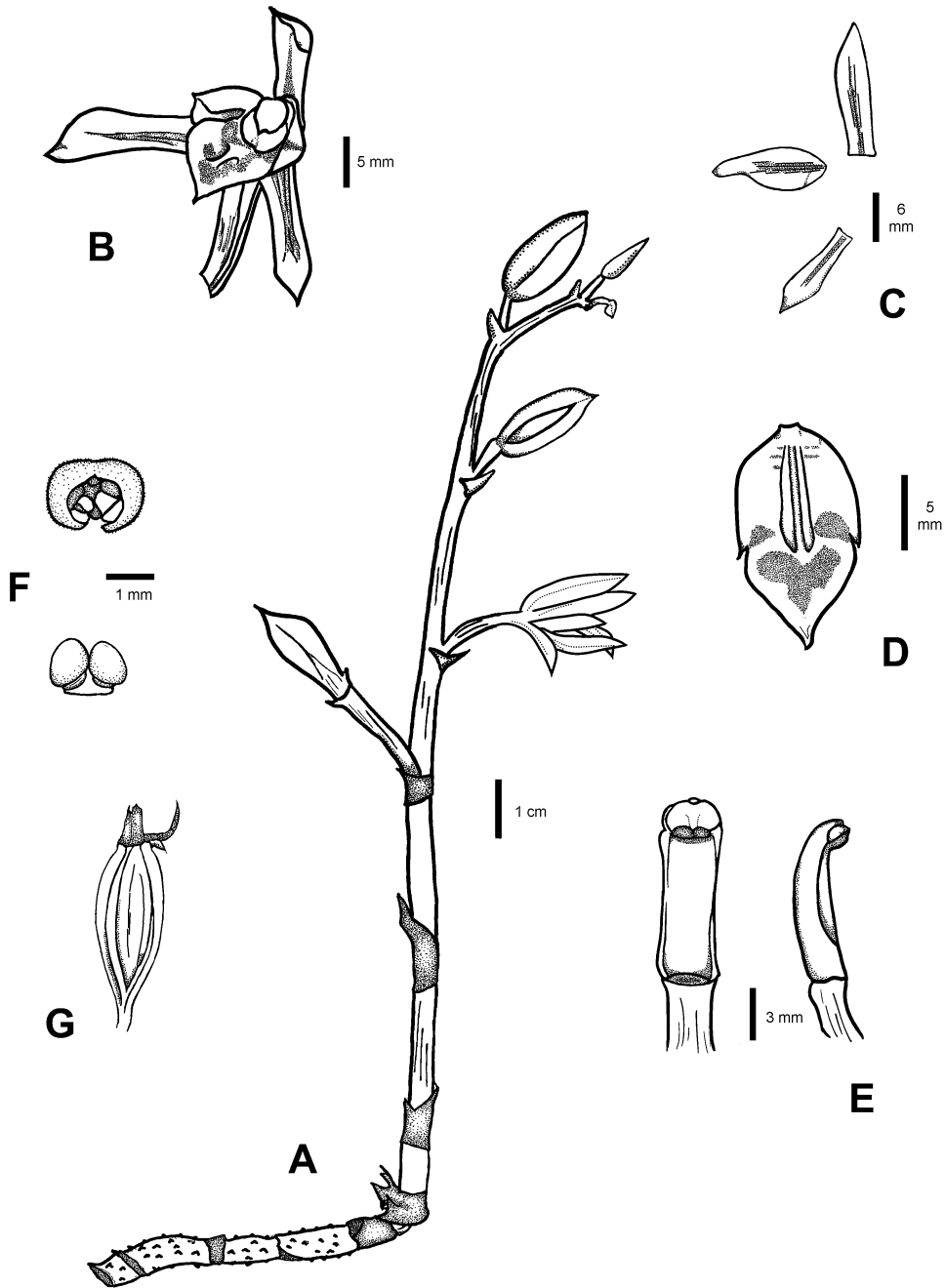


Fig. 1. *Cymbidium macrorhizon* Lindl. A: Habit. B: Flower. C: Sepals and lateral petal. D: Lip (flattened). E: Column. F: Anther and pollinia. G: Capsule.



Fig. 2. *Cymbidium macrorhizon* Lindl. A: Habit. B: Flower. C: Capsule.

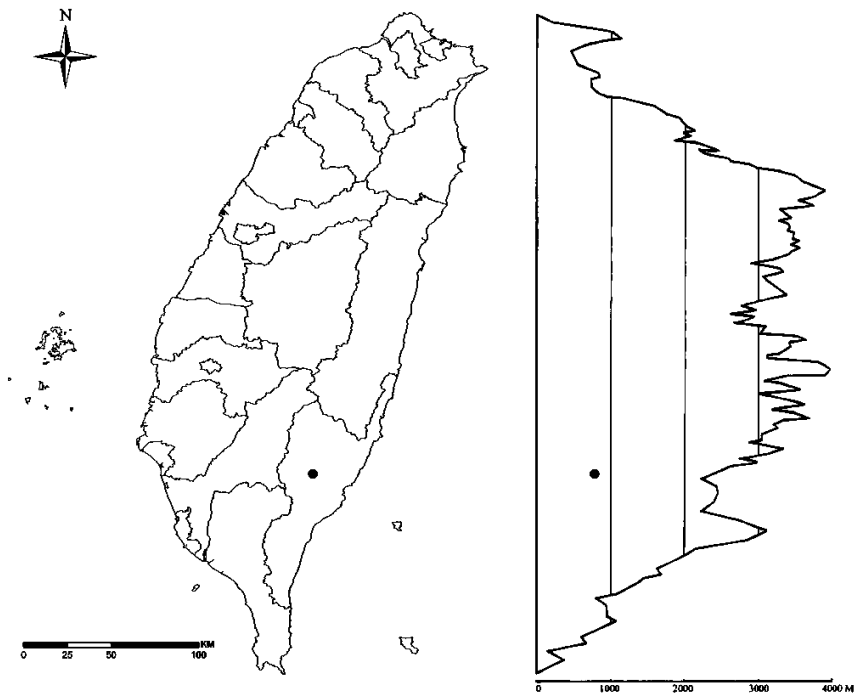


Fig. 3. Distribution map of *Cymbidium macrorhizon* Lindl. in Taiwan.

Small, terrestrial herbs, only visible above ground in flowering. Root nearly absent. Rhizome subterranean, fleshy, whitish, ca. 8 mm in diameter, tuberculate. Tubercles closely spaced, with short hairs or scales. Scales scarious, often disintegrating leaving an indistinct scar. Pseudobulb and leaf absent. Scape 15-20 cm long, erect, with 3-6 flowers, usually terminal on rhizome; peduncle covered with (1-)4 sheaths above ground; sheaths 13-27 mm long, ovate, with a cylindrical sheathing base and a loosely sheathing; bracts 2-17 mm long, oblong to lanceolate, acute, somewhat keeled, becoming scarious. Flower 3-4 cm across; rachis, pedicel and ovary 10-20 mm long, pale green to cream, often tinged with pink or purple. Tepals cream to pale yellow or brownish-pink with a diffuse, central, purple-red stripe to near the apex. Sepals ca. 15 mm long, narrowly obovate to oblanceolate, acute; Petals ca. 14 mm long, narrowly elliptic, oblique, acute, usually porrect and covering the column. Lip ca. 14 mm long when flattened, rhombic or ovate to oblong in outline, subentire 3-lobed; side-lobes minute, acute to subacute at the apex; mid-lobe triangular, acute to obtuse, the margin usually slightly undulating; callus ridges 2, convergent towards the apex, forming a tube-like structure at the base of the mid-lobe; white with purple-red spots on the mid-lobe and purple-red spots or stripes on the side-lobes; callus ridges white, sometimes pink. Column ca. 10 mm long, slender, arching, narrow; white, or slightly purple-pink above; anther-cap cream; pollinia 4, broadly ovate, in two unequal pairs. Capsule fusiform to

ellipsoidal, pedicellate, erect.

Phenology: Flowering June to October. Fruiting August to November.

Distribution: Pakistan, N India, Myanmar, SE China, Thailand, Laos, Vietnam, Korea, Japan, and the Ryukyus; Taiwan, at low altitudinal mountains about 800 m in southeastern part of the island, under pine or broad-leaf forests.

Specimens examined: TAIWAN: Taitung Co.: Neibenlu ancient trail, ca. 800m, Nov. 11, 2009. *Yang, C.-J.* 330, 559 (TNU); same loc., Jul. 21, 2010. *Yang, C.-J.* 694 (TNU).

Notes: *Cymbidium macrorhizon* Lindl. was sometimes regarded as two species, *C. aberrans* (Finet) Schltr. and *C. macrorhizon* Lindl. (e.g. Motomua *et al.* 2010). The former differs from the latter in lacking purple coloration on whole plant, having not fully open flowers, and having an almost entire lip. Our discovered plant in Taiwan displays the intermediate morphology. To be more precisely, the open degree of flower and lip shapes of the newly found plant are closer to that of *C. aberrans* (Finet) Schltr., whereas the floral coloration are closer to that of *C. macrorhizon* Lindl. Regardless of the taxonomic issues of the species, the plant we found in Taiwan is herein recognized as *C. macrorhizon* Lindl. in a broad sense.

In Taiwan, the newly recorded species was first collected in late October, 2009 when it was

at the end of the flowering season and only few individuals were found. We revisited the same locality in July 2010 and estimated that their wild individuals might be fewer than 50. Considering the confined distribution and small population size, this species was assessed as Critically

Endangered (CR) in Taiwan according to the criteria of IUCN (2001). In Japan, the species was also included in the red list and categorized into Endangered (EN) (Yahara and Nagata 2003).

Table 1. Overview of newly discovered mycoheterotrophic plants in Taiwan in recent years

taxa	References
Burmanniaceae	
<i>Burmannia cryptopetala</i> Makino ^b	Hsu et al., 2005
<i>Thismia huangii</i> P.Y. Jiang & T.H. Hsieh ^a	Chiang and Hsieh, 2011
<i>Thismia taiwanensis</i> S.Z. Yang, R.M.K. Saunders & C.J. Hsu ^a	Yang et al., 2002
Orchidaceae	
<i>Aphyllorchis rotundatipetala</i> C.S. Leou, S.K. Yu & C.T. Lee ^a	Hsieh et al., 2013
<i>Didymoplexis micradenia</i> (Rchb.f.) Hemsf. ^b	Hsu and Chung, 2007
<i>Epipogium aphyllum</i> (F. W. Schmidt) Sw. ^b	Chung and Tzeng, 2001
<i>Epipogium kentingensis</i> T.P. Lin & S.H. Wu ^a	Lin and Wu, 2012
<i>Gastrodia albida</i> T.C. Hsu & C.M. Kuo ^a	Hsu and Kuo, 2011
<i>Gastrodia callosa</i> J.J. Sm. ^b	Hsu and Kuo, 2010
<i>Gastrodia clausa</i> T.C. Hsu, S.W. Chung & C.M. Kuo ^a	Hsu et al., 2012
<i>Gastrodia confusoides</i> T.C. Hsu, S.W. Chung & C.M. Kuo ^a	Hsu et al., 2012
<i>Gastrodia flexistyla</i> T.C. Hsu & C.M. Kuo ^a	Hsu and Kuo, 2010
<i>Gastrodia nipponica</i> (Honda) Tuyama ^b	Hsu and Kuo, 2010
<i>Gastrodia shimizuana</i> Tuyama ^b	Chung and Hsu, 2006
<i>Gastrodia sui</i> C.S. Leou, T.C. Hsu & C.L. Yeh ^a	Yeh et al., 2011
<i>Gastrodia theana</i> Aver. ^b	Hsieh et al., 2012
<i>Gastrodia uraiensis</i> T.C. Hsu & C.M. Kuo ^a	Hsu and Kuo, 2010
<i>Lecanorchis amethystea</i> Y. Sawa, Fukunaga & S. Sawa ^b	Hsu and Chung, 2010
<i>Lecanorchis nigricans</i> Honda var. <i>yakushimensis</i> T. Hashim ^b	Hsu and Chung, 2010
<i>Lecanorchis latens</i> T.P. Lin & W.M. Lin ^a	Lin and Lin, 2011
<i>Lecanorchis subpelorica</i> T.C. Hsu & S.W. Chung ^b	Hsu and Chung, 2010
<i>Lecanorchis suginoana</i> (Tuyama) Serizawa ^b	Hsu and Chung, 2009
<i>Lecanorchis trachycaula</i> Ohwi ^b	Hsu and Chung, 2010
<i>Lecanorchis virella</i> T. Hashim. ^b	Hsu and Chung, 2009
<i>Lecanorchis triloba</i> J. J. Sm. ^b	Hsu and Chung, 2009
<i>Yoania amagiensis</i> Nakai & F. Maekawa var. <i>squamipes</i> (Fukuyama) C.L. Yeh & C.S. Leou ^c	Yeh et al., 2006
Triuridaceae	
<i>Sciaphila arfakiana</i> Becc. ^b	Hsieh et al., 2003
<i>Sciaphila maculata</i> Miers ^b	Hsieh et al., 2003

^anew species; ^bnewly recorded; ^crediscovered.

Mycoheterotrophic plants are partly or entirely non-photosynthetic plants that obtain energy and nutrients from fungi. In the world, there are more than 400 fully mycoheterotrophic species from nine families in monocots and dicots (Lee Taylor 2004). In Taiwan, 36 fully mycoheterotrophic species from five families, i.e., Burmanniaceae, Orchidaceae, Petrosaviaceae, Pyrolaceae, and Triuridaceae, were formerly reported in *Flora of Taiwan* second edition (Boufford *et al.* 2003). Because fully mycoheterotrophic plants are only visible in a short period of time when their flowers or fruits emerge from the substrate, the discovery of this kind of plant often represents the effort of botanical inventory in a local region. Since the completion of *Flora of Taiwan* second edition in 2000, plant taxonomy and botanical inventory of Taiwan entered a new era. During the past decade, the fully mycoheterotrophic flora of Taiwan enriched rapidly, approximate 30 new species and new records have been added (Table 1). So far over 60 fully mycoheterotrophic species were recorded in Taiwan, which is concordant with the conclusion of Merckx *et al.* (2013) that Southeast Asia represents the highest diversity of fully mycoheterotrophic plants in the world.

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