Commelina erecta L. (Commelinaceae), a newly naturalized species in Taiwan

臺灣新歸化植物-直立鴨跖草(鴨跖草科)

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Abstract

This paper is a report of *Commelina erecta* L. (Commelinaceae), a plant species native to America, that is newly naturalized in Taiwan. It is found along roadsides and in parks at low altitudes in Taiwan. *Commelina erecta* can be distinguished from the endemic species *Commelina auriculata* by the stem habit and petal size in that the former has erect growth and lateral petals larger than 1.5 cm, while the latter is repent or procumbent and has lateral petals smaller than 1 cm. The description and photographs of this species are provided to add to the inventory of Taiwanese flora and for its identification.

Key words: *Commelina erecta*, Commelinaceae, naturalized plant, Taiwan

摘要

本文報導臺灣鴨跖草科的新歸化種－直立鴨跖草 (*Commelina erecta* L.)。此物種原產於美洲，在臺灣已分布全島低海拔道路邊或公園。本種與臺灣原生種耳葉鴨跖草的差異在於直立鴨跖草通常直立生長，側花瓣較大，約1.5 cm；耳葉鴨跖草通常匍匐或橫臥生長，側花瓣較小，約1 cm。本文提供此物種特徵描述和彩色照片，以增加臺灣的物種清單與鑑定之用。

關鍵詞：直立鴨跖草、鴨跖草屬、歸化植物、臺灣

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Introduction

The family Commelinaceae contains approximately 41 genera and 731 species (Christenhusz and Byng 2016), mainly distributed in tropical and warm temperate areas (Faden 1998). The genus *Commelina* L. is the largest genus in this family, comprising about 205 species (Govaerts 2009), which are distributed in tropical, subtropical and warm temperate areas, especially in Africa and Asia (Hutchinson and Dalziel 1954;

Mohsin *et al*. 1987; Faden 1998). Eight genera and 19 species have been found in Taiwan, including five species in the genus *Commelina*, namely, *C. auriculata*, *C. benghalensis*, *C. communis*, *C. diffusa*, and *C. paludosa* (Wang *et al*. 2000). In 2019, one unknown species of this family was found in Taiwan, such as the cities of Taipei, Taichung, Changhua, Chiayi and Kaohsiung, growing beside roads or wasteland. The morphology and habit of this plant were similar to that of the genus *Commelina*. Examination of the collected materials combined with information from published literatures (Faden 1998; Joseph and Nampy 2012, 2015; Lee *et al*. 2017; Hassemer 2018) revealed that this species is related to the genus *Commelina* on the basis of its terminal inflorescences, with 1–2 cincinni enclosed in folded spathes. The morphological characteristics of this newly naturalized species in Taiwan, *Commelina erecta* L., through photographs and detailed descriptions, are provided, together with a key to six *Commelina* species for identification.

Taxonomic treatment

Key of *Commelina* (Commelinaceae) in Taiwan

1. Spathes clustered……2
-1. Spathes single……3
2. Spathe surfaces ciliate… *C. benghalensis*
-2. Spathe surfaces glabrous…..*C. paludosa*
3. Spathe surfaces glabrous, 3 cm long or more…… *C. diffusa*
-3. Spathe surfaces pilose or puberulous, ≤ 3 cm long……4
4. Upper cincinnus exserted, male flower 1……*C. communis*
-4. Upper cincinnus lacking or vestigial……5
5. Spathe length < 2 cm, lower cincinnus 2–3 flowers, lateral petal length < 1 cm……*C. auriculata*
-5. Spathe length ≥ 2 cm, lower cincinnus 3–5 flowers, lateral petal length > 1.5 cm…… *C. erecta*

***Commelina erecta* L.**, Sp. Pl. 1: 41. 1753.

直立鴨跖草(Fig. 1)

Perennial herbs, 30–100 cm tall. Stems erect, rarely decumbent. Leaves alternate, linear, lanceolate or lanceolate–ovate, 3–7 × 1.3–2.5 cm, base rounded or acute, margin entire, apex acuminate, venation parallel, surface glabrous or puberulous; sheath cylindrical, with red stripes, pilose at margins, auriculate at apex. Inflorescences terminal to apparently terminal, cincinnus; spathes solitary, infundibuliform, obliquely obtriangular, 2–2.5 × 1.1–1.5 cm, margins longitudinally fused basally, surfaces pilose, pale green with darker green veins, sessile or subsessile, peduncle 5–6 mm long, upper

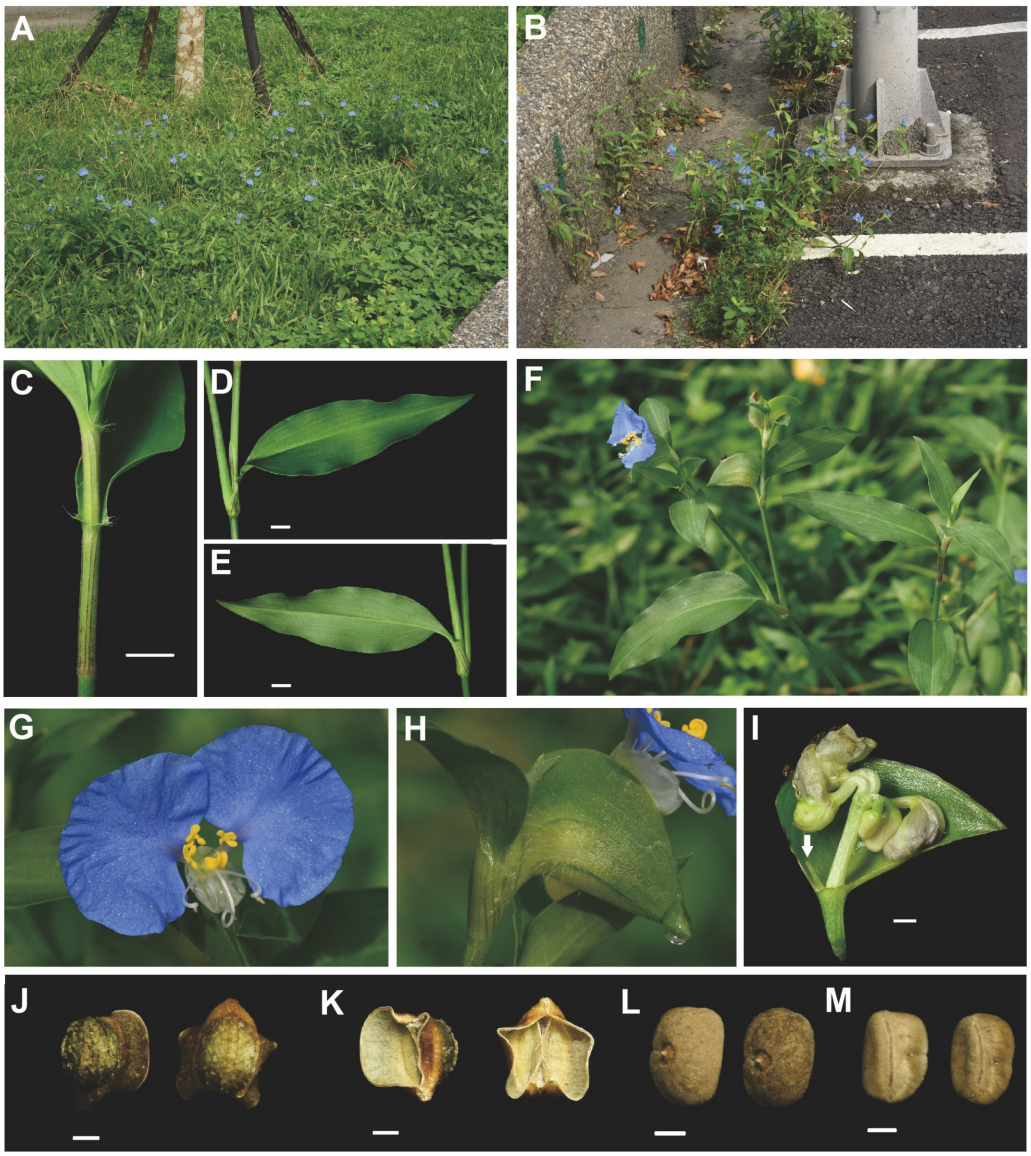

Fig. 1. *Commelina erecta* L. A and B, Habitat; C, Sheath, auriculate at the apex; D, Leaf, adaxial view; E, Leaf, abaxial view; F, Habitat; G, Corolla, face view; H, Inflorescence, spathes funnelform with puberulous surface; I, Inflorescence, upper cincinnus aborted (arrow), lower cincinnus with five flowers; J, Capsules, dorsal convex with farinose granules; K, Capsules, ventral planar and dehiscent; L, Seeds, adaxial view; M, Seeds, abaxial view. Scale bars: C–E = 5 mm; I = 2 mm; J–M = 1 mm.

Table 1. Spathe and cincinnus characteristics of the species in the genus *Commelina* in Taiwan

	Position	Number of spathe	Size (cm)	Shape	Pubescence	Length of peduncle (cm)	Upper cincinnus	Bisexual flowers number in lower cincinnus	References cited
C. auriculata	terminal	single	1–2	infundibuliform, obliquely obtriangular	pilose	0.5–1	lacking or vestigical	2–3	Wang *et al.* (2000)
C. benghalensis	terminal	clustered	0.5–1.7 × 0.5–1.2	cucullate	ciliate	absent	exserted or vestigial, male flower 1	2	Joseph and Nampy (2015)
C. communis	terminal	single	1.7–2.6 × 2.5	broadly cordate, folded	puberulous	1.7–2.5	exserted, male flower 1	1–3	Wang *et al.* (2000)
C. diffusa	opposed with leaf	single	3.5 × 1	conduplicate, acute at apex, cordate at base	glabrous	1.5	exserted, male flower 1 or 2	2–5	Joseph and Nampy (2015)
C. erecta	terminal	single	2–2.5 × 1.1–1.5	infundibuliform, obliquely obtriangular	pilose	5–6	aborted, lacking or vestigical	3–5	This study
C. paludosa	terminal	clustered	2–3 × 2–2.2	cucullate, acuminate at apex	glabrous	0.5	lacking	5–6	Joseph and Nampy (2015)

Table 2. Capsule and seed characteristics of the species in the genus *Commelina* in Taiwan

	Capsule		Seed					References cited
	Size (mm)	Shape	Number	Shape	Size (mm)	Colour	Ornamentation of testa	
C. auriculata	4	globose	2–3	reniform	2.8–3 × 2–2.4	brown or black	reticulate	Wang *et al.* (2000)
C. benghalensis	5–6 × 3–4	elliptic	5	ovoid	2 × 1.5	black-brown	white farinose	Joseph and Nampy (2012)
C. communis	6–7	ellipsoid	4	deltoid	2.5–3.5 × 2.5	brown	reticulate, scrobiculate	Wang *et al.* (2000)
C. diffusa	8–9 × 4–5	oblong	5	oblong	3–4 × 1.2	brown	white farinose	Joseph and Nampy (2012)
C. erecta	3.5–4 × 3	globose	1–2	oblong	3–3.5 × 2–2.5	brown	surface smooth to slightly granular	This study
C. paludosa	4 × 3	obovoid	3	ellipsoid	3–4 × 2.5	dark brown	white farinose	Joseph and Nampy (2012)

cincinnus aborted, lacking or vestigial, lower cincinnus with 3–5 flowers. Flowers bisexual, zygomorphic, rachis 8 mm long; sepals triangular, 4 × 2.5 mm, petals 3, free; lateral petals 2, broadly rounded-ovate, 1.5–1.7 × 1.7–2.3 cm, base clawed, 4–5 mm long, indigo; medial petal 1, small, 4–5 × 6–7 mm, white; staminodes 3, 6–7 mm long, cruciform, yellow; stamens 3, medial stamen 1, 8 mm long, with a larger anther, hastate, yellow; lateral stamens 2, 1.2–1.3 cm long, filament curling at apex, anther sagittate; filaments glabrous, white; style 1.4–1.5 cm long, curling at apex, glabrous, white; ovary green, 1 mm in diameter, 3-locular; pedicel 3–4 mm long. Capsules globose, 3.5–4 × 3 mm, 3-locular, 2-valved, ventral planar, dehiscent; dorsal convex, with farinose granules, indehiscent. Seeds 1–2, oblong, 3–3.5 × 2–2.5 mm, surface smooth to slightly granular, brown.

Distribution:

The species *C. erecta* is mainly distributed along roadsides and in divisional islands and parks at low altitudes in Taiwan.

Specimens examined: Changhua County: Changhua Coastal Park, *TESRI Team 952* (TAIE); Yuanlin, *T.-W. Hsu 11202* (TAIE). Pingtung County: Wandan Township, *P.-H. Chen and A.-C. Chung 2381* (PPI); Pingtung City, *P.-H. Chen and S.-Z. Yang 2423* (PPI); Chiuju Township, *P.-H. Chen and S.-Z. Yang 2424* (PPI); Fangliao Township, *P.-H. Chen and A.-C. Chung 2516* (PPI); Fangshan Township, *P.-H. Chen and A.-C. Chung 2517* (PPI); Hsinpi Township, *P.-H. Chen and A.-C. Chung 2518* (PPI); Neipu Township, *P.-H. Chen 2519* (PPI).

Discussion

This plant was found in the south in this study. Later, some people began to post this unknown species on the Internet, but they were all identified as *C. auriculata*. When examining the specimens of the major herbaria (e.g. TAIF, HAST, TAIE, and TNM), this species was identified as *C. auriculata* from 2003, demonstrating that this plant had invaded Taiwan for a long time.

According to the evolutionary relationships of some species of the genus *Commelina* reported by Lee *et al*. (2017), *C. auriculata*, *C. benghalensis* and *C. suffruticosa* are in the same clade with *C. erecta*. Moreover, *C. auriculata* is sister to the clade of *C. erecta* and *C. suffruticosa*; *C. benghalensis* is sister to the above three species. *C. suffruticosa* is not found in Taiwan. Therefore, *C. benghalensis* and *C. auriculata* have the nearest evolutionary relationship with *C. erecta* in the genus

Commelina in Taiwan. *C. benghalensis* has oval or subrounded leaves, which are distinguishable from those of *C. erecta* and *C. auriculata*. The sheath is auriculate at the apex (Fig. 1C), the spathes are funnelform (Fig. 1H) and the upper cincinnus is aborted (Fig. 1I); these characteristics are more similar between *C. erecta* and *C. auriculata.* The difference between *C. erecta* and *C. auriculata* is that the former usually grows erect (Fig. 1A, B) and has lateral petals measuring 1.5–1.7 × 1.7–2.3 cm (Fig. 1G), while the latter is usually repent or procumbent, with lateral petals measuring 0.5–0.7 × 0.8–1.1 cm.

The diagnostic characteristics of the spathe (Fig. 1H, I), length of the peduncle and nature of cincinni can be used to distinguish *Commelina* species (Joseph and Nampy 2015). The characteristics of the six species in the genus *Commelina* in Taiwan are summarized in Table 1. The features of capsules (Fig. 1J, K) and seeds (Fig. 1L, M) are also useful for the identification of the species of the genus *Commelina* (Joseph and Nampy 2012). The capsule and seed characteristics of the six species of *Commelina* in Taiwan are summarized in Table 2.

Commelina erecta is native to North and South America (Lee *et al*. 2017) and has a wide and cosmopolitan distribution, such as in neighboring Japan (Nakamura 2017). Its conservation status is least concern (LC) (Hassemer 2018). In Taiwan, *C. erecta* has been found along roadsides and parks and not in primary or secondary forest yet. From the ecological and taxonomic standpoints, it is important to monitor the expansion of this species in Taiwan.

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