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The Umbrella Sedge in Taiwan

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ABSTRACT: The umbrella sedge *Cyperus involucratus* was misidentified as *C. alternifolius* subsp. *flabelliformis* in Taiwan. The investigation of the status of the umbrella sedge is prompted by the recent discovery of *C. alternifolius* which was naturalized to eastern Taiwan. *Cyperus alternifolius*, though similar to *C. involucratus* in appearance, differs on the fine structure of achene surface, bract margin, etc. In this article, we report the newly naturalized plant, compare the differences of characteristics between the species, and provide the photos of habitat and fine structure for taxonomic identification.

KEY WORDS: ***Cyperus*, *Cyperus alternifolius*, *Cyperus involucratus*, naturalized plant, Taiwan, Taxonomy.**

INTRODUCTION

Cyperus alternifolius L. subsp. *flabelliformis* (Rottb.) Kukenth. was first introduced and planted in Taiwan by Tashiro Yasusada in 1901 from Japan as an ornamental plant (Chen and Hu, 1976). There was no record of planting or field collection on Taiwanese plant checklists, such as Matsumura and Hayata (1906), Kawakami (1910), Hayata (1917), Masamune (1936), until 1954 when Masamune listed and applied it in his *A List of Vascular Plants of Taiwan*. Koyama (1961) firstly pointed out that this species was cultivated and occurred abundantly in the wild in Taiwan. Consequently, this species was listed in *Flora of Taiwan* (Koyama, 1978) and *A List of Plants in Taiwan* (Yang, 1982). Recently, it was confirmed as a naturalized plant in Taiwan (Koyama, 2000; Yang, et al., 2002).

Recently we discovered a population of umbrella sedge in Baliwan Community of Fengbin Township, Hualian County, Taiwan, which is almost indistinguishable from *C. alternifolius* L. subsp. *flabelliformis* (Rottb.) Kukenth. After comparison with the study of Baijnath (1975), it was determined to be *C. alternifolius* L. Both subspeices of *C. alternifolius* are similar in appearance. *Cyperus alternifolius* is distinguished from *C. alternifolius* subsp. *flabelliformis* by the different achene morphology and the shape of spikelet. Baijnath (1975) pointed out that *C. alternifolius* subsp. *flabelliformis* should adopt the earlier Latin name *C. involucratus* Rottb., this opinion had been accepted by modern Flora scholars (Kukkonen, 2001; Tucker et al., 2002). In this paper, we follow Baijnath's opinion adopting the reported name *C. alternifolius* subsp. *flabelliformis* in Taiwan as *C. involucratus.* In addition, we propose *C. alternifolius* as newly naturalized umbrella sedge from eastern Taiwan.

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TAXONOMIC TREATMENTS

Comparison of *Cyperus alternifolius* L. and *Cyperus involucratus* Rottb.

As compared in terms of herbarium specimens, fresh material, habitat observation, and laboratory microscopy and SEM examination of microstructure, *Cyperus alternifolius* L. has the following differences from *Cyperus involucratus* Rottb. (Figs. 1-4; Table 1).

1. *Cyperus alternifolius* L., Mant. Pl.: 28. 1767; Koyama, Quart. Jour. Taiwan Mus. 14: 177. 1961; Baijnath, Kew Bull. 30(3): 521. 1975; Shimizu, Nat. Pl. Japan. 296. Pl. 159-4 & 5. 2003.
光桿輪傘莎草 Figs. 1, 3 & 5

Perennial herbs, 50-300 cm tall, rhizome white. Culms obtusely trigonous to subterete, glabrous, dark green, 3-7 mm wide. Leaves bladeless, reduced to sheaths; sheaths 10-30 cm long, pale green to light brown.

Anthela compound; 16 to 18, primary rays 7-10 cm long, patent; spikes bearing 4 to 9 spikelets; leafy bracts 11 to 18, 9.5-20 cm long, 1-14 mm wide, equal in length, spreading umbrella-like, margins sharply toothed, stiff, not nodding. Spikelets clustered at apex of raylets, linear, linear lanceolate, to lanceolate,

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Fig. 1. *Cyperus alternifolius* L. A: Habitat. B: Inflorescence and leafy bracts. C: Upper part of plant.

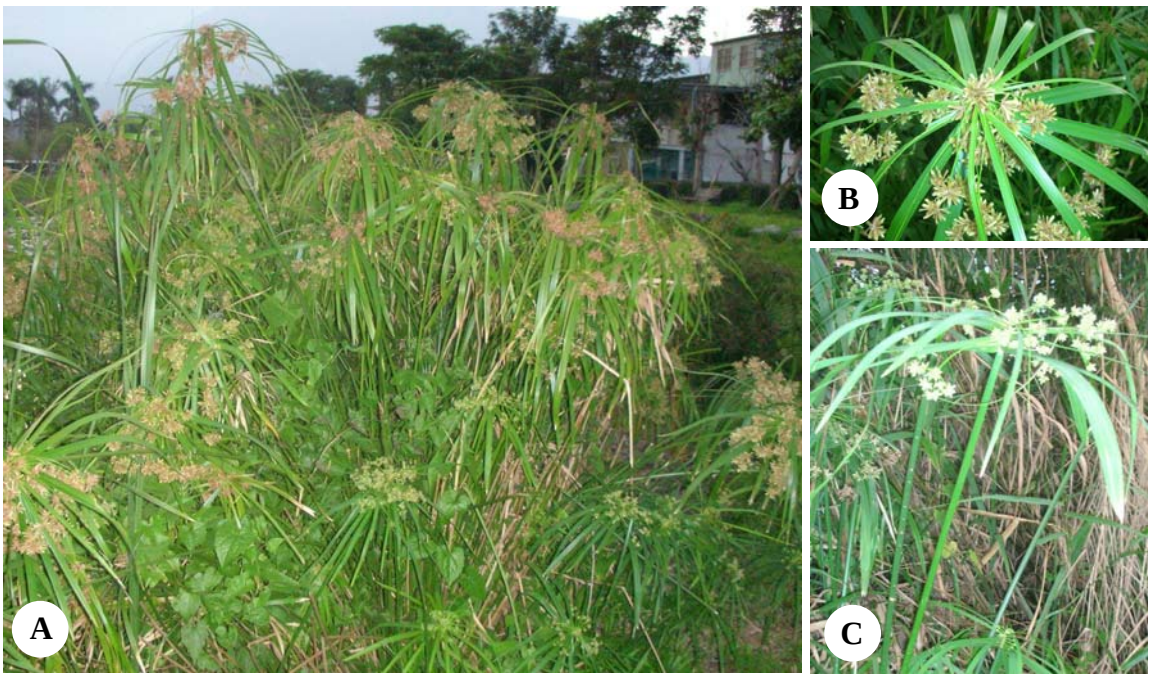


Fig. 2. *Cyperus involucratus* Rottb. A: Habitat. B: Inflorescence and leafy bracts. C: Upper part of plant.

flattened, 5-20 mm long, 1-1.5 mm wide, loosely 10-40 flowered, light green; rachilla wingless. Glumes ovate, acute at apex, 2 mm long, 0.8 mm wide, 3-nerved, membranaceous, pale-green, the midrib green. Stamens 3, anther linear, yellow, 1 mm long. Style 1 mm long, stigmas 3, 1 mm long, ovary trigonous, 0.8 mm long. Achenes trigonous, elliptic to ovate, 0.79 mm long, 0.48 mm wide, brown, reticulate-tuberculate, cell margin frilled; frills raised.

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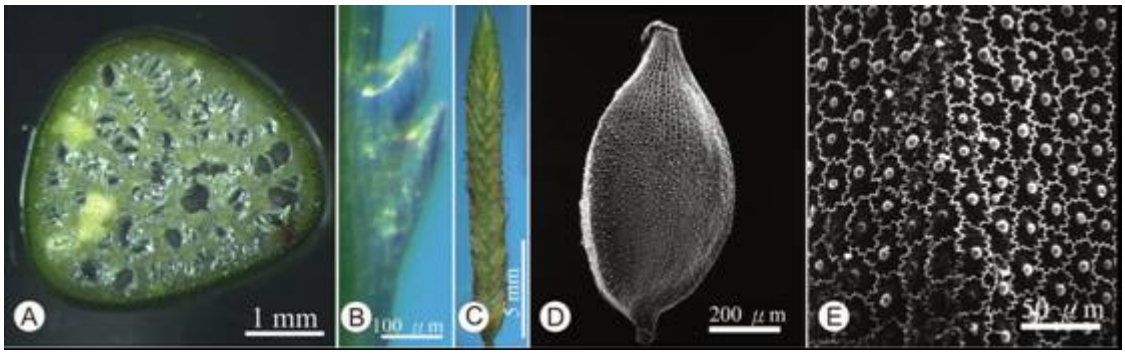


Fig. 3. *Cyperus alternifolius* L. A: Transection of culm. B: The margin of bract. C: Spikelet. D: Achene. E: Pericarp of achene (D, E, SEM photographs).

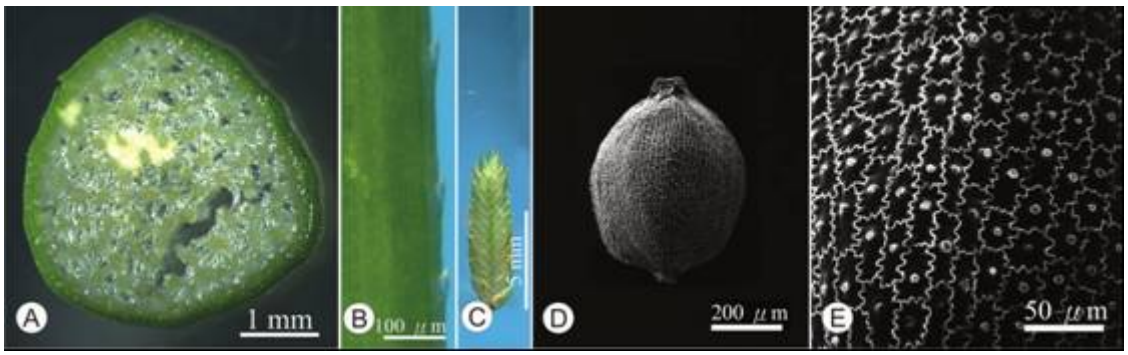


Fig. 4. *Cyperus involucratus* Rottb. A: Transection of Culm. B: The margin of Bract. C: Spikelet. D: Achene. E: Pericarp of achene (D, E, SEM photographs).

Table 1. Comparison of *Cyperus alternifolius* L. and *Cyperus involucratus* Rottb.

Characters	*Cyperus alternifolius* L.	*Cyperus involucratus* Rottb.
Culm	Obtusely trigonous to subterete, glabrous, dark green (Fig. 3A)	Trigonous, scabrous, green (Fig. 4A)
Bracts	Margins with conspicuous teeth under a stereomicroscope (Fig. 3B)	Margins with unconspicuous teeth under a stereomicroscope (Fig. 4B)
Spikelet	Linear, linear lanceolate, to lanceolate, loosely flowered, light green (Fig. 3C)	Lanceolate, narrowly oblong, to narrowly ovate, densely flowered, light green to rusty brown (Fig. 4C)
Glume	Pale-green	Rusty brown
Achene	Elliptic to ovate (Fig. 3D)	Broadly elliptic (Fig. 4D)
Pericarp of achene	Cell margin frilled (Fig. 3E)	Cell margin wavy (Fig. 4E)

Distribution: Africa, Madagascar (Baijnath, 1975. Koyama, 1961; 1977), Reunion (Baijnath, 1975).

Notes: *Cyperus alternifolius* is naturalized to Japan (Shimizu, 2003) and Taiwan. In Taiwan, *C. alternifolius* lives in wetlands beside the Bali River (Fig. 5). There is also *C. involucratus* present. Both species have been used by Amis tribesmen as mat material for nearly one hundred years. Though they are mixed in one habitat, there is no hybrid found.

Specimens examined: Hualien Co.: Fengbin Township, Baliwan Community, *Chen & Weng 85* (Herbarium, National Hualien University of Education; NHU).

2. ***Cyperus involucratus*** Rottb., Descr. Pl. Rar. Ic. Illustr., Progr.: 22. 1772; Baijnath, Kew Bull. 30(3): 522. 1975; Tucker, Syst. Bot. Monog. 2: 12. 1983; Tucker, Marcks and Carter, *Cyperus* in Fl. N. Amer. 23: 150. 2002. Roger, Fl. S. Australia 5: 534. 2005. 輪傘莎草 Figs. 2 & 4

Cyperus alternifolius L. subsp. *flabelliformis* (Rottb.) Kukenth, in Engler, Pflanzenr. 4(20), 101: 193. 1936; Backer and Bakhuizen van den Brink, Fl. Java. 3: 475. 1968; Koyama, Fl. Taiwan. 5: 270. 1978; Koyama, in M. D. and F. R. Fosberg(eds.), Fl. Ceylon. 5: 201. 1985; Koyama, Fl. Taiwan 5, 2nd ed.: 239. 2000; Kukkonen, in Ali and Qaiser, Fl. Pak. 206: 119. 2001.
Cyperus flabelliformis Rottb., Descr. Icon. Rar. Nov. Pl. 42, *t.12, f. 2.* 1773.
Cyperus alternifolius L. var. *flabelliformis* (Bockeler) T. Koyama, Quart. J. Taiwam Mus. 14: 177. 1961.

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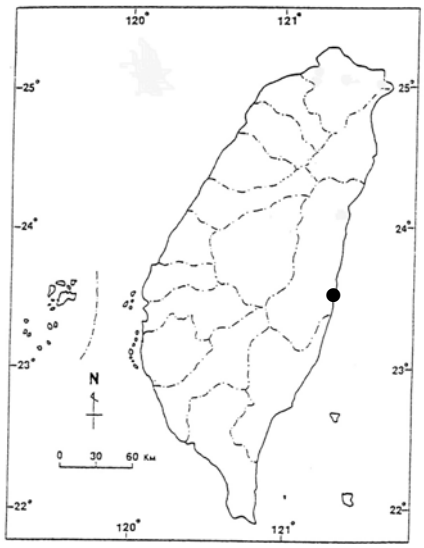


Fig. 5. Distribution map of *Cyperus alternifolius* L. (●) in Taiwan.

Perennial herbs, 50-180 cm tall, rhizome white. Culms trigonous, scabrous, green, 3-10 mm wide. Leaves bladeless, reduced to sheaths; sheaths 10-20 cm long, light brown.

Anthela compound; 16 to 18, primary rays 1-10 cm long, patent; spikes bearing 6 to 18 spikelets; leafy bracts 14 to 24, 10.5-30 cm long, 0.5-17 mm wide, equal in length, spreading umbrella-like, margins not sharply toothed, supple, nodding. Spikelets clustered at apex of raylets, lanceolate, narrowly oblong, to narrowly ovate, flattened, 3-12 mm long, 1.5-3 mm wide, densely 8-36 flowered, light green to rusty brown; rachilla wingless. Glumes ovate, acute at apex, 2 mm long, 1.1 mm wide, 3-nerved, rusty brown, the midrib green. Stamens 3, anther linear, yellow, 1 mm long. Style 1 mm long, stigmas 3, 1 mm long, ovary trigonous, 0.5 mm long. Achenes trigonous, broadly elliptic, 0.52 mm long, 0.47 mm wide, brown, reticulate-tuberculate, cell margin wavy; wave raised.

Distribution: Africa (Baijnath, 1975).

Notes: It is naturalized in other parts of the world through cultivation (Baijnath, 1975). In Taiwan it is distributed over the whole island.

Specimens examined: Hualien Co.: Shoufeng, 19 January 2005, *Zeng s. n.* (NHU); Hualien City, Fengchuan, 14 March 1991, Yech s. n. (NHU); Sincheng, Peipu, *Chen & Weng 6* (NHU). Yilan Co.: Nanao, Zhao-yang wetland, 2 January 2005, *Huang s. n.* (NHU). Taipei Co.: Wu-lai, Meng-meng-ku, 26 December 2000, *Lu s. n.* (HAST). Pingtung Co.: Keng-ting Park, *Kuoh 1018* (NTU); Keng-ting Beach, Wo-luan-pi, *Kuoh 1360* (NTU); Mutan, Kaoshih village, 7 December 1995, *Lin s. n.* (HAST); Manchou, between Nanjenshan and Wanliteshan, 30 April 2001, *Huang s. n.* (HAST).

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LITERATURE CITED

Baijnath, H. 1975. A study of *Cyperus alternifolius* L., sens. lat. (Cyperaceae). Kew Bull. **30**: 521-526.

Chen, T.-S. and T.-W. Hu. 1976. A List of Exotic Ornamental Plants in Taiwan. Self Published. Taipei, Taiwan. 514pp.

Hayata, B. 1917. Icones Plantarum Formosanarum. Taiwan Bureau of Industry. Taihoku (Taipei), Taiwan. pp. 89-93.

Henry, M. A. 1896. A list of the plants from Formosa with some preliminary remarks on the geography, nature of the flora and economic botany of the island. Trans. Asiat. Soc. Jap. 24. Suppl.: 102-104.

Kawakami, T. 1910. A List of Plants of Formosa. Taiwan Bureau of Industry. Taihoku (Taipei), Taiwan. pp. 131-132.

Koyama, T. 1961. Classification of the family Cyperaceae (3). Quart. Jour. Taiwan Mus. **14**: 159-194.

Koyama, T. 1977. Ceylon Cypereae. Gard. Bull. Singapore **30**: 127-146.

Koyama, T. 1978. *Cyperus*. In: Li, H.-L. et al. (eds.), Flora of Taiwan **5**: 270-271. Epoch Publishing Co., Ltd., Taipei, Taiwan.

Koyama, T. 1985. *Cyperus*. In: Dassanayake, M. D. and F. R. Fosberg (eds.), A Revised Handbook to the Flora of Ceylon. **5**: 167-215. A. A. Balkema, Rotterdam, The Netherlands.

Koyama, T., C.-S. Kuoh and W.-C. Leong. 2000. *Cyperus*. In: Huang, T.-C. et al. (eds.), Flora of Taiwan, 2nd ed. **5**: 237-253. Editorial Committee, Dept. Bot., NTU, Taipei, Taiwan.

Kukkonen, I. 2001. Cyperaceae. In: Ali, S. I. et al. (eds.). Flora of Pakistan **206**: 119-120. Dept. Bot. Univ. Karachi, Karachi and Missouri Bot. Press, MBG, St. Louis, Missouri, USA.

Masamune, G. 1936. Short Flora of Formosa. KUDOA, Taipei. Taiwan. pp. 249-250.

Masamune, G. 1954. A List of Vascular Plants of Taiwan. Hokurikunoshoku Butzunokai Press, Kanazawa, Japan. pp. 138-143.

Matsumura, J. and B. Hayata. 1906. Enumeratio Plantarum Formosanarum. J. Coll. Sci. Imp. Univ. Tokyo. **25**: 471-476.

臺灣大學學術期刊資料庫

Shimizu, T. 2003. Naturalized Plants of Japan. Heibonsha Ltd., Publishers, Tokyo, Japan. 337pp.

Tucker, G. C. et al. 2002. *Cyperus*. In: Flora of North America Editorial Committee. Flora of North America **23**: 150-151. Oxford University Press. New York, USA.

Yang, Y.-P., H.-Y. Liu and T.-P. Lin. 2002. Manual of Taiwan Vascular Plants **5**: 66-103. Council of Agriculture, Executive Yuan, Taipei, Taiwan.

Yang, T.-I. 1982. A List of Plants in Taiwan. Natural Publishing Co., LTD. Taipei, Taiwan. pp. 260-261.

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摘　　要

輪傘莎草在臺灣一直被鑑定為「*Cyperus alternifolius* L. subsp. *flabelliformis* (Rottb.) Kukenth.」，其正確學名應為「*Cyperus involucratus* Rottb.」。本研究同時發現新近歸化於東臺灣之光桿輪傘莎草 (新擬中名；*Cyperus alternifolius* L.)，其外形雖然與輪傘莎草酷似，但瘦果表皮、苞片外緣等微細構造有所不同。本文除報導新歸化種光桿輪傘莎草外，並列表比較光桿輪傘莎草與輪傘莎草之形態差異，同時提供生態及微細構造照片，做為鑑定之參考。

關鍵詞：莎草屬、光桿輪傘莎草、輪傘莎草、歸化植物、臺灣、分類。

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