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Euphorbia graminea Jacquin (Euphorbiaceae), A Newly Naturalized Plant in Taiwan

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ABSTRACT: *Euphorbia graminea* Jacquin, a species of the Euphorbiaceae native in Mexico, has naturalized in Pingtung county, southern Taiwan. *E. graminea* can be easily distinguished from the other species of genus *Euphorbia* as leaves are alternate, leaf-bracts are opposite and linear, seeds are ovate-rounded, angular and its surface are deeply punctate with pits in regular longitudinal rows. This paper provides a description of the species, line drawings and color photographs to aid in identification.

KEY WORD: naturalized plant, *Euphorbia graminea*, Euphorbiaceae, Taiwan, Taxonomy.

INTRODUCTION

Euphorbiaceae is a highly diversified family containing about 300 genera and 8,000 species, mostly distributed in tropical and subtropical regions (Webster and Bruch, 1967). The genus *Euphorbia* includes about 1,200 species and could migrate and occupy to newly disturbed locations. Among them, there are eight species recorded in Taiwan (Lin and Hsieh 1993), four species of them were naturalized, mainly from American and Africa (Wu *et al*., 2004). In 2004 we found two populations of *Euphorbia graminea* Jacquin, which is a native weed from southern Mexico and has spread as far as Central America to northern South America (Webster and Bruch, 1967).

TAXONOMY

Euphorbia graminea Jacquin, Sel. Stirp. Amer. 151, 1763; Webster and Bruch in Flora of Panama, Part VI, 334, 1967. 禾葉大戟 Fig. 1

Euphorbia picta Jacquin, Coll. 3: 178, 1790.

Perennial herb, 30-80 (150) cm high with milky juice, ascending or erect, stem pentagonal, glabrous to glabrescent, stipules none, with 1-2 gland. Leaves alternate, ovate-rounded to oblong, 17-40 (50) mm long, 10-20 (25) mm wide, acuminate to acute at apex, acute to obtuse at base, entire and ciliate, pubescent on both surface; petioles 8-13 (23) mm long, pubescent. Cyathia together with a peduncle cyme, and leaf-bracts opposite, linear or lanceolate, 20-30 mm long, 4-7 mm wide; involucres turbinate, 1-1.6 mm long, pubescent outside; petaloid appendage 2-4 (5), white, obcordate at apex, with gland inside; tip of involucral bract free,

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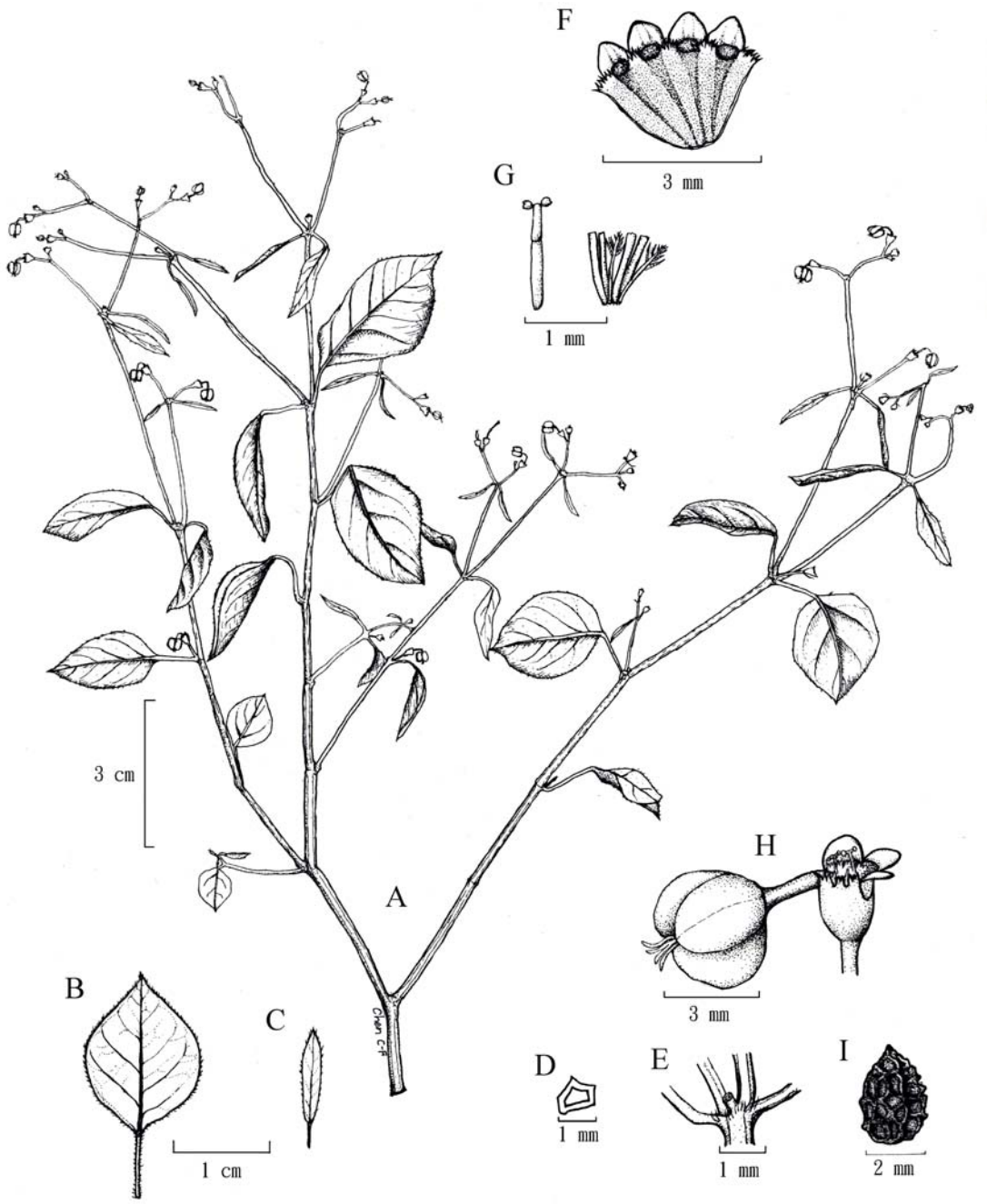

Fig. 1. *Euphorbia graminea* Jacquin. A: Habit. B: Leaf (lower leaf). C: Leaf-bract (upper leaf). D: Cross section of stem. E: Gland in the node. F: Dissected involucre show the petaloid appendage with gland inside and bracteole. G: Male flower and transparent silks. H: Cyathium. I: Seed.

alternate with petaloid appendage, lobed at apex; stamen 13-20, basifixed, inner filament ca. 1 mm, outer ones ca. 0.5 mm; anther yellow, 2 cells with transparent silks; female flower pedicel pubescent; ovary, 3 carpels, ca. 0.5 mm long, styles 3, each style 2-fid at apex, ca. 0.5 mm long. Capsules 2 mm long, 3 mm diam., exserted out of involucre, pedicel ca. 4 mm long, each carpel with 1 seed; seed 3, ca. 1.5 mm long, 1.3 mm diam., ovoid, grayish white, rugose, strongly angular, surface deeply punctate with pits in regular longitudinal rows.

Habitat: The first population of *E. graminea* was collected at the Hsien Rd. # 185 on the way to Nanhe village, Laiyi Hsiang, Pingtung county, southern Taiwan. The growth site is adjacent to Taiwan Sugar Corporation's sugarcane farm. This perennial herb grew at the roadside where the microhabitat had strong light intensity and dry soil and forced some individuals be semi-deciduous. The other population was found by the roadside in Xialiao Xiang, Chungtzu Hsiang (Figs. 2 & 3), adjacent to a pineapple farm, and sometimes grew in the farm or personal fish pool hedges. According to patches or clumps distribution in the field, the plant can regenerate either by seeds or by vegetative growth. The associated plants included *Abutilon indicum* (L.) Sweet, *Bidens pilosa* L. var. *minor* (Blume) Sherff, *Brachiaria mutica* (Forsk.) Stapf, *Cardiospermum halicacabum* L., *Chloris barbata* Sw., *Chamaesyce hyssopifolia* (L.) Snall., *Desmodium tortuosum* (Swartz.) DC., *Ipomoea obscura* (L.) Ker-Gawl., *Lantana camara* L., *Leucaena glauca* (L.) Benth., *Panicum maximum* Jacq, *Pennisetum setosum* (Swartz.) L. C. Rich., *Solanum verbascifolium* L. Among them, *B. pilosa* var. *minor*, *I. obscura*, *P. maximum* were dominant respectively.

Euphorbia graminea was found in southern Taiwan recently and the collected specimens (22°29' N, 120°35' E, *C. F. Chen* 791, 9 November, 2004; 22°40' N, 120°32' E, *C. F. Chen* 790, 1 January, 2005) were preserved in PPI. It is worthwhile to note that *E. graminea* can be distinguished from other species of the genus *Euphorbia* by linear, opposite leaf-bract (Figs. 4-A & B); alternate, ovate- rounded leaf; seed strongly angled, surface deeply punctate with pits in regular longitudinal rows (Fig. 4-C).

DISCUSSION

Pyšek *et al.* (2004) defined naturalized or established plants as plants that can sustain self-replacing populations without direct intervention by people and their recruitment is by seed or tillers, tubers, bulbs, fragments, etc. capable of independent growth. The authors also defined invasive plants as a subset of naturalized plants that produce reproductive offspring, often in vary large numbers, at considerable distance from the parent plants, and thus have the potential to spread over a large area. So, a few numbers of populations and a small area about *Euphorbia graminea* we have found, we then classified this species as naturalized plant and it may become invasive plant in the near future.

This species has been always found near artificial farms such as *Areca catechu* L. and *Ananas comosus* (L.) Merr. Since a function of sugarcane and pineapple management is to promote the land productivity, the improvement of the soil nutrients is one of the important functions, so the managers bought some materials for organic fertilization from abroad for fruit products and the small seeds of this species may be included within those materials. Next the species grew in dry area and produced more seeds to spread, suggested that it had been suitable the local habitat and could migrate quickly throughout the island in the future. Finally the habitat of these two populations usually have artificial disturbance by burning. The post-fire conditions are different such as changing space, light, nutrients and temperatures (Whelan, 1986). These microhabitat changed may be available to seed dispersal. There is no evidence proving when and how the species immigrated to Taiwan, but it is clear that the species can regenerate readily here.

Recently, Williamson and Fitter (1996) described the characters of successful invaders and Daehler and Carino (1999) suggested that invasive plants reduce native plant diversity

Fig. 2. Microhabitat of *Euphorbia graminea* between pineapples farm and hedges.

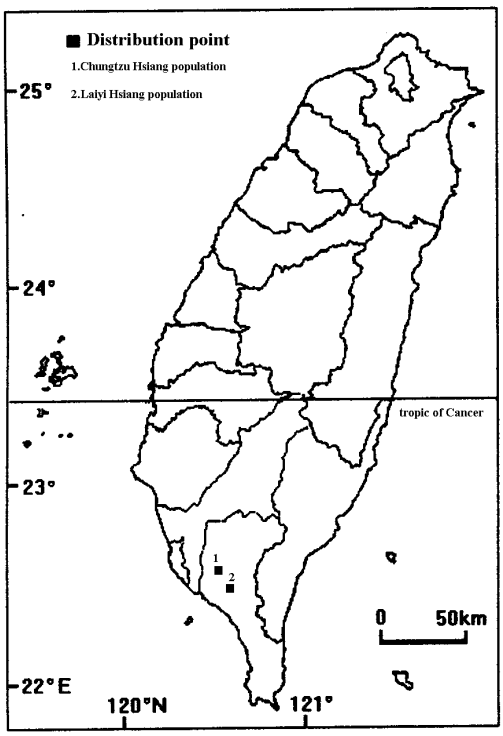

Fig. 3. Distribution of *Euphorbia graminea* in Pingtung, southern Taiwan. (1. Chungtzu Hsiang 2. Laiyi Hsiang)

Fig. 4. Morphology of *Euphorbia graminea*. A: Cyathium and seed. B: Leaf-bracts, Cyathium and Capsule. C: Seed (scale = 0.5 mm).

and region-specific screening system have been developed in some parts of the world (Tucker and Richardson. 1995, Reichard and Hamilton 1997) in an effort to restrict future introduction of invasive plants. Kolar and Lodge (2001) stated that using quantitative approaches for predicting invaders allowed us to predict patterns of invading species. From the reviews of related reports about alien plants, we suggest that in addition to paying attention to the dispersal process and controlling the amounts of the population needed to inhibit its distribution, the introduction of plants could be greatly curtailed by screening system using the risk assessment model developed for Taiwan.

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LITTERATURE CITED

Daehler, C. C. and D. A. Carino. 1999. Threats of invasive plants to the conservation of biodiversity. In: Chao, C.-H., G. R. Walter, and C. Reinhardii (eds.) Biodiversity and Allelopathy. Academic Sinica, Taipei, Taiwan. pp. 21-27.

Kolar, C. S. and D. M. Lodge. 2001. Progress in invasion biology: predicting invaders. Trends in Ecol. and Evol. **16**: 199-204.

Lin, S.-C. and C.-F. Hsieh. 1991. A taxonomic study of the genus *Euphorbia* L. (Euphorbiaceae) in Taiwan. Taiwania **36**: 57-79.

Pyšek, P., D. M. Richardson, M. Rejmanek, G. L. Webster, M. Williamson and J. Kirschner. 2004. Alien plants in checklists and floras: towards better communication between taxonomists and ecologists. Taxon **53**: 131-143.

Reichard, S. H. and C. W. Hamilton. 1997. Predicting invasions of woody plants introduced into North America. Conserv. Biol. **11**: 193-203.

Tucker, K. C. and D. M. Richardson. 1995. An expert system for screening potentially invasive alien plants in South African fynbos. J. Envir. Manag. **44**: 309-338.

Webster, G. L., and D. Bruch. 1967. Flora of Panama. Part VI. Family 97. Euphorbiaceae. In: Woodson, Jr. R. E., R. W. Schery, G. L. Webster and D. Bruch. Ann. Missour. Bot. Gard. **54**: 211-350.

Whelan, R. J. 1986. Seed Dispersal in Relation to Fire. In: Murray, D. R. (eds.). Seed Dispersal. Biology Department, The University of Wollongong, New South Wales, USA. 322 pp.

Williamson, M. H. and A. Fitter. 1996. The characters of successful invaders. Biol. Conserv. **78**: 163-170.

Wu, S.-H., C.-F. Hsieh and M. Rejmánek. 2004. Catalogue of the naturalized flora of Taiwan. Taiwania **49**: 16-31.

臺灣新歸化植物－禾葉大戟 (*Euphorbia graminea* Jacquin)

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摘　　要

本文報導原產墨西哥之新歸化種－禾葉大戟 (*Euphorbia graminea* Jacquin)，目前已歸化於台灣南部屏東縣。禾葉大戟與大戟屬其他物種可藉由其葉互生；葉狀苞對生，線形；種子卵圓形，角狀，表面具縱向之深斑點狀凹陷加以區別。本文提供本植物的形態描述、繪圖及彩色照片。

關鍵詞: 歸化植物，禾葉大戟，大戟科，台灣，分類。

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