TAIWANIA, 54(1): 69-75, 2009

Supplements to the Grasses (Poaceae) in Taiwan (I)

Ming-Jer Jung[(1)], Chien-Wen Chen[(2)], Shih-Wen Chung[(2)] and Chang-Sheng Kuoh[(3*)]

1. Herbarium of Taiwan Forestry Research Institute (TAIF), Taiwan Forestry Research Institute, 53, Nanhai Road, Taipei 100, Taiwan.
2. Division of Forestry Biology, Taiwan Forestry Research Institute, 53, Nanhai Road, Taipei 100, Taiwan.
3. Department of Life Sciences, National Cheng-Kung University, 1, Ta-Hsueh Road, Tainan 701, Taiwan.
** Corresponding author. Email: kuohpp@gmail.com*

(Manuscript received 7 April 2008; accepted 9 July 2008)

ABSTRACT: *Cynodon nlemfuensis* Vanderyst has recently become naturalized in low elevations of Taiwan, and *Tripsacum dactyloides* (L.) L. established its population in low elevations, central Taiwan. The occurrence of *Eragrostis cumingii* Steud. in lowlands and low elevations in Taiwan was confirmed. We describe these three grasses new to the flora of Taiwan. Besides, we provide a key to species of *Cynodon* in Taiwan, and the treatment of *C. arcuatus* J. Presl ex C. Presl, as the synonym of *C. radiatus* Roth ex Roemer & Schultes.

KEY WORDS: *Cynodon nlemfuensis*, *C. radiatus, Eragrostis cumingii*, Poaceae, *Tripsacum dactyloides*, Taiwan.

INTRODUCTION

The genus *Cynodon* Rich. (Poaceae) is native to tropical regions of Eastern Hemisphere, and members of this genus are used as lawn and fodder in tropical and warm-temperate areas (Barkworth, 2003; Hsu, 2000). *Cynodon arcuatus* and *C. dactylon* were recorded in the flora of Taiwan (Hsu, 2000; Sun and Phillips, 2006). Sun and Phillips (2006) regarded *Cynodon arcuatus* as belonging to *C. radiatus*. Besides, *Cynodon plectastachyus* (K. Schum.) Pilger, which is native to Africa, was introduced as fodder from America and Africa into Taiwan about 60 years ago (Hsu, 1975). In recent, *Cynodon nlemfuensis* Vanderyst broadly naturalized in lowlands of Taiwan (Fig. 1A).

Members of *Eragrostis* Wolf (Poaceae) in Taiwan has been recently revised, and 19 species were recorded (Boufford et al., 2003; Jung et al., 2008). In past, the application of *Eragrostis atrovirens*, *E. brownii,* and *E. cumingii* in SE Asia was confusing. Nowaday, the application of these three *Eragrostis* species was clarified (Veldkamp, 2002; Jung et al., 2008). The distributions of *E. atrovirens* and *E. brownii* in Taiwan had been reported (Jung et al., 2008). *Eragrostis cumingii* distributes in Australia, China, and Malesia (Chen and Paul, 2006; Lazarides, 1997; Veldkamp, 2002). After our field survey and specimens examination, the distribution of *E. cumingii* Steud. in low elevations of Taiwan was confirmed (Fig. 1B).

Tripsacum L. (Poaceae) is a genus of 12 species native to tropical and subtropical areas of the Western Hemisphere (Barkworth, 2003). In past, *T. laxum* Nash, which is native to North and South America, was introduced to Taiwan as pastures (Hsu, 1975). In recent, *T. dactyloides* (L.) L. has become naturalized in low elevations of central Taiwan (Fig. 1A). Descriptions and line drawings of these confirmed and newly naturalized grasses: *Cynodon nlemfuensis, Eragrostis cumingii, and Tripsacum dactyloides* were offered. Key to species of *Cynodon* in Taiwan and the treatment of *C. arcuatus* as the synonym of *C. radiatus* were also provided.

TAXONOMIC TREATMENTS

Cynodon Rich. 狗牙根屬

Key to the species of *Cynodon* in Taiwan

1. Glumes shorter than 1 mm, or shorter than quarter length of lemma ..... *C. plectastachyus*
1. Glumes longer than 1 mm, or longer than half length of lemma 2
2. Plant rhizomous, blade convolute to flat ..... *C. dactylon*
2. Plant stolontiferous, stolon longer than 30 cm, blade flat 3
3. Diameter of basal culm narrower than 2 mm, nodes exposed; digitate spikes usually longer than 5 cm ..... *C. radiatus*
3. Diameter of basal culm wider than 2 mm, nodes included; digitate spikes usually shorter than 5 cm ..... *C. nlemfuensis*

Cynodon nlemfuensis Vanderyst, Bull. Agric. Congo Belge. 13: 342. 1922. Barkworth, Fl. N. Amer. 25: 235. 2003. 長穎星草 Figs. 1 & 2

Herbs, stoloniferous, leaf sheath glabrous, longer or shorter than internodes, margin hyaline, glabrous; ligule apex truncate, membranous, ca. 0.5 mm long; blade linear, flat, 25-80 mm long, 4-6 mm wide, base hairy, pilose hairs 1.5-3 mm long. Inflorescence in digitate spikes, spikelet solitary, 1-floreted, lower glume linear,

臺灣大學學術期刊資料庫

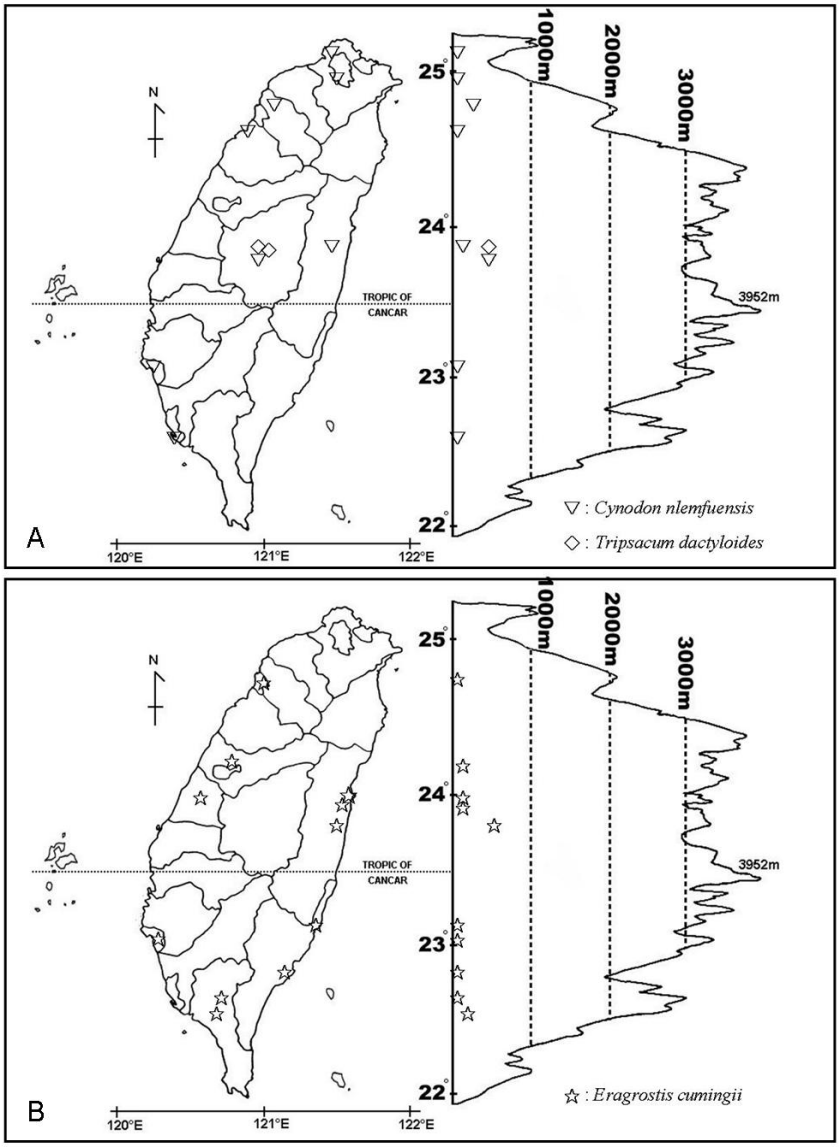


Fig. 1. Distribution map. A: *Cynodon nlemfuensis* (▽) and *Tripsacum dactyloides* (L.) L. (◇). B: *Eragrostis cumingii* (☆)

apex acute, 1-nerved, 1.8 - 2 mm long; upper glume lanceolate, apex acute, 1-nerved, 1.8 - 2 mm long; lemma ovate, laterally compressed, apex acuminate, muticus or with one short awn, awn ca. 0.1-0.2 mm long, 3-nerved, central vein totally ciliate, marginal veins and intercostal regions glabrous; palea ellipse, apex acute, 2-keeled, ca. 2 mm long; anther ca. 1.5 mm long.

Specimens examined: Taiwan. Taipei City, Zhongzheng District, Zhongzheng Riverside Park, 18 Apr. 2008, *M.-J. Jung 2694* (TAIF). Taipei Co., Tamshui Town, Shaluen, 29 Feb. 2008, *M.-J. Jung 2410* (TAIF). Hsinchu Co., Hsinpu Town, First Public Cemetery, 22 Jan. 2008, *M.-J. Jung 2217* (TAIF). Miaoli Co., Chunan Town, Pinhai Forest Rest Area, 15 Feb. 2005, *S.-H. Liu, et al. 918* (TAIF). Nantou Co., Yuchih Town, Toushe, 5 Mar. 2008, *M.-J. Jung 2432* (TAIF). Tainan City, Anping District, Anping, 15 Nov. 2005, *M.-J. Jung 1317* (TAIF). Kaoshiung City, Chichin, 27 Dec. 1980, *T.-T. Ling et al. s. n.* (TAIF). Hualien Co., Shoufeng, 20 Sept. 2000, *T.-T. Chen et al.* 10958 (TAIF).

Distribution and notes: *Cynodon nlemfuensis* is native to east and central Africa and naturalized in southern United States and Hawaii (Barkworth, 2003; USDA, NRCS, 2004). Vernacular names of *C. nlemfuensis* include: African bermudagrass, Rhodesian star grass, and robust star grass. Somewhere, *C. nlemfuensis* is also called “star grass”, same to the vernacular name of *C. plectostachyus*. We suggested the Chinese vernacular name of *C. nlemfuensis* to emphasize the longer glumes (ca. 2 mm) than *C.*

臺灣大學學術期刊資料庫

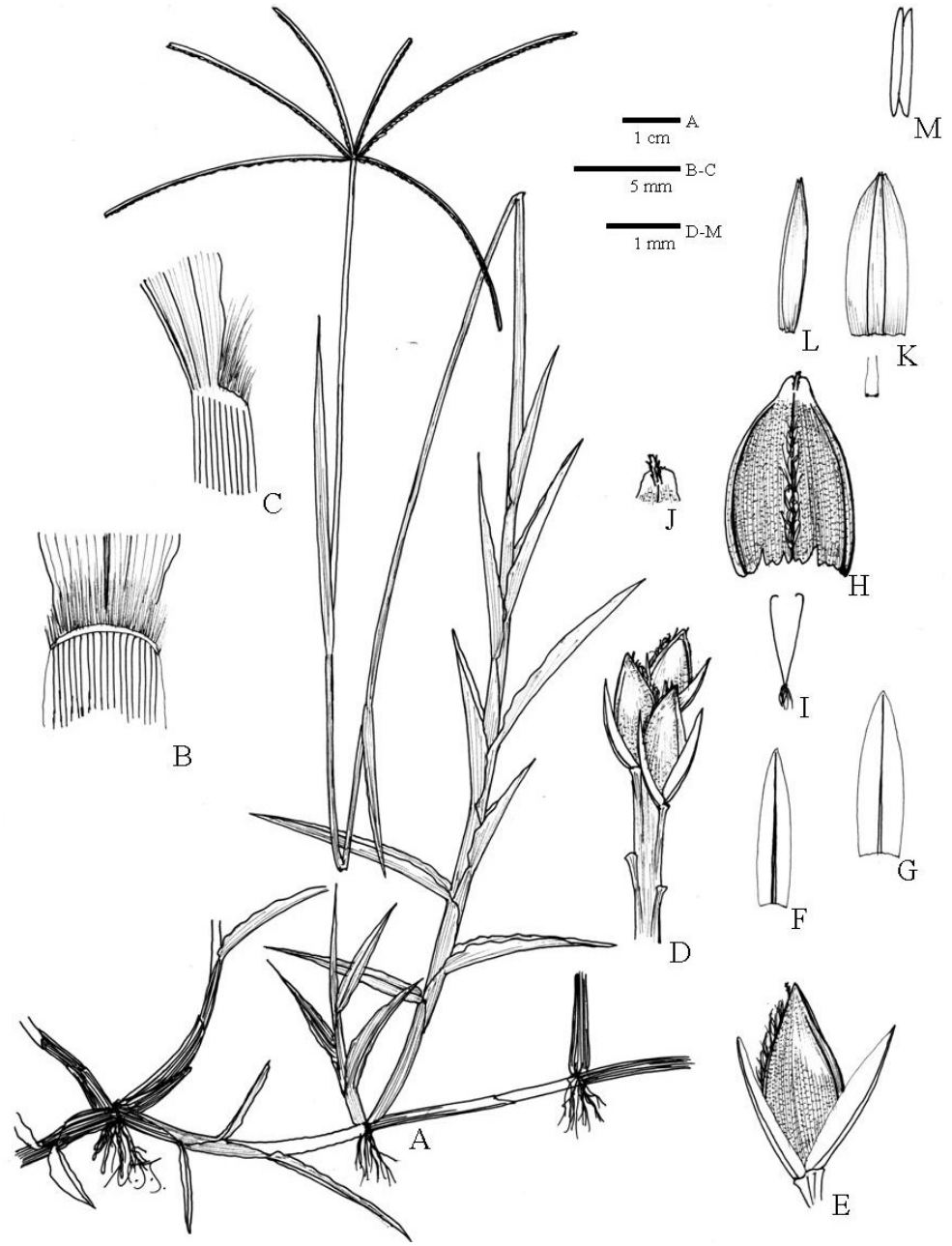


Fig. 2. *Cynodon nlemfuensis* Vanderyst. A: Habit. B: Ligule. C: Leaf base, lateral view. D: Part of digitate raceme. E: Spikelet. F: Lower glume. G: Upper glume. H: Lemma, flatten. I: Cross section of lemma. J: Short awn rising from subapex of lemma. K: Palea, flatten. L: Palea, lateral view. M: Anther.

plectastachyus (0.1-0.2 mm). Beside the differences listed in the key in previous, stolon internodes are arched in *C. radiatus* but straight in *C. nlemfuensis* and *C. plectastachyus*. basal leaf sheaths of *C. nlemfuensis* are longer than internodes, then nodes of flowering culms are involved Persistent leaf sheaths are easily found on stolon nodes in *C. nlemfuensis* but wanted in *C. radiatus*. On flowering culms, in leaf sheaths. In *C. radiatus*, all the leaf sheathes are shorter than internodes and nodes are exposed.

Cynodon radiatus Roth ex Roemer & Schultes, Syst. Veg. 2: 411. 1817; Sun & Phillips, Fl. China 22: 492. 2006. 恆春狗牙根

Cynodon arcuatus J. Presl ex C. Presl, Reliquiae Haenkeanae 1 (4-5): 290. 1830; Hsu, Fl. Taiwan 5 (2nd ed.): 405.

臺灣大學學術期刊資料庫

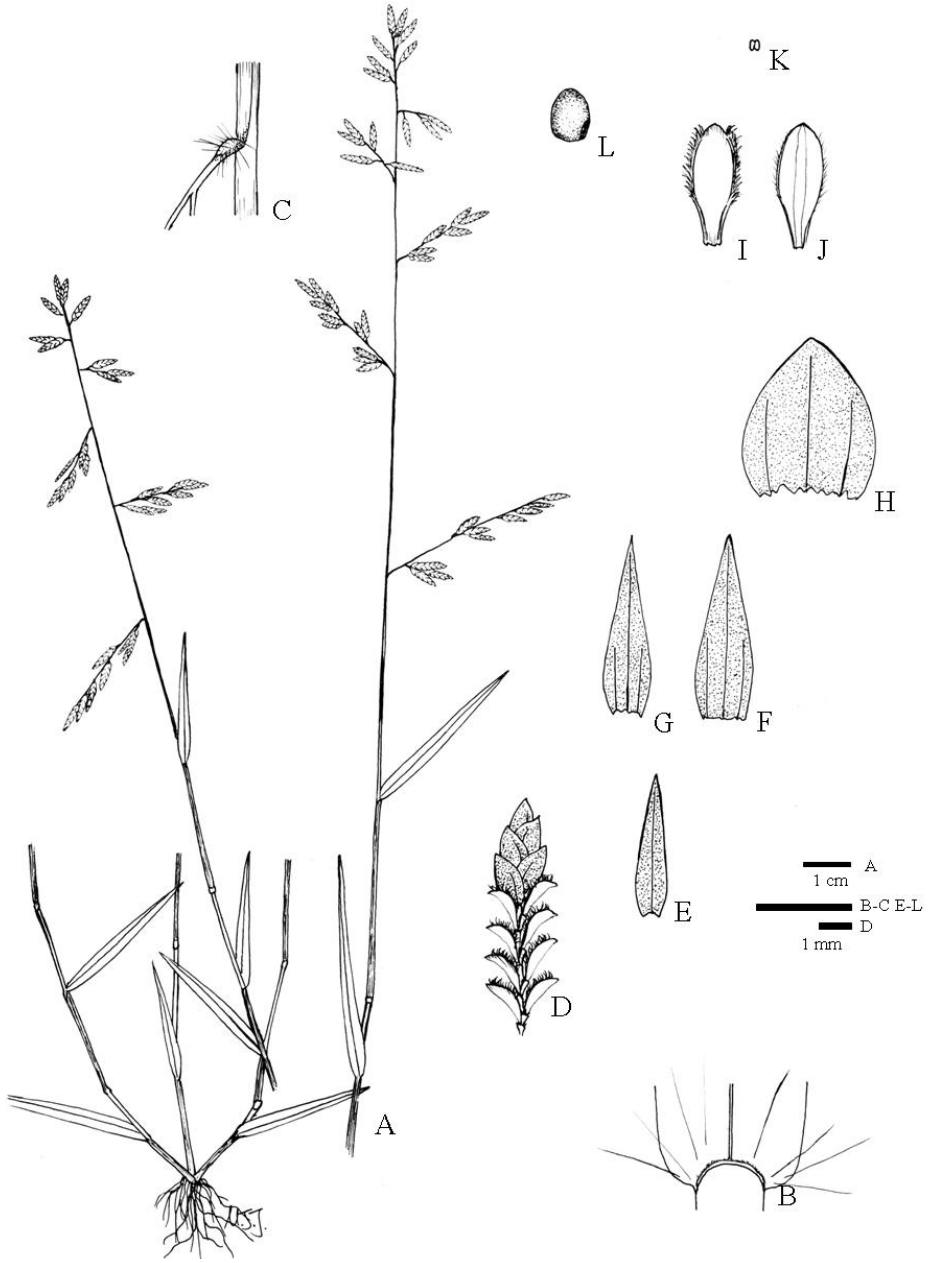


Fig. 3. *Eragrostis cumingii* Steud. A: Habit. B: Ligule. C: Inflorescence axial. D: Part of spikelet, with persistent paleas. E: Lower glume. F and G: Upper glumes. H: Lemma. I: Palea, abaxial view. J: Palea, adaxial view. K: Anther. L: Caryopsis.

Eragrostis Wolf 畫眉草屬

Key to the species of *Eragrostis* in Taiwan

1. Palea deciduous, falling with mature caryopsis, anther 0.7-0.8 mm long ……..…… *E. atrovirens*
1. Palea persistent with rachilla when caryopsis mature, anther shorter than 0.5 mm long …….……...…….... 2
2. Perennial herbs, keels of palea scabrous, anther 0.3-0.4 mm long ……..……..… *E. brownii*
2. Annual herbs, keels of palea hispidulate, anther 0.1-0.2 mm long ……..……..… *E. cumingii*

3. ***Eragrostis cumingii*** Steud. Syn. Pl. Glumac. 1: 266. 1854. Lazarides,. Austral. Syst. Bot. 10: 109. 1997; Veldkamp, Blumea 47: 172. 2002.

肯氏畫眉草 Figs. 1 & 3

Herbs erect to ascending, node exposed, sheaths shorter than internodes; ligule membranous, ca. 0.15 mm long, margin ciliate, blade linear, apex acute, leaf base sparsely pilose, pilose hairs ca. 1.5 mm long. Inflorescence a open panicle, branches alternate, solitary, axial glandular, glabrous or sparsely pilose. Spikelet

臺灣大學學術期刊資料庫

outline linear to lanceolate, laterally compressed, lower glume lanceolate, apex acute, l-nerved, ca. 1.5 mm long; upper glume lanceolate to lanceo-ovate, ca. 2 mm long, slightly longer than lower glume, apex acute, 3-nerved; lemma ovate, ca. 1.8 mm long, apex acute, 3-nerved, palea ellipse, ca. 1.5 mm long, apex acute, 2-nerved, persistent, keeled, keels hispidulate, hispids 0.1-0.2 mm long, anther 3, nearly globular, ca. 0.2 mm long; caryopsis ellipsoid, glabrous, ca. 0.7 mm long.

Specimens examined: Taiwan. Hsinchu City, Shih-Pa-Chien-Shan, 4 Oct. 1971, *Y. Simada 4789* (HAST), Senkyakuseki, 25 Jun. 1927, *Y. Simada 4275* (HAST). Hualien Co., Shoufeng Town, Campus of the NDHU, 18 Aug. 2000, *T.-T. Chen 10877* (TAIF); Hualien, 19 Sept. 2000, *T.-T. Chen et al. 10939* (TAIF); Yuen-Mei, 11 Oct. 2001, *T.-T. Chen 11681* (TAIF). Pingtung Co., Laiyi Town, Walusi Stream, 29 Oct. 1999, *W.-C. Leong 1548* (HAST); Neipu Town, Campus of NPUST, 6 Nov. 2007, *M.-J. Jung 1796* (TAIF). Taichung Co., Holi Town, Holi, 11 Aug. 1940, *Y. Simada 5986* (HAST). Tainan City, Campus of NCKU, 9 Aug. 2002, *M.-J. Jung 298* (TAIF); Tainan, 13 Sept. 1917, *Y. Simada s.n.* (TAIF). Taitung Co., Cheng-gang-au, 8 Aug. 1907, *T. Kawakami et al. s.n.* (TAIF); Taitung airport, 24 Mar. 2008, *M.-J. Jung 2517* (TAIF).

Distribution and notes: Vernacular name of *Eragrostis cumingii* is Cuming's lovegrass. The Chinese vernacular name of *E. cumingii* used here is same to the Chinese vernacular name in the Flora of China (Chen and Paul, 2006). This Chinese vernacular name fits the meanings of specific epithet and English vernacular name, although it had been used in Taiwan as the Chinese vernacular name of *E. bulbillifera* Steud., which had been treated as synonym of *E. brownii* (Kunth) Nees (Hsu, 1975, 1978, and 2000; Jung et al., 2008).

The paleas of *E. brownii* and *E. cumingii* are both persistent with the rachilla. Hispids on palea's keels in *E. cumingii* are much longer and dominant than that in *E. brownii*. The anthers of *E. cumingii* are globular, 0.1-0.2 mm long, shorter than those of *E. brownii* (0.3-0.4 mm). Besides, *E. cumingii* is an annual grass rather *E. brownii* is perennial.

Tripsacum L. 加拿草屬

Tripsacum dactyloides (L.) L. Syst. Nat. (ed. 10) 1261. 1759. Barkworth, Fl. N. Amer. 25: 693-695. 2003. 指狀加拿草 Figs. 1 & 4

Herbs erect, upto 3 m tall, with short rhizome, culms 1-3 cm in diameter, nodes exposed, internode glabrous, leaf sheath glabrous, margin open, shorter than internode; ligule membranous, margin ciliate, ca. 1.5 mm long, blade linear, glabrous, upto 80 cm long, 5-6 cm wide, blade base coated with cilia, cilia ca. 2 mm long. Panicles of 1-several subdigitate to racemose rames, terminal and/or axillary, rame with proximal pistillate spikelets and distal staminate spikelets. Pistillate spikelet solitary, embedded in the indurate rame axes, axes 7-9 mm long, ca. 5 mm wide; lower glumes broadly ovate, apex acute, 13-nerved, coriaceous, 6.5-7 mm long; upper glume broadly ovate, apex acuminate, coriaceous, margin membranous, 6.5-7 mm long; lower lemma broadly ovate, apex acuminate, 5.5-6 mm long, lower palea ovate, apex acuminate, 2-nerved, 4.5-5 mm long, upper lemma ovate, apex acute, 4.5-5 mm long, upper palea ovate, apex acute, 2-nerved, 4.5-5 mm long. Staminate spikelets in sessile-pedicellate pairs, rachis ca. 5 mm long, pedicel ca. 2 mm long; lower glume ellipse, apex round, coriaceous, 19-nerved, ca.7.5 mm long, 2-keeled, keels hispidulate; upper glume ovate, apex acute to truncate, membranous, ca.7.5 mm long; lower glume ovate, apex truncate, membranous, 3-nerved, ca. 7.5 mm long, lower palea lanceo-ovate, apex truncate, membranous, 2-nerved, ca. 7.5 mm long; upper lemma ovate, apex truncate, membranous, 1-nerved, ca. 7 mm long, upper palea lanceolate, apex truncate, membranous, 2-nerved, *ca.* 7 mm long; anthers 3, 4.5-5 mm long.

Specimens examined: Nantou Co., Yuchih Town, Peacock Garden, 12 Dec. 2007, *M.-J. Jung 2041* (TAIF), at the same loc., 17 Mar. 2008, *M.-J. Jung 2458* (TAIF); Shueishe, 5 Mar. 2008, *M.-J. Jung 2419* (TAIF), at the same loc., 17 Mar. 2008, *M.-J. Jung 2455* (TAIF).

Distribution and notes: *Tripsacum dactyloides* were collected at roadside around the Sun-Moon Lake, central Taiwan. Vernacular name of *T. dactyloides* is Eastern Gamagrass. In Taiwan, *T. laxum*, which its vernacular name is Guatemala grass, was introduced to Taiwan from Philippine as pastures (Hsu, 1975). Lower glumes of staminate spikelets are coriaceous in *T. dactyloides*, rather the lower glumes are membranous in *T. laxum* (Clayton et al., 2002).

ACKNOWLEDGEMENT

This work was supported in part by the National Science Council of Taiwan (Grant NSC-96-2621- B-054-002).

LITERATURE CITED

Barkworth, M. E. 2003. In: Barkworth, M. E., K. M. Capels, S. Long and M. B. Piep. 2003. Fl. N. Amer. **25**: 235-241, 693-695. Oxford University Press, Inc. New York, USA.

Boufford, D. E., C.-F. Hsieh, T.-C. Huang, C.-S. Kuoh, O. Hiroshi, C.-I Peng, J.-L. Tsai and K.-C. Yang. 2003. A Checklist of the Vascular Plants of Taiwan: Eragrostis. In: Huang, T.-C. et al. (eds.), Flora of Taiwan, 2nd ed. **6**: 414. Editorial Committee, Dept. Bot., NTU, Taipei, Taiwan.

臺灣大學學術期刊資料庫



Fig. 4. *Tripsacum dactyloides* (L.) L. A: Habit. B: Ligule. C: Pistillate spikelet, lateral view. D: Pistillate spikelet. E-G: Lower glume of pistillate spikelet; F: lateral view; G: cross section. H-J: Upper glume of pistillate spikelet; I: lateral view; J: crass section. K: Lower lemma of pistillate spikelet. L: Lower palea of pistillate spikelet. M: Upper lemma of pistillate spikelet. N: Upper palea of pistillate spikelet. O: Part of staminate raceme. P & Q: Lower glume of staminate spikelet; Q: flatten lower glume. R & S: Upper glume of staminate spikelet; S: flatten upper glume. T & U: Lower lemma of staminate spikelet; U: flatten lower lemma. V & W: Lower palea of staminate spikelet; V: flatten lower palea; W: adaxial view. X: Upper lemma of staminate spikelet. Y: Upper palea of staminate spikelet. Z: Anther.

臺灣大學學術期刊資料庫

Chen, S.-L. and M. P. Paul. 2006. 131. *Eragrostis* Wolf. In: Wu, Z.-Y. and P. R. Raven (eds.), Flora of China **22**: 471-479. Science Press, Beijing, China.

Clayton, W. D., K. T. Harman and H. Williamson. (2002 onwards). World Grass Species: Descriptions, Identification, and Information Retrieval. (GrassDase – The Online World Grass Flora: www.kew.org/data/grasses-db.html)

Hsu, C.-C. 1975. Taiwan Grasses. Taiwan Provincial Education Association, Taipei, Taiwan. pp. 277, 397, 797.

Hsu, C.-C. 1978. Gramineae. In: Huang, T.-C. et al. (eds.), Flora of Taiwan **5**: 481. Editorial Committee, Dept. Bot., NTU, Taipei, Taiwan.

Hsu, C.-C. 2000. Gramineae (Poaceae). In: Huang, T.-C. et al. (eds.), Flora of Taiwan, 2nd ed. **5**: 405-406; 414-425. Editorial Committee, Dept. Bot., NTU, Taipei, Taiwan.

Jung, M.-J., J. F. Veldkamp and C.-S. Kuoh. 2008. Notes on *Eragrostis* Wolf (Poaceae) for the Flora of Taiwan. Taiwania **53**: 96-102.

Lazarides, M. 1997. A Revision of *Eragrostis* (Eragrostideae, Eleusininae, Poaceae) in Australia. Austral. Syst. Bot. **10**: 77-187.

Sun, B. and S. M. Phillips. 2006. *Cynodon* Richard in Persoon. In: Wu, Z.-Y. and P. R. Raven (eds.), Flora of China **22**: 492-493. Science Press, Beijing, China.

USDA, NRCS. 2004. The PLANTS Database, Version 3.5 (http://plants.usda.gov). National Plant Data Center, Baton Rouge, LA, USA.

Veldkamp, J. F. 2002. Revision of *Eragrostis* (Gramineae, Chloridoideae) in Malesia. Blumea **47**: 157-204.

臺灣產禾草補註(三)

鍾明哲[(1)]、陳建文[(2)]、鐘詩文[(2)]、郭長生[(3*)]

1. 林業試驗所植物標本館，行政院農業委員會林業試驗所，100 台北市中正區南海路 53 號，臺灣。
2. 行政院農業委員會林業試驗所森林生物組，100 台北市南海路 53 號，臺灣。
3. 國立成功大學生命科學系，701 台南市東區大學路 1 號，臺灣。
* 通信作者。*Email: kuohpp@gmail.com*

(收稿日期：2008 年 4 月 7 日；接受日期：2008 年 7 月 9 日)

摘要:本文描述分布於臺灣低海拔的新歸化禾草：長穎星草(*Cynodon nlemfuensis* Vanderyst)，及於中部低海拔地區尋獲的歸化禾草：指狀加拿草(*Tripsacum dactyloides* (L.) L.)，並確認肯氏畫眉草(*Eragrostis cumingii* Steud.)分布於臺灣平原及低海拔地區。此外，本文將恆春狗牙根學名 *Cynodon arcuatus* 列為 C. *radiatus* 之異名，並提供臺灣產狗牙根屬 (*Cynodon*) 植物的檢索表。

關鍵詞：長穎星草、恆春狗牙根、肯氏畫眉草、禾本科、指狀加拿草、臺灣。

臺灣大學學術期刊資料庫