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The Genus *Poa* L. (Poaceae) in Taiwan: a Delta Database for Generating Key and Descriptions

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ABSTRACT: We examined herbarium specimens of the genus *Poa* L. (Festuceae, Festucoideae, Poaceae) in Taiwan and recognized seven taxa. The DELTA (DEscriptive Language for TAxonomy) database programs were used to generate an identification key and descriptions of the taxa.

KEY WORD: DELTA, Description, Key, *Poa*, Festuceae, Festucoideae, Poaceae, Taiwan, Taxonomy.

INTRODUCTION

Hsu (1971, 1975, 1978) treated seven species and one variety of *Poa* (Poaceae) in the first edition of the *Flora of Taiwan* (Li *et al.*, 1978). They were *Poa acroleuca* Steud., *P. annua* L., *P. formosae* Ohwi, *P. nankoensis* Ohwi, *P. sphondylodes* Trin. var. *kelungensis* (Ohwi) Ohwi, *P. taiwanicola* Ohwi, *P. takasagomontana* Ohwi and *P. tenuicula* Ohwi. *Poa acroleuca* is restricted to east Asia and *P. annua* is cosmopolitan. The others, all described by Ohwi in 1930's, are endemic to Taiwan. Since then, Koyama (1987) renamed *P. sphondylodes* var. *kelungensis* as *P. sphondylodes* subsp. *kelungensis*.

We reviewed the taxonomy of Taiwanese *Poa* for volume 5 of the second edition of the *Flora of Taiwan*. The DELTA (DEscriptive Language for TAxonomy) programs were used to collect data and generate an identification key and descriptions of the taxa. This system is a flexible and powerful computer processing tool for taxonomic descriptions (Dallwitz, 1974, 1980; Dallwitz *et al.*, 1999a, b). Its data format has been adopted by the Taxonomic Databases Working Group (TDWG), a commission of the International Union of Biological Sciences (IUBS), as a standard for data exchange (Aiken *et al.*, 1996). This system has been used previously for treatments of the Poaceae (Aiken *et al.*, 1996; Watson *et al.*, 1989; Watson and Dallwitz, 1994; Xu *et al.*, 1997).

This project (1) reviewed the *Poa* in Taiwan; (2) developed a list of characters for recording data; (3) generated a key for identification of the taxa; (4) produced descriptions of taxa for the treatment of *Poa* for the second edition of the *Flora of Taiwan*, volume 5.

MATERIALS AND METHODS

We prepared a list of characters for the genus *Poa* in Taiwan based on descriptions of the taxa in *Taiwan Grasses* (Hsu 1975), in the *Flora of Taiwan* (Hsu 1978) and in other

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publications (Watson and Dallwitz, 1994; Aiken *et al.*, 1996). Besides morphological characters, literature, synonyms, distribution status, specimens cited and notes were also included. All specimens of *Poa* deposited in the herbaria of the Department of Botany, Taiwan University (TAI), the Institute of Botany, Academia Sinica, Taipei (HAST) and the Department of Biology, Cheng-Kung University (NCKU) were examined.

The DELTA programs were downloaded from the website http://biodiversity.uno.edu/delta/www/programs.htm. We entered the data obtained from the herbarium specimens into DELTA. A data editor program run under Windows 95/98 is available in the most updated version of DELTA programs released in 1999. It was necessary to export the data to three basic files, CHARS, ITEMS and SPECS, from this editor because all the other functions of DELTA are still run under MS-DOS. Four essential directive files, TOKEY, KEY, TONAT and LAYOUT were edited. The identification key was generated by the program CONFOR with the directive file TOKEY and the program KEY with the directive file KEY. In addition, descriptions of the taxa were generated by the program CONFOR using the directive files TONAT and LAYOUT (Dallwitz *et al.* 1999a, b).

RESULTS AND DISCUSSION

The final list of 50 characters for the Taiwanese taxa of *Poa* is presented in Appendix 1. Of the 50 characters, 44 are morphological. Previously, 452 morphological characters were used by Watson and Dallwitz (1994), 102 by Aiken *et al.* (1996) and 422 by Xu *et al.* (1997) for their treatments of the grasses. Furthermore, researchers at the Royal Botanic Garden, Kew, have developed an electronic database "World Grass Species" in the DELTA format (Royal Botanic Gardens, Kew, 1999). They developed a list of 1068 morphological characters to record all grass taxa of the world. The large numbers of characters used in the above studies were essential because they covered a larger geographical area and many more taxa. However, we chose 44 important, morphological and diagnostic characters for the generation of the key and descriptions of *Poa* in Taiwan.

After examining specimens at TAI, HAST and NCKU, we excluded *P. acroleuca* from the flora of Taiwan and recognized the other seven taxa. Most of the specimens are *P. annua*, indicating that this species is common in Taiwan. In contrast, there are few specimens of the six endemic taxa.

TAXONOMIC TREATMENT

The following key to the Taiwanese taxa of the genus *Poa* was generated by DELTA. It was a bracketed key originally, but modified it to an indented key to fit the format of the *Flora of Taiwan*.

1. Lower glume 1-nerved.
   2. Apex of upper glume sharp.
      3. Lemma nerves villous; caryopsis apex villous ..... 3. *Poa nankoensis*
      3. Lemma nerves glabrous; caryopsis apex glabrous ..... 6. *Poa takasagomontana*
   2. Apex of upper glume acute-obtuse.
      4. Callus cobwebby ..... 7. *Poa tenuicula*
      4. Callus hairless ..... 1. *Poa annua*
1. Lower glume 3 –nerved.
   5. Callus cobwebby; palea blunt at apex.
      6. Inflorescence an open panicle ..... 2. *Poa formosae*
      6. Inflorescence a narrowly contracted panicle ..... 4. *Poa sphondylodes* var. *kelungensis*
   5. Callus hairless; palea acute at apex ..... 5. *Poa taiwanicola*

The above key is different from Hsu's (1978). We set some directives in TOKEY and KEY to exclude some unstable and dubious characters used by Hsu (1978), such as length of anther and ligule, width of leaf-blade and height of plant. These quantitative characters are highly variable. There are many specimens without anthers. The height of the plants and the width of the leaf-blade are also unstable and depend on the stage of maturation. Use of these characters may cause confusion. Instead, stable and distinct characters were chosen to generate the above key, which distinguishes the taxa easily and clearly.

1. **Poa annua** L., Sp. Pl. 68. 1753; Honda, Monogr. Poac. Jap. 71. 1930; Ohwi, Acta Phytotax. Geobot. **10**: 120. 1941; Hitchc., Man. Grass. U.S. 106. f. 119. 1951; Senaratna, Grass. Ceylon 43. 1956; Keng, F. Ill. Pl. Prim. Sinicarum, Gram. 224. *f. 179.* 1959; Bor, Grass. India 555. 1960; Hsu in Hara, Fl. E. Himalaya 372. 1966; Hsu, Taiwania **16**: 244. 1971; Hsu, Taiwan Grass. 329. *pl. 60.* 1975; Hsu in Li, H.-L., T.-S. Liu, T.-C. Huang, T. Koyama and C. E. DeVol, eds. Fl. Taiwan **5**: 447. 1978; Hatusima, Fl. Ryukyus 666. 1971; Gilliland, Grass. Malaya 58. 1971; Osada, Ill. Grasses Jap. Enl. Ed. 160. 1993; Veldkamp, Blumea **38(2)**: 421. 1994.

   Poa acroleuca auct. non Steud.: Ohwi, Acta Phytotax. Geobot. **10**: 120. 1941; Hsu in Taiwania **16**: 244. 1971; Hsu, Taiwan Grass. 327. *pl.* 59. 1975; Hsu in Li, H.-L., T.-S. Liu, T.-C. Huang, T. Koyama and C. E. DeVol, eds. Fl. Taiwan **5**: 447. 1978, *pro parte*.

Annuals or biennials. Culms ascending, 11-36 cm tall, 1.5 mm wide. Leaf-blades linear, 4-15 cm long, 2-4 mm wide, apex obtuse-acute or acuminate. Sheath not compressed. Ligule membranaceous, rounded or triangular, 1-2 mm long. Inflorescence an open panicle, 2.5-18 cm long. Spikelets with 3-5 florets, ellipsoid, oblong or ovoid, 4 mm long, 1.5-3 mm wide. Pedicel glabrous. Lower glume chartaceous, lanceolate to ovate, 1-2 mm long, 1-nerved. Upper glume chartaceous, elliptic to ovate, apex acute-obtuse, 1.5-3 mm long, 3-nerved. Florets 2.5-3.5 mm long. Lemma chartaceous or membranaceous, ovate-lanceolate to elliptic, 2.5-3.5 mm long, 5-nerved, nerves villous. Palea narrowly lanceolate, apex blunt or acute, 2-3 mm long, 2-nerved, nerves villous. Callus hairless. Anthers 1 mm long. Caryopsis ellipsoid, 1-1.5 mm long, apex villous.

Distribution: cosmopolitan.

This is one of the most common grasses growing gregariously in yards and fields. It flowers year round.

Specimens examined: TAIPEI: Pali, *Lee s. n.* Apr. 14, 1968; Shihmen, *Lin 720*; Mt. Yangmingshan, *Hsu 48*. TAOYUAN: Yangmei, *Kuo 6591*. HSINCHU: Lake Yuanyanghu, *Shen 620*. TAICHUNG: Lishan, *Kuoh 80141*, *Ho 305*; Mt. Pahsienshan, *Hsu 439*; Wuling, *Huang 7035*. NANTOU: Mt. Hohuanshan, *Lin s. n.* 1970; Mt. Fenghuangshan, *Hsu 6222*; en route from Hsitou to Mt. Fenghuangshan, *Kuoh 10337*; Meifeng, *Liu 1252*. CHIAYI: Mt. Alishan, *Feung & Kao s. n.* Oct. 26, 1962; *Hsu 3355*. KAOHSIUNG: en route from Tienchih to Yakou, *Huang 8887*; Chuyunshan Forest Path, *Ho 880*; en route from Kuankao to Patungkuan, *Huang 8498*. ILAN: Chilan, *Wang 1068*. HUALIEN: along the Suhua highway, *Kuoh 2639*; Tayuling, *Peng 9157*; Lanshan, the 24th Forest Station, *Hsu 3593*.

Ohwi (1941) reported that *P. acroleuca* occurred in Taiwan firstly but he didn't cite any specimen in the publication. Since then, Hsu (1971, 1975, 1978) and Koyama (1987) agreed with Ohwi's opinion and recognized the existence of *P. acroleuca* in Taiwan. Hsu identified some specimens as *P. acroleuca* and cited them in the first edition of the *Flora of Taiwan* (Hsu, 1978). Koyama also mentioned that *P. acroleuca* was distributed in Taiwan and some

other regions but didn't cite any specimen either (Koyama, 1987). According to Keng (1959) and Osada (1993), *P. acroleuca* has scabrous panicle branches but *P. annua* has smooth ones. In addition, the callus of *P. acroleuca* is cobwebby but hairless for *P. annua*. Both Keng (1959) and Osada (1993) didn't think there was *P. acroleuca* in Taiwan. The specimens we examined which may be identified as *P. acroleuca* or *P. annua*, including some of those identified as *P. acroleuca* by Hsu (1978), are all hairless on callus and have indistinctly scabrous panicle branches. Furthermore, the characters of the speciemens all fit in with Veldkamp's descrioption of *P. annua* (Veldkamp, 1994). Thus we excluded *P. acroleuca* from the flora of Taiwan and all the specimens which were identified as *P. acroleuca* would be *P. annua* actually.

2. **Poa formosae** Ohwi, Repert. Spec. Nov. Regni Veg. **36**: 41. 1934; Hsu in Taiwania **16**: 244. 1971; Hsu, Taiwan Grass. 331. *pl. 61*. 1975; Hsu in Li, H.-L., T.-S. Liu, T.-C. Huang, T. Koyama and C. E. DeVol, eds. Fl. Taiwan **5**: 449. 1978.

Perennials. Culms ascending, 56-74 cm tall, 1.5 mm wide. Leaf-blades linear, 11-13 cm long, 2 mm wide, apex acuminate. Sheath not compressed. Ligule membranaceous, tongue-shaped or rounded, 1 mm long. Inflorescence an open panicle, 12-19 cm long. Spikelets with 2 florets, ellipsoid or ovoid, 4-6 mm long, 2-2.5 mm wide. Pedicel hispid to minutely hispid. Lower glume chartaceous, lanceolate, 3-5 mm long, 3-nerved. Upper glume chartaceous, broadly lanceolate, apex sharp, 3.5-5 mm long, 3 -nerved. Florets 3-5 mm long. Lemma chartaceous, ovate-lanceolate, 3-4 mm long, 5-nerved, nerves villous. Palea narrowly lanceolate, apex blunt, 3-4 mm long, 2-nerved, nerves minutely hispid. Callus cobwebby. Caryopsis ellipsoid, 2 mm long, apex villous.

Endemic to Taiwan.

Specimens examined: NANTOU: Meifeng, *Peng 9114*. TAICHUNG: Li-shan, *Chen M. Y. s. n.* May, 1998. KAOHSIUNG: Mt. Kuanshan, *Suzuki s. n.* Oct. 19. 1933.

3. **Poa nankoensis** Ohwi, Acta Phytotax. Geobot. **2**: 165. 1933; Keng, F. Ill. Pl. Prim. Sinicarum, Gram. 218. *f. 173*. 1959; Hsu in Taiwania **16**: 244. 1971; Hsu, Taiwan Grass. 333. *pl. 62*. 1975; Hsu in Li, H.-L., T.-S. Liu, T.-C. Huang, T. Koyama and C. E. DeVol, eds. Fl. Taiwan **5**: 449. 1978.

Perennials. Culms ascending, 16-40 cm tall, 1.5-2 mm wide. Leaf-blades linear, 6-16 cm long, 1-4 mm wide, apex acuminate. Sheath not compressed. Ligule membranaceous, tongue-shaped or rounded, 1-2 mm long. Inflorescence an open panicle, 5-13 cm long. Spikelets with 2-4 florets, ellipsoid or lanceolate, 5-6 mm long, 2-3 mm wide. Pedicel hispid to minutely hispid. Lower glume chartaceous, lanceolate to narrowly lanceolate, 3.5-4 mm long, 1-nerved. Upper glume chartaceous, broadly lanceolate to elliptic, apex sharp, 3-5 mm long, 3-nerved. Florets 4-5 mm long. Lemma chartaceous, ovate-lanceolate to elliptic, 4-5 mm long, 5-nerved, nerves villous. Palea narrowly lanceolate, apex blunt or apex acute, 3-4 mm long, 2-nerved, nerves minutely hispid. Callus cobwebby. Anthers 1 mm long. Caryopsis ellipsoid, 2 mm long, apex villous.

Endemic to Taiwan.

Specimens examined: MIAOLI: Mt. Hsuehshan. *Sasaki s. n.* Jul. 7, 1923. NANTOU: main peak of Mt. Chilai, *Sasaki s. n.* Aug. 24, 1929. ILAN: Mt. Nanhutashan, *Sasaki s. n.* Oct. 1928; *Futuyama 4084*.

4. **Poa sphondylodes** Trin. var. **kelungensis** (Ohwi) Ohwi, Acta Phytotax. Geobot. **10**: 126. 1941; Keng, F. Ill. Pl. Prim. Sinicarum, Gram. 194. *f. 146*. 1959; Hsu in Taiwania **16**: 244. 1971; Hsu, Taiwan Grass. 335. *pl. 63*. 1975; Hsu in Li, H.-L., T.-S. Liu, T.-C. Huang, T. Koyama and C. E. DeVol, eds. Fl. Taiwan Fl. Taiwan **5**: 449. 1978.

Poa kelungensis Ohwi, Acta Phytotax. Geobot. **4**: 60. 1935.
Poa kelungensis Ohwi subsp. *kelungensis* (Ohwi) T. Koyama, Grass. Jap. Neighb. Reg. pp.104 & 525. 1987.

Perennials. Culms ascending, 23-45 cm tall, 1.5 mm wide. Leaf-blades linear, 7-13 cm long, 2-3 mm wide, apex acuminate. Sheath not compressed. Ligule membranaceous, tongue-shaped, 2-2.5 mm long. Inflorescence a narrowly contracted panicle, 3-7 cm long. Spikelets with 2-4 florets, ellipsoid or lanceolate or ovoid, 3-4 mm long, 1.5-2.5 mm wide. Pedicel hispid to minutely hispid. Lower glume chartaceous, lanceolate to linear-lanceolate, 2-3.5 mm long, 3-nerved. Upper glume chartaceous, lanceolate to ovate, apex sharp or acute-obtuse, 2-3 mm long, 3 -nerved. Florets 2-3 mm long. Lemma chartaceous, ovate-lanceolate to ovate, 2-3 mm long, 5-nerved, nerves villous. Palea linear-lanceolate to narrowly lanceolate, apex blunt, 2-3 mm long, 2-nerved, nerves minutely hispid or nerves ciliate. Callus cobwebby. Anthers 1-2 mm long. Caryopsis ellipsoid, 1 mm long, apex villous.

Endemic to the littoral region of northern and northeastern Taiwan.

Specimens examined: KEELUNG: Alipang, *Kao 3600*; Keelung, *Odashima 17807*; Is. Keelung, *Peng 14148*. TAIPEI: Tanshui, *Sasaki s. n.* May 29. 1932.

5. **Poa taiwanicola** Ohwi, Acta Phytotax. Geobot. **7**: 131. 1937; Keng, F. Ill. Pl. Prim. Sinicarum, Gram. 186. *f. 138*. 1959; Hsu in Taiwania **16**: 244. 1971; Taiwan Grass. 337. *pl. 64*. 1975; Hsu in Li, H.-L., T.-S. Liu, T.-C. Huang, T. Koyama and C. E. DeVol, eds. Fl. Taiwan Fl. Taiwan **5**: 450. 1978.

Perennials. Culms ascending, 48 cm tall, 2 mm wide. Leaf-blades linear, 12 cm long, 2 mm wide, apex acuminate. Sheath not compressed. Ligule membranaceous, tongue-shaped, 1 mm long. Inflorescence a narrowly contracted panicle, 15 cm long. Spikelets with 3 florets, lanceolate, 5 mm long, 2 mm wide. Pedicel hispid. Lower glume chartaceous, linear-lanceolate, 4 mm long, 3-nerved. Upper glume chartaceous, lanceolate, apex sharp, 4.5 mm long, 3-nerved. Florets 4 mm long. Lemma chartaceous, ovate, 4 mm long, 5-nerved, nerves villous. Palea narrowly lanceolate, apex acute, 3 mm long, 2 -nerved, nerves minutely hispid. Callus hairless. Anthers 1.5 mm long.

Endemic to the alpine region of Taiwan.

Specimen examined: NANTOU: en route from Tayuling to Mt. Hohuanshan, *Hsu 3821*.

6. **Poa takasagomontana** Ohwi, Repert. Sped. Nov. Regni Veg. **36**: 41. 1934; Hsu in Taiwania **16**: 244. 1971; Hsu, Taiwan Grass. 339. *pl. 65*. 1975; Hsu in Li, H.-L., T.-S. Liu, T.-C. Huang, T. Koyama and C. E. DeVol, eds. Fl. Taiwan **5**: 450. 1978.

Perennials. Culms ascending, 45-48 cm tall, 1.5 mm wide. Leaf-blades linear, 12-13 cm long, 2-3 mm wide, apex acuminate. Sheath not compressed. Ligule membranaceous, tongue-shaped, 1-2 mm long. Inflorescence an open panicle, 10-14 cm long. Spikelets with 1 or 2 florets, lanceolate, 4-5 mm long, 2 mm wide. Pedicel hispid. Lower glume chartaceous,

lanceolate, 2-3 mm long, 1-nerved. Upper glume chartaceous, lanceolate to narrowly ovate, apex sharp, 3-4 mm long, 3-nerved. Florets 4 mm long. Lemma chartaceous, ovate-lanceolate, 4 mm long, 5-nerved, nerves glabrous. Palea narrowly lanceolate, apex blunt, 3 mm long, 2-nerved, nerves minutely ciliate. Callus cobwebby. Anthers 1 mm long. Caryopsis ellipsoid, 2 mm long, apex glabrous.

Endemic to the alpine region of Taiwan.

Specimens examined: HSINCHU: Mt. Tapachienshan, *Hsu 12134*. TAICHUNG: Mt. Hsuehshan, *Koyama 23988*. KAOHSIUNG: Second mountain house to Guan-shan, *Kuoh 10778*.

7. **Poa tenuicula** Ohwi, Repert. Spec. Nov. Regni Veg. **36**: 42. 1934; Hsu in Taiwania **16**: 244. 1971; Hsu, Taiwan Grass. 341. *pl. 66*. 1975; Hsu in Li, H.-L., T.-S. Liu, T.-C. Huang, T. Koyama and C. E. DeVol, eds. Fl. Taiwan **5**: 450. 1978.

Perennials. Culms ascending, 19 cm tall, 3 mm wide. Leaf-blades linear, 4 cm long, 2 mm wide, apex acuminate. Sheath obviously compressed. Ligule membranaceous, tongue-shaped, 2 mm long. Inflorescence an open panicle, 5 cm long. Spikelets with 2 florets, ovoid, 4 mm long, 2.5 mm wide. Pedicel glabrous. Lower glume chartaceous, lanceolate, 3 mm long, 1-nerved. Upper glume chartaceous, narrowly ovate, apex acute-obtuse, 4 mm long, 3-nerved. Florets 3.5 mm long. Lemma chartaceous, ovate, 3.5 mm long, 5-nerved, nerves villous. Palea narrowly lanceolate, apex blunt, 2.5 mm long, 2-nerved, nerves minutely ciliate. Callus cobwebby. Anthers 1 mm long. Apex of caryopsis villous.

Endemic to the alpine region of Taiwan.

Specimens examined: NANTOU: Jenai Hsiang, Wuling, *Peng 14474*.; Ho-huan-tang-hon, *Chen 16066*. ILAN: Mt. Nanhutashan, *Hsu 6013*.

Poa was revised in Taiwan and DELTA was used to generate an identification key and descriptions of the taxa. Traditionally, taxonomists spent considerable time in writing taxonomic descriptions and editing identification keys. The DELTA programs is a very useful and powerful tool for doing such work efficiently.

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Appendix 1. The list of characters

#1. <literatures>/

#2. <synonyms>/

#3. <plant duration>/
1. annuals/
2. biennials/
3. perennials <with remains of old sheaths and/or culms>/

#4. culms <habit>/
1. ascending/
2. decumbent/

#5. culms <height>/
cm tall/

#6. culms <diameter>/
mm wide/

#7. leaf-blades <shape>/
1. linear/

#8. leaf-blades <length>/
cm long/

#9. leaf-blades <width>/
mm wide/

#10. leaf-blades <apex>/
1. apex obtuse-acute/
2. apex acuminate/

#11. sheath/
1. obviously compressed/
2. not compressed/

#12. <adaxial> ligule <texture>/
1. membranaceous/

#13. <adaxial> ligule <shape>/
1. tongue-shaped/
2. rounded/
3. triangular/

#14. <adaxial> ligule <length>/
mm long/

#15. inflorescence <shape or type>/
1. an open panicle/
2. a narrowly contracted panicle/

#16. inflorescence <length>/
cm long/

#17. spikelets with <number of florets>/
florets/

#18. spikelets <shape>/
1. ellipsoid/
2. lanceolate/
3. oblong/
4. obovate/
5. ovoid/

#19. spikelets <length>/
mm long/

#20. spikelets <width>/
mm wide/

#21. pedicel <vestiture>/
1. hispid/
2. minutely hispid/

3. glabrous/

#22. lower glume <texture>/
1. chartaceous/

#23. lower glume <shape>/
1. lanceolate/
2. narrowly lanceolate/
3. linear-lanceolate/
4. deltoid-lanceolate/
5. ovate/

#24. lower glume <length>/
mm long/

#25. lower glume <number of nerves>/
-nerved/

#26. upper glume <texture>/
1. chartaceous/

#27. upper glume <shape>/
1. lanceolate/
2. broadly lanceolate/
3. elliptic/
4. narrowly ovate/
5. boat-shaped/
6. ovate/

#28. upper glume <apex>/
1. apex sharp/
2. apex acute-obtuse/

#29. upper glume <length>/
mm long/

#30. upper glume <number of nerves>/
-nerved/

#31. florets <length>/
mm long/

#32. lemma <texture>/
1. chartaceous/
2. membranaceous/
3. subcoriaceous/

#33. lemma <shape>/
1. lanceolate/
2. deltoid-lanceolate/
3. ovate-lanceolate/
4. ovate/
5. elliptic/

#34. lemma <length>/
mm long/

#35. lemma <number of nerves>/
-nerved/

#36. lemma <vestiture on nerves>/
1. nerves villous/
2. nerves minutely villous/
3. nerves glabrous/

#37. palea <shape>/
1. linear-lanceolate/
2. narrowly lanceolate/
3. linear oblong/

#38. palea <apex>/
1. blunt at apex/
2. round or truncate at apex/
3. acute at apex/

#39. palea <length>/
mm long/

#40. palea <number of nerves>/
-nerved/

#41. palea <vestiture on nerves>/
1. nerves villous/
2. nerves minutely hispid/
3. nerves ciliate/
4. nerves minutely ciliate/

#42. callus/
1. cobwebby/
2. hairless/

#43. anthers <length>/
mm long/

#44. caryopsis <shape>/
1. ellipsoid/
2. oblong/
3. linear-oblong/

#45. caryopsis <length>/
mm long/

#46. caryopsis <apex>/
1. apex villous/
2. apex glabrous/

#47. <distribution>/

#48. <note 1>/

#49. <specimen cited>/

#50. <note 2>/

台灣的早熟禾屬（禾本科）植物：應用 DELTA 電腦資料庫系統以產生檢索表及分類群描述

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摘　　要

本研究重新檢討台灣的禾本科早熟禾屬植物的分類，詳細檢視標本館的標本後，我們確認了 7 個分類群。此外，並應用 DELTA（分類學的描述性語言）系統，建立各分類群之特徵資料庫，並據以自動化產生分種檢索表及各分類群之描述。DELTA 系統的使用，使得我們在編輯檢索表及描述物種的效率大為提昇，並得到極佳的成果。

關鍵詞：DELTA 系統，描述，檢索表，早熟禾屬，羊茅族，羊茅亞科，禾本科，台灣，分類學。

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