‘Tainan No. 2’ Statice: A Low Vernalization-requiring *Limonium* Cultivar

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The genus *Limonium*, belonging to Plumbaginaceae, consists of ≈300 species (Burchi et al., 2006). Plants of *Limonium* are grown worldwide in the field or under protection as fresh or dried cut flowers. Differential vernalization is required for cut inflorescence production of *Limonium* depending on the species or hybrid (Armitage and Laushman, 2003; Dole and Wilkins, 2005). Flowering control is not well understood for some taxa. Most of the research has been with *Limonium sinuatum* (L.) Mill., which requires at least 3 to 6 weeks of 11 to 13 °C for floral initiation (Shillo and Zamski, 1985). Harada (1998) divided *Limonium* into Type I and Type II based on their flowering requirements. Type I plants have an absolute vernalization requirement and flowering occurs only once during late spring or summer. Type II plants will flower any time of the year if temperature, light intensity, and duration are appropriate.

In the lowland area of Taiwan, Type I *Limonium* cultivars are usually planted in October. After the natural cooling in winter, plants either remain vegetative or flower erratically between March and May, a period when the price is low. Growers must transport Type I *Limonium* cultivars grown in plug trays to the highland plastic houses between July and October (11 to 18 °C, 12- to 13.5-h day lengths) for flower initiation and then move them back to the lowland area for flowering in winter when the price is high. Introducing the Type II flowering characteristics into the current Type I cultivars is desirable for *Limonium* cut flower production in Taiwan or other subtropical climates.

Origin

A native accession of *Limonium sinense* (Girard) Kuntze was collected from the southern coast in Chaoyi of Taiwan located directly on the Tropic of Cancer. This accession poses the Type II flowering behavior for its year-round flowering nature and was selected as the pollen parent. Hybrid *Limonium* ‘Yellow Diamond’, a commercial Type I cultivar, was selected as the seed parent for its eye-catching yellow calyx and corolla. The parents have dimorphism in the structure of pollen and stigma (Baker, 1953) and crosses between them are compatible and produce seeds. Three hundred F1 progenies were planted in the field of Tainan District Agricultural Research and Extension Station (TNDARES) (long. 23°03' N, lat. 120°20' E) to select for early flowering in Oct. 2005, and 30 plants were selected in Mar. 2006. The open-pollinated seeds were collected from the selected plants, and 50 seeds

of each selection were planted to the field for the second round selection in Oct. 2006. Ten early-flowering individual plants were selected for flower and other horticultural traits in Mar. 2007. Fifty seeds from each individual were planted to the field in Oct. 2007, and ‘Tainan No. 2’ (Fig. 1) was selected and propagated in vitro using shoot multiplication for subsequent performance studies.

Description and Performance

The color descriptions that follow are based on The Royal Horticultural Society’s (RHS) color chart (Royal Horticultural Society, 2007). The elliptic leaves (52 mm wide × 388 mm long) have very weak margin undulation, strong glossiness, and lack hairs. The length of cut inflorescences of ‘Tainan No. 2’ ranges from 80 to 100 cm. The inflorescences have a medium degree of ramification and the lateral branches are semierect. Each lateral flowering branch bears a medium amount of campanulate-typed florets. The 5-mm-wide yellow calyx (RHS 1D) and 4-mm-wide yellow corolla (RHS 1A) give the cut inflorescence a showy color. The peduncle does not have hairs or wings. The cob-typed stigma is higher than the anthers.

The plants of ‘Tainan No. 2’ and ‘Yellow Diamond’, propagated by tissue culture, were raised at 24 to 36 °C in a nursery room. When the vegetative plants had 15 to 20 visible leaves, they were then transferred to growth rooms at pre-planting temperatures of 15/10 or 35/30 °C under a 12-h photoperiod with 150 μmol·m⁻²·s⁻¹ photosynthetic photon flux, provided by the cool-white fluorescent tubes, for 4 weeks. Fifteen plants from each temperature regimen were then planted on 6 Dec. 2008 in field conditions under 10.5- to 12.5-h natural day lengths at temperatures of 15 to

Fig. 1. The inflorescences of *Limonium* ‘Tainan No. 2’.

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Table 1. Effect of pre-planting temperature treatments for 4 weeks on flowering characteristics of *Limonium* 'Tainan No. 2' and 'Yellow Diamond' planted in the field at Tainan District Agricultural Research and Extension Station from Dec. 2008 to Apr. 2009 (15 to 28 °C, 10.5- to 12.5-h natural day lengths).

Cultivar	Day/night temp. (°C)	Time to flowering (d)	Number of inflorescences	Length of inflorescences (cm)
Tainan No. 2	15/10	91.3 a ^c	18.0 a	92.7 a
	35/30	102.0 b	17.3 a	83.8 b
Yellow Diamond	15/10	101.1 b	13.3 a	81.3 b
	35/30	— ^y	—	—

^aMean separation within columns by least significant difference at $P \leq 0.05$.

^yPlants did not flower after 150 d of cultivation after the 35/30 °C pre-planting treatment.

Fig. 2. Flowering performance of *Limonium* 'Tainan No. 2' (right) and its parental cultivar, Yellow Diamond (left) in a plastic house at Tainan District Agricultural Research and Extension Station from Nov. 2009 to Mar. 2010 (17 to 30 °C, 10.5- to 12.5-h day lengths).

28 °C for further growth. Time elapsed from planting in the field to flowering (showing color of the first inflorescence) and the number and average length of the inflorescences were recorded. Least significant differences were determined at the $P \leq 0.05$ level to compare means. Plants of 'Tainan No. 2' flowered 10 d earlier and had longer inflorescences than 'Yellow Diamond' for the 15/10 °C pre-planting treatment (Table 1). Flowering of 'Tainan No. 2' at 35/30 °C was delayed by 10 d compared with those

at 15/10 °C. In contrast, 'Yellow Diamond' plants did not flower after 150 d of cultivation after the 35/30 °C pre-planting treatment.

In another experiment, when the tissue-cultured plants of 'Tainan No. 2' and 'Yellow Diamond' had 15 to 20 leaves, 25 plants of each cultivar were planted on 12 Nov. 2009 in a natural plastic house (17 to 30 °C, 10.5- to 12.5-h day lengths) at TNDARES for 4 months. 'Tainan No. 2' had produced many inflorescences, whereas 'Yellow Diamond' remained vegetative growth as shown in Figure 2.

Uses

'Tainan No. 2' is selected for cut flower production in subtropical climates. In the lowland area of Taiwan, 'Tainan No. 2' can flower year-round with good cut flower quality except in the summer. Plants can be planted in October and flower naturally in winter when the price is high. The cut inflorescences of 'Tainan No. 2' can be used in both fresh and dried forms, because the papery calyx remains open and retains its color. Cut inflorescences should be harvested when approximately half of the florets have opened.

Availability

Taiwan Plant Breeder's Right has been granted by the Council of Agriculture, Executive Yuan, Taiwan, Republic of China. A limited quantity of liners may be available for research purposes only by sending a request to the first author (d96628002@ntu.edu.tw).

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