

‘Florida Blue Frill’ and ‘Florida Pink Frill’—Semi-dwarf Heat-tolerant *Lisianthus* with Bicolored Flowers

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Additional index words. high temperature, rosette, potted flowering plants, *Eustoma grandiflorum*, Gentianaceae, plant breeding

‘Florida Blue’ was released in 1995 as a blue flowering, semi-dwarf, and heat-tolerant cultivar of *lisianthus* [*Eustoma grandiflorum* (Raf.) Shinnery; Gentianaceae Juss.] developed at the University of Florida’s Gulf Coast Research and Education Center, Bradenton, Fla. (Harbaugh et al., 1996). It was the first semi-dwarf cultivar whose seedlings could be grown at 28 to 31 °C without rosetting. Seedlings of most commercial cultivars of *lisianthus* form rosettes when grown at or above 25 to 28 °C (Harbaugh et al., 1992; Ohkawa et al., 1991). Rosetted plants have a basal cluster of leaves, very short internodes typical of biennials, and do not bolt or flower for 3 to 6 months unless exposed to <15 to 18 °C for 3 to 4 weeks (Ohkawa et al., 1994; Pergola, 1992). Thus, commercial production of *lisianthus* for late spring or summer sales is limited by high temperatures in many areas of the United States and other countries. Also, rosetting of plugs caused by the interaction of high temperatures and short days makes fall plug production to produce flowering plants for early spring sales difficult (Harbaugh, 1995).

‘Florida Pink’ and ‘Florida Light Blue’ released in 1998 (Harbaugh and Scott, 1999) and ‘Florida Silver’ released in 2001 (Harbaugh and Scott, 2001) were F1 semi-dwarf, heat-tolerant, low rosette-forming *lisianthus* similar to ‘Florida Blue’. These cultivars provided different flower color selections in the Florida cultivar group. ‘Florida Blue Frill’ and ‘Florida Pink Frill’ plants also are semi-dwarf and heat-tolerant. They have vegetative and flower characteristics that are similar to ‘Florida Blue’ and provide blue- and pink-bicolor flower selections to the Florida cultivar-group (Fig. 1).

Origin

‘Florida Blue Frill’ is an F1 hybrid resulting from crossing inbred lines UF03-529 and UF03-524 (Fig. 2). Both parents were chosen for their heat-tolerance and bright white petals with violet-blue borders. In addition, UF03-529 was chosen for its branching habit and UF03-524 for its compactness.

UF03-529 was the F8 selection of a cross between UF96-426 and UF96-255. A blue/white bicolored flowering plant was selected in the F2. Stable expression of the blue petal border often is problematic with an undesirable bleeding of the blue color downward into the white portion of the petal, completely blue flowers developing, or the thickness and length of the blue border may vary from just a small blotch to the entire petal apex. Thus, the F2 was improved over six generations before uniform and stable plants were developed. UF96-426 was the F2 selection of a cross between UF94-237 and UF94-404 and was chosen for its bright white flowers and basal branching. UF94-237 and UF94-404 were used as sources of heat-tolerance and are described by Harbaugh and Scott, 1998 and Harbaugh and Scott, 2001, respectively. UF94-237 also was used for its floriferousness and UF94-404 was selected for its dwarf plant habit and pure white flowers. The white portion of the petal can vary from a dull cream color to a bright, pure white. The latter is necessary to achieve the ideal contrast with the dark blue border.

UF96-255 was the F2 selection of a cross between UF94-46 and UF94-393 and it was chosen for its bright white petals with dark violet-blue borders on the petal apex. UF94-46 was used as a source of heat-tolerance (Harbaugh et al., 1996) and dwarf plant habit. UF94-393 was selected in the F2 and improved two generations. It primarily was used to intro-

duce blue/white bicolored flower traits into our heat-tolerant lines. UF94-393 was the result of crossing the F1 of an unknown tall parent (large blue flower) × ‘Mermaid Blue’ (dwarf habit) with ‘Double Echo Misty Blue’.

UF03-524 was the F8 selection of a cross between UF96-393 and UF96-255. A blue/white bicolored flowering plant was selected in the F2 and improved over six generations until a stable expression of both the white and blue portions of the petal were achieved. UF96-393 was the F2 selection of a cross between UF94-226 and UF94-230. They were used as a source of heat-tolerance and dwarf plant habit. UF94-226 was a selection of UF95-309 described by Harbaugh and Scott, 1999, and UF94-230 was the F3 of a cross between 94-214 (Harbaugh and Scott, 1998) and a sister line of UF95-309.

‘Florida Pink Frill’ is an F1 hybrid resulting from crossing inbred lines UF02-1381 and UF02-1377 (Fig. 1). UF02-1381 was chosen for its heat-tolerance, pink/white bicolored flowers, basal branching, and floriferousness. UF02-1377 was chosen for its heat-tolerance, compactness, sturdy stems, and pink/white bicolored flowers. Both lines have stable expression of bicolored petals with thick, bright pink petal borders.

UF02-1381 was the F7 selection of a cross between UF96-255 and UF96-426. A pink/white bicolored flowering plant with was selected in the F2 and improved over five generations. UF02-1377 was the F7 selection of a cross between UF96-393 and UF96-255. A plant with flowers having very vivid dark pink borders on the petal apex was selected in the F2 and improved over five generations. UF96-255, UF96-426, and UF96-393 were also used in breeding ‘Florida Blue Frill’ and are described above.

Growing conditions used to select seedlings for resistance to heat-induced rosetting during development of heat tolerant parents included 1) production during summer months under greenhouse conditions at day temperatures >35

Fig. 1. ‘Florida Blue Frill’ (left) and ‘Florida Pink Frill’ (right) *lisianthus*.



Received for publication 4 Nov. 2004. Accepted for publication 29 Nov. 2004. This research was supported by the Florida Agricultural Expt. Station, and approved for publication as journal series R-10565. We thank Nancy West and Gail Bowman for their excellent technical support.

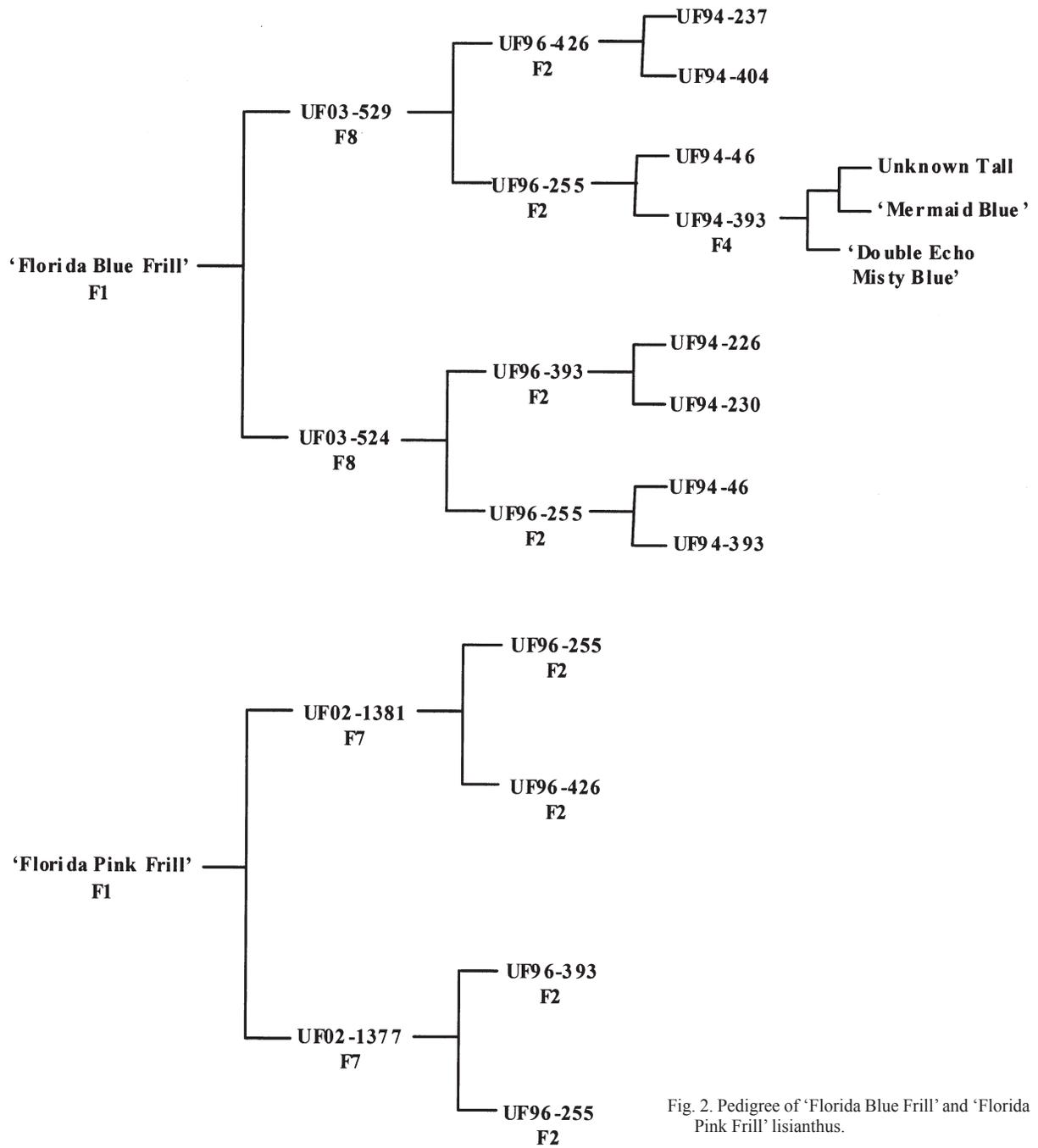


Fig. 2. Pedigree of 'Florida Blue Frill' and 'Florida Pink Frill' lisianthus.

Table 1. Percentage rosetted plants^a and growth and flowering characteristics^b of nine cultivars of lisianthus grown in 11.5-cm (0.65-L) square pots at Bradenton, Fla.

Cultivar	Rosetted (%)	Plant ^a		Basal branches ^w (no.)	Flowers and buds (no.)	Petal length (cm)	Days to flower (no.)
		ht (cm)	width (cm)				
'Florida Blue'	4	39	23	4.2	56	6.0	138
'Florida Blue Frill'	0	33	21	4.0	37	6.1	138
'Florida Pink Frill'	0	35	23	1.6	46	6.3	132
'Heidi Lilac Rose'	100	84	17	2.8	43	6.0	150
'Heidi Pastel Blue'	62	97	21	2.0	35	6.6	149
'Mermaid Pink'	100	27	18	2.8	37	4.9	141
'Sapphire Blue Chip'	92	39	20	5.4	45	5.8	131
'Sapphire Pink Rim'	71	25	20	6.6	35	5.0	127
LSD ($\alpha = 0.05$)	16	7.5	2.3	1.1	11.8	0.5	4.6

^aSeventeen-d-old seedlings were grown at 31 °C for 5 weeks in a growth chamber and evaluated after 4 weeks for percentage of rosetted plants. Value are means of three replications with eight plants as the experimental unit arranged in a randomized block design.

^bVegetative and flowering characteristics were for plants grown in a greenhouse at 33 to 35 °C day and 13 to 15 °C night. Values are means of five replications of single-plant experimental units arranged in a completely randomized design.

^cPlant height = distance from the pot rim to the tip of the highest bud measured after three flowers had opened.

^wLateral stems forming from the first four to five leaf pairs before bolting.

°C, 2) exposure of 2- to 4-week-old seedlings to 28 °C for 4 weeks in growth chambers for initial selections in early generations, and 3) exposure of 17-d-old seedlings to 31 °C for 5 weeks in growth chambers for selection of final parents used in F1 hybrids. The photosynthetic photon flux in growth chambers was 150 to 190 $\mu\text{mol}\cdot\text{m}^{-2}\cdot\text{s}^{-1}$ from cool-white fluorescent bulbs.

Flower Color Description

Flower color was determined under natural light using the Royal Horticultural Society Colour Chart (Royal Horticultural Society, 1966). A number plus a letter are used for each color chip (e.g., 65B). Petals of lisianthus typically are one color over most of the surface, but exhibit a distinct basal eyespot (i.e., base of petals surrounding the ovary) of a different color.

'Florida Blue Frill' and 'Florida Pink Frill' flower petals are predominantly white (155D) on the adaxial and abaxial petal surface. 'Florida Blue Frill' flowers have a violet-blue (89C on the adaxial and 90C on the abaxial petal surface) border on the petal apex that is usually 0.5 to 0.75 cm wide. 'Florida Pink Frill' flowers have a dark pink (55C on the adaxial and 56A on the abaxial petal surface) border on the petal apex. The eyespot is a yellow-green (145B) on both cultivars.

Characteristics and Use

Cultivars used in our research belonged to four cultivar-groups. Cultivars in the Sapphire and Mermaid cultivar-groups are dwarf, cultivars in the Florida cultivar-groups are semi-dwarf, and cultivars in the Heidi cultivar-group are tall (cut flowers). 'Florida Blue' was the only cultivar that was known to have heat-tolerance and low rosette formation. Seeds of all cultivars were planted on 16 Dec. 2003 (control) or 21 Jan. 2004 (heat stress test) at Bradenton. Seedlings (17-d-old) were

grown either in a glasshouse (control) with a high of 33 to 35 °C day and 13 to 15 °C night or at a constant 31 °C for 5 weeks in a growth chamber (heat stress test). Seedlings exposed to 31 °C were rated as rosetted if they had not bolted after growth for an additional 4 weeks in the control greenhouse. Nonrosetted plants from the control greenhouse were evaluated for plant height, plant width, number of basal branches (lateral stems originating at the first four to five leaf pairs; i.e., from the basal cluster of leaves below the bolted stem), total number of flowers and buds per plant after three flowers were open, petal length, and the number of days from sowing to flowering.

The most important and distinguishing attribute of all the Florida cultivar-group cultivars as compared with the dwarf and cut-flower commercial lines was their heat tolerance (Table 1). Only 0% to 4% of the heat stressed seedlings of Florida cultivars rosetted. However, 71% to 75% of the Sapphire cultivar-group and 100% of the Heidi cultivar-group seedlings exposed to 31 °C rosetted.

In addition to heat-tolerance, we considered that 'Florida Blue Frill' and 'Florida Pink Frill' plants exhibited sufficient similarities in flower form and display, branching habit, and in the number of days from sowing to flowering in comparison with 'Florida Blue' that they could be included in the Florida cultivar-group. Notable differences between the Florida cultivars were 1) 'Florida Pink Frill' had fewer basal branches and flowered an average of 6 d earlier than the other Florida cultivars, and 2) the number of flowers and buds were less on 'Florida Blue Frill' plants compared to the other Florida cultivars.

Florida cultivars are intended to be used as bedding plants or for flowering potted plants. Treatment with growth retardants is necessary for production of Florida cultivars in ≤ 11.5 -cm-diameter pots (Harbaugh et al., 1998). One to three plugs per 7.6 to 11.5-cm-diameter pot is recommended for optimal marketing display.

Availability

Distribution of seed is through the Florida Foundation Seed Producers, P.O. Box 309, Greenwood, FL 32443. Scientist interested in small amounts of seed for research purposes should contact B.K.H.

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