



## Lisianthus 'Double Joy' -- Five Colors of Double-Flowering and Heat-Tolerant Cultivars Released by the University of Florida's Lisianthus Breeding Program<sup>1</sup>

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Brent K. Harbaugh and Zhanao Deng<sup>2</sup>

In 1985, When we started a breeding program for lisianthus [*Eustoma grandiflorum* (Raf.) Shinnery; Gentianaceae Juss.] at the University of Florida's Gulf Coast Research and Education Center - Bradenton, Florida, the emphasis was on development of single flowering, pot or bedding plant types with heat tolerance and basal branching. At that time, cut flowers with single flowers were the most prominent type of lisianthus being grown in the United States, and evaluation of the potential of lisianthus as a pot crop generally was with single-flowering types (Halevy and Kofranek, 1984; Roh et al., 1989). Single flowers are still more popular than double flowers in cut-flower markets in Europe and Japan, but double flowers have become the most popular in the United States cut-flower markets. Presently, over 80% of the lisianthus grown for cut-flowers in the United States are double-flowering types. Double flowers typically have two to five rows of petals compared to a single row with five petals in single flowers. The original double flowers were natural mutations found by Japanese growers (Ohkawa, personal

communication). Since double flowering types had such a high acceptance in the United States, we started a program in 1995 to breed our heat tolerance into double flowering pot types.

High temperatures during the seedling stage cause rosetting, or the formation of a basal cluster of leaves with no flowering stems, in lisianthus (Harbaugh et al., 1992; Harbaugh, 1995; Ohkawa et al., 1991; Ohkawa et al., 1994; Pergola, 1992), and cultivars differ significantly in their sensitivity to high temperatures (Fukuda et al., 1994; Harbaugh et al., 1992; Li et al., 2002). 'Maurine Blue' (Harbaugh and Scott, 1996) and 'Florida Blue' (Harbaugh et al., 1996) were the first heat-tolerant lisianthus whose seedlings could be grown at 28-31°C (82-88°F) without rosetting. The UF Double Joy cultivar group is intermediate in height between the Florida cultivar group and the Maurine cultivar group. Double-flowering types are not yet available in the Maurine and Florida cultivar groups. While a few double-flowering pot type lisianthus cultivars have recently been released by commercial seed

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1. This document is ENH1067, one of a series of the Environmental Horticulture Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Original publication date February, 2007. Visit the EDIS Web Site at <http://edis.ifas.ufl.edu>.

2. Brent K. Harbaugh, professor, and Zhanao Deng, assistant professor, Gulf Coast Research and Education Center, Florida Cooperative Extension Service, IFAS, University of Florida, Gainesville, FL 32611.

companies in the US market, to our knowledge the UF Double Joy cultivars are the first double-flowering and heat-tolerant cultivar group. The UF Double Joy types are represented with five colors including blue, pink, white, blue rim, and pink rim (Fig. 1).

## Selection Procedures

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  $\geq 35^{\circ}\text{C}$ , (2) exposure of 2- to 4-week-old seedlings to  $28^{\circ}\text{C}$  for 4 weeks in a growth chamber for initial selections in early generations, and (3) exposure of 17-day-old seedlings to  $31^{\circ}\text{C}$  in a growth chamber for 5 weeks for selection of final parents used in  $F_1$  hybrids. The photosynthetic photon flux in growth chambers was  $150\text{--}190 \mu\text{mol}\cdot\text{m}^{-2}\cdot\text{s}^{-1}$  from cool-white fluorescent bulbs.

Heat tolerance as well as vegetative and flower characteristics of the Double Joy cultivar group were compared to seven commercial bedding or pot type cultivars. Seeds of all cultivars were planted on 19 January 2005, at Bradenton, Fla. Seventeen-day-old seedlings were grown either in a glasshouse (control) with a high of  $30$  to  $33^{\circ}\text{C}$  day and  $13$  to  $15^{\circ}\text{C}$  night or at a constant  $31^{\circ}\text{C}$  for 5 weeks in a growth chamber (heat-stressed). Seedlings exposed to  $31^{\circ}\text{C}$  were rated as rosetted if they had not bolted after growth for an additional 4 weeks in the control greenhouse. Non-rosetted plants from the control greenhouse were evaluated for plant height, plant width, number of branches (lateral stems forming on the central stem from the basal leaves to the first flower), 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 'Double Joy' cultivar group cultivars as compared with other commercial lines was their heat tolerance (Table 1). 'Florida Silver' was an exception, but it was released from our program as a semi-dwarf and heat-tolerant line and is now commercialized (Harbaugh *et al.*, 1996). None of the

heat stressed Double Joy cultivar group rosetted, while 70% 'Forever White', 97% 'Lisa Lavender', 100% 'Lizzy Pink', 97% 'Mermaid Lilac Rose', 86% 'Sapphire Blue Chip', and 53% 'Tiramisu Double Violet' seedlings rosetted.

In addition to heat tolerance, we considered that the UF Double Joy cultivars exhibited sufficient similarities in flower form and display, branching habit, and in the number of days from sowing to flowering to be included in the Double Joy cultivar-group. Notable differences were that plant height ranged from 38 to 48 cm for all UF Double Joy cultivars except 'UF Double Joy Pink' was 55 cm, and 'UF Double Pink Rim' flowered 119 days from sowing compared to 115-116 days for the other UF

## Characteristics and Use

UF Double Joy cultivars are intended to be used as flowering potted plants in containers  $\geq 15\text{-cm}$  diameter pots. Plant height for Maurine cultivars averaged 75 to 102 cm (Harbaugh and Scott, 1998) and Florida cultivars 28 to 35 cm (Harbaugh and Scott, 2001). Thus the UF Double Joy cultivars were intermediate in height averaging 39 to 55 cm. Treatment with growth retardants is necessary for production of UF Double Joy cultivars in  $\leq 15\text{-cm}$ -diameter pots (Harbaugh *et al.*, 1998). Three to four plugs per 15-cm-diameter pot are recommended for optimal marketing display.

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## 'UF DOUBLE JOY' Series

### Lisianthus



Blue



White



Pink



Pink Rim



Blue Rim

Cultivar	Plant <sup>z</sup>				Flowers and buds	Petal length	Days to flower
	Rosetted	ht	width	Branches			
	(%)	(cm)	(cm)	(no.)	(no.)	(cm)	(no.)
Florida Silver	0	37	23	11	80	6.2	114
Forever White	70	31	20	12	56	5.9	112
Lisa Lavender	97	29	20	7	49	5.9	108
Lizzy Pink	100	31	20	8	54	5.6	116
Mermaid Lilac Rose	97	28	18	8	55	5.8	112
Sapphire Blue Chip	83	28	19	11	66	5.5	107
Tiramisu Double Violet	53	39	21	7	43	5.4	119
UF Double Joy Blue	0	40	21	9	44	5.8	116
UF Double Joy Blue Rim	0	38	20	11	59	5.6	116
UF Double Joy Pink	0	55	16	8	38	5.9	116
UF Double Joy White	0	39	23	10	67	5.6	115
LSD (P=0.05)	11	3.5	4.7	2.1	9.2	0.4	3

<sup>z</sup> Seventeen-day-old seedlings were exposed to 31°C for 5 weeks in a growth chamber and then grown in a greenhouse for 4 weeks. Percentages of rosetted plants are means of three replications with eight plants as the experimental unit arranged in a randomized block design.

<sup>y</sup> Vegetative 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.

<sup>x</sup> Plant height = distance from the pot rim to the tip of the highest bud measured after three flowers had opened.

<sup>w</sup> Lateral stems forming on the central stem from the basal leaves to the first flower.