‘UF-331’ and ‘UF-340’: New Dwarf Caladium Cultivars for Landscape and Pot Plants

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Additional index words. Araceae, *Caladium ×hortulanum*, *Caladium bicolor*, ornamental aroids, breeding

Caladiums (*Caladium ×hortulanum* Birdsey, Araceae Juss.) are ornamental aroids grown for their bright, colorful leaves. Their short forcing period, shade tolerance, and low maintenance requirements in the landscape make caladiums popular among pot-plant producers, homeowners, and landscapers (Evans et al., 1992; Harbaugh and Tjia, 1985). The majority of caladiums commercially produced in the world belong to the fancy leaf type, and the most popular color has been white (white center with green veins or white center with white veins). In surveys of Florida caladium growers, who supply more than 95% of the caladium tubers in the world market, white-colored cultivars account for greater than 35% of the caladiums the growers produce (Bell et al., 1998; Deng et al., 2005).

In recent decades, lance-leaved cultivars have gained much more popularity as a result of their inherent characteristics such as shorter stature, better resilience to environmental stresses, and easier forcing in containers. Short lance-leaved cultivars are much easier and less expensive to ship from production facilities to market sites. However, the number of lance-leaved cultivars and the color selection within these cultivars have been rather limited (Bell et al., 1998; Deng et al., 2005) and many of the available lance-leaved cultivars have low tuber yield or production value (Wilfret, 1991a). These factors have made production of tubers for these cultivars difficult and less profitable compared with production of fancy-leaved cultivars and, in turn, resulted in limited

supply and increased costs of tubers for greenhouse growers and nurseries interested in lance-leaved caladiums. Developing new lance-leaved cultivars with improved or novel foliar characteristics and good tuber yield has been a major objective in the caladium breeding program of University of Florida’s Institute of Food and Agricultural Sciences since 1976.

‘UF-331’ (Fig. 1) and ‘UF-340’ (Fig. 2) are two new white lance-leaved caladium cultivars with novel combinations of foliar characteristics. Leaves of ‘UF-331’ are characterized by large dark green veins and white interveinal areas, which result in an attractive coloration pattern. Although the white face with green veins is similar to the popular fancy-leaved caladium ‘Candidum Junior’ (and ‘Candidum’), ‘UF-331’ is the first lance-leaved cultivar with this pattern. ‘UF-340’ develops a large number of wide lance leaves with a large, bright, and pure white center surrounded by green margins. It is distinct from other white lance-leaved cultivars such as ‘Florida White Ruffles’ and ‘White Wing’ that have narrow, creamy white leaves. In addition, ‘UF-331’ and ‘UF-340’ have improved performance in container forcing and landscape use compared with other lance-leaved cultivars. Tuber yield of both cultivars was similar to or better than the currently available, commercial white lance-leaved cultivars. Both cultivars produce multibranching tubers that do not require de-eyeing, a time-consuming and costly practice for preparing caladium tubers for container forcing.

Origin

‘UF-331’ was initially selected in 2004 as GCRC-3220 out of a population of progeny from a 2003 cross between ‘Florida Sweetheart’ and ‘Florida Fantasy’ (Fig. 3). ‘Florida Sweetheart’ was selected as one of the parents because of its multiple leaf development, lance leaf shape, compact growth habit, high tuber yield, and multiple

branching habit, whereas ‘Florida Fantasy’ was selected because of its netted venation pattern. Both ‘Florida Sweetheart’ and ‘Florida Fantasy’ were produced by crossing ‘Candidum Junior’ and ‘Red Frill’ (Wilfret, 1991a, 1991b).

‘UF-340’, derived from a 2003 cross between ‘Florida Moonlight’ and ‘Florida Sweetheart’, was initially selected as GCRC-3230 (Fig. 4). ‘Florida Moonlight’ was selected as one of the parents for its bright white leaf color and high tuber yield. It was a progeny from the cross between ‘Aaron’ and ‘Candidum Junior’ (Miranda and Harbaugh, 2003).

The ancestry of ‘Aaron’, ‘Candidum Junior’, and ‘Red Frill’ is unknown, although ‘Candidum Junior’ was suspected to be a field mutation of ‘Candidum’ (Wilfret, 1991a), a cultivar widely produced and used as a result of its unique venation/coloration pattern and good tuber yield. ‘Red Frill’ is known for its compact growth habit, multiple leaf development, and lance leaf shape. ‘Aaron’ has been a major white fancy-leaved cultivar because of its large white leaf center and high tuber yield.

Description

Descriptions of color [e.g., Royal Horticultural Society (RHS) 200B] for plant parts are based on comparison with the Royal Horticultural Society Colour Chart (Royal Horticultural Society, 1986). Plants used for describing color were grown in 11.5-cm containers in a 45% shaded greenhouse from No. 1 (3.8 to 6.4 cm) de-eyed tubers.

‘UF-331’. Jumbo-sized tubers (6.4 to 8.9 cm in diameter) are multisegmented bearing four to seven dominant buds. Tuber surfaces are brown (RHS 200B) with the cortical area yellow-orange (RHS 15D). Leaves are lanceolate with a sagittate-cordate base and a broad acuminate tip slightly undulate with green (RHS 137A) penniform venation. The upper surface has dark green (RHS 139A) margins, 1 to 2 mm wide, bordering the entire leaf except for the basal leaf valley where it is gray-purple (RHS 187A). The leaf center is gray-purple (RHS 187A) and up to 20 mm. Leaves have a thick (3 to 5 mm wide) central main vein in dark green (RHS 137A) and numerous (up to 18) large veins (2 to 4 mm wide) in dark green (RHS 137A) radiating from the central vein. These large veins connect marginally with a thinner (1 to 2 mm wide) green vein (RHS 137A) that roughly parallels the leaf margins and a peripheral thin green (RHS 137B) vein. A small green (RHS 137B) vein is located between and parallel to the leaf margins and the peripheral vein. Netted secondary veins are green (RHS 137B). The interveinal area is variable, from white (RHS 155C) to red-purple (RHS 61D), depending on light conditions and leaf maturity, and the area is translucent, making the main veins very prominent. Leaves have a large (≈2 cm) gray-purple (RHS 178A) blotch at the petiole attachment covering a small portion of the

Received for publication 7 July 2008. Accepted for publication 11 Aug. 2008.

This research was supported by the Florida Agricultural Experiment Station and by grants from the Florida Caladium Growers Association. We thank Richard O. Kelly, Joyce Jones, Nancy West, and Gail Bowman for their excellent technical support.

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Fig. 1. 'UF-331' plant produced by forcing four intact No. 1 tubers (3.6 to 6.4 cm in diameter) in a 20.3-cm pot. Photo was taken 10 weeks after the tubers were planted.

Fig. 2. 'UF-340' plant produced by forcing four intact No. 1 tubers (3.6 to 6.4 cm in diameter) in a 20.3-cm pot. Photo was taken 8 weeks after the tubers were planted.

Fig. 3. Pedigree of caladium cultivar UF-331.

central and large veins. The undersurface has narrow (1 to 2 mm) gray-green (RHS 191A) margins. Primary veins are gray-green (RHS 191). Interveinal areas are variable, gray-white (RHS 156) to red-purple (RHS 61D). Petioles are 3 to 5 mm thick and light brown (RHS 200D) at the apex, but the colors diffuse into a dark brown (RHS 200B) at the base that is ≈ 7 mm in diameter.

Plants grown for ≈ 4 months in full sun in ground beds had an average height of 27 cm. The largest leaf on plants grown in a 45% shaded greenhouse produced from an intact No. 1 tuber in an 11.4-cm pot averaged 19 cm long and 13 cm wide 10 weeks after planting. When grown from 2.54-cm tuber propagules in ground beds with full sun, leaves averaged 22 cm long and 12 cm wide 4 months after planting.

'UF-340'. Jumbo-sized tubers are multi-segmented, bearing five to nine dominant buds. Tuber surfaces are brown (RHS 200C) with the cortical area yellow-orange (RHS 10C). Leaves are sagittate-cordate, 15 to 21 cm long and 10 to 15 cm wide, and very slightly undulate with a white (RHS 155D) penniform venation. Two lobes are up to one-third of the leaf length. The upper surface has green (RHS 138A) margins, to 10 mm wide, bordering the entire leaf except for the basal leaf valley formed by the two lobes where it is gray-purple (RHS 185B). The central and main veins are white (RHS 155C). Interveinal areas are white (RHS 155B) except for the areas near the margins, where irregular light green (RHS 136C) mottling is present. A 1- to 2-mm gray-purple line (RHS 185B) is present on the basal leaf collar at the petiole apex. The undersurface has gray-green (RHS 191A) margins, up to 10 mm wide, and a white (RHS 155D) center and light green (RHS 130D) central and main veins. Secondary veins are light green (RHS 130D) and netted. Petioles are 3 to 5 mm thick and green (RHS 191C) at the apex, but the colors diffuse into a dark brown (RHS 200A) at the base that is ≈ 6 mm in diameter.

Plants grown for ≈ 4 months in full sun in ground beds had an average height of 27 cm. The largest leaf on plants grown in a 45% shaded greenhouse produced from an intact No. 1 tuber in an 11.4-cm pot averaged 19 cm long and 13 cm wide 8 weeks after planting. When grown from 2.54-cm tuber propagules in ground beds with full sun, leaves averaged 18 cm long and 13 cm wide 4 months after planting.

Performance

'UF-331' and 'UF-340' were evaluated for tuber production and plant performance at the Gulf Coast Research and Education Center in Wimauma, FL, in 2006 and 2007. The soil was an EauGallie fine sand with $\approx 1\%$ organic matter and a pH of 6.2. In 2006, raised ground beds (91 cm wide, 20 cm high) were fumigated on 30 Mar. with a mixture of 67% methyl bromide and 33% chloropicrin (by volume) at the rate of 196 kg ha⁻¹ and

Fig. 4. Pedigree of caladium cultivar UF-340.

covered with white-on-black plastic mulch (white side facing plants). Caladium seed pieces (tuber pieces, ≈ 2.54 cm $\times$ ≈ 2.54 cm $\times$ ≈ 2.54 cm) were planted in the beds on 11 Apr. with 15-cm spacing between rows and in rows. A constant water table was maintained below the beds using the seep irrigation system (Geraldson et al., 1965). Osmocote 18N-2.6P-10K 8- to 9-month controlled-release fertilizer (Scotts Co., Marysville, OH) was applied to the bed surface when shoot tips were emerging from the soil with N at 336 kg·ha⁻¹. In 2007, the beds (71 cm wide, 21 cm high) were fumigated on 3 Apr. using the same fumigant mixture (196 kg·ha⁻¹). Caladium seed pieces were planted on 16 Apr. with 25.4-cm between-row spacing and 15.2-cm in-row spacing. A drip irrigation system was used to provide water (≈ 6 mm·d⁻¹) and 6N-0.8P-3.9K soluble fertilizer with N at the rate of ≈ 1.9 kg·ha⁻¹·d⁻¹ (total N at 290 kg·ha⁻¹ per growing season). Tubers were dug in Dec. 2006 and Jan. 2008, respectively. Dried tubers were graded by maximum diameter: No. 2 (greater than 2.5 cm and less than 3.8 cm), No. 1 (greater than 3.8 cm and less than 6.4 cm), Jumbo (greater than 6.4 cm and less than 8.9 cm), Mammoth (greater than 8.9 cm and less than 11.4 cm), and Super Mammoth (greater than 11.4 cm).

The production index, an indicator of economic value of the harvested tubers, was calculated as follows: N (No. 2) + 2N (No. 1) + 4N (Jumbo) + 6N (Mammoth) + 8N (Super Mammoth), where N = number of tubers in each grade.

Field plots were organized in a randomized complete block design consisting of three replications, and each plot contained 30 propagules. 'Florida White Ruffles', 'White Wing' (the two major white lance-leaved cultivars), and 'Candidum Junior' (a semidwarf, fancy-leaved cultivar that had a similar venation and coloration pattern) were included in the field trials as controls or checks. To compare the performance (tuber weight, number of marketable tubers, and production index) of 'UF-331' and 'UF-340' with the controls, an analysis of variance was conducted using the GLM procedure in the SAS program followed by mean separation by Fisher's least square difference at $P = 0.05$ (SAS Institute, 2003).

The average tuber weight of 'UF-331' was the same as 'White Wing', but was 40% or 50% greater than that of 'Florida White Ruffles' and 'Candidum Junior', respectively, in 2006 (Table 1). In 2007, the tuber weight of 'UF-331' was onefold to 3.8-fold greater than that of the controls (Table 1).

The production index was 18% to 166% higher for 'UF-331' compared with the controls in both 2006 and 2007. 'UF-331' produced a similar number of marketable tubers as 'Florida White Ruffles' and 'White Wing' in both 2006 (49 to 55 tubers) and 2007 (26 to 36 tubers). Compared with 'Candidum Junior', 'UF-331' produced a few more tubers (36 versus 31) in 2007 and significantly more (54 versus 39) in 2006. The majority (greater than 75%) of marketable tubers produced by 'UF-331' were in the No. 1, Jumbo, and Mammoth categories. This size distribution is ideal for tubers marketed for container forcing and landscape use.

The tuber weight of 'UF-340' was lower than that of 'White Wing' but was similar to that of 'Florida White Ruffles' and 'Candidum Junior' in 2006 (Table 1). In 2007, the average tuber weight of 'UF-340' was 67% to 289% greater than that of the three controls. The production index of 'UF-340' was similar to that of 'Florida White Ruffles' and 'White Wing' but 22% greater than that of 'Candidum Junior' in 2006, and in 2007, 'UF-340' was 1.2-fold to 2.8-fold greater than the commercial controls. In both 2006 and 2007, 'UF-340' consistently produced the greatest number of marketable tubers, significantly higher than any of the controls. The majority of the tubers produced by 'UF-340' were in the No. 1, No. 2, and Jumbo categories with few in the Mammoth size category.

Landscape performance of cultivars grown under full sun conditions was evaluated in 2006 and 2007 on the same plots used for evaluating tuber production. The overall plant performance was rated multiple times (July, August, and September) in each growing season on a scale of 1 to 5 with 1 being very poor (few leaves and lack of vigor) and 5 being excellent (full plants, numerous leaves,

Table 1. Tuber weight, production index, number, and grade distribution of five caladium cultivars in 2006 and 2007^a.

Cultivar	Tuber			Tuber distribution ^b (%)				
	Wt (kg)	Production index ^c	Marketable (no.)	Super Mammoth	Mammoth	Jumbo	No. 1	No. 2
Year 2006								
UF-331	5.7 a ^w	194 a ^w	54 b ^w	2	21 a ^v	43 ab ^v	22 b ^w	12
UF-340	3.8 b	157 b	70 a	0	5 b	18 c	50 a	27
Florida White Ruffles	4.4 b	163 b	55 b	1	17 a	26 bc	30 ab	27
White Wing	5.7 a	164 b	50 b	3	13 ab	38 abc	33 a	13
Candidum Junior	4.0 b	128 c	39 c	3	11 ab	50 a	21 b	16
Year 2007								
UF-331	4.3 a ^w	109 b ^w	36 b ^w	1	10 a ^w	28 a ^w	36 b ^w	16 b ^w
UF-340	3.5 a	155 a	66 a	2	6 ab	21 a	28 b	43 a
Florida White Ruffles	1.0 b	43 c	30 b	0	1 b	4 b	27 b	68 a
White Wing	0.9 b	41 c	29 b	0	0 b	4 b	33 b	63 a
Candidum Junior	2.1 b	71 c	32 b	0	0 b	26 a	54 a	20 b

^aValues presented are means of three replications with 30 propagules planted in a plot.

^bTubers graded by maximum diameter: No. 2 (greater than 2.5 cm and less than 3.8 cm), No. 1 (greater than 3.8 and less than 6.4 cm), Jumbo (greater than 6.4 cm and greater than 8.9 cm), Mammoth (greater than 8.9 cm and less than 11.4 cm), and Super Mammoth (greater than 11.4 cm). Tuber distribution data (%) were transformed using the formula arcsine [square root (percentage/100)] before analysis of variance and mean separation.

^cThe production index is an indicator of economic value of the crop harvested and is calculated as follows: N (No. 2) + 2N (No. 1) + 4N (Jumbo) + 6N (Mammoth) + 8N (Super Mammoth), where N = number of tubers in each grade.

^wNumbers in the same column followed by the same letter are not significantly different by Fisher's least significant difference (LSD) test at $P \leq 0.05$.

^vMeans in this column for year 2006 followed by different letters were not significantly different by Fisher's least significant difference test at $P \leq 0.05$ but were significantly different at $P \leq 0.09$.

and bright color display). Similarly, leaf sunburn tolerance was also evaluated multiple times in each growing season on a scale of 1 to 5 with 1 being very susceptible to sunburn and showing numerous sun-damaged areas or holes on leaves and 5 being resistant to sunburn and not showing any sun-damaged areas. At $\approx$ 4 months after planting, plant height, number of leaves, and foliar characteristics were measured.

'UF-331' was significantly taller (5 to 11 cm) and developed significantly larger (4 to 7 cm longer and 2 to 6 cm wider) leaves than 'Florida White Ruffles' and 'White Wing' (Table 2). 'UF-331' performed much better than 'White Wing' during the whole growing season with much fuller plants and better color display. Compared with 'Florida White Ruffles', the performance ratings of 'UF-331' were higher, but the difference was significant only in the early season (July ratings). 'UF-331' had good tolerance to sunburn during the whole growing season and showed little leaf tissue damage, resulting in the highest ratings.

'UF-340' averaged 27 cm tall, similar to 'White Wing' (24 cm) but taller than 'Florida White Ruffles' (18 cm), a very prostrate cultivar (Table 2). 'UF-340' was shorter than 'Candidum Junior', a semidwarf fancy-leaved cultivar. 'UF-340' produced the greatest number (33) of leaves, exceeding both 'Florida White Ruffles' (27) and 'White Wing' (20). Leaves of 'UF-340' were similar to those of 'White Wing' in length but longer than those of 'Florida White Ruffles' and wider than both cultivars. The performance ratings of 'UF-340' were 3.9 to 4.4, which

was higher than that of 'Florida White Ruffles' and 'White Wing'.

The suitability for container forcing was evaluated by forcing tubers in 11.4-cm containers. No. 1 tubers were planted either intact or de-eyed in a peat/vermiculite mix (VerGro Container Mix A; Verlite, Tampa, FL) on 26 Mar. 2007. The study was conducted in a greenhouse with 45% light exclusion during the summer in Wimauma, FL. Average daily temperatures ranged from a low of 16 °C night to 29 °C day during the experiment. Potted plants were arranged on metal benches in the greenhouse. Plant height, number of leaves, and foliar characteristics were recorded 8 to 10 weeks after planting. The experiment was a randomized complete block design with 10 replications. 'Florida White Ruffles', 'White Wing', and 'Candidum Junior' were included as controls. An analysis of variance and mean separation were conducted using the GLM procedure in the SAS program to compare the performance of 'UF-331' and 'UF-340' with the controls.

'UF-331' sprouted in 42 d (intact) or 44 d (de-eyed) after planting, 6 to 9 d later than 'Florida White Ruffles', 9 to 11 d later than 'White Wing', and 10 to 11 d later than 'Candidum Junior' (Table 3). When intact tubers were forced, 'UF-331' was 16 cm tall, similar to the three controls; when tubers were de-eyed, 'UF-331' was 15 cm tall, similar to 'Candidum Junior', but 2 to 3 cm shorter than 'Florida White Ruffles' and 'White Wing'. 'UF-331' had seven to eight leaves on intact plants 10 weeks after planting, but $\approx$ 13 on de-eyed plants. Overall, leaves of

'UF-331' were similar to 'Florida White Ruffles', 'White Wing', and 'Candidum Junior' in length and width. 'UF-331' produced high-quality plants in small pots (11.4 cm in diameter) even without de-eyeing (Table 3).

'UF-340' sprouted in 26 d (intact) to 28 d (de-eyed) after planting, significantly earlier (4 to 7 d) than any of the controls, regardless of tuber treatments (Table 3). 'UF-340' was similar to 'Florida White Ruffles' and 'White Wing' in height when tubers were intact or de-eyed. Surprisingly, de-eyed plants of 'UF-340' were taller than de-eyed 'Candidum Junior'. 'UF-340' produced a similar number of leaves as 'Florida White Ruffles' and 'Candidum Junior', but nearly twice as many leaves than all three controls when tubers were de-eyed. 'UF-340' produced high-quality plants in small pots (11.4 cm in diameter) even without de-eyeing (Table 3). When tubers were de-eyed, 'UF-340' yielded pot plants of even higher quality with plant quality ratings greater than the three controls.

Recommendation

Both 'UF-331' and 'UF-340' are intended for use in containers and landscapes. Their performance was outstanding both in pots and landscapes and superior to 'Florida White Ruffles', 'White Wing', and 'Candidum Junior', cultivars that have a leaf color and pattern that is closest of all cultivars that we are aware of in the commercial trade. De-eyeing is not required for either cultivar but can help produce a shorter potted plant with more leaves. In planning for tuber forcing, it may be necessary to plant

Table 2. Plant characteristics, performance, and sun tolerance from planting 2.54-cm caladium tuber propagules in ground beds in full sun (2006 and 2007)*.

Cultivar	Plant ht ^y (cm)	Leaves ^y (no.)	Leaf length ^y (cm)	Leaf width ^y (cm)	Performance rating ^x			Sun tolerance rating ^w		
					July	August	September	July	August	September
UF-331	29 ab ^v	23 bc	22 a	12 b	3.8 a	3.5 ab	4.4 a	4.8 a	4.3 a	4.4 a
UF-340	27 bc	33 a	18 b	13 b	4.2 a	3.9 a	4.4 a	4.5 ab	4.0 b	3.7 c
Florida White Ruffles	18 d	27 b	16 c	8 d	2.0 b	2.9 bc	3.5 ab	4.5 ab	4.1 b	4.2 ab
White Wing	24 c	20 cd	18 b	10 c	2.0 b	2.3 c	2.9 b	4.2 b	4.1 b	4.3 a
Candidum Junior	32 a	17 d	23 a	16 a	—	2.3 c	3.6 ab	—	2.7 c	4.0 b

*Values presented for plant height, leaf number, length, and width are means of three replications with three plants measured per plot per year, whereas performance and sunburn tolerance ratings are means of three replications based on whole plot evaluation.

^yData were taken over two growing seasons (2006 and 2007), $\approx$ 4 months (Aug. 2006 and 2007) after tubers were planted in April each year.

^xPlants were rated on a scale of 1 to 5 with 1 being very poor, 3 fair and acceptable, and 5 being excellent in plant vigor, fullness, and color display in July, August, and September, respectively.

^wPlants' sunburn tolerance was rated on a scale of 1 to 5 with 1 being very poor, 3 fair and acceptable, and 5 being excellent without showing any signs of leaf burns or resulting holes on leaf surfaces taken in July, August, and September, respectively.

^vMean separation within columns by Fisher's least significant difference (LSD) test at $P \leq 0.05$ unless otherwise indicated.

Table 3. Plant performance for caladium cultivars grown from No. 1 tubers in 11.4-cm containers in a 45% shaded glasshouse, 2007, Wimauma, FL^z.

Cultivar	Days to sprout ^y		Plant ht (cm)		Leaves (no.)		Leaf length (cm)		Leaf width (cm)		Quality rating	
	Intact	De-eye	Intact	De-eye	Intact	De-eye	Intact	De-eye	Intact	De-eye	Intact	De-eye
UF-331 ^x	42 a ^w	44 a	16	15 b	8 b	13 b	19	16 c	13	10 b	3.9 ab	4.4 a
UF-340	26 d	28 c	19	19 a	13 a	20 a	19	19 ab	13	13 a	4.0 a	4.6 a
Florida White Ruffles	36 b	36 b	18	17 ab	11 a	13 b	20	20 a	11	11 b	3.3 bc	3.5 c
White Wing	31 c	35 b	19	18 a	8 b	11 b	19	18 ab	12	9 b	3.2 c	4.0 b
Candidum Junior	31 c	34 b	19	15 b	11 a	10 b	20	18 ab	13	11 b	3.6 abc	3.5 c

^zValues represent the means of 10 plants produced from intact or de-eyed No. 1 (3.8 to 6.4 cm in diameter) tubers planted individually per container. Data were taken 8 weeks after planting, except for UF-331, whose data were taken 10 weeks after planting.

^yNumber of days from planting to the first unfurled leaf.

^xData were taken 10 weeks after tubers were planted in the containers.

^wMean separation within columns by Fisher's least significant difference (LSD) test at $P \leq 0.05$.

'UF-331' 2 weeks early, because it sprouts $\approx$ 2 weeks later than most commercial cultivars. 'UF-331' can do well in sunny or shady landscape locations, but 'UF-340' performs better in partially shady locations. Although extensive research and evaluations of these cultivars have been performed on small acreages, tuber producers are encouraged to plant only limited quantities of 'UF-331' and 'UF-340' until they have gained experience in producing these cultivars. Standard post-harvest treatment of tubers is recommended (Harbaugh and Tjia, 1985) and preplant hot water treatment of tubers (Rhodes, 1964) is encouraged to prolong their life.

Availability

The caladium cultivars UF-331 and UF-340 will be sold and marketed under the trade name Angel Wing Dwarf Tricolor and Angel Wing Dwarf White. A plant patent application will be submitted to the U.S. Patent and

Trademark Office and plant patent rights assigned to the University of Florida, Board of Trustees. Propagation and distribution will be licensed by the Florida Foundation Seed Producers, Inc., P.O. Box 110200, Gainesville, FL 32611. Information on tuber availability and propagation agreements can be obtained from the Florida Foundation Seed Producers, Inc.

Literature Cited

- Bell, M.L., G.J. Wilfret, and D.A. DeVoll. 1998. Survey of caladium tuber producers for acreage of cultivars grown. *Proc. Fla. State Hort. Soc.* 111:32–34.
- Deng, Z., B.K. Harbaugh, R.K. Schoellhorn, and R.C. Andrew. 2005. 2003 survey of the Florida caladium tuber production industry. *Univ. of Fla./IFAS extension fact sheet*, ENH 1007. 16 July 2006. <<http://edis.ifas.ufl.edu/EP258>>.
- Evans, M.R., G.J. Wilfret, and B.K. Harbaugh. 1992. Caladiums as potted and landscape plants. *Univ. of Fla./IFAS Agr. Ext. Serv. Circ.* 1060.
- Geraldson, C.M., A.J. Overman, and J.P. Jones. 1965. Combination of high analysis fertilizers, plastic mulch and fumigation for tomato production on old agricultural land. *Proc. Soil and Crop Sci. Soc. Fla.* 25:18–24.
- Harbaugh, B.K. and B.O. Tjia. 1985. Commercial forcing of caladiums. *Univ. of Fla./IFAS Agr. Ext. Serv. Circ.* 621.
- Miranda, B.D. and B.K. Harbaugh. 2003. 'Florida Moonlight'—A white fancy-leaved caladium for pots and shady landscapes. *HortScience* 38:635–637.
- Rhodes, H.L. 1964. Effect of hot water treatment of seed tubers and soil fumigation for control of root knot on yield of caladiums. *Plant Disease Rptr.* 8:568–571.
- Royal Horticultural Society. 1986. RHS colour chart. Royal Hort. Soc., London, UK.
- SAS Institute. 2003. The SAS system for Windows. Release 9.1. SAS Inst., Cary, NC.
- Wilfret, G.J. 1991a. Florida Sweetheart, a rose lance caladium for landscape and containers. *Univ. Fla., Inst. Food Agr. Sci., Circulation S-380* Gainesville, FL.
- Wilfret, G.J. 1991b. Florida Fantasy, a multicolored caladium for containers. *Univ. Fla., Inst. Food Agr. Sci. Circulation S-381* Gainesville, FL.