

‘Garden White’—A Large White Fancy-leaved Caladium for Sunny Landscapes and Large Containers

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Additional index words. *Caladium ×hortulanum*, *C. bicolor*, Araceae, plant breeding, cultivar release

Caladiums (*Caladium ×hortulanum* Birdsey) are tropical plants often used to provide color in shady locations in the landscape. White fancy-leaved cultivars are particularly popular for this use because they can create a striking contrast with surrounding grasses, flowers, shrubs or trees. Commercial caladium plants are propagated asexually from tubers. The world production of caladium tubers is concentrated in south-central Florida, which provides more than 95% of commercial tubers used worldwide. A survey conducted in 1998 (Bell et al., 1998) showed that white fancy-leaved cultivars represented 29% of tuber production industry, i.e. white is the most popular color in caladium. Four cultivars, ‘Aaron’, ‘Candidum’, ‘Candidum Junior’ and ‘White Christmas’, accounted for over 90% of all white cultivars grown. Two white fancy-leaved caladium cultivars recently have been released from the Univ. of Florida caladium breeding program. ‘Florida Blizzard’ (Harbaugh et al., 2002) was released in 2002 because of its unique white color pattern and demonstrated potential to produce a superior number of leaves compared to major white fancy-leaved cultivars. It performed best in large containers or shady landscapes. ‘Florida Moonlight’ (Miranda and Harbaugh, 2003), released from our program in 2003, had superior vigor compared to ‘June Bride’ when grown in shady locations in outdoor landscapes. When buds were excised, it also made an attractive potted plant due to production of many leaves. ‘Garden White’ (Fig. 1) is an extremely vigorous, large leaved, tall white fancy-leaved cultivar that is ideal for sunny landscapes and large containers. Its also has improved tuber production over the commonly grown white cultivars Aaron, Candidum, Candidum Junior and White Christmas.

Origin

‘Garden White’, derived from a cross between the white heart-shaped leaf caladium cultivars Aaron and Candidum Junior, was evaluated in 2001 as GC815. ‘Aaron’ was selected as the female parent because of its

vigor, tuber yield, white-veined character, and excellent sun tolerance. ‘Candidum Junior’ was selected because of its leaf production and bright white color. Ancestry of ‘Aaron’ is unknown, while ‘Candidum Junior’ is believed to be a field mutation of ‘Candidum’ (Wilfret, 1991). Tubers were propagated on fumigated Eau Gallie fine sand soil at the Gulf Coast Research and Education Center (GCREC) at Bradenton, Fla., and were treated with hot water for nematode control (Rhodes, 1964).

Description

Descriptions of color for plant parts are based on comparison with the Royal Horticul-

tural Society colour chart (Royal Horticultural Society, 1986). Plants used for describing color were grown in 15-cm containers in a 25% shaded greenhouse from jumbo (6 to 9 cm in diameter) de-eyed tubers.

‘Garden White’ plants grown for about 4 months in full sun in ground beds had an average height of 66 cm (Table 1). Jumbo tubers are multi-segmented, bearing three to four dominant buds. Tuber surfaces are brown (RHS 200C) with the cortical area yellow-orange (RHS 15C). Leaves are peltate, sagittate-cordate, with white (RHS 157D) palmate-pinnate venation. The upper surface has a green (RHS 137A) margin, 1 to 2 mm wide, bordering the entire leaf, except for the basal leaf sinus where it is grayed-purple (RHS 185A). Interveneal areas are white (RHS 157C). Leaves have a small red-purple blotch (3 to 5 mm in diameter) at the petiole attachment. Netted green (RHS 157D) venation occurs on 75% to 100% of the leaf surface. The undersurface has a grayed-green (RHS 191A) margin, 1 mm wide. Primary veins are green-white (RHS 157B), and netted venation is green (RHS 137C) and occurs over entire leaf surface. Interveneal areas are quite variable with a green-white (RHS 157C) color near the center to a grayed-green (RHS 194C) near the margin. Petioles are 4 to 5 mm and light green (RHS 139D) at the apex, but the colors diffuse into a dark brown (RHS 200A) at the base that is around 8 mm in diameter.



Fig. 1. Caladium ‘Garden White’ forced in a 11.4-m container using one No. 1 tuber (>3.8 and <6.4 cm). Dominant eyes were excised from tubers before planting.

Received for publication 22 Nov. 2005. Accepted for publication 10 Jan. 2006. This research was supported by the Florida Agricultural Expt. Station and grants from the Florida Caladium Growers Association and the Gloeckner Foundation. We thank Richard Kelly, Nancy West, Joyce Jones and Gail Bowman for their excellent technical support.

Leaves of 'Garden White' are relatively large compared to many other cultivars. The largest leaf on plants grown in a 25% shaded greenhouse produced from an intact number one tuber in a 12.7-cm pot averaged 33 cm long and 24 cm wide 7 weeks after planting (Table 2). When grown from 2.54-cm tuber propagules in ground beds with full sun, leaves were measured approximately 4 months after planting averaged 32 cm long and 18 cm wide (Table 2).

Performance

'Garden White' was evaluated for tuber production and plant performance at the GCREC at Bradenton, Fla., in 2003 and the GCREC at Dover, Fla., in 2004. The soil in Bradenton was

an EauGallie fine sand with about 1% organic matter and a pH of 6.2, and the soil in Dover was a Seffner fine sand with about 1% organic matter and a pH of 6.5. Plants were grown in a plastic-mulched raised-bed system maintaining a constant water table with seepage irrigation (Geraldson et. al, 1965) or irrigated with drip tapes. The beds were 91 cm wide and 20 cm high with 2.54-cm caladium seed pieces planted 15 cm apart in 3 rows (Bradenton) or 2 rows (Dover) also spaced 15 cm apart. Osmocote 18N-2.6P-10K 8 to 9 month controlled release fertilizer (Scotts Co., Marysville, Ohio) was applied to the bed surface when shoot tips were emerging from the soil with N at 336 kg·ha⁻¹ (Harbaugh and Overman, 1983; Wilfret and Harbaugh, 1988).

Plots were organized in a randomized complete block design with three replications. For tuber production, each plot was 1.2 m² (91 cm × 137 cm) and contained 30 propagules. Harvested tubers were graded by their maximum diameter: No. 2 (2.5 to 3.8 cm), No. 1 (3.8 to 6.4 cm), Jumbo (6.4 to 8.9 cm), Mammoth (8.9 to 11.4 cm), and Super Mammoth (>11.4 cm). A production index was calculated as: N (No. 2s) + 2N (No. 1s) + 4N (Jumbos) + 6N (Mammoth) + 8N (Super Mammoth), where N = number of tubers in each grade, and used as an indicator of economic value of the crop harvested. ANOVA was performed on tuber weight, grade, production index, etc. to compare the performance of 'Garden White' to its parents

Table 1. Performance of caladium cultivars grown from 2.54-cm tuber propagules in ground beds under full sun.

| Cultivar | Plant ht ^a (cm) | Leaves ^a | | | Overall plant performance ^b | | |
|-------------------|-------------------------------|---------------------|----------------|---------------|--|--------|---------|
| | | No. | Length (cm) | Width (cm) | Early | Middle | Late |
| Aaron | 53.8 b ^a | 16.3 abc | 28.9 bc | 17.5 c | 3.8 bc | 4.0 ab | 3.2 c |
| Candidum | 46.1 b | 13.3 bc | 28.3 bc | 18.1 bc | 3.3 dc | 3.7 b | 3.5 abc |
| Candidum Junior | 26.1 c | 15.9 abc | 22.1 d | 14.4 d | 2.8 d | 2.5 c | 2.7 c |
| Garden White | 66.4 a | 17.0 ab | 32.4 a | 18.1 bc | 4.7 ab | 4.5 a | 4.2 ab |
| June Bride | 50.7 b | 13.0 c | 30.9 abc | 19.3 ab | 3.7 dc | 4.3 a | 3.2 c |
| Florida Moonlight | 53.1 b | 18.4 a | 27.8 c | 20.0 a | 5.0 a | 4.5 a | 4.3 a |
| White Christmas | 51.1 b | 14.6 bc | 31.4 ab | 19.8 ab | 5.0 a | 4.3 a | 3.3 bc |

^aValues presented are means of three replications with three plants measured per plot per year, averaged over two years (2003 and 2004).

^bOverall plant performance was rated 22 July (early), 31 Aug. (mid), and 16 Nov. (late), 2004, on a scale of 1 to 5, with 1 being very poor (stunted plants with few leaves and severe sun burn), and 5 being very good (full plants with many bright colorful leaves and little sun burn).

^cMean separation within column by SAS GLM procedure (SAS Institute, 2004) and least significant difference (LSD), $P \leq 0.05$. Numbers in the same column followed by the same letter are not significantly different.

Table 2. Plant performance for caladium cultivars grown from No. 1 tubers in 11.4-cm containers in a 25% shaded glasshouse, 2005, Bradenton, Fla. Values represent the means of eight plants produced from intact or de-eyed No. 1 (3.8- to 6.4-cm in diameter) tubers planted individually per container.

| Cultivar | Days to sprout ^a | | Plant ht (cm) | | Leaves (no.) | | Leaf length (cm) | | Leaf width (cm) | |
|-------------------|-----------------------------|---------|---------------|---------|--------------|---------|------------------|---------|-----------------|---------|
| | Intact | De-eyed | Intact | De-eyed | Intact | De-eyed | Intact | De-eyed | Intact | De-eyed |
| Aaron | 34 b | 32 a | 38 a | 29 a | 4 c | 11 a | 27 bc | 20 b | 19 cd | 15 b |
| Candidum | 27 c | 30 ab | 30 bc | 25 b | 9 a | 10 ab | 26 c | 22 b | 17 d | 15 b |
| Florida Moonlight | 32 b | 30 ab | 28 c | 26 b | 7 b | 8 b | 32 a | 28 a | 22 b | 21 a |
| Garden White | 25 c | 27 b | 37 a | 29 a | 4 c | 11 a | 33 a | 23 b | 24 a | 15 b |
| White Christmas | 38 a | 30 ab | 36 ab | 27 ab | 9 a | 9 ab | 29 b | 22 b | 21 bc | 15 b |

^a Number of days from planting to the first unfurled leaf.

Mean separation within column by SAS GLM procedure (SAS Institute, 2004) and least significant difference (LSD), $P \leq 0.05$. Numbers in the same column followed by the same letter are not significantly different.

Table 3. Tuber weights, production index, and tuber grade distribution of caladium cultivars harvested in 2003 and 2004. Values presented are means of three replications with 30 propagules per 1.2 m² plot per year.

| Cultivar | Tuber | | | Tuber distribution ^a (%) | | | | |
|-------------------|-----------|----------------------------------|---------------------|-------------------------------------|---------|-------|--------|-------|
| | Wt (g) | Production index ^a | Marketable (no.) | Super Mammoth | Mammoth | Jumbo | No. 1 | No. 2 |
| 2003 | | | | | | | | |
| Aaron | 2867 c | 91 b | 29 c | 3 ab | 23 ab | 24 b | 38 a | 12 a |
| Candidum | 2784 c | 98 b | 33 bc | 1 ab | 12 ab | 30 ab | 43 a | 14 a |
| Candidum Junior | 3082 c | 107 b | 37 bc | 3 ab | 8 b | 32 ab | 38 a | 19 a |
| Garden White | 6338 b | 185 a | 59 a | 0 b | 16 ab | 31 ab | 40 a | 13 a |
| June Bride | 7741 a | 161 a | 40 b | 8 a | 29 a | 24 b | 24 a | 15 a |
| White Christmas | 3192 c | 123 b | 37 bc | 0 b | 14 ab | 49 a | 26 a | 11 a |
| 2004 | | | | | | | | |
| Aaron | 3255 cd | 95 c | 29 c | 0 a | 15 abc | 41 a | 35 abc | 9 c |
| Candidum | 2860 d | 96 c | 35 bc | 2 a | 6 bc | 26 ab | 54 a | 12 c |
| Candidum Junior | 2431 d | 86 c | 36 bc | 0 a | 5 bc | 21 b | 47 ab | 27 a |
| Garden White | 4879 b | 153 a | 45 a | 1 a | 19 ab | 39 a | 31 abc | 11 c |
| June Bride | 6038 a | 143 ab | 37 b | 2 a | 28 a | 40 a | 17 c | 13 bc |
| Florida Moonlight | 4253 b | 140 ab | 45 a | 0 a | 15 abc | 38 a | 24 bc | 24 ab |
| White Christmas | 4062 bc | 113 bc | 39 ab | 0 a | 2 c | 43 a | 52 a | 3 c |

The production index is an indicator of economic value of the crop harvested and is calculated as: N (No.2s) + 2N (No. 1s) + 4N (Jumbos) + 6N (Mammoth) + 8N (Super Mammoth); where N = number of tubers in each grade. Tubers graded by maximum diameter; No. 2 (2.5 to 3.8 cm), No. 1 (3.8 to 6.4 cm), Jumbo (6.4 to 8.9 cm), Mammoth (8.9 to 11.4 cm), and Super Mammoth (>11.4 cm).

Mean separation within column by SAS GLM procedure (SAS Institute, 2004) and least significant difference (LSD), $P \leq 0.05$. Numbers in the same column followed by the same letter are not significantly different.

and other commercially important white fancy-leaved cultivars.

Landscape performance of cultivars grown under full-sun conditions was evaluated in 2003 and 2004 on the same plots used for evaluating tuber production. Three plants in the center of each plot were selected, and plant height, leaf number, and leaf size were measured approximately 4 months after planting.

'Garden White' tubers were forced in 11.4-cm containers (680 ml in volume) and its growth parameters were compared to that of four white fancy-leaved commercial cultivars. No. 1 tubers were planted in a peat-vermiculite mix (Vergro Container Mix A; Verlite Co., Tampa, Fla.; 60% peat : 20% perlite : 20% coarse vermiculite) on 22 Apr. 2005. The study was conducted in a glasshouse with 25% light exclusion during the summer in Bradenton, Fla. Light intensity was 600 to 1200 $\mu\text{mol}\cdot\text{m}^{-2}\cdot\text{s}^{-1}$. Average daily temperatures ranged from a low of 16 °C night to 29 °C day during the experiment. Plant height, number of leaves, and foliar characteristics were recorded 7 weeks after planting.

The weight of 'Garden White' tubers from each plot exceeded that of all other cultivars except 'June Bride' in 2003 (Table 3). In 2004, tuber weight of 'Garden White' was similar to that of 'Florida Moonlight' and 'White Christmas', but exceeded that of other cultivars except 'June Bride'. The production index (an economic indicator of crop value) was highest for 'Garden White' and 'June Bride' compared to all other cultivars in 2003. In 2004, the production index for 'Garden White' exceeded other cultivars except 'Florida Moonlight' and 'June Bride', which had similarly high values. Although the same number (30) of seed pieces were planted per plot, more than 30 tubers were harvested since several sprouts can emerge from each tuber and result in more than one tuber developing per planted seed piece. This multiplication is advantageous to growers as it can increase profitability. 'Garden White' had more marketable tubers per plot (59) than all other cultivars in 2003, and a similar number

of tubers (45) with 'Florida Moonlight' and 'White Christmas' in 2004. The distribution of tubers within grades also is an important factor for marketing. 'Garden White' had about 86% of tubers in the No. 1, Jumbo, and Mammoth categories. These sizes are ideal for tubers marketed for landscape use.

Overall landscape plant performance ratings (Table 1) of 'Garden White' were excellent for all rating periods (22 July, 31 Aug., and 16 Nov.). 'Garden White' was the tallest cultivar evaluated in this test, out-growing both parents.

'Garden White' tubers sprouted 25 d (intact) or 27 d (de-eyed) after planting and were earlier than all cultivars except 'Candidum', which had similar sprouting dates of 27 and 30 days after planting (Table 2). Plants from intact tubers of 'Garden White' were 37 cm tall, similar in height to 'Aaron' and 'White Christmas', while plant height was 29 cm from de-eyed tubers. All cultivars had similar plant heights when tubers were de-eyed. 'Garden White' and 'Aaron' had only 4 leaves on plants grown from intact tubers, but 11 on plants grown from de-eyed tubers. 'Garden White' had the largest leaves of all cultivars tested. The performance of 'Garden White' from intact tubers suggested that it is best suited to landscape use. If used in small pots, 'Garden White' may perform better if tubers are de-eyed and treated with a growth retardant.

In summary, 'Garden White' is intended for use in full sun or part shade landscapes or large containers. Its performance was outstanding for a white cultivar, as leaves of most white cultivars deteriorate under full sun conditions. Due to its vigor, height, and huge leaves, it is well-suited as a garden or landscape plant. Although extensive research and evaluations of this cultivar have been performed on small acreages, tuber producers are encouraged to plant only limited quantities of 'Garden White' until they have gained experience in producing this cultivar. Standard postharvest treatment of tubers is recommended (Harbaugh and Tjia, 1985) and preplant hot-water treatment of tubers is encouraged to prolong their life.

Availability

A patent will be applied for 'Garden White' by the Florida Agricultural Experiment Station, and production of this cultivar will be with a licensing agreement with the Florida Foundation Seed Producers, Inc., P.O. Box 309, Greenwood, FL 32443. Information on tuber availability and propagation agreements can be obtained from the Florida Foundation Seed Producers, Inc.

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