



## Caladiums As Potted and Landscape Plants<sup>1</sup>

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Because of their popularity and versatility, caladiums have often been referred to as the geranium of the South. However, caladiums are not limited exclusively to the southern United States but can be used successfully as potted and landscape plants throughout much of the United States. With improved tuber storage techniques, potted caladiums may be used nearly year around in both the traditional florist trade and for interiorscape situations where additional color is desired.

### GENERAL INFORMATION

#### Caladium Tuber Quality and Cold Temperatures

Just as poor quality seed, improper germination temperature and use of "abused" seedlings can lead to poor results for seed-grown potted plants, improper handling of caladium tubers at any stage from harvesting through planting can increase production time and diminish the quality of finished plants.

Caladiums are tropical plants and tubers should not be stored, shipped, or handled at temperatures below 65°F. For long-term storage, 70°F is optimal. Once tubers are cold injured, the damage is irreversible. The extent of the cold injury depends not only upon the temperature but also on the duration of the low temperature exposure. For example, injury caused by exposure to 60°F for 4 weeks in storage may be similar to injury caused by 5

to 10 days of exposure at 50°F. One or 2 hours at these temperatures may have no apparent effect on subsequent growth. Cold-injured tubers are slow to sprout, have fewer shoots, are more prone to disease, and do not grow as fast as properly handled tubers. Tubers damaged by exposure to low temperatures are rubbery, while properly handled tubers are firm.

#### Tuber Storage After Harvest

After harvest, caladium tubers are washed, treated with fungicides, and allowed to dry. During this time, wounds from the harvest process heal which minimizes the potential for disease development. Tubers are then usually stored for at least 6 weeks at 70 - 80°F. This practice is usually conducted by the tuber producer and results in more rapid and uniform emergence of shoots when the tubers are planted. Fully cured tubers from the current year's crop are usually available in mid-January. Vigor is reduced if tubers are stored for longer than 16 weeks. Tubers which have not been stored 6 weeks may require 8 weeks from the time of planting to begin to sprout and an additional 4 weeks to develop to a marketable stage. Tubers stored at 70°F within the 6 to 16 week ideal period will sprout and be marketable in only 4 to 8 weeks from planting. Thus, growers should request information from suppliers concerning the date the tubers were dug as well as the storage and shipping temperatures.

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If tubers are purchased which have not been stored for 6 weeks, then the tubers should be stored for the required period at 70°F prior to planting since storage rooms require a minimum of space, energy and associated costs to maintain at 70°F as compared to a greenhouse. Storage rooms should have humidity control (75% relative humidity) and air exchange to prevent disease development and buildup of ethylene gas.

### Tuber Size

Although grading systems vary somewhat between producers, both fancy and lance-leaf caladium tubers are graded according to their diameter as follows:

- Super Mammoth: 4 1/2 inches or larger
- Mammoth: 3 1/2 to 4 1/2 inches
- Jumbo: 2 1/2 to 3 1/2 inches
- No. 1: 1 1/2 to 2 1/2 inches
- No. 2: 3/4 to 1 1/2 inches

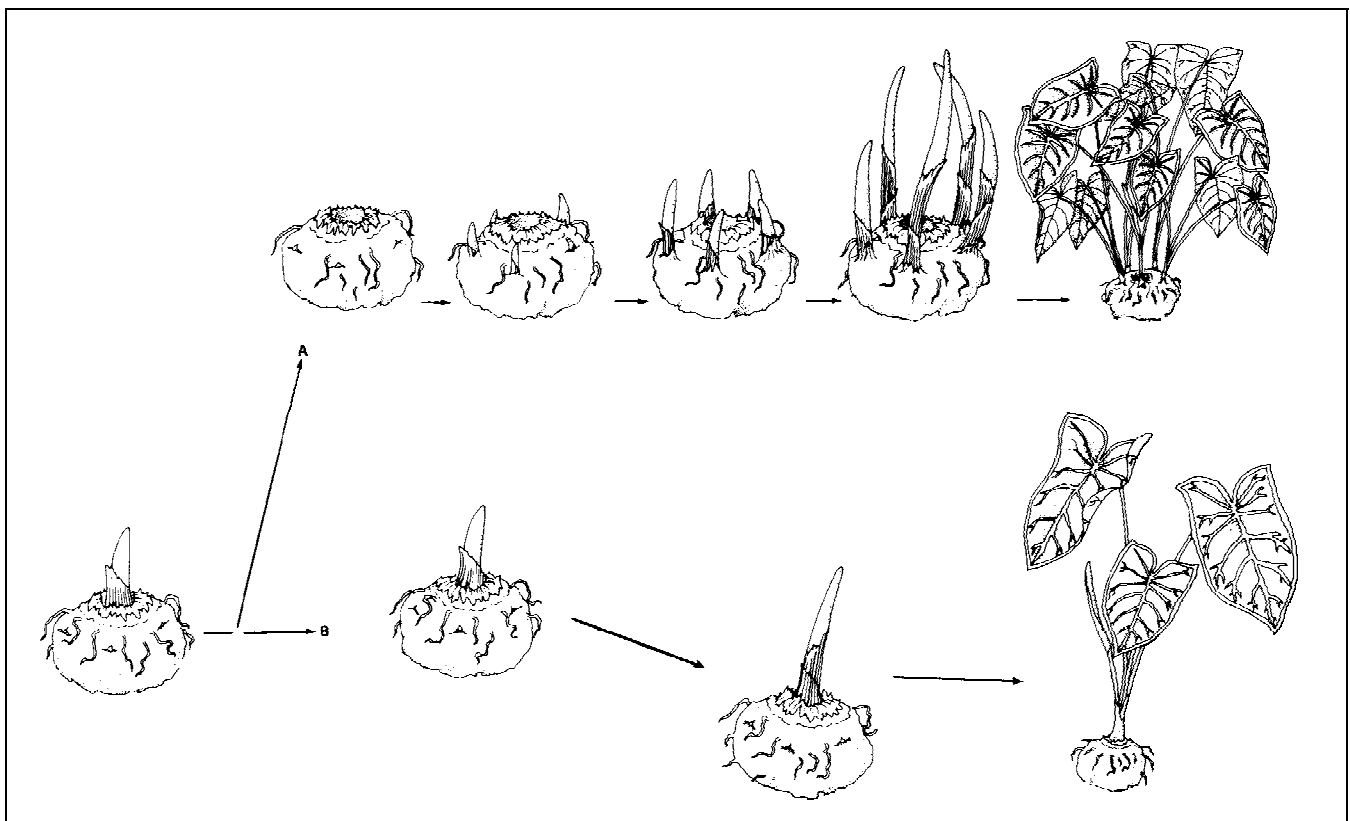
Choice of tuber size for a given pot size is important. One mammoth tuber per 6-inch pot, one jumbo tuber per 5-inch pot, one No. 1 tuber per 3 1/2- or 4-inch pot, one No. 2 tuber per 3-inch pot, or

one No. 2 tuber per cell of a six-pack produces a marketable plant quickly. Many growers try to use tubers a grade smaller than normally required. However, this can often prove to be a costly mistake. To illustrate, if a No. 2 tuber is used in a 4-inch pot instead of a No. 1 tuber, the first leaves of the initial sprouts from the smaller tuber will not yield a plant with the proper pot-to-shoot ratio. Thus, 2, 3 or 4 weeks extra greenhouse time would be required for the plant to reach a marketable size.

In the landscape, the tuber size required depends upon the specific use of the plant in the landscape. Jumbo or mammoth size tubers will give large robust plants more suitable for areas where tall plants with large leaves are required. Where shorter and smaller-leaved plants are desired, such as in borders, No. 1 or No. 2 sized tubers are best. However, if the smaller tubers are used, more tubers will be required to fill in a given area.

### Terminal Bud Removal — De-Eyeing

Tubers with the terminal or dominant bud removed (de-eyed) produce more leaves initially than tubers planted intact and upright (Figure 1) and



**Figure 1.** Preparation of caladium tubers for pot plant forcing. (A) De-eyed tuber compared to (B) intact tuber.

sprout faster than inverted (planted upside-down) tubers. De-eyeing eliminates the apical dominance of the center bud allowing the lateral shoots to emerge rapidly. In addition, the leaves of the terminal shoot are usually larger and taller than those from the lateral shoots. When the terminal bud is removed, a shorter and more uniform plant with a fuller canopy results. De-eyeing is not commonly performed on tubers to be used in the landscape; however, de-eyeing tubers to be used as borders will result in shorter and more uniform plants.

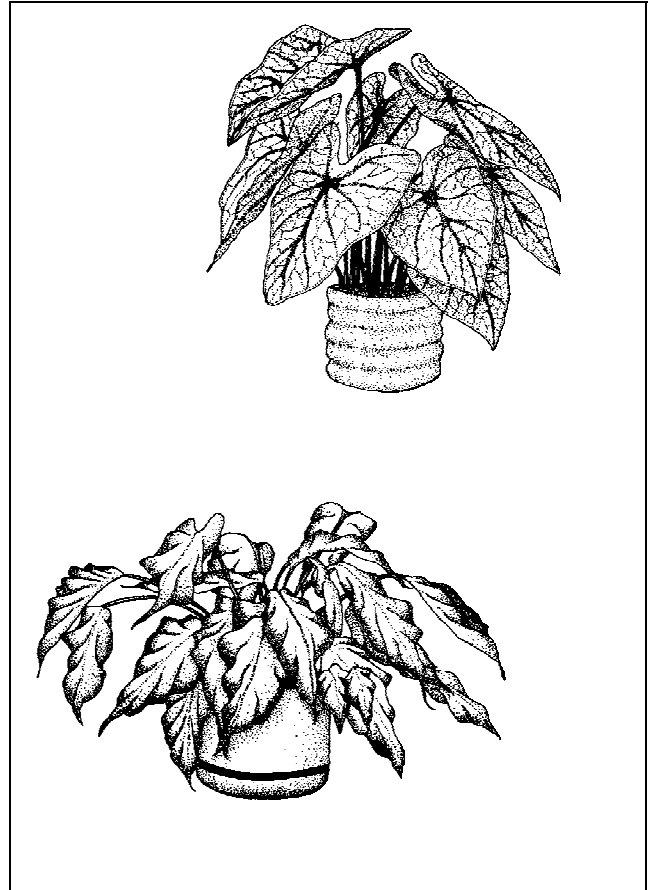
De-eyeing is recommended for most cultivars when using a No. 1 tuber or larger, and No. 2 tubers of the tall cultivars. Most lance-leaf cultivars will not need to be de-eyed as these cultivars generally have many uniformly sprouting buds and fill the pot quickly.

De-eyeing requires only a 1/16 to 1/8 inch deep cut no larger than 1/4 inch in diameter since the growing point is on the surface of the tuber. Deeper cuts increase disease potential and larger diameter cuts may destroy desired lateral buds. Tubers may have several similar-sized dominant buds, especially tubers in the larger grades. As a general rule, for tubers with two to four similar-sized dominant buds, the similar-sized buds are de-eyed. De-eyeing is generally not required when five or more similar-sized dominant buds are present on the same tuber since all these buds will develop and produce a full pot quickly. However, the tall cultivars should be de-eyed even with five or more buds to reduce the height of the finished plant.

### Cultivars

There are two distinct types of caladiums: fancy-leaf and lance-leaf (Figure 2). Fancy-leaf caladiums have broad heart-shaped leaves borne on erect petioles. Lance-leaf caladiums have narrow, lanceolate leaves on short petioles, producing a more compact or prostrate plant than the fancy-leaved type. Generally, lanced-leaf cultivars produce more leaves than fancy-leaf caladiums and are ideal for hanging baskets as well as 4-inch to 5-inch pots.

Although there are over 100 cultivars of caladiums, many of the cultivars should not be grown as potted plants since they have characteristics resulting in a poor quality finished product. Common caladium cultivars are listed in Table 1 along with recommended uses and de-eyeing requirements.



**Figure 2.** Two common types of caladiums based on leaf shape: Fancy-leaved caladium (top); Lance-leaved caladium (bottom).

### Tissue-Cultured Plant Material

Caladiums are commercially propagated through tissue culture. However, due to variability and the cost of tissue culture-produced plants, potted caladiums are not generally produced from tissue-cultured plants. Tissue-cultured plants are used in the production of virus-free stock for commercial tuber production.

### Insect and Disease Problems

Occasionally, root aphids or mealybugs proliferate on tubers during storage. If insects are detected on tubers, an appropriate insecticidal dip prior to planting will control the problem. Mites, whiteflies, aphids, mealybugs and lepidopterous larvae (caterpillars) may attack foliage of plants. However, these pests usually do not become severe. Since the turnover of caladiums is rapid, a scouting procedure

and application of insecticides on demand is a better approach than preventive sprays.

Tubers should be examined for rot caused by fungal organisms or bacteria. Healthy tubers are firm and the fleshy part of the tuber is bright yellow. Internal discoloration, such as brown streaks or milky-white areas with a pungent odor, is an indication of infection. Severely infected tubers should be discarded. Preventative drenches of broad spectrum fungicides, especially those controlling pythium and fusarium, are beneficial in preventing tuber damage from fungal organisms.

## **FORCING CALADIUMS AS POTTED PLANTS**

### **Growing Media**

Adequate moisture retention is the most critical concern with the growing medium. Caladiums, if allowed to wilt, may not only lose leaves but also go dormant. Once dormant, caladiums require additional time to produce a marketable plant since they do not re-sprout quickly. Soil mixes should contain a significant proportion of peat or other water-holding components to produce a soil with high water retention and have sand or perlite added for drainage (55-65 percent capillary pore space and 4-5 percent noncapillary pore space).

### **Planting Depth**

Roots emerge around each sprout on the tuber. Since sprouts are only on the top or side of tubers, roots form primarily on the top and sides of the tuber. Tubers should be planted upright with 1 to 1 1/2 inches of soil over the top of the tuber to ensure emerging roots are not exposed.

### **Prefinished Plants**

Prefinished plants may be purchased in 4 or 6-inch pots and are available from approximately March through May. Prefinished pots usually have 2 to 4 tubers per 4-inch pot and 3 to 5 tubers in a 6-inch pot. Prefinished pots are usually shipped after the leaf sheathes have emerged. Many pot growers find that purchasing prefinished pots is more economical than forcing tubers for holidays after Valentine's Day. Since the prefinished plants are not received until March or later, the caladium crop does not utilize space needed for Christmas or Valentine's Day crops.

## **Fertilization**

A maintenance fertilizer program of 5 to 8 pounds of a slow-release fertilizer such as Osmocote 14-14-14 or Nutricote 13-13-13 per cubic yard of soil at planting is satisfactory. A liquid fertilization program, beginning when the plants sprout, using 20-20-20 or 20-10-20 and supplying 400-500 ppm nitrogen once a week is also satisfactory. If tubers are to be forced with average temperatures above 70-75°F (such as in heat tents), then the slow-release fertilizer should be top-dressed at sprouting (1 to 1 1/3 teaspoons per 6-inch pot) rather than incorporated in the soil before planting. If the fertilizer is incorporated prior to planting, the high temperature can cause a rapid release of the fertilizer salts and result in soluble salt damage to the plant.

Dolomite should be used to adjust the pH to a range of 5.5 to 6.5, and 5 pounds per cubic yard of single superphosphate should be incorporated into the soil. These amendments provide sources of calcium, magnesium and sulphur, create a favorable pH for nutrient availability and reduce problems of iron toxicity associated with low pH.

## **Irrigation**

Assuming the growing medium has adequate air space, enough water should be applied to keep the soil at, or near, the water holding capacity. As previously mentioned, allowing caladiums to wilt will result in tubers becoming dormant. Caladiums can be watered using overhead sprays, "spaghetti tube," ebb-and-flow, or capillary mat irrigation systems. However, since water conservation from 40-80 percent can be achieved, the latter three methods should be considered in areas where water is scarce or expensive.

## **Light Intensity**

Light intensity in the growing area can be important for two reasons. First, most cultivars do not develop proper color unless they are grown under 2500 to 5000 footcandles of light. Secondly, light intensities lower than 2500 footcandles will cause undesirable stretching of petioles, oversized leaves for small pots, and unsightly plants which fall over when handled. There are exceptions since some cultivars require light levels lower than 2500 footcandles for optimal coloration including: the white cultivars Candidum, White Christmas, June Bride, and White Wing; the pink cultivars Kathleen, Fannie Munson,

and Lord Derby; and the red cultivars Frieda Hemple, Postman Joyner, Poecile Anglais, and Dr. T. L. Meade. In addition, the dwarf cultivars in the tissue-cultured Honey Bunch series perform best at 1500 to 2500 footcandles.

Some cultivars perform well under light levels of 5000 to 10,000 footcandles. Among these are the white cultivars Candidum Junior and Seagull; the pink cultivars Carolyn Whorton, Rosebud, Mrs. W. B. Haldeman, Pink Gem, and Lance Whorton; and the red cultivars Fire Chief and Red Frill.

### **Forcing Temperature**

After potting, caladiums should be forced at temperatures averaging at least 70°F. Although a night temperature of 55°F for a few hours over several days can be tolerated, longer durations of cold temperatures or colder temperatures may damage the plants. Regrowth may occur but will be slow and usually of poor quality. Day temperatures above 90°F are not favorable, since the rate of emergence can be reduced. Therefore, a day temperature range of 70-90°F and a night temperature range of 65-90°F is optimal.

Many growers stack potted tubers in a confined and easily heated area (such as heat tents) until sprouting occurs and then space plants in the greenhouse. This method reduces heating costs and appears satisfactory when air exchange is used to prevent build-up of ethylene gas and to prevent temperatures from exceeding 90°F. The costs of handling plants twice should be weighed against heat savings before this method is adopted, especially if tubers have been stored properly and are ready to sprout.

### **Growth Retardants**

Although growth retardants can reduce the height of caladiums, the response to a given growth retardant can be variable and is cultivar-dependent. Further, growth retardants do not satisfactorily control the height of the primary leaves from the terminal bud. Therefore, growth retardant usage is currently not recommended for use on caladiums.

### **Shipping**

If caladium plants are to be shipped and sold in other than the production greenhouse, then shipping and retail outlet temperatures should be maintained near 70°F. Research has shown that storage of plants at 55°F for 3 days in the dark caused 40 percent of the caladium leaves to turn brown and abscise. Even greater leaf loss occurred with temperatures below 55°F.

Caladiums will not tolerate the cool temperatures that may be ideal for shipping other potted plants. Additionally, mass merchandisers often display plants in produce sections that may be too cold for caladiums. If caladiums are displayed out-of-doors, they must be protected from the low night temperatures and windy conditions that occasionally occur in late spring.

## **CALADIUMS IN THE LANDSCAPE**

### **Site Selection and Preparation**

Caladiums have proven to be excellent bedding plants for shade and partial shade locations. Although plants develop more intense leaf color in partial shade, they will grow and survive in full sun if provided adequate water. In addition some cultivars perform best in full sun locations. Cultivars that tolerate full sun conditions and still maintain good color include the white cultivars Candidum Junior and Seagull; the pink cultivars Carolyn Whorton, Rosebud, Mrs. W. B. Haldeman, Pink Gem, and Lance Whorton; and the red cultivars Fire Chief and Red Frill.

The major requirement, once plants are established, is an adequate supply of water as caladiums will not perform well under dry conditions. Soils high in organic matter are usually excellent. Whatever the soil type, it should have a high water holding capacity and yet have good drainage. The soil should be tilled to a depth of at least 6 inches before planting, and the soil should be moist. Before planting tubers, the soil temperature should be at least 65°F.

### **Planting Tubers**

Tubers should be planted so that 1 to 1 1/2 inches of soil cover the tubers. The spacing of the tubers depends upon the size of the tuber planted. Generally, a No. 1 sized tuber should be planted on

12 to 14 inch centers. No. 2 sized tubers should be planted on 10 to 12 inch centers. Tubers may be planted closer in order to fill in the bed more quickly. Tubers that are de-eyed will produce both more shoots and shorter shoots than tubers that are not de-eyed.

**Fertilization and Irrigation**

Caladiums require a moderate level of fertility. Many types of fertilizers may be used including organic materials incorporated prior to planting, granular fertilizers, slow-release fertilizers, or liquid fertilizers. Regardless, a balanced fertilizer such as 14-14-14 or 20-20-20 is satisfactory. Plants grown in warmer climates and on sandy soils will require higher fertilizer levels than plants grown in cooler climates or on organic soils and may need supplemental applications throughout the growing season.

Caladiums have a relatively high water requirement. If plants are allowed to wilt, foliage loss will occur and foliar color will deteriorate. However, caladiums should not be kept constantly wet as tuber rot may develop.

**Digging and Storing Tubers**

Caladiums do not tolerate cold temperatures. When air temperatures drop below 65°F plants will begin to deteriorate and the foliage will eventually collapse. Tubers will need to be lifted throughout most of the continental U.S. except for south-central Florida and extreme southern Texas where foliage will die but tubers can over-winter. In south Florida, temperatures may never get low enough to stop growth and caladiums will survive year round. Plants grown in the northern half of the U.S., where the growing season is short, or that are grown in dense shade may fail to produce well developed tubers. In this case it is better to purchase new tubers and replant in the spring.

When caladiums are lifted, the tubers should be dug from the soil, cleaned, dried and held in a well ventilated area at 70°F. Temperatures should not exceed 90°F or fall below 65°F. Tubers held for many weeks may begin to sprout. However, tubers should not be planted out-of-doors until the soil temperatures are above 65°F.

**Table 1.** Common Caladium Cultivars, Characteristics, and Appropriate Uses.

| Cultivar                | Primary Foliage Colors | Uses and Requirements <sup>1</sup> |             |                |                |
|-------------------------|------------------------|------------------------------------|-------------|----------------|----------------|
|                         |                        | 6-inch Pots                        | 4-inch Pots | Hanging Basket | Bedding Plants |
| <b>Fancy-leaf Types</b> |                        |                                    |             |                |                |
| Aaron                   | white/green            | D                                  | ---         | ---            | SHD            |
| Blaze                   | red                    | D                                  | D           | ---            | SHD            |
| Candidum                | white/green            | D                                  | ---         | ---            | SHD            |
| Candidum Junior         | white/green            | N                                  | O           | ---            | SHD, SUN       |
| Carolyn Whorton         | pink/white/green       | D                                  | ---         | ---            | SHD, SUN       |
| Dr. Groover             | pink                   | O                                  | D           | ---            | SHD            |
| Fannie Munson           | pink                   | D                                  | ---         | ---            | SHD            |
| Festivia                | pink/green             | O                                  | D           | ---            | SHD            |
| Fire Chief              | rose/red               | O                                  | D           | ---            | SHD, SUN       |
| Florida Cardinal        | red/green              | D                                  | ---         | ---            | SHD            |
| Florida Roselight       | pink/green             | D                                  | ---         | ---            | SHD            |
| Florida Sunrise         | white/green/red        | D                                  | ---         | ---            | SHD            |
| Frieda Hemple           | red/green              | O                                  | D           | HB             | SHD            |
| Gingerland              | green/red              | N                                  | O           | ---            | SHD            |
| Irene Dark              | red                    | D                                  | ---         | ---            | ---            |

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|                         |                        | 6-inch Pots                        | 4-inch Pots | Hanging Basket | Bedding Plants |
| Itecapus                | rose/red               | O                                  | D           | ---            | SHD            |
| John Peed               | red                    | D                                  | ---         | ---            | SHD            |
| Jubilee                 | white/rose             | ---                                | ---         | ---            | SHD            |
| June Bride              | white/green            | D                                  | ---         | ---            | SHD            |
| Kathleen                | pink                   | O                                  | D           | ---            | ---            |
| Lord Derby              | pink/green             | O                                  | D           | ---            | ---            |
| Miss Chicago            | rose/red               | D                                  | ---         | ---            | ---            |
| Mrs. Arno Nehrling      | white/pink/red         | O                                  | D           | ---            | ---            |
| Mrs. F.M. Joyner        | rose/red               | O                                  | D           | ---            | SHD            |
| Pink Beauty             | pink/red               | D                                  | ---         | ---            | SHD            |
| Pink Cloud              | pink/green             | D                                  | ---         | ---            | SHD            |
| Postman Joyner          | red/green              | D                                  | ---         | ---            | SHD            |
| Red Flash               | red                    | D                                  | ---         | ---            | SHD            |
| Rosebud                 | pink                   | O                                  | D           | ---            | SHD, SUN       |
| Scarlet Pimpernell      | red/green              | D                                  | D           | ---            | SHD            |
| Tom Tomlinson           | dark red               | O                                  | D           | ---            | SHD            |
| White Christmas         | white/green            | D                                  | ---         | ---            | SHD            |
| White Queen             | white/red              | D                                  | ---         | ---            | SHD, SUN       |
| <b>Lance-Leaf Types</b> |                        |                                    |             |                |                |
| Caloosahatchee          | rose                   | O                                  | D           | ---            | ---            |
| Clarice                 | pink                   | D                                  | ---         | ---            | SHD            |
| Jackie Suthers          | white                  | D                                  | ---         | HB             | SHD, SUN       |
| Lance Whorton           | pink/red               | O                                  | D           | ---            | SHD, SUN       |
| Miss Muffet             | green/red              | N                                  | O           | HB             | SHD, SUN       |
| Mumbo                   | pink                   | O                                  | D           | HB             | SHD, SUN       |
| Pink Gem                | pink/white             | N                                  | D           | HB             | SHD, SUN       |
| Pink Symphony           | pink/white             | O                                  | D           | HB             | ---            |
| Red Frill               | red                    | N                                  | O           | HB             | SHD, SUN       |
| Rosalie                 | red                    | N                                  | O           | HB             | SHD            |
| Sea Gull                | white/green            | O                                  | D           | ---            | SHD, SUN       |
| Sunset                  | rose/white             | N                                  | N           | ---            | SHD, SUN       |
| Sweet Heart             | pink                   | N                                  | O           | HB             | SHD, SUN       |
| Tropicana               | rose/white             | O                                  | D           | ---            | ---            |
| White Wing              | white/rose             | O                                  | D           | HB             | SHD            |

**Table 1.** Common Caladium Cultivars, Characteristics, and Appropriate Uses.

| Cultivar   | Primary Foliage Colors | Uses and Requirements <sup>1</sup> |             |                |                |
|--|------------------------|------------------------------------|-------------|----------------|----------------|
|  |                        | 6-inch Pots                        | 4-inch Pots | Hanging Basket | Bedding Plants |
| <p>1 Where letters appear under a category, the specific cultivar is suitable for the indicated use. "N" indicates that de-eyeing is not necessary for the indicated use. "O" indicates that de-eyeing is optional and "D" indicates that de-eyeing is required. "SHD" indicates that the cultivar should only be grown in the shade and "SUN" indicates that the cultivar performs best in sun. Where both "SHD" and "SUN" appear, that cultivar performs well under both sun and shade. "HB" indicates that the cultivar performs well in hanging baskets.</p> |                        |                                    |             |                |                |