

CALLA LILIES FOR CUT FLOWERS AND POTS

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The callas are species and hybrids of the genus *Zantedeschia*. The calla flower is a spathe and spadix type inflorescence of elegant beauty. Within this genus, there are both warm- and cool-season types. The warm-season callas are deciduous and include *Z. elliottana* and *Z. albomaculata*. The cool-season callas include *Z. aehieopicca* and its derivatives. The cool-season types require a dormancy period, while the warm-season types do not. The warm-season flowers include a variety of yellow and pink shades, but the cool-season types are predominately white. Callas grow from rhizomes, modified stems that resemble bulbs, and these are available from Florida, California, New Zealand, Holland, Israel, and France. They are considered hardy in zones 7-11, but may encounter difficulty surviving in areas with extremely hot summers.

Callas may be grown for cut flowers or as flowering potted plants. Most cultivar development has been among the warm-season types, but the cool season callas remain popular as cuts. *Z. aehieopicca* is a large plant (45-60cm tall) and is best suited for cuts or large containers. The warm-season species and hybrids are smaller (30-45cm tall) and are more often grown as potted plants. For cut flowers, callas are often planted in beds outdoors or in shade structures at a density of 27,000 to 43,000 rhizomes per acre. They may also be planted for cut flower production in 2 or 3 gallon containers with 3 rhizomes per pot. For flowering pot plants, single rhizomes are potted in 6" or smaller pots.

Callas require a well-drained root medium, and they should be kept evenly moist during forcing. Overwatering may increase the incidence of root rots and bacterial soft rots, but plants should not be allowed to wilt or dry out. Callas are not heavy feeders, but they may benefit from incorporation of a slow-release fertilizer, such as Osmocote 14-14-14, at low rates. Fertility may also be maintained by intermittent liquid feeding at 200 ppm, but excessive nitrogen can result in leafy growth at the expense of the flower production. Callas prefer a root medium pH of 6-6.5, and perform best in high light (>2500 f.c.). Full sun is best in winter months, but plants may benefit from 30% shade in warmer weather. To establish newly planted rhizomes, temperatures should be maintained at 60 to 65 F after planting. Once sprouting has occurred, cool-season types should be grown at 55 nights and day temperatures of 65 to 70, while warm-season types prefer 60 nights. Proper ventilation is required for greenhouse production. Excessive moisture and temperature stress must be avoided to prevent induction of dormancy. Warm-season types typically go dormant after flowering, but cool-season types can be evergreen under proper environmental conditions. Flowering in callas is not under photoperiodic control, but short-day photoperiods can produce shorter plants, and long-days, provided by night-break lighting can increase plant height.

Propagation

Seed: Species of *Zantedeschia* can be propagated by sexual means, but cultivars generally will not come true to type. Production of flowering plants from seed requires 3 years, and is typically used only in breeding programs.

Division: Two-year old rhizomes of calla can be lifted and divided after flowering, when foliage has died back. Care must be taken not to introduce bacterial pathogens during this process. Cut rhizomes must be cured at 70-80 with 70-80% relative humidity until a callus is formed. Cured rhizomes are then stored at 68-70 for 6-8 weeks prior to planting if dormancy has not been broken. Rhizomes are held at 45-48 if continued storage is required. Once shipped, cured rhizomes should be held at 50-60 prior to planting.

Tissue culture: Tissue-cultured explants of new cultivars are rapidly becoming available from specialty labs, and rapid multiplication of new cultivars has been accomplished by these means.

Scheduling - Cut flowers

Field production: Rhizomes must be planted in well-drained soil. Sandy loams are best, and heavy clay soils are to be avoided. Soil should be well-tilled, bedded-up, and fertilized sparingly. Rhizomes are typically set 1' deep on 8" centers in the row with 2-4 rows per bed, and at least 12" between rows. Shade cloth provides protection and temperature reduction, and also increases scape length of callas.

Scheduling of outdoor crops varies depending on climate. In subtropical regions, callas may be planted in fall and flowered from late winter through early summer. In temperate climates, an early spring will generally yield flowering scapes in 11 weeks, and flowering can continue as long as temperatures remain moderate. Time to flower will vary depending on both cultivar and environmental conditions. Rhizomes may be lifted and divided annually, or they may be left in place for 2-3 years if adequate space is provided.

Greenhouse production: Controlled environments can allow for much greater precision in scheduling of cut calla crops. Rhizomes are planted in beds, boxes, or pots, and flowering generally occurs 9-12 weeks after planting or breaking dormancy. Days to flower depend on cultivar and temperature. Examples are shown in Table 1 on the next page.

Flowers are harvested when open, but prior to shedding of pollen. Cut stems may be stored dry for 3-4 days at 41.

Scheduling - Potted plants

Rhizomes are typically potted in a well-drained, peat-lite medium. Forcing times at given temperatures are similar to those listed above for cut flowers. Schedules may be modified to some extent by adjusting temperatures, but temperatures should always be maintained in the 50-80 range. Plants are shipped when the first flower is showing color.

Growth Regulators

Gibberellic acid (GA) is often used as a pre-plant rhizome dip to encourage flower production. GA is effective at a wide range of rates, and numerous application methods and GA formulations have been used successfully. Generally, immersion for 5-15 minutes in a 50-100 ppm GA solution works best.

Diseases and Pests

Bacterial soft-rot caused by *Erwinia* spp. is a frequent problem in calla culture. Bacterial infections damage both the foliage and the rhizomes, and may cause serious losses if not prevented. Soft-rot may be an insidious disease, often appearing in later stages of production, and control may be difficult if proper growing conditions are not maintained. Chemical controls are largely ineffective. Copper compounds such as Kocide 101 may suppress the spread of soft-rot symptoms, but streptomycin sulfate (Agri-Strep) can be phytotoxic. Clean stock is essential, and prevention of soft-rot begins with careful handling and curing of rhizomes. Rhizomes may be dipped in a 2% hydrogen peroxide immediately after cutting to reduce the spread of bacteria during division. Properly drained root medium, good ventilation, and avoidance of stress are critical for prevention of soft-rot. Other diseases affecting cal-

las are *Pythium* root rots and *Alternaria* black spot. Physiological disorders common to callas include "chalking" of rhizomes, sunburn, and a susceptibility to mechanical damage. Thrips are the major pest of callas, and their control may be difficult, due to the morphology of the inflorescence. Aphids and mites can also damage callas, and preventative spray programs are advisable in order to control pests prior to flowering.

Literature Cited

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Table 1.
Days to flower by cultivar and temperature

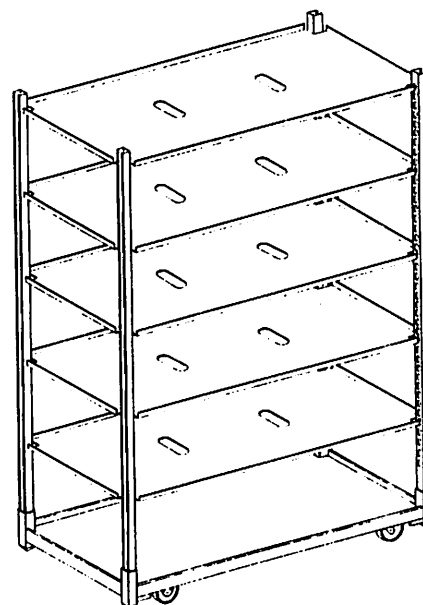
<u>Species or cultivar</u>	<u>Temperature</u>	<u>Approximate days to flower</u>
<i>Z. aethiopica</i>	55	70-95
<i>Z. albomaculata</i>	55	60-85
<i>Z.elliottana</i>	60	55-80
<i>Z. rehmannii</i>	55	55-85
Z. 'Hybrid Yellow'	55	60-80
Z. 'Galaxy'	60	55-65
Z. 'Golden Sun'	60	55-65

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