

**Crop: Kalanchoe**  
**Scientific Name: Kalanchoe blossfeldiana (Crassulaceae)**

**I. Introduction**

- A. The genus *Kalanchoe* is a member of the Crassulaceae family. Other genera of this family include *Crassula*, *Echeveria*, *Sedum* and *Sempervivum*.
- B. Several good characteristics makes kalanchoe a suitable plant for greenhouse production.
  - 1. It can be forced into flower at any time of the year and can be accurately timed for holidays.
  - 2. Cultural requirements can easily be met throughout the year.
- C. Production time from seed is 6-10 months, but plants can be produced from cuttings in 10-15 weeks.

**II. Species, Cultivars, Breeding, Development**

- A. *Kalanchoe* species originate from Madagascar and other arid regions of Africa and Asia.
- B. Madagascar is located between 12° and 25° S latitude. In the south and southwest part of the island, semi-desert conditions exist with rainfall under 250-380 mm (10-15 inches) per year. Xerophytic plants characterize the vegetation.
- C. Early cultivars were seed propagated and took about 6 months to flower from the time of seeding.
- D. Major problems with early kalanchoe cultivars included a long growing period, heat delay, non-uniformity from seed and poor growth in humid, dark, northern climate.
- E. New vegetatively propagated cultivars are regularly introduced. These cultivars are more compact, better branching, more disease resistant, fast developing and longer lasting.

**III. Flower Induction Requirements**

- A. *Kalanchoe* is classified as a short day plant. Most cultivars require 14-15

hours darkness (9-10 house light) to develop flowers.

- B. Long nights must be applied continuously 7 days a week for flower induction to occur. Black cloth should be used to flower all crops planted from February 15 through October 15.
- C. Temperatures above 24°C (75°F) during the first part of the dark span can cause heat delay.
- D. Four to five weeks of short days are adequate for floral induction and initiation of all cultivars. Plants will then flower under either short or long days.
- E. Flowering occurs on the earliest cultivars 9 weeks after beginning short days. An additional week or two is required during the winter, depending on the cultivar. About 10 days are required from first buds in color to first open flower. Another 10 days are required to get 10 buds in bloom. The table below shows the expected weeks to flower for different plant sizes.

Month of Flowering	Pot Size		
	10 cm (4") (SD, no pinch)	13 cm (5") (3 wk LD, pinch <sup>z</sup> , SD)	15 cm (6") (5 wk LD, pinch <sup>y</sup> ,SD)
	Weeks to flower		
Dec-Feb	13	16	18
March-April	12	15	17
May	11	14	16
June-Sept	10	13	15
Oct	11	14	16
Nov	12	15	17

<sup>z</sup> - pinch 0 to 2 weeks before SD

<sup>y</sup> - pinch 2 to 3 weeks before SD

- G. Plants for propagation are maintained vegetative by 16 hours of light or night interruption lighting for 3-4 hours.
- H. Growth habit of leaves are different under long days and short days.
  1. Long days - leaves are thin and flexible.

2. Short days - leaves become thick, succulent and rigid.
- I. Sudden drops in temperature to about 10°C (50°F) have been reported to induce flower buds under long day conditions.

#### IV. Environmental Requirements

##### A. Light

1. Plants grow best under high light intensity.
2. Full sun can be provided from October to May with light shade during the summer to improve temperature control.
3. Provide photoperiodic control for flowering as described in section III above, Flower Induction Requirements.

##### B. Temperature

1. Grow plants at 18-20°C (65-68°F) night temperature.
2. Fastest growth occurs at a night temperature of 20°C (68°F). Plants grow very slowly at temperatures below 16°C (60°F).
3. High day and night temperature cause heat delay in kalanchoe. Cultivar tolerance to high temperature varies. Research by Gehrke, Nell, and Barrett showed the following sensitivity to 95°F day/75°F night temperatures.

**Table 1. Kalanchoe Flowering Response at Supraoptimal Day and Night Temperatures.**

Tolerant Cultivar	Flower Color*	Intermediate Cultivar	Flower Color*	Sensitive Cultivar	Flower Color*
Attraction	OR	Adobe Rose	R	Bali	O
Eternity	CP	Cinnabar	O	Fascination	Pu
Inspiration	R	Firefly	Y	Osage Orange	O
Sensation	Pi	Fortyniner	Y	Pollux	R
		Satisfaction	Pu	Red Sunrise	R

\*Flower Color: Orange (O), coral pink (CP), orange red (OR), purple (Pu), red (R), Yellow (Y), pink (Pi).

### C. Water

1. Kalanchoes are relatively drought resistant. Rotting of the root system will occur if the medium remains soaking wet. However, do not allow plants to wilt or severely dry out.
2. Sufficient amounts of water should be applied to the young plantlet to produce a well-branched plant. After flower initiation, overwatering can soften and cause elongation of the main and individual flower stems resulting in a lanky, floppy plant.
3. Overhead watering becomes difficult due to the large fleshy leaves. Either tube watering or subirrigation systems work best.

### D. Nutrition

1. Maximum growth occurs with constant liquid feed consisting of 200-250 ppm nitrogen, 50 ppm phosphorous and 150 ppm potassium. Some recommendations suggest the use of 400 ppm nitrogen, 190 ppm phosphorous and 400 ppm potassium. The lower rates work very well with low leaching, while the higher rates may be necessary when leaching is heavy. Assuming an adequate nutrient change at planting rates as low as 100 ppm, nitrogen will be acceptable on subirrigated plants. Low nutrient levels may be desirable to control leaf size on plants grown in 4" pots.
2. Calcium is an important nutrient in kalanchoe production. A good source is calcium nitrate. Calcium nitrate should be used in the winter.
3. High phosphorus can cause flattened stems due to a zinc imbalance. Application of zinc chelate spray at 75 ppm corrects the problem.
4. If plants are grown in an inert medium without soil, a trace element mix should be incorporated. No fertilizer is required after the plants are well budded.

### E. Gases

1. Especially during vegetative growth, supplemental CO<sub>2</sub> can give faster growth and improve plant quality. Best benefit comes from CO<sub>2</sub> in the 1,000 ppm range.

## V. Cultivation

### A. Propagation

1. Seed propagation - not common
  - a. Kalanchoe seeds are very small with approximately 1,000,000 to 2,500,000 seeds per oz.
  - b. Seeds should be pressed into a fine medium. Do not cover.
  - c. Germination occurs in 10 days at 21°C (70°F under lighted conditions).
  - d. Sow seeds in January for single plants in 13-15 cm (5-6 inch pots) to flower in December, for 10 cm (4 inch) - sow in March.
2. Cutting propagation - most commonly used today
  - a. Cuttings should be 5-7 cm (2-3 inches) in length. Large leaves may be trimmed to facilitate spacing.
  - b. Stick cuttings 4 cm ( 1 1/2 inches) deep in a good rooting a growing medium. Cuttings can be stuck directly in plugs or in the finished pot.
  - c. Use an intermittent mist. Begin misting heavily and decrease over the following 14 days when cuttings should be rooted.
  - d. Maintain media temperature at 21-23°C (70-72°F). Air temperature should be 21-22° (70-72°F) at night.
3. Somemol growers delay pinching 2 to 4 weeks and use the pinch as a cutting.
4. Many cultivars are patented and a license is necessary for any vegetative propagation.
5. Many growers purchase rooted 2 1/4 inch (6 cm) liners from specialist propagators.

### B. Medium and Planting

1. The medium should be well-aerated and well-drained. A medium of 50% peat and 50% perlite or vermiculite works well.

2. The pH should be adjusted to about 6.0.
3. Avoid deep planting, as stem rot can occur. Plant the liners with the soil level of the cutting at or slightly above the pot medium level.
4. Generally only 1 cutting is needed per pot. However, sometimes 2-3 cuttings are placed in 13 and 15 cm (5 and 6 inch) pots, especially with smaller varieties.

**C. Spacing**

1. Final spacing depends upon pot size. Recommended final spacings are:

Pot Size	Spacing	
	cm	inches
4 inch (10 cm)	13 x 13	5 x 5
5 inch (13 cm)	18 x 18	7 x 7
6 inch (15 cm)	23 x 23	9 x 9 to
	25 x 25	10 x 10

Plants can be maintained pot to pot until after the short day treatment.

**D. Pinching**

1. Plants grown in 10 cm (4 inch) pots normally are not pinched.
2. Plants in 13 and 15 cm (5-6 inch) pots sometimes are pinched.
3. The top 1 to 2 cm (1/2 - 3/4 inches) of the growing point is removed when pinched.
4. Plants pinched for 13 cm (5 inch) pots receive up to an additional 2 weeks of long days after pinching. Plants for 15 cm (6 inch) pots receive 2-3 weeks additional long days.
5. Some kalanchoe plants are sold pre-pinched, ready to be potted and short days started immediately.

**E. Growth Regulators**

1. A B-Nine application 2-3 weeks after the start of short days reduces

the height of the main flower stem. A second application 4-5 weeks after the start of short days controls the height of the individual flower stems. A third application may be required under extremely high temperatures. Recommended rate of B-Nine is 2,500-5,000 ppm.

2. For extremely vigorous cultivars, A-Rest may be desired over B-Nine for the first application. A-Rest applied as a 5 ppm spray or as a drench effectively controls the height of all varieties. Apply 1/4 to 1/2 mg active ingredient per 10 cm (4 inch) pot.
3. B-Nine or A-Rest applications do not delay flowering.

## VI. Problems

### A. Insects

1. Aphids are the most serious insect pest, but can be controlled with many insecticides.
2. Cyclamen mite has recently become a difficult pest.

### B. Diseases

1. Powdery mildew (*Sphaerotheca humuli* var *fuliginea*) is the most troublesome disease. It is especially difficult under high humidity and unevenly moist plants. Vaporized sulfur from sulfur pots gives good control.
2. *Botrytis cinerea* causes rotting at the base of the stem and blighting of flowers and other plant tissues. The best preventive control is good air circulation.
3. Crown rot is caused by *Phytophthora cactorum*. The fungus attacks the base of the stem and progresses upward. It can be prevented by using a light, porous soil (sterile medium) and by not overwatering.

### C. Physiological

1. Yellowing and cupping of the foliage occurs on some varieties during flower bud formation. It can be cured by providing long days after the short day treatment is completed.

## **VII. Harvesting, Handling, and Marketing**

- A. Plants are sold in full bloom. Kalanchoes have a long decorative life in the home but flowers are sensitive to ethylene. Avoid exposing plants to ethylene.
- B. Plants kept under 50 foot-candles ( $7-8 \mu\text{mol s}^{-1}\text{m}^{-2}$ ) fluorescent light have a decorative life of about 17 days. Under light levels of 250 foot-candles ( $35 \mu\text{mol s}^{-1}\text{m}^{-2}$  or more, the decorative life increases to 27-35 days.
- C. Plant shipments at  $2^{\circ}\text{C}$  ( $35^{\circ}\text{F}$ ) for 8 days can result in chilling injury of some cultivars. Cultivars with large leaves can be difficult to ship.
- D. Large 15 cm (6 inch) plants are sold mainly through the florist market.
- E. Smaller 10 cm (4 inch) plants are mainly sold in mass markets.



## VII. Scheduling

### A. Seed propagation

Growing Time for Cultural Segment	Cultural Procedures	Temperature	Photoperiod
	Sow seed	21°C (70°F)	Long day
1-2 weeks	↓ ↓ ↓		
	Germination complete	18-20°C (65-58°F)	Long day
5 weeks	↓ ↓ ↓		
	Transplant to 6x8 cell packs	18-20°C (65-68°F)	Long day
6 weeks	↓ ↓ ↓		
	Transplant to 8 cm (3 inch) pots	18-20°C (65-68°F)	Long day
16 weeks	↓ ↓ ↓		
	Transplant to 13-15 cm (5-6 inch) pots	18-20°C (65-68°F)	Long day
10 weeks	↓ ↓ ↓		
	Start short days	18°C (65°F)	Short day
5-6 weeks	↓ ↓ ↓		
	Normal photoperiods can be used	16°C (60°F)	Short or natural days
5-6 weeks	↓ ↓ ↓		
	Flower		

B. Cutting propagation

Growing Time for Cultural Segment	Cultural Procedure	Temperature	Photoperiod
	Propagate cutting	20-21°C (68-70°F)	Long day
2 weeks	↓ V		
	Transplant to finish pot	18°C (65°F)	Long day
0-4 weeks	↓ V		
	Start short days	18°C (65°F)	Short day
5-6 weeks	↓ V		
	Normal photoperiods	16°C (60°F)	---
4-6 weeks	↓ V		
	Flower		