

Crop: Campanula, Bellflower, Star of Bethlehem
Scientific Name: Campanula isophylla (Campanulaceae)

I. Introduction

- A. *Campanula isophylla* (Bellflower or Star of Bethlehem) belongs to the family Campanulaceae and originates from Italian Alps. The plant has trailing growth habit making it excellent for hanging baskets. The flowers are erect, violet-blue and 2.5-4 cm (1-1.5 inch) in diameter.
- B. Campanula is an important crop in Scandinavia grown in 10-11 cm (4-4.5 inch) pots for spring sale or hanging baskets for indoor or outdoor use during the summer.

II. Species, Cultivars, Breeding, Development

- A. The family Campanulaceae consists of about 200 species. Most of these species are perennial herbs with a few annuals and biennials.
- B. Cultivars propagated by cuttings:
 - 1. 'Alba' - white flowers, one of the most grown cultivars.
 - 2. 'Bla' - blue flowers, found in Skjold Nursery, Norway. The origin is unknown. This cultivar has better growth and flower color than other cutting propagated blue cultivars.
 - 3. 'Mayii' - pale blue flowers with grayish looking foliage and about 7 days later than 'Bla'.
 - 4. 'Moretti' - blue flowers.
- C. F₁-hybrids have recently been introduced. These cultivars have compact, uniform plant habit and large, showy, star-shaped flowers. The 2 best known are:
 - 1. 'Stella White'
 - 2. 'Stella Blue'

III. Flower Induction Requirements

- A. *C. isophylla* is a long day plant and requires more than 14 hours of light to initiate and develop flowers.
- B. Short photoperiod (8-12 hours) are used to keep stock plants vegetative.

IV. Environmental Requirements

A. Light

1. Plants should receive the full natural light intensity in the greenhouse.
2. Supplemental lighting is required during the winter in Northern Europe to achieve acceptable vegetative growth.
3. Flower induction by long days can be accomplished during natural short days by day extension (to at least 16 hours of light) or light interruptions of the night. Incandenscent lamps for day extension may induce stem elongation. Fluorescent lamps are preferred to eliminate this problem.
4. Long days are required both during flower initiation and development. Returning plants to short days after buds form causes flower bud blasting.

B. Temperature

1. Stock plants should be grown at 16-18°C (60-65°F).
2. For rooting cuttings, maintain 21°C (70°F) soil and 18°C (64 °F) air temperature.
3. Maintain a soil temperature of 16-18°C (60-65°F) and a relative humidity of 85-95% for germination.
4. Maintain 18°C (64°F) after potting for 6-9 weeks until start of LD.
5. After LD starts, maintain 18°C (64°F) and avoid high day temperatures which can cause stretch and poor quality plants. Plants grown under a positive DIF will be tall while negative or zero DIF plants will be more compact.

C. Water

1. Campanulas are sensitive to overwatering.
2. Plants should be kept moist, but not excessively wet.

D. Nutrition

1. Constant liquid feeds of 200 ppm N and K should provide adequate nutrients.

E. Gases

1. Supplemental CO₂ at 900 ppm is beneficial.

V. Cultivation

A. Propagation

1. Cuttings

- a. Cuttings are taken in fall/winter from stock plants which were maintained under short days (minimum 12 hours of darkness) conditions.
- b. A rooting media consisting of perlite:peat (3:1) works well.
- c. Dipping cuttings in a 1,000-1,500 ppm IBA solution for 5 seconds speeds rooting.
- d. Temperatures of 21°C (70°F) versus 15°C (59°F) stimulate rooting and growth. The light intensity should be at least 250 foot-candles (50 $\mu\text{mol s}^{-1}\text{m}^{-2}$).
- e. Rooting takes place in 17-18 days.
- f. Cuttings with flower buds form roots poorly even after IBA treatments.

2. Seed
 - a. Sow seed in a peat-lite medium and do not cover.
 - b. Maintain 16-18°C (60-65°F) soil temperature and relative humidity of 85-95%.
 - c. Germination takes up to 21 days.
3. Supplemental lighting stimulates the development of lateral shoots on the young plant or seedling. The minimum light intensity should be 250 foot-candles ($50 \mu\text{mol s}^{-1}\text{m}^{-2}$).

B. Medium and Planting

1. Media should be well drained.
2. Plants or seedlings can be planted in cell-paks initially and then transplanted to finish pots.
3. For 10-12 cm (4-5 inch) large pots, use one plant. Transplant 3 plants into 20 cm (8 inch) hanging baskets and 4-5 plants into 30 cm (12 inch) hanging baskets.

C. Spacing

1. The plants can be grown pot to pot after transplanting into the final pot. Plants should be spaced 3-4 weeks later depending on season. Final spacing for 11 cm (4 inch) pots is about 3.0 plants per ft^2 and 2.5 plants per ft^2 for 12 cm (5 inch) pots.
2. When some of the plants are grown in hanging baskets placed above the benches, the total number of plants produced in a greenhouse can be increased.

D. Support

1. None

E. Pinching

1. The plants are grown both unpinched or pinched.

2. A soft pinch can be given 10-12 days after transplanting into final pot. Plants should not be pinched later than 3-4 days prior to long days.
3. Pinching delays flowering 2-3 weeks.

F. Disbudding

1. None

G. Growth Regulators

1. B-Nine effectively controls height.
2. The plants are treated 1 week after start of long days or on pinched plants, when the shoots are 3-4 cm (1 - 1 1/2 inches) in length.
3. The normal rate is 1,500 - 2,500 ppm of B-Nine.
4. Repeated application may be necessary to achieve desired height control depending on cultivar. The second application is made 6 weeks after the first treatment.
5. Treatments with B-Nine delays development about one week.

VI. Problems

A. Insects

1. Aphids, spider mites and fungus gnats are the most troublesome pests.

B. Diseases

1. Campanula is highly susceptible to Botrytis blight (*Botrytis cinerea*), especially on plants closely spaced under high humidity conditions.
2. *Pythium*, *Rhizoctonia* and *Verticillium* can cause root rot.
3. Fusarium attacks the shoots at the base. The shoots turn black and the plant dies.

C. Physiological

1. Bud blast occurs when plants are returned to short days after flower bud formation.
2. Positive DIF temperatures during long days and the use of incandescent lamps for day extension cause legginess (long internodes).

VII. Harvesting, Handling, and Marketing

- A. The plants are sold in full bloom.
- B. In Scandinavian, about 70% white and 30% blue cultivars are produced.
- C. The largest demand for this plant is during spring and early summer.

VII. Scheduling

| Growing Time For Cultural Segment | Cultural Procedure | Temperature | Photoperiod |
|-----------------------------------|-----------------------|-------------------|-------------|
| | Propagate cutting | 18°C (65°F) | Short day |
| 3 weeks | ↓ V | | |
| | Pot cuttings | 18-19°C (64-65°F) | Short day |
| 6-9 weeks | ↓ V | | |
| | Start long day period | 18-19°C (64-65°F) | Long day |
| 1 week | ↓ V | | |
| | Apply B-Nine | 18-19°C (64-65°F) | Long day |
| 9 weeks | ↓ V | | |
| | Flowering | | |