Section 8

Campanula

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Introduction

There are more than 300 species within the *Campanula* genus, many of which have been popular garden plants for hundreds of years. *Campanula carpatica* is native to the Carpathian mountains of Eastern Europe and is also known as "Carpathian harebell." Recommendations given here apply only to this plant and may not be appropriate for other species of *Campanula*.

Campanula carpatica is hardy from USDA zones 3 to 8 and has a long flowering season. The plant grows as a compact mound 9 to 12 inches tall, which is ideal for rock gardens or edging a flower bed. The blue or white flowers are bell-shaped, face upward, and are held above the foliage (Figure 8-1). This attractive, showy plant is used extensively in perennial gardens in the United States and Europe.

Campanula carpatica is an important pot crop in northern Europe and could easily be adapted to that use in North America. It is an attractive potted flowering plant, as well as a long-lived addition to the home garden. *C. carpatica* responds strongly to photoperiod, so growers can control plant development and schedule flowering quite predictably.

Cultivars

The most common seed-propagated cultivars in North America are 'Blue Clips,' with medium lavender/blue flowers, and 'White Clips' with clear white flowers. Recent introductions include 'Deep Blue Clips,' which has flowers of darker lavender/blue, and the 'Uniform' series. 'Karl Foerster' is a clone with lilac-blue flowers; it is grown extensively in Europe. Suggested production information in this article was primarily tested on 'Blue Clips,' and some experiments included 'White Clips.' While we expect other cultivars of *C. carpatica* will respond similarly, our recommendations may not be appropriate for all cultivars.

Flower Induction Requirements

Daylength is the main factor controlling flowering in *Campanula carpatica* 'Blue Clips' and 'White Clips.' This species is an obligate long-day plant – it will not flower under short days.

Figure 8-1. *Campanula carpatica* 'Blue Clips' in a 4-inch pot – a real charmer.

Plant Size

Small seedlings of 'Blue Clips' can be induced to flower, and we have even observed flowering on 9- to 11-leaf plants in plug trays when long daylengths were provided during germination. However, to produce an attractive flowering potted plant, plants need a period of vegetative growth to gain size or "bulk up" before flowering is induced. At all stages prior to reproductive forcing, 'Blue Clips' should be grown under daylengths shorter than 13 hours to avoid premature floral initiation and promote lateral branching. Natural daylengths in late winter and early spring are ideal for this stage. After April 1, natural daylengths will be too long for bulking, so if bulking is needed, plants should be placed under black cloth until reproductive forcing begins. Bulking will result in more attractive finished plants with greater numbers of flowers at sale (Figures 8-2 and 8-3, page 44).

Cold Treatment

Cold temperatures are not required for flowering of 'Blue Clips.' Exposure to cold does not significantly hasten flowering and has little effect on plant appearance. However, cold is not detrimental either, and plants can readily be held or overwintered in a cooler or cold greenhouse at 35 to 45°F or colder if necessary.

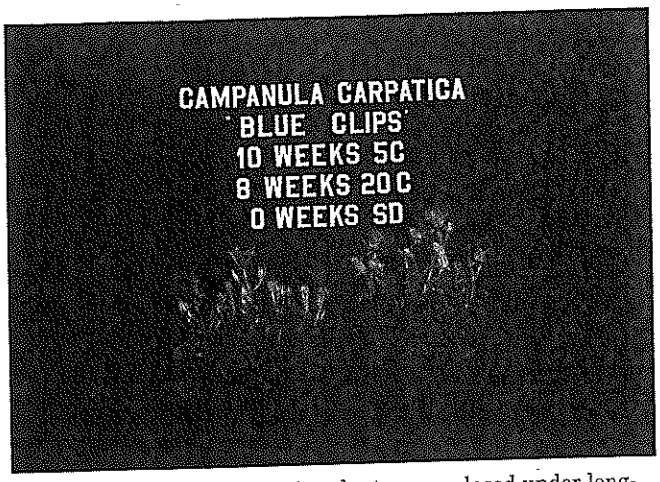


Figure 8-2. These *C. carpatica* plants were placed under long-days (LD) immediately after transplanting from 128-cell plug trays, when they had approximately 8 to 10 leaves. LD were provided with a four-hour night interruption. Photo was taken after eight weeks of LD.

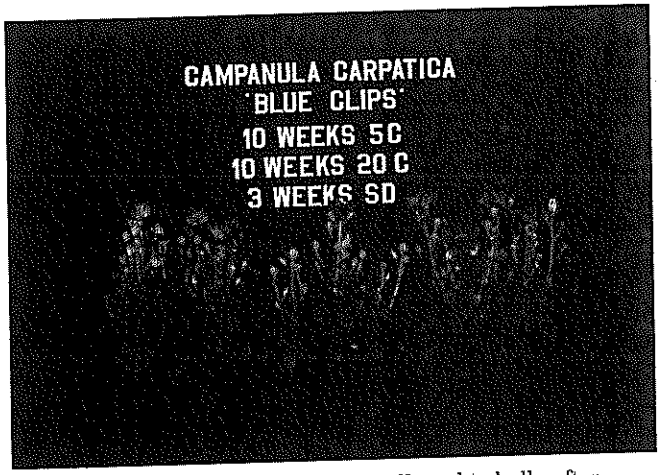


Figure 8-3. *C. carpatica* plants were allowed to bulk, after transplant from 128-cell plug trays, under a nine-hour photoperiod for three weeks before LD treatments began. Plants had approximately 15 to 17 leaves at the start of LD. Photo was taken after seven weeks of LD.

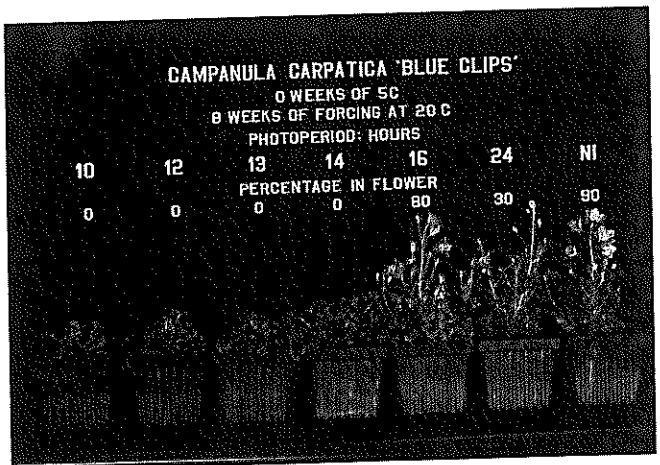
Photoperiod

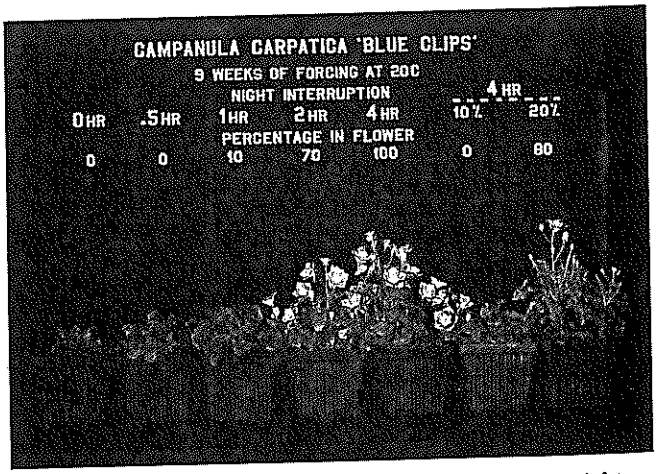
Under photoperiods of 12 hours or less, 'Blue Clips' remains vegetative and forms a compact rosette of leaves. Flower induction occurs when the photoperiod exceeds 14 hours, and is hastened under 16 hour photoperiods or a 4-hour night break (Figures 8-4a and 8-4b). After flower initiation has occurred and buds are visible, flowering will occur even if the plants are subsequently placed under short days. Under short days, some of the elongation associated with long-day (LD) bolting will decrease; hence plants will be shorter.

LD treatments can begin any time after the plants have at least 15 leaves and should continue at least until flower buds are visible. LD can be provided either by extending the daylength to 16 hours, or by night-break lighting for four hours from 10 p.m. to 2 a.m. Flowering will be slower if night breaks are less than four hours.

Cyclic Lighting. We have also tested two cyclic lighting programs, lighting plants for 10 percent or 20 percent of the four-hour night break. The 10 percent lighting program (lights on for six minutes, off for 54 minutes) was not effective for flower induction. Under the 20 percent lighting program (lights on for six minutes, off for 24 minutes), all plants eventually bloomed, but flowering was delayed and not uniform. For rapid and uniform flowering, night breaks should be four hours long and the lights should be on for the entire four hours.

Light Source. Incandescent, high-pressure sodium, cool white fluorescent, or metal halide lamps are effective, but incandescent lights generally cause more stem elongation than the other light sources. Provide a minimum light intensity





Figures 8-4a and 8-4b. Critical photoperiod for flowering of *C. carpatica*. All plants under 16-hour photoperiods or four-hour night-interruption treatments eventually flowered. Less than 60 percent flowered under the 14-hour photoperiod, and none flowered under photoperiods shorter than 14 hours. Photo courtesy of Erik Runkle.

of 5 to 10 footcandles. When using incandescent lamps, about 1.5 watts per square foot of growing space is required. 'Blue Clips' are very sensitive to light, and a light intensity of 0.5 footcandles will induce some flowering. Growers should be aware that light from adjacent greenhouses may affect development of 'Blue Clips' and could inadvertently result in flower induction when vegetative growth is desired.

Propagation

Campanula carpatica can be propagated easily by cuttings or by seed. In North America, most plants are started from seed. Some seedling variation will be present, but available cultivars are quite uniform. Light is required for germination, so the small seeds should not be covered. Maintain media temperatures at 68 to 72°F. Seedlings will emerge in 14 to 20 days. After germination, the photoperiod should be maintained at less than 14 hours to maintain vegetative growth. Established seedlings are readily available from plug producers. In our experience, seedlings from 128-cell trays have 8 to 12 leaves, and those from 50-cell trays have 12 to 17 leaves.

Media And Fertilization

Use of well-drained media is especially important. The pH should be maintained around 6.0. Campanula requires moderate levels of fertility, and constant fertilization at 100 to 150 ppm N, 10 to 20 ppm P, and 100 to 150 ppm K_2O is adequate (for example, 20-10-20).

Lighting And Spacing

Provide full natural light intensity during late spring forcing. Supplemental lighting with 500 footcandles of light from high-pressure sodium lamps has greatly improved plant quality during winter and early spring forcing in Northern areas.

Irrigation

Keep plants evenly moist, avoiding waterlogging or drought. Repeated drought will delay flowering, and reduce plant quality.

Plant Height Control

'Blue Clips' is naturally quite compact and generally forms a well-proportioned potted plant. If needed, several cultural techniques can be used to control plant height. Plants grown under positive DIF conditions will be taller than those grown under 0 DIF or negative DIF. A two-hour temperature drop at sunrise also reduced final plant height in experiments at MSU. Average daily temperature does not affect plant height.

The type of supplemental lighting used to provide LD will influence plant height. Incandescent lights cause more elongation than high-pressure sodium, metal halide, or cool white fluorescent lights due to the higher proportion of far-red light emitted by incandescent lamps. In our experiments, 'Blue Clips' treated with incandescent lamps were 1 to 2 inches taller than those under any other light source.

Growth regulators can also be used to control height. Our research shows that A-Rest, B-Nine, Bonzi, Cycocel, and Sumagic are all effective (Figure 8-5).

Temperatures And Crop Scheduling

The time to flower after beginning LD depends on forcing temperature (Table 8-1, page 46). Allow about 10 to 11 weeks at 60°F, eight to nine weeks at 65°F, or seven to eight weeks at 70°F. During forcing, we suggest temperatures of 60 to 68°F, because flower size is larger at cooler temperatures (Figure 8-6, page 46).

'Blue Clips' plants are available in several plug sizes and as field-grown divisions. Plants from 128-cell plug trays are appropriate for 4-inch pots. To fill out 6-inch or gallon pots, use several small plugs or plants from 50-cell trays or larger.

'Blue Clips' are generally quite uniform, but they do show some variability in time to visible bud and flower within a population. Date of first flower can progress over a 10-day period. Variability in a population of 'White Clips' was similar. Plants are attractive for a period of time as subsequent flowers open.

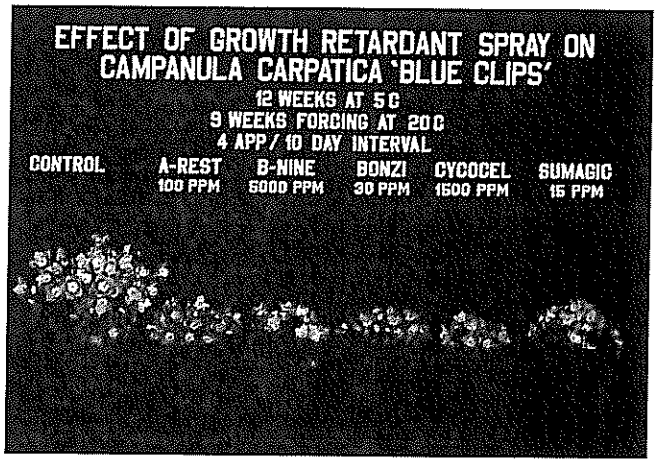


Figure 8-5. Response of *C. carpatica* to common growth retardants applied frequently and at high rates. Applications began 10 days after LD treatments began. This experiment was intended only to determine which compounds would be effective, not to determine recommended rates. Photo courtesy of Cheryl Hamaker.

Table 8-1. ***Campanula carpatica*** **'Blue Clips' production schedule.**

Growing Time	Cultural Practice	Temperature	Photoperiod
2-3 weeks	sow seeds ↓ germination OR purchase plugs	68 to 72°F	< 13 hours of light
9-11 weeks	Grow on until at least 15 leaves have formed. ↓	64 to 68°F	< 13 hours of light
	Hold at 35 to 45°F if needed. (Plants do not require cold to flower.)		
	↓ ↓ Begin forcing		16 hours of light or 4-hour night interruption **Visible Bud to Flower** 61°F – 26 days 66°F – 22 days 70°F – 20 days
↓	↓	↓	
↓	↓	70°F	
↓	66°F	7-8 weeks	
61°F	8-9 weeks	flower	
10-11 weeks	flower		
flower			

Disease And Insect Pests

'Blue Clips' are susceptible to damping-off or root rot caused by *Pythium* or *Rhizoctonia.* Use of a well-drained media will help to reduce these problems. Leaves may become infected by *Botrytis cinerea*, so it is helpful to keep the foliage as dry as possible. Few insects are attracted to 'Blue Clips,' but spider mites may become a problem. We have noticed that pesticide applications caused some discoloration of open flowers, so avoid spraying blooming plants if possible.

Postproduction Concerns

Conditions in the retail setting or the consumer's home are very different from those of the greenhouse. Water may not be provided regularly, and salt damage to the roots is a potential problem if the media is nutrient-rich and allowed to dry out. For maximum shelf life, a reduction in fertilization near the end of the crop is recommended. Two or three weeks before harvest, begin irrigating with clear water or use reduced levels of fertilizer – especially nitrogen.

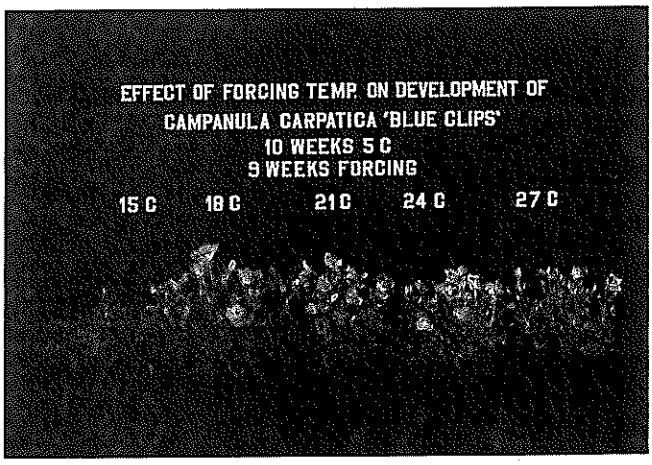


Figure 8-6. Influence of forcing temperature on flowering in *C. carpatica*. Plants flowered more quickly under warmer temperatures, but note the marked reduction in flower size with increasing forcing temperature. Average daily temperature did not affect plant height.

Flower longevity is correlated with ethylene production. In Europe, a spray of 6 ppm of silver in the form of silver thiosulfate is commonly applied shortly before harvest to maximize postproduction life. Silver thiosulfate has not been cleared in the United States.

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