

## COMING UP IN THIS SERIES

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Russian sage (*Perovskia atriplicifolia*)

THE  
NEW SCIENCE  
OF FORCING  
PERENNIALS TO  
FLOWER

Perennials

# FORCING PERENNIALS

— CROP BY CROP —

**SPECIES: PHYSOSTEGIA VIRGINIANA**  
**COMMON NAME: OBEDIENT PLANT**

*Editor's note: In this exclusive series, Michigan State University researchers tell growers how to give the public what they want: perennials in flower. Part Eight provides precise prescriptions for *Physostegia virginiana*. The articles will be bound into a handy booklet at the end of the year.*

by **CHERYL K. HAMAKER, ROYAL HEINS, ARTHUR CAMERON, and WILL CARLSON**

**T**HE genus *Physostegia* belongs to the Lamiaceae, or mint family, which is characterized by square stems. *Physostegia* flower spikes are typically 1-1½ feet tall and each side of the four-sided stems is lined with 1-inch bi-lobed flowers.

*Physostegia virginiana*, commonly known as obedient plant, is aptly

named for the tendency of its individual flowers to remain in any position to which they are shifted. When planted in full sun or partial shade, this vigorous perennial

**Figure 1.**



Figure 1. *Physostegia* 'Alba' can yield an impressive flowering plant, shown here in a 6-inch standard pot.

**Figure 2.**



Figure 2. The bright pink flowers of *Physostegia* 'Pink Bouquet' are quite showy in the landscape. Photo courtesy of Ann Hanchek.

quickly spreads to form broad sweeps of spiky white, pink, or lavender flowers. Obedient plant typically flowers in late summer or fall and may bloom for a month or more if continually dead-headed in the garden.

The crown of the obedient plant expands through creeping stems. *P. virginiana* is indigenous to eastern North America and is hardy in USDA zones 3 through 9. Because of its low maintenance and value as both a cut flower and a naturalizer, *P. virginiana* has become a popular choice for the garden.

### Cultivars

*P. virginiana* carries its purple-red, rose-pink, or lilac flowers on wand-like stems of 4-5 feet. Many cultivars of various heights and flower color, including white, are available. *Physostegia* 'Alba' is a seed-propagated cultivar with pure white blooms on 3- to 4-foot-tall stems (Figure 1). Another white cultivar, 'Summer Snow,' has a relatively low stature of only 3 feet and an earlier bloom time in the landscape than other *P. virginiana* cultivars. 'Pink Bouquet' sports bright-pink flowers on 3- to 4-foot-tall stems (Figure 2). 'Vivid' is a 2-foot-tall selection with vibrant rose-pink flowers. 'Variegata' is unusual in that

it has cream-edged leaves to offset its pale pink blossoms.

### Flower Induction Requirements

All suggested production information is based on observed responses of various cultivars of *P. virginiana*. Flowering requirements among other cultivars may vary.

#### 1. PLANT SIZE

*P. virginiana* plants are available as plugs or field-grown divisions. It is important that starting material, whether plugs or divisions, be sufficiently large to fill the container when

plants are in bloom. Shorter cultivars of *P. virginiana* are more suitable for smaller containers.

#### 2. COLD TREATMENT

A cold treatment is required to uniformly flower *P. virginiana* (Figure 3). Sporadic and nonuniform flowering will occur without a cold treatment. However, to achieve 100% flowering, a cold period of at least 5 weeks at 41°F (5°C) is necessary. We recommend a 10-week cold treatment to accelerate flowering and increase final inflorescence number.

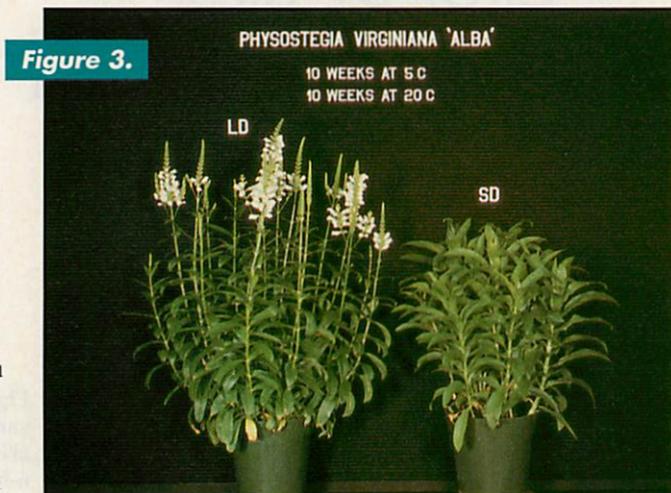
#### 3. PHOTOPERIOD

*P. virginiana* is a facultative long-day (LD) plant (Figure 4). Plants eventually flower under short days, but flowering is delayed up to 4 weeks. Flowering occurs fastest when plants are exposed to LD in excess of 16 hours or a 4-hour night interruption from 10 p.m. to 2 a.m. (Figure 4). As the daylength increases, time to flower decreases and the final number of inflorescences increases.

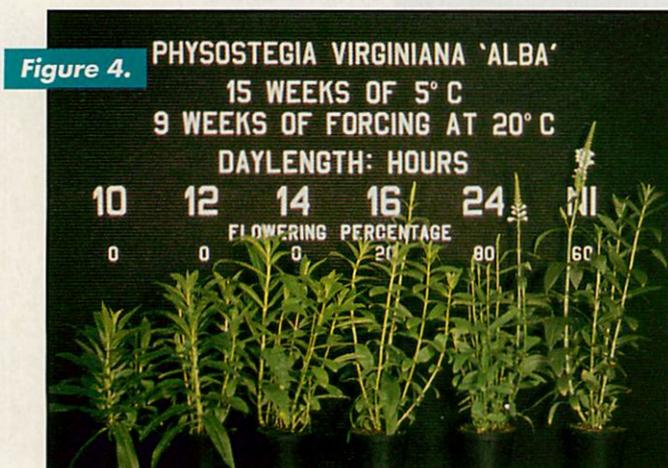
Both high-pressure sodium and incandescent lamps successfully promote flowering for *P. virginiana*. The minimum light intensity for all lamp types should be 10 foot-candles.

#### 4. PROPAGATION

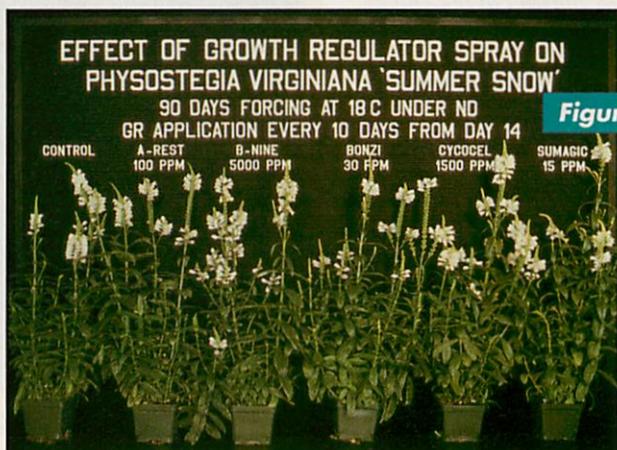
In the garden, propagation of *P. virginiana* usually is ac-



**Figure 3.** Horticulturally, *P. virginiana* has an obligate requirement for both cold and long days (LD) for flowering. Both plants received cold; however, the plant on the left was forced under a 4-hour night interruption, while the plant on the right was forced under a 9-hour short day.



**Figure 4.** *Physostegia* 'Alba' requires a photoperiod longer than 16 hours for fastest flowering. However a 4-hour night interruption is as effective as a 16-hour photoperiod for flower initiation and development. Following a cold treatment, plants will flower under a 14-hour photoperiod, but flowering will be delayed. Photo courtesy of Erik Runkle.



**Figure 5.** Unfortunately *Physostegia* 'Summer Snow' did not respond to growth retardants even when applied at high rates at 10-day intervals during forcing.

complished by division in spring or late fall. It is necessary to divide clumps frequently to rejuvenate old plants and control their invasive nature. In the commercial industry, many cultivars of *P. virginiana* have been selected for flower color or other characteristics and are vegetatively propagated by stem cuttings. *Physostegia* 'Summer Snow' has been chosen for its white blooms, shorter height, and less-invasive nature. Propagation from seed may not ensure these characteristics. Two nice seed-propagated cultivars are 'Alba' and 'Crown of Snow.'

Because *P. virginiana* is an LD plant, stock plants must be held under short days to ensure vegetative development. Cuttings produced under short photoperiods will root more vigorously than those produced under LD.

## 5. MEDIA AND FERTILIZATION

*P. virginiana* does not have a specific medium requirement. Plants will perform well in the greenhouse in any well-drained, evenly moist medium with a pH range of 5.5-6.0. It does not require a high fertilizer concentration either in the greenhouse or garden. Plants become excessively tall with weak stems when high nitrogen fertilization is provided; therefore, a constant fertilization at 100 ppm N from a balanced fertilizer is suggested.

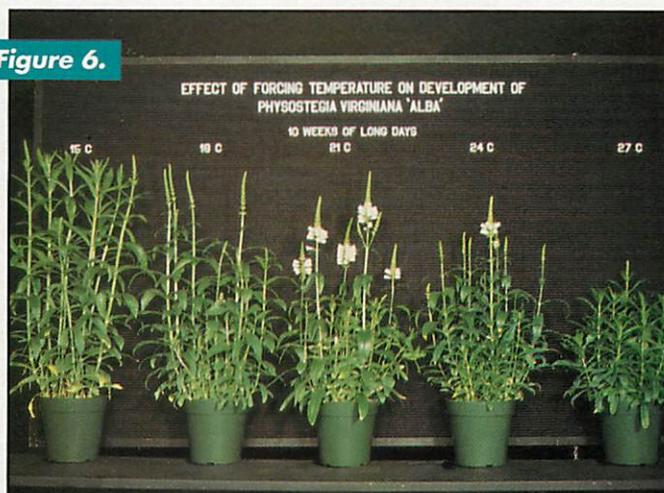
## 6. IRRIGATION

While *P. virginiana* will tolerate considerable moisture, best growth occurs when plants are kept evenly moist. Leaf necrosis will occur if plants are allowed to become overly dry.

## 7. LIGHTING AND SPACING

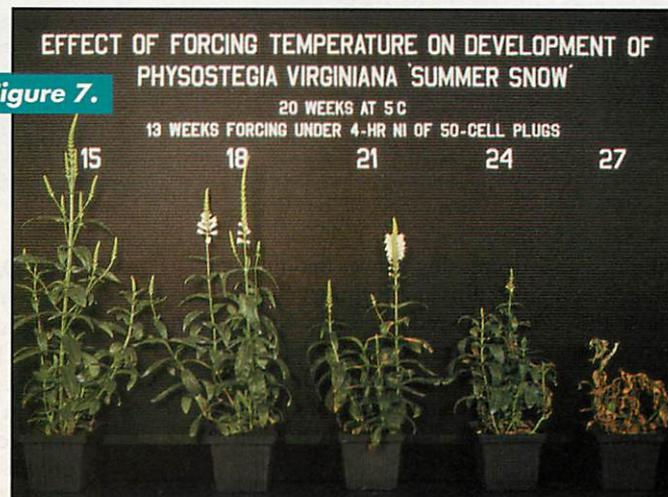
*P. virginiana* thrives in high light conditions as long as moisture requirements are met. Overall plant quality is best when appropriate lighting and spacing are used.

**Figure 6.**



**Influence of forcing temperature on flowering of *Physostegia* 'Alba.'** Plants performed best when grown under cooler temperatures.

**Figure 7.**



**Production time of *Physostegia* 'Summer Snow' from the start of forcing to opening of the first flower is approximately 13-14 weeks at 59°F (15°C), 12-13 weeks at 64°F (18°C), and 11-12 weeks at 71°F (21°C). Unfortunately, some cultivars of *Physostegia* may be sensitive to higher temperatures. Plants grown at 75°-80°F (24°-27°C) never reached flowering. Plant death may have been caused by INSV infection that was expressed at elevated temperatures.**

Supplemental lighting from high intensity discharge lights at 400-500 footcandles is beneficial in greenhouse conditions, especially during dark winter months. To encourage proper growth habit and stem strength, pots should be spaced in the greenhouse so that light can penetrate into the lower part of the plant.

## 8. PLANT HEIGHT CONTROL

Often the final plant height of *P. virginiana* becomes quite exorbitant for container production.

Unfortunately, no growth retardant tested effectively controlled final plant height of *P. virginiana* (Figure 5). However, the often leggy habit of this species may be curbed by growing in full sun or selecting more compact cultivars.

## 9. TEMPERATURES AND CROP SCHEDULING

It is important when forcing *P. virginiana* to consider the size of the starting material when selecting final pot size. Cooled plugs and bare-root plants can be purchased and directly forced into bloom. For small containers, 4- or 5-inch pots, one plug is sufficient for final size. In order to fill a 6-inch or 1-gallon container, larger plants are required.

Two strategies for "filling" larger containers are using field-grown divisions or planting an uncooled plug in late September or early October to allow bulking during the late fall. If small plugs are used as starting material, it may be necessary to plant several plugs per 6-inch or 1-gallon container to produce a quality final product. Only shorter cultivars of this species are suitable for both small and large containers.

To fill large containers, it may be necessary to increase the vegetative size of smaller starting material. Final plant size can be influenced by either pinching

plants before forcing or growing them in photoperiods short enough to prevent induction but long enough for vegetative development to occur, known as bulking. Pinching encourages lateral branching, and plants have more but smaller, flowering spikes.

The decision to pinch or bulk the plugs is determined by the time of forcing. We recommend that plants be either pinched in spring or bulked in fall. After pinching, plants are placed under inductive photoperiods as soon as new growth is detected. Pinching

**TABLE 1.** *Physostegia virginiana* 'Alba' Production Schedule

Growing Time	Cultural Practice	Temperature	Photoperiod
3-4 weeks	Take cuttings ↓ Root	Media temperature 72°-76°F (22°-24°C)	<14 hours of light
4-5 weeks (50-cell plug) Longer for larger plugs	Bulk or pinch to increase vegetative growth of plants	Air temperature 68°-72°F (20°-22°C) 58°-62°F (14°-17°C) for 1-2 weeks before cold	13-14 hours of light initially  10-12 hours of light for final weeks before cold
- OR - Purchase plugs or bare root plants			
10-15 weeks (Can be held longer if needed)	Cold treatment ↓	35°-45°F (1°-7°C)	< 12 hours of light
<b>Begin Forcing</b>			≥16 hours of light or a 4-hour night interruption  <b>Visible Bud to Flower</b> 59°F (15°C) – 44 days 64°F (18°C) – 42 days 70°F (21°C) – 39 days
↓	↓	70°F (21°C)	
↓	↓	9-10 weeks	
59°F (18°C) 10-11 weeks flower	64°F (18°C) 10 weeks flower	flower	

does not necessarily increase the number of new stalks originating from below the soil but will cause the lower laterals to develop, which adds bulk to the final product.

Bulking requires a longer period for subsequent development than pinching the plugs. The length of the bulking interval is determined by the size of the starting material and the desired final pot size. Bulking plugs for 3 weeks in natural daylengths during late October at 68°F (20°C) or overwintering in a cool greenhouse increased the final bud number 30% and 50%, respectively, compared to a 3-week pretreatment of 9 hours of natural daylight plus a 4-hour night interruption.

If forcing schedules do not permit time for bulking, adequate-size plant material for the final pot size should be purchased.

Time to flower depends on the forcing temperature from the start of LD (Figure 6). *P. virginiana* performs best when forced between 59°F and 70°F (15°-21°C). For 'Alba,' allow about 10-11 weeks at daily averages of 59°F (15°C), 10 weeks at 64°F (18°C), or 9-10 weeks at 70°F (21°C) (Table 1). High temperatures (81°F) stressed the plants, stunting growth, delaying flowering for 2 weeks, and

decreasing flower bud number.

Cultivars 'Summer Snow' and 'Vivid' require 2 and 4 weeks longer to flower, respectively, than 'Alba.' We have had mixed results growing different cultivars of *P. virginiana*. Some cultivars may not tolerate high

### FORMULA FOR SUCCESS: 'ALBA'

1. Grow plants in 6-inch or larger pots.
2. Large plants make a more impressive display. Use multiple or field-grown divisions that are disease free.
3. Provide plants with a 10-week cold treatment at 41°F (5°C) before LD treatment.
4. Provide LD either by extending the daylength to 16 hours or by a 4-hour night interruption.
5. Force at temperatures between 59°F and 71°F (15°-21°C).

temperatures during forcing (Figure 7). However, this intolerance may be related to symptom expression of impatiens necrotic spot virus (INSV) (see Section 10).

## 10. DISEASE AND INSECT PESTS

*P. virginiana* is susceptible to spider mites, aphids, and western flower thrips. It also contracts INSV, which causes a unique crinkling in the foliage. However, the symptoms of INSV may not become noticeable until plants are grown at higher temperatures or are drought-stressed (Figure 7). This problem can be avoided by purchasing virus-indexed plant material.

## 11. POSTHARVEST CONCERNS

*P. virginiana* should be shipped just before the first flower opens, which is important for two reasons: 1) as flowers open, they senesce and drop from the stem, leaving behind a rather unattractive flowering stalk, and 2) plants tend to become more floppy the longer they are held after flowering has begun.

*P. virginiana* can be cut back after the initial flush of flowers for a repeated full bloom. Plants will continue to flower if provided bright light, continual long days, and sufficient water and can be enjoyed in the garden for many years. **GG**

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