**Phlox paniculata**

**Herbaceous Perennials:**

by AMY ENFIELD, ERIK RUNKLE, ROYAL HEINS, and ARTHUR CAMERON

**GARDEN** phlox, or *Phlox paniculata*, is an old-time favorite hardy from USDA zones 4 to 8. Native to the United States, *P. paniculata* grows naturally from New York to Georgia and west to Arkansas and Illinois. Phlox has long been a favorite of hybridizers and can have a great colorful impact mid-summer in the garden. The plant may be best when placed toward the middle to back of the garden because the lower leaves tend to be quite susceptible to powdery mildew. *P. paniculata* grows better in the Northern parts of the country because it is not particularly heat tolerant. Despite a few drawbacks, it is still a popular herbaceous perennial.

Traditionally, most summer-blooming perennials such as garden phlox were sold as nonflowering plants. In the past decade, Michigan State University (MSU) researchers have performed numerous experiments to determine how environmental factors and cultural practices influence growth and development of a wide range of perennials. In this article, we present detailed information and strategies on how to propagate and control flowering of *P. paniculata*. The emphasis is on propagation and production of plants from vegetative cuttings rather than other forms of propagation. It will cover both traditional, long-cycle production, as well as the short-cycle production method introduced by MSU.

### Table 1. Phlox paniculata Production Schedule

<table>
<thead>
<tr>
<th>Duration</th>
<th>Cultural Practice</th>
<th>Temperature</th>
<th>Photoperiod</th>
<th>Light Intensity</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 weeks</td>
<td>Grow Stock Plants</td>
<td>68°F-72°F</td>
<td>12 to 13 hours</td>
<td>Moderate to High</td>
</tr>
<tr>
<td>3 weeks</td>
<td>Propagation</td>
<td>72°F-76°F</td>
<td>12 to 13 hours</td>
<td>120 to 180 µmol m⁻² s⁻¹ (600 to 900 footcandles)</td>
</tr>
<tr>
<td>3 weeks</td>
<td>Bulking</td>
<td>68°F-72°F</td>
<td>12 to 13 hours</td>
<td>Moderate to High</td>
</tr>
<tr>
<td>5 weeks or more</td>
<td>Cold Treatment</td>
<td>35°F-45°F</td>
<td>Natural daylength or nine hours of light in cooler</td>
<td>Outdoors: natural</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2°C-7°C)</td>
<td></td>
<td>In cooler: 10 µmol m⁻² s⁻¹</td>
</tr>
<tr>
<td>63°F (17°C)</td>
<td>Begin Forcing</td>
<td>68°F (20°C)</td>
<td>16 hours or longer, or with a 4-hour night interruption</td>
<td>High</td>
</tr>
<tr>
<td>11 to 12 weeks</td>
<td></td>
<td></td>
<td></td>
<td>Use supplemental lighting during dark periods</td>
</tr>
<tr>
<td>flower</td>
<td></td>
<td></td>
<td></td>
<td>Visible bud to flower: 63°F - 12 days</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>68°F - 10 days</td>
</tr>
</tbody>
</table>

Figure 1. *Phlox paniculata* flower clusters contain many large, fragrant, five-lobed flowers.

**Schedule**

Michigan State University researchers’ seven-part series on herbaceous perennials covers topics from *Phlox paniculata* to chemical height control.

**June**: *Phlox paniculata*

July: Delphinium

August: Plant Growth Retardants

September: Digitalis

October: Aquilegia

November: Campanula

December: Summary Tables

**Cultivars & Plant Sizes**

Flower heads are produced on long stems from mid-summer to fall and are composed of many small, five-lobed flowers (Figure 1). In the landscape, plant height ranges from two feet for shorter cultivars (such as 'Fairest One') to five feet for taller ones (such as 'Robert Poore'); plant spread reaches two to three feet depending on cultivar. Traditionally, garden phlox was propagated from rooted cuttings, although unrooted or rooted stem cuttings have recently become more available. Bare-root, field-grown plants can also be purchased.

Flower color ranges from various shades of violet and...
red to salmon and white, often with a contrasting eye (Figure 2). In addition, some cultivars have a pleasing fragrance. In 2002, the Perennial Plant Association named *Phlox paniculata* 'David' the Perennial Plant of the Year. 'David' has large, fragrant, white flower clusters composed of numerous one-inch (2.5 centimeters) diameter florets and is somewhat more resistant to powdery mildew (Figure 3).

**Stock Plant Management**

*Phlox paniculata* is relatively easy to propagate by unrooted cuttings. To maintain consistent production, stock plants need to be grown in an environment in which photoperiod can be controlled so cuttings will remain vegetative. Phlox flowers under long days and goes dormant under relatively short daylengths (see "Forcing Photoperiod"). Therefore, the photoperiod must be sufficiently short to prevent flower induction and sufficiently long to prevent dormancy. To achieve this, the photoperiod needs to be shortened during the long days of summer and lengthened during the short days of winter in most latitudes. Although the optimal photoperiod for vegetative growth varies among cultivars, a daylength between 12 and 13 hours is recommended for most. Therefore, stock plant production is well suited for equatorial areas, where the photoperiod is always around 12 to 13 hours.

![Figure 2. A variety of phlox cultivars grown in a greenhouse.](image)

*P. paniculata* stock plants should be grown at moderate temperatures of 64°F to 68°F (18°C to 20°C) with moderate light intensities. Cuttings should be harvested every four to five weeks to ensure continued branching and cutting production, and to prevent cuttings from becoming reproductive following extended periods of vegetative growth. Vegetative cuttings root more readily and uniformly than reproductive cuttings.

![Figure 3. Phlox paniculata 'David' has large, fragrant flowers and was named the 2002 Perennial Plant of the Year by the Perennial Plant Association.](image)
Propagation

Management of light, temperature, and humidity is required for rapid production of vegetative rooted cuttings. Tip cuttings should be harvested and stuck in plug flats containing a well-drained media, such as a 50% peat and 50% perlite mixture. Rooting hormone, such as a 1500 ppm liquid IBA dip, accelerates and improves the uniformity of rooting.

Provide a 12- to 13-hour photoperiod to maintain vegetative growth; premature flowering can occur under longer daylengths. Maintain a root zone temperature of 73°F to 77°F (23°C to 25°C), and provide a high relative humidity (90%).

The rooting time for phlox (and many other plants) is partially dependent on the amount of light that plants receive, on average, during the rooting process. Under low light levels, rooting is delayed and nonuniform. Rapid, uniform rooting of phlox requires a daily light integral of at least 3.5 mol·m⁻²·d⁻¹. Rooting quality increases as light quantity increases to approximately 8.5 mol·m⁻²·d⁻¹ (Figure 4). To achieve these light levels, the average light intensity should be around 120 to 180 μmol·m⁻²·s⁻¹.

Figure 4. Rooting of phlox cuttings is promoted when grown under relatively high light intensities during propagation. The numbers in the photographs represent the average daily light integrals. Photographs were taken 21 days after cuttings were stuck.

Figure 5. *Phlox paniculata* plants go dormant when exposed to short days and cool temperatures. Note the new shoots emerging from the soil, which occurred once plants were grown at warmer temperatures.
PHLOX PANICULATA 'EVA CULLUM'

15 WEEKS OF SC...IP

PHOTOPERIOD HOURS:

<table>
<thead>
<tr>
<th>Int</th>
<th>10</th>
<th>12</th>
<th>13</th>
<th>16</th>
<th>19</th>
<th>24</th>
</tr>
</thead>
<tbody>
<tr>
<td>PERCENTAGE</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>50%</td>
<td>66%</td>
<td>0%</td>
</tr>
</tbody>
</table>

Figure 6. The most rapid and uniform flowering of phlox occurs when plants are grown under photoperiods of 14 hours or longer, or with a four-hour night interruption (NI).

Bulking

Phlox paniculata plugs should be bulked under noninductive photoperiods of 12 to 13 hours. The duration of bulking is dependent on the size of the finish pot. For a five-inch pot, three weeks of bulking at 68°F (20°C) is adequate. Pinching the shoot tip one to two weeks after propagation may be desirable to promote branching.

Cold Treatment

The requirement of cold temperatures for flowering of Phlox paniculata depends on cultivar and the environmental conditions in which stock plants and rooted cuttings were grown. Some cultivars, such as 'Mt. Fuji,' 'Eva Cullum,' and 'Tenor,' do not require a cold treatment for flowering. In some instances, however, these plants are more vigorous and may flower more rapidly and uniformly following a cooling treatment of at least five weeks. Other cultivars, such as 'Orange Perfection' and 'Blue Boy,' require a cold treatment (for at least five weeks) for flowering. For production of multiple cultivars having different cold requirements, exposing all cultivars to cold may be the easiest strategy if cooling space is available.

If rooted cuttings or stock plants are exposed to short photoperiods (12 hours or less) for several weeks or longer, plants may become dormant. If this occurs, plants should be cooled for at least five weeks at 35°F to 45°F (2°C to 7°C) to overcome dormancy. If cooling plants in a cooler, provide light for nine to 12 hours at an intensity of approximately 10 μmol·m⁻²·s⁻¹ (50 footcandles). During the cooling process, plants may go dormant and stems may die back (Figure 5). Upon exposure to warm temperatures, cut stems back to approximately one inch (2.5 centimeters) above media level so that dead foliage is removed and Botrytis is prevented. New buds will originate from or near the soil surface.

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Forcing Photoperiod

To achieve complete, rapid, and uniform flowering of Phlox paniculata, force plants under photoperiods of 14 hours or longer, or provide a four-hour night interruption (Figure 6). All common lamp types (e.g., incandescent and high-pressure sodium) are effective at extending the day or interrupting the night, as long as the minimum intensity is approximately 2 μmol·m⁻²·s⁻¹ (10 footcandles). If natural daylengths are short (September through March) and lighting is not used, then flowering is less uniform, delayed, and not all plants may flower.

Lighting And Spacing

Plant quality improves as the daily light integral increases. Therefore, grow plants in a high light environment with adequate plant spacing. If forcing plants in a greenhouse during low light periods of the year (October to February), providing supplemental lighting from high intensity lamps improves plant quality. Under low light conditions, stems can be too weak to support the flower heads. In addition, flower number can be low, which reduces flower cluster size.

Plant Height Control

One of the major difficulties in forcing P. paniculata in containers is producing a plant that is not too tall for the pot. One solution is selecting naturally short cultivars such as ‘Fairest One.’ For other cultivars, a soft pinch to actively growing plants (one to two weeks after transplant) not only reduces plant height, but also increases the number of flowering stems. However, pinching a plant after it has been exposed to long days can delay flowering by one to two weeks.

In our trials, the two most effective chemical growth retardants as spray applications were Cycocel (1500 ppm) and Sumagic (15 ppm) (Figure 7). Bonzi sprays at 60 ppm were moderately effective and higher rates may provide more control. We did not observe any flowering delay with any of the chemicals tested. Multiple applications will likely be required for potted plant production, especially for tall cultivars.

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The two major insect and disease problems on phlox are powdery mildew and spider mites. Powdery mildew can be avoided by selecting cultivars that are more resistant, such as 'David' and 'Blue Paradise.' Once powdery mildew becomes established, it can be difficult to eliminate. As with all perennials, routine scouting for insects and diseases is recommended.

Postharvest Concerns

Ship plants as the first flowers open because individual florets have a short life span. Although new flower buds continue to open, old flowers can persist on the flowering head, making plants less attractive. Phlox can have a bloom time of up to six to eight weeks if provided with high light levels. Removing the spent flowerhead can encourage new flowering branches to emerge.

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