Lighting Up Pansies

Michigan State University researchers are making pansies flower faster with extra lighting.

by ERIK S. RUNKLE and ROYAL D. HEINS

PANSY production has increased dramatically during the past several years, particularly in the fall. Surveys show that pansies are among the most popular bedding plants to grow.

Pansy (Viola xwittrockiana) is a facultative long-day plant—one that eventually flowers under short days, but actually prefers long days. But how and when are the best ways to provide long days to accelerate flowering? For the past 3 years, we have conducted experiments at Michigan State University (MSU) to uncover the answers.

The natural photoperiod varies over time, based on the latitude and time of year (Graph 1). In East Lansing, MI, for example, the shortest days are just less than 10 hours, and the longest days are slightly more than 16 hours. But the photoperiod varies less in locations nearer to the equator. In Athens, GA, for instance, the extremes in photoperiod are approximately 10°/15 hours. Growers who know their natural daylengths will be able to determine when lighting is necessary for fastest pansy flowering.

There are several lighting strategies that provide long days to plants. One technique—day-extension lighting—is lighting from sunset until the desired photoperiod is reached. The most common method of providing long days is to light for several hours during the middle of the natural dark period (10 p.m. to 2 a.m.). This is called night-interruption (NI) lighting.

Our studies were designed to determine what photoperiod is considered a long day, how much long days can accelerate flowering, and how a pansy's stage of development influences flowering response to long days.

In the first series of experiments, 6-week-old 'Crown Blue,' 'Crystal Bowl Yellow,' and 'Majestic Blue' were received in 288-cell plug trays. Eight seedlings of each cultivar then were transplanted into 4-inch containers and placed under the following photoperiods: 10, 12, 14, 16, or 24 hours of continual light or 9-hour days with a 4-hour NI. All photoperiods consisted of 9-hour natural days that were completed (as day extension or NI) with incandescent lamps, which provided 10-30 footcandles at plant level. The greenhouse temperature setting was a constant 68°F (20°C). Plants that did not flower within 8 weeks of transplanting were considered nonflowering and discarded. The experiment was repeated a second year for...
PANSIES

LIGHTING

What Is A Long Day?

A long day, for horticultural purposes, is the photoperiod resulting in rapid, uniform flowering of a plant population. Less than 2/3 of 14-week-old 'Crystal Bowl Yellow' and 'Crown Blue' plants flowered under 10-hour photoperiods. The flowering percentage increased as the photoperiod increased from 10 hours (Graph 2).

Photoperiod did not affect flowering percentage of 'Majestic Blue' as dramatically. For all three cultivars, some plants under 10- or 12-hour photoperiods initiated visible buds, but the buds failed to develop into open flowers.

While the flowering percentage varied slightly among cultivars, most plants flowered under 14-hour photoperiods. Nearly all plants flowered under 16 or 24 hours of light or under NI. For uniform pansy flowering, long days are those with a daylength of at least 14 hours.

Accelerating Flowering

Photoperiod also affects time to flower. Plants grown under photoperiods of 14 hours or greater flowered a week faster than flowering plants under 10- or 12-hour photoperiods.

In addition, plants under long days flowered more uniformly than those under short days. Figure 1 shows the flowering response of 'Crystal Bowl Yellow.' Typical of the cultivars studied, this shows faster flowering under long days. For the most rapid and uniform flowering at a particular temperature, provide pansies with long days – or a daylength of at least 14 hours.

Determining How Long To Light

For pansies, photoperiodic lighting is not necessary once flower initiation has occurred. The duration of lighting required for flower initiation depends on plant age at the start of photoperiodic lighting.

We conducted a separate experiment to determine how the stage of pansy development influenced the response to

Graph 1. The approximate natural biological daylengths on clear days vary by latitude. Photoperiods are about 40 minutes longer than the sunrise-to-sunset duration, since plants perceive light before sunrise and after sunset.

Graph 2. The flowering percentage of three cultivars of pansy under 10- to 24-hour photoperiods or night interruption (NI). Photoperiods of at least 14 hours or a 4-hour NI induces the highest flowering percentage. Plants that did not flower within 8 weeks of forcing were considered nonflowering.

Lighting becomes most important during the winter, when the natural daylengths are less than 12 hours. Pansies will flower during the short days of winter, but flowering is delayed and uneven.

By using Graph 1, we can determine when natural photoperiods delay and reduce uniformity of pansy flowering. If 14 hours is selected as the minimum desirable daylength for rapid, uniform flowering, then a grower in Michigan should light the crop from September 1 through mid-April. A Georgia grower should use lighting from mid-August until late April.
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minimum flowering percentage for sales is 80%, then 2-5 weeks of long days are required, depending on plant size (see Table 1 for specific recommendations).

For example, to flower four- to five-leaf ‘Majestic Blue’ plants fastest, we recommend providing long days for 4 weeks. For both cultivars, plants with six or more leaves need only 2 weeks of long days for the most rapid flowering.

By following these recommendations, flowering will occur after the start of long days in 7-8 weeks for ‘Crystal Bowl Yellow’ and 8-9 weeks for ‘Majestic Blue’ at 68°F. If long-day conditions are not used, then flowering percentage will be relatively low, and time to flower will be delayed.

Regardless of plant size, lighting for durations longer than recommended will not improve flower timing or uniformity and may cause undesired stem elongation, especially if incandescent lamps are used.

**Getting Good Results**

Pansies will flower most rapidly and uniformly when photoperiods are at least 14 hours long or when 4 hours of light is provided during the middle of long nights.

When natural photoperiods are less than 14 hours, turn lights on at sunset until a total of at least 14 hours of light has been delivered, or use 4-hour NI lighting. Light for 2-4 weeks, depending on plant size.

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**Table 1.**

<table>
<thead>
<tr>
<th>Number of leaves at the start of long days</th>
<th>Recommended number of weeks of long days for ≥ 80% flowering</th>
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<tbody>
<tr>
<td>1.0</td>
<td>‘Crystal Bowl Yellow’ 4</td>
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<tr>
<td>1.0</td>
<td>‘Majestic Blue’ 5</td>
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<tr>
<td>3.0</td>
<td>4</td>
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Table 1. For fast flowering of pansies, provide the following duration of long days, either with ≥ 14-hour photoperiods or by using a 4-hour night interruption.