By Erik Runkle

Long-Day Perennials

Ornamental herbaceous perennials represent approximately 14 percent of the total value of floriculture crop production in the United States. An increasing number of perennials are grown and marketed in flower. Michigan State University faculty and graduate students have worked with hundreds of perennial varieties over the past two decades to determine their flowering requirements. One of the major flowering triggers is exposure to long days (short nights). Many crops simply do not flower unless the night length is shorter than some variety-specific duration, whereas flowering of other varieties is accelerated by long days.

Table 1 comprises a list of perennial crops that we've studied over the years that benefit from or require long days for flowering. In many cases, multiple cultivars have been studied, and generally flowering requirements are similar. However, some genera such as gaillardia have been bred to reduce or even eliminate the long day flowering response. Therefore, some varieties of species listed are day neutral, meaning that there is no flowering response under long days. Also, in some cases such as leucanthemum and lobelia, a cold treatment can reduce or eliminate the need for long days. More information on perennial production can be found at www.flor.hrt.msu.edu/perennials.

Lighting of perennials can be delivered the same way as for other floriculture crops. Briefly, here are some of the effective ways of delivering long days:

- Traditional incandescent lamps operated during the middle of the night for four hours (e.g., from 10 p.m. to 2 a.m.). Typically, 100-watt lamps are placed 6 to 8 feet apart and 6 to 8 feet above the crop. Lamps can be operated continuously for four hours each night, or turned on for 10 minutes every half hour for the four-hour period.
- Alternate incandescent lamps with compact fluorescent (CFL) lamps. This strategy reduces the electrical load and cost of electricity. Every other 100-watt incandescent lamp can be replaced by a 25-watt CFL.
- Operate high-intensity discharge (HID; high-pressure sodium, metal halide or mercury) lamps that deliver a minimum intensity of 10 foot-candles (about 1.5 $\mu mol \cdot m^{-2} \cdot s^{-1}$) for four hours each night.
- Operate HID lamps that have a rotating reflector for 4 hours each night. Our research has shown that one 600-watt lamp with a rotating reflector (e.g., a Beamflicker) can provide a sufficient amount of light for about 1,500 square feet of greenhouse space.
- Operate high-intensity lighting on moving booms for at least four hours each night. Ensure that plants are exposed to light at least once every 20 to 30 minutes.

The critical photoperiod is longer for some perennials than it is for a lot of common bedding plants. Some perennials won't flower until the natural day length is at least 14 hours, and some even require at least a 15-hour day. Therefore, when lighting a variety of long-day perennials, operate lights until flower buds are visible or until early May in the Northern United States and late May in the South.

Table 1. *A list of herbaceous perennials that require or benefit from long days (short nights) based on research performed at Michigan State University. An asterisk (*) denotes that some varieties, especially newer ones, have little or no response to long days.*

Achillea	*Laurentia axillaris*
Aconitum x cammarum	*Lavandula angustifolia*
*Agastache**	*Lavandula stoechas*
Asclepias tuberosa	*Leucanthemum x superbum*
*Astilbe x arendsii**	*Lobelia x speciosa*
Astilbe chinensis pumila	*Lupinus*
Brunnera macrophylla	*Lysimachia*
Campanula carpatica	*Monarda didyma*
Campanula garganica	*Nepeta faassenii**
Campanula punctata	*Nepeta subsessilis*
Ceratostigma plumbaginoides	*Oenothera fruticosa*
Cimicifuga racemosa	*Oenothera speciosa*
Coreopsis x grandiflora	*Oxalis crassipes*
Coreopsis rosea	*Phlox paniculata*
Coreopsis verticillata	*Penstemon barbatus*
Corydalis	*Penstemon hartwegii*
Digitalis purpurea	*Penstemon mexicale*
Digitalis thapsi	*Physostegia virginiana*
Echinacea	*Polemonium*
Erigeron	*Prunella grandiflorum*
Erysimum	*Rudbeckia*
*Gaillardia x grandiflora**	*Salvia nemorosa*
*Gaura lindheimeri**	*Salvia x superba*
Geranium dalmaticum	*Salvia sylvestris*
Helianthus helianthoides	*Sedum*
Helenium autumnale	*Stokesia laevis*
Hibiscus moscheutos	*Tanacetum niveum*
*Hosta**	*Viola*

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