



By Erik Runkle

Vernalizing Perennials

For some cold-hardy perennials, a cold treatment is the key to initiate flowering. Here are tips for successful vernalization treatments of cold-hardy perennials that are propagated by seeds or cuttings.

The flowering of many cold-hardy herbaceous perennials is initiated by an extended period of cold, known as a vernalization treatment. Some perennials will not flower without a cold treatment, while others flower more rapidly and have a stronger flowering response (such as more flowers) when provided with a cold treatment. This article contains tips for successful vernalization treatments of cold-hardy (USDA Zone 6 or higher) perennials that are propagated by seeds or cuttings.

Most perennials propagated by cuttings can be satisfactorily cooled in their plug trays. However, some perennials propagated by seed must develop a minimum number of leaves before they become sensitive to a cold treatment. For example, several varieties of columbine (*aquilegia*) should have at least 8-10 leaves per plant (not per cell) before starting a cold treatment. Less mature plants may be juvenile and not responsive to the cooling treatment. In many cases, subsequent flowering is improved when plants are cooled in larger plug sizes rather than smaller ones. Highest

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plant quality, regardless of propagation technique, is usually achieved when plants are planted in their final containers, allowed to grow for three weeks or more at warm temperatures and then cooled.

Effective Temperature Ranges

In the past five years, researchers at Michigan State University (especially Beth Fausey, Sonali Padhye and Art Cameron) have methodically quantified how many perennials respond to a range of cooling temperatures and durations (visit www.hrt.msu.edu/florae/articles.htm for more info). The most effective cooling temperature range for a large number of species was between 41° and 46° F, especially when short durations (4 or 6 weeks) of cooling were provided. With longer cooling durations, the effective temperature range broadened. In general, 6-8 weeks of cooling at 41° F saturates the vernalization response of nearly all species; however, a few exceptions exist.

Light Improves Survival Chances

Most perennials continue to actively grow — albeit slowly — when held in the low 40s. Therefore, plants should be provided with light, water and low levels of fertilizer during above-freezing cold treatments. In our refrigerated coolers, we use a 9-hour photoperiod that delivers about 5-10 $\mu\text{mol}\cdot\text{m}^{-2}\cdot\text{s}^{-1}$ (35-70 foot-candles) of light from fluorescent lamps. The need for light decreases as the cooling temperature decreases, but for highest plant quality and survival, we recommend providing light even down to the recommended minimum temperature of 35° F. In general, the photoperiod during cooling does not influence the vernalization response. Fluorescent lamps are desirable if cooling is provided in refrigerated chambers because of their potential for uniform light distribution, although their output declines with temperature.

Outdoor Cooling

Perennials can also be successfully vernalized in their final containers either in minimally heated greenhouses or outdoors under a thermal blanket. Outdoor cooling is typically not a problem when snow covers the blanket, which provides an additional layer of insulation. Extreme temperature fluctuations (without snow cover) can cause plant stress, and insufficient cool temperatures can prevent a complete vernalization response. In addition, when temperature rises in the spring, covers need to be promptly removed so that plants can receive light to sustain their growth. Rodents can damage plants under blankets, so their entry should be restricted. Of the various cooling techniques, outdoor vernalization is the most unpredictable and uncontrollable, yet it is usually the least expensive.

Regardless of vernalization technique, some plants go dormant and lose their leaves during cooling. Therefore, try to keep foliage dry to help prevent problems with *Botrytis*. In addition, maintain a slightly moist media, if possible, to avoid dehydration of plants (when the media is too dry) and root rot (when the media is too wet). **GPN**

Erik Runkle is associate professor and floriculture extension specialist in the Department of Horticulture at Michigan State University. He can be reached at runkleer@msu.edu or at (517) 355-5191, x1350.

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