By Erik Runkle and Tasneem Vaid

MICHIGAN STATE UNIVERSITY EXTENSION FLORICULTURE TEAM

Temperature on Chrysanthemum

Potted garden (hardy) chrysanthemum is one of the most valuable segments of floriculture crop production in the United States. Produced and sold mostly from summer through autumn, they can be challenging to grow because of their responses to photoperiod and temperature. Chrysanthemum is a short-day plant, meaning that long nights (11 to 12 hours of darkness or longer, depending on cultivar) are required for rapid flower initiation and development. Blackout systems are sometimes used to induce flowering before plants normally would under naturally shortening days.

Flowering of chrysanthemum is also regulated by temperature. Once short days begin, exposure to temperatures of around 85° F or higher delays flowering, which is a phenomenon known as heat delay. High temperature during the first two weeks of short days has greater potential to delay flowering than later in production. When a blackout system is used in greenhouses, high temperature can be at least partially mitigated by deploying the blackcloth at or after sunset (for example, from 8 p.m. to 8 a.m.). If blackcloth is closed before sunset, it can be opened once it is completely dark to let heat escape. Low temperatures (less than 55° F) can also delay flower initiation in at least some varieties, whereas in others, temperatures less than 68° F can promote early initiation, even under long days.

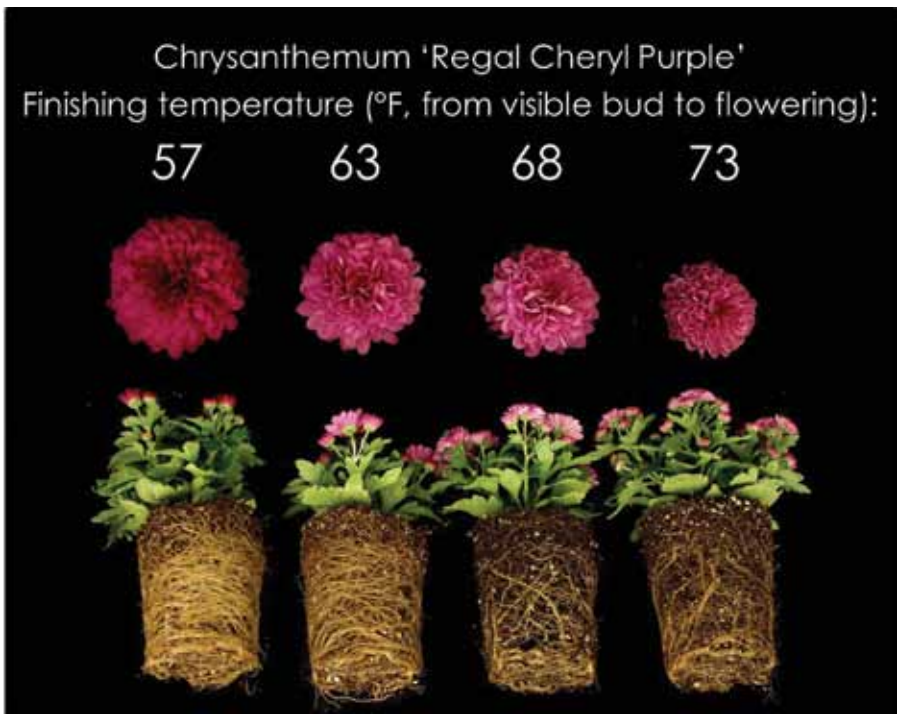

Figure 1. *Chrysanthemum grown at cooler finishing temperatures (from visible bud to first flowering) developed larger, more intensely colored inflorescences and had a more developed root system than plants finished at warmer temperatures.*

Flower initiation of chrysanthemum is usually complete after four weeks of short days. After that time, flowers will continue to develop regardless of day length. Therefore, the only possible way to accelerate or delay flowering after initiation is to regulate temperature. We performed an experiment on three chrysanthemum varieties ('Regal Cheryl Purple', 'Miranda Orange' and 'Elena Gold') to determine how average temperature influenced flowering once flower buds were visible. Plants at the visible inflorescence stage (flower buds with a diameter of 2.5 mm, or 1/10 of an inch) were received from Henry Mast Greenhouse and grown at a constant 57, 63, 68, or 73° F under natural short days (11 to 12 hours of light). Plant and environmental data were collected until all plants had inflorescences with fully reflexed flowers. A summary of our results follow.

Temperature had little effect on flower development time. We were surprised to learn that chrysanthemum was relatively insensitive to temperature once flower buds were visible; flowering time was essentially the same when crops were finished at 63 to 73° F. Plants that finished at 57° F flowered only one or two days after those grown at the higher temperatures. However, one would predict that lower temperatures would delay flowering, especially at temperatures less than 50° F. Therefore, once flower buds are visible, adjusting the growing temperature will have little or no impact on time to flower unless plants are held at low temperatures (50° F or less).

Plant quality is higher when finished at cool temperatures. We measured the size of inflorescences and took photos of inflorescences and root systems of plants finished at the four temperatures. Inflorescence size and color intensity consistently increased as temperature decreased. For example, inflorescence size of 'Regal Cheryl Purple' increased by 35 percent as temperature decreased from 73 to 57° F (Figure 1). Visually, the root systems were much more developed at the lower temperatures, but data were not collected. Therefore, when temperature control is possible, finishing plants at lower temperatures (60 to 65° F) can increase plant quality with little or no flowering delay. g

Erik Runkle is associate professor and floriculture extension specialist and Tasneem Vaid is former graduate research assistant in Michigan State University's department of horticulture. Erik can be reached at runkleer@msu.edu or 517.355.5191 ext. 1350.