MICHIGAN STATE UNIVERSITY
2000 Station Report
NCR-101 Committee on Controlled Environment Technology & Use

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Equipment Upgrades: Eleven walk-in growth cabinets were retrofitted in 2000-2001 with new refrigeration and TC2 microcontrollers, which allows communication via networking computer software. Hot gas defrost is a welcome addition to prevent coil icing, especially during the summer months.

Unique Plant Responses: We are continuing to elucidate the environmental flowering responses of an array of herbaceous perennials species, with an emphasis on cooling treatments and photoperiod. This year Beth Fausey, a Ph.D. student, performed experiments with varying natural light intensities and supplemental electrical lighting to determine how the daily light integral (DLI) controls flowering of several herbaceous perennial species. All plants of some species (e.g., *Gaura lindheimeri* 'Whirling Butterflies') flower when the DLI is as low as 5.6 $mol \cdot m^{-2} \cdot d^{-1}$. In contrast, few or no *Digitalis purpurea* 'Foxy' plants flower with 5.6 $mol \cdot m^{-2} \cdot d^{-1}$, but all plants flower when the DLI exceeds 9 $mol \cdot m^{-2} \cdot d^{-1}$.

Technology transfer: We continued to investigate how far-red (FR) light controls flowering and stem extension for various pot and bedding plant species. In previous research, former Ph.D. student Erik Runkle observed that in some long-day plants (LDP), including pansy (*Viola ×witrockiana*), extension growth and flowering were inhibited when grown under a filter that absorbed a significant amount of FR light. This year, FR light was added at different times during the day or night under the FR_d filter to determine if compact plants could be produced without a concomitant delay in flowering. As Figure 1 illustrates, flowering percentage was high when pansy was grown under 16 h of natural light (#2), or under the FR_d filter when FR-rich light was added during the night (#4: 2 to 6 am or #8: 10 pm to 2 am), at the end of the day (#7: 6 to 10 pm), or during the entire photoperiod (#9: 6 am to 10 pm). However, the treatments that produced the most complete and rapid flowering also produced the tallest plants.

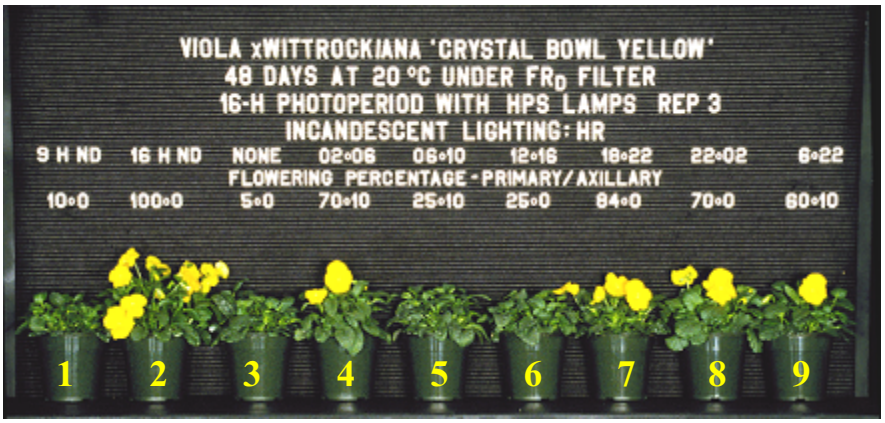

Figure 1. When under the far-red filter, pansy flowered when light rich in far-red was added during the entire photoperiod, at the end of the day, or during the night.

In a separate experiment, Erik determined if some minimal amount of FR light could be provided to the LDP pansy and petunia to promote flowering with minimal extension growth. Under a 9-hour natural or far-red deficient (FR_d) base photoperiod, plants were provided with one of five night-break durations (0 to 4 hours) using three light sources with varying red (R) : FR ratios. Treatments that induced the most rapid flowering (e.g., an NI with a low R : FR for 4 hours) also produced the tallest plants. During the night, longer durations of light were required to promote

flowering under the FR_d filter compared to that under the N filter. Therefore, it appears that in LDP such as pansy and petunia, light duration and quality concomitantly promote extension growth and flowering and cannot readily be separated with lighting strategies.

Amy Enfield, a Masters student, is continuing to perform experiments to rapidly and efficiently produce flowering perennials. Referred to as "quick crop perennials", the protocol involves utilizing appropriate photoperiod and temperature environments at each stage of production (stock plant management, propagation, vernalization, and forcing) to minimize inputs (time) to produce high-quality flowering perennials.

Kari Robinson, a Masters student, has been performing experiments to quantify the rate of flower development as a function of temperature of potted *Phalaenopsis* orchids. Using her data, a decision support model will be developed to predict the time to visible bud and flower to improve commercial greenhouse scheduling of flowering *Phalaenopsis.*

Charles Rohwer, a Masters student, is determining the environmental conditions and cultural practices to rapidly produce and flower Easter cactus (*Hatiora ×graeseri*). Environmental parameters investigated include: light intensity and photoperiod before vernalization, vernalization temperature, vernalization duration, and light intensity during vernalization. Experiments are being conducted on four cultivars with two plant ages.

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