Michigan State University 2012 Station Report
NCERA-101: Committee on Controlled Environment Technology & Use

Erik Runkle and Ryan Warner
Department of Horticulture, East Lansing, MI 48824

New Facilities and Equipment

Construction of a new 90,000 ft^2 plant sciences building was completed in spring, 2012 and connects the Plant and Soil Sciences building with the Plant Biology building. The project focused on creating flexible, open laboratory space that fosters interdisciplinary research. The basement of the facility was built to house a number of growth chambers, some of which are already in place. MSU now has 209 growth chambers of which 184 are managed centrally and 25 are managed departmentally. For more information, visit the MSU Growth Chamber Facility.

Accomplishment Summaries

We grew five popular bedding plant crops in glass-glazed greenhouses to quantify how temperature and transplant size influence flowering time and quality parameters. Seedlings from two different transplant size trays were grown at constant temperature setpoints of 63 or 73 degrees F and under a 16-hour photoperiod. Flowering time decreased as average daily temperature increased in all five species. American marigold, geranium and snapdragon flowered earlier when grown from a larger compared to a smaller transplant, whereas transplant size did not influence flowering time in gerbera and osteospermum.

Reciprocal transfer experiments were performed with three petunia cultivars in which plants with 4, 6, 8, 10, or 12 leaves were moved from inductive long days to non-inductive short days, and vice versa, to determine when these varieties become sensitive to photoperiod. In a separate experiment, the effects of average daily temperature and photoperiod on the flowering of petunia were quantified. Plants were grown in glass-glazed greenhouses at 57 or 68 degrees F with a 10- or 16-hour photoperiod. Petunia 'Easy Wave Neon Rose' became receptive to photoperiod after unfolding 4 or fewer leaves, whereas 'Classic Wave Purple' and 'Improved Wave Purple' became photoperiod-sensitive after unfolding more than 8 leaves. Flowering was fastest in plants grown under 16-hour days and at 68 F for all petunia varieties. Results also showed that temperature modified the flowering response to photoperiod, which indicates that greenhouse growers can obtain the maximum benefit of daylength lighting when crops are grown at moderate to high temperatures (e.g., 65 F or higher).

We evaluated the impact of photoperiod treatments on flowering of *Echinacea*. *Echinacea* exhibits a dual photoperiod requirement for flowering, requiring a period of exposure to short days followed by a period of long days to promote flowering. We determined that a 14-hour photoperiod satisfied both of these photoperiod requirements for several *Echinacea* hybrids and *E. purpurea* cultivars, but a 12-hour photoperiod was insufficiently long to satisfy the long-day requirement. While growth under a constant 14-hour photoperiod resulted in earliest flowering, crop quality was generally improved by exposure to 9-hour days for 4 to 8 weeks prior to exposure to long days.

We also determined the impact of daily light integral (DLI) on the synthesis of a group of diterpenoid glycoside compounds called steviol glycosides, which are extracted from leaf tissue of *Stevia rebaudiana* for use as a natural, non-caloric sugar substitute. Expose to a DLI less than

ca. 7 $mol \cdot m^{-2} \cdot d^{-1}$ reduced the concentration of the total pool of steviol glycosides, while exposure to a DLI between 7 and 20 $mol \cdot m^{-2} \cdot d^{-1}$ resulted in a similar total steviol glycoside concentration. However, the relative proportions of specific steviol glycosides within the total pool were altered by increasing DLI.

Impact Statements

Experiments performed at MSU quantified the effects of temperature and transplant size on production time of five bedding plant species, and results were used to estimate the net profit per pot and per square meter week. In all five crops, estimated net profit per pot was greater at 73 F and with the smaller transplant size. In addition, net profit was always the least for crops grown at 63 F from the larger transplant size. Results can be used by greenhouse growers to improve scheduling accuracy as well as profitability.

Petunia flowers earlier when grown under long days and therefore, lighting is commonly used by growers to reduce cropping time. Research at MSU showed that there was little or no acceleration of flowering until one petunia variety had developed at least 4 leaves while two other varieties only became responsive once they had developed approximately 8 leaves. Furthermore, lighting had relatively little effect on flowering was petunia was grown at a low temperature. Greenhouse growers can use this information to determine when to begin lighting petunia and to maximize the utility of lighting to accelerate flowering.

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