

MSU Plant Science Research Greenhouse Lighting Policy

Effective September 22, 2023

Background:

The Plant Science Research Greenhouses (PSRG) has recently installed high-tech environmental control systems in several greenhouse zones and many more will be coming with the greenhouse renovation project. These systems have the capability to turn off lights when there is sufficient sunlight and then turn lights back on when sunlight levels fall. Greenhouse lighting is supplemental lighting; it is not meant to replace sunlight. Having supplemental lighting on when there is sufficient sunlight outside does not add enough light to affect plant growth ([Runkle, 2007*](#)), wastes energy, adds heat to the greenhouse, and decreases the longevity of the lighting fixtures.

Plants with medium light requirements need 10-15 mol m⁻² of light per day. We assessed supplemental lighting regimes to optimize plant growth and energy usage over a six-month period. Assuming lights provided 110 μmol m⁻² s⁻¹, our standard for new light-emitting diode (LED) installations, constant supplemental lighting would have provided an extra 0.79 mol m⁻² of light per day in January 2023 compared to lights turning off when there was sufficient sun. This is less than a 10% increase over our proposed policy. Considering this, the PSRG Faculty Users Committee approved the following policy. PRSG will have a “lights off during bright sunlight” policy. This is consistent with modern greenhouse practices.

Policy:

In greenhouses where it is feasible, supplemental lighting will turn off when outdoor PPFD is >450 μmol m⁻² s⁻¹ and will turn back on when outdoor PPFD drops to 400 μmol m⁻² s⁻¹.

The “ballast time,” which is the minimum amount of time that lights will remain off or on will be 5 minutes in zones with LED fixtures and 30 minutes in zones with high-pressure sodium (HPS) fixtures. The longer ballast time is necessary for houses with HPS fixtures because they have a warm-up time (time from ignition until full output), and frequent on/off cycles decrease fixture and bulb lifetime. This is not the case with LED fixtures.

Additional Information:

Exceptions to this policy will be considered on a case-by-case basis by the PSRG Faculty Users Committee. Please discuss any need you feel will not be met by this policy with the PSRG Director. If they are unable to resolve your concern, the PSRG Faculty Users Committee will be consulted. You may be asked to make your case to the Committee. As always, the goal is to maximize the value added by the PSRG to research at MSU.

As budget and time allows, PSRG staff will install light meters in individual zones, which will allow the daily light integral (DLI) to be measured ([Torres and Lopez, 2010](#)). Greenhouse users may also measure DLI using self-purchased light meters; PSRG staff are available for consultation.

** This article uses foot-candles instead of $\mu\text{mol m}^{-2} \text{s}^{-1}$ to measure light intensity. Until recently, foot-candles were commonly used in the greenhouse industry. Conversion factors can be found [here](#).*