



By Erik Runkle



# Lighting the Way with LEDs

Light-emitting diodes (LEDs) are one of the trendiest technologies in the greenhouse industry. There are particularly interesting opportunities with LEDs in the production of young plants (plugs and liners) and high-wire vegetable (tomato, cucumber and pepper) crops.


The question is not if, but when, LEDs will become commonplace for plant lighting in commercial greenhouses. Opportunities also exist for LEDs in completely enclosed environments, especially when there are prospects to produce plants during much or all of the year.

It's probably obvious, but light is critical to plant growth and development. Light controls growth of leaves, stems and roots; plant architecture (plant height and branching); and flowering (time to flower and flower quality). The growth and development of LEDs is based on human applications — both indoor lighting (homes and offices) and outdoor lighting (street lights and parking garages). Although there are some similarities to

potentially confounding variables. When we provide lighting treatments to crops, we have to carefully and meticulously ensure that other factors, such as light intensity, temperature and fertility, are similar among treatments. In addition, experiments are often repeated to ensure what happens the first time happens the second time. This helps improve the confidence we place in results from lighting treatments.

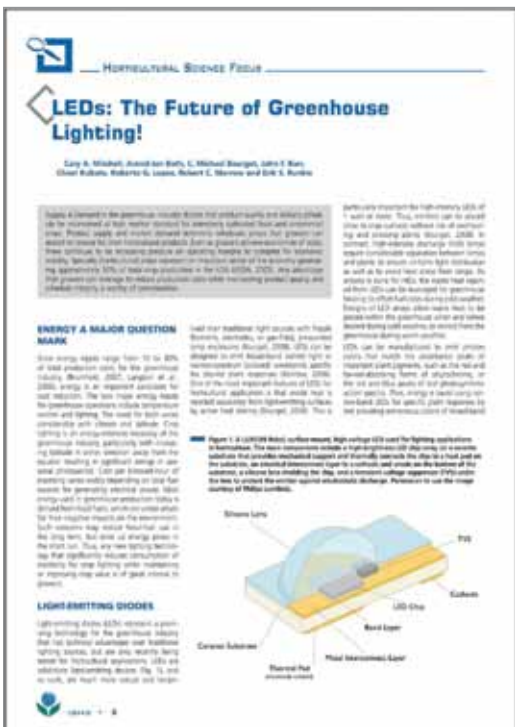
Recently, we developed a website for our LED project (<http://leds.hrt.msu.edu>) that provides information about our project's objectives, background information on the desirable attributes of LEDs, unbiased publications about greenhouse lighting from our group, and the people and companies involved. There are two recent additions to this website: 1) presentations delivered to scientific and grower groups, which provide updates on the research being conducted and 2) a frequently asked questions page that presents responses to 14 questions about LEDs for plant applications. Some of the questions we address are:

- Why use LED lighting in greenhouses?
- What color spectrum should be used and should it be adjustable?
- When selecting an LED system, what are the most important things to be considered?

Our team is certainly not the only group working with LEDs for plant applications; universities and companies throughout the world — especially in the Netherlands — are determining how to best use LED technology for different plant production situations. As we move forward, it is important for potential users of LEDs to be able to separate marketing claims and hype from scientific, research-based information. Presently, the limiting factor to the installation of LEDs in commercial greenhouses is cost. A return on investment will be more favorable in situations where lighting is used much of the year and where electricity costs are especially high. 

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Our team wrote a review article about LEDs for plant applications that appeared in *Chronica Horticulturae*, a publication of the International Society for Horticultural Science. To download the article, visit <http://leds.hrt.msu.edu/publications>.



lighting for plants as there are for people, there are also many differences. People don't flower, and people don't branch or elongate based on the light environment. Most people prefer white light whereas that's not necessarily true for plants.

In late 2010, a grant was funded by the USDA National Institute of Food and Agriculture through the Specialty Crop Research Initiative to investigate the development and application of LEDs in specialty crop production. This multi-disciplinary team includes faculty and graduate students at Purdue University, the University of Arizona, Rutgers University and Michigan State University, as well as the company ORBITEC. We have a stakeholder group that includes a broad range of ornamental and vegetable crop producers, providing input and support (financial and otherwise) in this project.

Scientific research is a relatively slow and rigorous process. Experiments have to be conducted so plant responses can be specifically attributed to treatment effects, and not some other,