LEDs versus High Pressure Sodium Lights for Growing Bedding Plants

There is considerable grower interest in the potential to use Light Emitting Diodes (LEDs) as supplemental light sources for production of greenhouse crops. LEDs are touted as being more energy efficient and longer lasting that standard high pressure sodium (HPS) lighting systems. As LEDs run cool they also have less potential to overheat the crop – although the waste heat generated by the HPS light systems can help offset heating costs in winter. Because each LED emits light over a very narrow bandwidth there is some concern as to whether crop appearance and other quality aspects will be "normal" under LED lights. One way that this concern could potentially be addressed is by altering the ration of red to blue LEDs in the lighting system. Randall and Lopez (2014) have recently examined the growth and plant quality of a range of bedding plant crops (Antirrhinum, Catharanthus, Celosia, Impatiens, Pelargonium, Petunia, Tagetes, Salvia and Viola) grown in a greenhouse with 16h/day of supplemental light (100 *u*mol/m^2/s^{-1}) provided by either HPS or LED lights. LED systems with 100:0, 85:15 or 70:30 mixes of red (660 nm) and blue (470 nm) LEDs were tested. The results of the tests can be summarized as:

- In some crops stem thickness was increased under the LED lights, while in other species the light source had no impact on stem thickness.
- Root mass was consistently reduced when LEDS were used as the supplemental light source.
- Shoot weight under the LED lights was lower than or equal to the HPS lights
- Plants grown under the LEDS were consistently shorter than under the HPS lights
- Flowering was delayed in Celosia, Impatiens, Salvia and Tagetes crops grown under the LED lights
- Plant height at flowering under the HPS lights was shorter in Catharanthus and Pelargonium than when LED lights were used.
- As the LED light tended to reduce plant height while increasing stem thickness this resulted in a very sturdy plant well suited to handling and post-transplanting stresses

The overall consensus was that using LED lights as a source of supplemental light in the greenhouse was generally suitable for the production of a wide range of bedding plant crops. Growth and quality of the bedding plants was influenced by the ratio of red:blue lights in the LED light systems – but the effects varied with the crop species and the growth/ quality parameter being evaluated. A ratio of 85% red to 15% blue LEDs was considered to be a good overall compromise. The LED light systems, which were all passively cooled via heat fins, used 50-60% less power to generate the same amount of light as the HPS system. However the large surface area required to passively dissipate the heat produced by the LEDS meant that the LED light fixtures were so large that they blocked more than 50% of the sunlight coming into the greenhouse. By adding fans to actively dissipate heat the size of LED fixtures can be reduced so that the shadow they cast is comparable to a HPS system – however the combined power consumption of the fans + LEDs can then exceed the power required to run a HPS system (Currey and Lopez 2013). The study concludes that while LED lighting systems clearly have potential value in greenhouses there are still some issues that need to be addressed.

Source : Randall and Lopez (2014). HortScience 49: 589-595.

Curry and Lopez (2013). HortScience 48:428-434.