

LIGHT EMITTING DIODE (LED) LIGHTING TECHNOLOGY: A NOVEL TOOL FOR SUSTAINABLE AGRICULTURE

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Although LED (light-emitting diode) lighting technology was advanced rapidly through the past decade, it was not a realistic alternative tool for irradiating agricultural crops until recent years. The extraordinary benefits of LEDs including long lamp life expectancy and low heat generation compared to incandescent and compact florescent lights result in substantial savings in energy and operating costs. Additionally, LEDs do not involve mercury and other detrimental chemicals contributing significantly to the sustainability goals in new agricultural systems for minimizing their environmental impact. There are notable examples where LED technology has been successfully applied to enhance plants growth and their quality due to illumination with one or combinations of monochromatic LED lights in greenhouse and growth chambers. LEDs can dramatically improve the source use efficiency of plants to increase yield and quality of horticultural crops by customizing the input light spectrum to where plants can use competently for production. They have provided the conditions to deliver light recipes to each individual plant matched with the requirements over the full plant growth cycle. Flowering of many ornamentals is hastened under LED lights, the height is shortened and the size is compacted. By optimizing the color and intensity of LED lights, it is possible to develop a system for producing high quality transplants at low costs in ornamentals and some vegetables like tomato and facilitating intra-canopy lighting in high-wire crops. By this, shelf life and post-harvest changes in fruits and flowers may be positively manipulated. It seems that by LED innovation, color, taste, flavor and metabolite content of plant parts could be also market oriented. Modifying light environments by using LEDs could be also configured to help reduce insect damage due to the change in appearance of plants. This might disrupt the ability of pest insects to locate and attack host plant species. There is also possibility to attract insects into the traps or sticky LED cards all useful as an array of complementary methods in integrated pest management programs. LED lighting industries are still maturing and horticultural research is being done on the wavelength and intensity of LED lighting needed for a range of economically important species to have a promising future in commercial controlled-environment agriculture.

Keywords; LED (light Emitting diode); metabolite; pest management; sustainability



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