Challenges and Solutions on Led Technology for Indoor Growth Chambers

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Climate change, unplanned urbanization, and overpopulation threaten food security, increasing the demand for access to good quality food for human consumption all over the world. Indoor farming is a technology that promises to better the access to cheap and healthy food. Until the development of stable and high-power Light Emitting Diodes (LEDs), it was economically unavailable for indoor growth chambers to compete with traditional methods. Solid-state light technology offered not only massive efficiency gains if compared to previous offers but also shortened the minimum distance between plant and light source, making it possible to stack multiple layers of substrate, plants, light, and electronics where previously could there be only one, implicating in unparalleled productivity per area grown. Plants grown in this way are also less susceptible to harsh climate conditions, plagues, and diseases. The finer electromagnetic spectrum offered by LEDs also allows for targeted growth in plants, where certain desired phenotypes can be incentivized by controlling both light intensity and light frequency. On the other hand, LEDs are fragile and generate a lot of heat, which can be challenging to dissipate in a temperature-control dense environment, as well as requiring more robust electrical work to fully access all the benefits they can offer. In this ongoing research, more studies are still needed to understand and overcome such challenges in the development of indoor cultivation chambers.