Lighting the Path to Photosynthetic Efficiency in Vertical Farming

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80% of deforestation across the globe happens for agricultural purposes, with much deforestation resulting in unrecoverable land. However, with over 1.3 billion people suffering from food insecurity, there seems to be no end to this cycle. Vertical Farming proposes a solution, as it allows for more environmentally friendly farming. The purpose of this study was to investigate the impact of varying intensities and wavelengths of artificial light on the development plants in vertical farming. Although similar research has been done, other projects looked at only the intensity or wavelength of the light, not both of them at once. Based on this previous research, it seemed that red light at 1000 lux would be the most effective for plant growth, due to the specifications of the photosynthetic process. A unique apparatus was constructed to model the vertical farming system by placing a black cardboard box in a dark room. A hole was cut into the box, and a growth light was placed over the box to grow plants that were placed inside of the apparatus. Two microgreens, peas and radishes, were grown in a week, with moisture content being monitored, and at the end of the week their heights and weights were measured. Three different intensities (800, 1000, and 1200 lux) were used, along with light wavelengths of 465 and 660 nm (blue and red). A control of sunlit plants was also used, creating seven trials. Artificial lighting systems, regardless of plant type, grew to a height around double that of the sunlit plants, along with generally better heights in red light than blue light. As intensities increased, the plants saw an approximately linear decrease in height in red lighting, and a parabolic growth pattern in blue light (with one point of very high or low growth).

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