Effect of LED Light Spectrum on the Growth, Yield, and Phytochemicals of Red Cabbage Microgreens

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Abstract

Microgreens are functional plants rich in phytochemicals beneficial for human health. They can be grown in urban agriculture, with controlled environments maximizing space and resource efficiency amid climate change. Specifically, different wavelengths of light play a crucial role in plant physiology. This study aimed to evaluate the effects of LED light spectra on the growth, yield, and phytochemicals of red cabbage microgreens to improve the efficiency of microgreen production. The experiment was arranged in a Randomized Complete Block Design (RCBD) with four replications. Five types of LED light spectra were used: T1 as white light (control), T2 as full-spectrum LEDs (400-700 nm), T3 as purple (3 red: 1 blue) LEDs (410-695 nm), T4 as red LEDs (590-695 nm), and T5 as blue LEDs (410-485 nm). The results showed that the T4 treatment promoted taller plant height than all treatments except the T5 treatment. The T2, T3, and T4 treatments induced increases in the shoot-to-root ratio. In contrast, LED light spectra did not affect yield. The T2 treatment, which contained chlorophyll a, chlorophyll b, and carotenoids compounds, was the most effective in increasing the levels of these compounds. However, the T5 treatment promoted higher anthocyanin content. In summary, for red cabbage microgreen production, it is advisable to select all LED light spectra for crop production; meanwhile, full-spectrum LEDs (400-700 nm) improved chlorophyll and carotenoid activity, and blue LEDs (410-485 nm) favored higher anthocyanin content. This study implemented LED light spectra to optimize growth and enhance phytochemical activity in microgreens, thereby offering promising avenues for sustainable agriculture and climate action.

Keywords**:** *LED light spectra, Microgreens, Phytochemicals, Red cabbage, urban agriculture*