

Title : Co-cultivation of Microalgae and Lettuce in Indoor Hydroponic System with Different LED Light Wavelength

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ABSTRACT

Light is essential for plants and algae as it enables them to produce food through photosynthesis, which supports their growth. However, there is currently a lack of research exploring the effects of different light colors on the growth of both plants and algae simultaneously. This study investigates the impact of various light colors on the growth of plants and algae by co-cultivating microalgae and lettuce in an indoor hydroponic system with four LED light colors: white, red, green, and blue. Each light color was tested in two experimental groups: one group with a hydroponic nutrient solution containing microalgae and another group without microalgae, across three cultivation cycles. The results showed that blue light was the most effective for microalgae growth, yielding a biomass of 0.517 g/L and a lipid content of 0.270 g/L, compared to other light colors across all cycles. Conversely, red light proved most effective for lettuce growth. Under red light, the number of leaves increased by 1.2 times, stem height by 1.2 times, root length by 1.2 times, fresh shoot weight by 1.6 times, dry shoot weight by 1.8 times, fresh root weight by 1.8 times, and dry root weight by 7.4 times, relative to other light colors. Overall, it can be concluded that blue light is optimal for microalgae growth, while red light is most suitable for lettuce growth in indoor hydroponic systems.