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EFFECTS OF CONTINUOUS LED LIGHTING ON REDUCING NITRATE CONTENT AND ENHANCING EDIBLE QUALITY OF LETTUCE DURING PRE-HARVEST STAGE

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Lettuce easily accumulates higher nitrate content during production, especially in hydroponic system, and higher nitrate content poses a threat to human health. Light condition (light quality, intensity and duration) significantly affects nitrate content in plants. Lighting-emitting diodes (LEDs) have showed the great potential for plant growth and development with the higher luminous efficiency and positive impact compared with other artificial light. The effects of combination of red (R)/ blue (B) or/and green (G), and white (W) LED lights on the plant growth, plant physiological changes, including chlorophyll fluorescence, nitrate contents and phytochemical concentration before harvest were investigated. The results showed that Pre-harvest continuous light exposure can effectively reduce nitrate accumulation and increase phytochemical concentrations in lettuce plants, and the reduction in nitrate content is dependent on the spectral composition and light intensity of the applied light sources and continuous light duration. Lettuce plants grown under the continuous combined red, green and blue LED light (RGB) with a PPFD at 200 $\mu\text{mol}\cdot\text{m}^{-2}\cdot\text{s}^{-1}$ (RGB-200) and RB-200 treatments exhibited a remarkable decrease of nitrate contents at 24 h compared to other LED light treatments. Moreover, continuous LED light at 24 h significantly enhanced the DPPH free-radical scavenging activity and increase phenolic compound concentrations. In this study, we suggest that a period of continuous LED light (RGB-200 or RB-200) exposure is needed in order to decrease nitrate concentrations and enhance lettuce quality. The period of 24 h continuous LED light exposure appears to be the best, and this period should not exceed 48 h.