EFFECT OF ARTIFICIAL LIGHTING IN HORTICULTURE THROUGH A SYSTEMATIC REVIEW AND BIBLIOMETRIC ANALYSIS

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ABSTRACT

The growing global population has necessitated an increase in food production. However, climate changes, such as heavy rainfall and fluctuating light conditions in tropical and temperate regions, have driven a shift towards protected cultivation systems like greenhouses integrated with artificial lighting. This study aims to systematically review the existing literature on the evaluation of artificial lighting technology in horticulture. Key components of artificial lighting, including light spectrum, intensity, duration, and distance from plants, must be carefully managed to optimize plant growth. A systematic review of existing literature identifies red and blue light, as well as their combinations, as the most effective light pairings for horticulture within the 400 nm to 700 nm wavelength range. Light intensities between 60 $\mu mol \cdot m^2 \cdot s^{-1}$ and 600 $\mu mol \cdot m^2 \cdot s^{-1}$ are commonly used in supplemental lighting, particularly for leafy vegetables. Controlled lighting conditions enhance plant productivity by adjusting light duration, with treatments like short night breaks promoting flowering in species such as *Xanthium* and *Pharbitis*. Light intensity also varies based on the height and arrangement of lighting sources, with staggered grids aligned with crop height ensuring uniform light distribution. Bibliometric analysis identifies the trends, gaps, and patterns in the research on the effect of artificial lighting on horticulture. Identifying specific lighting requirements through systematic review and bibliometric analysis is essential for addressing knowledge gaps in the field and improving the efficacy of artificial lighting in protected horticulture.

Keywords: Horticulture, artificial lighting, spectrum, intensity, circadian clock, LED

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