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"Gheorghe Asachi" Technical University of Iasi, Romania

INNOVATIVE LED LIGHTING CONTROL SYSTEM FOR SUSTAINABLE HORTICULTURE: ENHANCING STRAWBERRY CULTIVATION

Ahmet Feyzioglu*

Department of Mechanical Engineering, Faculty of Technology, Marmara University, Istanbul, Turkey

Abstract

This study aimed to design and develop a sustainable horticultural system using LED (Light Emitting Diode) technology to enhance the growth and nutritional quality of strawberry plants. By focusing on specific wavelengths within the blue (465 nm) and red (640 nm) spectrum, which are known to be effective for photosynthesis and plant growth, a programmable control system was created to simulate natural sunlight conditions. Four test groups were established under controlled conditions: Red dominant, Blue dominant, Red and Blue equal, and a Control using Fluorescent light. The study evaluated growth rates, aromatic compound accumulation, and phenol content, with results indicating that the Red dominant treatment produced the highest growth rates and phenol content. These findings highlight the potential of LED lighting to improve plant growth and quality in sustainable horticultural practices.

Key words: energy efficiency in horticulture, horticultural control systems, led lighting, Sustainable agriculture, strawberry cultivation

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* Author to whom all correspondence should be addressed: e-mail: magdalena.domanska@upwr.edu.pl; Phone: +48 713205553; Fax: +48 71320 5579