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"Reconcile land system changes
with planetary health"

Photosynthetic bacteria enhance cherry tomato yield and quality while promoting sustainable agriculture

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Abstract

Photosynthetic bacteria represent a promising biological approach to sustainable agriculture, offering multifaceted benefits for plant growth and crop quality through phytohormone production, antioxidant protection, nitrogen fixation, and improved stress tolerance. As agricultural systems face mounting challenges from climate change and chemical input concerns, such biological approaches warrant thorough investigation. This study evaluated the effects of photosynthetic bacterial application on the yield and quality of cherry tomatoes (*Solanum lycopersicum* L.) under greenhouse conditions. The selection of photosynthetic bacterial isolated from wetland areas at Chiang Mai University, Thailand. Results indicated that treatments with photosynthetic bacteria significantly improved plant growth at 28, 42, and 56 days after transplanting ($p = 0.004$) and resulted in higher yields compared to untreated controls (2.64 and 2.14 kg plant^{-1}; $p = 0.001$). Moreover, treated plants exhibited significantly greater total soluble solid, TSS (7.2 and 6.0 °Brix; $p = 0.001$), although no significant differences were observed in individual fruit weight, fruit length, or fruit width. These findings underscore the considerable potential of photosynthetic bacteria as sustainable bio-inputs for modern horticultural systems, capable of simultaneously enhancing both yield parameters and nutritional quality attributes. The integration of such microbial technologies offers a promising pathway toward reducing synthetic fertiliser dependency while improving soil health, minimising environmental contamination, and supporting sustainable agricultural practices. Furthermore, the carbon fixation capabilities of photosynthetic bacteria represent an additional ecological benefit, contributing to CO utilisation within agricultural ecosystems. This research highlights the role of beneficial microorganisms in developing resilient, productive, and environmentally responsible food production systems for future generations.

Keywords: Bio-input, Environmental Health, photosynthetic bacteria, Sustainable agriculture

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