Title : Application of Vegetable Trimming and Spirulina Biomass in Combination with Actinobacteria for Promoting Lettuce Growth

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Major : Microbiology

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ABSTRACT

Agricultural production in Thailand relies heavily on chemical fertilizers to maximize yields and meet market demands. However, their prolonged use contributes to environmental degradation, deteriorates soil quality, and disrupts beneficial soil microbial communities. An alternative approach to reducing chemical fertilizer inputs while maintaining crop productivity is the integration of organic amendments with plant growth–promoting bacteria. This study investigated the effects of vegetable trimmings (VT) and Spirulina biomass (SP), applied alone or in combination with the actinobacterium Streptomyces sampsonii MFA02, compared with conventional chemical fertilizer (CF), on lettuce growth. The experiment was divided into two main groups based on the presence or absence of S. sampsonii MFA02 inoculation. Each group included the following treatments: 100% vegetable trimmings (VT100), 100% Spirulina biomass (SP100), 100% chemical fertilizer (CF100), 50% vegetable trimmings + 50% chemical fertilizer (VT50+CF50), 50% Spirulina biomass + 50% chemical fertilizer (SP50+CF50), 50% Spirulina biomass + 50% vegetable trimmings (SP50+VT50), and a control (no amendment). The results demonstrated that VT50+CF50 with MFA02 inoculation significantly enhanced plant height, leaf number, root length, fresh weight, and dry weight compared with the control, with increases of 1.05-, 1.44-, 1.57-, 1.44-, and 2.25-fold, respectively, although values were slightly lower than those obtained with CF100. Notably, VT50+CF50 with MFA02 produced total photosynthetic pigment contents comparable to CF100. Higher soil carbon dioxide emissions were observed in MFA02-inoculated treatments, indicating increased microbial activity and improved nutrient cycling in the rhizosphere. Overall, the integration of organic residues with beneficial actinobacteria shows strong potential as a sustainable strategy to partially substitute chemical fertilizers while maintaining crop performance and promoting environmentally friendly agricultural production.

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