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

Chayawee Dueandao, Wasu Pathom-aree, Sirasit Srinuanpan*

Department of Biology, Faculty of Science, Chiang Mai University, 50200, Thailand

*Email address : Sirasit.s@cmu.ac.th

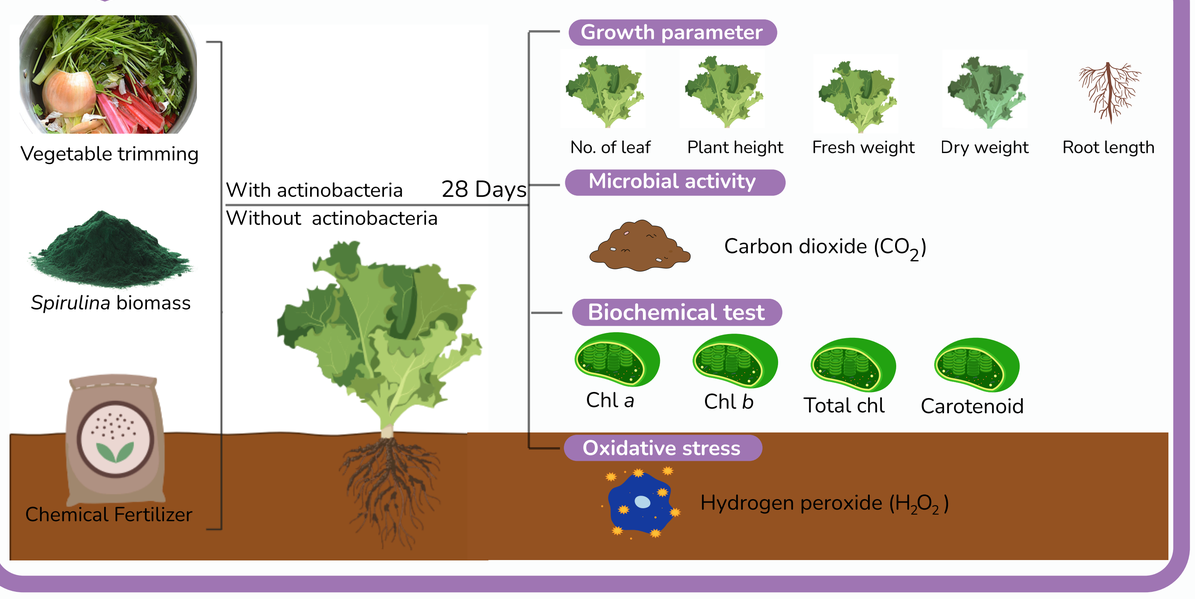
Abstract

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.

Objectives

- To investigate the effects of vegatable trimmings and *Spirulina* biomass in combination with actinobacteria on the growth of lettuce plants
- To compare the effects of vegetable trimmings and *Spirulina* biomass combined with actinobacteria with that of commercial chemical fertilizers

Methods



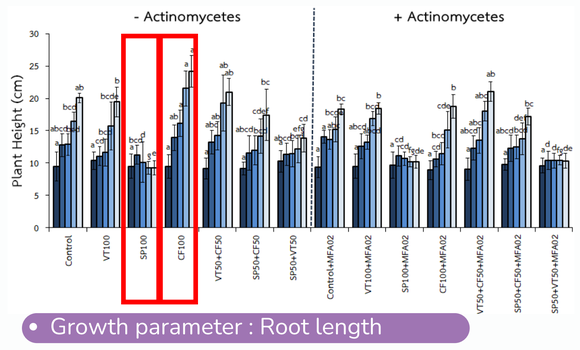
Results



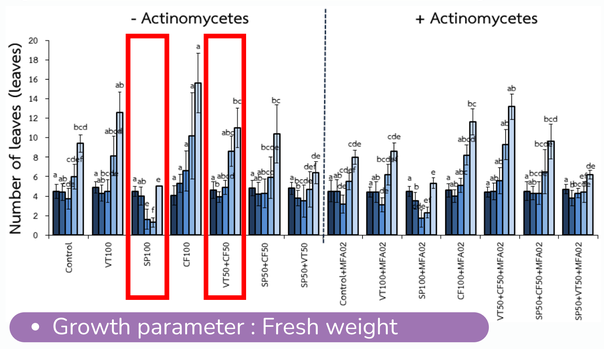
Conclusions

- Vegetable trimming and Spirulina biomass have potential to promote the growth of lettuce, ether alone or combination with actinobacteria (*Streptomyces sampsonii* MFA02).
- The treatment was 50% vegetable trimming + 50% chemical fertilizer (VT50+CF50), showing the similar growth parameter like 100% Chemical fertilizer (CF100).
- The treatment was 50% *Spirulina* biomass + 50% chemical fertilizer (SP50+CF50), showing the similar Chlorophyll and carotenide like 100% Chemical fertilizer (CF100).
- The treatments with *Streptomyces sampsonii* MFA02 resulted in reduced hydrogen peroxide levels, demonstrating its potential to reduce bioticstress and abiotic stress in plants.
- The treatments with *Streptomyces sampsonii* MFA02 have ability to increase Carbon dioxide levels

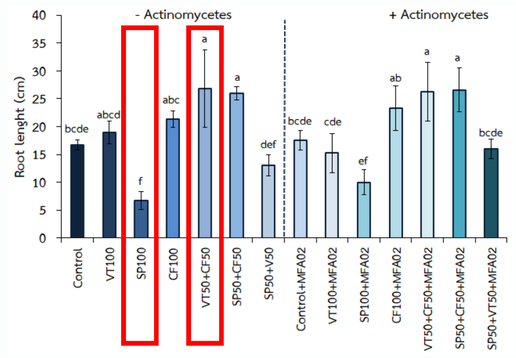
- Growth parameter : Plants height



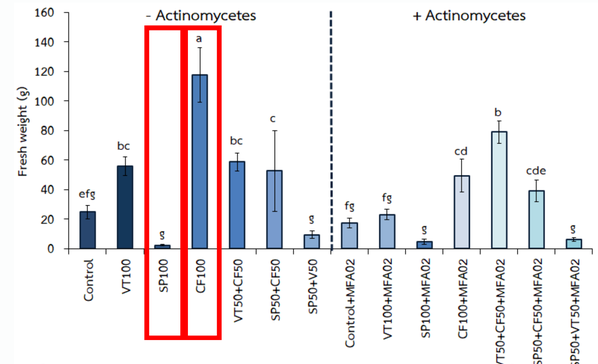
- Growth parameter : Number of leaves



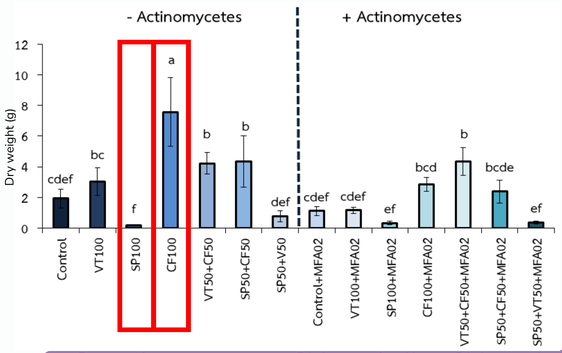
- Growth parameter : Root length



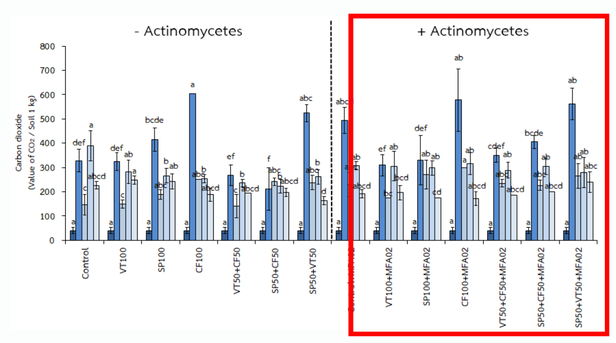
- Growth parameter : Fresh weight



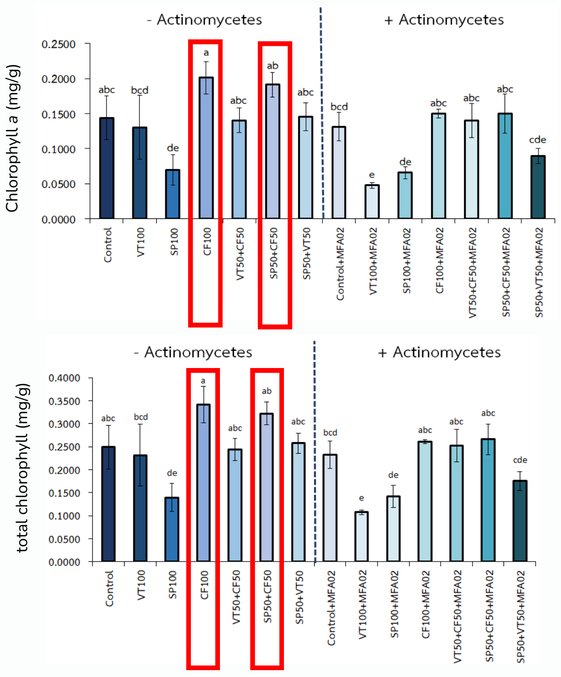
- Growth parameter : Dry weight

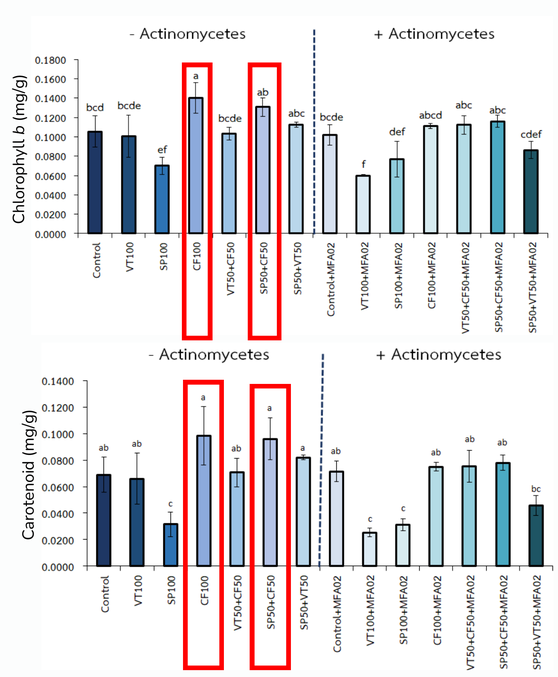


- Microbial activity : CO_2

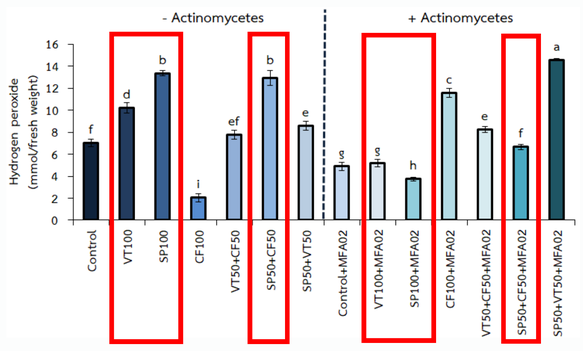


- Growth parameter : Chlorophyll *a*, Chlorophyll *b*, Total chlorophyll, Carotenoid

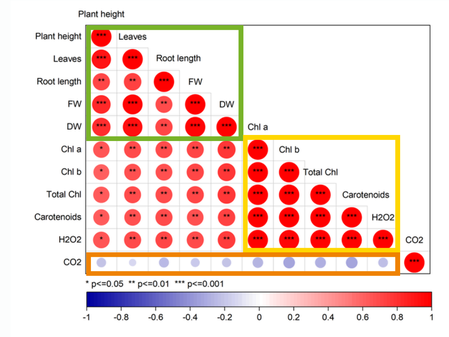




- Oxidative stress : H_2O_2



- Pearson Correlation



Acknowledgement

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