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## Evaluation of *streptomyces sampsonii* (MFA02) from mealworm frass as a biofertiliser for chinese kale

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### Abstract

Mealworm frass has excellent potential as a partial or complete substitute for mineral, nitrogen, phosphorus, and potassium fertilisers due to its rapid mineralisation rate and high content of readily available nutrients. Furthermore, mealworm frass contains biostimulants based on plant growth promoters (PGPs). These mechanisms include nutrient solubilisation, nitrogen fixation, and phytohormone secretion, which enhance plants' resistance to abiotic and biotic stress, improve crop yield and quality, and help avoid environmental problems associated with excessive chemical fertilisation. This study evaluated the plant growth-promoting potential of *Streptomyces sampsonii* (MFA02), isolated from mealworm frass. *S. sampsonii* (MFA02), isolated from mealworm frass provided by Waranon Farm, Lamphun Province, Thailand, demonstrated a strong ability to solubilise phosphate (37.20 mg P L<sup>-1</sup>) and potassium (17.01 mg K L<sup>-1</sup>), as well as to produce indole<sup>-3</sup>-acetic acid (IAA) (9.31 mg IAA L<sup>-1</sup>). Application of *S. sampsonii* (MFA02) to Chinese kale seedlings resulted in enhanced germination rates (92.0 %) and increased fresh weight (1.49 g plant<sup>-1</sup>) and dry weight (0.14 g plant<sup>-1</sup>) compared to untreated controls. After inoculation with *S. sampsonii* (MFA02), Chinese kale seedlings exhibited elevated essential nutrient concentrations (N, P, K, Ca, Mg) in both roots (2.9 %, 0.43 %, 1.09 %, 0.63 %, 0.23 %, respectively) and shoots (3.5 %, 0.50 %, 2.84 %, 3.52 %, 0.54 %, respectively). Analysis of the growing medium revealed improvements in nutrient availability, organic matter content, and electrical conductivity following *S. sampsonii* (MFA02) application. These findings indicate that *S. sampsonii* (MFA02) could serve as an effective biofertiliser for sustainable farming, helping to reduce dependence on chemical fertilisers, improve crop quality and yield, and minimise both costs and environmental impact.

**Keywords:** Biofertiliser, plant growth promotion, *Streptomyces*, sustainable agriculture