Enhancing the yield of Scotch Bonnet (*Capsicum chinense*) using forest-derived indigenous microorganisms (IMOs)
A comparative study of mixed consortia and axenic microbial strains

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Introduction and Objectives: Indigenous microorganisms (IMOs) play a crucial role in sustainable agriculture by enhancing soil fertility and promoting plant growth. In many countries, including South Korea, farmers collect microbial communities from natural environments and apply them with sugary solutions or potato extracts without isolating individual species, based on the idea that microbial synergy drives productivity of soil. This study aimed to isolate IMOs from a forest ecosystem (Kodigahakanda) and evaluate their effects on the growth and yield of Scotch Bonnet (*Capsicum chinense*) under controlled conditions. This study further investigated whether a mixed microbial community performs better than isolated microbial strains.

Methods: IMOs were collected using a steamed rice-based baiting method and cultured in the laboratory at 27 °C. The experiment included 9 single isolate bacterial treatments, a mixed bacterial suspension (all isolates combined), a *Trichoderma*-only treatment, an inorganic fertiliser treatment (Albert solution) as a positive control, and an untreated negative control. Each contained 12 plant replicates. Microbial suspensions were adjusted to approximately 1×10^9 CFU/ml, measured by spectrophotometry, and 50 ml was applied as a soil drench around the root zone of each plant on days 5 and 15 after transplanting. Two-week-old nursery Scotch Bonnet plants were transplanted into grow bags inside a polytunnel and filled with a solarised potting mixture (surface soil: compost: burned rice husk in 1:1:1). Growth rate was measured based on height increment. The first fruits were harvested 6 weeks after transplanting, and fruit yields were monitored weekly over a 10-week period to assess production trends.

Results: The mixed bacterial suspension significantly outperformed all individual treatments in fruit yield of Scotch Bonnet (ANOVA, $p=0.013$). Its average 10-week yield (500.6±0.5g) was greater than both the control (332.8±0.5g) and the inorganic fertiliser treatment (390±0.5g). Plants treated with the mixed bacterial suspension had an average growth rate of 1.594 cm/day, which was higher than most treatments except for T4 (one isolate) (1.851 cm/day). This suggests that while certain individual microbes may promote growth individually, the overall synergy within the microbial community is more beneficial.

Conclusions: Locally sourced microbial consortia can serve as effective biofertilisers for sustainable Scotch Bonnet cultivation. Their application improved plant growth and yield beyond or similar to inorganic fertilisers, affirming the ecological value of forest-derived microbial communities in eco-friendly agriculture.

Keywords: *Indigenous microorganisms, biofertilizers, Scotch Bonnet, microbial synergy, sustainable agriculture*

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