

Development of Biosurfactant-Based Adjuvant for Enhancing Biocontrol Efficiency

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Abstract : Adjuvant is commonly mixed with agricultural spray solution during foliar application to improve the performance of microbial-based biological control, including better spreading, absorption, and penetration on a plant leaf. This research aims to replace chemical surfactants in adjuvant by biosurfactants for reducing a negative impact on antagonistic microorganisms and crops. Biosurfactant was produced from *Brevibacterium casei* NK8 and used as a cell-free broth solution containing a biosurfactant concentration of 3.7 g/L. The studies of microemulsion formation and phase behavior were applied to obtain the suitable composition of biosurfactant-based adjuvant, consisting of cell-free broth (70-80%), coconut oil-based fatty alcohol C12-14 (3) ethoxylate (1-7%), and sodium chloride (8-30%). The suitable formula, achieving Winsor Type III microemulsion (bicontinuous), was 80% of cell-free broth, 7% of fatty alcohol C12-14 (3) ethoxylate, and 8% sodium chloride. This formula reduced the contact angle of water on parafilm from 70 to 31 degrees. The non-phytotoxicity against plant seed of *Oryza sativa* and *Brassica rapa* subsp. *pekinensis* were obtained from biosurfactant-based adjuvant (germination index equal and above 80%), while sodium dodecyl sulfate and tween80 showed phytotoxic effects to these plant seeds. The survival of *Bacillus subtilis* in biosurfactant-based adjuvant was higher than sodium dodecyl sulfate and tween80. The mixing of biosurfactant and plant-based surfactant could be considered as a viable, safer, and acceptable alternative to chemical adjuvant for sustainable organic farming.

Keywords : biosurfactant, microemulsion, bio-adjuvant, antagonistic microorganisms

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