

Dissertation Title	Biocontrol Product of <i>Streptomyces</i> sp. strain S4 for Controlling Fungal Seedling Damping Off Disease in Economic Plant Nursery
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Candidate	Miss Bajaree Loliam
Dissertation Advisor	Assoc. Prof. Dr. Saipin Chaiyanan
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B.E.	2555

Abstract

This research aimed to establish a biocontrol product for controlling fungal seedling damping off disease in economic plant nursery. Seedling damping off disease is a serious problem for seedling production business. The disease causative fungi were isolated from the infected tomatoes and chinese spinach seedlings. The pathogenic fungi were identified to be *Phytophthora infestans* and *Pythium aphanidermatum*. Soil actinomycetes were isolated and screened for the antagonists against the two pathogenic fungi. The soil actinomycetes, strain S4 that were isolated from termite mounds at the grove of Amphoe Si-sawat, Kanchanaburi Thailand, exhibited growth inhibitory activity against both *P. infestans* and *P. aphanidermatum*. The isolate S4 was classified to be the genus *Streptomyces* based on a 16S rRNA gene sequence. This isolate had 100% similarity to *Streptomyces fradiae* and *Streptomyces rubrolavendulae*. Antagonistic mechanisms of *Streptomyces* sp. strain S4 against seedling damping off fungi were investigated. The *Streptomyces* sp. strain S4 produced extracellular cellulase and chitinase. The fungal growth inhibition was proven to be resulted from both hydrolytic enzymes and antifungal substance produced by the antagonist. The destructions of *P. infestans* and *P. aphanidermatum* mycelia by *Streptomyces* sp. strain S4 were demonstrated clearly in scanning electron micrographs. In plant protection test, the antagonistic *Streptomyces* sp. strain S4 successfully protected seedlings of tomato, chili, and Chinese spinach from damping off caused by *P. infestans* and *P. aphanidermatum*. The production of *Streptomyces* sp. strain S4 cell mass for using as biological control product was studied using solid state fermentation. Shrimp head waste from the frozen shrimp industry and rice bran from rice milling industry were formulated as culture media using Central Composite Design. The maximum antagonistic cells at 6.94 log CFU/g were obtained from the culture medium having the ratio of dried shrimp heads

and rice bran at 50:50 and the moisture content at 60%. The fermented product was ground into powder form and stored in aluminum foil bag with vacuum seal. The biological control product was effective for at least six months when stored at 4°C.

Keywords : *Streptomyces* / *Phytophthora infestans* / *Pythium aphanidermatum* / Antibiosis / Mycoparasitism / Biocontrol product