

Combination of Bacillus subtilis and Pseudomonas fluorescens as Biological Control Agents Against Anthracnose (Colletotrichum truncatum) in Soybean (Glycine max) Plant In vitro And In vivo

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ABSTRACT

Soybean (Glycine max) is a staple food widely consumed by the Indonesian population; however, its production has declined due to infections caused by Colletotrichum truncatum, the pathogen responsible for anthracnose disease. Therefore, the application of Pseudomonas fluorescens and Bacillus subtilis as biological control agents was carried out to suppress anthracnose disease in soybeans. The study was conducted in the laboratory using the dual-culture assay method with four treatments: control, 10^7 cfu/mL, 10^8 cfu/mL, and 10^9 cfu/mL of P. fluorescens and B. subtilis. Meanwhile, the field experiment consisted of two treatments—namely, the laboratory-derived bacterial inoculation and a chemical control using the active ingredient mancozeb. Observed parameters included the inhibition rate of pathogen growth in vitro and the effects of treatments on vegetative growth (number of trifoliates and productive nodes) and yield components (number of pods and pod weight per sample). The results showed that the combination of P. fluorescens and B. subtilis effectively inhibited the growth of C. truncatum, with the highest inhibition percentage (42.9%) observed at a concentration of 10^8 cfu/mL. In field trials, the biological control treatment produced comparable results to the synthetic fungicide Mancozeb in terms of growth and yield parameters, although significant differences were only observed in the number of productive nodes. These findings indicate that the combination of both bacterial species has strong potential to be developed as an environmentally friendly and sustainable biological alternative to chemical fungicides.

Keywords: : Anthracnose, B. Subtilis, P. fluorescens, Soybean