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Isolation and Screening of Endophytic Bacteria Against *Colletotrichum* sp. Causing Antracnose in Edamame

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Abstract: Edamame (*Glycine max* L. Merr.) is a horticultural commodity with high potential as a protein-rich functional food, in line with the increasing demand from both domestic and export markets. However, edamame productivity in Indonesia continues to face serious constraints due to anthracnose disease caused by *Colletotrichum* sp. This pathogen can infect nearly all parts of the plant and significantly reduce both yield quality and quantity. Conventional control strategies relying on synthetic fungicides have caused various negative impacts; therefore, alternative, environmentally friendly, and sustainable approaches are urgently required. This study aimed to isolate endophytic bacteria from edamame plant tissues and to screen their antagonistic activity against *Colletotrichum* sp. Endophytic bacteria were isolated from the roots, stems, and leaves of edamame, and their antagonistic activity was assessed using the dual culture method. The results revealed several endophytic bacterial isolates with varying abilities to inhibit the growth of *Colletotrichum* sp. Selected isolates exhibited high inhibition percentages and did not induce hypersensitive reactions in the tobacco assay, indicating their potential to be further developed as biological control agents in edamame disease management systems.

Keywords: anthracnose, biological control, *Colletotrichum* sp, edamame, endophytic bacteria

1. Introduction

The demand for edamame continues to rise in line with the global trend toward healthy lifestyles, which has positioned edamame as a protein-rich functional food. However, edamame productivity in Indonesia still faces significant challenges, particularly anthracnose disease caused by *Colletotrichum* sp., which can markedly reduce both the quality and quantity of yield. *Colletotrichum* sp. is capable of infecting seeds up to the post-harvest stage and can attack all parts of the plant, including leaves, stems, pods, and soybean cotyledons. Symptoms typically begin with the appearance of sunken, irregularly shaped black lesions on stems, petioles, leaves, and pods. Lesions on leaves generally cause curling and the formation of dark brown necrotic areas.

Efforts to control anthracnose disease have so far been dominated by the use of synthetic fungicides. Although effective, intensive fungicide application has negative consequences, such as chemical residues in agricultural products, pathogen resistance, environmental degradation, and potential risks to human health. Therefore, alternative control strategies that are environmentally friendly, sustainable, and supportive of export-oriented agricultural systems are urgently required. One promising approach that has gained increasing attention is the use of endophytic bacteria as biological control agents.