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Activities *Pseudomonas* spp. and *Bacillus* sp. to Stimulate Germination and Seedling Growth of Tomato Plants

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Abstract

Microbes, that are beneficial to plants, the group of Rhizobacteria such as *Pseudomonas* spp. and *Bacillus* sp. can serve as fertilizer, as a means of biological control of plant pathogens and can increase plant resistance. This study aimed to determine the activity of *Pseudomonas* spp. and *Bacillus* sp. in promoting germination and seedling growth of tomato plants. This is experimental study using RBD basic design (Randomized Block Design). There are three treatments of tomato seed soaking time is 10, 20, and 30 minutes with 3 types of suspension that isolates of *Pseudomonas* spp., *Bacillus* sp., and a mixture of both these bacterial isolates. The study of tomato seed germination time showed that treatment of bacterial isolates is very real effect, where the control slower germination 2-3 days, while the treatment of both types of isolates germination between 4-5 days. Tomato seed treatment by soaking period of bacterial isolates between 10 to 30 minutes does not give a significantly different effect on the time of germination and growth of tomato seedlings. Isolate the *Bacillus* sp. tends to give a tomato seedling growing faster than the *Pseudomonas* spp. isolates, while a mixture of both isolate the bacteria does not give a different impression with a single treatment. Among the three treatment isolates showed no significant differences, except compared to control.

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Keywords:Pseudomonas spp., *Bacillus* sp., biofertilizer, tomato seedlings

1. Introduction

Rhizobacteria is a group of bacteria with plant roots habitat area (rhizosphere) which has been researched and proven to improve soil fertility, increase plant resistance and can suppress plant pathogens. Rhizobacteria act

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directly as biological fertilizer and stimulants biologically by producing hormones to grow crops such as IAA (indole acetic acid), gibberellin, cytokine, ethylene, dissolving minerals, and indirectly also prevents pathogenic microorganisms through formation of siderophore and an antibiotic (McMilan, 2007 ; Sarma et al., 2009).

Rhizobacteria Group of *Pseudomonas* (*P. fluorescens, P. putida,* and *P. aeruginosa*) is known to be beneficial to plants. Some strains have long been known as a biological control agent (Xu and Gross, 1986; Weller, 1988). The bacteria are also known as plant growth promoting rhizobacteria (PGPR), either directly or as a result of its ability to control the disease (Weller and Cook, 1986; Van Peer and Schippers, 1988). An explanation of some strains of *Pseudomonas* spp. associated with the plant, which can encourage the growth of plants or suppress plant diseases continues to grow, and knowledge of the mechanisms involved continue to increase.

Rhizobacteria of the group *Bacillus* sp. which is one group of gram-positive bacteria are often used as a biological control root diseases. Members of this genus have an advantage, because the bacteria form spores that are easily stored, have long life durability, and relatively easily inoculated into the ground. The *Bacillus* bacteria Strain PRBS-1 and strain AP-3 have inhibited five soybean seed pathogenic fungi *in vitro, Rhizoctonia solani, Colletotrichum truncatum, Sclerotinia sclerotiorum, Macrophomina phaseolina and Phomopsis* sp. The results have shown the potential of using selected strains of *B. subtilis* in the biological control of seed pathogens, as well as in promoting soybean growth. (Araújo et al., 2005).

Tenuta (2004) says PGPR mechanisms to improve plant health can occur through three ways, namely: a) Decrease development of pest/disease (bioprotectant): has a direct influence on the plant in the face of pests and diseases, b) Producing phytohormones (biostimulant): IAA (Indole Acetic Acid); cytokines; gibberellins; and inhibiting ethylene production: to increase the surface area of fine roots, c) Increasing the availability of nutrients for plants (biofertilizer). Meanwhile, according to McMilan (2007), several roles PGPR in spurring the growth of the plants: (a) increase nitrogen fixation in legumes, (b) increase the population of bacteria nitrogen- other, (c) increase the supply of other nutrients, such as phosphorus, sulfur, iron and copper, (d) production of hormones, (e) increase the population of beneficial fungi or bacteria, (f) controlling fungal pathogens, (g) controlling pathogens because bacteria, and (h) controlling insect pests.

Rhizobacteria *Pseudomonas* spp. has a positive effect by occupying the plant root tissue surface and provides compounds that are beneficial to plants. Some of these bacteria enter further into the network and into endophyte without causing damage or morphological changes in plants (Rosenblueth and Martinez-Romero, 2006). Population density of endophytic bacteria on the roots of a healthy garden higher than the hospital garden. The test results of the germination endophytic bacteria showed that as many as five isolates of endophytic bacteria that EB4, EB7, EB10, EB12, EB14 and has the ability to accelerate germination and stimulate root growth of tomato plants. Endophytic bacteria on the roots of corn plants capable of accelerating the growth of corn sprouts for two weeks of planting.

This study was conducted to obtain information on the speed of germination of the seeds of tomatoes after immersion in suspense *Pseudomonas* sp., *Bacillus* sp. and both bacteria mixture with a population density of different bacteria and different soaking time. Results of previous studies show that both the bacterial isolates are compatible with each other.

2. Methods

2.1. Isolation Rhizobacteria Pseudomonas sp. and Bacillus sp.

Isolates of *Pseudomonas* sp. and *Bacillus* sp. obtained from previous research funded by Ditlitabmas Higher Education in 2012-2013 (Widnyana et al., 2013) To keep isolates of *Pseudomonas* sp. of contaminants then re – isolation *Pseudomonas* sp. is done by using selective media King's B to maintain its ability to produce color figment fluorescents (Fox, 1993). Re-isolation of the bacteria *Bacillus* sp. done using media NA (Nutrient agar). To maintain the viability of the bacterial isolate the re-insulation made at the latest 3 months.

2.2. Treatment for tomato seeds

Tomato seed soaking treatment in a suspension of *Pseudomonas* sp. and *Bacillus* sp. done for 10, 20, and 30 minutes later the seedlings planted in the media that have been prepared. Bacterial population density is 4×10^8