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# Evaluation of photosynthesizing bacteria for the growth of rice var. RD41

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Photosynthesizing bacteria LB01 and LB02 was tested for the growth of rice var.RD41 to examine the plant growth promotion ability in pot experiments. The results indicated that the application of liquid organic fertilizers with the photosynthesizing bacteria showed significantly enhanced the plant height, tiller numbers, fresh weight and dry weight of plant and grain yield over the uninoculated control.

**Keywords:** Photosynthesizing bacteria, bacteria, rice, growth of rice

## Introduction

*Oryza sativa* is Asian rice and it is the most widely consumed staple food for a large part of the world's human population. (https://en.wikipedia.org/wiki/Rice. In Asia, It is the agricultural commodity with the third-highest worldwide production, after sugarcane and maize, according to 2015 FAOSTAT data (FAO, 2015). Rice is one of the most important staple foods for the increasing world population, especially in Asia. Diseases are among the most significant limiting factors that affect rice production, causing annual yield losses conservatively estimated at 5% (Song and Goodman, 2001). More than 70 diseases caused by fungi, bacteria, viruses or nematodes have been recorded on rice (Manandhar *et al*., 1998). Photosynthetic bacteria can be found in various kinds of habitats such fresh water, sea water, sulfur-containing hot water springs, clay and sediment (Imhoff, 1988). The purple nonsulfur bacteria (PNSB) are one of the most diverse photosynthetic bacteria. They are adaptable phototrophic organisms known to occur in water columns of rice fields, wastewater environments, aquatic sediments and in activated sludge systems. (Magdalene *et al*., 2013). The objective was tested photosynthetic bacteria for the growth of rice var. RD41.

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## Materials and methods

### *Isolation of photosynthetic bacteria*

Photosynthesis bacteria LB01 and LB02 obtained from previuos research work of Vareeket and Soytong (2013). Thease isolates were tested for plant growth promoting agents for rice growth variety RD41 in the pot experiment.

The experiment was conducted by using Randomized Block Design (RCBD) wuth four replications. Treatments were as follows:- T1 = Non treatment (inoculated *Curvularia lunata*) T2 = Photosynthetic bacteria (LB01) at concentration of $1x10^7$ cells/ml, T3 = Photosynthetic bacteria (LB02) at concentration of $1x10^7$ cells/ml and T4 =Tebuconazole 20cc/20L of water. All treatments were sprayed every 15 days until harvest.

Dayta were collected as plant height (cm), number of tiller, plant weight g), weight of grain yield (g). The collected data were summarized and computed analysis of variance. Treatments were compared using Duncan's Multiple Range Test (DMRT) at P=0.05 and P=0.01

## Results and discussion

### *Effects on Rice Growth by phothosynthetic bacteria.*

The effects of each phothosynthetic bacteria strain on growth of rice in the pot experiment are shown in Table 1. It was significantly highter plant height, No. of tiller, plant fresh and dry weight, and fresh and dry grain than uninoculated control.

**Table 1.** Effect of inoculation of phothosynthetic bacteria strains LB01 and LB02 on growth of rice in the pot experiment.

| Treatment | Plant height (cm) | No. of Tiller per plant | Fresh weight of plant (g) | Dry weight of plant (g) | Dry weight of root (g) | Dry grain yield(g) |
|---|---|---|---|---|---|---|
| **Control** | 47.75c* | 2.93c | 48.39bc | 14.31b | 6.177b | 3.81c |
| **LB01** | 52.61a | 5.18a | 79.52a | 25.64a | 11.03a | 8.48a |
| **LB02** | 50.88b | 4.37b | 63.72ab | 22.01a | 12.57a | 6.28b |
| **Chemical** | 24.29d | 3.43c | 33.09c | 11.14b | 8.325ab | 0.55d |
| **CV.%** | 1.3563 | 9.2506 | 20.4650 | 17.4258 | 27.26 | 6.7957 |
| **LSD(P=0.05)** | 0.952 | 0.5895 | 18.3914 | 5.0943 | 4.1536 | 0.5201 |

*Means with the same letters are not significantly different by Duncan's multiple range test (DMRT) at $p<0.05$

It was clearly demonstrated that at 90 days after treatment, all tested phothosynthetic bacteria gave significant differences in plant height when compared to chemical fungicide (P=0.05). LB01 significantly promoted plant growth (52.61 cm), followed by LB02 and non-treated control wherein the plant heights were 50.88 and 47.75 cm, respectively. The height of chemical fungicide was only 24.29 cm which was significantly lower than all the other treatments (Table1, Fig. 1).

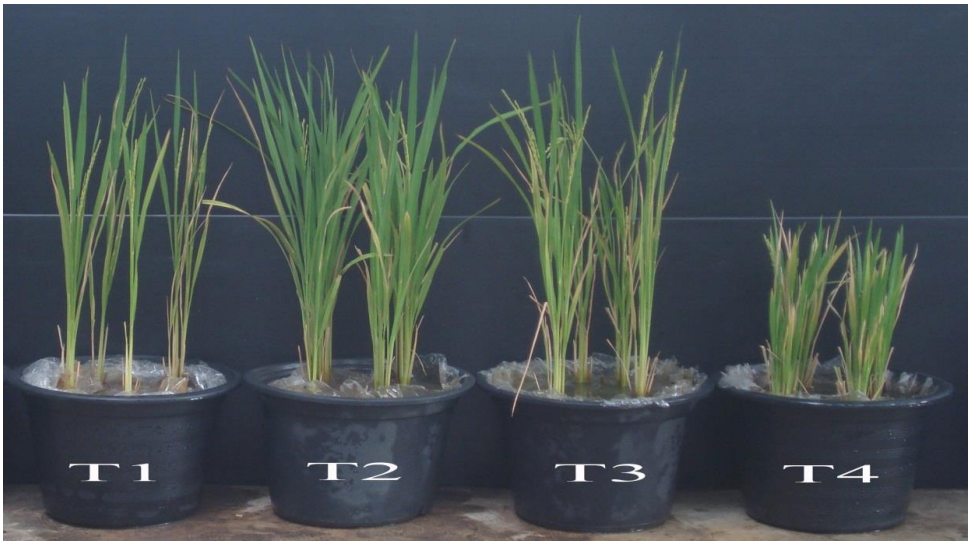


**Fig. 1.** Plant height of rice 90 days after treatment with phothosynthetic bacteria. T1= Non-treated control, T2= Treated with LB01, T3= Treated with LB02, T4=Treated with tebuconazole

The number of tiller, all tested phothosynthetic bacteria gave significant differences in plant height when compared to chemical fungicide (P=0.05). The number of tiller after treated with LB01 was 5.18 which gave significantly different from other treatments and followed by LB02 which the number of tiller was 4.37. The chemical fungicide and non-treated control gave non-significantly different in root dry weights were 3.43 and 2.93, respectively (Table 1)

The plant fresh and dry weights showed that all tested phothosynthetic bacteria gave significantly different in plant fresh and dry weights when compared to chemical fungicide (P=0.05). The plant fresh weight after treated with LB01 was 79.52 g which gave significantly different from other treatments and followed by LB02 and non-treated control which the root fresh weight were

63.72 and 48.39 g, respectively. While, the root fresh weight of chemical control was 33.09 g which gave the lowest root fresh weight and significantly differed from phothosynthetic bacteria treatments. The plant dry weight after treated with LB01 and LB02 gave non-significantly different in root dry weights were 25.64 and 22.01 g., respectively, chemical fungicide and non-treated control gave non-significantly different in root dry weights which were 11.14 and 14.31 g, respectively. (Table 1, Fig 2).


**Fig. 2.** Fresh of plant after treatment with phothosynthetic bacteria. T1= Non-treated control, T2=Treated with LB01, T3= Treated with LB02, T4=Treated with tebuconazole

The root dry weight showed that all tested phothosynthetic bacteria gave significantly different in root dry weights when compared to non-treated control (P=0.05). The root dry weight after treated with LB01 and LB02 gave non-significantly different in root dry weights were 11.03 and 12.57 g., respectively. As similar to the work of Ramchander (2012). Chemical fungicide was 8.325 g. The root dry weight of non-treated control was only 6.177 g which significantly lower than all the other treatments (Table 1).

The grain dry weight showed that all tested phothosynthetic bacteria gave significantly different in grain dry weights when compared to chemical fungicide (P=0.05). The grain dry weight after treated with LB01 was 8.48 g, followed by LB02 and non-treated control wherein the plant height were 6.28

and 3.41 g, respectively. The yield of chemical fungicide was only 0.55 g which was significantly lower than all the other treatments (Table1, Fig. 3).


**Fig. 3.** Dry grain of rice after treatment with phothosynthetic bacteria. T1= Non-treated control, T2=Treated with LB01, T3= Treated with LB02, T4=Treated with tebuconazole

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