Rice Plant Growth Enhancement and Bacterial Leaf Blight Control by the Rhizobacterial Consortium

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Abstract. *Bacterial leaf blight (BLB) in rice plants is brought on by the bacterium Xanthomonas oryzae pv. oryzae (Xoo).* Rhizobacteria are a group of plant root microorganisms that have a beneficial effect on plants. The rhizobacteria A consortium is a collection of friendly microorganisms that can prevent the spread of plant diseases. In this study, we to boost rice plant growth and manage BLB disease by acquiring an efficient consortium of rhizobacteria. The study employed a two-stage, entirely randomized design. Stenotrophomonas pavanii KJKB 5.4, S. malthophilia LMTSA 5.4, and Bacillus cereus AJ 3.4 were combined in stage 1 to test the viability of the mixture with shelf lives of 0, 2, and 6 weeks. The rhizobacteria consortium's second stage of testing a biocontrol agent and biological fertilizer in plants. The seeds were soaked before being added to the rhizobacteria consortium solution, and roots of rice seedlings, followed by inoculation of Xoo bacteria when the plants were 40 days old. Phase 1 results showed that the rhizobacterial population was relatively stable up to six weeks of storage, around 107 CFU/mL. The results of stage 2 demonstrated that when compared to controls, the rhizobacteria consortium significantly affected various levels of severity. *S. pavanii* KJKB 5.4 + *S. malthophilia* LMTSA 5.4) and *S. pavanii* KJKB 5.4 + *S. malthophilia* LMTSA 5.4 + *B. cereus* AJ 3.4) were both preserved for six weeks. Which was kept in storage for two weeks revealed illness severity of 43.15 and 43.93%, respectively, with disease suppression effectiveness of 52.04 and 48.77%. As a result of the consortium of *S. pavanii* KJKB 5.4 + S. malthophilia LMTSA 5.4 + B. cereus AJ 3.4 being stored for six weeks, rice plants with an effective vigor index of 13.15% and root length of 41.41% grew more quickly. The results of this study indicate that the rhizobacteria consortium is effective in suppressing the severity of BLB disease and increasing the growth of rice plants.

Keywords: Rhizobacterial consortium · rice plants · Xanthomonas oryzae pv · oryzae

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1 Introduction

The majority of Indonesians eat rice as a staple diet and the primary source of carbohydrates, rice (Oryza sativa L.) is one of the most significant food crops for the country's citizens. Along with the increase in population, the need for rice will also increase [1]. Along with the rise in population growth, the demand for rice also increases every year [2]. Rice productivity in Indonesia in 2017–2019 was 5.15; 5.20; 5.11 tons/ha, respectively [3]. This data is still below rice's potential productivity, which can reach 6–9 tons/ha [4].

The supply of rice is usually significantly impacted by rice disease. Even a reasonable estimate of an annual loss of 1–5 percent, given the size of the rice-producing region, would result in thousands of tonnes of lost rice and billions of dollars. Therefore, preventing disease outbreaks and minimizing losses from year to year are essential for preserving rice yield [5]. Bacterial leaf blight (BLB) caused by *Xanthomonas oryzae pv. oryzae* (Xoo) is an important disease in rice plants. Yield losses due to this disease can reach 30–50%, especially in susceptible varieties. The area of damage due to BLB disease in Indonesia in 2018 was 17,142 Ha ([6].

Xoo is a seed-borne pathogen that can infect rice plants from the nursery to harvest. This disease is growing if the growth of rice plants is not optimal due to less fertile land conditions [7]. Therefore, farmers have carried out control by increasing the frequency of using pesticides to boost crops. However, the widespread use of chemical pesticides has had several unfavorable effects, including pesticide residue contamination of food, soil, and water as well as biodiversity loss. Additionally, overusing chemical pesticides disturbs the stability of soil micro-ecosystems and is a major contributor to soil-borne illnesses [8]. One alternative for safe control is biological control by utilizing beneficial microorganisms.

One of the microorganisms used for biological control is Plant Growth Promoting rhizobacteria (PGPR) or rhizobacteria. Rhizobacteria are bacteria that live in the rhizosphere or plant root areas. These bacteria can colonize plant roots and promote plant growth by various mechanisms. Several types of rhizobacteria can act as bio-fertilizers and bio-control against plants [9].

The mechanism of rhizobacteria in providing benefits to plants can occur directly or indirectly. The direct mechanism occurs through the ability of rhizobacteria to suppress the growth of pathogens by producing antimicrobial compounds [10]; lytic enzymes and siderophores [11], nutrients, competing for iron, space, and parasitism. The indirect mechanism occurs by inducing systemic resistance that allows plants to have resistance to potential pathogens [12]. B. cereus bacteria can control bacterial leaf blight on shallots [13], bacterial wilt in potato plants [14], bacterial wilt in tomatoes [15]. [16] reported that *S. pavanii* is a nitrogen-fixing bacteria that functions as a biofertilizer. [17] reported that B. cereus AJ 3.4, S. pavanii KJKB 5.4, *S. maltophilia* LMTSA 5.4, and could inhibit the growth of Xoo bacteria that cause BLB disease.

Recent research has shown that managing rhizobacteria communities contribute to plant disease control [18]. The rhizobacteria consortium is considered more effective in controlling pathogens because it has complementary metabolic functions and can provide various control mechanisms simultaneously [19]. The purpose of this research

was to create a useful consortium of rhizobacteria to combat BLB illness and promote rice plant growth.

2 materials and Methods

The research was conducted at the Laboratory of Andalas University at Padang's Faculty of Agriculture's Biological Control and Greenhouse. Sumatera West. This study is experimental and uses a totally random design. The experiment consisted of 19 treatments which were repeated 3 times. With the following details: a consortium of compatible Plant Growth Promoting Rhizobacteria, namely.A = *Stenotrophomonas pavanii* KJKB 5.4 + *S.malthophilia* LMTSA 5.4, B = *S. pavanii* KJKB 5.4 + *Bacillus cereus* AJ 3.4, C = *S.malthophilia* LMTSA 5.4 + *B.cereus* AJ 3.4, D = *S.pavanii* KJKB 5.4 + *S.malthophilia* LMTSA 5.4 + *B.cereus* AJ 3.4, E = Positive control (without pathogen inoculation and consortium), F = Negative control (pathogenic inoculation) without consortium) and G = bactericide. Each consortium was propagated in coconut water waste media with the addition of golden snail extract (*Pomacea canaliculata* L.) which was then stored for 0, 2, 4 and 6 days.

2.1 Plant Growth Promoting Rhizobacteria Strains and Pathogen

Three rhizobacteria strains (*S. pavanii* KJKB 5.4, *S. malthophilia* LMTSA 5.4, and *B. cereus* AJ3.4) were cultivated on Luria-Bertani (LB) agar at 28 °C for 24 h. The next step was to choose individual colonies from newly scraped plates, inoculate them into LB broth, and incubate them at 28 °C for 48 h while shaking them at 200 rpm. For 15 min, the culture broth was centrifuged at 6000 g while being spun. The resultant pellets were adjusted to a concentration of 10^9 and resuspended in sterile water. CFU/ml for further experiments. Pathogenic bacteria *Xoo* pathotype III collection from the Sukamandi Rice Research Center was rejuvenated on Wakimoto Agar media and incubated for 48 h. Single colonies of pathogenic bacteria were incubated on Wakimoto liquid medium and set at 28^0C for 48 h while shaking at 200 rpm.

2.1.1 Compatibility Test Between Bacterial Strains

The rhizobacteria consortium compatibility test was carried out using the cross streak method. Each different rhizobacteria was streaked on LB media vertically and horizontally, then incubated for 48 h and observed whether there was lysis or intersection of the bacterial streaks [20]. If there is an intersection/lysis in the scratch cross, the rhizobacteria cannot consort.

2.1.2 Viability of Rhizobacteria Consortium in Liquid Formula After Storage with Different Time

One colony of each rhizobacterium on Luria Bertani Agar medium was cultured on 50 ml Luria Bertani Broth in 100 ml volume of Erlenmeyer and incubated for 2 × 24 h (10^9 CFU/ml). The compatible rhizobacteria propagated using coconut water

waste media. This media consists of 83% coconut water, 5% snails gold (boiled from 10 g/100 ml distilled water), 10% molasses) [17] added 2% glycerol, incubated for ten days, or until the consortium had a population density of 10^9 CFU /ml equivalent to 8 scales McFarland solution. The viability of the rhizobacteria consortium was determined based on the bacterial population on Luria Bertani Agar media, using the Total Plate Count (TPC) method. The test was carried out by mixing 1 ml of rhizobacteria consortium culture with 9 ml of LB media in a test tube that was still liquid. Then homogenized using a vortex and poured into a petri dish. Then incubate for 2 × 24 h and count the bacterial population that grows used colony counter [21].

2.2 The Ability of the Rhizobacteria Consortium to Prevent Rice Plants from Developing Bacterial Leaf Blight

2.2.1 Preparation of Planting Media

The planting medium used is soil mixed with manure in a ratio of 2:1. The soil was put into a plastic measuring 5 kg and sterilized using an autoclave for 1 h at a temperature of 100 °C. Furthermore, the soil is cooled by allowing it to stand for one day, then put into a tub of sprouts and a plastic bucket with a size of 8 cm top diameter, 6 cm bottom diameter, and 12 cm height.

2.2.2 Introduction of the Rhizobacteria Consortium on Rice Seed

Surface sterilization of rice seeds of the IR64 variety was accomplished by soaking the seeds in a solution of 2 percent NaOCl for 1 min, followed by 1 min of sterile distilled water rinse. The rice seeds were also immersed in each treatment for 30 min before drying. Rice seeds were simultaneously steeped in sterile distilled water as a control [22]. Sowed the rice seeds in a 25 cm × 20 cm × 5 cm sprout tub that already contained sterile soil and manure (2:1) media for 20 days. Maintenance includes watering rice seedlings in the morning and evening. After 20 days, removed the seedlings and the The remaining soil sticking to the roots was removed, and they were then bathed in each treatment for 30 min [7]. Meanwhile, For the control, the seedlings spent the same amount of time submerged in sterile, distilled water. After soaking, place the rice seedlings in sterile plastic buckets with dirt manure (2:1) as many as three seeds.

2.2.3 Inoculation of Xoo

Inoculation of Xoo was carried out when the rice plants were 35 days after planting using Leaf Clipping Method [7]. Rice leaves were cut 5 cm using sterile scissors dipped in Xoo suspension (10^7 CFU/ml) for ± 10 s.

2.2.4 Observation Parameters

Rice plants were scored for its BLB disease severity using IRRI-Standard Evaluation System for Rice (SES) scale based Table 1. The severity measured the length of the blight to determine the extent of the disease. Observation begins at the same time as

Table 1. Score of HDB Disease Severity in Rice

Scale	Symptom Extent of Leaf Area Scale (%)
0	0 No attack
1	Attack 1–5
3	Attacks 6–12
5	Attacks 13–25
7	Attack 26–50
9	Attack 51–100

disease occurrence. The severity of the disease is calculated by the formula Towsend and Hueberger (1943) in [23]:

$$I = \frac{ni \times vi}{Z \times N} \times 100\%$$

I = illness severity
ni = how many diseased leaves there are in each category.
vi = a score (number) for each attack category
Z = the highest assault category's scale value
N = observed leaves in number

2.3 Data Analysis

Parameter observed in this research were disease development such as incubation time (observed when the first symptoms of bacterial blight disease appear), disease incidence and disease severity. ANOVA was used to evaluate the data at the 0.05 level of probability. Least Significance Difference (LSD) was used to examine the difference between two means at the 0.05 level of probability. Statistics 8 Software was used for all of the analysis. Utilizing the formula of, effectiveness of all therapies for control was also calculated [24].

3 Result and discussion

3.1 Compability Between Rhizobacteria and Viability in Storage

The results of the compatibility test between bacteria showed that there was no lysis at the intersection of each bacterium. These results indicate that the bacteria *B. cereus* AJ 3.*4, S. pavanii* KJKB 5.4, and *S. malthophilia* LMTSA 5.4 are compatible with each other, combining them to form a consortium. These rhizosphere bacteria live together with other organisms to develop a mutually dependent relationship. According to [25], rhizobacteria that live on the same medium will produce various kinds of certain compounds that other bacteria can utilize in the media. In the bacteria in the consortium, there is a mutual symbiotic relationship between each group of bacteria. One of the simplest forms of

Table 2. Population of rhizobacteria in liquid medium with different storage times

Consortium	Bacterial Population/Weeks (CFU/ml)			
	0 weeks	2 weeks	4 weeks	6 weeks
A	6,5 × 107	12,7 × 10^7	23,8 × 10^7	10,8 × 10^7
B	18,8 × 10^7	35,5 × 10^7	28,5 × 10^7	11,0 × 10^7
C	7,7 × 10^7	12,9 × 10^7	13,4 × 10^7	33,6 × 10^7
D	36,5 × 10^7	35,2 × 10^7	28,8 × 10^7	12,1 × 10^7

Information:
A = *S. malthophilia* LMTSA 5.4 + *S. pavanii* KJKB 5.4
B = *S. pavanii* KJKB 5.4 + B. cereus AJ 3.4
C = *S. malthophilia* LMTSA 5.4 + B. cereus AJ 3.4 equals C.
D = is equal to *S. pavanii* KJKB 5.4, *S. malthophilia* LMTSA 5.4, and B. cereus AJ 3.4.

mutualist symbiosis is cross-feeding, where the growth of one bacterium depends on the development of the other because the two bacteria need each other's essential growth factors, which are excreted by each bacterium.

The total population of rhizobacteria in each consortium after being stored for six weeks showed a stable condition in the range of 10^7 cells/ml (Table 2). The ability of rhizobacteria to survive up to 6 weeks is thought to be related to the nutrient content of the media consisting of a mixture of organic waste coconut water, molasses, and golden snail extract. The mix of the three organic materials contains macro and microelements that are important for bacterial growth. According to [17], coconut water waste media + 5% gold snail meat extract contains 17.10% C-Organic composition, N-Total 1.96%, P-Total 0.878%, 29.48% organic matter, almost similar to Luria Bertani media.

The results of [26] state that coconut water media is the right formula for producing liquid bio-fertilizers rather than the tofu wastewater formula and the Politkovskaya formula. Coconut waste water media the viability of bacteria is higher up to 60 days of storage. The high population of bacterial growth is because coconut water contains many carbon sources that bacteria can use for their proliferation to survive for a long time. In this study, a consortium of rhizobacteria stored for six weeks also showed the highest effectiveness in stimulating the growth of rice plants. The bacterial population in the formula for 107 cells/ml after six weeks of storage.

3.2 The Results of the Rhizobacteria Consortium on the Development of Bacterial Leaf Blight in Rice Plants

3.2.1 Incubation Period of Pathogenic Bacteria Xanthomonas Oryzae Pv Oryzae

The treatment of the rhizobacteria consortium showed no significant effect on the incubation period of Xoo when compared with negative controls. The incubation period of Xoo in treated rice plants ranged from 3.00–3.85 days (Table 3). The bactericidal treatment showed an incubation period of 3.85 days after inoculation with effectiveness of 28.44%. Treatment D (*S. pavanii* KJKB 5.4 + *S. malthophilia* LMTSA 5.4 + B. cereus AJ) that

Table 3. The incubation period of *Xoo* in rice plants introduced by a consortium of rhizobacteria in a liquid formula with different storage times

Treatment		Incubation Period (Day)	Effectiveness (%)
Consortium bacteria	Storage time (Weeks)		
Bactericide	2	3.85 a*	28.44
D	6	3.74 ab	24.67
B	4	3.56 ab	18.56
B	4	3.52 ab	17.33
C	0	3.52 ab	17.22
D	2	3.52 ab	17.22
A	6	3.37 ab	12.33
C	0	3.33 ab	11.11
B	2	3.30 ab	9.89
B	4	3.22 ab	7.33
D	4	3.22 ab	7.33
A	0	3.15 ab	4.89
A	6	3.08 ab	2.44
D	6	3.08 ab	2.44
A	0	3.00 b	0.00
C	2	3.00 b	0.00
C		3.00 b	0.00
Control –		3.00 b	0.00

Information:
*The LSD test at the 5% level finds no statistically significant difference between numbers in the same column that are followed by the same letter.
A = *S. malthophilia* LMTSA 5.4 + *S. pavanii* KJKB 5.4
B = *S. pavanii* KJKB 5.4 + B. cereus AJ 3.4
C = *S. malthophilia* LMTSA 5.4 + B. cereus AJ 3.4 equals C.
D = is equal to *S. pavanii* KJKB 5.4, *S. malthophilia* LMTSA 5.4, and B. cereus AJ 3.4

was kept for two weeks demonstrated an incubation period of Xoo 3.74 days after inoculation with effectiveness of 24.67%. Then treatment A (Treatment C *(S. malthophilia* LMTSA 5.4 + *B. cereus* AJ 3.4) without storage and two weeks of storage revealed that *S. pavanii* KJKB 5.4 + *S. malthophilia* LMTSA 5.4 was stored for six weeks. a faster incubation period 3,00 days. According to [27], bacteria's incubation period after being inoculated on the host plant is influenced by several factors, namely pathogenic bacteria, host plant, and environmental conditions. Inoculum density is a crucial factor for successful inoculation. The minimum concentration of pathogen required to induce infection is 10^3 CFU/ml. If the concentration of pathogenic bacteria is higher, it will speed up the incubation period.

3.2.2 Incidence and Severity of Bacterial Blight Disease

The rhizobacteria consortium showed a significantly different effect on the severity of BLB disease. The severity of BLB disease ranged from 41.15–85.70% (Data in Table 4).

A total of three consortiums of rhizobacteria showed the severity of BLB disease under bactericidal treatment, with a disease intensity value of 41.15%-47.16%. Consortium (*S. malthophilia* LMTSA 5.4 + S. pavanii KJKB 5.4) with a shelf life of 6 weeks showed a disease severity value of 41.15%, significantly different from the negative control with a suppression effectiveness value of 52.04%; Consortium B. cereus AJ 3.4 + *S. pavanii* KJKB 5.4 + *S. malthophilia* LMTSA 5.4 = D. showed a disease severity value of 43.93% with a disease suppression effectiveness of 48.77%; and consortium B. cereus AJ 3.4 + S. malthophilia LMTSA 5.4 = C. showed a diseases severity value of 47.16 and effectiveness 47.16%. This treatment were efficient in preventing the spread of the disease, presumably due to the activity of antimicrobial compounds from the rhizobacteria consortium that could inhibit or kill Xoo. Negative control indicated that the plant could not suppress the development of the disease and would cause more severe damage. Treatment with a consortium of rhizobacteria was able to suppress disease progression by slowing down the period of symptom onset and suppressing disease severity.

The rhizobacteria used in this study were selected bacteria from the results of previous studies. [28] reported that *S. malthophilia* produced secondary metabolites such as HCN and siderophores. HCN is a secondary metabolite compound that is antimicrobial. Siderophores are organic compounds that can bind Fe elements so that they are not available to pathogens. The rhizobacteria's ability to suppress BLB diseases in rice plant was assumed this bacteria produce siderophores and HCN. Several researchers reported that the bacteria Stenotrophomonas sp. Has been used as a bio-control agent because it contains antimicrobial secondary metabolites. [29] reported that *S. malthophilia* LMTSA 5.4 was the best isolate in inhibiting the development of the fungus Fusarium verticillioides on corn plants, and *S. pavanii* KJKB5.4 isolate was able to suppress the severity of corn cob rot disease. Bacillus sp. Has also been widely reported as a bio-control agent. These bacteria can be used as biological control agents because they can produce secondary metabolites such as antibiotics, chitinase enzymes, mycobacillin, bacitracin, and produce siderophores. According to [30], *B. cereus* UW85 strain had several antibiotics such as zwittermicin and kanosamine which could suppress various plant pathogens. According to [31], genus Bacillus can produce siderophores, bacteriocins, and other volatile compounds and stimulate plant growth.

Information:

*numbers with the same letter in the following column are not statistically different when tested using the LSD method at the 5% level.

A = *S. malthophilia* LMTSA 5.4 + *S. pavanii* KJKB 5.4

B = *S. pavanii* KJKB 5.4 + B. cereus AJ 3.4

C = *S. malthophilia* LMTSA 5.4 + B. cereus AJ 3.4 equals C.

D = is equal to *S. pavanii* KJKB 5.4, *S. malthophilia* LMTSA 5.4, and B. cereus AJ 3.4

3.3 Effect of Rhizobacteria Consortium for Rice Plant Growth

The rhizobacteria consortium showed no significant effect on plant height when contrasted to the control. Rice plant height ranged from 77.15–66.11 cm (Table 5). However, the consortium of rhizobacteria D (*S. pavanii* S. malthophilia LMTSA 5.4 + B. cereus

Table 4. The rhizobacteria consortium was introduced, BLB illness in rice plants increased in frequency and severity.

Consortium bacteria	Storage time (Weeks)	Disease Incidence (%)	Disease Severity (%)	Effectiveness of Disease Severity (%)
Control -	0	100.00	85.70 a	0,00
A	2	100.00	69.66 ab	18.67
A	2	100.00	62.63 bc	26.95
C	4	100.00	60.16 bcd	29.75
A	0	100.00	57.27 bcd	33.14
B	6	100.00	56.73 bcd	33.84
C	6	100.00	56.66 bcd	33.84
B	2	100.00	54.50 bcd	36.41
B	6	100.00	53.68 bcd	37.34
D	4	100.00	51.39 bcd	40.02
D	4	100.00	49.74 cd	42.01
B	0	100.00	48.63 cd	43.29
D	0	100.00	48.17 cd	43.76
C	4	100.00	47.41 cd	44.69
Bactericide	2	100.00	47.37 cd	44.69
C	6	100.00	47.16 cd	44.92
D		100.00	43.93 cd	48.77
A		100.00	41.15 d	52.04

AJ + KJKB 5.4 3.4) stored for six weeks showed a significantly different effect on root length when compared to the positive control, which was 30.16 cm with effectiveness of 41.41%. Consortium A (*S. pavanii* KJKB 5.4 + *S. malthophilia* LMTSA 5.4), stored for two weeks, showed the lowest effect of 21.33 cm (Table 6). Rhizobacteria from the Stenotrophomonas and Bacillus groups can create substances that can promote plant development., such as having growth hormone IAA, dissolving phosphate, and nitrogen binding. According to the results of research by [16], *Stenotrophomonas pavanii* is a nitrogen-fixing bacterium. Bacteria from the Bacillus group can produce formic acid, acetic acid, and lactic acid, which can dissolve the phosphate form to be easily absorbed by plants [32].

The consortium C (The four-week-old *S. malthophilia* LMTSA 5.4 + *B. cereus* AJ 3.4) was the best treatment compared to other treatments. Based on the growth curve of the bacterial population (Fig. 1), cosortium B. cereus AJ 3.4 + S. malthophilia LMTSA 5.4 = C, showed an increasing graph until the sixth week of storage. According to [33], the consortium bacteria was followed by an increase in the metabolic rate of these bacteria. [34] states that the increase in the rate of bacterial growth is directly proportional to the rise in the rate of bacterial metabolism. An increase follows the rise in the number of bacteria in the production of IAA. It is suspected that the consortium C (*S. malthophilia* LMTSA B. cereus AJ + 5.4 3.4), which was for four weeks in storage was the best treatment for all parameters observed for rice plant growth.

Table 5. Height of rice plants introduced by the rhizobacteria consortium

Treatment		Plant height (cm)	Effectiveness (%)
Consortium bacteria	Storage time (weeks)		
B	6	77.15 a	3.65
C	4	76.77 ab	3.14
C	2	76.72 ab	3.06
C	6	75.03 abc	0.79
Control +	6	74.44 abcd	0.00
D	6	73.55 abcde	−1.19
A	2	71.99 abcdef	−3.30
B	4	71.88 abcdef	−3.43
B	0	71.61 bcdef	−3.80
C	4	70.99 cdefg	−4.63
A	0	70.83 cdefg	−4.85
A	0	70.77 cdefg	−4.92
D	2	69.66 defg	−6.42
A	0	68.27 efg	−8.29
B	4	67.07 fg	−9.89
D	2	66.77 fg	−10.30
D		66.11 g	−11.19

Information:
*numbers with the same letter in the following column are not statistically different when tested using the LSD method at the 5% level.
A = *S. malthophilia* LMTSA 5.4 + *S. pavanii* KJKB 5.4
B = *S. pavanii* KJKB 5.4 plus B. cereus AJ 3.4
C = *S. malthophilia* LMTSA 5.4 plus B. cereus AJ 3.4 equals C.
D = is equal to *S. pavanii* KJKB 5.4, *S. malthophilia* LMTSA 5.4, and B. cereus AJ 3.4

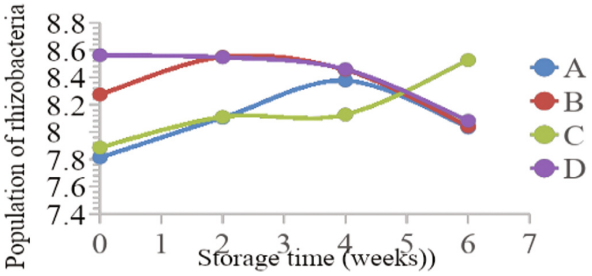

Fig. 1. Bacterial population growth curve of each treatment at different storage times

According to [28], *Stenotrophomonas malthophilia* bacteria can dissolve phosphate, produce IAA, produce auxin, organic acids, nitrogen fixation, zinc dissolution, production of ACC Deaminase, hydrogen cyanide, siderophore production, and potassium solubilization. In addition to the influence of rhizobacteria, the organic material used for formula making is thought to be a factor that stimulates the growth of rice plants. Coconut

Table 6. Root length of rice plants introduced by the rhizobacteria consortium

Treatment		Root Length (cm)	Effectiveness (%)
Consortium bacteria	Storage time (weeks)		
D	6	30.16 a	41.41
B	6	26.83 ab	25.78
D	0	26.50 ab	24.22
A	0	26.33 ab	23.44
A	4	26.33 ab	23.44
C	2	26.00 ab	21.88
C	4	25.66 ab	20.32
B	4	25.00 ab	17.19
C	0	23.83 b	11.72
D	2	23.33 b	9.38
C	6	23.00 b	7.81
A	6	22.83 b	7.03
D	4	22.50 b	5.47
B	2	22.16 b	3.91
B	0	21.83 b	2.34
A	2	21.33 b	0.00
Control +		21.33 b	0.00

Information:
*numbers with the same letter in the following column are not statistically different when tested using the LSD method at the 5% level.
A = *S. malthophilia* LMTSA 5.4 + *S. pavanii* KJKB 5.4
B = *S. pavanii* KJKB 5.4 plus B. cereus AJ 3.4
C = *S. malthophilia* LMTSA 5.4 plus B. cereus AJ 3.4 equals C.
D = is equal to *S. pavanii* KJKB 5.4, *S. malthophilia* LMTSA 5.4, and B. cereus AJ 3.4

water is one of the organic ingredients used in the manufacture of rhizobacteria liquid formula. Coconut water has a mineral composition and growth hormone gibberellin [35] to support plant growth.

4 Conclusion

The population of a consortium of rhizobacteria stored for six weeks was around 10^7 cells/ml. Consortium of rhizobacteria A (After being kept for six weeks, *S. pavanii* KJKB 5.4 and *S. malthophilia* LMTSA 5.4) can suppress the development of BLB disease with a disease intensity of 41.15% with an effectiveness of 52.04%. Consortium D (*B. cereus AJ* + *S. pavanii* KJKB 5.4 + *S. malthophilia* LMTSA 5.4 3.4) kept for a month gave a significantly different impact on root length with 30.16% control with 41.41% effectiveness.

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