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RESEARCH PAPER

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Growth and yield of red chili pepper (*Capsicum annuum* L.) by seed treatment with rhizobacteria as a plant growth promoting

Ratnawati*[1], Syamsuddin[1], Syafruddin[1]

[1]*Department of Agroecotechnology, Faculty of Agriculture, Syiah Kuala University, Darussalam, Banda Aceh, Indonesia*

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Key words: Isolate, Varieties, plant height, crop production.

Abstract

Seeds are one of the main components in agricultural production systems. Seeds are demanded superior and high quality in order to produce high production. The use of low quality seeds and infectious diseases is one of the causes of low yield productivity. Seed treatment using biological agents or biological extract (biofungiside seed treatment) is an alternative as a substitute for synthetic chemicals in seed treatment. This study aims to determine the role of rhizobacteria as a driver of plant growth to growth and production. The research was conducted at the Laboratory of Seed Science and Technology and Plant Disease Pest Laboratory and Experimental Garden of Department Agrotechnology of Faculty of Agriculture, Syiah Kuala University of Darussalam Banda Aceh, from June to December 2017. This experiment used a randomized block design with a factorial pattern of 2 x 8 with 3 replications. Observations on growth parameters of vegetative plant, pre planting seed treatment using isolate rhizobacteria *Flavobacterium* sp. Relatively better than the treatment of pre planting seeds with other isolate. Pre-planting seed treatment using isolate Rhizobacteria *Azotobacter* sp. Effectively able to increase the yield of pepper plant based on the number of fruit production per plant. Chili varieties used to influence vegetative growth and plant reproduction. The varieties of PM999 are superior to the Kiyo F1 variety, both to vegetative and reproductive growth.

* **Corresponding Author:** Ratnawati ✉ ratna.agroekotek@gmail.com

Introduction

Seeds are one of the main components in agricultural production systems. Seeds are demanded superior and high quality in order to produce high production. The use of low quality seeds and infectious diseases is one of the causes of low yield productivity. Fungi or mushrooms are the main group of pathogenic pathogens (*seed born*) or transmitted through seed. Diseases caused by these fungi are critical both in the field, during transit and in storage. The quality and quantity of production can be reduced to 100% by fungus-induced disease (AVRDC, 2011).

Control of the disease of broke sprouts in red chili plants are often done by farmers with synthetic fungicides. Disease control in this way has a negative impact and new problems. Some examples include the death of non-target organisms that lead to reduced biodiversity and disruption of natural ecosystems. Use of high quality and pathogen-free seeds and seed protection through seed treatment is a new strategy for controlling the pathogenic fungus *Pythium sp* causes of disease sprout sprouts in red chili plants. The availability of pathogen-free seed is very important. One attempt to eliminate the pathogen carried by seeds and disease incidence, required preliminary treatment on seed (Maude, 2006; Brandl, 2001).

Seed treatment using biological agents or biological extract (biofungiside seed treatment) is an alternative as a substitute for synthetic chemicals in seed treatment. Biological seed treatment is a seed treatment performed by using one or more organisms other than humans to reduce the amount of inoculum or activity generating the disease of a pathogen (Cook & Baker, 1983; Baker, 19 72). Roots are the source of life, the roots can occur air exchange, nutrients, decomposition. Many micro-organisms found at the root that are able to keep plants alive and thrive. In the roots can be found antagonistic agents, such as rhizobacteria act as a promoter of plant growth (Plant Growth Promoting Rhizobacteria) which is a bacterium that lives around the roots of plants, live in colonies enveloping plant roots. The existence of these microorganisms is very good and gives an advantage in the process of physiology and plant growth. Harman *et al.* (1989) reported that biological seed treatment can colonize plant root systems and control disease disorders effectively. The results showed that red chili seeds treated with biocontrol agents resulted in higher growth and production in greenhouses and were more resistant to *P. capsici* (Syamsuddin 2009).

We know that crop protection as an integral part of the overall agricultural ecosystem management system to produce productivity growth and seed quality, the control of plant-disturbing organisms by utilizing biological resources (rhizobacteria) is a priority that needs to be developed. Therefore, this study aims to determine the role of rhizobacteria as a driver of plant growth on growth and production.

Materials and methods

Location and time of research

The research was conducted at the Laboratory of Seed Science and Technology and Plant Disease Pest Laboratory and Experimental Garden of Department Agrotechnology of Faculty of Agriculture, Syiah Kuala University of Darussalam Banda Aceh. From June to December 2017.

Experimental material

The tools used in this research are *autoclave*, *cleane band,* analytical scales, *spectrophotometer*, electric oven, binocular microscope, incubation room, bunsen lamp, petri dish, test tube, erlenmeyer, measuring cup, gas stove, ose needle, tweezers, growth rack, tillage equipment and other equipment needed in this research. Materials used in this study is chili seed PM999 and Kiyo F1 varieties, seed-borne pathogen isolate *(Phytium,* sp.), Rhizobacteria, medium *Potato Dextrose Agar* (PDA), alcohol 96%, 2% sodium hypochlorite solution, aquades, spirtus, soil, manure, SPA media, TSA media (tryptic soy jelly), King' B media, NA media (jelly nutrient), black silver plastic mulch, fertilizer, pesticide and other materials necessary for the conduct of this research.

Experimental design

Experimental effect of seed treatment with rhizobacteria of plant growth promoters using a randomized block design in a factorial pattern.

Varieties used consisted of 2 varieties, namely Varieties PM999 (V_1) and Kiyo F1 Varieties (V_2). Treatment of Rhizobacteria consists of 8 isolate, ie. Control, *Azotobacter* sp., *B. Megaterium, P. dimuta, B. alvei, Flavobacterium* sp., *B. coagulans, B. firmus,* and *B. Pilymixa*. In comparison also the unsealed seeds of the seeds with rhizobacteria as control. Each treatment was repeated 3 times so that overall there were 57 experimental units.

Research procedure

Prior to planting, the seeds of pepper seedlings are sown at 20x1 0x5cm boats. Seedlings moved to the field after 4 weeks of age. Planting medium used is a mixture of soil and manure (1: 4v/v). Fertilization is done 5 times, the first fertilizer is given simultaneously with the planting time with the dosage of NPK Mutiara Naramilla 2kg/200 liters of water (leak system), while the second fertilization is done after the plant is 4 weeks old with a dose of NPK Mutiara 4kg/200 liters of water. Then fertilization is done every 2 weeks with a dose of 4kg/200 liters. The variables observed were height and diameter of plant stems 30 and 45 days after planting (DAP), number of branches (30 DAP) and number of productive branches per plant age 60 DAP, amount of flower (60 DAP) and number of fruits per plant 5 times the harvest). The data obtained then analyzed using Analysis of variance (Anova), if there is a significant effect on the treatment, further test with DMRT 5% are performed.

Result and discussion

Plant Vegetative Growth

The result of variance analysis showed that vegetative growth of red chili plant from each of the tested varieties gave different responses to the seed treatment using various rhizobacteria isolate in pre germination especially on plant height variables 30 days after planting move (DAP). While in the height variable of plant age of 45 DAP both varieties of red chili were tried to give the same response to pre-plant treatment using various types of rhizobacteria. The result of variance analysis on stem diameter variable of age 30 DAP, also showed that both varieties of chili tried not give different response although given pre seed treatment with different type of rhizobacteria. However, the observation of diameter of 45 DAP occurred different things, namely the two varieties produce different stem diameters due to pre-plant seed treatment with different types of rhizobacteria as plant growth promoting.

The influence of single factor of pepper varieties on vegetative growth was observed, the result of variance analysis showed that varieties had significant effect on plant height of 30 DAP and stem diameter of 45 DAP. While the height of plant age of 45 DAP and stem diameter of 30 DAP age is not significantly influenced by the treatment of varieties. While the effect of single rhizobacteria factor given on pre plant treatment of vegetative growth, the result of variance analysis showed that the treatment had a significant effect on plant height of 30 DAP, stem diameter of 30 and 45 DAP. However, height of plant age of 45 DAP was pre- rhizobacteria do not have a significant effect.

The average height and diameter of chili pods aged 30 and 45 days after planting (DAP) in two varieties for each pre-plant seed treatment with various types of rhizobacteria as plant growth promoting are presented in Tables 1 and 2.

From Table 1 it can be seen that the differences of rhizobacteria isolate used in pre-plant seed treatment were followed by different values of different vegetative growth parameters of chili plants. Pre-planting seed treatments on the PM999 using isolated Rhizobacteria varieties *flavobacterium* sp. giving higher plant growth of 30 DAP higher than control and seed treatment with other rhizobacteria species. However, the increase in plant height has not been statistically significant. While the high growth of Kiyo F 1 varieties, the result of vegetative was higher in seeds that received rizobacteria treatment than without treatment except in the treatment of *B. pilymixa* isolate *rhizobacteria*. As well as in the PM999 varieties the plant's high growth is not statistically significant. Table 1 show that the measured stem diameter of both chrysanthemum varieties gave different responses to pre-plant seed treatment using rhizobacteria. All rhizobacteria isolate were tested in pre-seed treatment, effectively increasing the diameter of chili rods at age 45 DAP on PM999 varieties, when compared to seeds without treatment. The highest value obtained in pre-planting seed treatments using isolated *flavobacterium* sp. The same thing was also obtained on Kiyo varieties F 1, that the pre-planting seed treatments effectively enhance stem diameter increment age 45 DAP, only vegetative higher values obtained in a seed treatment using isolated *Azotobacter* sp.

Table 1. Average Plant Height Two Varieties of Chili Pre-seed germination Treatment Using Rhizobacteria as Plant Growth Promoting.

Rhizobacteria isolate	Plants Height (30 HST)			Plants Height (45 HST)		
	PM999 (V_1)	Kiyo F1 (V_2)	Average	PM999 (V_1)	Kiyo F1 (V_2)	Average
Control	31.80bc	24.72a	28.26ab	51.28	49.11	50.20 a
Azotobacter sp.	29.62abc	29.17abc	29.40a	64.46	74.41	69.44 a
B. megaterium	26.04ab	27.00ab	26.52ab	47.35	53.01	50.18 a
P. dimuta	29.86abc	28.97abc	29.42a	59.48	60.61	60.05 a
B. alvei	30.95abc	26.29ab	28.62ab	56.28	74.75	65.52 a
Flavobacterium sp.	33.76c	26.16ab	29.96a	69.81	64.01	66.92 a
B. coagulans	31.70bc	26.81ab	29.26ab	49.08	42.29	45.69 a
B. firmus	27.12abc	24.70a	25.91b	67.21	68.21	67.72 a
B. pilymixa	30.40abc	26.40ab	28.40ab	49.01	52.21	50.62 a
DMRT 0,05	30.14A	26.69B		57.11A	59.85A	

Description: The numbers followed by the same letter in the same column (lower case) and the same line (capital letter) are not significantly different at the DMRT test level of 5%.

Table 2. Mean of Stem Diameter Two Varieties of Red Chili Pre-seed germination Treatment Using Rhizobacteria as Plant Growth Promoting.

Rhizobacteria Isolate	Stem Diameter (30 HST)			Stem Diameter (45 HST)		
	PM999 (V_1)	Kiyo F1 (V_2)	Average	PM999 (V_1)	Kiyo F1 (V_2)	Average
Control (R_0)	6.39	5.92	6.15 ab	8.64c	7.04a	8.29 g
Azotobacter sp. (R_3)	5.78	6.66	6.22 ab	10.11h	9.65efg	9.88 b
B. megaterium (R_7)	5.11	5.64	5.38 b	9.15d	8.38b	8.76 f
P. dimuta(R_8)	5.50	6.10	5.80 ab	10.08h	9.24d	9.66 c
B. alvei(R_{12})	6.33	6.04	6.18 ab	9.67fg	9.45def	9.56 c
Flavobacterium sp. (R_{13})	7.00	6.16	6.58 a	11.84i	9.29de	10.56 a
B. coagulans (R_{14})	6.10	5.58	5.83 ab	10.16h	8.50bc	9.33 d
B. firmus(R_{15})	6.63	6.07	6.35 ab	.97gh	9.20d	9.58 c
B. pilymixa (R_{16})	6.37	6.14	6.26 ab	.90gh	8.26b	9.08 e
DMRT 0,05	6.13A	6.03A		9.94A	8.88B	

Description: The numbers followed by the same letter in the same column (lower case) and the same line (capital letter) are not significantly different at the DMRT test level of 5%.

From Table 1 it can be seen that the vegetative growth of red chili plant based on the height variables of the plant age of 30 DAP with significant varieties of PM999 resulted in higher plant height than the Kiyo F varieties. Nevertheless, in observation of plant height of 45 DAP, both varieties did not give significant difference of plant height growth. Similarly, the diameter of chrysanthemum stems of PM999 varieties, especially at age 45 DAP, was significantly greater than that of Kiyo F 1 (Table 2). Pre-planting seed treatment using different types of rhizobacteria was followed by vegetative growth of different plants to both plant height and plant stem diameter. Pre-plant seed treatment using rhizobacteria isolate *Azotobacter* sp., *Flavobacterium* sp., And *B. coagulans* resulted in higher plant growth at a higher 30 DAP, although statistically significant increases were not significant (Table 2). The result of the measurement of stem diameter of 30 DAP, seeds treated with pre-planted rhizobacteria, had a positive impact especially on some rhizobacteria species, although not statistically (Table 2). Nevertheless, on the measurement of stem diameter of 45 DAP, the stem diamaeter of pepper plant originated from pre-planted seeds using Rhizobacteria was greater compared to the untreated seed (control).

All rhizobacteria isolate used effectively increase plant growth based on stem diameter.

Parameter of Crop Production

The results of the analysis of variance showed that based on the production parameters of red pepper plants from each of the tested varieties gave the same response to the treatment of rizobacteria isolate used in pre-seed germination treatment. All observed production parameters did not show significant differences in values of both varieties tested for differences in rhizobacteria isolate used in pre-seed germination treatment. However, the result of analysis of variation of influence of single factor varieties significantly influence to crop production based on component of production parameter that is number of fruit per plant age 45 DAP. The result of variance analysis also showed that single factor of pre-seed germination treatment using rhizobacteria species had no significant effect on all parameters of plant reproduction observed by variables of number of branches per plant, number of productive branches, number of flowers and number of fruit per plant 45 days after planting.

The average number of branches per plant (30 DAP), the number of productive branches and the number of flowers (60 DAP) and the number of fruits per plant (5 crops) in each of the red chili seed treatment with various species of plant growth rhizobacteria are presented in Table 3 and 4. Table 3 shows that pre-planting seed treatment using 8 rhizobacteria isolate did not provide an increase in the value of red chili plant production parameters observed based on the number of branches of age 30 DAP and number of productive branches until age 60 DAP, as well as the number of flowers aged 60 DAP. However, on the number of fruits per plant (5 crops), pre-planting seed treatment using rizobacteria significantly increased the number of fruits per plant, especially in some rhizobacteria (Table 3). From Table 3 it can also be seen that the response of varieties to the treatment of rhizobacteria was also different based on the number of chili pods per plant. There were 5 rhizobacterialisolate that effectively increased the number of fruits per plant on the PM999 variety compared to the control treatment, ie *Azotobacter* sp., *P. dimuta*, *Flavobacterium* sp., *B. firmus*, and isolate *B. pilymixa*. The highest number of fruit crops was obtained in pre-planting seed treatment using rhizobacteria from isolate *Flavobacterium* sp. While for Kiyo F_1 varieties of Rhizobacteria isolate that effectively increased the number of fruit per plant there were also 5 isolate, beside isolate *Azotobacter* sp., *P. dimuta*, and *B. firmus*, also isolate *B. megaterium*, and *B. alvei*. The highest amount of fruit was obtained in pre-plant seed treatment using *rhizobacteria* isolate *B. alvei*.

From Table 4 it can also be seen that both varieties were tested to see the response of chili plants to the treatment of seeds using Rhizobacteria, it turns out that both varieties provide different responses to seed treatment based on the number of fruit per plant. The PM999 variety provides an excellent response to the treatment of seeds using rhizobacteria compared to Kiyo F_1 varieties. This is as evidenced by the results of the measurements of the variables of fruit per plant, that the varieties of PM999 are significantly higher than that of Kiyo F_1 varieties.

The varieties of PM999 produce an average number of fruit per plant of 53.07 pieces, while Kiyo F_1 variety only produces an average number of fruit per plant of 44.05 pieces. The effect of a single factor of rhizobacteria treatment, also shows differences in the number of fruits per plant due to different types of rhizobacteria. The number of fruits per plant was significantly higher in pre-plant seed treatment using the *Azotobacter* sp. *Rhizobacteria* isolate, *P. dimuta*, *B. alvei*, and *B. firmus*.

The average weight of fruit consumption per plant (total of 5 harvests) in each of the treatment of red chili seedlings with various species of rhizobacteria as plant growth promoting is presented in Table 5.

Table 5 shows that both varieties were tested to see the response of chili plants to the treatment of seeds using rhizobacteria, in fact both varieties gave the same response to the seed treatment based on the consumption weight of the fruit.

Although relative varieties of PM999 provide a better response to the treatment of seeds using Rhizobacteria than Kiyo F_1 varieties based on the weight of consumption.

This is as evidenced by the results of the measurements of the variables of fruit per plant, that the varieties of PM999 are significantly higher than that of Kiyo F_1 varieties. The effect of single factor of rhizobacteria treatment, also showed differences in the weight of fruit consumption per plant due to different types of rhizobacteria. Higher fruit consumption per plant significantly higher in pre-plant seed treatment using rhizobacteria isolate *Azotobacter* sp., *P. dimuta*, *B. alvei*, and *B. firmus*. These results indicate that the four isolate Rhizobacteria the same effect as in the previous variables that is on the variable of the number of flowers and the number of fruits per plant. It can be concluded consistently isolate rhizobacteria is a positive impact to increase the weight of fruit consumption per plant.

The results of this study can be concluded that Rhizobacteria used in pre germination treatment showed its role as rhizobacteria plant growth promoting, both in vegetative growth phase and in reproduction phase. Theoretically the production level of a plant depends on how the condition of vegetative growth. The role of plant growth rhizobacteria in the vegetative growth phase in this study was also contributed to the reproductive phase of the plant. Effective rhizobacteria group in the reproductive phase is also suspected to be associated with the ability of Rhizobacteria as rhizobacteria spur growth plant. One rhizobacteria character who acts as a spur plant growth is to have the ability to produce growth regulators (auxin, gibberellin, and cytokines), nitrogen fixation and the ability to dissolve phosphates and induce systemic resistance to disease attacks. As has been stated previously that rizobakteri has been acting as a trigger of plant growth since the process of germination, seedling growth, and vegetative growth.

Observations on the reproductive phase of plants, the influence of single factor varieties, also turns out that the varieties of PM999 are superior to the Kiyo F1 varieties. This is as indicated by the results of the measurement of the number of fruits per plant. The number of fruits per plant measured at age 45 DAP, PM999 varieties yielded an average of 52 fruits per plant, while Kiyo varieties produce only 43 fruits per plant. These results are the same as the results of vegetative growth parameter measurements, where the PM999 variety is better than the Kiyo F1 varieties. The difference in results is also thought to be related to the genetic character of the variety.

Table 3. Average Number of Branches (30 DAP) and Number of Productive Branches Per Plant Age 60 DAP Two Varieties of Red Chili Pre-seed germination Treatment Using Rhizobacteria as Plant Growth Promoting.

Rhizobacteria isolate	Number of Branches (peace)			Number of Productive Branches (peace)		
	PM999 (V_1)	Kiyo F1 (V_2)	Average	PM999 (V_1)	Kiyo F1 (V_2)	Average
Control (R_0)	50.40	48.46	49.43 a	49.13	50.80	49.97 a
Azotobacter sp. (R_3)	61.46	74.40	67.93 a	59.00	72.33	65.67 a
B. megaterium (R_7)	48.60	53.40	51.00 a	45.60	51.40	48.50 a
P. dimuta(R_8)	63.26	60.60	61.93 a	57.86	54.40	58.14 a
B. alvei(R_{12})	54.46	80.46	67.47 a	53.26	73.26	63.17 a
Flavobacterium sp. (R_{13})	69.46	64.86	67.17 a	67.26	62.20	64.74 a
B. coagulans (R_{14})	47.46	37.20	42.33 a	46.66	33.20	39.94 a
B. firmus(R_{15})	65.46	68.53	67.00 a	64.40	69.13	66.77 a
B. pilymixa (R_{16})	44.20	52.56	48.23 a	42.93	49.93	46.43 a
DMRT 0,05	56.08A	60.02A		54.01A	57.85A	

Description: The numbers followed by the same letter in the same column (lower case) and the same line (capital letter) are not significantly different at the DMRT test level of 5%.

Table 4. Average Number of Flowers (60 DAP) and Number of Plant Fruit (5 harvests) on Two Varieties of Red Chili Pre-seed germination Treatment Using Rhizobacteria as Plant Growth Promoting.

Rhizobacteria isolate	Number of Flower (peace)			Number of Fruit (peace)		
	PM999 (V_1)	Kiyo F1 (V_2)	Average	PM999 (V_1)	Kiyo F1 (V_2)	Average
Control (R_0)	50.40	52.20	51.30	47.83 f	39.96 c	43.89 d
Azotobacter sp. (R_3)	60.33	73.53	66.93	60.70 m	55.50 k	58.10 a
B. megaterium (R_7)	46.46	52.15	49.30	43.03 d	42.90 d	42.96 e
P. dimuta(R_8)	58.60	59.53	59.16	57.70 l	48.56 g	53.13 b
B. alvei(R_{12})	55.41	73.86	64.63	45.43 e	57.30 l	51.36 c
Flavobacterium sp. (R_{13})	68.93	63.13	66.03	70.56 n	35.43 b	52.99 b
B. coagulans (R_{14})	48.20	38.07	43.14	47.96 fg	32.90 a	40.43 f
B. firmus(R_{15})	66.33	67.33	66.83	53.56 j	52.70 i	53.13 b
B. pilymixa (R_{16})	48.13	51.33	49.73	50.83 h	34.83 b	42.83 e
DMRT 0,05	55.86A	59.03A		53.07A	44.05B	

Description: The numbers followed by the same letter in the same column (lower case) and the same line (capital letter) are not significantly different at the DMRT test level of 5%.

Table 5. Average Weight of Fruit consumption per plant (g) on Two Varieties of Red Chili Pre-seed germination Treatment Using Rhizobacteria as Plant Growth Promoting.

Rhizobacteria isolate	Weight of Fruit consumption per plant (g)		
	PM999 (V_1)	Kiyo F1 (V_2)	Average
Control (R_0)	98.58	92.45	95.52 c
Azotobacter sp. (R_3)	128.03	132.56	130.30 ab
B. megaterium (R_7)	85.20	68.90	77.05 c
P. dimuta(R_8)	108.21	105.95	142.20 a
B. alvei(R_{12})	103.65	138.16	104.80 bc
Flavobacterium sp. (R_{13})	151.76	73.08	112.42 a
B. coagulans (R_{14})	105.72	174.06	89.40 c
B. firmus(R_{15})	133.14	73.42	153.06 a
B. pilymixa (R_{16})	114.21	92.45	93.81 c
DMRT 0,05	115.47A	113.78A	

Description: The numbers followed by the same letter in the same column (lower case) and the same line (capital letter) are not significantly different at the DMRT test level of 5%.

The results of reproduction parameter measurements due to pre planting seed treatment using rhizobacteria as plant growth promoting can generally be explained that pre planting seed treatment using various rhizobacteria species showed that of 8 rhizobacteria species tried there were 7 rhizobacteria species which relatively effectively increased the number of branches and number of productive branches. While the number of flowers and the number of fruits per plant there are 5 rizobacteria isolate that give relative effects of increased production, namely *B. megaterium*, *Azotobacter* sp., *P. dimuta*, *Flavobacterium* sp., and *B. firmus*. The highest amount of fruit was obtained in pre planting seed treatment using rhizobacteria isolate *Azotobacter* sp. with the number of fruit 58.10 pieces per plant. The same is also found in the variables of consumption weight per plant, where the isolate of *Azotobacter* sp., *P. dimuta*, *B. alvei* and *B. firmus rats* are significantly able to increase the weight of fruit per plant significantly compared to other rhizobacterial treatments.

Increased yield (amount of fruit) due to pre-planting seed treatment with plant growth-promoting rhizobacteria is a cumulative effect of improved plant growth caused by treatment with rhizobacteria. As mentioned previously, both the rhizobacteria isolate of *Azotobacter* sp., *P. dimuta*, *B. alvei*, *Flavobacterium* sp., and the *B. firmus* isolate are rhizobacteria groups that act as a catalyst for plant growth which is effective enough to increase vegetative growth of plants and yields.

In relation to differences in response to pre-planting seed treatment from both varieties, it can be concluded that the variety of PM999 is superior to the varieties of Kiyo F1, both in the vegetative growth phase and in the reproductive phase. Differences in the nature of these advantages are thought to relate to the genetic characteristics of both varieties. Each variety has different genetic characteristics that can be seen from the phenotype character. This is as has been proved in the results of previous studies, i.e. there are experiments of two different chili varieties, i.e. local chili Cipanas highest production amount obtained in the parent plant derived from seeds treated rhizobacteria *B. BSPJG20* alvei then followed by seed treatment with rhizobacteria *B. megaterium* BSKW03 and *P. putida* PSKW12. In cv TM 999, the highest number of fruit per plant obtained at the parent plant are derived from seeds treated BSKW21 rizobakteri *B. brevis,* followed by *B. alvei* BSPJG20, PSPJG05 *P. fluorescens,* and *P. putida* PSKW12 (Syamsuddin, 2011).

Conclusion

Observations on growth parameters of vegetative plants, pre planting seed treatment using isolate rhizobacteria *Flavobacterium* sp. relatively better than the treatment of pre planting seeds with other isolate. Pre planting seed treatment using isolate rhizobacteria *Azotobacter* sp. Effectively able to increase the yield of pepper plant based on the number of fruit production per plant. Chili varieties used to influence vegetative growth and plant reproduction. The varieties of PM999 are superior to the Kiyo F1 variety, both to vegetative and reproductive growth.

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