FIELD TESTING FOR THE BIOLOGICAL FERTILIZER FLOUR EFFECTIVENESS, HATAKE BRAND IN BROCCOLI PLANT

FINAL REPORT

By:
Dr. Ir. Sugiyana, Msi
Raisa Baharuddin, SP. MSi
Tri Herdiyanti, SP

In Association :

PT. Harvest Ariake Indonesia

With

Department of Agronomy and Horticulture,
IPB Agricultural Faculty of Bogor
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Applicant : PT. Harvest Ariake Indonesia

The Responsible
Head of Deparment of Agronomy and Horticultura

Dr. Agus Purwito, MSc. Agr
NIP. 19611101 198703 1 003

Bogor, August 2014

Researcher

Dr. Ir. Sugiyanta, M.Si
NIP. 1963115 198811 1 002

SUMMARY

Field Testing for the effectiveness of biological fertilizer flour from Hatake Brand for Broccoli plant. The experiment was conducted at Kebun Percobaan of IPB Pasir Sarongge, Pacet District, Cianjur, West Java as the cooperation between PT. Harvest Ariake Indonesia with the Department of Agronomy and Horticulture, Faculty of Agriculture, IPB.

PT Harvest Ariake Indonesia intends to register the biological floured-fertilizer formulation of Hatake brand In Pusat Perlindungan Varietas Tanaman dan Perijinan Pertanian, Ministry of Agriculture. To obtain a registration permit is required to test the effectiveness. In order to test the effectiveness of the Department of Agronomy and Horticulture, Faculty of Agriculture IPB was asked to perform a field test the effectiveness of biological fertilizer flour Hatake brands. Field testing for the effectiveness conducted on broccoli plants.

The materials used in this test is the broccoli seeds and biological fertilizers flour Hatake brands that has been tested its effectiveness as well as the standard NPK fertilizer. The experimental design used is a randomized block design with 4 replications. Treatment is arranged in a 7 level of fertilization, i.e. no biological fertilizer application under test but in standard NPK fertilizer (PO), standard biological fertilization of local recommendations where comparator + 1 WK (PI), 1 dose of Biological Hatake Fertilizer + 1 NPK (P2), 1 dose of Biological Hatake Fertilizer + 0.75 NPK (P3), 1 dose of Biological Hatake Fertilizer + 0.5 NPK (P4), 1 dose Biological Hatake Fertilizer +0.25 + NPK (P5), 1 dose of Biological Hatake Fertilizer (P6). The experiments were performed with four replications so that there are 28 experimental units. Each experimental unit is a plot of land with an area of 25 m^2.

From the experimental results it concluded that the biological fertilizer flour Hatake brand which is applied at a dose of 2 kg/ha it proved that generating plant

height, number of leaves, crop diameter, the results/plant and yield/ha of broccoli plants higher and much than the control treatment. Treatment of biological fertilizer flour application Hatake brand plus 1 dose of NPK fertilizer (250 kg/ha) most effective in Agronomy in terms of generating the highest, but the application of bio-fertilizer have seen most economically effective because it generates profit and R/C ratio is highest. From the test results of biological fertilizers flour Hatake brands can be stated that the fertilizer is effective because obviously effect to increases the growth and yield as well as a greater benefit than if the fertilizer is not applied. The recommended dose for broccoli plant is 2 kg ha biological fertilizer flour of Hatake brand.

PREFACE

Praise be to Allah SWT due to the successful completion of the Final Report On Field Testing the Effectiveness of Biological Fertilizer Flour Hatake Brand on Broccoli.

PT. Harvest Ariake Indonesia intends to register Biological Fertilizer flour Hatake Brand to Pusat Perlindungan Varietas Tanaman dan Perijinan Pertanian, Ministry of Agriculture. In this regard the Department of Agronomy and Horticulture, Faculty of Agriculture IPB appointed to carry out effectiveness testing as a feasibility condition of the fertilizer registration. Report of this test results outlines the background and purpose of testing, testing methodologies, test results, conclusions and recommendations.

Tests carried out in Kebun Percobaan IPB Pasir Saronggo, District Pacet, Cianjur Regency. Types of plants used for testing is broccoli.

Special thank go to PT Harvest Ariake Indonesia, which has given us the confidence to perform the test. Hopefully the results of such testing can be useful as information for those who need.

Bogor, August 2014

Researcher

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I. INTRODUCTION

1.1. background

According to Forestry Minister Regulation No. 70/SR. 140/10/2011, bio-fertilizers is an active biological product consists of microbes that can improve the fertilization efficiency, fertility and soil condition. Biological fertilizer is formulated fertilizers containing microbes either single or multiple microbes in a carrier material with the function to provide nutrients and increase crop production. Microbes are formulated is beneficial microbes and do not act as plant pathogens. Some microbes used as a bio-fertilizer is from the class of symbiotic N2 fastening bacteria (rhizobia), non-symbiotic N2 fastening bacteria (among others Azotobacter and Azospirillum), microbial solvent P (Bacillus sp., Pseudomonas sp., Streptomyces sp. and fungi Trichodermu sp., Aspergillus sp) (Atlas and Bortha 1998, Isroi 2007). The bacteria are also able to produce growth hormones such as auxin. gibberellins, and kinetin which stimulate the growth of hair follicles thus increasing plant nutrient uptake (Pattern and Glick, 2005). The existence of these microbes may be single, or in the form of a combination of several types of microbes. Microbes used as a bio-fertilizer could stimulate the plant growth, tie up nitrogen, dissolve phosphate and inhibit the growth of plant diseases. In addition, the role of these bacteria cause the plant can absorb more nutrients so that growth can be better. In principle, bacteria play a role in increasing the availability of plant nutrients and increase plant nutrient absorbing capacity. According Wibowo (2007), the use of biological fertilizers among others Azospirilum sp. and Pseudomonas sp. can increase the hormone auxin in caisim plants around 73-159%.

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As stipulated in the Regulation of the Minister of Agriculture No. 70, Year of 2011 fertilizer should obtain registration permit from the Ministry of Agriculture prior to distribution. It ensure the quality and fertilizer effectiveness to the plant. For that reason, each fertilizer to be distributed in Indonesia have to first test the quality and effectiveness test. Biological fertilizer quality test is a laboratory

analysis to determine the type and microbial populations contained in the bio-fertilizer whether it meets the minimum standards of technical requirements, whereas the effectiveness test carried out in the field to determine its effects on plant growth as well as agronomic and economic effectiveness.

PT Harvest Ariake Indonesia intends to register the biological fertilizer flour formulation Hatake Brand Pusat Perlindungan Varietas Tanaman dan Perijinan Pertanian, Ministry of Agriculture. To obtain a registration permit is required to test the effectiveness. In order to test the effectiveness of the Department of Agronomy and Horticulture, Faculty of Agriculture IPB is asked to field test the effectiveness of biological fertilizer flour Hatake brands. Field experiment conducted for effectiveness carried out on broccoli plants.

1.2. Purpose

This experiment aims to test the effectiveness of biological fertilizer flour Hatake brand on growth and yield of broccoli as well as agronomic and economic effectiveness of their farm.

II. LOCATION AND TESTING TIME

2.1. Tests Location

Tests carried out in Kebun Percobaan IPB Pasir Sarongge, Pacet District, Cianjur, West Java.

2.2. Time of Testing Implementation

Testing was conducted for 4 months from April to August 2014.

III. METHODOLOGY

3.1. Materials and Equipment

The materials used in this test is the broccoli seeds and biological fertilizer Hatake brands whose effectiveness and NPK fertilizer standard were tested. The tools used include farming tools (hoes, leftovers and sprayers), the sample marker, meter, digital scales. The tools used to process the data i.e. computer and Statistical Analysis Program SAS. Based on the results of Soil Biology laboratory analysis, Soil Research Institute of Bogor, February 25, 2014, the content and composition of biological fertilizers flour from Hatake Brands are as follows:

Table 1. Composition and Content of Biological Fertilizer Flour from Hatake Brand

Name of Microbe	**Contents**
Bacillus sp. (CFU/m1)	1.14×10^8
N Fastening Activity	Positive
P Dissolution Activity	Positive
pH	7.12
Water content	13.10
Escherichia coli (MPN/m1)	<30
Salmonella (MPN/m1)	<30
pH	7.12
Auxin (IAA) (ppm)	225.22

3.2. Testing Methods

The experimental design used was a randomized block design with four replications. Treatments are arranged in a 7 level of fertilization, i.e.: no biological fertilizer application under test but standard NPK fertilized (PO), standard biological fertilization from local recommendations comparator + 1 NPK (PI), 1 dose of Biological fertilizer Hatake + 1 NPK (P2), 1 dose of Biological Hatake + 0.75 NPK (P3), 1 dose of Biological Hatake + 0.5 NPK (P4), 1 dose Biological Hatake 0:25 + NPK (P5). 1 Dose Biological Hatake (P6). The experiments were performed with 4 replications so that there are 28 experimental units. Each

experimental unit was a plot of land with an area of 25 m^2. In detail, the treatment is tested in this effectiveness test as shown in Table 2 below.

Table 2. Details of Biological Fertilizer Treatment of Hatake Brand on Broccoli Plant

Treatment	Dose of Bio-fertilizer Hatake Brand (kg/ha)	Comparation Bio-fertilizer Dose (kg/ha)	Dose of NPK (kg/ha)
Control	-	-	250
Comparison	-	2	250
1 Dose of Biological Hatake + 1 Dose of NPK	2	-	250
1 Dose of Biological Hatake + 0.75 Dose of NPK	2	-	188
1 Dose of Biological Hatake + 1 Dose of NPK	2	-	125
1 Dose of Biological Hatake + 0.5 Dose of NPK	2	-	63
1 Dose of Biological Hatake + 0.25 Dose of NPK	2	-	-

NPK fertilizer was applied as basal fertilizer sown in the groove along the plant rows at planting time. Hatake bio-fertilizer applied by sown in a groove around the row of plants and covered with soil so that microbes can be grown directly in the ground.

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3.3. Methods of Experiment Implementation

Cultivated land perfectly with hoeing twice until ready for planting. The second ground processing continues with the making of ridge about 1 meter wide. The distance between the ridges of about 50 cm. In one unit (unit testing) consists of 5 seedbeds ridge) with a ridge length of 5 m. Seedlings planted at the age of 21 days after sowing with 1 seed/planting hole.

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Planting space used is 60 cm x 40 cm with one plant/planting hole. Fertilization is done in accordance with local recommendations. Biological fertilizer flour Hatake Brand was applied at a dose according to treatment. Pest and disease control is done in accordance with the attack level with limited pesticide.

3.4. Observation

- Growth of plants: plant height and number of leaves. Observations of plant height and number of leaves carried out on 10 plants randomly specified sample.
- Yield and yield components include: the crop diameter, the results/plant, results/plots and results/ha which is converted from results/plot.

3.5. Data analysis

Data is statistically analyzed using Variance and Duncan's Multiple Range Test (DMRT) at 5% level. Analysis of farming using calculations of economic analysis with profit modifiers and R/C.

Additive linear model used in the statistical analysis are:

Yij = μ + Pi + £ j + € ij

Yij : crop response due to fertilizer treatment to the i and groups to the j

p. : the general average

Pi : the effect of fertilizer treatment to i

£ j : group influence to j

€ ij : error of fertilizer treatments i and group to j

3.6. Assessment method

- Fertilizer assessed technically has passed for effectiveness test if fertilizer treatment statistically is the same as the comparator treatment or better than the control treatment at 5% significance level.
- Fertilizer is assessed has passed for economically effectiveness test if economic analysis of their farm profitable.

IV. RESULTS AND DISCUSSION

4.1. Result

4.1.1. Effect of Biological Fertilizer Flour with Hatake Brand on the Plant Growth

From the results of statistical analysis, observations on plant height modifier was found that treatment of biological fertilizers flour Hatake Brand significantly effect on height of broccoli plant. Treatment of biological fertilizer flour Hatake brand with a dose of 2 kg/ha either by application of NPK dose 0.25-1 or without NPK visible produce height of broccoli plant is higher than the treatment control but significantly it's not different to the comparable treatment at 3-6 MST. At the time the plant was 6 MST, the average height of the broccoli plant in treatment 1 dose of biological fertilizer flour Hatake brands applied with 0.25-1 dose of NPK fertilizer or without NPK fertilizer around 53-55 cm, while the treatment control (not fertilized biologically but fertilized NPK) generating plant height of about 47 cm (Table 3).

Table 3. Effect of Biofertilizer Flour Application from Hatake Brand on the Height of Broccoli Plant

Treatment	Height of Plant (in Cm)			
	3 MST	**4 MST**	**5 MST**	**6 MST**
Control	22,9b	28.0b	39.0b	47.5b
Comparison	25.5a	31.9a	44.3a	52.9a
HATAKE Biofertilizer + 1 Dose of NPK	**26.0a**	32.7a	**44.6a**	**55.2a**
HATAKE Biofertilizer + 0.75 Dose of NPK	24.6ab	30.6ab	43.1ab	**53.1a**
HATAKE Biofertilizer + 0,5 Dose of NPK	**25.6a**	**32.0a**	**43.8a**	**53.3a**
HATAKE Biofertilizer + 0,25 Dose of NPK	**25.5a**	**31.9a**	**44.1a**	**53.6a**
HATAKE Biofertilizer	**25.7a**	**31.8a**	43.2ab	53.3a

Description: The numbers in the same column followed by the same fonds showed no significantly different according to DMRT level of 5%

Biological fertilizer flour Hatake brand also significantly affect the amount of broccoli plant leaves when the plants aged 5 and 6 MST. Application treatment 2 kg/ha of biological fertilizers flour Hatake brands applied with multiple doses of NPK fertilizer (0.25 - 1 dose) or without significant NPK produce the amount of

broccoli leaves more than the control treatment and did not differ by comparison treatment during 5 and 6 MST. The average number of leaf in NPK fertilizer dose treatment (0.25 – 1 dose) or without NPK is about 12.9 13.6 while the control treatment i.e. 12 leaves.

Table 4. Effect of Biological Fertilizer Flour Application Hatake Brand on Number of Broccoli plant leaves.

Treatment	Height of Plant (in Cm)			
	3 MST	**4 MST**	**5 MST**	**6 MST**
Control	5.4a	6.9a	9.0b	12.0b
Comparison	5.7a	7.4a	10.0a	13.2a
HATAKE Biofertilizer + 1 Dose of NPK	5.7a	7.6a	**10.3a**	**13.6a**
HATAKE Biofertilizer + 0.75 Dose of NPK	5.6a	7.4a	**9.8ab**	**12.9a**
HATAKE Biofertilizer + 0,5 Dose of NPK	5.8a	7.6a	**9.9ab**	**13.4a**
HATAKE Biofertilizer + 0,25 Dose of NPK	5.6a	7.4a	**9.8ab**	**13.1a**
HATAKE Biofertilizer	5.7a	7.6a	**10.1a**	**13.4a**

Description: The numbers in the same column followed by the same fonts showed significantly not different according to DMRT level of 5%

4.1.2. Effect of Biological Fertilizer Flour on Hatake Brand on Components of Broccoli Plant Results

Yield components modifier was observed is diameter measure of broccoli crop where that observation and analysis results as shown in Figure 1. The pattern of biological fertilizers flour effect Hatake brand to diameter of broccoli plant crop look different from its effect on the number of leaves. Treatment 1 dose of biological fertilizers flour Hatake brand applied with 1 dose of NPK fertilizer significantly produce the largest crop diameter is 121 mm. Control treatment resulted in lowest crop diameter of 98 mm, while the comparator generates a crop diameter of 112.8 mm.

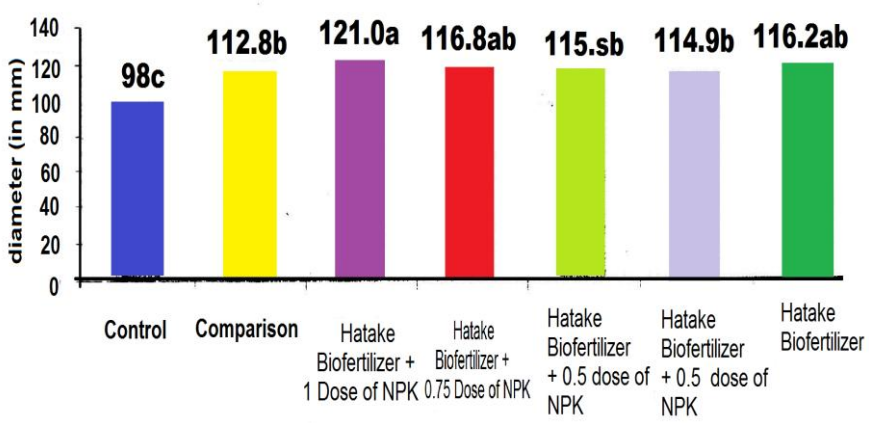

Figure 1. Effect of Biological Fertilizer Flour Application Hatake brand on Diameter of Broccoli Crop

The experiment results showed that treatment of 1 dose of biological fertilizers flour Hatake brand applied with 0:25 -1 dose of NPK fertilizer and without fertilizer NPK significantly effect on results/plant, results/plot and the alleged results/ha of broccoli plants (Table 5). Treatment of biological fertilizer flour application Hatake brand are applied with 1 dose of significant NPK fertilizer produce the highest yields compared to the control treatment, comparison treatment and treatment of biological fertilizers flour from other Hatake brands. In Table 5 it can be seen that the treatment of NPK fertilizer dose reduction in biological fertilizer application tends to degrade the results and significantly reduced yield if the reduction is greater than 50% especially without the addition of NPK fertilizer. This indicates that the application of NPK fertilizer is still required on biological fertilizers application.

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Table 5 shows that the average yield/plant on bio-fertilizer treatment with the addition of 0.25-1 NPK fertilizer doses ranging from 398-477 g/plant, while the control treatment resulted in approximately 301 g/plant and biological fertilizer treatments without NPK fertilizer approximately 411 g/plant. Results/ha of broccoli plant given biological fertilizer flour application Hatake brand with NPK

fertilizer application 25-1 doses ranged from 6.3-7.0 tons ha, while the control treatment produces about 4.6 tons/ha and biological fertilizer applications without NPK produces about 6.4 tons/ha.

Table 5. Effect of Biological Fertilizer Flour Application from Hatake Brand on Broccoli Plant Yields.

Treatment	Yield/Plant (in gr)	Yield/Lot (in kg)	Alleged Yield/ha (kg/ha)
Control	301.0c	11.5d	4600d
Comparison	387.0b	14.8c	5900c
Hatake Biofertilizer + 1 Dose of NPK	**477.0a**	**17.5a**	**7000a**
Hatake Biofertilizer + 0.75 Dose of NPK	**409.0b**	**15.8bc**	**6300bc**
Hatake Biofertilizer + 0.5 Dose of NPK	**423.0b**	**16.3ab**	**6500ab**
Hatake Biofertilizer + 0.25 Dose of NPK	**398.5b**	**15.3bc**	**6100bc**
Hatake Biofertilizer	**411.3b**	**16.0bc**	**6400bc**

Description: The numbers in the same column followed by the same fonts are not significantly different shows by DMRT level of 5%.

4.1.3. Relative Agronomical Effectiveness

The relative agronomic effectiveness is one measure of the fertilizer effectiveness. An effective fertilizer is certified ergonomically effectiveness if it has effectiveness value >100. By the relative effectiveness of Agronomy value > 100 it means that the fertilizer could increase the yield is greater if compared with the increase of comparison fertilizer results to controls. The results of the relative agronomy effectiveness analysis of biological fertilizers flour Hatake brands are presented in
Table 6.

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Table 6. The Value of Relative Agronomic Effectiveness in the Biological Fertilizer Flour Treatment Brands Hatake

Treatment	Effectiveness Value Relative Agronomy (%)
Control	-
Comparison	-
Hatake Biofertilizer + 1 Dose of NPK	185
Hatake Biofertilizer + 0.75 Dose of NPK	131
Hatake Biofertilizer + 0.5 Dose of NPK	146
Hatake Biofertilizer + 0.25 Dose of NPK	115
Hatake Biofertilizer	138

From Table 6 obtained that biological fertilizer flour application treatments Hatake brand with a dose of 2 kg/ha with the addition of 0.25-1 NPK fertilizer dose agronomically effective because it can produce effective agronomic value >100. Fertilizer treatment flour Hatake brand applied with 1 dose of NPK fertilizer was seen most effective in agronomically that can improve yield up to 1.85-fold (185%) compared to the increase in yield caused by the comparator treatment (standard fertilization) to the control treatment.

4.1.3. Results of Soil Analysis

Analysis of initial soil before treatment is intended to determine the level of soil fertility, while the analysis after testing to determine the effect of fertilizers applied to the soil fertility. Analysis of the soil before the test is carried out compositely of the entire treatment plots, whereas the analysis of post experiments conducted on soil samples taken compositely from each treatment. The results of the soil analysis as presented in Table 7.

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Table 7 Results of Soil Analysis Before and After Experiment

Parameter	Before Experiment	Post Experiment						
		P0	P1	P2	P3	P4	P5	P6
pH H_2O	5.0	5.1	5.3	5.5	5.5	5.7	5.7	5.8
C-Organic	1.6	1.6	1.7	1.9	1.9	1.9	1.8	1.8
N-Total (%)	0.34	0.30	0.31	0.36	0.37	0.37	0.38	0.38
P (ppm)	6.2	6.3	6.7	6.7	7.0	7.5	7.7	7.9
K (me/100g)	0.35	0.37	0.46	0.46	0.48	0.48	0.49	0.50

From the results of the soil analysis that is shown in Table 7 shows an increase in organic C, total-N, P, and C in the soil before and after of bio-fertilizers flour application Hatake brand. It shows that there has been an increase in nutrients in the soil are thought to originate either from biological fertilizers or NPK fertilizer was applied to the basal fertilizer. Control treatment without application of bio-fertilizers but applied by NPK fertilizers and biological treatment without fertilizer NPK, the both showed increased nutrient N. P, and K. This shows that both the NPK fertilizer was applied as basal fertilizer and biological fertilizer can increase the availability of soil nutrients.

4.1.5. Analysis of Farming

Economically effectiveness of biological fertilizers flour Hatake brand views from modifier profit and R/C ratio. The both modifiers are used to determine economy feasibility of farming. Results of farming analysis some treatment on testing the biological fertilizers flour effectiveness Hatake brand is presented in Table 8.

Table 8. Results of Farming Analysis Some Test Treatment in Biological Fertilizer Flour Hatake Brand on Broccoli Plant.

Treatment	Cost (IDR)	Income (IDR)	Profit (IDR)	R/C Ratio
Control	8.306.000	11.500.000	3.194.000	1,38
Comparison	8.891.000	14.750.000	5.859.000	1,66
Hatake Biofertilizer + 1 Dose of NPK	8.891.000	17.500.000	8.609.000	1,97
Hatake Biofertilizer + 0.75 Dose of NPK	7.696.500	15.750.000	8.053.500	2,05
Hatake Biofertilizer + 0.5 Dose of NPK	6.638.000	16.250.000	9.612.000	2,45
Hatake Biofertilizer + 0.25 Dose of NPK	5.299.500	15.250.000	9.950.500	2,88
Hatake Biofertilizer	4.105.000	16.000.000	11.895.000	3,90

From the economic results (Table 8) showed that all treatments of bio-fertilizer brands Hatake brand economically has positive profit positively and value of R/C ratio > 1 and higher than the control treatment. It seen an increase in the value of R/C ratio by reduction of NPK fertilizer dose up to 100%. The greatest value of R/C ratio obtained in the biological fertilizer itself is 3.9 compared to bio-fertilizer treatment with the addition of NPK fertilizer which ranged between 1.97-2.88, and control treatment of 1.38.

4.2. Discussion

Of the experiment shows that the biological fertilizer application effective significantly on the increase of plant growth, diameter of the crop, and the results of broccoli plants. It shows that biological fertilizer applied function in fastening N, P and K elements dissolving P and K elements so it is available to plants, or may generate growth regulating substance that can increase root growth and it's crown so that growth and better crop yields.

Some previous research has shown that certain bacteria and fungi can increase the availability of nutrients N, P, and K for plants or produce regulating substances of growth. Micro-organisms of N fastening and phosphate solvent has the ability to produce reductase urea and phospativec enzymes that play an important role in N fastening free from air and P dissolving P from an insoluble P compounds. Nitrogen-fastening bacteria among others Azotobacter and Aztapirilum, phosphate solvent bacteria, Bacillus sp., Lactobacillus sp., And Pseudomonas sp., Identified as bacteria fastening N and P are solvent-free life without symbiosis with plants (Isroi, 2007). Bacteria such as Pseudomonas sp. capable of dissolving P from insoluble form so that is available for plants (Atlas and Bortha, 1998 II Bacteria such as Azotobacter and Azospirilum, Bacillus sp., Lactobacillus sp., and Psneiomonas sp. capable of producing growth hormones such as auxin, gibberellin and kinetin which stimulate growth of hair follicles thus increasing the uptake of plant nutrients (Pattern and Glick, 2005). Results of the soil analysis in biological fertilizer treatment itself also seen an increase in the content of soil N, P, and K showed that the microbes that exist in fertilizer the effective functioning

of fastening N nutrient and dissolve P and K nutrients. The increase in the availability of nutrients thusly will further enhance nutrient uptake by plants and improve metabolism and growth and plant yield.

Bacteria require nutrients N, P and K for energy and its body composer. If not available nutrients N, P and K as well as C elements either organic or inorganic sufficiently it will hamper the addition of the microbial population so that causing the biological fertilizers are not effective.

V. CONCLUSION AND RECOMMENDATION

5.1. Conclusion

From the experimental results we concluded that the biological fertilizer flour Hatake brand applied at a dose of 2 kg/ha significantly generating plant height, number of leaves, crop diameter, the results/plant and yield/ha of broccoli plants higher than the control treatment. Treatment of biological fertilizer flour application Hatake brand added by 1 dose of NPK fertilizer (250 kg/ha) are the most effective in terms of agronomically it has highest yield, but the application of bio-fertilizers itself have seen most effective economically because it generates profit and R/C ratio is highest.

5.2 Recommendation

From the test results of biological fertilizers flour Hatake brand can be identified that the fertilizer is effective because significantly effect to increases the growth and plant yield as well as giving a greater benefit than if the fertilizer is not applied. The recommended dose for broccoli plant is 2 kg/ha of biological fertilizer flour Hatake brand. Depending on the level of soil fertility, NPK fertilizer can be reduced from 25% to 100%

VI. LITERATURE

Eny Dyah Y, Ivan K dan Ira Y. 2007. Provision of Various Algifert Concentrations as Efforts to Increase Broccoli Crop Yields Book Vol 3 (1): 63-75.

Fitriani ML. 2009, Cauliflower Plant Cultivation *(Brassica oleraceae var. botrystis L.)* at Horticultura Seeding Garden KBH Tawamangu. Paper of Sebelas Maret University.

Pracaya, 1981. Kol alias Cabbage. Penebar Swadaya, Jakarta.

Rukmana, R. 1994. Cauliflower Cultivation and Broccoli. Kanisius Yogyakarta.

Appendix

General Condition	Control
Comparison	pH + 1 NPK
pH + 0.75 NPK	pH + 0.5 NPK
pH + 0.25 NPK	pH + 0 NPK

Figure 1. Performance of Broccoli Plant for Each Treatment

Table of Attachment 1. Analysis of the Farming Control Treatment (P0)

Description	Unit	Unit of Price (IDR)	Volume	Total
A. Income	kg	2.500	4.600	11.500.000
B. Cost				
1. Means of Production				
a. Broccoli Seed	g	1.200	100	120.000
b. Urea Fertilizer	kg	2.500	219	547.500
c. Fungicide	kg	90.000	2	180.000
d. Insecticide	1	80.000	4	320.000
e. SP-36	kg	3.500	311	1.088.500
f. KCI	Kg	14.000	225	3.150.000
				-
2. Workers				
a. Soil processing	HKP	25.000	50	1.250.000
b. Planting				-
b.1. To Plant	HKP	25.000	3	75.000
b.2. To plant	HKW	15.000	15	225.000
c. Breeding				-
c.1.Weeding, fertilizing, Irigation	HKP	25.000	30	750.000
c.2. Spraying of pesticides and fertilizers	HKP	25.000	5	125.000
d. Harvesting				-
d.1. Male	HKP	25.000	10	250.000
d.2. Female	HKW	15.000	15	225.000
Total of Cost				8.306.000
C. Profit				3.194.000
D. R/C Ratio				1,4

Table of Attachment 2. Analysis of the Farming Comparison Treatment (P1)

Description	Unit	Unit of Price (IDR)	Volume	Total
A. Income	kg	2.500	5.900	14.750.000
B. Cost				
1. Means of Production				
a. Broccoli Seed	g	1.200	100	120.000
b. Urea Fertilizer	kg	2.500	219	547.500
c. Fungicide	kg	90.000	2	180.000
d. Insecticide	1	80.000	4	320.000
e. Comparison Biofertilizer	kg	130.000	2	260.000
f. SP-36	Kg	3.500	311	1.088.500
g. KCI	Kg	14.000	225	3.150.000
				-
2. Workers				
a. Soil processing	HKP	25.000	50	1.250.000
b. Planting				-
b.1. To Plant	HKP	25.000	3	75.000
b.2. To plant	HKW	15.000	15	225.000
c. Breeding				-
c.1. Weeding, fertilizing, irigation	HKP	25.000	40	1.000.000
c.2. Spraying of pesticides and fertilizers	HKP	25.000	5	125.000
d. Harvesting				-
d.1. Male	HKP	25.000	10	250.000
d.2. Female	HKW	15.000	15	300.000
Total of Cost				8.891.000
C. Profit				5.859.000
D. R/C Ratio				1,66

Table of Attachment 3. Farming Analysis for Treatment 1 Dose of HATAKE Biofertilizer + 1 Dose NPK (P2)

Description	Unit	Unit of Price (IDR)	Volume	Total
A. Income	kg	2.500	7.000	17.500.000
B. Cost				
1. Means of Production				
a. Broccoli Seed	g	1.200	100	120.000
b. Biofertilizer Flour of HATAKE	kg	2.500	219	260.000
c. Fungicide	kg	90.000	2	180.000
d. Insecticide	1	80.000	4	320.000
e. Urea Fertilizer	kg	2.500	219	547.500
f. SP-36	kg	3.500	311	1.088.500
g. KCI	Kg	14.000	225	3.150.000
				-
2. Workers				
h. Soil processing	HKP	25.000	50	1.250.000
i. Planting				-
b.1. To Plant	HKP	25.000	3	75.000
b.2. To plant	HKW	15.000	15	225.000
j. Breeding				-
c.1. Weeding, fertilizing, irigation	HKP	25.000	40	1.000.000
c.2. Spraying of pesticides and fertilizers	HKP	25.000	5	125.000
k. Harvesting				-
d.1. Male	HKP	25.000	10	250.000
d.2. Female	HKW	15.000	20	300.000
Total of Cost				8.891.000
C. Profit				8.609.000
D. R/C Ratio				1,97

Table of Attachment 4. Farming Analysis for Treatment 1 Dose of HATAKE Biofertilizer + 1 Dose NPK (P3)

Description	Unit	Unit of Price (IDR)	Volume	Total
A. Income	kg	2.500	6.300	15.750.000
B. Cost				
1. Means of Production				
a. Broccoli Seed	g	1.200	100	120.000
b. Biofertilizer Flour of HATAKE	kg	130.000	2	260.000
c. Fungicide	kg	90.000	2	180.000
d. Insecticide	1	80.000	4	320.000
e. Urea Fertilizer	kg	2.500	164	410.000
f. SP-36	kg	3.500	233	815.500
g. KCI	Kg	14.000	169	2.366.000
				-
2. Workers				
h. Soil processing	HKP	25.000	50	1.250.000
i. Planting				-
b.1. To Plant	HKP	25.000	3	75.000
b.2. To plant	HKW	15.000	15	225.000
j. Breeding				-
c.1. Weeding, fertilizing, irigation	HKP	25.000	40	1.000.000
c.2. Spraying of pesticides and fertilizers	HKP	25.000	5	125.000
k. Harvesting				-
d.1. Male	HKP	25.000	10	250.000
d.2. Female	HKW	15.000	20	300.000
Total of Cost				7.696.500
C. Profit				8.053.500
D. R/C Ratio				2,05

Table of Attachment 5. Farming Analysis for Treatment 1 Dose of HATAKE Biofertilizer + 0.5 Dose NPK (P4)

Description	Unit	Unit of Price (IDR)	Volume	Total
A. Income	kg	2.500	6.500	16.250.000
B. Cost				
1. Means of Production				
a. Broccoli Seed	g	1.200	100	120.000
b. Biofertilizer Flour of HATAKE	kg	130.000	3	390.000
c. Fungicide	kg	90.000	2	180.000
d. Insecticide	1	80.000	4	320.000
e. Urea Fertilizer	kg	2.500	110	275.000
f. SP-36	kg	3.500	156	546.000
g. KCI	Kg	14.000	113	1.582.000
				-
2. Workers				
a. Soil processing	HKP	25.000	50	1.250.000
b. Planting				-
b.1. To Plant	HKP	25.000	3	75.000
b.2. To plant	HKW	15.000	15	225.000
c. Breeding				-
c.1. Weeding, fertilizing, irigation	HKP	25.000	40	1.000.000
c.2. Spraying of pesticides and fertilizers	HKP	25.000	5	125.000
d. Harvesting				-
d.1. Male	HKP	25.000	10	250.000
d.2. Female	HKW	15.000	20	300.000
Total of Cost				6.638.000
C. Profit				9.612.000
D. R/C Ratio				2,45

Table of Attachment 6. Farming Analysis for Treatment 1 Dose of HATAKE Biofertilizer + 0.25 Dose NPK (P5)

Description	Unit	Unit of Price (IDR)	Volume	Total
A. Income	kg	2.500	6.100	15.250.000
B. Cost				
1. Means of Production				
a. Broccoli Seed	g	1.200	100	120.000
b. Biofertilizer Flour of HATAKE	kg	130.000	3	260.000
c. Fungicide	kg	90.000	2	180.000
d. Insecticide	1	80.000	4	320.000
e. Urea Fertilizer	kg	2.500	55	137.500
f. SP-36	kg	3.500	78	273.000
g. KCI	Kg	14.000	56	784.000
				-
2. Workers				
a. Soil processing	HKP	25.000	50	1.250.000
b. Planting				-
b.1. To Plant	HKP	25.000	3	75.000
b.2. To plant	HKW	15.000	15	225.000
c. Breeding				-
c.1. Weeding, fertilizing, irigation	HKP	25.000	40	1.000.000
c.2. Spraying of pesticides and fertilizers	HKP	25.000	5	125.000
d. Harvesting				-
d.1. Male	HKP	25.000	10	250.000
d.2. Female	HKW	15.000	20	300.000
Total of Cost				5.299.500
C. Profit				9.612.000
D. R/C Ratio				2,88

Table of Attachment 7. Farming Analysis for Treatment 1 Dose of HATAKE Biofertilizer + 0 Dose NPK (P6)

Description	Unit	Unit of Price (IDR)	Volume	Total
A. Income	kg	2.500	6.400	16.00.000
B. Cost				
1. Means of Production				
a. Broccoli Seed	G	1.200	100	120.000
b. Bio-fertilizer Flour of HATAKE	kg	130.000	2	260.000
c. Fungicide	kg	90.000	2	180.000
d. Insecticide	1	80.000	4	320.000
e. Urea Fertilizer	kg	2.500	-	-
f. SP-36	kg	3.500	-	-
g. KCI	Kg	14.000	-	-
				-
2. Workers				
a. Soil processing	HKP	25.000	50	1.250.000
b. Planting				-
b.1. To Plant	HKP	25.000	3	75.000
b.2. To plant	HKW	15.000	15	225.000
c. Breeding				-
c.1. Weeding, fertilizing, irigation	HKP	25.000	40	1.000.000
c.2. Spraying of pesticides and fertilizers	HKP	25.000	5	125.000
d. Harvesting				-
d.1. Male	HKP	25.000	10	250.000
d.2. Female	HKW	15.000	20	300.000
Total of Cost				4.105.000
C. Profit				11.895.000
D. R/C Ratio				3,90