

The Growth and Production of Baby Corn with the Introduction of Bokashi of Water Hyacinth (*Eichorniacrassipes*) and Plant Growth Promoting *Rhizobacteria* (PGPR)

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Abstract—The corn is a food commodity that has the important economic value as the second carbohydrate source after rice. Besides that, corn can also be used as fodder and the raw material for industry. This research aim is 1) to understand the effect of the giving time of bokashi of water hyacinth (*Eichornia crassipes*) towards the growth and production of baby corn. 2) to know the effect of the giving of various doses of PGPR towards the growth and production of baby corn. The research is designed by using Random Pattern Testable (RPT), with two factors: the first is treatment of giving time of bokashi of water hyacinth (W) [(W1 = a week after planting, W2 = two weeks after planting, W3 = three weeks after planting)] and the second factor is the treatment of the doses of the giving of PGPR (U) [(U0 = The control without any treatment, U1 = 200 ml/plant, U2 = 400 ml/plant, U3 = 600 ml/plant)]. Each treatment is repeated three times. Result of the study shows the effect of the giving of the dose of PGPR towards plant height, quantity of leaf, length of cob of baby corn, as well as the weight of the corn cob for treatment U2 with the dose 400 ml/plant has the best result with the analysis of variance that isn't really different. The giving time of bokashi of water hyacinth works very well towards the growth of the baby corn with the treatment during two weeks after planting (WAP).

IndexTerms—Baby corn, production, bokashi, water hyacinth, PGPR.

I. INTRODUCTION

The corn is a food commodity with the important economic value from the second carbohydrate source after rice. The corn can also be used as fodder and the raw material for industry. The demand for corn for food, fodder, and the raw material for industry keeps increasing each year [1]. Corn can also be used as the vegetable, as an example is baby corn. Vegetable itself is one of food needed by the human and is rich in nutrition like vitamin and mineral. Though needed in small proportion, the roles of this nutrition are important. One of the vegetables liked by people nowadays is baby corn [2][2]. Baby corn is one of corn harvest that is consumed as a vegetable and has many uses and is very popular among Indonesians for its fresh and unique aroma[1][3].

There are efforts that can be done to increase the production of baby corn. One of the efforts to increase the production is giving the liquid organic fertilizer to the plant. Fertilizer is divided into two types, which are organic and inorganic fertilizer [4]. Organic fertilizer is a fertilizer that most of, or all of the composition of it comes from the plant or animal with some engineering, has solid or liquid form, and used to supply the organic substances to repair the physical, biological and chemical characteristics of the soil [5].

The application of water hyacinth as bokashi for the growth and production of baby corn and technology makes it possible to be cultivated and is relatively safe by using the natural enemies Plant Growth Promoting *Rhizobacteria* (PGPR). PGPR can be functioned as the bio-protector and bio-stimulant [6].

According to Joseph & Lawrence, n.d., the use of PGPR of bamboo root for the plant with the dose 12.5 ml/plant can increase the growth of the plant. Based on these circumstances, the writer is motivated to conduct this research. The aim of the research is (1) to understand the effect of giving the various doses of PGPR towards the growth and production of baby corn, (2) to know how big the effect of the giving time of bokashi of water hyacinth (*Eichorniacrassipes*) towards the growth and production of baby corn.

II. MATERIALS AND METHODS

The research is designed by using Random Pattern Testable (RPT), with two factors: the first is treatment of giving time of bokashi of water hyacinth (W) [(W1 = a week afterplanting, W2 = two weeks after planting, W3 = three weeks after planting)] and the second factor is the treatment of the doses of the giving of PGPR (U) [(U0 = The control without any treatment, U1 = 200 ml/plant, U2 = 400 ml/plant, U3 = 600 ml/plant)]. Each treatment is repeated three times. The soil is cultivated with the canal is 20-30 cm in depth, graded, and made into slots with the size 150 x 250 cm. The distance per slot is 50 cm, while the distance between the line is 50 cm. After that, the soil added with calcium 1.5 kg/slot that if it is converted per hectare is equal to 4 tonha⁻¹.

The fertilizer of bokashi of water hyacinth is given 1, 2, 3 week(s) that is fit to the treatment after planting with the dose 20 tonha⁻¹ that if it's get conversed per ha become 7.50 kg/slot. Before get planted, the seeds are inundated first into the suspension of the fertilizer of PGPR for 15-30 minutes. After the experiment slots are prepared, the seeds are planted at a depth of 5 cm with the plant distance is 25 x 70 cm. Each of the slots is planted by 2 baby corn seeds, and after the plants grow, only the healthiest one remained in the slot.

The dose giving of PGPR to the baby corn plant, for the treatments U1, U2 and U3 are for every 2 days in the morning after planting by spraying it directly to the plant. Breeding of the plants is done by water in the morning (in a day without rain), as well as the weeding for every week. As for the controlling of the pest and disease, it is done once the infected sign(s) appear. Before harvesting, the any male flowers are disposed of using sharp scissors. After the disposing of the male flowers, plant controlling is done because about 5 – 7 days after the disposing of the cob will appear. The first cobs will have to be already harvested at least two days after appearing, and the second cobs will appear after that, and so on until 3 – 5 cob harvests for every plant.

Parameters observed and measured while conducting the research are (1) plant height (cm), measured from the surface of the soil to the highest peak of the plant; (2) quantity of leaf, conducted by counting every perfect formed leaf; length of cob (cm), measured from both edges of the cob and weight of cob (g), measured by weighed all cobs per slot after harvest and counting the cobs of every plant. The measurement of the plants is conducted when the plant aged 1, 2, 3 and 4 weeks after planting (WAP).

III. RESULTS AND DISCUSSIONS

Plant Height

The observation that is conducted towards baby corn for three months resulted in the data of the plant height for W1, W2 and W3 that is fit to the treatment of the giving of bokashi of water hyacinth and PGPR can be seen in the following Table 1 and Fig. 1.

Table 1 Analysis of Variance of Plant Height of Baby Corn with the Treatment of Bokashi of Water Hyacinth and PGPR

Treatment	U0	U1	U2	U3
W1	18.16	19.10	20.96	18.76
W2	31.66	31.66	29.66	33.66
W3	26.33	29.33	29.30	36.33

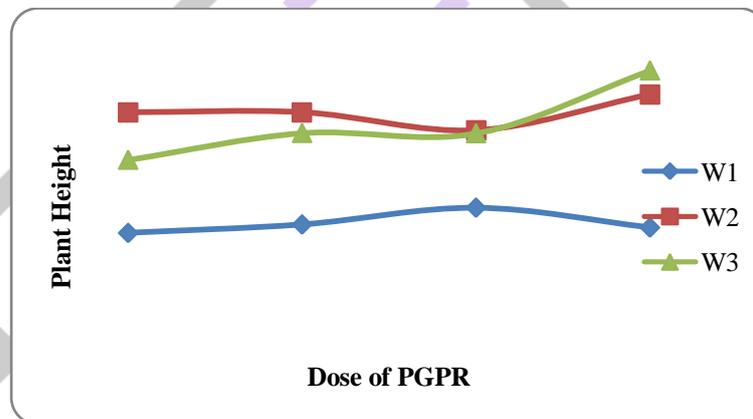


Figure 1 Plant height of baby corn with various doses of PGPR

Based on Table 1 and Fig. 1, the result of plant height of baby corn for W1, W2, and W3 shows that the best treatment is the addition of the dose 600 ml/plant of PGPR (U3). The data shows that every combination bokashi of water hyacinth and various doses of PGPR are able to increase the plant height. As for the bokashi of water hyacinth, the more often it is given to the plant the higher the plant will grow but at the excessive dose will only make the plant droop [8]. The use of PGPR isn't too reality different, based on the obtained result so that the use of PGPR can goad the growth of the baby corn, the same goes for bokashi of water hyacinth.

Quantity of Leaf

Leaf is one of the organs of the plant that grows from a twig, is green in color and functioned as the food production place of the plant. The quantity of the leaf of baby corn with the treatment of bokashi of water hyacinth and PGPR towards the plants for W1, W2 and W3 can be seen in Table 2 and Fig.2.

Table 2 The Quantity of the Leaf of Baby Corn With The Treatment of Bokashi of Water Hyacinth and PGPR

Treatment	U0	U1	U2	U3
W1	2.4	3.16	4.43	5.36
W2	3.6	4.20	4.63	5.90
W3	3.5	3.66	5.43	5.36

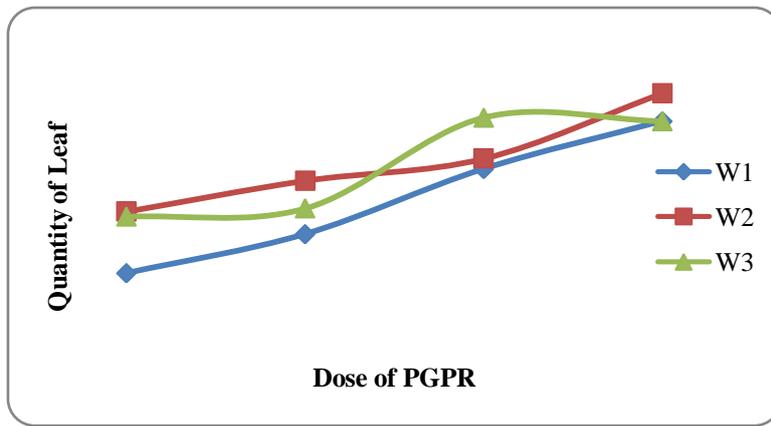


Figure2Quantity of the Leaf of Baby Corn With Various Doses of PGPR

According to Vetayasuporn (2006), that the giving of liquid bokashi of water hyacinth can goad and increase the formation of the leaves chlorophyll, and the form of the nodule to increase the photosynthesis process. Based on Table 2 and Fig.2, the results of the quantity of the leaf of baby corn with the treatment of bokashi of water hyacinth and PGPR are not too reality different for both the giving time and the dose used.

Length and Weight of Cob

Data on the length of baby corn’s cob with the application of various doses of bokashi of water hyacinth and PGPR towards the length of the cob is shown in Table 3.

Table 3 The Length of Baby Corn’s Cob With Various Doses of PGPR

Treatment	Mean (cm)
U0	20.50
U1	28.40
U2	35.60
U3	23.00

The weight of the baby corn’s cob with various doses of bokashi of water hyacinth and PGPR can be seen in Table 3.4 and mean of the both can be seen in Fig. 3.3.

Table 3.4 The Weight of Baby Corn’s Cob With Various Doses of PGPR

Treatment	Mean (g)
U0	14.6
U1	15.8
U2	16.8
U3	15.3

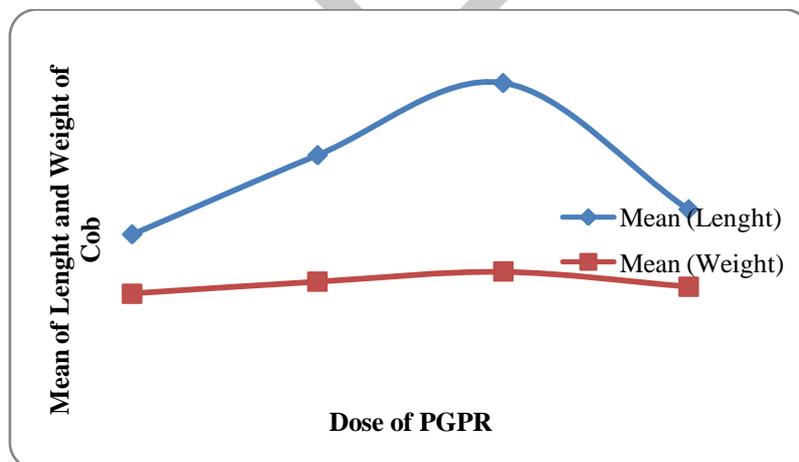


Figure3Mean of the Length and Weight of Baby Corn’s Cob With Various Doses of PGPR

Based on Table 3.3, Table 3.4 and Fig. 3.3, the best treatment of giving PGPR is at 35.60 cm and 16.8 g with the given dose 400 cc/plant. It's better for the higher production of the plant to use the local varieties. The giving of bokashi of water hyacinth with a time interval that's not too often can cause the inefficiency. The use of PGPR and bokashi of water hyacinth can give the better production result rather than use the chemical ones [4]. The giving of treatment with the appropriate application will give the better result.

IV. CONCLUSIONS

Based on the result and discussion, we can make conclusion that (1) The effect of the giving of various doses of PGPR towards the quantity of the leaf, plant height, length of the cob, as well as the weight of the cob for the treatment of addition U2 with dose 400cc/plant gives the best result with analysis of variance that's not reality different. (2) Time of the giving of bokashi of water hyacinth greatly affects the growth of baby corn with the treatment of 2 weeks before the planting.

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