GROWTH RESPONSE AND PRODUCTION OF LETTUCE PLANTS(*Lactuca sativa L.)* BY GIVING BANANA PEEL COMPOST AND WATER HYACINTH BOKASHI

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Abstract

This research was carried out at The Asahan University, Faculty of Agriculture Experimental Garden, Asahan District, North Sumatera Province with a height of 12 meters above sea level, This research was conducted at the beginning of March 2018 and ended in April2018. The Ingredients used are Banana Peel Compost, Water Hyacinth Bokashi, Lettuce seeds (Lactuca Sativa L.)varietas Grand Rapids, Topsoil soil, Water, Solution EM – 4. The Design used in this research was a Factorial Randomized Block Design (RBD),The First factor in providing Banana peel Compost consists of 4 levels : P1= 10 ton/ha (1 kg/plot) , P2= 20 ton/ha (2 kg/plot), P3 = 30ton/ha (3 kg/plot), P4= 40 ton/ha (4 kg/plot). The Second Factor is Water Bokashi Hyacinth (E) consists of 3 levels :E1 = 0 ton/ha(0.kg/plot),E2= 10 ton/ha(1.kg/plot), E3 = 20 ton/ha(2.kg/ha), W4 = 30 ton/ha(.kg/plot). Parameters observed were plant height, number of leaves, production of sample crops, production of each plot. Statistical Analysis showed that giving compost Banana Peel and Water Bokashi Hyacinth had a significant effect on all observed parameters.

Keyword:*Lettuce plant (Lactuca Sativa L.), Banana Peel Compost, Water Bokhasi Hyacinth.*

A. Introduction

Lettuce (Lactuca sativa L.) is a leaf vegetable that is an annual age and belongs to the family compositae. Lettuce grows optimally on fertile land which contains a lot humus , sand or mud with a soil pH of 5-6,5. The best planting time at the end of rainy season, (Center for Assessment and Development of Agricultural Technology, 2010).

Lettuce (Lactuca sativa L.) although not native to Indonesia, but has long been known in Indonesia which is an annual plant, Lettuce is much favored by the people of Indonesia. Because Lettuce has an attractive appearance, and every 100g of heavy lettuce contains 1.2 proteins, 0.2g fat, 22.0 mg Ca, 25.0 mg P, 0.5 mg Fe, 162 mg vitamin A, 0,04 mg of vitamin B, 8.0 mg of vitamin C. Judging from the demand of the domestic and foreign markets for lettuce plants, this commodity has a bright prospect to be developed.

Banana peel waste cannot be directly applied to plants. Nutrients contained in the waste of banana peel are bonded in a bond of organic compounds that are not easily dissolved. To make the availability of nutrients, then the composting process is carried out. While the composting process is the process by which organic matter undergoes biological decomposition, especially by microbes that utilize organic matter as an energy source. Making compost is regulating and controlling the natural process so that compost can form faster. This process involves making a balanced mixture of ingredients, giving enough water, the composting process can take place naturally, but takes a long time between 6 to 12 months.At present there are many technologies developed to accelerate the composting process. The development of this technology includes:

manipulation of conditions / factors that influence the composting process, adding composting activator microbes, and combining the two previous strategies (Novizan, 2008)

Banana peels contain 15% potassium and 12% more phosphorus than banana meat, so banana peels have the potential to be used as fertilizer. In addition to containing Potassium and Phospor, banana peels also contain elements of Magnesium, Sulfur, and Sodium. Magnesium is needed by plants in addition to the formation of chlorophyll as a catalyst for absorption of potassium and phosphorus elements. Indonesia is a tropical area that grows a lot of banana plants. Bananas are consumed by many people, so much banana peel waste is produced. The banana peel can be used as a source of potassium and phosphorus which is cheap, environmentally friendly and effective. (Rohendi, 2005)

B. Methods

This experiment was conducted at the Asahan University Faculty of Agriculture Experimental Garden, Asahan Regency, North Sumatra Province with a height of 12 m above sea level, this research was conducted at the beginning of March 2018 and ended in April 2018

The material used is organic waste from banana peel, lettuce (Lactuca sativa L.) Topsoil soil, water, EM solution - 4

The tools used are hoes, meters, water hoses, buckets, machetes, hoops, saws, hammerheads, nails, stationery, calculators etc. which are considered necessary. The method of this study was carried out using a

factorial randomized block design with 2 settings and 2 replications, the first factor was giving a compost of banana peel (P) consisting of 4 levels:

P_1= 10 ton/Ha (1 kg/plot)
P_2= 20 ton/Ha (2 kg/plot)
P_3= 30 ton/Ha (3 kg/plot)
P_4= 40 ton/Ha (4 kg/plot)

While the second factor Bokashi Hyacinth (E) consists of 4 levels :

E_1 = 0 ton/ha (0 kg/plot)
E_1 = 10 ton/ha (1 kg/plot)
E_2 = 20 ton/ha (2 kg/plot)
E_3 = 30 ton/ha (3 kg/plot)

The parameters observed in the research were plant height (cm) number of leaves (strands), production per plant sample (g), production per plot (kg)

C. Results and Discussion

1. Plant height (cm)

The results of observations and variance can be known that giving of Compost Banana peels shows a significant effect on plant height at all age observations. The treatment of water hyacinth bokashi showed no significant effect on plant height aged 2 and 3 MST, but had a significant effect at age 4 MST. Interaction Compost of banana peel and bokashi water hyacinth showed no significant effect on plant height at all age observations.

The results of different test average effect of giving banana peel compost and water hyacinth bokashi to lettuce plant height at 4 MST can be seen in Table 1. below.

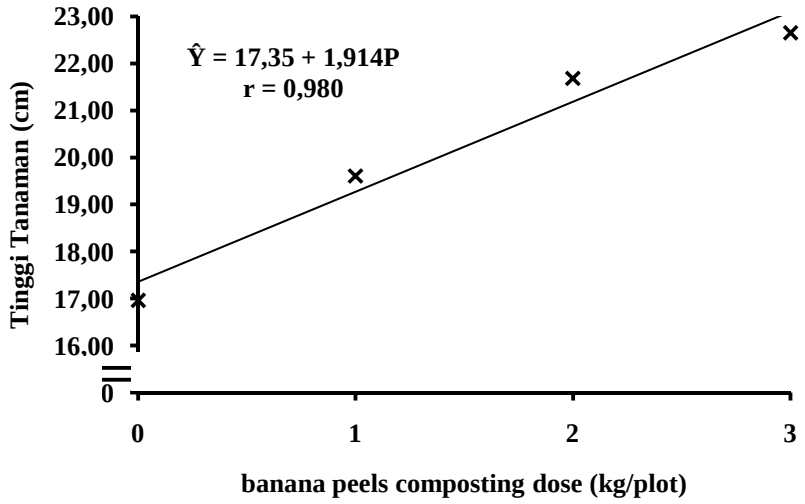
Table 1. Average Difference Test Results Effect of Composting Banana peel and Bokashi Water Hyacinth on Plant Height (cm) Age 4 Lettuce MST.

P/E	P_0	P_1	P_2	P_3	Rataan
E_0	14.52	18.16	21.01	21.45	18.79 b
E_1	16.18	19.21	23.05	21.77	20.05 ab
E_2	17.73	21.09	21.31	23.97	21.02 a
E_3	19.40	19.98	21.38	23.40	21.04 a
Rataan	16.96 c	19.61 b	21.69 a	22.65 a	

Information : The numbers followed by the same letter in the same row or column show that there is no significant difference at the level of 5 % using the BNT Test.

In Table 1, it can be seen that each level of treatment Compost of banana peel is significantly different from the control, then it is known that the treatment of P2 and P3 shows different but not significantly different from each other with treatment P1. Each level of treatment of bokashi water hyacinth is different from each other not real, while the control treatment is different not significantly with treatment E1 but different from treatment E2 and E3.

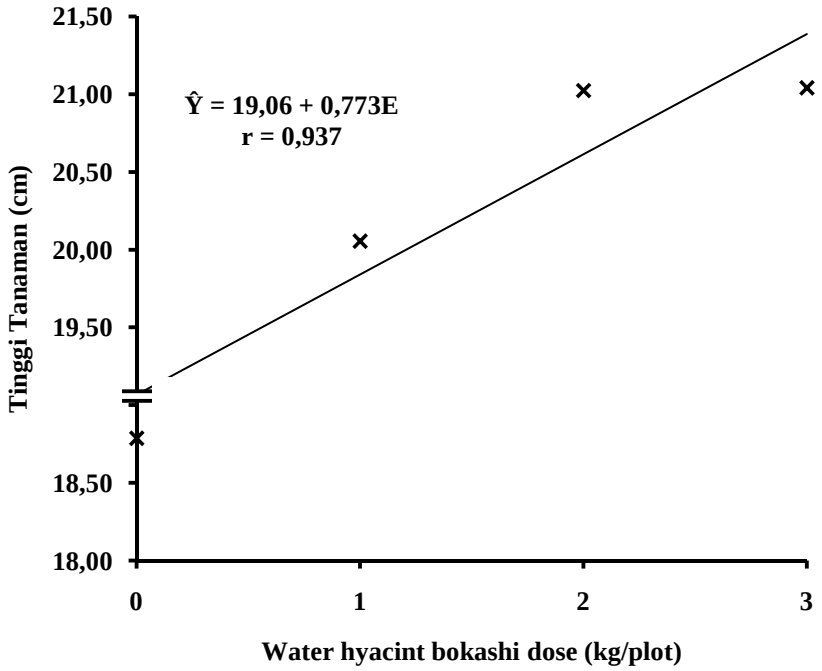
The effect of banana peel compost on plant height can be seen in Picture 1. below.



Picture 1. Curve Effect of Composting banana peel on the height of Lettuce Plant Age 4 MST.

From the regression equation above, it can be seen that the increase in plant height for each level of treatment of banana peel compost is 1.914 cm times the value of the dose. With a correlation of 0.980, the regression equation is able to explain the relationship between plant height and banana peel compost dose of 96%.

The effect of giving water hyacinth bokashi to plant height can be seen in Picture 2. below.



Picture 2. Curve Effect of Bokashi Hyacinth Giving on the Height of Lettuce Plant age 4 MST.

From the regression equation above, it can be known that the increase in plant height for each level of treatment of water hyacinth bokashi is 0.773 cm times the value of the dose. With a correlation of 0.937, the regression equation is able to explain the relationship between plant height and water hyacinth bokashi dose of 87%.

2. Number of leaves (strands)

Observations and variance can be known that the compost of banana peel showed a significant effect on the number of leaves at all age observations, the treatment of single water hyacinth bokashi, and

interaction of banana peel compost and bokashi water hyacinth showed no significant effect on the number of leaves at all age observations. The results of different test average influence of banana peel compost on the number of lettuce leaves aged 4 MST can be seen in Table 2. below.

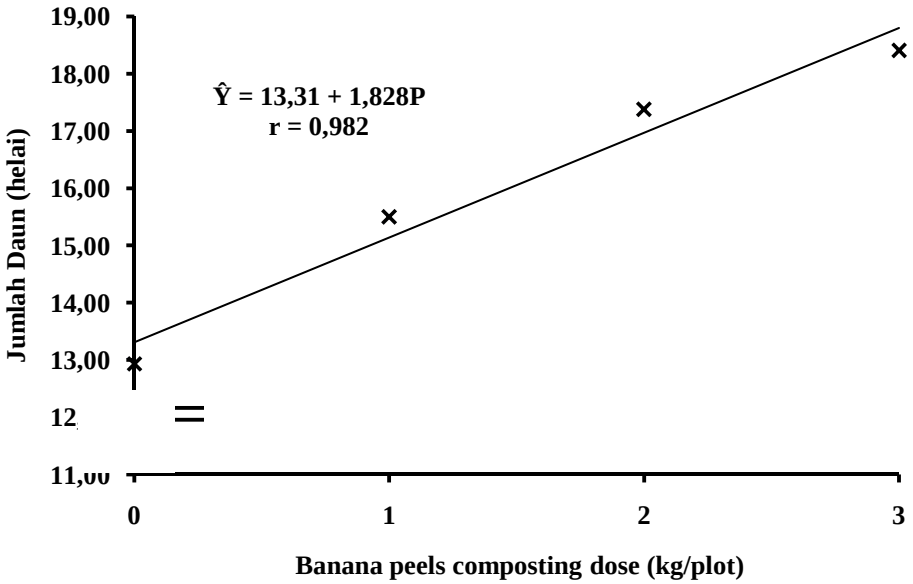
Table 2. AverageDifference Test Results Effect of Banana Peel Compost on The Number of Leaves (Strands) of Red Lettuce Age 4 MST.

Perlakuan	Rataan	Notasi
P_0	12.94	C
P_1	15.50	B
P_2	17.38	Ab
P_3	18.41	A

Information : The numbers followed by the same letter in the same row or column show that there is no significant difference at the level of 5% using the BNT Test.

In Table 2, it can be known that each level of treatment of banana peel compost is significantly different from the control, then it is known that treatment P2 is different not significantly with P1 and P3, but P1 and P3 are significantly different from each other.

The effect of banana peel compost on the number of leaves can be seen in Picture 3. below.



Picture 3. Curve Effect of Composting Banana Peel on the Number of Lettuce Age 4 MST.

From the regression equation above, it can be known that the addition of leaves for each level of Compost treatment of banana peel is 1,828 strands multiplied by the value of the dose. With a correlation of 0.980 the regression equation is able to explain the relationship between the number of leaves and the Banana peel composting by 96%.

3. Production per plant(g)

The results of observations and variance can be known that single banana peel compost and single water hyacinth bokashi treatment showed a significant effect on production per plant. The interaction of banana peel compost and bokashi water hyacinth showed no significant effect on production per plant.

The results of different test average effect of giving banana water compost and water hyacinth bokashi to the production per plant can be seen in Table 3. below.

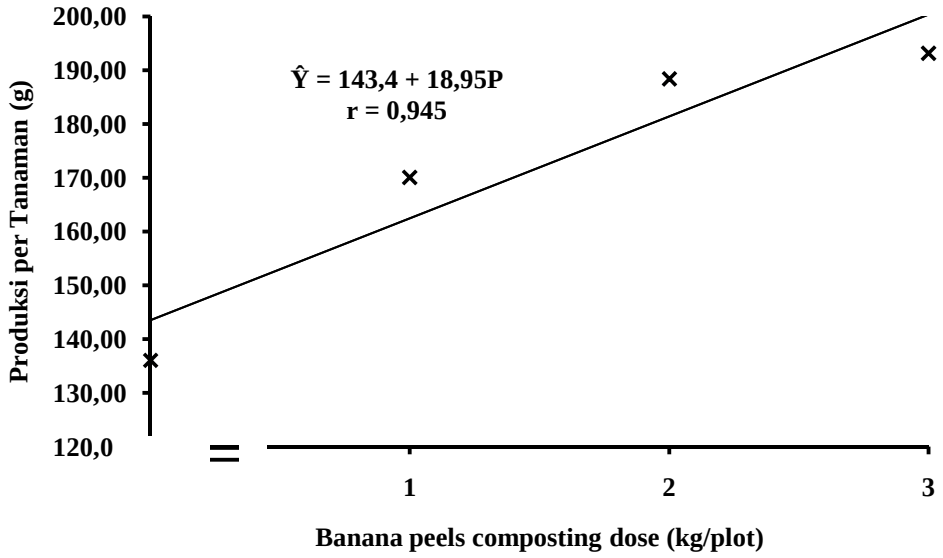
Table 3. Average Difference Test Results Effect of Banana Peel Compost and Bokashi Hyacinth Compost on Production per Plant (g).

P/E	P_0	P_1	P_2	P_3	Rataan
E_0	113.68	157.69	169.41	173.54	153.58 b
E_1	131.95	181.96	189.58	180.22	170.92 ab
E_2	144.58	168.43	190.28	222.65	181.48 a
E_3	154.11	172.02	204.18	196.16	181.62 a
Rataan	136.08 b	170.03 a	188.36 a	193.14 a	

Information : The numbers followed by the same letter in the same row or column show that there is no significant difference at the level of 5% using the BNT Tes.

In Table 3, it can be known that between each level of treatment the compost of banana peel is different from each other not real and mutually significantly different from the control. Each level of treatment of bokashi water hyacinth is different from each other not real, while the control treatment was different not significantly with the treatment of E1 but different from the treatment of E2 and E3.

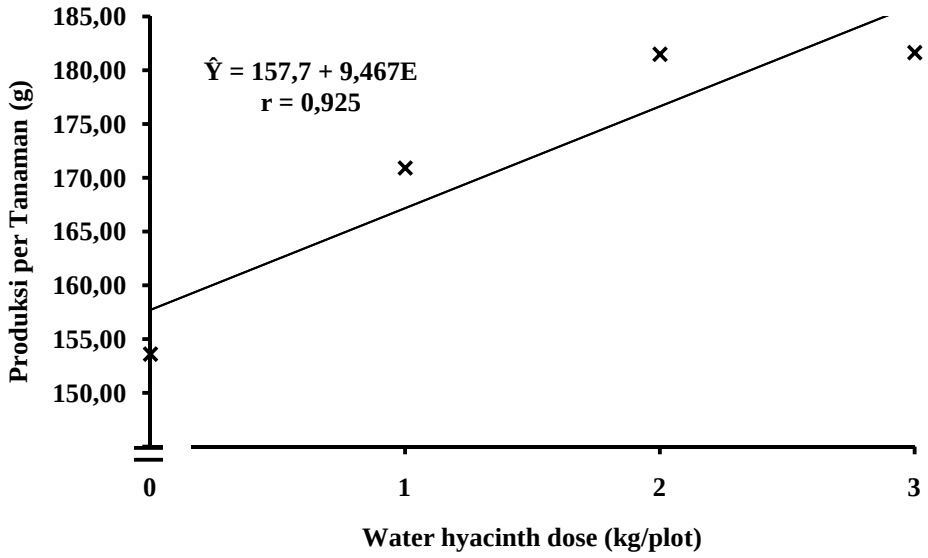
The effect of banana peel compost on production per plant can be seen in Picture 4. below.



Picture 4. Curve Effect of Composting Banana Peel on Production per Plant.

From the regression equation above, it can be known that the increase in production per plant for each level of treatment of composted banana peels is 18.95 g times the value of the dose. With a correlation of 0.945 the regression equation is able to explain the relationship between production per plant and compos dose of banana peel by 89%.

ffect of water hyacinth bokashi on production per plant can be een in Picture 5. below.



Picture 5. Curve Effect of Giving Bokashi Hyacinth Against Production per Plant.

From the regression equation above it can be known that the increase in production per plant for each level of treatment of water hyacinth bokashi is 9,46 g times the value of the dose. With a correlation of 0.925, the regression equation is able to explain the relationship between production per plant and dose of water hyacinth bokashi by 85%.

4. Production per plot (kg)

The results of observations and variance can be known that single banana peel compost shows a significant effect on production per plot. Single treatment of water hyacinth bokashi, and comos interaction of banana peel and water hyacinth bokashi showed no significant effect on production per plot.

The results of different test average effect of giving banana peel compost and water hyacinth bokashi to the production per plot can be seen in Table 4 below.

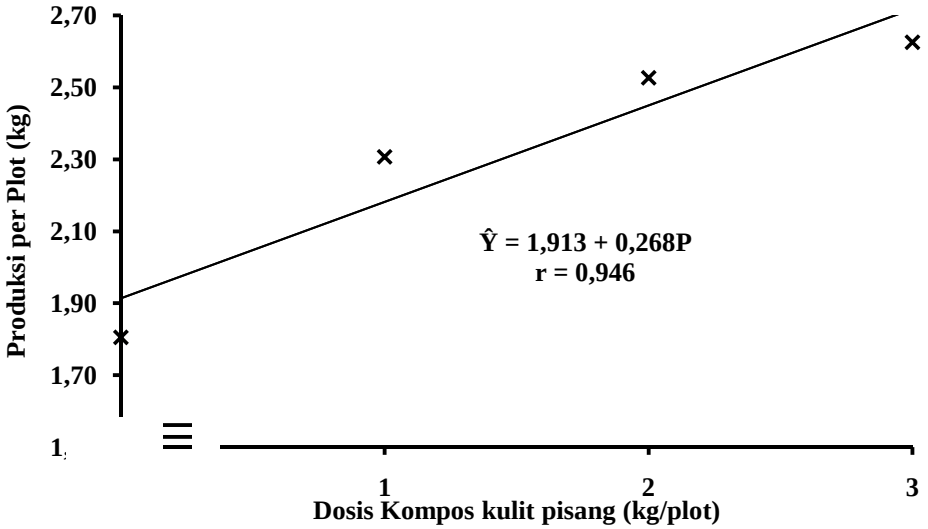
Table 4. Average Difference Test Results Effect of Banana Peel Compost on Production per Plot (kg).

Perlakuan	Rataan	Notasi
P_0	1.80	B
P_1	2.31	A
P_2	2.53	A
P_3	2.63	A

Information : The numbers followed by the same letter in the same row or column show that there is no significant difference at the level of 5% using the BNT Test.

In Table 4, it can be known that between each level of treatment the compost of banana peel is different from each other not real and mutually significantly different from the control.

The effect of composting banana peel on production per plot can be seen in Picture 6. below.



Picture 6. Curve Effect of Composting Banana Peel on Production per Plot.

From the regression equation above it can be known that the increase in production per plot for each level of treatment of banana peel compost is 0.268 kg times the value of the dose. With a correlation of 0.946 the regression equation is able to explain the relationship between production per plot and the dose of banana peel compost by 89%.

A. Disussion

1. Effect of banana peel compost on plant growth and production.

Based on the results of analysis of variance showed that the treatment of giving banana peel compost showed a significant effect on all age observations, but did not affect the production per plot.

Organic C content is an important element for organic fertilizer, because it is intended to add soil organic matter. The results obtained are that compost made from banana peel has a value of 29.7% organic C which is in accordance with the standard minimum technical requirements of Organic Fertilizers Permentan Solid No. 70 / Permentan / SR.140 / 10/2011 which is at least 15% One of the uses of adding compost as organic fertilizer into the soil is to increase the content of organic matter into the soil. At present the conditions of agricultural land and plantations have soil quality which only has a low C-organic content of 2%. Reportedly, around 60 percent of rice fields in Java contain less than 1 percent of organic matter (Sugito, et al 1995).

One of the roles of organic / compost fertilizer is that it can have macro and micro nutrients, so it can act as a source of nutrients for plants (Harianto, 2007) Macro nutrients include N, P, K, Ca, Mg and S. values (N + P2O5 + K2O) compost made from banana stem is 7.74%. This value is in accordance with the minimum technical requirements of Permentan Solid Organic Fertilizer Number 70 / Permentan / SR.140 / 10/2011 which requires a value (N + P2O5 + K2O) of at least 4%. This shows that compost made from banana stems can be used as a nutrient source if applied to the land, because it has a large value of macro nutrients (N + P2O5 + K2O).

Other than that, compost also contains humus (soil flowers) which are needed for increasing macro and micro nutrients and are very much needed by plants. Humus micelles have a greater cation exchange capacity (CEC) than clay micelles (3-10 times) so that the provision of macro and micromineral nutrients is longer. Cation exchange capacity (CEC) of organic acids from compost is higher than clay minerals, but more sensitive to

changes in pH because it has a source of pH dependent charge (pH dependent charge). At pH 3.5, clay CEC and C-organic were 45.5 and 199.5 me 100 g-1 while at pH 6.5 increased to 63 and 325.5 me 100 g-1. The CEC value of kaolinite clay minerals (3-5 me 100 g-1), illite (30-40 me 100 g-1), montmorillonite (80-150 me 100 g-1), whereas in humic acid (485-870 me 100 g-1) and acid fulfat (1,400me 100 g-1). Therefore, adding compost to the soil can increase the value of soil CEC (Tan, 1991)

2. Effect of water hyacinth bokashi on plant growth and production.

Variety results revealed that the treatment of water hyacinth bokhasi showed a significant effect on all parameters of observation. Furthermore, it was found that each level of treatment of water hyacinth bokhasi showed significantly different from the control treatment. This shows that the giving of water hyacinth bokh with doses of 10 tons / ha, 20 tons / ha and 30 tons / ha, can increase the growth and production of lettuce plants.

There is a significant influence on plant height and number of leaves which are plant growth parameters due to banana peel compost is one of the green manure which has a high nitrogen content while lettuce plants are vegetable plants that use nitrogen more to compile their body morphology than other nutrients. According to Glio (2015) plants commonly used for green manure include legumes (legumes), water plants, and. Furthermore, it was explained that this type of plant was chosen because it has a nutrient content, especially nitrogen which is high and rapidly decomposes in the soil. From the results of research conducted by the Indonesian Institute of

Agriculture Technology Assessment in 2010, fresh water hyacinth has a chemical content of: 36.59% organic matter, 21.23% organic C, 0.28% total N, P total 0.0011% and K total 0.016% (Hajama, 2015). Wijaya (2012), argues that nitrogen plays a role in forming vegetable protein which is very important for life and spurs plant growth and determines the crispness of harvested vegetable organs.

In addition to the high nutrient content in bokashi water hyacinth, the processing of water hyacinth into bokashi with the addition of fermentation solutions causes an increase in soil biological activity. This is due to bokashi water hyacinth rich in decomposer microorganisms. These microorganisms are able to moisturize the soil so that the soil temperature is ideal for the growth of soil biota and is then able to increase the activity of soil biota so as to produce nutrients for plants. According to Marianah (2016) Soil microorganisms have a very real role in the decomposition of organic matter in high-level plants. In the process of decomposition the remaining plants are destroyed or overhauled into elements that can be used by plants to grow.

There is a real influence on production per plant and production per plot as plant production parameters due to an increase in plant wet weight due to the increase in height and number of leaf plants. This can be understood because lettuce plants are vegetable plants produced by leaves and stems.

Production per plot in this study using water hyacinth bokashi is 2.63 kg / plot or 26.3 tons / ha while the potential yield based on the description

of new red fire varieties of lettuce listed in Appendix 4 is 27-30 tons / ha. This shows that the use of bokashi water hyacinth is single able to support the growth and production of genetically lettuce plants.

3.

4. Effect of interaction between bokashi hyacinth and bokashi bagasse on plant growth and production.

From the list of variance, it can be seen that there are no observational parameters that show a real interaction with banana peel and bokashi hyacinth compost. The absence of interaction with the combination of these two treatments may be due to the fact that they cannot influence each other.

Another possibility that causes no interaction between the exposure of banana peel and bokashi water hyacinth to all parameters observed is the lack of factors that support the interaction between the two. According to Lingga and Marsono (2013) states that the response of fertilizers given to soil to plants is largely determined by various factors including the genetic properties of plants, climate, soil, where each of these factors does not stand alone but a one is interrelated with other factors.

D. Conclusions and Recommendations

Conclusions

1. 1. Provision of bokashi banana peel compost has a significant effect on all observed parameters with the best treatment at 30 tons / ha (E3).
2. 2. The Giving of water hyacinth bokashi significantly affects plant age 4 MST and production per plant with the best treatment is at 30 tons / ha (T3).
3. 3. The interaction of banana peel compost and water hyacinth bokashi has no significant effect on all observed parameters.

Recommendations

1. A more accurate composting method is needed to optimize the utilization of banana peel waste.
2. Bokashi water hyacinth can be used as fertilizer to suppress the use of synthetic fertilizers such as urea to move towards organic farming systems.
3. . Further research is needed to get better results.

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