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AN EFFECT OF APPLICATION SYSTEM ORGANIC FERTILIZERS AND ECOENZIM ON GROWTH SOYBEAN EDAMAME (Glycine max L. Meril)

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ABSTRACT

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This study aims to determinethe effectiveness of chicken manure and ecoenzymes on the growth of soybean (Glycine max L. Merril) plants. This study used a factorial randomized block design (RAK) with 2 treatment factors, 16 treatment combinations and 2 blocks so that there were 32 plots. Treatments (1) Chicken Manure Organic Fertilizer (A) consisted of A0 = No Chicken Manure Organic Fertilizer, A1 = Chicken Manure Organic Fertilizer 7.00 g/plot, A2 Chicken Manure Organic Fertilizer 1,400 g/plot, A3 Chicken Manure Organic Fertilizer 2,100 g/ plots. For treatment (2) Ecoenzyme (R) consisted of R0 = Without Ecoenzyme Treatment, R1 = Ecoenzyme Treatment 1:100, R2 = Ecoenzyme Treatment 1: 200, R3 = Ecoenzyme Treatment 1:300. The changes observed were plant height (cm), and number of leaves (strands).

Keywords: Encoenzymes, A New System, Design

1. INTRODUCTION

Edamame soybean (Glycine max (L.) Merr.) is native to mainland China and has been cultivated since 2500 BC. In line with the growing development of trade between countries that occurred in the early 19th century, causing edamame plants also spread to various trading destination countries, namely Japan, Korea, Indonesia, India, Australia, and America (Sumarno, 1991). Edamame is a potential crop that needs to be developed because it has an average production of 3.5 tons ha-1 which is higher than the production of ordinary soybean plants which have an average production of 1.7±3.2 tons ha-1 (Marwoto, 2007). In addition, edamame also has a wide export market opportunity. Export demand from Japan is 100,000 tons year-1 and America is 7,000 tons year-1.

Fertilization is one of the most important efforts in increasing plant productivity, liquid organic fertilizer contains various types of nutrients that are far more complete than chemical fertilizers. Although it contains various elements at lower levels than those contained in chemical fertilizers, the natural content of liquid organic fertilizers is by the characteristics of the soil so that soil and plants can absorb nutrients more easily. The excess of liquid organic fertilizers containing various minerals effectively increases the cation capacity of the soil, which can provide essential nutrients needed by soil and plants (Noor, 2001).

Chicken manure is often used for planting, the use of chicken manure aims to increase the number of microorganisms and accelerate microbiological decomposition to increase nutrient availability so that it can be utilized by plants. Microbial fertilizer contained in chicken manure compost activates nutrient uptake by plants, suppresses soil-borne disease, accelerates the composting process, improves soil structure, and produces active substances that can increase plant growth (BPG, 2006). The use of chicken manure in large quantities is used as basic fertilizer. In Indonesia, almost most of the soil is in a condition of lacks of nutrients and dense structure because it is dominated by clay elements so chicken manure is needed in large enough quantities, namely 10-20 tons/ha, Eco Enzyme is a kind of organic compound that is naturally synthesized with vegetable protein, and

minerals with adolescent hormones. Through fermentation, the ingredients used to make Eco Enzymes will affect each other (Bathara Surya Yusuf).

2. METHOD

This research was conducted on Jalan Diponegoro, Tunggurono Village, East Binjai District, Binjai City with a height of 30 meters above sea level. This research was conducted from December to February 2021. The tools used in this study were hoe, gembor, bucket, water hose, machete, basin, knife, ruler, meter, scale, jerry can, pen, plastic, data book and electric sprayer.

The materials used in this research are soybean seeds Edamame(Glycine max L. Merrill)., Chicken Manure, EM4, Orange Peel, Pineapple Peel, Molasses, Water, Soursop Leaf and Aloe Vera. The design used in this study was a factorial randomized block design (RAK) with 2 treatment factors with 16 treatment combinations and 2 blocks so that there were 32 research plots, namely:

a. Factor I is the Provision of Chicken Manure Organic Fertilizer (A) which consists of 4 levels of administration, namely:
   A0 = No Treatment
   A1 = 7.00 g/plot
   A2 = 1,400 g/plot
   A3 = 2,100 g/plot
b. Factor II is Variation in Concentration of Ecoenzyme (R) there are 4 levels consisting of
   R_0= No Treatment
   R_1=1 : 100
   R_2= 1: 200
   R_3= 1: 300

So that obtained 16 combinations obtained, namely:.

A0R0	A_0R1	A_0R2	A0R3
A1R0	A1R1	A_1R2	A1R3
A2R0	A_2R1	A2R2	A2R3
A3R0	A3R1	A_3R2	A_3R3

c. Number of Blocks

(t-1) (n-1)	15
(16-1) (n-1)	15
15 n-15	15
15 n	15+15
15n	30
n	30/15
n	= 2block

3. RESULT AND DISCUSSION

3.1. Plant Height (cm)

Observational data and analysis of the mean height variance of edamame soybean plants (Glycine maxL. Merill)The effects of giving organic chicken manure and ecoenzymes at 3,4, 5 weeks after planting can be seen in Appendices 6, 7 and 8. The results of the analysis of variance statistically showed that the application of organic chicken manure and ecoenzymes and the interaction of the two treatments had no significant effect on plant height of edamame soybeans at 3, 4 and 5 weeks after planting.

The average yield of plant height (cm) due to the application of organic chicken manure and ecoenzymes can be seen in Table 1.

Table 1. Average Plant Height (cm) Due to Application of Organic Chicken Manure and Ecoenzymes at 3, 4 and 5 Weeks After Planting (MST)

Treatment	Plant Height (cm)		
	3 MST	4 MST	5 MST
A = Chicken Manure Organic Fertilizer			
A0 = No Treatment	12.81 aA	18.35 aA	28.23 aA
A1 = 700 g/plot	12.88 aA	18.90 aA	29.05 aA
A2 = 1400 g/plot	13.03 aA	20.15 aA	29.40 aA
A3 = 2100 g/plot	14.40 aA	20.53 aA	29.80 aA
R = Variation of Ecoenzyme Concentration			
R0 = No Treatment	13.11 aA	19.05 aA	28.65 aA
R1 = 1:100	13.75 aA	19.43 aA	30.00 aA
R2 = 1:200	13.14 aA	20.30 aA	29.00 aA
R3 = 1:300	13.11 Aa	19.15 aA	28.80 aA

In Table 1 it can be seen that the highest plants were found in the organic fertilizer treatment of chicken manure A3 = (2,100 g/plot) which was 29.80 cm and the lowest plants were found in the organic fertilizer treatment of chicken manure A0 = (without treatment) which was 28.23 cm. The highest plant was found in the ecoenzyme treatment R1 = (1:100) which was 30.00 cm and the lowest plant was found in the ecoenzyme treatment R0 = (without treatment) which was 28.65 cm.

3.2. Number of Leaves (strands)

Observation data and analysis of the mean number of leaves (strands) of edamame soybean plants (Glycine maxL. Merill). The effects of giving organic chicken manure and ecoenzymes at 3,4, 5 weeks after planting can be seen in Appendices 9, 10 and 11. The results of statistical analysis of variance showed that the application of organic chicken manure and ecoenzymes and the interaction of the two treatments had no significant effect on the number of leaves of edamame soybean plants at 3, 4 and 5 weeks after planting. The results of the average number of leaves (strands) due to the application of organic chicken manure and ecoenzymes can be seen in Table 2.

Table 2. Average number of leaves (strands) due to application of organic chicken manure and ecoenzymes at 3, 4 and 5 weeks after planting (MST)

Treatment	Number of Leaves (strands)		
	3 MST	4 MST	5 MST
A = Chicken Manure Organic Fertilizer			
A0 = No Treatment	17.75 aA	22.90 aA	31.83 aA
A1 = 700 g/plot	19.05 aA	24.60 aA	33.73 aA
A2 = 1400 g/plot	21.28 aA	27.48 aA	37.93 aA
A3 = 2100 g/plot	22.40 aA	28.75 aA	39.45 aA
R = Variation of Ecoenzyme Concentration			
R0 = No Treatment	17.95 aA	23.68 aA	33.23 aA
R1 = 1:100	22.00 aA	28.63 aA	38.05 aA
R2 = 1:200	21.28 aA	26.78 aA	37.73 aA
R3 = 1:300	19.25 Aa	24.65 aA	33.93 aA

Note: The numbers followed by the same letter in the same column show no significant difference at the level of 5% (lowercase) and 1% (uppercase).

In Table 2 it can be seen that the highest number of leaves was found in the organic fertilizer treatment of chicken manure A3 = (2,100 g/plot) which was 39.45 strands and the lowest number of leaves was found in the treatment of organic chicken manure A0 = (without treatment) which is 31.23 strands. The highest number of leaves was found in the ecoenzyme treatment R1 = (1:100) which was 38.05 leaves and the lowest number of leaves was found in the ecoenzyme treatment R0 = (without treatment) which is 33.23 strands.

Analysis of diversity in the results showed that the treatment using Chicken Manure and Ecoenzyme had no significant effect, the dose treatment had an effect on plant height growth and production per plot but had no significant effect on other changes. Data from soil analysis conducted at the PT Binasawit Makmur Laboratory (2017), that pH (H2O) 4.20, Total N 0.14%, Total Organic C 1.31%, Ca 2.16 c mol/kg, Mg 0 ,77 c mol/kg, Na, P2O5 39,88 mg/100 g, K2O 8,70g/100 g, P bray 88,78 ppm. The soil texture is 56.05% sand, 15.33% dust, and 28.62% clay.

Based on the data from the analysis, the soil is classified as very acidic (low pH) and soil fertility is classified as low. This condition requires technology that can increase soil fertility, namely by giving organic fertilizer, it is hoped that by giving this organic fertilizer it can increase soil fertility and plant productivity. This condition is suspected to be nutrient deficient soybean plants, because soybean plants only get a supply of nutrients from the soil where they grow and there is also no additional organic matter. Soil has (H2O) 4.20, N Total 0.14%, P2O5 39.88 mg/100g K2O 8.70 mg/100g. Based on the analysis data, the soil has a low fertility level with a very acidic pH. This condition causes some macro and micro nutrients to be unavailable and cannot be absorbed by soybean plants. In acidic soil conditions, Rhizobium bacteria which are in symbiosis with soybean plant roots cannot develop, as a result these bacteria cannot fix N from the air, thus increasing nutrient deficiency conditions, especially N elements in soybean plants.

According to Hairiah (1999) in Nazari et al. (2012), that if there is no input of organic matter into the soil, there will be leaching problems as well as delays in the provision of nutrients. Furthermore, according to Sudaryono and Heri (2011), that in acidic soils have a low fertility rate caused by poor macro nutrients (N, P, K, Ca, Mg, S), micro nutrients (Zn, Mo, Cu, B), and low levels of organic matter. Mulyani (2006) added, that at low pH also causes high levels of Al, Fe, and Mn dissolved in the soil so that it can poison plants. High levels of P fixation, erosion-sensitive soil properties, and poor microorganisms. According to Sutedjo (2008), the lack of one or more nutrients will cause plant growth not as it should. per plot on soybean plants. Although statistically the effect is not significant, tabulation shows that there is a difference in the average value of each observed variable. The treatment with 20 tons/ha of chicken manure tended to produce better growth and production compared to 10 tons/ha and 30 tons/ha of manure. This can be seen in the average value of the observed variables, namely the number of primary branches 4.98, the number of empty pods 4.24, the weight of 100 seeds was 17.99 g and the production weight per plot was 15.84 kg. It is suspected that the dose of chicken manure 20 tons/ha is the right and ideal dose to support optimal growth and production in soybean plants. At this dose there is an increase in the amount of nutrients available in sufficient and balanced conditions and can be absorbed by soybean plant roots. The increase in the number of nutrients is due to the increase in microorganisms originating from chicken manure, thereby increasing the activity of microorganisms that can help the process of overhauling organic matter, consequently increasing the availability and absorption of nutrients needed by soybean plants. In line with the opinion of Sutedjo (2008), that physically organic fertilizer can improve soil pores and soil aggregates so that soil drainage and aeration are better and the ability of roots to absorb nutrients increases. Chemically organic fertilizer acts as a source of N, P, K and other micro nutrients and is biologically capable of activating microorganism activity so as to support plant growth and development. So by giving organic fertilizer, it can reduce empty pods in soybean plants.

According to Sarief (2003), in Latu, that the application of fertilizer is intended to meet the needs of nutrients in sufficient and balanced quantities so that they can support the vegetative and generative growth of plants that lead to high production and good quality. The application of chicken manure manure at a dose of 20 tons/ha, actually had a significant effect on vegetative growth, such as plant height and number of branches which were higher than the doses of 10 tons/ha and 30 tons/ha. It

is suspected that the high N content in chicken manure manure, where the function of the N element is to stimulate the vegetative growth of plants, such as branches, leaves and stems. The better the vegetative growth of soybean plants, the photosynthesis process will run well so that more photosynthate is produced and will be stored as food reserves in the form of carbohydrates in the form of seeds. The higher the photosynthesis, the higher the seed yield will also be. In line with the opinion of Lingga and Marsono (2010), that the role of nitrogen in plants is to stimulate overall plant growth, especially stems, branches and leaves. Sutedjo (2008), stated that the N content in chicken manure helps the metabolism of carbohydrates in the seeds affect the weight of the seeds. Novizan (2005), stated that the element N contained in chicken manure is a constituent of organic matter in seeds such as amino acids, proteins, coenzymes, chlorophyll and a number of other ingredients in seeds. So that the application of chicken manure containing N will increase the weight of the seeds. The dose of chicken manure 20 tons/ha caused the generative growth of soybean plants, pod filling and production per plot to be better than 10 tons/ha and 30 tons/ha. It is suspected that there are nutrients P, K and Ca contained in chicken manure which can stimulate and improve the process of photosynthesis in the distribution of soybean plant storage organs, namely seeds. This is in line with the opinion of Sutedjo (2008), that element P is one of the nutrients that greatly helps increase plant production, the role of element P in plants is to increase root growth, accelerate and strengthen the growth of young plants to mature, accelerate flowering and fruit ripening. and seeds. Furthermore, according to Kristono and Subandi (2013), that the need for K in soybean plants is quite high. Potassium plays an important role during the seed filling period, K can also prolong the seed filling period, so that plants can better supply photosynthate to seeds.

According to Latumury (2015), that the production of one plant is the resultant of photosynthesis, decreased assimilation due to respiration and translocation of dry matter into crop yields. The high production of soybeans (seeds) fed with chicken manure at the right dose cannot be separated from the effect of net photosynthesis results. Added by Jumini (2002), that the increase in production is directly proportional to the increase in the relative growth of the net photosynthesis. In the treatment with 10 tons/ha of chicken manure, the growth and production of soybeans tended to be lower than the treatments of 20 tons/ha and 30 tons/ha. This can be seen from the average value of the observed variables, namely, plant height 67.07 cm, dry weight of 6.78 g, and production weight per plot of 10.78 kg. It is suspected that the dose given is not sufficient, so that the chicken manure given has not been able to provide the nutrients needed to support the growth and development of soybean plants. This condition is caused by a lack of microorganisms that will carry out the decomposition process of organic matter, as a result there is a delay in the solubility of nutrients in the soil, so that the availability of elements in the amount of the type of nutrients needed is hampered. This situation causes plants to experience nutrient deficiency which results in disrupted growth and development of soybean plants. This is in line with the opinion of Sarief (2003), that if chicken manure is given in inadequate quantities, the ability of organic matter to suppress P fixation by Al, Fe and Mn is also low. As a result, element P becomes unavailable to plants. Added by Tisdale and Nelson (1993) in Akino et al. (2013), that if plants cannot carry out metabolic processes if they lack N and P to form important materials. Pale color in plants that lack N, due to inhibition of chlorophyll formation and subsequent growth will be slow and stunted because chlorophyll is needed for the formation of carbohydrates in the photosynthesis proce ss.

Thus, if there is a severe shortage of N and P, it will stop the growth and production process. Based on the observational data that has been statistically analyzed, the combination of liquid organic fertilizer and the dose of chicken manure at all treatment levels showed no significant effect on the observed variables, except that the production variable per plot had a very significant effect, the two factors did not show any cooperation to support the growth and production of soybeans. The role of one of the factors or the role of each treatment neutralized each other so that the two treatments tested did not affect the overall plant activity.

According to Hanafiah (2010), that if there is no interaction of the two treatment factors, it means that the influence of a factor is the same for other factors and the same influence or the position of the two factors are equally supportive of plant growth, but do not support each other if one factor

covers the other factor. other. The role of one of the factors or the role of each treatment neutralized each other so that the two treatments tested did not affect the overall plant activity. According to Hanafiah (2010), that if there is no interaction of the two treatment factors, it means that the influence of a factor is the same for other factors and the same influence or the position of the two factors are equally supportive of plant growth, but do not support each other if one factor covers the other factor. other. The role of one of the factors or the role of each treatment neutralized each other so that the two treatments tested did not affect the overall plant activity. According to Hanafiah (2010), that if there is no interaction of the two treatment factors, it means that the influence of a factor is the same for other factors and the same influence or the position of the two factors are equally supportive of plant growth, but do not support each other if one factor covers the other factor.

4. CONCLUSION

Based on the results of research from the author on the tracker tool for solar power plants at four points, it is explained that the maximum heat generated is at 09.00 with the resulting voltage of 19 V. The Arduino nano-based solar tracker prototype with an LDR light sensor can direct the solar panels to the sun by following the sun's orientation. Solar cells using a tracker are better than using a tracker. The voltage generated by a battery using a tracker is better than without a tracker, it can be seen between 13.00 and 15.00 using a tracker and without a tracker, the voltage drop decreases.

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