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Growth Response and Production Of Eggplant (*Solanum melongena* L) with Dosage Test of Chicken Manure and Phospath Fertilizer

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ABSTRACT

The low production of eggplant plants in Indonesia is due to the fact that the business of these plants is less intensive and is still traditional without intensive cultivation, especially in the use of fertilizers so that it can support the growth and yield of eggplant plants. Research Objectives To determine the dose of chicken manure and phosphate fertilizer on the growth and yield of eggplant (Solanum malongena L). To determine the effect of chicken manure doses and phosphate fertilizer doses and the best interaction between chicken manure doses and phosphate fertilizer doses on the growth and yield of eggplant (*Solanum malongena* L). The experimental design used in this study was a factorial randomized block design (RBD) consisting of two treatment factors, namely: Factor I: Dosage of chicken manure (A) consisted of 3 levels, namely:A_0 = Control, A_1= 4 kg/plot (6 tons/ha), , A_2= 6 kg/plot (8 tons/ha). Factor II: Phosphate (P) fertilizer dosage consists of 4 levels, namely: , P_0 = Control, , P_1= 4.5 g/plot, = 9.0 g/plot, , P_2= 13.5 g/plot. The results showed that the dosage of chicken manure was significantly different for plant height, number of primary branches, number of sample planting fruit, sample planting production and production per plot. The best dose of chicken manure in this study was A2 (6 kg/plot). Phosphate fertilizer dosage treatment was significantly different for plant height, number of primary branches, number of sample planting fruit, sample crop production and production per plot. The best dose of NPK fertilizer in this study was P3 (13.5 g/plot). The interaction of cow manure and phosphate fertilizer doses was not significantly different on plant height, number of primary branches, number of sample planting fruits, sample planting production and production per plot

Keywords: Fertilizer Dosage, Organic Fertilizer, Phosphate Fertilizer, Eggplant Plant

1. INTRODUCTION

Organic fertilizers are the result of fermentation or decomposition of organic materials and plant, animal or other organic waste. Organic fertilizers are mainly used to improve soil structure and increase soil organic matter. With the increase in fertilizer prices, farmers now prefer compost to fertilize plants. According to Simanungkalit et al., (2015), organic fertilizers have several beneficial properties, including improving the structure of clay so that it becomes lighter, increasing the binding capacity of sandy soil so that the soil does not crumble, increasing the binding capacity of the soil to nutrients. (Amina et al., 2021)

Organic fertilizers contain complete nutrients, although the amount is small (the amount of these nutrients depends on the ingredients for making organic fertilizers), organic fertilizers also help the process of weathering mineral materials, such as providing food for microbes, reducing the activity of harmful microorganisms and neutralizing soil pH. One of the organic fertilizers is manure which is a waste product from domestic animals such as chickens, goats, cows and buffalo which can be used to add nutrients, improve the physical and biological properties of the soil. The quality of manure greatly influences plant response (Bahua, M. I. 2016). Chicken manure in general has advantages in terms of speed of absorption of nutrients, composition of nutrients such as N, P, K and Ca compared to cow and goat manure (Sulkan et al., 2014). The use of chicken manure manure serves to improve the physical and biological structure of the soil, increase the soil's absorption of water. (Yadi et al., 2012)

The application of manure has an effect on increasing Al-dd and lowering pH, Al-dd is the level of Aluminum in the soil. Al-dd is generally found in acidic soils with a pH <5.0. This is because organic matter from manure can neutralize the source of soil acidity. (Utami et al., 2019)

Manure will also contribute a number of nutrients to the soil that can function to support its growth and development such as N, P and K (Farida and Chozin, 2015). When calculated from body weight, chicken manure is greater than other livestock manure, where every 1,000 kg/year of live chicken weight can produce 2,140 kg/year of dry manure. Meanwhile, cow manure with the same body weight produces dry manure only 1,890 kg/year. (Marlina et al., 2021)

Likewise, in terms of the nutrient content produced, each ton of chicken coop contains 65.8 kg N, 13.7 kg P and 12.8 kg K. Meanwhile, cow manure with the same cage weight contains 22 kg N, 2.6 kg P and 13.7 kg K. Thus it can be said that the use of poultry manure will be much better than other livestock pens (Muchtar, J. 2020).

To support the growth and yield of eggplant plants also require the addition of phosphate fertilizer. according to (Purwati, A. D., & Asngad, A. 2017), phosphate is a component of enzymes and proteins. Element P plays a role in the growth of seeds, roots, flowers and fruit. The better the root structure, the better the absorption of nutrients. Phosphates also function in

the process of photosynthesis, plant chemical physiology and for cell division. (Sahetapy, M.M. 2017).

If there is a deficiency of phosphate, the old leaves tend to be gray, the edges of the leaves are brown, the veins on the young leaves are dark green, the growth of the leaves is small, stunted, eventually falls off, the growth phase is slow and the plants are stunted. In accordance with research by Istiqomah, N. (2013), the best growth and yield of eggplant plants was found at a dose of 45 kg P2O5 per ha which had a very significant effect on plant height and stem diameter. Phosphate fertilizer is a single fertilizer that provides P elements for plants. There are quite a lot of types of P fertilizers on the market with various levels of elements they contain, one of which is SP-36 fertilizer. Rini et al., (2021), argues that the purpose of fertilization is twofold, namely to provide sufficient nutrients, and to improve and maintain soil conditions in terms of structure, conditions of degree of acidity, binding potential for plant nutrients.

This research will combine the use of organic fertilizers (chicken manure cages) and inorganic fertilizers (phosphate) in eggplant production in an effort to determine the dosage that provides maximum growth and yields. According to Yuniarti, et al (2020) giving inorganic fertilizers combined with organic fertilizers is better than just giving one organic fertilizer or only inorganic fertilizers. The combination of inorganic and organic fertilizers is the most effective treatment to achieve optimal growth and results in tomato cultivation. Therefore, this study was aimed at observing the growth and yield of eggplant plants fed with chicken manure and phosphate fertilizers.

2. RESEARCH METHOD MATERIALS

Place and Time of Research

The research was conducted on the agricultural land of the Yashafa Aceh Singkil College of Agriculture with a height of ± 8 meters above sea level. The time for conducting the research will start from July to October 2022,

Materials and Tools

The materials and tools used in this study were eggplant seeds, SP-36 fertilizer, chicken manure, Sevin 85 EC insecticide and Dithane M-45 fungicide. While the tools used are hoes, machetes, bamboo, gembor, analytical scales, tape measure and writing implements.

Research Method

The experimental design used in this study was a factorial randomized block design (RBD) consisting of two treatment factors, namely: Factor I: The dose of chicken manure (A) consisted of 3 levels, namely: == Control, = 4 kg/plot (6 tonnes/ha), = 6 kg/plot (8 tonnes/ha). Factor II: Phosphate (P) fertilizer dosage consists of 4 levels, namely: = Control, = 4.5 g/plot, = 9.0 g/plot, = 13.5 g/plot. The assumed linear model for the factorial randomized block design (RBD) in this study is: $Yijk = \mu + pi + \alpha j + \beta k + (\alpha\beta)jk + \sum ijk$. Where: Y = Observations of factor A and factor P at the k-level in the I-th repetition, μ = The effect of the mean

value, pi = The effect of the block at the I-level, αj = The effect of factor A at the j-level , βk = Effect of factor P on the k-th level, (αβ)jk = Effect of the combination of factor A on the j-th level and factor P on the k-th level, ∑ijk = Error effect of the factor

Observation Parameters

Plant Height (cm) : Observation of plant height was carried out at 2 weeks after planting at intervals of 2 weeks until 75% of the plants per plot had flowered. Plant height was measured using a tape measure from the neck of the root to the last growing point or the tip of the leaf of the eggplant plant at the very end (height).

Number of Primary Branches (branches):

It's counting the number of main branches on the stem of the eggplant plant at the first harvest of the eggplant plant.

Number of Fruits Per Sample Plant (fruit) :

By counting the fruit that is harvested, namely fruit with the criteria of having a shiny fruit color. Harvesting is done 3 times with an interval of once a week by selecting fruits that are ready to be picked.

Production Per Sample Plant (kg) :

The weight of the fruit is weighed at each harvest, by weighing the total weight of the fruit at each harvest for the sample plants.

Production Per Plot (kg) :

All fruit production from each plot was weighed at harvest.

3. RESULTS AND DISCUSSION

Plant Height (cm)

Data on measurements of the average plant height from the first measurement (age 2 MST) to the last measurement (age 6 MST) and the list of variances can be seen that the doses of chicken manure and phosphate doses had a significant effect, but the interaction of the doses of manure chickens with doses of Phosphate fertilizer had no significant effect on plant height. To find out which doses of chicken manure and phosphate fertilizers gave significantly different plant heights, a test was carried out

Duncan's distance as presented in Table1 below.

Table 1. Duncan's Distance Test Effect of Chicken Manure and Phosphate Fertilizer on Plant Height (cm) Age 6 WAP

Treatment	P0	P1	P3	P3	Average
A0	38,83	42,63	45,63	46,83	43,83 b
A1	37,03	44,40	49,40	50,17	45,25 a
A2	41,00	43,83	46,07	53,13	46,01 a
Average	38,95 c	43,62 b	47,03 b	50,04 a	

Information : Numbers in the same column followed by the same letter are not significantly different at the 5% level

In Table 1 it can be seen that the dose of chicken manure treatment has a significant effect on plant height. The highest plant height was obtained in treatment A2 (6 kg/plot), namely 46.01 cm, which was significantly different from the control treatment, namely 43.48 cm, but not significantly different from the 4 kg/plot treatment, namely 45.25 cm. Based on observations of the observed growth parameters and plant yields, the use of chicken manure had a significant effect on plant height, number of primary branches, number of fruit trees planted, sample crop production and production per plot. This is because the application of manure is able to increase the availability of nutrients in the soil and support the vegetative and generative growth of plants. The availability of nutrient elements greatly influences plant growth, both plant height, number of primary branches, number of fruit plants, sample crop production and production per plot. This situation is inseparable from the many nutrients that can be absorbed by plant roots from the soil (Yudha, et al., 2014)

Number of Primary Branches (stalks)

Measurement data for the average number of primary branches can be seen in the list of variances. From the list of variances, it can be seen that the doses of chicken manure and phosphate doses had a significant effect, but the interaction between the doses of chicken manure and phosphate fertilizers had no significant effect on the number of primary branches. To find out which doses of chicken manure and Phosphate fertilizer gave significantly different number of primary branches, a test was carried out with Duncan's Distance Test as presented in Table 2 below.

Table 2. Duncan's Distance Test Effect of Chicken Manure Manure and Phosphate Fertilizer on the Number of Primary Branches (Stalks)

Treatment	Phosphate Fertilizer				
	P0	P1	P2	P3	Average
Chicken Manure					
A0	4,47	4,47	4,90	4,77	4,65 b
A1	4,32	4,53	4,93	5,33	4,78 b
A2	4,45	4,98	5,02	5,28	4,93 a
Average	4,41 c	4,66 b	4,95 b	5,13 a	

Information : Numbers followed by the same letter in the same column or row are significantly different at the 5% level.

In Table 2 it can be seen that the dose of chicken manure has a significant effect on the number of primary branches. The highest number of primary branches was obtained in treatment A2 (6 kg/plot), namely 4.93 stalks, which was significantly different from treatment A1 (4 kg/plot), namely 4.78 stalks and A0 (0.kg/plot), but A1 (4 kg/plot) was not significantly different from A0 (0 kg/plot). In addition, manure is an organic fertilizer that can improve soil fertility and also has sufficient nutrients to

stimulate plant growth and is easily absorbed by roots which are used for the process of preparing metabolism in the plant body. According to Harahap et al., (2021), manure contains organic matter which can improve soil conditions so that water is always available in the soil which can improve conditions in the soil and increase the activity of microorganisms, thereby increasing the availability of N, P, K elements for plants for growth.

From the list of variances, it can be seen that the treatment of chicken manure with Phosphate fertilizer doses had a significant effect, but the interaction of Phosphate fertilizer doses had no significant effect on the number of fruit plants sampled.

To find out which dose gives a significantly different number of fruit planting samples, a test is carried out with the Duncan Distance Test as presented in Table 3 below:

Number of Fruit Planted Samples (fruits)

Table 3. Duncan's Distance Test Effect of Chicken Manure Manure and Phosphate Fertilizer on Number of Fruits Per Plant (Fruits)

Treatment	Phosphate Fertilizer				
	P0	P1	P2	P3	Average
Kotoran Ayam					
A0	15,12	16,88	18,13	18,00	17,03 b
A1	17,52	18,47	18,55	18,33	18,22 a
A2	17,88	17,92	18,45	19,23	18,25 a
Average	16,67 c	17,76 b	18,38 a	18,52 a	

Information : Numbers followed by the same letter in the same column or row are significantly different at the 5% level

The results of Table 3 show that the treatment of chicken manure had a significant effect on the number of fruit planting samples. The highest number of fruit sample plants was obtained in treatment A2 (6 kg/plot), namely 18.25 fruit, which was significantly different from treatment A0 (0 kg/plot), namely 17.03 fruit, but A2 (6 kg/plot) was not significantly different from A1 (4 kg/plot). Likewise, the application of Phosphate fertilizer had a significant effect on the number of fruit planting samples. The highest number of fruit sample plants was obtained in treatment P3 (13.5 g/plot), namely 18.52 fruit, significantly different from treatment P1 (4.5 g/plot), namely 17.76 fruit and treatment P0 (0 g/plot), namely 16.67 fruit, but not significantly different from P2 (9.0 g/plot), namely 18.38 fruit. According to Oesman (2022), nutrients N, P and K are very important elements in the growth and production of eggplant plants, namely increasing plant height and number of branches and increasing the production of the number of fruit planting samples, production of sample plantings and production per plot. These elements have different roles in compiling organic compounds in plant growth and production.

4. Sample Planting Production (kg)

From the list of variances, it can be seen that the doses of chicken manure and phosphate doses had a significant effect, but the interaction between the doses of chicken manure and phosphate doses had no significant effect on the sample crop production.

To find out which doses of chicken manure manure and Phosphate fertilizer gave a significantly different number of fruit planting samples, a test was carried out with the Duncan Distance Test as presented in Table 4 below.

Table 4. Duncan's Distance Test Effect of Chicken Manure and Phosphate Fertilizer on Sample Planting Production (kg)

Treatment	P0	P1	P2	P3	Average
A0	2,130	2,230	2,400	2,470	2,310 c
A1	2,300	2,630	2,700	2,900	2,630 b
A2	2,470	2,770	3,000	3,270	2,880 a
Average	2,300 d	2,540 c	2,700 b	2,880 a	

Information : Numbers followed by unequal letters in the same column or row are significantly different at the 5% level based on Duncan's Distance Test

From Table 4 above it can be seen that the dose of chicken manure treatment has a significant effect on the sample crop production. The highest sample crop production was obtained in treatment A2 (6 kg/plot), namely 2.880 kg, which was significantly different from treatment A1 (4 kg/plot), namely 2.630 kg and A0 (0 kg/plot), namely 2.310 kg. From the experimental data that were analyzed statistically, it turned out that the phosphate fertilizer treatment had a significant effect on plant height, number of primary branches, number of fruit trees planted, sample crop production and production per plot. This is because the use of Phosphate fertilizer in plants affects every phase of plant life. According to Pristiwanto et al., (2010), states that in the plant body Phosphate plays an important role in terms of several activities including: cell division and the formation of fat and albumin, the formation of flowers, fruit and seeds, plant maturity against the effects of nitrogen, stimulates root development, increasing the quality of crop yields and resistance to pests and diseases. (Purnamasari et al., 2020)

5. Production Per Plot (kg)

The results of production per plot and the list of variance show that the doses of chicken manure and phosphate fertilizers had a significant effect, but the interaction between the doses of chicken manure and phosphate doses had no significant effect on production per plot. To find out the dosage of chicken manure and phosphate fertilizer which gave significantly different production per plot, a test was carried out with the Duncan Distance Test as presented in Table 5below.

Table 5. Duncan's Distance Test Effect of Chicken Manure Manure and Phosphate Fertilizer on Production Per Plot (kg).

Treatment	P0	P1	P2	P3	Average
A0	4,970	5,070	5,070	5,100	5,050 c
A1	5,200	5,230	5,430	5,630	5,370 b
A2	5,330	5,600	5,470	5,930	5,580 a
Average	5,170 c	5,300 b	5,320 b	5,560 a	

Information : Numbers followed by the same letter in the same column or row are significantly different at the 5% level.

From Table 5 above it can be seen that the dose treatment of chicken manure has a significant effect on production per plot. The highest production per plot was obtained in treatment A2 (6 kg/plot) which was 5.580 kg which was significantly different from treatment A1 (4 kg/plot) which was 5.370 kg and A0 (0 kg/plot) which was 5.050 kg. The interaction of chicken manure and phosphate doses had no significant effect on plant height, number of primary branches, number of fruit trees planted, sample crop production and production per plot. This shows that the factors of cow manure and phosphate fertilizer affect the growth and production of eggplant plants, but each does not affect each other simultaneously, so that one treatment with another is hampered as a result there is no cooperation. According to Baharuddin, R. (2016), states that two factors are said to interact if one of these factors influences each other and the interaction will work together optimally if one of these factors influences each other so that the growth of the plant becomes better.

4. CONCLUSION

1. The dosage of chicken manure was significantly different for plant height, number of primary branches, number of sample planting fruit, sample planting production and production per plot. The best dose of chicken manure in this study was A2 (6 kg/plot).
2. Treatment of Phosphate fertilizer doses was significantly different for plant height, number of primary branches, number of sample planting fruit, sample crop production and production per plot. The best dose of NPK fertilizer in this study was P3 (13.5 g/plot).
3. The interaction of cow manure and phosphate fertilizer doses was not significantly different on plant height, number of primary branches, number of sample planting fruit, sample crop production and production per plot.

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