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UJI PUPUK PHOSPAT DAN DOSIS PUPUK KANDANG KOTORAN AYAM TERHADAP RESPON PERTUMBUHAN DAN HASIL TANAMAN TERUNG (*Solanum melongena L)*

(Test of Phosphate Fertilizer and Dosage of Chicken Manure Manure on Growth Response and Yield of Eggplant (Solanum melongena L) Plants)

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ABSTRACT

Eggplant cultivation is still traditional in Indonesia and does not involve much intensive cultivation. Using the right fertilizer dosage can also help increase production yields. Research Objectives Determine the effect of compost and phosphate fertilizer on the development and yield of eggplant (*Solanum malongena* L). to find out how the growth and yield of eggplant (*Solanum malongena* L) are influenced by the dose of phosphate fertilizer and chicken manure, as well as the optimal interaction between these two substances. In this study, the experimental design used in this research was a factorial randomized block design (RAK), which consisted of two treatment factors, namely: Factor I: Dosage of chicken manure (A) consisting of 3 levels, namely: A_o = control, A_1 = 4 kg/plot (6 tons/ha), and A_2 = 6 kg/plot (8 tons/ha). Factor II: Phosphate fertilizer dosage (P) consists of 4 levels, namely: P_o = control, P_1 = 4.5 g/plot, P_2 = 9.0 g/plot, and P_3 = 13.5 g/plot. The dosage of chicken manure varies greatly depending on plant height, number of primary branches, number of fruit planted samples, planted sample production, and plot production. A2 (6 kg/plot) was the most effective dose of chicken manure in this study. The dose of phosphate fertilizer was significantly different for plant height, number of primary branches, number of fruits on sample plants, sample plant production, and plot production. P3 (13.5 g/plot) was the best NPK fertilizer dose in this study. There were no significant differences in plant height, number of primary branches, number of fruits on sample plants, production of sample plants, or production per plot between doses of cow manure and phosphate.

Keywords*: Dosage of Fertilizer, Sometimes Chicken Fertilizer, Phosphate Fertilizer, Eggplant Plants*

ABSTRAK

Usaha budidaya tanaman terong masih bersifat tradisional di Indonesia dan tidak banyak melibatkan budidaya intensif, Penggunaan dosis pupuk yang tepat juga dapat membantu meningkatkan hasil produksi. Tujuan Penelitian Menentukan porsi pupuk kompos dan pupuk

ZIRAA'AH, Volume 48 Nomor 3, Oktober 2023 Halaman 467-475 p-ISSN 1412-1468 e-ISSN 2355-3545

fosfat terhadap perkembangan dan hasil tanaman terong (Solanum malongena L). untuk mengetahui bagaimana pertumbuhan dan hasil tanaman terong (Solanum malongena L) dipengaruhi oleh dosis pupuk fosfat dan kotoran ayam, serta interaksi optimal antara kedua zat tersebut. Pada penelitian ini, Rancangan percobaan yang digunakan dalam penelitian ini adalah Rancangan Acak Kelompok (RAK) Faktorial yang terdiri dari dua faktor perlakuan yaitu : Faktor I : Dosis pupuk kandang kotoran ayam (A) terdiri dari 3 taraf yaitu : A_o= Kontrol, A_1 = 4 kg/plot (6 ton/ha), A_2 = 6 kg/plot (8 ton/ha). Faktor II : Dosis pupuk Phospat (P) terdiri dari 4 taraf yaitu : P_o = Kontrol, P_1 = 4,5 g/plot, P_2 = 9,0 g/plo, P_3= 13,5 g/plot. Dosis pupuk kandang ayam sangat bervariasi tergantung pada tinggi tanaman, jumlah cabang primer, jumlah buah contoh tanam, contoh produksi tanam, dan produksi petak. A2 (6 kg/petak) merupakan dosis pupuk kandang ayam yang paling efektif dalam penelitian ini. Dosis pupuk fosfat berbeda nyata terhadap tinggi tanaman, jumlah cabang primer, jumlah buah tanaman contoh, produksi tanaman contoh, dan produksi petak. P3 (13,5 g/petak) merupakan dosis pupuk NPK yang paling baik dalam penelitian ini. Tidak ada perbedaan yang nyata pada tinggi tanaman, jumlah cabang primer, jumlah buah tanaman contoh, produksi tanaman contoh, atau produksi per petak antara dosis pupuk kandang sapi dan fosfat.

Kata Kunci : *Dosis Pupuk, Pupuk Kadang Ayam, Pupuk Phospat, Tanaman Terung*

INTRODUCTION

Most organic fertilizers are used to improve soil structure and increase the amount of organic matter in the soil. With the increasing cost of manure, breeders today prefer fertilizer to prepare crops. Simanungkalit et al., stated that (2015), organic fertilizers have several advantages, such as improving the structure of clay to make it lighter, increasing the binding power of sandy soil to prevent collapse, and increasing the binding of soil to nutrients. Amina *et al.,* (2021), Manure, a by-product of livestock such as chickens, goats, cows, and buffaloes that can be used to add nutrients and improve the physical and biological properties of the soil, is one type of organic fertilizer. The nature of fertilizer significantly affects plant reactions, according to Bahu, (2016) When compared to cow and goat manure, chicken manure generally has advantages in terms of nutrient absorption speed and nutrient composition such as N, P, K, and Ca (Sulkan et al., 2014). The use of chicken manure can improve the biological and physical structure of the soil and increase the ability of the soil to absorb water. Yadi *et al.,* 2012).

The use of compost affects Al-dd expands and lowers pH, Al-dd is the Aluminum content in the soil. Al-dd is usually found in soils with a pH below 5.0 which is acidic. This is because organic matter derived from manure has the ability to neutralize the cause of soil acidity. Utami et al, 2019) According to Farida and Chozin (2015), manure will also contribute a number of nutrients to the soil that can help its growth and development, such as nitrogen, phosphorus, and potassium. When viewed from its body weight, chicken compost is more considered than other animal fertilizers, where every 1,000 kg / year of live chicken weight can produce 2,140 kg / year of dry manure. At the same weight, cow dung produces only 1,890 kg/year of dry manure. Marlina *et al.,* 2021)

Phosphate fertilizers are also needed to support the growth and yield of eggplant plants. Phosphorus is a component of enzymes and proteins, as stated by Purwati and Asngad (2017). Component P plays a role in the development of seeds, roots, flowers and organic products. The absorption of nutrients is enhanced by the superior structure of the roots. Phosphates also play a

ZIRAA'AH, Volume 48 Nomor 3, Oktober 2023 Halaman 467-475 p-ISSN 1412-1468 e-ISSN 2355-3545

role in plant chemical physiology, photosynthesis processes, and cell division. (Sahetapy, 2017). This study will combine the use of organic fertilizer (chicken manure coop) and inorganic fertilizer (phosphate) in eggplant production in an effort to determine the dose that provides maximum growth and yield. According to Yuniarti *et al*. (2020), the application of inorganic fertilizer combined with organic fertilizer is better than just applying one organic fertilizer or inorganic fertilizer. The combination of inorganic and organic fertilizers is the most effective treatment to achieve optimal growth and yield in tomato cultivation. Therefore, this study is intended to see the growth and yield of eggplant plants fed with chicken manure and phosphate fertilizer.

Research Objectives (1) to determine the dose of chicken manure and phosphate compost on the development and yield of eggplant (*Solanum malongena* L), (2) to determine how the growth and yield of eggplant (*Solanum malongena* L) is affected by the dose of phosphate fertilizer and chicken manure, as well as the best combination of both.

MATERIALS AND METHODS

Place and Time of Research

This research was conducted in the experimental field of the Faculty of Agriculture, University of Indonesian Community Development, Medan Kota District with an altitude of 22 meters above sea level. The research implementation time will be from February to September 2023.

Materials and Tools

Materials and tools used in this research are eggplant seeds, SP-36 fertilizer, chicken manure, Sevin 85 EC insecticide, and Dithane M-45 fungicide. The tools used were hoes, machetes, bamboo, paddles, analytical scales, meters, and stationery.

Research Methods

The experimental design used in this study was a factored randomized group design (RAK) (Gomes and Gomes, 1995). consisting of two treatments. factors, namely: Factor I: Dose of chicken manure fertilizer (A) consists of 3 levels, namely: A_0= Control, A_1= 4 kg/plot (6 tons/ha), A_2 A_3= 6 kg/plot (8 tons/ha). Factor II: Phosphate fertilizer dose (P) consists of 4 levels, namely: P_0= Control, P_1= 4.5 g/plot, P_2= 9.0 g/plo, = 13.5 g/plot. The linear model assumed for the Factorial Randomized Group Design (RAK) in this study is: $Yijk = \mu + pi + \alpha j + \beta k + (\alpha\beta)jk + \sum ijk$. Where: Y = The observation of factor A and factor P at the kth level in the Ith replication, μ = The effect of the mean value, pi = The effect of the block at the Ith level, αj = The effect of factor A at the jth level, βk = The effect of factor P at the kth level, (αβ)jk = The effect of the combination of factor A at the jth level and factor P at the kth level, ∑ijk = The error effect of the factor A and factor P at the jth level.

Observation Parameters

Plant Height (cm)

Plant height observations were made at the age of 2 weeks after planting with an interval of 2 weeks until 75% of the plants per plot had flowered. Plant height was measured using a meter starting from the root collar to the last growing point or the tip of the eggplant plant's last (tallest) leaf.

Number of Primary Branches (branches):

Counting the number of primary branches on the stem of eggplant plants at the time of the first harvest of eggplant plants.

Number of Fruits Per Sample Plant (fruit)

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

Production per sample plant (kg)

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

ZIRAA'AH, Volume 48 Nomor 3, Oktober 2023 Halaman 467-475 p-ISSN 1412-1468 e-ISSN 2355-3545

Production Per Plot (kg): All fruit production from each plot weighed at harvest.

RESULTS AND DISCUSSION

Plant Height (cm)

The average measurement data of plant height from the first measurement (age 2 MST) to the last measurement (age 6 MST) and the list of variances can show that the treatment of chicken manure doses, and Phospat fertilizer doses give a real effect, but the interaction of the treatment of chicken manure doses with Phospat fertilizer doses gives no real effect on plant height. To find out which doses of chicken manure and Phosphate fertilizer give significantly different plant heights, the Duncan Distance Test was conducted as presented in Table 1 below.

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

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	

Notes: The numbers in the same column followed by the same letter indicate that they are not significantly different at the 5% level.

In Table 1, it can be seen that the dose of chicken manure treatment significantly affects the plant height. The highest plant height was obtained in the A2 treatment (6 kg/plot), which was 46.01 cm, which was significantly different from the A0 treatment (0 kg/plot), which was 43.48 cm, but not significantly different from the A1 treatment (4 kg/plot), which was 45.25 cm. Based on the observations of the observed plant growth and yield parameters, the use of chicken manure had a significant effect on plant height, number of primary branches, number of fruits per plant, production per sample plant, 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 nutrients greatly affects plant growth, plant height, number of primary branches, number of fruits per plant, sample plant production and production per plot. This situation is inseparable from the amount of nutrients that can be absorbed by plant roots from the soil (Yudha, *et al.*, 2014).

Number of Primary Branches (stalk)

Data on the average measurement of the number of primary branches can be seen in the list of variances. From the list of variance, it can be seen that the treatment of chicken manure dose and Phosphate fertilizer dose gave a real effect, but the interaction of the treatment of chicken manure dose and Phosphate fertilizer gave no real effect on the number of primary branches. To find out which doses of chicken manure and Phosphate fertilizer give significantly different numbers of primary branches, Duncan's Range Test was conducted as presented in Table 2 below.

ZIRAA'AH, Volume 48 Nomor 3, Oktober 2023 Halaman 467-475 p-ISSN 1412-1468 e-ISSN 2355-3545

Tabel 2. Duncan distance test the effect of chicken manure and phospate fertilizer on the number of primary branches (stalks)

Treatment	P0	P1	P2	P3	Average
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	

Notes: The numbers in the same column followed by the same letter indicate that they are not significantly different at the 5% level.

Table 2 shows that the dose of chicken manure treatment significantly affects the number of primary branches. The highest number of primary branches was obtained in the A2 treatment (6 kg/plot) which was 4.93 stalks which was significantly different from the A1 treatment (4 kg/plot) which was 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 the roots which are used for metabolic processes in the plant body. According to Harahap et al. (2021), manure contains organic matter that 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 Harahap et al. (2021)

Number of Fruit per Plant Sample (fruit)

From the list of variances, it can be seen that the treatment of chicken manure with Phosphate fertilizer dose gives a real effect, but the interaction of Phosphate fertilizer dose treatment gives no real effect on the number of fruits per sample plant. To find out which dose gives the number of fruits per plant sample that is significantly different, testing with the Duncan Distance Test is done as presented in Table 3 below:

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

Treatment	P0	P1	P2	P3	Average
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	

Notes: The numbers in the same column followed by the same letter indicate that they are not significantly different at the 5% level

The results of Table 3 show that the treatment of chicken manure has a significant effect on the number of fruits per sample plant. The highest number of fruits per sample plant was obtained in the A2 treatment (6 kg/plot) which was 18.25 fruits which was significantly different from the A0 treatment (0 kg/plot) which was 17.03 fruits, but A2 (6 kg/plot) was not significantly different from A1 (4 kg/plot). Likewise, the application of Phosphate fertilizer significantly influenced the number of fruits per sample plant. The highest number of fruits per sample plant was obtained in the P3 treatment (13.5 g/plot) which was 18.52 fruits, significantly different from the P1 treatment (4.5 g/plot) which was 17.76 fruits and the P0 treatment (0 g/plot) which was

ZIRAA'AH, Volume 48 Nomor 3, Oktober 2023 Halaman 467-475 p-ISSN 1412-1468 e-ISSN 2355-3545

16.67 fruits, but not significantly different from P2 (9.0 g/plot) which was 18.38 fruits. 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 production of the number of fruits per sample plant, production of Pristiwanto, *et al..,* (2017), per sample plant and production per plot. These elements have different roles in preparing organic compounds for growth and production

Sample Plant Production (kg)

From the list of variance, it can be seen that the treatment of chicken manure dose and Phosphate fertilizer dose gives a real effect, but the interaction of chicken manure dose with Phosphate fertilizer dose gives no real effect on the production of sample plants.

To find out which dose of chicken manure and Phosphate fertilizer gives the number of fruits per sample plant that is significantly different, testing with the Duncan Distance Test as presented in Table 4 below.

Tabel 4. Duncan distance test The effect of chicken manure and phospate fertilizer on sample crop 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	

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

From Table 4 above, it can be seen that the dose of chicken manure treatment significantly affects the production of sample plants. The highest sample plant production was obtained in the A2 treatment (6 kg/plot) which was 2,880 kg which was significantly different from the A1 treatment (4 kg/plot) which was 2,630 kg and A0 (0 kg/plot) which was 2,310 kg.

From the experimental data analyzed statistically, it turns out that phosphate fertilizer treatment has a real influence on plant height, number of primary branches, number of fruits per plant, production of sample plants, and production per plot. This is because the use of Phosphate fertilizer on plants affects every phase of plant life. According to Pristiwanto et al., (2010), states that in the plant body Phosphate provides an important role in terms of several activities including cell division and the formation of fat and albumin, the formation of flowers Rini *et al.,* (2021), fruits, and seeds, plant maturity against the effects of nitrogen, stimulating root development, improving the quality of plant yields and resistance to pests and diseases.(Purnamasari *et al.,* 2020).

Production Per Plot (kg)

The results of Production per plot and the list of variances can be seen that the treatment dose of chicken manure and phosphate fertilizer has a real effect but the interaction of the treatment dose of chicken manure with the dose of Phosphate fertilizer has no real effect on production per plot.

To determine the dose of chicken manure and Phosphate fertilizer which gives significantly different production per plot, testing with the Duncan Distance Test as presented in Table 5 below.

ZIRAA'AH, Volume 48 Nomor 3, Oktober 2023 Halaman 467-475 p-ISSN 1412-1468 e-ISSN 2355-3545

Table 5. Duncan Distance Test of the Effect of Chicken 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	

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

From Table 5 above, it can be seen that the dose of chicken manure treatment significantly affects the production per plot. The highest production per plot was obtained in the A2 treatment (6 kg/plot) which was 5,580 kg which was significantly different from the A1 treatment (4 kg/plot) which was 5,370 kg and A0 (0 kg/plot) which was 5,050 kg.

The interaction of doses of chicken manure and Phosphate fertilizer had no significant effect on plant height, number of primary branches, number of fruits per plant, production per sample plant, and production per plot. Sahetapy (2017), shows that the factors of cow manure and Phosphate fertilizer affect the growth and production of eggplant plants, but each affects not simultaneously each other, so between one treatment and the other treatment becomes inhibited as a result there is no cooperation that occurs Sulkan,2016 According to Baharuddin, R. (2016), states that two factors are said to interact if one of these factors affects each other and the interaction will work optimally if one of these factors affects each other so that the growth of the plant becomes better.

CONCLUSIONS AND SUGGESTIONS

Conclusion

1. Doses of chicken manure were significantly different on plant height, number of primary branches, number of fruits per sample plant, production per sample plant, and production per plot. The best dose of chicken manure in this study was A2 (6 kg/plot).
2. Phosphate fertilizer dose treatment was significantly different on plant height, number of primary branches, number of fruits per sample plant, production of sample plants, and production per plot. The best dose of NPK fertilizer in this study was P3 (13.5 g/plot).
3. The interaction of the dose of cow manure and Phosphate fertilizer was not significantly different on plant height, number of primary branches, number of fruits per sample plant, production of sample plants, and production per plot.

Recommendation

1. It is recommended to conduct further research on the effect of the dose of chicken manure on other varieties of eggplant (Solanum melongena L) to obtain the appropriate dose and the right time so that it can be applied in eggplant cultivation.
2. It is recommended to conduct further experiments on the use of chicken manure for other crops.

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