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The Response To Multifunctional Fertilizer And Cow Manure Growth And Production Of Sedele Plant (Glysine Max L)

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ABSTRACT

The purpose of this study was to determine the response of multifunctional fertilizer and cow dung on the growth and production of Soybean (Glycine max L.) plants and their interactions. This study was conducted in Klambir Lima Hamparan Perak Village, Deli Serdang Regency, North Sumatra from January to March 2023, using a factorial Randomized Block Design (RAK), with three blocks, 12 combinations. The first factor is cow dung fertilizer (P0) = 0 kg/plot, (P1) = 1.5 kg/plot, (P2) = 3 kg/plot, and (P3) = 4.5 kg/plot. The second factor is ecoenzyme (E1) = 90 ml/plot, (E2) = 180 ml/plot and (E3) = 270 ml/plot. The parameters observed were plant height (cm), number of productive branches (branches), number of pods per sample (plong), number of plong per plot (pods), production per sample (g) and production per plot (g). The results of the study showed that the provision of cow dung fertilizer had an effect on all observation parameters. The best observation parameter results on soybean plants were in the P3 = 4.5 kg / plot treatment. The provision of multifungal fertilizer on the growth and production of soybean plants had an effect on all observation parameters. With a treatment of 270 ml / plot gave the best results on soybean plants, while the interaction between cow dung fertilizer and ecoenzyme had no significant effect on all observation parameters.

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INTRODUCTION

In Indonesia, the most important food commodity after rice and corn is soybeans. This commodity is used for household food consumption, industry, and seeds. In the past 13 years, the need for processed soybeans as processed products has tended to increase. In 2015, soybean consumption was 2.54 million tons of dry beans consisting of direct consumption by the population of 2.3 million tons, seeds of 39,000 tons, non-food industry of 446,000 tons, and milk of 49,000 tons (Krisnawati, 2017).

The consumption of processed soybeans by the people of Indonesia is certain to continue to increase every year considering several considerations such as the increasing population, increasing employment opportunities, and awareness due to the high consumption of tofu and tempeh by the people, as well as for the supply of the soy sauce industry (Aldillah, 2015).

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Important aspects of soybeans as a functional food source can be seen from the nutritional content of the seeds. Based on dry weight basis, soybeans contain about 40% protein, 20% oil, 35% soluble carbohydrates (sucrose, stachyose, and raffinose) and insoluble carbohydrates (dietary fiber). Although it does not contain vitamin B12 and vitamin C, soybeans are a better source of vitamin B compared to other grain commodities. In addition, soybeans contain minerals rich in K, P, Ca, Mg, and Fe, as well as other beneficial nutritional components, such as isoflayone which functions to prevent various diseases (Krisnawati, 2017).

Excessive inorganic fertilizer application at the farmer level causes land productivity to decrease. Therefore, the addition of organics that function as a balancing material that can absorb some substances so that excessive compounds do not damage plants. One effort to increase soybean production through cultivation techniques is by applying organic materials and providing multifunctional fertilizers. Multifunctional fertilizers are fermented products of a mixture of brown sugar, water, kitchen waste or fresh vegetables or fruit waste. The planting medium used in this study was cow dung. Microorganisms that decompose organic materials are biological activators that grow naturally or are deliberately given to accelerate composting and improve compost quality. The number and type of microorganisms determine the success of the decomposition or composting process.

METHODS

This research was conducted in Klambir V Village from January to March 2024 using a Randomized Block Design (RAK) with 2 factors and 2 blocks to obtain 24 research plots.

a. The First Factor is Multifunctional Fertilizer (E) where the fertilizer is mixed with 1 liter of water and then poured onto the plant as much as 200 ml/plant. The level of multifunctional fertilizer treatment consists of 3 treatments, namely:
   - E1 = 90 ml/plot
   - E2 = 180 ml/plot
   - E3 = 270 ml /plot

b. The second factor is cow dung fertilizer (P) which is first immersed in the plot for 2 weeks before soybeans are planted. The cow dung treatment stage consists of 4 treatments, namely:
   - P0 = no treatment (0 kg/plot)
   - P1 = cow dung (1.5 kg / plot)
   - P2 = cow dung (3 kg / plot)
   - P3 = cow dung (4.5 kg / plot)

RESULTS AND DISCUSSION

Plant Height (cm)

Measurement of the average plant height (cm) due to the administration of cow dung and multifunctional fertilizer at the age of 2, 3, 4, and 5 weeks after planting can be seen in table 1 below;

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Table1. Average Plant Height (cm) Due to Application of Cow Manure and Multifunctional Fertilizer at 2, 3, 4 and 5 Weeks After Planting.

Treatment	Plant Height (cm)							
	2 MST		3 MST		4 MST		5 MST	
P = Cow dung								
P0 = 0.0 kg/plot	16.12	a B	23.07	b. A	34.20	bB	50.25	bB
P1 = 1.5 kg/plot	16.20	b B	23.36	ab.A	35.31	bB	50.88	bB
P2 = 3.0 kg/plot	16.26	chapter	23.60	a A	36.07	chapter	51.91	bB
P3 = 4.5 kg/plot	18.60	a A	25.90	a A	38.96	a A	57.40	a A
E = Multifunctional Fertilizer								
E1 = 90 ml/plot	16.08	bB	22.93	bB	35.00	bB	50.42	bB
E2 = 180 ml/plot	16.60	bB	23.68	bB	35.98	bB	51.90	bB
E3 = 270 ml/plot	23.68	a A	33.78	a A	49.96	a A	74.10	a A

Note: Numbers in the same column followed by different letters are significantly different at the 5% level (lower case letters) and very significantly different at the 1% level (capital case letters).

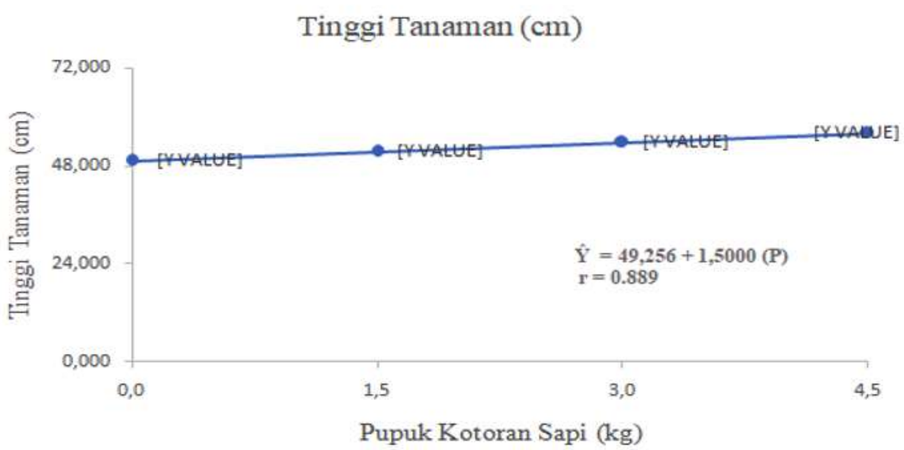

Figure 1. relationship between plant height during 5 weeks using manure fertilizer

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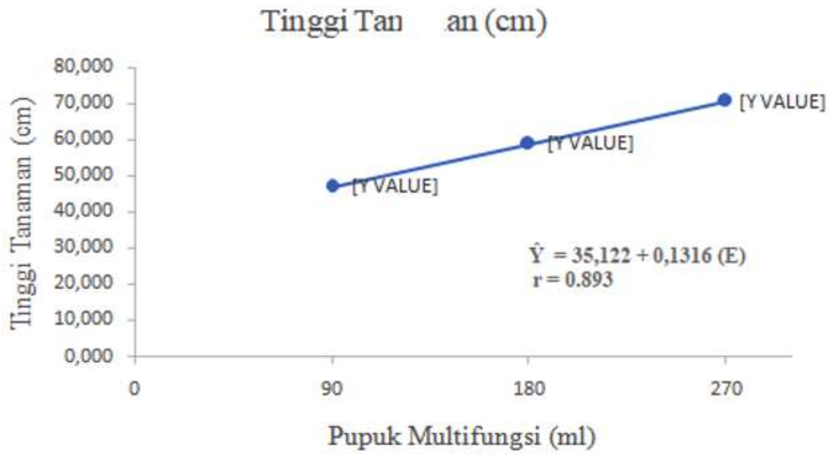

Figure 2. relationship between plant height during 5 weeks using multifunctional fertilizer

Number of Productive Branches Per Sample (branches)

Based on the results of observations and statistical analysis, it is known that the effectiveness of providing cow manure and multifunctional fertilizer has a very real effect on the number of productive branches. The interaction between providing cow manure and multifunctional fertilizer does not have an effect on the productive branches of soybean plants. The effectiveness of providing cow dung and multifunctional fertilizers has an effect on productive branches as presented in Table 2.

Table2. Average Number of Productive Branches (branches) in Soybean Plants with Cow Manure and Multifunctional Fertilizer Application.

Treatment	Number of Productive Branches	
P = Cow dung	Average	Notation
P0 = 0.0 kg/plot	4.85	c B
P1 = 1.5 kg/plot	5.07	bcB
P2 = 3.0 kg/plot	5.22	abAB
P3 = 4.5 kg/plot	5.45	a A
E = Multifunctional Fertilizer		
E1 = 90 ml/plot	4.91	bB
E2 = 180 ml/plot	5.05	bB
E3 = 270 ml/plot	7.30	a A

Note: Numbers in the same column followed by different letters are significantly different at the 5% level (lower case letters) and very significantly different at the 1% level (capital case letters).

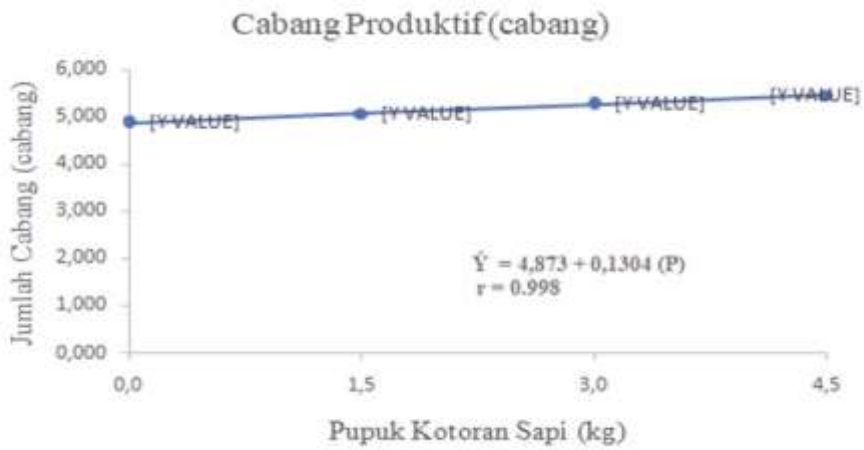

Figure 3. number of productive branches using manure fertilizer

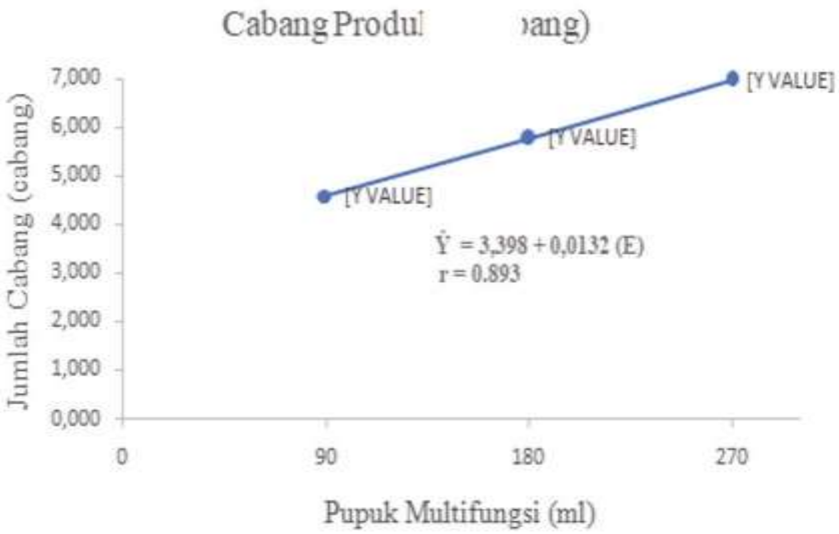

Figure 4. number of productive branches using multifunction fertilizer

Number of Pods Per Sample (g)

Based on the results of observations and statistical analysis, it is known that the effectiveness of providing cow manure and ecoenzyme fertilizer has an effect on the number of pods per sample. The interaction between providing cow manure and ecoenzyme fertilizer does not have an effect on the number of pods per sample (pods) of soybeans.

Table3. Average Number of Pods Per Sample (Pods) in Soybean Plants Due to Application of Cow Manure and Multifunction Fertilizer

Treatment	Number of Pods Per Sample	
P = Cow dung		
P0 = 0.0 kg/plot	109.60	bB
P1 = 1.5 kg/plot	121.34	a A

P2 = 3.0 kg/plot	122.25	a A
P3 = 4.5 kg/plot	124.87	a A
E = Multifunctional Fertilizer		
E1 = 90 ml/plot	114.93	bB
E2 = 180 ml/plot	115.13	bB
E3 = 270 ml/plot	171.31	a A

Note: Numbers in the same column followed by different letters are significantly different at the 5% level (lower case letters) and very significantly different at the 1% level (capital case letters).

Number of Pods Per Plot (pods)

Based on the results of observations and statistical analysis, it is known that the effectiveness of providing cow manure and multifunctional fertilizers has an effect on the number of pods per plot. The interaction between the provision of cow manure and multifunctional fertilizers does not have an effect on the number of pods per plot (pods) of soybeans.

Table4. Number of Pods Per Plot (pods) in Soybean Plants Due to Application of Cow Manure and Multifunctional Fertilizer.

Treatment	Number of Pods Per Plot	
P = Cow dung		
P0 = 0.0 kg/plot	1538.43	bB
P1 = 1.5 kg/plot	1681.10	a A
P2 = 3.0 kg/plot	1683.55	a A
P3 = 4.5 kg/plot	1812.77	a A
E = Multifunctional Fertilizer		
E1 = 90 ml/plot	1596.07	bB
E2 = 180 ml/plot	1604.66	bB
E3 = 270 ml/plot	2448.21	a A

Note: Numbers in the same column followed by different letters are significantly different at the 5% level (lower case letters) and very significantly different at the 1% level (capital case letters).

Sample Production (g)

Based on the results of observations and statistical analysis, it is known that the effectiveness of providing cow manure and multifunctional fertilizers has a very real effect on the production per sample (g). The interaction between the provision of cow manure and multifunctional fertilizers does not have an effect on the production per sample (g) of soybeans.

Table5. Average Production Per Sample (g) in Soybean Plants Due to Application of Cow Manure and Multifunction Fertilizer

Treatment	Sample Production
P = Cow dung	

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P0 = 0.0 kg/plot	129.61	bB
P1 = 1.5 kg/plot	138.23	chapter
P2 = 3.0 kg/plot	141.28	bA
P3 = 4.5 kg/plot	171.55	a A
E = Multifunctional Fertilizer		
E1 = 90 ml/plot	128.39	bB
E2 = 180 ml/plot	143.16	bB
E3 = 270 ml/plot	218.61	a A

Note: Numbers in the same column followed by different letters are significantly different at the 5% level (lower case letters) and very significantly different at the 1% level (capital case letters).

Production Per Plot

Based on the results of observations and statistical analysis, it is known that the effectiveness of providing cow manure and multifunctional fertilizer has an effect on production per plot (g). The interaction between providing cow manure and multifunctional fertilizer has no effect on production per plot (g) of soybeans. For more details, the effectiveness of providing cow manure and multifunctional fertilizer has an effect on the number of pods per plot (g) as presented in Table 6.

Table6. Production Per Plot (g) in Soybean Plants Due to Application of Cow Manure and Multifunction Fertilizer.

Treatment	Production Per Plot	
P = Cow dung		
P0 = 0.0 kg/plot	1457.63	bB
P1 = 1.5 kg/plot	1587.00	abAB
P2 = 3.0 kg/plot	1632.64	a A
P3 = 4.5 kg/plot	1788.64	a A
E = Multifunctional Fertilizer		
E1 = 90 ml/plot	1532.30	bB
E2 = 180 ml/plot	1548.55	bB
E3 = 270 ml/plot	2358.08	a A

Note: Numbers in the same column followed by different letters are significantly different at the 5% level (lower case letters) and very significantly different at the 1% level (capital case letters).

Effectiveness of Growth and Production of Soybean Plants (Glycine max L.) Due to Application of Cow Manure Fertilizer

From the results of statistical analysis showed that the treatment of cow dung fertilizer gave a very significant effect on the parameters of plant height, productive branches and production per sample, had a significant effect on the parameters of the number of pods per sample, pods per plot and production per plot. The best observation parameter results were in the treatment P3 = 4.5 kg / plot and the lowest in the treatment P0 = 0 kg / plot.

The provision of cow dung fertilizer has an effect on each parameter observed, this is because cow dung fertilizer contains nutrients (macro) such as phosphorus (P), nitrogen (N), and potassium (K) while the content of micro nutrients in manure fertilizer includes calcium, magnesium, sulfur, sodium, iron and copper (Rundengan et al., 2020). The N element contained in the fertilizer plays a role in the composition of protein, the K element plays a role in the formation of carbohydrates and sugars which function to make the quality of the flowers and fruits produced better, and the P element plays a role in the formation of fruit. Plus, microbes in the soil due to the provision of biofertilizers increase so that they can maintain nutrients and facilitate absorption by plants (Sipayung, et al., 2017).

The effect of giving cow dung fertilizer has a very real effect on the parameters of plant height, productive branches and production per sample, this is because the nutrients in cow dung fertilizer are able to meet the nutrient needs of soybean plants. The nutrients needed by plants must be sufficient so that when absorbed by the plant they do not experience a deficiency which results in disrupted plant growth, while if a nutrient is excessive it can have negative consequences (Indrawan, et al., 2020)

Effectiveness of Growth and Production of Soybean Plants (Glycine max L.) with Multifunctional Fertilizer Application

From the results of statistical analysis showed that multifunctional fertilizer treatment gave a very significant effect on plant height parameters 2, 3, 5 MST while having a significant effect on 4 MST. Productive branch parameters, number of pods per sample, number of pods per plot had a very significant effect while production parameters per sample and production per plot gave significant results. Where the best observation parameter results were in treatment E3 = 270ml/plot and the lowest results were in treatment E1 = 90 ml/plot.

The effect of giving multifunctional fertilizer to soybean plants has an effect on all observed parameters, this is because the nutrients contained in multifunctional fertilizers affect the nutrient requirements of each treatment during the vegetative and generative periods of soybean plants. In accordance with Manurung (2022) who stated that if it is intended for growth, multifunctional fertilizers can be made rich in nitrogen using raw materials in the form of leaves, if it is intended to nourish fruit growth, multifunctional fertilizers can be used that are rich in potassium and phosphorus with raw materials that are rich in both elements, namely fruits and banana peels. Therefore, in line with the materials used in this study, namely banana peels, pineapples, oranges and mustard greens.

Interaction of Growth Effectiveness and Production of Soybean Plants (Glycine max L.) Due to Application of Cow Manure and Multifunction Fertilizer

The results of the analysis showed that the interaction between cow dung and multifunctional fertilizers on the growth and production of soybean plants (Glycine max L.) did not significantly affect all observed parameters. This shows that both treatment factors have their respective influences so that the plant roots do not respond and this is in

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accordance with the opinion of Nurhayati in Rahmadi (2019) which states that good safe growth can be achieved if the factors that influence growth are balanced and profitable.

Tenaya (2015) stated that if one factor has a stronger influence on another factor, then the other factor will be covered up and each factor has different properties or ways of working which will result in a relationship that is not significantly different in supporting plant growth.

CONCLUSION

Research on the response of multifunctional fertilizer and cow dung fertilizer to the growth and production of soybean plants (Glycine max L) produced several important findings as follows: The use of multifunctional fertilizer showed a significant increase in growth parameters such as plant height, number of leaves, and leaf area compared to no fertilization. Cow dung fertilizer made a positive contribution to growth, although the increase was slower than multifunctional fertilizer. The combination of the two gave the best results due to the synergistic effect between organic and inorganic nutrients. Application of multifunctional fertilizer increased the number of pods per plant, weight of 100 seeds, and total yield per hectare. Cow dung fertilizer plays a role in increasing soil fertility in the long term, providing stable and environmentally friendly production results. The combination of multifunctional fertilizer and cow dung produced the highest production, showing the importance of a balance between organic and inorganic fertilizers to maximize yields. Multifunctional fertilizer provides direct nutrients that are easily absorbed by plants, while cow dung fertilizer improves soil structure and supports long-term nutrient absorption. The combination of the two improves the efficiency of nutrient use and increases overall land productivity. The combination of multifunctional fertilizer and cow dung fertilizer is recommended to increase soybean yields optimally, both in terms of quantity and quality. The use of organic fertilizers such as cow dung supports agricultural sustainability by improving soil fertility and reducing dependence on chemical fertilizers. This study shows that the integration of organic and inorganic fertilizers is an effective strategy to increase soybean growth and production, while supporting the sustainability of the agroecosystem.

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