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Test of the Use of Cow Manure Fertilizer and Fermented Goat Urine POC on the Growth and Production of Soybean Plants (*Glycine max L. Merril*)

M. Wasito[1], Najla Lubis[2], Sulardi[3], Muhmmad Ibnu Ali Alif[4]

[1,2,3,4]Agrotechnology Department, Universitas Pembangunan Panca Budi, Indonesia

Corresponding Author: M. Wasito

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ABSTRACT

Cow dung and fermented goat urine POC were applied to soybean plants (Glycine max LMerryl) in order to increase the growth process and production results. This study was conducted to determine the effect of using cow dung and fermented goat urine POC on the growth and production of soybean plants (Glycine max LMerryl). This study used a Factorial Randomized Block Design (RBD) consisting of 2 factors. The first factor of cow dung fertilizer administration consists of S0 = 0 kg / plot, S1 = 1kg / plot, S2 = 2kg / plot, S3 = 3kg / plot. The second factor of fermented goat urine POC administration consists of K0 = 0 ml / L water / plot, K1 = 100 ml / L water / plot, K2 = 200 ml / L water / plot, K3 = 300 ml / L water / plot. The results showed that the provision of cow dung fertilizer had a very significant effect on the parameters of plant height, number of pods per sample, number of pods per plot and weight of pod production per plot and had a significant effect on the weight of 100 seeds per plot. The provision of fermented goat urine had a significant effect on the parameters of plant height, number of pods per sample, number of pods per plot and weight of pod production per plot and had a very significant effect on the weight of 100 seeds per plot. The interaction between cow dung fertilizer and fermented goat urine was not significantly different in all observations.

Keywords: Soybeans, Cow Dung, Goat Urine, Fermentation

INTRODUCTION

Soybean is a crop that is an important commodity after rice and corn. The demand for soybean in Indonesia is very high, but the availability is still far from sufficient because the production is very low so that to cover the shortage is still dependent on imports. Low soybean cultivation technology, reduced harvest area, cheap soybean import prices and prolonged dry season result in low domestic soybean production (Rahmasari et al., 2016).

Increasing the productivity efforts of soybean crops can be done in many ways, cultivation techniques. One of the appropriate cultivation techniques to increase soybean productivity is by fulfilling the needs of plant nutrients through fertilization using both organic and inorganic materials (Rahman et al. 2014).

Soybean production in 2022 is 8,214 tons, an increase compared to 2021 of 1,463 tons (Directorate General of Food Crops, 2022). This shows that there is still a great opportunity to increase soybeans. Soil that has a good level of fertility will affect plant growth.

Organic fertilizers contain a source of nutrients for the soil produced from organic materials of plant or animal origin. Organic fertilizers contain macro and micro nutrients that are at the same level as inorganic fertilizers when processed effectively. Organic fertilizers have several advantages, namely loosening the soil, increasing crop yields, plants grow better, are more environmentally friendly with the recycling process, reducing waste accumulation, minimizing gas emissions, protecting plants from certain diseases, safe for anyone and the price is more economical than chemical fertilizers (Oviasogie, et. al., 2013).

Cow dung fertilizer is very good for soybean plants, because cow dung fertilizer in addition to meeting nutrient needs can also improve soil physical properties, soil structure and easy to obtain. cow dung contains 0.402% N, 0.20-0.50% P and 0.10-1.5% K (Fachrurrozi, et.al., 2014). Fertilization is one of the efforts that can be taken in maximizing crop yields, fertilization is carried out as an effort to meet the nutrient needs of plants so that production goals can be achieved, but if the application of fertilizers that are not wise or excessive can cause problems for the plants being cultivated, such as poisoning, susceptibility to disease, low production quality and besides that high production costs can cause pollution (Hakim, 2019).

Goat urine POC has a high nitrogen element. The potential is that one adult goat produces 2.5 liters of urine/head/day. Goat urine is able to provide macro and micro nutrients and contains growth regulators (ZPT) needed by plants. Goat urine contains 1.5% Nitrogen, 0.13% Phosphorus, and 1.8% Potassium. Goat urine contains natural hormones of IAA, gibberellin, and cytokinin higher than other livestock urine. The content of chemical elements in goat urine contains nutrients N and K which are very high and easily absorbed by plants, and contains natural hormones for plant growth. Goat urine processing can be done by fermentation. Fermentation is a process of chemical changes in an organic substrate through enzyme activity produced by microorganisms. The results of fermentation of organic materials such as sugar, alcohol, amino acids, proteins, carbohydrates, vitamins and other organic compounds are easily absorbed directly by plant roots. The use of effective microorganisms in making goat urine fermentation samples aims to accelerate the fermentation process. EM4 is a mixed culture of various types of beneficial microorganisms such as photosynthetic bacteria, lactic acid bacteria, actinomycetes yeast, fermentation fungi that can increase soil microbes. Utilization of EM4 can improve growth and increase yields in plants (Sarah, 2016).

Urine is one of the liquid wastes that can be found in animal husbandry. Urine is formed in the kidney area after being eliminated from the body through the urinary tract (urineary) and comes from nitrogen metabolism in the body (urea, uric acid, and keratin) and 90% of urine consists of water. Urine produced by livestock is influenced by diet, livestock activity, external temperature, water consumption, season and so on. The amount of feces and urine produced is 10% of the weight of the livestock.

From that small amount, it turns out that every 2.5 liters of goat urine contains approximately 36% Nitrogen (N), the amount is equivalent to the N content in SP36 fertilizer. In addition to nitrogen, goat urine has other nutrients such as Phospor (P) as much as 0.13, Potassium (K) 1.80% and water content as much as 85%.

An adult goat is able to produce approximately 0.6-2.5 liters of urine per day so that for the livestock industry, urine is a very potential commodity to produce high economic value. The ratio of feces and urine produced by livestock is 1.2 :1 pigs (55% feces, 45% urine), beef cattle 2.4 :1
(71% feces, 29% urine), goats 1:1 (50% feces, 50% urine), and dairy cows 2.2 :1 (69% feces, 31% urine) (Rinekso et. al., 2014).

MATERIALS & METHODS

Research Method

Factorial Randomized Group Design consisting of 2 (two) factors 16 treatments 3 replications namely cow dung fertilizer and fermented goat urine liquid organic fertilizer.

Cow dung organic fertilizer factor (S)
S0 = 0 gr/plot
S1 = 1 kg/plot
S2 = 2 kg/plot
S3 = 3 kg/plot

Fermented goat urine POC factor (K)
K0 = 0 ml/L water/plot
K1 = 100 ml/L water/plot
K2 = 200 ml/ L water/ plot
K3 = 300 ml/ L water/ plot

Variable operational parameters

Plant Height (cm)

Soybean plants can be measured starting in plants aged 2 weeks - 5 weeks. Measurement of plant height is done by measuring the plant starting from the standard peg to the tip of the highest leaf blade. Measurement of plant height can be done using a meter, at intervals of 1 week. Observations of plant height were stopped when soybeans began to flower.

Number of Petioles (stalks)

Observations were made by counting the number of plant petioles, this is because soybean plants have trifoliate leaves. This observation can be calculated manually, the observation of the number of petioles is done when soybean plants are 2 weeks old - 5 weeks old with an interval of 1 week, the observation of the number of petioles of soybean plants is done 4 times.

Number of Pods per Sample (pods)

Observations of the number of pods per sample were made at the time after harvest. Then the pods were counted and summed up. Observations were made only once.

Number of Pods per Plot (pods)

Observation of the number of pods per plot was done at the time after harvest. Then the pods are counted and summed up. Observations were made only once.

Weight of 100 Seeds per Plot (g)

Observations of the weight of 100 seeds can be made by looking for seeds in each plot at the time after harvest and the seeds are weighed in a dry state, soybean seeds are first dried for 2 days.

Pod Production Weight per Plot (g)

Observations of pod production weight per plot can be made at harvest time by weighing the pods containing the whole fruit on each plot. Weighed using a weighing scale.

Population and Sample

In this study, plants were planted in 48 research plots. In each research plot there were 15 plants so that the total population was 720 plants. The sample plants used were 5 plants for each research plot so that 48 plots obtained a total of 240 plants.

Data Collection Technique

Data collection in the research used the field observation method, namely by making direct measurements in the field in accordance with predetermined parameters.

Research Implementation

Provision of Fertilizer from Cow Dung

The provision of cow dung organic fertilizer uses cow dung that has been dried or undergone a drying process first and has been cleaned from the rest of the garbage and uses other ingredients such as husk charcoal, bran, em4, brown sugar and water. The process of processing this fertilizer uses a closure system using a tarpaulin to avoid air and water which aims to avoid the presence of fungi and reduce the failure rate. Making the fertilizer is approximately 3-4 weeks and is successful when seen from the texture, aroma, color, changes.

Preparation of Fermented Goat Urine Liquid Organic Fertilizer

Making fermented goat urine liquid organic fertilizer is with goat urine, EM4, brown sugar. Then mix goat urine, brown sugar, and EM4, dissolve simultaneously, stir until evenly distributed then close until airtight. Every 2 days open the fermented goat urine POC mixture, stir and close again. This lasts for 14 days so that the goat urine fermentation process takes place properly.

Good goat urine POC is characterized by its ammonia odor is not pungent, the color is brownish yellow and not cloudy.

Land Preparation

The land is cleaned using tools such as hoes or machetes, then weeds on the soil surface are removed. Land clearing aims to avoid competition between main crops and weeds and avoid disease attacks.

Plot Creation

Plotting was done using a hoe with a length and width of 100 x 120 cm, with a distance between plots of 20 cm and a distance between replicates of 40 cm and a planting distance of 40 cm. Hoeing by reversing the soil below with the soil above. The reversal aims to improve the aeration system in the soil to reduce pests in the soil so that they cannot multiply.

Cow Manure Fertilizer Application

The application of tofu solid waste fertilizer is done twice during land cultivation and during flowering period with the dosage according to the treatment. The application of tofu solid waste fertilizer is done during the flowering period by sprinkling it on each plant on the soil surface in the morning after watering.

Seed Preparation

Preparation of high quality soybean seeds, because high quality seeds will produce uniform plants with an optimal population. The nature of

- The characteristics of high quality seeds include high germination rate of 80%, good vigor or seeds that grow simultaneously, fast and healthy. The use of quality seeds can also reduce the risk of pest and disease attacks. The seed variety used in this research is the Grobokan seed variety.

Planting

Seeds are planted on land conditions that have been given solid tofu waste fertilizer. The planting itself is done by making a hole by tugal then inserting 2 mung bean seeds in each hole, then covering the hole with soil.

Application of Fermented Goat Urine Liquid Organic Fertilizer

The application of fermented goat urine POC was carried out 4 times, namely 2, 4, 6 and 8 weeks after planting (MST) with a dose according to the treatment. The application of goat urine POC is done by sprinkling on each plant above the soil surface in the morning before watering.

Plant Care

Watering

Watering is done twice a day in the morning and evening according to the conditions in the field, if it rains then there is no need to water and watering is done using a paddle.

Weeding

Weeding is done manually by pulling weeds around the plant area so that there is no competition between the main plants and the nuisance plants.

Insertion

Insertion is done to replace plants that die or have abnormal growth, this is done when the plants are 1-2 weeks after planting. The inserted plants must be the same age as the main plants. Insertion plants are prepared and planted at the same time when seeding plants in polybags.

Pest and Disease Control

Pests and diseases that attack mung bean plants can be controlled manually by picking and uprooting plants that are attacked by pests and diseases. The pests that attack are leaf-rolling caterpillars, and are controlled by mechanical means, namely by manually citing the caterpillars found on the leaves of mung bean plants, and can also use organic vegetable pesticides fermented goat urine.

RESULT

Plant Height (cm)

Data on the average measurement of plant height (cm) in soybean plants with the effect of applying cow dung POC fermented goat urine fertilizer at the age of 2, 3, 4 and 5 weeks after planting, based on the analysis of variance on the parameters of soybean plant height, it can be seen that the application of cow dung fertilizer is not significantly different from plant height (cm) at the age of 2 and 3 weeks after planting but is very significantly different at the age of 4 and 5 weeks after planting. The

application of fermented goat urine POC on the parameter of plant height (cm) was not significantly different at the age of 2 and 3 weeks after planting but significantly different at the age of 4 and 5 weeks after planting. The interaction between the application of cow dung fertilizer and fermented goat urine POC showed no significant difference in the parameter of plant height (cm).

The average results of plant height (cm) of soybean at the age of 2, 3, 4 and 5 weeks after planting by applying cow dung fertilizer and fermented goat urine POC which have been tested for differences in means using the Duncan Distance Test can be seen in Table 1.

Table 1. Rata-Rata Tinggi Tanaman (cm) akibat Pemberian pupuk kotoran sapi dan POC urine Kambing fermentasi Pada Umur 2, 3, 4 dan 5 Minggu Setelah Tanam (MST)

Treatment	Plant Height (cm)			
	2 MST	3 MST	4 MST	5 MST
Cow Dung Fertilizer (S)				
S_0 = 0 ml/liter air/plot	13,93 aA	20,36 aA	32,04 aA	48,70 aA
S_1 = 1 kg/plot	14,21 aA	20,94 aA	32,21 aA	49,78 aA
S_2 = 2 kg/plot	14,46 aA	21,00 aA	35,04 bAB	50,87 bB
S_3 = 3 kg /plot	15,21 aA	22,16 aA	37,05 bB	56,75 cC
POC Goat Urine Fermentation (K)				
K_0 = 0 kg/plot	13,95 aA	20,63 aA	32,40 aA	49,81 aA
K_1 = 100 ml/L air/plot	14,05 aA	20,78 aA	33,15 abA	50,11 bAB
K_2 = 200 ml/L air/plot	14,69 aA	21,16 aA	34,94 abA	51,23 bAB
K_3 = 300 ml/L air/plot	15,13 aA	21,90 aA	35,85 bA	55,40 bB

Notes: Numbers in the same column followed by the same letter indicate that they are not significantly different at the 5% (lower case) and 1% (upper case) levels.

Table 1 above states that the provision of cow dung fertilizer has no significant effect on soybean plant height (cm) at 2 and 3 weeks after planting but is very significantly different at 4 and 5 weeks after planting, where the highest average at 5 weeks after planting is in S3 (3kg / plot) which is 56.75 cm which is very significantly different from S2 (2kg / plot) which is 50.87 cm, S1 (1 kg) which is 49.78 cm and S0 (0 kg / plot) which is 48.70 cm (lowest).

The results of regression analysis of cow dung fertilizer on plant height (cm) of soybean plantsaged 5 weeks after planting can be seen in Figure 1.

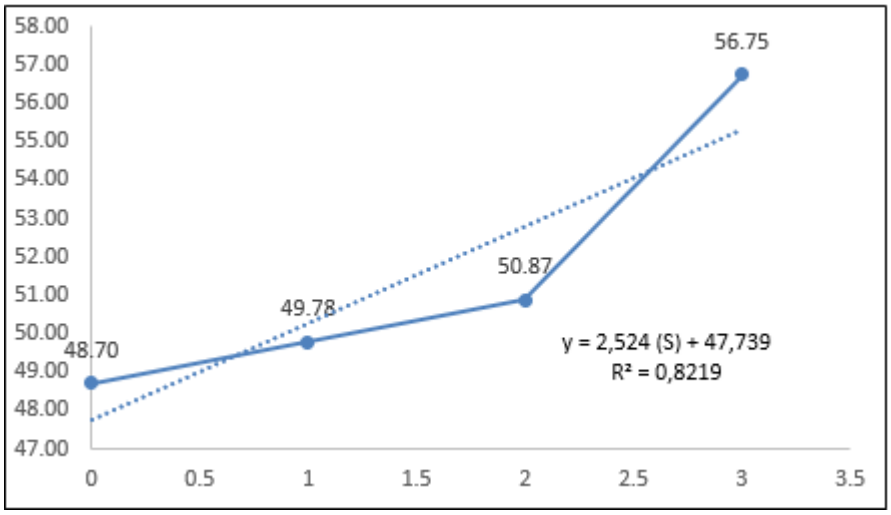

Figure 1. Graph of the Relationship Between the Application of Cow Dung Fertilizer and Plant Height (cm) of Soybean Plants (*Glycine max L*)

In Figure 1, it can be seen that the addition of cow dung fertilizer will have a positive effect on the height of soybean plants, the linear regression equation is Ŷ = 2.524 (S) +47.739 and r2 = 0.8219 this shows that every increase of 1 level of S (cow dung fertilizer) will increase the height of soybean plants by 0.8219 cm.

Table 1 above states that the provision of fermented goat urine POC has no significant effect on the height of soybean plants (cm) at the age of 2 and 3 weeks after planting but significantly different at the age of 4 and 5 weeks after planting, where the highest average at 5 weeks after planting is in K3 (4 kg/plot) which is 55.40 cm which is significantly different from K2 (3 kg/plot) which is 51.23 cm, K1 (2 kg/plot) which is 50.11 cm but very significantly different from K0 (0 kg/plot) which is 49.81 cm (lowest).

The results of regression analysis of fermented goat urine POC on plant height (cm) of soybean plants aged 5 weeks after planting can be seen in Figure 2.

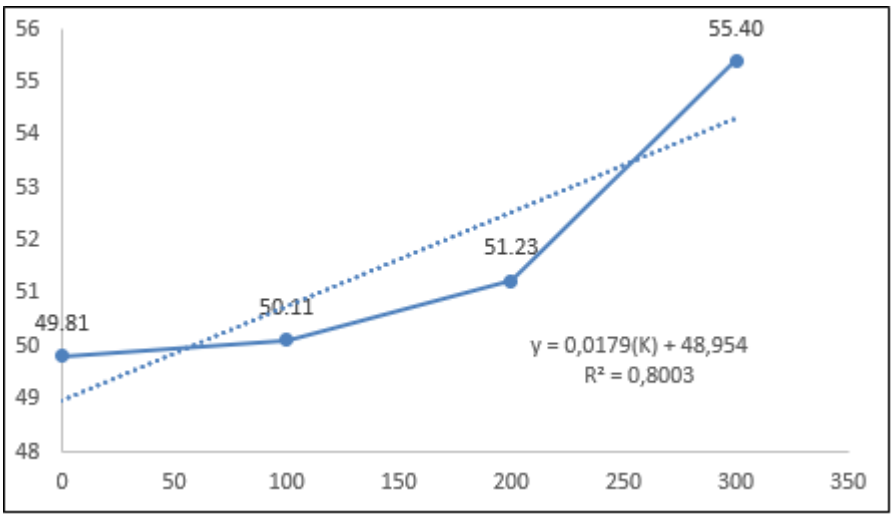

Figure 2. Graph of the Relationship Between Giving POC fermented goat urine to Plant Height (cm) of Soybean Plants (*Glycine max L*)

In Figure 2, it can be seen that the addition of fermented goat urine POC will have a positive effect on the height of soybean plants, the linear regression equation is Ŷ = 0.0179 (K)+48.954, r2 = 0.8003, this indicates that each increase of 1 level of K (fermented goat urine POC) will increase the height of soybean plants by 0.8003 cm.

Number of Petioles (stalks)

Data on the calculation of the average number of petioles (stalks) on soybean plants with the effect of applying cow dung fertilizer and fermented goat urine POC. Based on the analysis of variance on the parameter of the number of petioles of soybean plants, it can be seen that the provision of cow dung fertilizer is not significantly different from the number of petioles at the age of 2 and 3 weeks after planting but is significantly different at the age of 4 and 5 weeks after planting. The provision of fermented goat urine POC on the parameter of the number of petioles (stalks) was not significantly different at the age of 2 and 3 weeks after planting but significantly different at the age of 4 and 5 weeks after planting. The interaction between the provision of cow dung fertilizer and fermented goat urine POC showed no significant difference in the number of petioles (stalks).

The average results of the number of petioles (stalks) of soybean plants at the age of 2, 3, 4 and 5 weeks after planting by applying cow dung fertilizer and fermented goat urine POC which have been tested for differences in averages using the Duncan Distance Test can be seen in Table 2.

Table 2. Average Number of Petioles (stalks) due to the Application of Cow Dung Fertilizer and fermented goat urine POC at Age 2, 3, 4 and 5 Weeks After Planting (MST)

Treatment	Number of Petioles (Petiole)			
	2 MST	3 MST	4 MST	5 MST
Cow dung fertilizer (S)				
S0 = 0 ml/ liters of water /plot	1,78 aA	3,48 aA	6,98 aA	17,38 aA
S1 = 1 kg/plot	2,00 aA	3,60 aA	7,18 aA	18,88 aA
S2 = 2 kg/plot	2,38 aA	3,88 aA	7,98 aA	19,40 bB
S3 = 3 kg /plot	2,70 aA	4,03 aA	9,30 bB	21,88 cC
POC fermented goat urine (K)				
K0 = 0 kg/plot	1,90 aA	3,58 aA	7,38 aA	17,33 aA
K1 = 100 ml/L water/plot	1,85 aA	3,63 aA	7,45 abA	17,75 bAB
K2 = 200 ml/L water/plot	2,43 aA	3,83 aA	7,63 abA	18,28 bAB
K3 = 300 ml/L water/plot	2,68 aA	3,95 aA	8,98 bA	20,58 cC

Notes: Numbers in the same column followed by the same letter indicate that they are not significantly different at the 5% (lower case) and 1% (upper case) levels.

Table 2 above states that the provision of cow dung fertilizer has no significant effect on the number of soybean plant petioles (stalks) at 2 and 3 weeks after planting but is very significantly different at 4 and 5 weeks after planting, where the highest average at 5 weeks after planting is in S3 (3 kg/plot) which is 21.88 stalks which is very significantly different from S2 (2kg/plot) which is 19.40 stalks, S1 (1kg/plot) which is 18.88 stalks and S0 (0 kg/plot) which is 17.38 stalks (the lowest).

The results of regression analysis of cow dung fertilizer on the number of petioles of soybean plants at 5 weeks after planting can be seen in Figure 3.

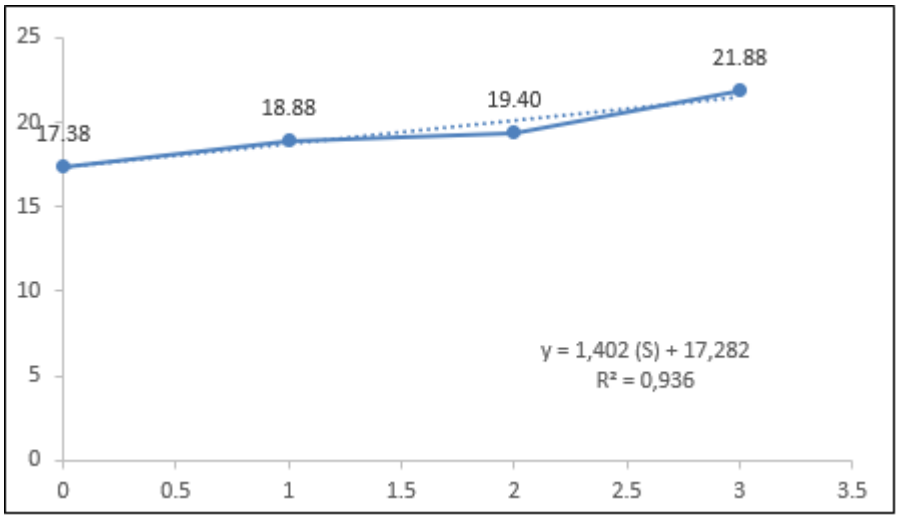

Figure 3. Application of cow dung fertilizer on the number of petioles (stalks) of soybean plants (*Glycine max L*)

In Figure 3, it can be seen that the addition of cow dung fertilizer will have a positive effect on the number of soybean plant petioles, the linear regression equation is $\hat{Y}$ = 1.402 (S) + 17.282 and r = 0.936, this shows that every increase of 1 level of S (cow dung fertilizer) will increase the number of soybean petioles by 0.936.

Table 2 above states that the provision of fermented goat urine POC has no significant effect on the number of soybean plant leaves (stalks) at 2 and 3 weeks after planting but is significantly different at 4 and 5 weeks after planting, where the highest average at 5 weeks after planting was found in K3 (300 ml / L water / plot) which was 20.58 stalks which was very significantly different from K2 (200 ml / L ar / plot) which was 18.28 stalks, K1 (100 ml / L water / plot) which was 17.75 stalks

and K0 (0 ml / L water / plot) which was 17.33 stalks (lowest).

The results of the regression analysis of the application of fermented goat urine POC to the number of petioles (stalks) of soybean plants aged 5 weeks after planting can be seen in Figure 4.

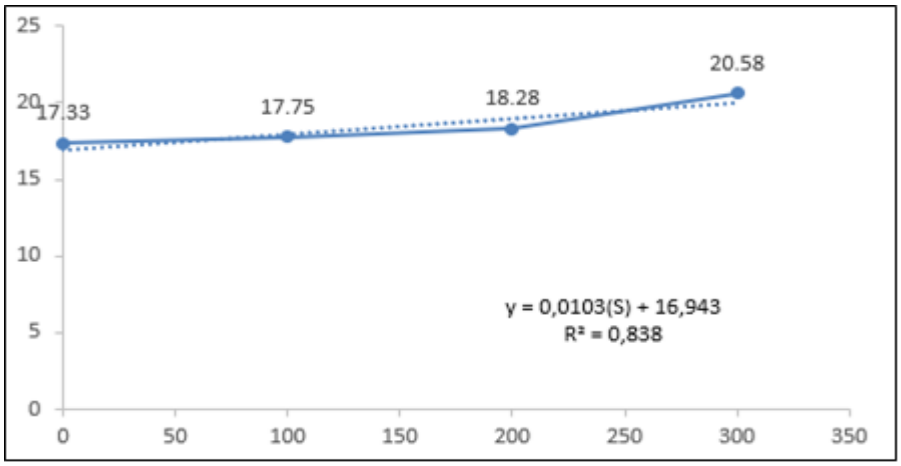

Figure 4. Graph of the Relationship Between Giving POC fermented goat urine to the Number of Leaves (stalks) of Soybean Plants (*Glycine max L*)

In Figure 4, it can be seen that the addition of fermented goat urine POC will have a positive effect on the number of soybean plant petioles, the linear regression equation is $\hat{Y}$ = 0.0103 (K)+16.943, r2 = 0.838, this shows that every increase of 1 level of K (fermented goat urine POC) will increase the number of soybean plant leaves by 0.838.

Number of Pods Per Sample (pods)

Data on the calculation of the average number of pods per sample (pods) on soybean plants with the effect of applying cow dung fertilizer and goat dung.

Goat manure. Based on the analysis of variance on the parameter of the number of pods per sample (pods) of soybean plants, it can be seen that the provision of cow dung fertilizer is very significantly different. The provision of fermented goat urine POC on the parameter of the number of pods per sample (pods) is significantly different. The interaction between the provision of cow dung fertilizer and fermented goat urine POC showed no significant difference in the number of pods per sample (pods).

The average number of pods per sample (pods) of soybean plants by applying cow dung fertilizer and fermented goat urine POC which has been tested for differences in averages using the Duncan Distance Test can be seen in Table 3.

Table 3. Average Number of Pods per Sample (Pods) Due to Cow Dung Fertilizer and Fermented Goat Urine POC

Treatment	Number of Pods Per Sample (Pods)
Cow dung fertilizer (S)	
S0 = 0 ml/liter of water/plot	77,13 aA
S1 = 1 kg/plot	81,55 abA
S2 = 2 kg/plot	83,10 bB
S3 = 3 kg /plot	94,90 cC
POC fermented goat urine (K)	
K0 = 0 kg/plot	78,10 aA
K1 = 100 ml/L water/plot	80,70 abA
K2 = 200 ml/L water/plot	80,88 bAB
K3 = 300 ml/L water/plot	93,00 cB

Notes: Numbers in the same column followed by the same letter indicate that they are not significantly different at the 5% (lower case) and 1% (upper case) levels.

Table 3 above states that the provision of cow dung fertilizer has a very significant effect on the number of pods per sample, where the highest average is in S3 (3 kg/plot) which is 94.90 pods which is very significantly different from S2 (2 kg/plot) which is 83.10 pods, S1 (1 kg/plot) which is 81.55 pods and S0 (0 kg/plot) which is 77.13 pods (the lowest).

The results of regression analysis of cow dung fertilizer on the number of pods per sample can be seen in Figure 5.

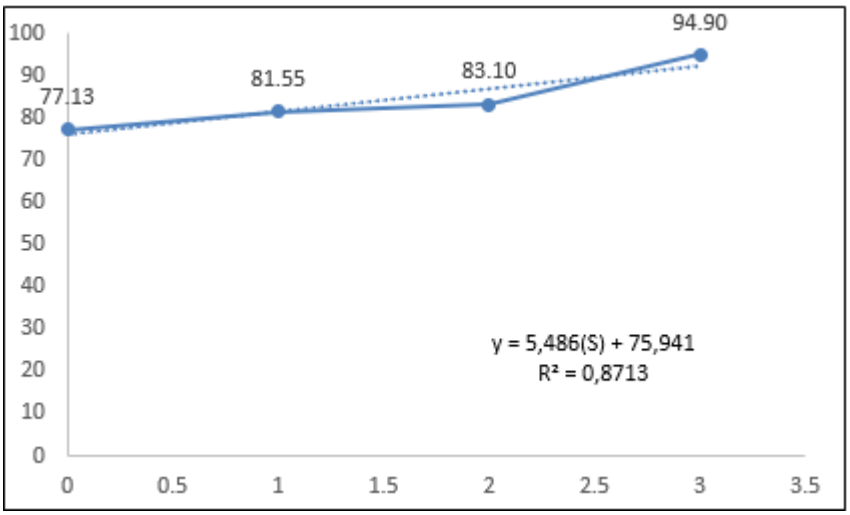

Figure 5: Graph of the Relationship Between the Application of Cow Dung Fertilizer and the Number of Pods Per Sample (pods) of Soybean Plants (*Glycine max L*)

In Figure 5, it can be seen that the addition of cow dung fertilizer will have a positive effect on the number of pods per sample of soybean plants, the linear regression equation is $\hat{Y}$ = 5.486 (S) + 75.941, r2 = 0.8713, this shows that each increase of 1 level of S (cow dung fertilizer) will increase the number of pods per sample of soybean plants by 0.8713.

Table 3 above states that the provision of fermented goat urine POC is significantly different on the perimeter of the number of pods per sample (pods), where the highest average is in K3 (300 ml / L water / plot) which is 93.00 pods which is significantly different from K2 (200 ml / L water / plot) which is 80.88 pods, and K1 (100 ml / L water / plot) which is 80.70 pods but is very significantly different from K0 (0 ml / L water / plot) which is 78.10 pods (lowest).

The results of regression analysis of POC goat urine fermentation on the number of pods per sample (pods) of soybean plants can be seen in Figure 6.

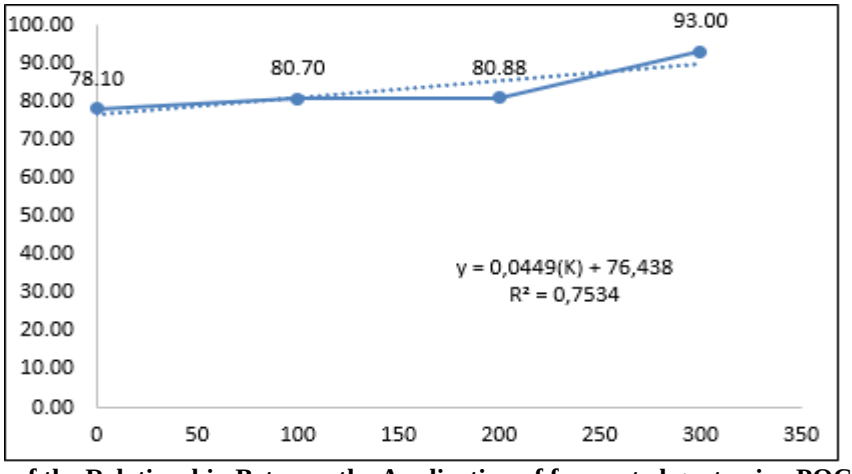

Figure 6: Graph of the Relationship Between the Application of fermented goat urine POC to the Number of Pods Per Sample (pods) of Soybean Plants (*Glycine max L*)

In Figure 6, it can be seen that the addition of fermented goat urine POC will have a positive effect on the number of pods per sample, the linear regression equation is $\hat{Y}$ = 0.449 (K) +76.438 and r2 = 0.7534, this indicates that each increase of 1 level of K (fermented goat urine POC) will increase the number of pods per sample of soybean plants by 0.7534.

Number of Pods Per Plot (pods)

Based on the analysis of variance on the parameter of the number of pods per plot (pods) of soybean plants, it can be seen that the provision of cow dung fertilizer is significantly different. The interaction between the provision of cow dung fertilizer and fermented goat urine POC showed no significant difference in the number of pods per plot (pods).

The average results of the number of pods per plot (pods) of soybean plants by applying cow dung fertilizer and fermented goat urine POC which have been tested for differences in averages using the Duncan Distance Test can be seen in Table 4.

Table 4: Average Number of Pods per Plot (pods) Due to Cow Dung Fertilizer and Fermented Goat Urine POC

Treatment	Number of Pods Per Plot (Pods)
Cow dung fertilizer (S)	
S0 = 0 ml/liter of water/plot	1258.75 aA
S1 = 1 kg/plot	1273.25 aA
S2 = 2 kg/plot	1364.88 bB
S3 = 3 kg /plot	1526.75 cC
POC fermented goat urine (K)	
K0 = 0 kg/plot	1289.75 aA
K1 = 100 ml/L water/plot	1292.75 bAB
K2 = 200 ml/L water/plot	1360.25 bAB
K3 = 300 ml/L water/plot	1480.88 cC

Notes: Numbers in the same column followed by the same letter indicate that they are not significantly different at the 5% (lower case) and 1% (upper case) levels.

Table 4 above states that the provision of cow dung fertilizer has a very significant effect on the number of pods per plot, where the highest average is in S3 (3kg/plot) which is 1526.75 pods which is very significantly different from S2 (2 kg/plot) which is 1364.88 pods, S1 (1 kg/plot) which is 1273.25 pods and S0 (0 kg/plot) which is 1258.75 pods (the lowest).

The results of regression analysis of cow dung fertilizer on the number of pods per plot can be seen in Figure 7.

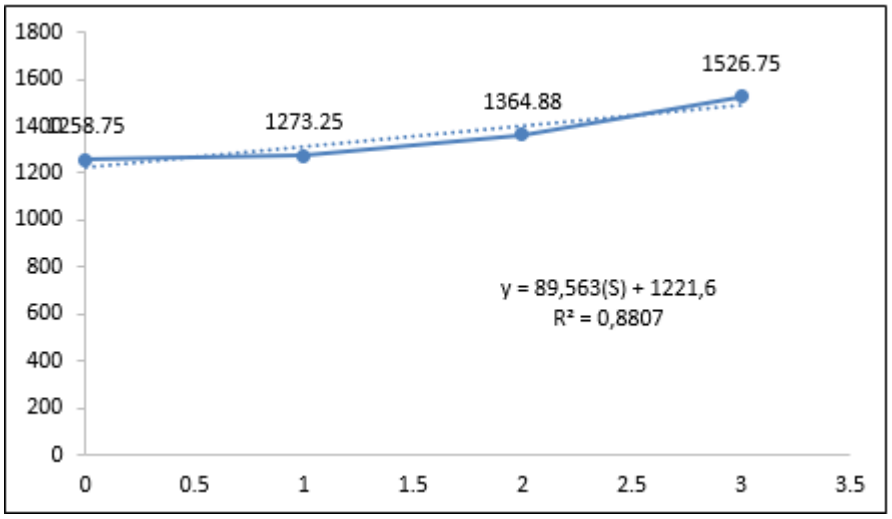

Figure 7: Graph of the Relationship Between the Application of Cow Dung Fertilizer and the Number of Pods Per Plot (pods) of Soybean Plants (*Glycine max L*)

In Figure 7, it can be seen that the addition of cow dung fertilizer will have a positive effect on the number of pods per plot of soybean plants, the linear regression equation is $\hat{Y}$ = 89.563 (S) + 1221.6 and r2 = 0.8807, this shows that every increase of 1 level of S (cow dung fertilizer) will increase the number of pods per plot of soybean plants by 0.8807.

Table 4 above states that the provision of fermented goat urine POC is significantly different on the perimeter of the number of pods per plot (pods), where the highest average is in K3 (300 ml / L Water / plot) which is 1480.88 pods which is very significantly different from K2 (200 ml / L Water / plot) which is 1360.25 pods, K1 (100 ml / L Water / plot) which is 1292.75 pods and K0 (0 ml / L Water / plot) which is 1289.75 pods (lowest).

The results of the regression analysis of the application of fermented goat urine POC on the number of pods per plot (pods) of soybean plants showed a linear relationship with the equation $\hat{Y}$ = 1356.496 + 44.182 (K), r = 0.844 can be seen in Figure 8.

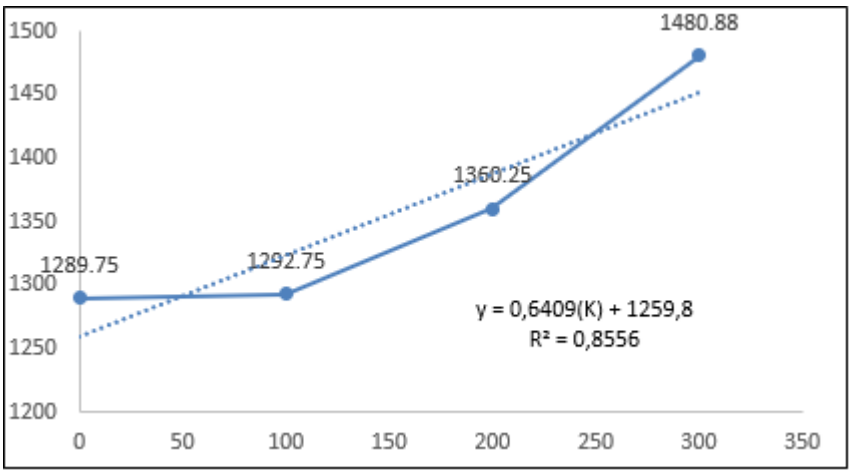

Figure 8. Graph of the Relationship Between the Application of POC fermented goat urine to the Number of Pods Per Plot (pods) of Soybean Plants (*Glycine max L*)

In Figure 8, it can be seen that the addition of fermented goat urine POC will have a positive effect on the number of pods per plot, the linear regression equation is $\hat{Y}$ = 0.6409 (K) +1259.8 and r2 = 0.8556, this indicates that every increase of 1 level of K (fermented goat urine POC) will increase the number of pods per plot of soybean plants by 0.8556.

Weight per 100 seeds

Based on the analysis of variance on the parameter of weight per 100 seeds (g) of soybean plants, it can be seen that the provision of cow dung fertilizer is significantly different. The provision of fermented goat urine POC on the parameter of weight per 100 seeds (g) is significantly different. The interaction between the provision of cow dung fertilizer and fermented goat urine POC showed no significant difference in weight per 100 seeds (g).

The average weight per 100 seeds (g) of soybean plants with cow dung fertilizer and fermented goat urine POC that have been tested for differences in averages using the Duncan Distance Test can be seen in Table 5.

Table 5. Average Weight per 100 Seeds (g) due to Application of Cow Dung Fertilizer and Fermented Goat Urine POC

Treatment	Weight per 100 Seeds (g)	
Cow dung fertilizer (S)		
S0 = 0 ml/liter og water/plot	14,13	aA
S1 = 1 kg/plot	14,50	abA
S2 = 2 kg/plot	15,13	abA

S3 = 3 kg /plot	15,50 bA
POC fermented goat urine (K)	
K0 = 0 kg/plot	13,63 aA
K1 = 100 ml/L water/plot	14,00 bAB
K2 = 200 ml/L water/plot	15,13 cC
K3 = 300 ml/L water/plot	16,50 dD

Notes: Numbers in the same column followed by the same letter indicate that they are not significantly different at the 5% (lower case) and 1% (upper case) levels.

Table 5 above states that the provision of cow dung fertilizer has a significant effect on the weight per 100 seeds, where the highest average is in S3 (3 kg/plot) which is 15.50 g which is significantly different from S2 (2 kg/plot) which is 15.13 g, S1 (1kg/plot) which is 14.50 g and S0 (0 kg/plot) which is 14.13 g (the lowest).
The results of regression analysis of cow dung fertilizer on weight per 100 seeds can be seen in Figure 9.

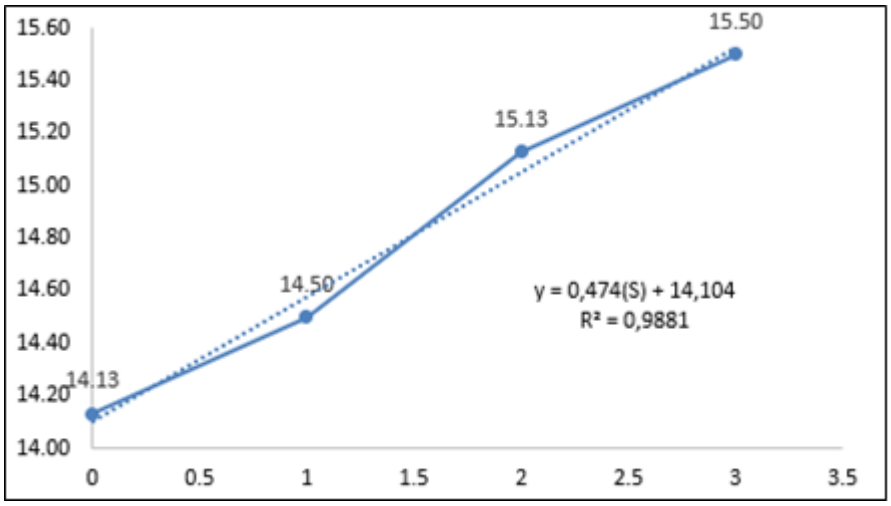

Figure 9. Graph of the Relationship Between the Application of Cow Dung Fertilizer and Weight per 100 Seeds (g) of Soybean Plants (*Glycine max L*)

In Figure 9, it can be seen that the addition of cow dung fertilizer will have a positive effect on the weight of 100 seeds per plot of soybean plants, the linear regression equation is $\hat{Y} = 0.474\ (S) + 14.104$ and r = 0.9881, this shows that every increase of 1 level of S (cow dung fertilizer) will increase the weight of 100 seeds per plot of soybean plants by 0.9881.
Table 5 above states that the provision of fermented goat urine POC is very significantly different on the weight per 100 seeds (g) paremeter, where the highest average is in K3 (300 ml / L Water / plot) which is 16.50 g which is very significantly different from K2 (200 ml / L Water / plot) which is 15.13 g, K1 (100 ml / L Water / plot) which is 14.00 g and K0 (0 ml / L Water / plot) which is 13.63 g (lowest).
The results of regression analysis of POC fermented goat urine weight per 100 seeds (g) of soybean plants can be seen in Figure 10.

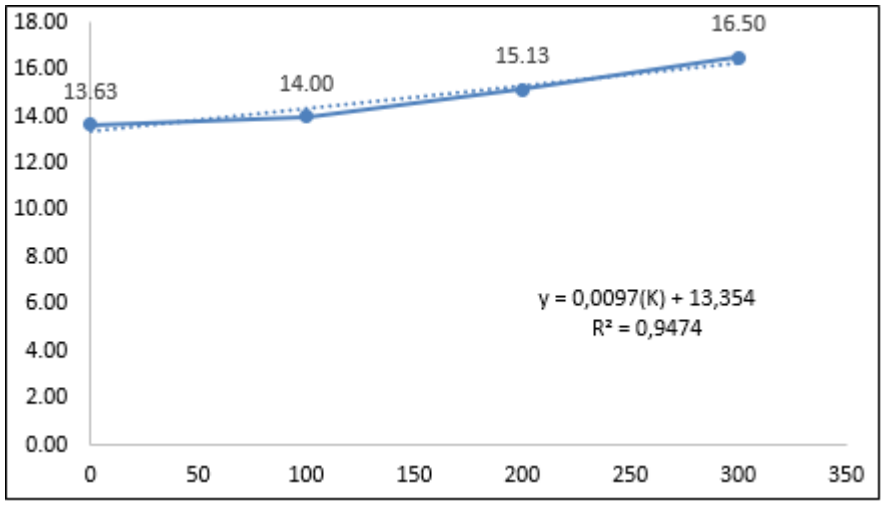

Figure 10. Graph of the Relationship Between Giving POC fermented goat urine to Weight per 100 Seeds (g) of Soybean Plants (*Glycine max L*)

In Figure 10, it can be seen that the addition of fermented goat urine POC will have a positive effect on the weight per 100 seeds, the linear regression equation is $\hat{Y}$ = 0.0097 (K) +13.354 and r2 = 0.9474, this indicates that each increase of 1 level of K (fermented goat urine POC) will increase the weight of 100 seeds per plot of soybean plants by 0.9474.

Weight of Pod Production Per Plot (g)

Data on the calculation of the average production weight of pods per plot (g) on soybean plants with the effect of applying cow dung fertilizer and fermented goat urine POC. Based on the analysis of variance on the parameter of the production weight of pods per plot (g) of soybean plants, it can be seen that the application of cow dung fertilizer has a very significant effect. The provision of fermented goat urine POC on the parameter of the production weight of pods per plot (g) is significantly different.

The average results of pod production weight per plot (g) of soybean plants by applying cow dung fertilizer and fermented goat urine POC which have been tested for differences in averages using the Duncan Distance Test can be seen in Table 6.

Table 6: Average Weight of Pod Production Per Plot (g) due to Cow Dung Fertilizer and Fermented Goat Urine POC

Treatment	Weight of Pod Production Per Plot (g)
Cow dung fertilizer (S)	
S0 = 0 ml/liter of water/plot	1473,25 aA
S1 = 1 kg/plot	1614,38 aA
S2 = 2 kg/plot	1812,50 bB
S3 = 3 kg /plot	2277,63 cC
POC fermented goat urine (K)	
K0 = 0 kg/plot	1595,13 aA
K1 = 100 ml/L water/plot	1609,50 abA
K2 = 200 ml/L water/plot	1979,50 bB
K3 = 300 ml/L water/plot	2173,63 cC

Notes: Numbers in the same column followed by the same letter indicate that they are not significantly different at the 5% (lower case) and 1% (upper case) levels.

Table 6 above states that the provision of cow dung fertilizer has a very significant effect on the weight of pod production per plot, where the highest average is in S3 (3 kg /plot) which is 2277.63 g which is significantly different from S2 (2 kg /plot) which is 1812.50 g, S1 (1 kg /plot) which is 1614.38 g and S0 (0 kg /plot) which is 1473.25 g (the lowest).

The results of regression analysis of cow dung fertilizer on the number of pods per plot can be seen in Figure 11.

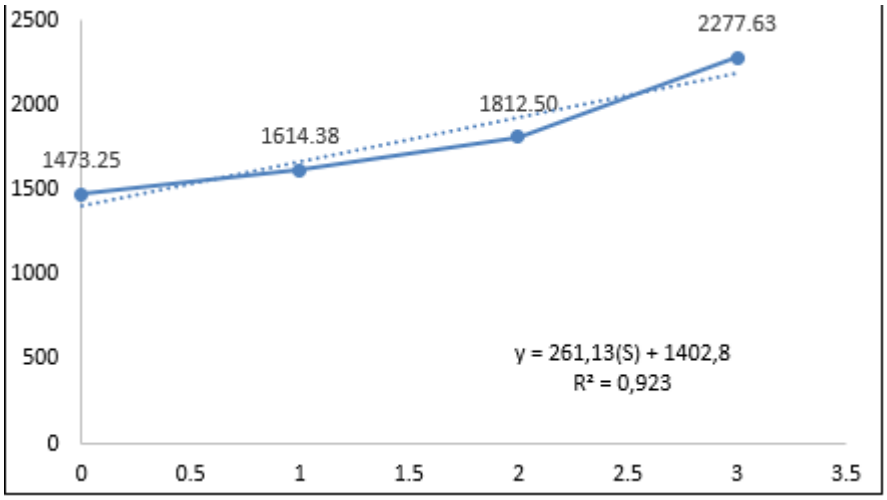

Figure 11. Graph of the Relationship Between the Application of Cow Dung Fertilizer and the Weight of Pod Production Per Plot (g) of Soybean Plants (*Glycine max L*)

In Figure 11, it can be seen that the addition of cow dung fertilizer will have a positive effect on the weight of pod production per plot of soybean plants, the linear regression equation is $\hat{Y}$ = 261.13 (S) + 1402.8 and r2 = 0.923, this shows that every increase of 1 level of S (cow dung fertilizer) will increase the weight of pod production per plot of soybean plants by 0.923.

Table 6 above states that the provision of fermented goat urine POC is significantly different on the weight of pod production per plot (g), where the highest average is in K3 (300 ml / l water / plot) which is 2173.63 g which is very significantly different from K2 (200 ml / l water / plot) which is 1979.50 g, K1 (100 ml / l water / plot) which is 1609.50 g and K0 (0 ml / l water / plot) which is 1595.13 g (lowest).

The results of the regression analysis of the application of POC fermented goat urine on the weight of pod production per plot (g) of soybean plants can be seen in Figure 12.

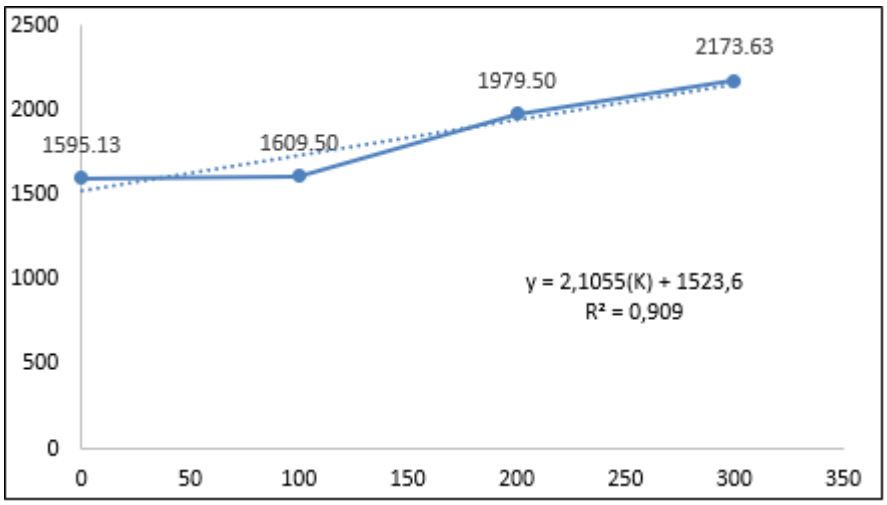

Figure 12: Graph of the Relationship Between the Application of POC fermented goat urine and the Weight of Pod Production Per Plot (g) of Soybean Plants (*Glycine max L*)

In Figure 12, it can be seen that the addition of fermented goat urine POC will have a positive effect on the weight of pod production per plot, the linear regression

equation is $\hat{Y}$ = 2.1055 (K) +1523.6 and r2 = 0.909, this shows that every increase of 1 level of K (fermented goat urine POC) will increase the weight of pod production per plot of soybean crops by 0.909 g.

DISCUSSION

Effect of Cow Dung Fertilizer on the Growth and Production of Soybean Plants (*Glycine max L*)

Based on the results of statistical tests, it shows that the application of cow dung fertilizer with different dosage levels has no significant effect on plant height and the number of leaves of soybean plants at the age of 2 and 3 weeks after planting, but has a very significant effect at the age of 4 and 5 weeks after planting. It is suspected that at the age of 2 and 3 weeks after planting, the need for nutrients for soybean plants is still relatively small so that there is no competition in utilizing existing nutrients, so that the liquid organic fertilizer given has not had a significant effect on plant height and the number of leaves of soybean plants at the age of 2 and 3 weeks after planting.

As the age of the plant increases, the need for nutrients also increases. This can be seen from the response of soybean plants when applying cow dung fertilizer at the age of 4 and 5 weeks after planting, which has a very significant effect, this is because the nitrogen nutrients in the applied cow dung fertilizer are absorbed by plants in sufficient conditions so that they can spur plant growth such as plant height and number of petioles. Kahar et al, (2021) stated that the adequacy and availability of plant nutrients depends on the type and amount of these nutrients in the soil, which is maintained in balance in accordance with plant growth.

In the process of photosynthesis, plants cannot live without chlorophyll in the leaves, and chlorophyll is closely related to protein, because protein is one of the components of chlorophyll. The state of protein in plants is strongly influenced by the nitrogen content in the soil. If more nitrogen is available than other elements, more protein can be produced and leaves can grow wider because of more photosynthesis processes. In addition, a sufficient amount of nitrogen can increase protoplasm, increase the size and number of cells, and thus cause an increase in the number of leaves and plant height (Sajar, 2023).

The treatment of cow dung fertilizer is significantly different in the number of pods per sample and the number of pods per plot of soybean plants because cow dung fertilizer has sufficient P nutrients so that it can help the growth process of soybean plants. According to the results of research by Nanda et al, (2021) said that a lot of organic matter has been broken down into nutrients that are ready to be absorbed by plants such as the element P which is quite important in the formation and filling of pods which ultimately for seed formation. The number of pods per plant is influenced by the dose of phosphorus given to soybean plants.

Effect of POC fermented goat urine on the Growth and Production of Soybean Plants (Glycine max L)

Based on the results of statistical tests showed that the application of fermented goat urine POC had no significant effect on the height of soybean plants at the age of 2 and 3 weeks after planting, but had a very significant effect at the age of 4 and 5 weeks after planting. This is thought to be because fermented goat urine POC contains nitrogen needed by plants for the high growth stage, and the availability of nitrogen accelerates plant vegetative growth, so that plants can grow normally. This is in accordance with Noverita (2018) who noted that fermented goat urine POC contains nitrogen which is the raw material for chlorophyll during photosynthesis. The results of photosynthesis are used to synthesize macromolecules in carbohydrates. Carbohydrates will be converted into food reserves that will accumulate in young tissues that grow like tall plants.

The growth of soybean plants applied with fermented goat urine POC on the parameter of the number of leaves has a significant

effect. This is because fermented goat urine POC contains nutrients that can increase the soil's ability to provide nutrients and increase soil absorption, a source of energy for soil microorganisms and a source of nutrients for plants. The N element contained in fermented goat urine POC encourages organs involved in photosynthesis, namely leaves. Potassium acts as an activator of various enzymes that are important in photosynthesis and respiration reactions, as well as enzymes involved in protein and starch synthesis (Noverita, 2018).

Based on the analysis of variance, the provision of fermented goat urine POC has a very significant effect on the weight per 100 seeds of soybean plants because fermented goat urine POC has provided sufficient P nutrients for the maturation process of soybean seeds. The element P has a fairly important role in plants such as helping plants in the process of filling soybean seeds which can increase the weight of soybean seeds (Haris et al, 2019).

Effect of Interaction of Cow Dung Fertilizer and Fermented Goat Urine POC on the Growth and Production of Soybean Plants

Based on the results of statistical tests, it shows that the interaction of cow dung fertilizer and fermented goat urine POC has no significant effect on the height of soybean plants at 2, 3, 4 and 5 weeks of age, the number of leaves at 2, 3, 4 and 5 weeks of age, the number of pods per sample, the number of pods per plot, the weight per 100 seeds and the weight of pod production per plot. This is because cow dung fertilizer and fermented goat urine POC do not affect each other caused by one factor that has a greater influence than other factors.

It is assumed that if there is no interaction that affects each other significantly, it indicates that the effect of a factor is the same for all levels of other factors and the same as the main effect so that it can be concluded that two factors that have the same position in supporting the process of growth and production of soybean plants, but become unsupportive of each other if one factor covers another factor. Specifically, two factors do not affect each other in the growth and production of soybean plants can be caused by differences in dosage levels in cow dung fertilizer and fermented goat urine POC (Sulardi, et al., 2022).

CONCLUSION

The effect of applying cow dung fertilizer on the growth and production of soybean plants (Glycine max L) has a very significant effect on the parameters of plant height, number of leaves, number of pods per sample, number of pods per plot, and weight of pod production per plot and has a significant effect on weight per 100 seeds.

The effect of giving fermented goat urine POC on the growth and production of soybean plants (Glycine max L) had no significant effect on the parameters of plant height and number of leaves at the age of 2 and 3 weeks after planting, but had a significant effect at the age of 4 and 5 weeks after planting, the number of pods per sample, the number of pods per plot and the weight of pod production per plot and had a very significant effect on the weight per 100 seeds. The highest average was found in K3 treatment which was 3 kg/plot.

The interaction effect of cow dung fertilizer and fermented goat urine POC on the growth and production of soybean plants (Glycine max L) had no significant effect on all parameters observed.

Declaration by Authors

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