

Effectiveness Of Eco Farming Photosynthesis Fertilizer and Goat Manure Fertilizer on The Vegetative Growth of Coffee Plant Seedlings (*Coffea Sp*)

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ABSTRACT

Effectiveness of Eco Farming Photosynthesis Fertilizer and Goat Manure Fertilizer on Vegetative Growth of Coffee Plants (*Coffea sp*) The purpose of this study is to determine the effectiveness of the application of photosynthetic eco farming fertilizer and goat manure fertilizer and its interaction on the vegetative growth of coffee plants (*Coffea sp*). This research was carried out from November 2023 to February 2024 in Sei Mencirim Village, Sunggal District, Deli Serdang Regency, North Sumatra Province. The study used the Factorial Group Random Design (RAK) method with two treatment factors, the first factor is photosynthetic eco farming fertilizer consisting of 4 levels, namely E0 = 0 ml/liter of water/plot, E1 = 100 ml/liter of water/plot, E2 = 200 ml/liter of water/plot, E3 = 300 ml/liter of water/plot, while the second factor is goat manure fertilizer which consists of 4 levels, namely K0 = 0 g/plot, K1 = 100 g/plot, K2 = 200 g/plot, and K3 = 300 g/plot. The parameters observed were plant height (cm), number of leaves (strands), and stem diameter (mm). The results showed that the effectiveness of applying photosynthetic eco farming fertilizer and goat manure fertilizer had an effect on plant height (cm), stem diameter (mm), and the number of leaves (strands) of coffee plant seedlings. The interaction of the effectiveness of the application of photosynthetic eco farming fertilizer and goat manure fertilizer did not affect the plant height (cm), stem diameter (mm), and the number of leaves (strands) of coffee plant seedlings.

Keyword : eco farming photosynthesis, coffee, goat manure, fertilizer



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Article history:

Received Oct 29, 2024
Revised Oct 30, 2024
Accepted Oct 31, 2024

1. INTRODUCTION

The coffee plant is found in Africa. After the discovery of the coffee plant, then this plant began to be cultivated and spread throughout the world. History records that coffee was first invented by Ethiopians about 3000 years ago. The history of coffee in Indonesia began when the Dutch Governor in Malabar (India) sent Yemeni coffee seeds or Arabica coffee (*Coffea arabica*) to the Dutch Governor in Batavia (now Jakarta) in 1696. This first seed failed to grow due to floods in Batavia In 1920, small companies in Indonesia began to grow coffee as a major commodity. Plantations in Java were nationalized on independence day and revitalized with a new variety of Arabica coffee in the 1950s. The North Sumatra Plantation Service (North Sumatra) noted that coffee bean production in North Sumatra reached 1,000 tons per month. Coffee land in North Sumatra itself has covered an area of 80 thousand hectares (Fitri & Amrul, 2022). Our production is from 80 thousand hectares for an average productivity of 1000 tons. The demand for coffee beans in North Sumatra continues to increase (Gayatri, 2019)

It is recommended to increase fertility and plant production, one way that can be done is to fertilize using organic fertilizers (Permadi et al., 2024; Siswanto et al., 2023). The benefits of organic fertilizers are to improve soil structure which makes the soil loose and makes it easier for plant roots to absorb nutrients (Budianto, et.al, 2015)

Eco Farming is a super-active organic fertilizer containing 13 complete nutrients according to plant needs equipped with microorganisms or positive bacteria that will become bioactivators in the process of improving physical, biological and chemical properties to restore soil fertility (Eco Farming Team, 2022)(M. Siregar et al., 2021)

Efforts to increase the production and productivity of coffee plants can use organic fertilizers, one of which is the use of livestock manure fertilizers such as goat manure manure, chicken manure manure, cow manure and other livestock manure manure (Perdana et al., 2024; Siswanto et al., 2024; Siswanto & Simangunsong, 2023). Solid and liquid manure fertilizer from livestock, both ruminant and ungulate livestock (Ali and Syarifudin, 2014).

2. LITERATURE REVIEW

Coffee Plant Botany

- a. Root
Coffee plants are a type of two-piece plant (dicot) and have taproot
- b. Trunk
Stems and branches Stems that grow from seeds are called stem trunks
- c. Leaf
The shape of the coffee leaves is oval, the tip is slightly tapered
- d. Fruit
Fruits and Seeds, The fruit of the coffee plant consists of the pulp and seeds
- e. Flower
Coffee plants have kisoma-shaped compound flowers with umbrella children, mostly 3-5 florets, so that they form pseudo-compositions that bloom a lot (Saragih, 2020)

Conditions for Growing Coffee Plants

- a. Climate
Coffea canephora is a shrub that can grow well in the tropics (15° N -12° LS)
- b. Soil
Robusta coffee can live in rather sour soil. namely pH 5.5-6.5. and liberica is a type of coffee found in Indonesia (Pratama, 2018)
- c. Photosynthetic Eco Farming Fertilizer
The benefits of eco farming in general are; helps meet the needs of element N for all types of plants, helps decompose H₂S in the soil, helps plants absorb nutrients better, PSB bacterial cells 60% protein, amino acids, B1, B2, B5, B12, folic acid, vitamins C, D, and E, PSB activity is able to add supplements and nutrients so as to reduce the use of fertilizers, stimulate root growth and increase plant immunity, accelerate the growth of stronger plant tissues (Eco Farming Team, 2022)
- d. Goat Manure Fertilizer
Goat manure contains organic matter that can provide nutrients for plants through the decomposition process (D. J. S. Siregar et al., 2018). This process occurs gradually by releasing organic matter that is simple for plant growth. Goat feces contain dry matter and nitrogen 40 – 50% and 1.2 – 2.1%, respectively (Hutapea & Sari Siregar, 2023; D. J. S. Siregar, Setyaningrum, et al., 2022b, 2022c; D. J. S. Siregar, Warisman, et al., 2022). The content depends on the ingredients that make up the ration, the level of solubility of feed nitrogen, the biological value of the ration, and the ability of livestock to digest the ration (Andayani and Sadiro, 2014).

3. RESEARCH METHOD

This study uses a Factorial Group Random Design (RAK). It consists of 2 factors, 16 treatments, 3 blocks, so there are 48 treatment plots.

The first factor is the application of Eco Farming Photosynthesis fertilizer given the symbol "E" which consists of 4 treatment levels, namely;

- E0 = 0 ml/liter of water/plot
- E1 = 100 ml/liter of water/plot

E2 = 200 ml /liter of water/plot

E3 = 300 ml/liter of water/plot

The second factor is that the provision of goat manure is given the symbol "K" which consists of 4 levels of treatment, namely;

K0 = 0 g/plot

K1 = 100 g/plot

K2 = 200 g/plot

K3 = 300 g/plot

4. RESULTS AND DISCUSSION

A. Result

1. Plant Height (cm)

Data on the measurement of the height of coffee seedlings due to the effectiveness of photosynthetic eco farming fertilizer and goat manure fertilizer at the age of 9, 11, 13, and 15 weeks after planting are presented in Appendix 4, 6, 8, and Appendix 10. The list of fingerprint analysis of the height of coffee seedlings aged 9, 11, 13, and 15 weeks after planting is presented in Appendix 5, 7, 9, and Appendix 11.

The results of the analysis of the height of coffee seedlings due to the effectiveness of applying photosynthetic eco farming fertilizer and goat manure fertilizer did not affect the height of coffee seedlings aged 9, 11, and 13 weeks after planting, but influenced the age of 15 weeks after planting.

The interaction of the effectiveness of photosynthetic eco farming fertilizer and goat manure fertilizer did not affect the height of coffee seedlings aged 9, 11, 13, and 15 weeks after planting.

The effectiveness of the application of photosynthetic eco farming fertilizer and goat manure fertilizer on the height of coffee seedlings aged 9, 11, 13, and 15 weeks after planting after statistical tests using the Duncan distance test can be seen in Table 2.

Table 1. Average Measurement of Plant Height (cm) of Coffee Seedlings Due to the Effectiveness of Eco Farming Photosynthesis Fertilizer (E) and Goat Manure Fertilizer (K) Age 9, 11, 13, and 15 Weeks After Planting (MST)

Treatment	Plant Height (cm)							
	9 MST		11 MST		13 MST		15 MST	
Photosynthetic Eco Farming Fertilizer (E)								
E0 = 0 ml/liter of water	6.55	Aa	6.69	Aa	7.27	Aa	7.78	Bb
E1 = 100 ml/liter of water	6.81	Aa	7.13	Aa	7.38	Aa	8.54	abAB
E2 = 200 ml/litre of water	6.88	Aa	7.23	Aa	7.75	Aa	8.57	Aa
E3 = 300 ml/liter of water	7.06	Aa	7.56	Aa	7.83	Aa	9.39	Aa
Goat Manure (K)								
K0 = 0 g/plot	6.61	Aa	6.79	Aa	7.44	Aa	7.71	Bb
K1 = 100 g/plot	6.74	Aa	7.02	Aa	7.45	Aa	8.10	Bb
K2 = 200 g/plot	6.97	Aa	7.11	Aa	7.53	Aa	8.44	Bb
K3 = 300 g/plot	6.98	Aa	7.69	Aa	7.80	Aa	10.03	Aa

Remarks: Numbers followed by the same letter in the same column show an unreal difference at the level of 5% (lowercase) and 1% (uppercase).

Table 2 can be explained that the effectiveness of eco farming photosynthesis pupuk has an effect on the height of coffee seedlings 15 weeks after planting, where the highest plant height was found in the E3 treatment = 300 ml/liter of water, which is 9.39 cm, which is not significantly different from the E2 treatment = 200 ml/liter of water, which is 8.57 cm, and the treatment of E1 = 100 ml/liter of water, which is 8.54 cm, but the difference is very real with the treatment of E0 = 0 ml/liter of water, namely 7.78 cm. The E2 treatment = 200 ml/liter of water, which is 8.57 cm, is not different from the E1 treatment = 100 ml/liter of water, which is 8.54 cm, but the difference is very obvious with the treatment

of E0 = 0 ml/liter of water, which is 7.78 cm. The E1 treatment = 100 ml/liter of water, which is 8.54 cm, but the difference is not evident from the E0 treatment = 0 ml/liter of water, which is 7.78 cm.

The effectiveness of applying photosynthetic eco farming fertilizer to the height of coffee seedlings aged 15 weeks after planting can be seen in Figure 1.

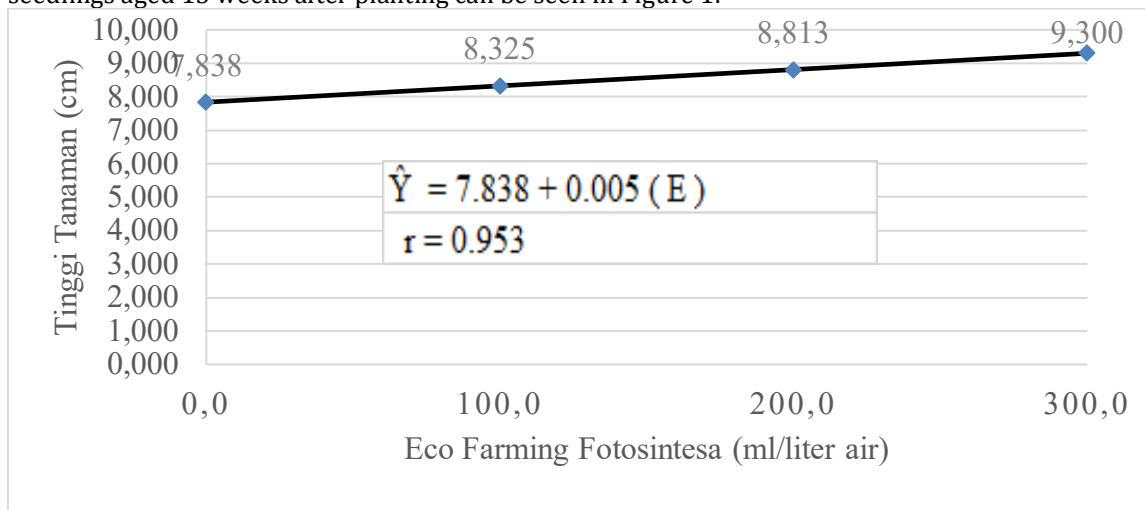


Fig 1. Graph of Plant Height Relationship (cm) of Coffee Plant Seedlings Due to the Effectiveness of Eco Farming Photosynthetic Fertilizer 15 Weeks After Planting

From Figure 1, it can be explained that with the increase in the concentration of photosynthetic eco farming fertilizer, the height of coffee seedlings will be higher where the equation obtained is $\hat{Y} = 7.838 + 0.005 (E)$ with a value of $r = 0.953$, meaning that the higher the concentration of photosynthetic eco farming fertilizer, the higher the height of coffee seedlings which forms a positive linear relationship.

Table 2 can be explained that the effectiveness of goat manure fertilizer has an effect on the height of coffee seedlings 15 weeks after planting, where the highest height of coffee plant seedlings was found in the treatment of K3 = 300 g/plot which is 10.03 cm which is very different from the treatment of K2 = 200 g/plot which is 8.44 cm, the treatment of K1 = 50 g/plot of 8.10 cm and the treatment of K0 = 0 g/plot of 7.71 cm. The treatment of K2 = 200 g/plot was 8.44 cm, which was not significantly different from the treatment of K1 = 50 g/plot of 8.10 cm and the treatment of K0 = 0 g/plot of 7.71 cm. The treatment of K1 = 50 g/plot of 8.10 cm was not significantly different from the treatment of K0 = 0 g/plot of 7.71 cm.

The effectiveness of goat manure fertilizer application on the height of coffee seedlings aged 15 weeks after planting can be seen in Figure 2.

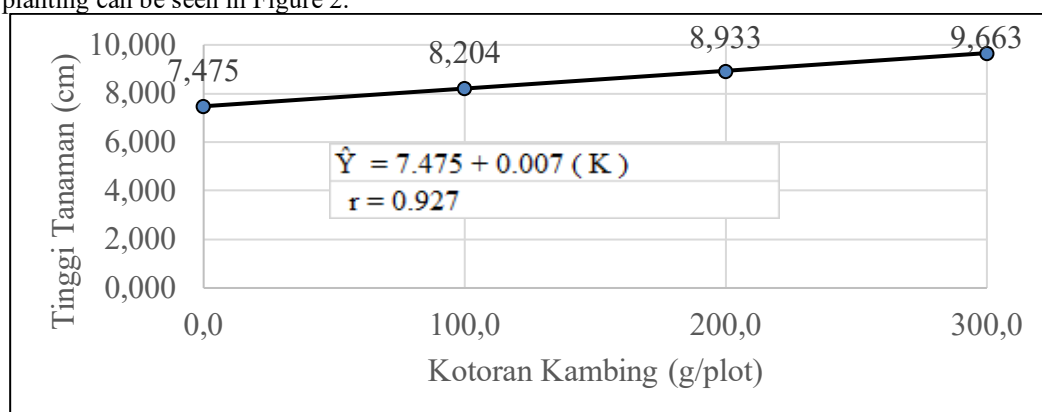


Figure 2. Graph of Plant Height Relationship (cm) of Coffee Plant Seedlings Due to the Effectiveness of Applying Goat Manure Fertilizer 15 Weeks After Planting

From Figure 2, it can be explained that with the increase in the dose of goat manure fertilizer, the height of coffee seedlings will be higher where the equation obtained is $Y = 7.475 + 0.007 (K)$ with a value of $r = 0.927$.

= 0.927, meaning that the higher the dose of goat manure fertilizer, the higher the height of coffee seedlings which forms a positive linear relationship.

2. Rod Diameter (mm)

Data from the measurement of the diameter of coffee plant seedlings due to the effectiveness of applying photosynthetic eco farming fertilizer and goat manure fertilizer at the age of 9, 11, 13, and 15 weeks after planting are presented in Attachments 12, 14, 16, and 18. The list of fingerprint analysis of the diameter of coffee seedlings aged 9, 11, 13, and 15 weeks after planting is presented in Appendix 13, 15, 17, and Appendix 19.

The results of the analysis of the variation in stem diameter of coffee plant seedlings due to the effectiveness of applying photosynthetic eco farming fertilizer and goat manure fertilizer did not affect the diameter of coffee plant seedlings at the age of 9, 11, and 13 weeks after planting, but had an effect on the age of 15 weeks after planting.

The interaction of the effectiveness of photosynthetic eco farming fertilizer and goat manure fertilizer did not affect the stem diameter of coffee seedlings aged 9, 11, 13, and 15 weeks after planting.

The effectiveness of applying photosynthetic eco farming fertilizer and goat manure fertilizer to the diameter of coffee plant seedlings aged 9, 11, 13, and 15 weeks after planting after a statistical test using the Duncan distance test can be seen in Table 3.

Table 3. Average Measurement of Stem Diameter (mm) of Coffee Seedlings Due to the Effectiveness of Eco Farming Photosynthesis Fertilizer (E) and Goat Manure Fertilizer (K) Age 9, 11, 13, and 15 Weeks After Planting (MST)

Treatment	Rod Diameter (mm)							
	9 MST		11 MST		13 MST		15 MST	
Photosynthetic Eco Farming Fertilizer (E)								
E0 = 0 ml/liter of water	1.58	Aa	2.88	Aa	3.44	Aa	4.09	Bb
E1 = 100 ml/liter of water	1.67	Aa	3.00	Aa	3.56	Aa	4.23	chapter
E2 = 200 ml/litre of water	1.67	Aa	3.04	Aa	3.58	Aa	4.26	Ba
E3 = 300 ml/liter of water	1.67	Aa	3.13	Aa	3.58	Aa	4.70	Aa
Goat Manure (K)								
K0 = 0 g/plot	1.50	Aa	2.96	Aa	3.46	Aa	4.14	Bb
K1 = 100 g/plot	1.50	Aa	2.96	Aa	3.46	Aa	4.16	chapter
K2 = 200 g/plot	1.75	Aa	3.04	Aa	3.58	Aa	4.29	Ba
K3 = 300 g/plot	1.83	Aa	3.08	Aa	3.66	Aa	4.69	Aa

Remarks: Numbers in the same column followed by different letters mean that they differ significantly at the level of 5% (lowercase letters) and differ very significantly at the level of 1% (uppercase letters)

Table 3 can be explained that the effectiveness of eco farming photosynthesis pupik has an effect on the stem diameter of coffee plant seedlings 15 weeks after planting, where the largest stem diameter was found in the E3 treatment = 300 ml/liter of water, which was 4.70 mm, which was significantly different from the E2 treatment = 200 ml/liter of water, which was 4.26 mm, and the treatment of E1 = 100 ml/liter of water, which was 4.23 mm, but the difference was very significant with the treatment of E0 = 0 ml/liter of water, which was 4.09 mm. E2 treatment = 200 ml/liter of water, which is 4.26 mm, the difference is not real with the E1 treatment = 100 ml/liter of water, which is 4.23 mm, but it is significantly different from the E0 treatment = 0 ml/liter of water, which is 4.09 mm. The E1 treatment = 100 ml/liter of water, which is 4.23 mm, but the difference is not evident from the E0 treatment = 0 ml/liter of water, which is 4.09 mm

The effectiveness of applying photosynthetic eco farming fertilizer to the diameter of coffee plant seedlings 15 weeks after planting can be seen in Figure 3.

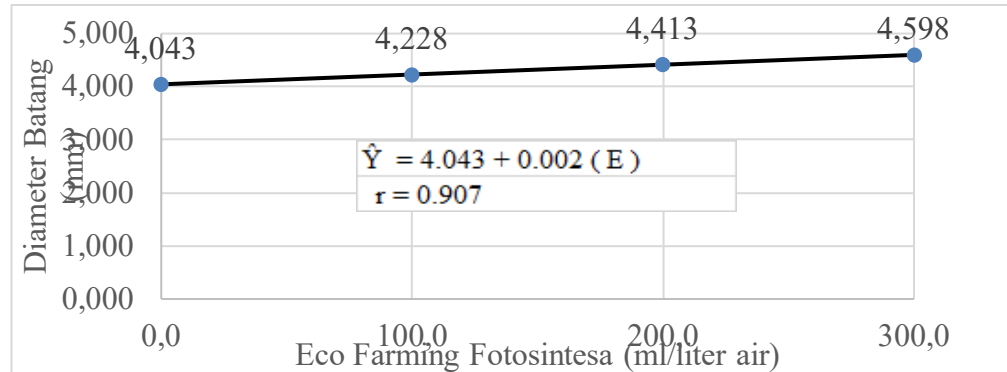


Figure 3. Graph of the Relationship between Stem Diameter (mm) of Coffee Plant Seedlings Due to the Effectiveness of Eco Farming Photosynthetic Fertilizer 15 Weeks After Planting

From Figure 3, it can be explained that with the increase in the concentration of photosynthetic eco farming fertilizer, the diameter of the stem of coffee plant seedlings will be larger where the equation obtained is $Y = 4.043 + 0.002 (E)$ with a value of $r = 0.907$, meaning that the higher the concentration of photosynthetic eco farming fertilizer, the larger the diameter of the stem of coffee plant seedlings which forms a positive linear relationship.

Table 3 can be explained that the effectiveness of goat manure fertilizer has an effect on the diameter of coffee plant seedlings 15 weeks after planting, where the largest diameter of coffee plant seedlings was found in the K3 treatment = 300 g/plot which was 4.69 mm which was significantly different from the K2 treatment = 200 g/plot which was 4.29 mm, the K1 treatment = 50 g/plot 4.16 mm, but it is very different from the treatment of K0 = 0 g/plot, which is 4.14 mm. The treatment of K2 = 200 g/plot was 4.29 mm, which was not significantly different from the treatment of K1 = 50 g/plot of 4.16 mm, but was significantly different from the treatment of K0 = 0 g/plot of 4.14 mm. The treatment of K1 = 50 g/plot was 4.16 mm, but there was no real difference from the treatment of K0 = 0 g/plot, which was 4.14 mm.

The effectiveness of goat manure fertilizer on the diameter of coffee seedlings 15 weeks after planting can be seen in Figure 4.

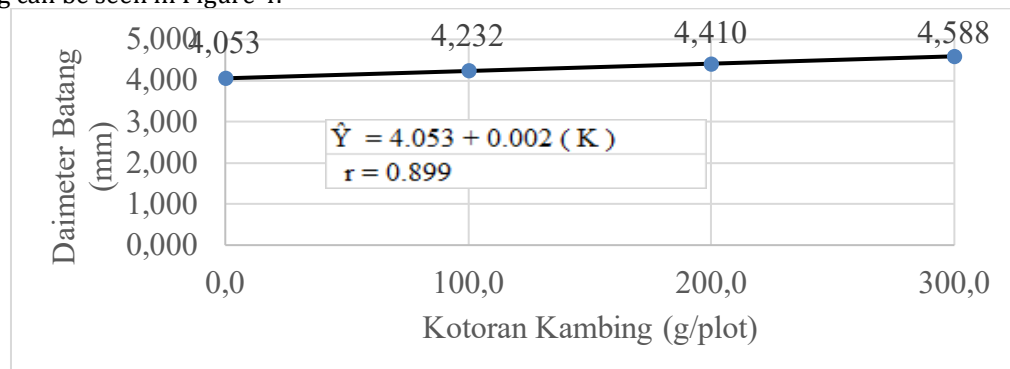


Figure 4. Graph of the Relationship between Stem Diameter (mm) of Coffee Plant Seedlings Due to the Effectiveness of Applying Goat Manure Fertilizer 15 Weeks After Planting

From Figure 4, it can be explained that with the increase in the dose of goat manure fertilizer, the diameter of the stem of the coffee plant seedlings will be larger where the equation obtained is $Y = 4.053 + 0.002 (K)$ with a value of $r = 0.899$, meaning that the higher the dose of goat manure fertilizer, the larger the diameter of the stem of the coffee plant seedlings which forms a positive linear relationship.

3. Number of Leaves (strands)

Data from the calculation of the number of leaves of coffee seedlings due to the effectiveness of applying photosynthetic eco farming fertilizer and goat manure fertilizer at the age of 11, 13, and 15 weeks after planting are presented in Attachments 20, 22, and 23. The list of fingerprint analysis of the diameter of coffee seedlings aged 11, 13, and 15 weeks after planting is presented in Attachments 21, 23, and 25.

The results of the analysis of the variation in stem diameter of coffee plant seedlings due to the effectiveness of applying photosynthetic eco farming fertilizer and goat manure fertilizer did not affect the stem diameter of coffee plant seedlings at the age of 11, and 13 weeks after planting, but had an effect on the age of 15 weeks after planting.

The interaction of the effectiveness of photosynthetic eco farming fertilizer and goat manure fertilizer did not affect the number of leaves of coffee seedlings aged 11, 13, and 15 weeks after planting.

The effectiveness of photosynthetic eco farming fertilizer and goat manure fertilizer on the number of leaves of coffee seedlings aged 11, 13, and 15 weeks after planting after statistical tests using the Duncan distance test can be seen in Table 4.

Table 4. Average Calculation of the Number of Leaves (Leaves) of Coffee Seedlings Due to the Effectiveness of Eco Farming Photosynthesis Fertilizer (E) and Goat Manure Fertilizer (K) Age 11, 13, and 15 Weeks After Planting (MST)

Photosynthetic Eco Farming Fertilizer (E)						
E0 = 0 ml/liter of water	1.67	Aa	2.67	Aa	5.58	Bb
E1 = 100 ml/liter of water	1.83	Aa	3.50	Aa	6.58	abAB
E2 = 200 ml/litre of water	2.00	Aa	3.50	Aa	6.92	Aa
E3 = 300 ml/liter of water	2.50	Aa	3.83	Aa	7.92	Aa
Goat Manure (K)						
K0 = 0 g/plot	1.17	Aa	2.33	Aa	5.92	Ba
K1 = 100 g/plot	1.83	Aa	3.67	Aa	6.25	Aba
K2 = 200 g/plot	2.50	Aa	3.67	Aa	6.92	Aa
K3 = 300 g/plot	2.50	Aa	3.83	Aa	7.92	Aa

Remarks: Numbers in the same column followed by different letters mean that they differ significantly at the level of 5% (lowercase letters) and differ very significantly at the level of 1% (uppercase letters)

Table 4 can be explained that the effectiveness of eco farming photosynthesis pupuk has an effect on the number of leaves of coffee plant seedlings 15 weeks after planting, where the highest number of leaves was found in the E3 treatment = 300 ml/liter of water, which was 7.92 leaves, which was not significantly different from the E2 treatment = 200 ml/liter of water, which was 6.92 leaves, and the E1 treatment = 100 ml/liter of water, which was 6.58 leaves, but the difference was very real with the E0 treatment = 0 ml/liter of water, namely 5.58 pieces. The E2 treatment = 200 ml/liter of water, which is 6.92 pieces, is not significantly different from the E1 treatment = 100 ml/liter of water, which is 6.58 pieces, but it is very different from the E0 treatment = 0 ml/liter of water. E1 treatment = 100 ml/liter of water, which is 6.58 pieces but the difference is not real from the E0 treatment = 0 ml/liter of water

The effectiveness of applying photosynthetic eco farming fertilizer to the number of leaves of coffee seedlings 15 weeks after planting can be seen in Figure 5.

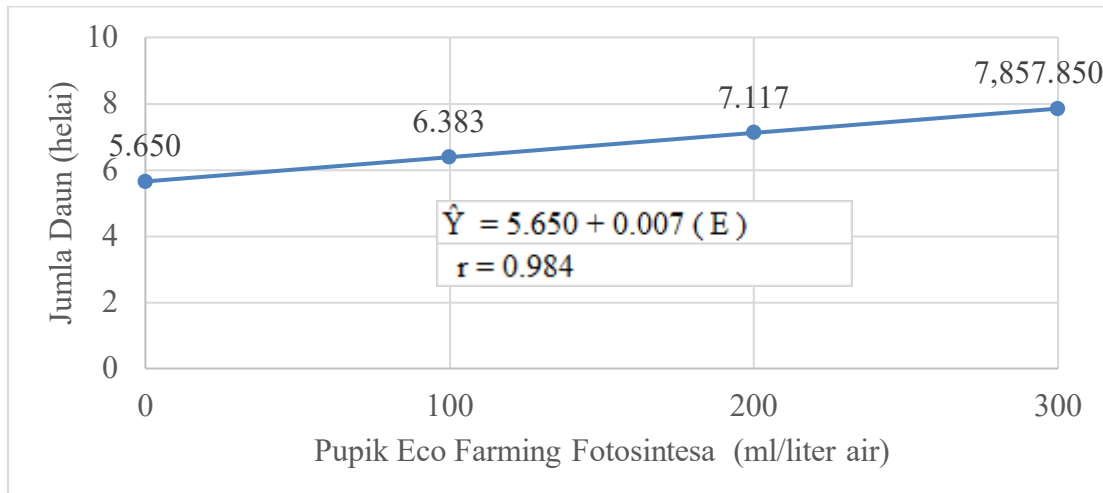


Figure 5. Graph of the Relationship between the Number of Leaves (Strands) of Coffee Plant Seedlings Due to the Effectiveness of Eco Farming Photosynthetic Fertilizer 15 Weeks After Planting

From Figure 5, it can be explained that with the increase in the concentration of photosynthetic eco farming fertilizer, the number of leaves of coffee plant seedlings will increase where the equation is obtained $\hat{Y} = 5.650 + 0.007 (E)$ with a value of $r = 0.984$, meaning that the higher the concentration of photosynthetic eco farming fertilizer, the more the number of leaves of coffee plant seedlings will form a positive linear relationship.

Table 4 can be explained that the effectiveness of goat manure fertilizer has an effect on the number of leaves of coffee plant seedlings 15 weeks after planting, where the highest number of leaves of coffee plant seedlings was found in the treatment of K3 = 300 g/plot, which was 7.92 leaves, which was not significantly different from the treatment of K2 = 200 g/plot, which was 6.92 sheets, K1 treatment = 50 g/plot of 6.25 sheets, but it was significantly different from the treatment of K0 = 0 g/plot, which was 5.92 pieces. The treatment of K2 = 200 g/plot was 6.92 pieces, which was not significantly different from the treatment of K1 = 50 g/plot of 6.25 pieces, but it was significantly different from the treatment of K0 = 0 g/plot of 5.92 pieces. The K1 treatment = 50 g/plot of 6.25 pieces, but it was significantly different from the treatment of K0 = 0 g/plot of 5.92 pieces.

The effectiveness of goat manure fertilizer on the number of leaves of coffee seedlings 15 weeks after planting can be seen in Figure 6.

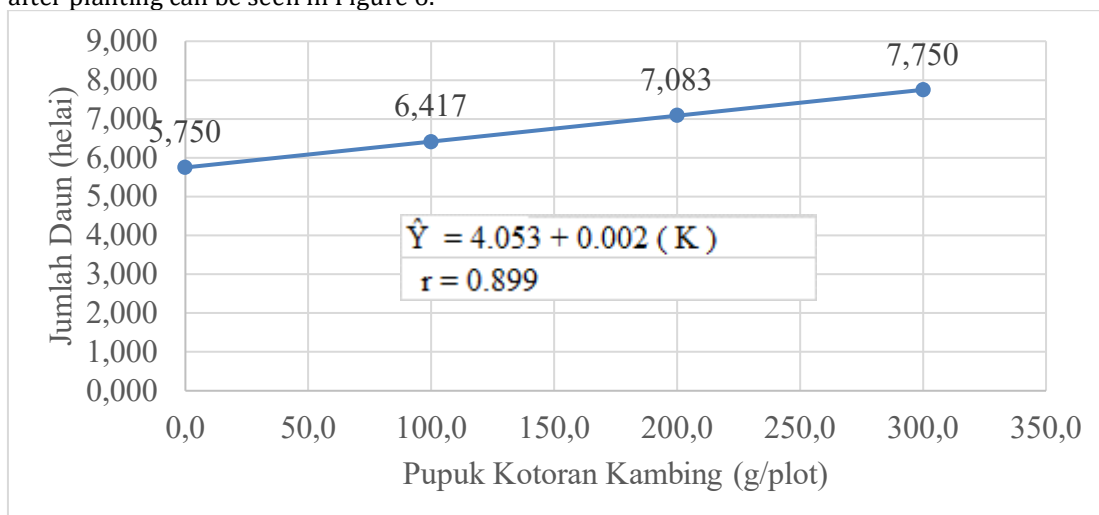


Figure 6. Graph of the Relationship between the Number of Leaves (Leaves) of Coffee Plant Seedlings Due to the Effectiveness of Applying Goat Manure Fertilizer 15 Weeks After Planting

From Figure 6, it can be explained that with the increase in the dose of goat manure, the number of leaves of coffee plant seedlings will increase where the equation obtained is $\hat{Y} = 4.053 + 0.002 (K)$ with a value of $r = 0.899$, meaning that the higher the dose of goat manure fertilizer, the more the number of leaves of coffee plant seedlings will be more which forms a positive linear relationship.

B. Discussion

1. Effectiveness of Photosynthetic Eco Farming Fertilizer Application on Vegetative Growth of Coffee Plants (*Coffea sp*)

The results of the study after statistical analysis showed that the application of photosynthetic eco farming fertilizer had an effect on the radical growth of coffee plants such as plant height (cm), stem diameter (mm), and number of leaves (strands). This is because the nutrients contained in photosynthetic eco farming fertilizer are very high, so that it has an influence on the vegetative growth of coffee plants, especially the Nitrogen nutrient that is needed during the vegetative phase. Photosynthetic eco farming fertilizer is a fertilizer or nutrient made of super active organic matter that contains complete nutrients according to plant needs and is also equipped with positive bacteria in the process of improving soil physics, soil biology, and soil chemistry, eco farming contains 51.06% organic C, 3.35% total nitrogen, 15.24% C/N 4.84% phosphorus, and 1.47% potassium, the application of eco farming fertilizer can increase plant growth and production (Gunawan *et al.*, 2022).

Nitrogen is the main nutrient needed by plants for the growth and formation of plant vegetative organs such as stems, leaves, and roots (Lismawati *et al.*, 2023).

According to (Friday 2022), it is stated that the element Nitrogen plays a role in enhancing vegetative growth, especially leaves, roots, spurring budding and increasing plant height.

The results showed that the application of photosynthetic eco farming fertilizer had an effect on plant height (cm), stem diameter (mm), and the number of leaves (strands), where the treatment that gave a positive response was obtained in the E3 treatment (300 ml/liter of water). This is due to the ability of coffee plants to absorb nutrients, if the nutrients obtained are higher, optimal photosynthesis results are obtained to produce better vegetative growth. In addition, this is also because the P nutrient content in Eco farming fertilizer is able to meet the needs of plants to stimulate root growth. The more roots are formed, the more nutrients and water the plant can absorb. The nutrient K plays a role in the formation of carbohydrates. According to Supriadi *et al.*, (2017) the increase in bulb weight is related to the parameters of the number of leaves and the number of permrumpun bulbs. The abundance of leaves will increase the photosynthesis process and produce a lot of photosynthes which are then translocated.

2. Effectiveness of Goat Manure Fertilizer on Vegetative Growth of Coffee Plants (*Coffea sp*)

The results of the study after statistical analysis showed that the application of goat manure fertilizer influenced the radical growth of coffee plants such as plant height (cm), stem diameter (mm), and the number of leaves (strands). Because the nutrients contained in goat manure fertilizer are very high, such as nitrogen, so it has an influence on the vegetative growth of coffee plants, especially nitrogen nutrients that are needed during the vegetative phase. This is suspected because goat manure contains nitrogen nutrients, where the nitrogen nutrient in goat manure is 1.19% which can meet the needs of plants in the growth process (Rahayu *et.al*, 2014).

Muharam (2017), the application of goat manure as a source of organic fertilizer is able to increase the pH content of the soil and has the ability to bind water in the soil to provide nutrients for plant growth, so that plants can grow well.

The results of the research on the application of goat manure fertilizer provide a positive response to the growth of coffee plants, namely, plant height (cm), stem diameter (mm), and number of leaves (strands). Where the treatment that gave a positive response was the K3 treatment = 300 g/plot. This is suspected because the phosphorus, nitrogen, and potassium content contained in goat manure is high enough to meet the needs of plants. This is in accordance with the statement of Muharam (2017), the application of goat manure as a source of organic fertilizer is able to increase the pH content of the soil and has the ability to bind water in the soil to provide nutrients for plant growth, so that plants can grow well.

Noverita (2014), stated that goat manure fertilizer has a nitrogen content which acts as a raw material for chlorophyll in the photosynthesis process. The results of photosynthesis are used to synthesize macromolecules inside carbohydrates. Carbohydrates will be overhauled into food reserves

that will be accumulated in young tissues that are growing so that they have an impact on increasing the length of plants.

Goat manure provides a large amount of nutrients, especially the N nutrient, which plays a very important role in the long relationship of the fruit produced. The availability of element N results in an increase in the length of the fruit. The availability of nitrogen affects the photosynthesis process which can convert carbohydrates into proteins, so that growth will be more effective, including in increasing the length of the fruit (Fatmawaty *et.al*, 2018).

Hadi *et.al*, (2015), stated that manure has several advantages compared to chemical fertilizers, namely it can help neutralize soil pH, help neutralize toxins due to the presence of heavy metals in the soil, improve soil structure to become loose so as to increase soil porosity and directly increase the availability of groundwater, help the absorption of nutrients from added chemical fertilizers, and also help maintain soil temperature so that it fluctuates not high (D. J. S. Siregar *et al.*, 2022).

Based on the results of the study, the application of goat manure fertilizer has an effect on plant height (cm), stem diameter (mm), and the number of leaves (strands) of coffee plant seedlings, this is suspected to be due to the balance of nutrients in the soil due to the application of goat manure fertilizer, thus affecting the vegetative and generative growth of plants, especially fruit weight. The fulfillment of plant nutrient needs, both micro and macro elements, will make plant metabolism run smoothly, then it will be useful in spurring plant growth, both vegetative and generative. The weight of the fruit is highly determined by the length of the fruit. The longer the fruit, the higher the weight of the fruit. In addition, soil fertility can meet the nutrient needs of plants and the availability of water also greatly affects the weight of cucumbers (Maulani, 2014).

3. Interaction of the Effectiveness of Eco Farming Photosynthesis Fertilizer and Goat Manure Fertilizer on the Vegetative Growth of Coffee Plants (*Coffea sp*)

The results of statistical data analysis showed that the interaction between the effectiveness of photosynthetic eco farming fertilizer and goat manure fertilizer did not affect the vegetative growth of coffee plant seedlings such as plant height (cm), stem diameter (mm), and number of leaves (strands). This can be because the treatment given has an equal role in increasing the vegetative growth of coffee plant seedlings. Hanafiah (2014) added that if there is no interaction, it means that the influence of one factor is the same for all other levels of factors and is the same as the main influence. In accordance with this statement, it can be concluded that the position of both factors is to support plant growth, but not to support each other if one factor covers the other (D. J. S. Siregar, Setyaningrum, *et al.*, 2022a; Wahyuni *et al.*, 2022, 2023)

The effectiveness of photosynthetic eco farming fertilizer and goat manure fertilizer tended to give a positive response to plant vegetative growth. Two treatment factors that act freely or their influence stand alone, so it can be said that the two factors do not interact with each other (Safei *et.al*, 2014)

5. CONCLUSION AND SUGGESTIONS

From the results of the research after statistical analysis and tests, it shows that;

The effectiveness of photosynthetic eco farming fertilizer has an effect on the parameters of plant height (cm), stem diameter (mm), and the number of leaves (strands) of coffee plant seedlings. Positive response was found in E3 treatment = 300 ml/liter of water

The effectiveness of goat manure fertilizer influences the parameters of plant height (cm), stem diameter (mm), and the number of leaves (strands) of coffee plant seedlings. Positive response was found in K3 treatment = 300 g/plot

The interaction between the effectiveness of eco farming photosynthesis fertilizer and goat manure fertilizer did not affect all parameters observed, namely plant height (cm), stem diameter (mm), and the number of leaves (strands) of coffee plant seedlings.

Based on the results of the above study, the effectiveness of applying photosynthetic eco farming fertilizer in the E3 treatment = 300 ml/liter of water and the application of goat manure fertilizer in the K3 treatment = 300 g/plot is the treatment that provides the best response to plant height, stem

diameter, and the number of leaves of coffee plant seedlings. Furthermore, for the same research with different levels in order to obtain optimal results for the vegetative growth of coffee seedlings.

REFERENCES

- Ali Zulfikar and Syarifudin Ahmad. 2014. Experiment on Compost Production from Cow Manure and Chicken Manure with the Addition of Papain Enzymes. *Journal of Environmental Health*. Vol. 11: No. 1.
- Andayani and La Sarido. 2014. Test of Four Types of Manure on the Growth and Yield of Curly Chili Pepper (*Capsicum annum* L.) *Journal of Agrifor*, 12(1), 22-29.
- Budianto, A., Sahiri, N. and Ikhwan, S.M. 2015. Effect of Various Doses of Chicken Manure on the Growth and Yield of Shallot Plants (*Allium ascalonicum* L.) Palu Valley Varieties, *E. J Agrotechnology* (4), ISSN: 2338-3011.
- Fatmawaty, A. A., Hermit, N., & Muchlisoh, L. 2018. Effect of Dose Level of Goat Animal Manure Fertilizer on the Growth and Yield of Three Varieties of Cucumber Plants (*Cucumis Sativus* L.). Faculty of Agriculture. Sultan Ageng Tirtayasa University
- Gunawan Heru, Mawarni Rita and Pratama Ridho. 2022 The Effect of Eco Farming Fertilizer on the Growth and Production of Three Varieties of Mustard Plants (*Brassica Chinensis*). *Journal of Pioneer LPPM, Asahan University*, Vol. 8 N0.1. P-ISSN: 2549-3043-E-ISSN: 2655-3201.
- Gayatri, 2019. History of the Coffee Plant. *Agriculture Dinads - BPP Busungbiu*. Buleleng Regency Government.
- Hadi, R. Y., Heddy, Y. S., and Sugito, Y. 2015. Effect of Planting Distance and Dosage of Goat Manure Fertilizer on the Growth and Yield of Chickpea Plants (*Phaseolus vulgaris* L.). *Journal of Plant Production*, 3(4), 294-301
- Hanafiah, K. A. 2014. *Experimental Design*. Rajawali Press. Jakarta
- Jumin. F. 2015. *Cultivating shallots*. Azka Press Jakarta : 9- 25
- Lismawati, Mahfudz and Maemunah. 2023. Increasing the Results of Shallot (*Allium aggregatum* L.) with Eco Farming Liquid Fertilizer. *e.J. Agrotekbis* 11 (6) : 1425 - 1435 , December 2023.
- Maulani, N. W. 2014. Effect of Liquid Organic Fertilizer (POC) Concentration on Growth and Yield of Cucumber (*Cucumis sativus* L.). *Journal of Agroteknan*, 1(2).
- Muharam, 2017. The Effectiveness of the Use of Goat Manure and Liquid Organic Fertilizer in Increasing the Growth and Yield of Soybean Plants (*Glycine Max* L) of the Anjasmoro Variety. *Indonesian Journal of Agrotek* 2 (1) : 44 – 53.
- Noverita, S.V, 2014. Effect of Nitrogen and Compost on the Growth of Aloe Vera Plants. *Journal of Research in the Field of Agricultural Sciences*. 3(3):95-105.
- Pratama. Y. 2018. Affiliation of Trichoderma to Chicken Manure and Administration of Various Doses of Volcanic Ash to Cocoa Nursery (*Theobroma cacao* L.). Thesis of the Faculty of Agriculture. University of Muhammadiyah North Sumatra Medan.
- Rahayu, B. T., Simanjuntak, H. B., and Suprihati, 2014. Application of Goat Manure to the Growth and Yield of Carrots (*Daucus carota*) and Onions (*Allium fistulosum* L.) With intercropping cultivation. *AGRIC Journal*. 26(1):52-60.
- Safei, M., Rahmi, A., & Jannah, N. 2014. Effect of Type and Dose of Organic Fertilizer on the Growth and Yield of Eggplant (*Solanum melongena* L.) Mustang F1 variety. *Journal of Agricultural and Forestry Sciences*, 13(1), 59-66.
- Saragih. H. R. 2020. Effect of Coconut Water and Cascing Fertilizer on the Growth of Cocoa Plant Seedlings (*Theobroma cacao* L.). Thesis of the Faculty of Agriculture. Riau Islamic University, Pekanbaru.
- Supariadi, Husna, Y. and Yoseva, S. 2017. Effect of Applying Manure and N, P, and K Fertilizers on the Growth and Production of Shallot Plants (*Allium cepa ascalonicum* L.). *Faperta Journal*. 3 (2) : 1 - 13.
- Eco Farming Team, 2022. *Farming Guide Book*. Smart Farmer Application Guidebook. Ecodia Farming.
- Fitri, R., & Amrul, H. M. Z. N. (2022). KAJIAN AIR PANTAI WONG POLO MENUJU DESA WISATA DESA KOTA PARI. *KOLONI*, 1(2), 478–484.

- Hutapea, A. R., & Sari Siregar, D. J. (2023). Quality of Cow Manure Compost Using Effective Microorganism (EM4) and Black Soldier Fly (BSF) Fly Larvae (Maggot). *International Journal of Research and Review*, 10(2), 271–276. <https://doi.org/10.52403/ijrr.20230234>
- Perdana, A., Zamriyetti, Z., & Siswanto, Y. (2024). Respon Pertumbuhan Stek Tanaman Jambu Madu Deli Hijau (*Syzygium aqueum*) Akibat Pemberian Pupuk Organik Cangkang Telur dan Pupuk Kotoran Ayam. *Jurnal Pertanian Agros*, 26(1), 5646–5654.
- Permadi, M. B., Amrul, H. M. Z. N., & Siswanto, Y. (2024). Pengaruh Media Tanam dan Pupuk Kompos Kotoran Sapi Terhadap Pertumbuhan Tanaman Jahe (*Zingiber officinale*). *JURNAL AGROPLASMA*, 11(2).
- Siregar, D. J. S., Amrul, H. M. Z. N., & Warisman. (2018). PEMANFAATAN LIMBAH ORGANIK DAN LIMBAH PETERNAKAN DESA CINTADAME KECAMATAN SIMANINDO KABUPATEN SAMOSIR. *Journal of Animal Science and Agronomy Panca Budi*, 3, 14–20.
- Siregar, D. J. S., Julianti, E., Tafsin, M., & Suryanto, D. (2022). Selection of Probiotic Candidate of Lactic Acid Bacteria from *Hermetia Illucens* Larvae Fed With Different Feeding Substrates. *Biodiversitas*, 23(12), 6320–6326. <https://doi.org/10.13057/biodiv/d231228>
- Siregar, D. J. S., Setyaningrum, S., & Warisman. (2022a). Optimalisasi Teknologi Pakan Lokal Dengan Pengolahan Jerami Jagung Di Desa Klambir Lima Kebun. *Jurdimas (Jurnal Pengabdian Kepada Masyarakat) Royal*, 5(2), 198–204.
- Siregar, D. J. S., Setyaningrum, S., & Warisman, W. (2022b). OPTIMIZATION OF MAGGOT (*HERMETIA ILLUCENS*) USING HOUSEHOLD WASTE MEDIA ON ECONOMIC ANALYZING OF NATIVE CHICKEN AT STARTER PERIOD. *Proceeding International Conference Keputeraan Prof. H. Kadirun Yahya*, 1(1), 151–156.
- Siregar, D. J. S., Setyaningrum, S., & Warisman, W. (2022c). OPTIMIZATION OF MAGGOT (*HERMETIA ILLUCENS*) USING HOUSEHOLD WASTE MEDIA ON ECONOMIC ANALYZING OF NATIVE CHICKEN AT STARTER PERIOD. *Proceeding International Conference Keputeraan Prof. H. Kadirun Yahya*, 1(1), 151–156.
- Siregar, D. J. S., Warisman, & Setyaningrum, S. (2022). *Pemanfaatan Larva Lalat Black Solder Fly (Hermetia illucens) dengan Berbagai Media Berbeda sebagai Pakan Puyuh*. 3(1), 88–95.
- Siregar, M., Zamriyetti, Wahyuni, S., & Rahmaniari. (2021). Pelatihan Sistem Tanam Hidroponik Kepada Para Ibu Jalasenastri FASHARKAN Belawan. *Jurnal Abdimas Hawari, Jurnal Pengabdian Kepada Masyarakat*, 1(1), 9–17.
- Siswanto, Y., Setiawan, A., & Amrul, H. M. Z. N. (2023). Teknik tanaman buah dalam pot untuk budidaya tanaman anggur (*Vitis vinifera* L.). *Penerbit Tahta Media*.
- Siswanto, Y., & Simangunsong, H. F. (2023). Pembibitan Tanaman Coklat (*Theobroma Cacao* L.) Secara Organik. *Penerbit Tahta Media*.
- Siswanto, Y., Sumartono, I., & Kurniawan, D. (2024). Pengaruh Pemberian Pupuk Eco Farming Fotosintesa dan Pupuk Kotoran Kambing Terhadap Pertumbuhan Vegetatif Bibit Tanaman Kopi (*Coffea* Sp). *Sinergi Multidisiplin Sosial Humaniora Dan Sains Teknologi*, 1(1), 51–65.
- Wahyuni, S., Sari, D. J., Hernawaty, H., & Afifah, N. (2022). Implementation of the Ternakloka Application membership method in increasing livestock sales in Kota Pari Village. *International Conference on Sciences Development and Technology*, 2(1), 197–202.
- Wahyuni, S., Sari, D. J., Hernawaty, H., & Afifah, N. (2023). Ternakloka: a Web-Based Marketplace for Qurban and Aqiqah. *JURTEKSI (Jurnal Teknologi Dan Sistem Informasi)*, 9(2), 249–254.