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Growth of Turi Seedlings (*Sesbania grandiflora* L. Pers) on Ex-Gold Mining Land Using Organic Cow Stall Fertilizer in Polybags

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ABSTRACT

This research aims to determine the growth of turi plants on former gold mining land, by applying cow manure. This research was carried out at the BPDAS Palu Poso Permanent Nursery in the Tadulako University area. This research was carried out from April to November 2023. This research used a Completely Randomized Design (CRD) consisting of 4 treatments including P0= No Treatment, P1= 150 gr Manure P2= 200 gr Cow Manure P3= 250 gr Cow Manure. Each treatment was repeated 10 times so that there were 40 experimental units. The results of the analysis of variance showed that the growth of turi seedlings in ex-gold mining soil with the application of cow manure had a significant effect on the increase in height, diameter and number of leaves. The treatment that gave the best response was treatment P3= (250 gr of cow manure) with an average increase in height of 19.53 cm, an average increase in diameter of 0.72 mm, and an average increase in the number of leaves of 7.4 pieces.

Keywords: Cow Manure. Growht, Turi, mining land.

1. INTRODUCTION

Turi (Sesbania grandiflora L. Pers) is a member of the fabaceae (legume) family, which has many benefits for humans. Some of the benefits of turi include, as medicine, animal feed, shade plants to cool other plants around it, living fences, windbreaks, vines, ornamental trees, and also often used in reclamation of critical land. This plant forms nodules on its roots which can bind nitrogen in the soil, thereby improving soil fertility. Fallen leaves, flowers and fruit make good mulch and green manure. (Kina et al, 2023).

Mining activities have the potential to provide quite large regional income. However, these activities also have a negative impact on the environment if the waste produced is not processed properly. Negative impacts that can occur on the environment are a decline in the condition of ex-mining land (tailings) in the form of loss of soil layer profile, soil compaction (high levels of bulk density), lack of important nutrients, low pH, pollution by heavy metals on ex-mining land. , as well as a decrease in soil microbial populations (Wasis, 2011).

Organic fertilizer has a very important role in soil fertility, because the use of organic

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fertilizer in the cultivation of food and non-food crops can improve the physical, chemical and biological properties of the soil. Another advantage of organic fertilizer is that it does not contain natural chemicals, so it is safer and healthier for humans. The large-scale use of inorganic fertilizers occurred precisely after the green revolution took place, this was because the use of chemical/inorganic fertilizers was felt to be more practical in terms of application to plants, the amounts were much smaller than organic fertilizers and were relatively cheaper because at that time fertilizer prices were subsidized by government and easier to obtain. However, the impact of long-term use of inorganic chemical fertilizers is actually dangerous because continuous use of a single inorganic fertilizer in the long term will make the soil hard because the sulfate residue and carbonate content contained in the fertilizer and the soil react to the soil's calcium. making land cultivation difficult (Sutrisno, 2019).

One of the organic fertilizers is cow manure compost, where this fertilizer is processed animal waste or cow dung which is applied to the soil to improve soil fertility. The nutrients contained in manure are macro and micro nutrients that can increase water holding capacity and increase cation exchange capacity. (Neltriana, 2015).

2. RESEARCH METHOD

This research used a Completely Randomized Design (CRD) consisting of 4 treatments and 10 replications, so there were a total of 40 experimental units. Research data was analyzed using the analysis of variance (F) test with the Least Significant Difference Test (LSD) at the 5% level. The research was carried out from April to November 2023 at the BPDAS Palu Poso Nursery, Tadulako University.

This research used the Completely Randomized Design (CRD) method which consisted of five treatment doses of cow manure, namely: P0 = No Cow Manure (control) P1 = 150 gr Cow manure P2 =200 gr Cow manure P3 = 250 gr Cow manure. The materials used in this research were turi plants, ex-mining soil, and cow manure. And the tools used in this research were hoes, shovels, sacks, tarpaulins, cameras, stationery and laptops

3. RESULTS AND DISCUSSION

Heigh Addition (cm)

To determine the effect of the treatment given on the increase in height of turi seedlings, an analysis of variance was carried out which is presented in Table 1.

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Table 1. Results of analysis of varieties of height increase in Turi seedlings

SD	DF	SS	MS	CF	TF
					5%
Treatment	3	7633.33	2544.44	230.91*	4.35
Error	36	396.68	11.0189		
Total	39	8030.01			
Information *= Significant			DC=45%		

Information : SD (Source Of Diversity), DF (degrees of freedom), SS (squared sum), MS (Middle square), CF (Count Factor), TF (Table Factor), DC= Diversity Coeficient

Table 1 shows that applying cow manure to ex-mining soil has a significant effect on the height of turi seedlings. Therefore, further tests were carried out using the Tukey Test (TS) which is presented in table 2.

Table 2. Results of the Tukey Test (TS) on height measurements (cm) of Turi Seedlings

Treatment	Average	TS
P0	9.07^{d}	3.97
P1	9.53^{c}	
P2	15.05^{b}	
P3	19.53^{a}	

Note: Numbers followed by the same letter notation indicate that they are not significantly different at the 5% Tukey test (TS) level

Table 2 shows that treatment P3 is significantly different from treatments P2, P1 and P0. Treatment P2 was also significantly different from treatments P1 and P0. The average height measurements for turi seedlings are P3= 19.53 (cm), P2= 15.05 (cm), P1= 9.53 (cm) and P0= 9.07 (cm). The average height measurement can be seen in Figure 1.

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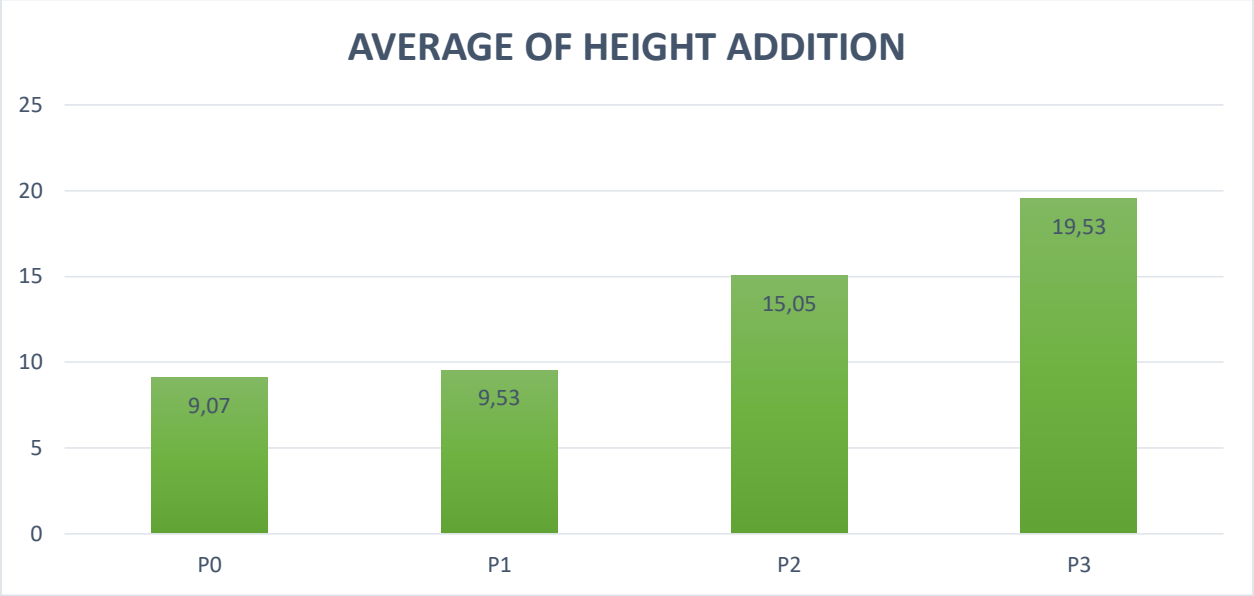

Figure 1. Average height addition of Turi seedlings

Diameter Addition (mm)

To determine the effect of the treatment given on the increase in diameter of turi seedlings, an analysis of variance was carried out which is presented in Table 3.

Table 3. Results of analysis of various fingerprints for addition the diameter of Turi seedlings

SD	DF	SS	MS	CF	TF
					5%
Treatment	3	10.08	3.36	65.383*	4.35
Error	36	1.85	0.05139		
Total	39				
Information *= Significant				DC=45%	

Information : SD (Source Of Diversity), DF (degrees of freedom), SS (squared sum), MS (Middle square), CF (Count Factor), TF (Table Factor), DC= Diversity Coeficient

Table 3 shows that applying cow manure to ex-mining soil has a significant effect on increasing the diameter of turi seedlings. Therefore, further tests were carried out using the Tukey Test which is presented in table 4.

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Table 4. Results of Analysis of the Tukey Test Test on Diameter (cm) measurements of Turi Seedlings

Treatment	Average	TS
P0	0.28[b]	0.27
P1	0.47[b]	
P2	0.68[b]	
P3	0.72[a]	

Note : Numbers followed by the same letter notation indicate that they are not significantly different at the 5% Tukey test (TS) level

Table 4 shows that treatment P3 is significantly different from treatments P2, P1 and P0. Meanwhile, treatment P2 was not significantly different from treatments P1 and P0. The average increase in diameter is P3= 0.72 (mm), P2= 0.68 (mm), P1= 0.47 (mm) and P0 = 0.28 (mm). The average increase in diameter can be seen in Figure 2.

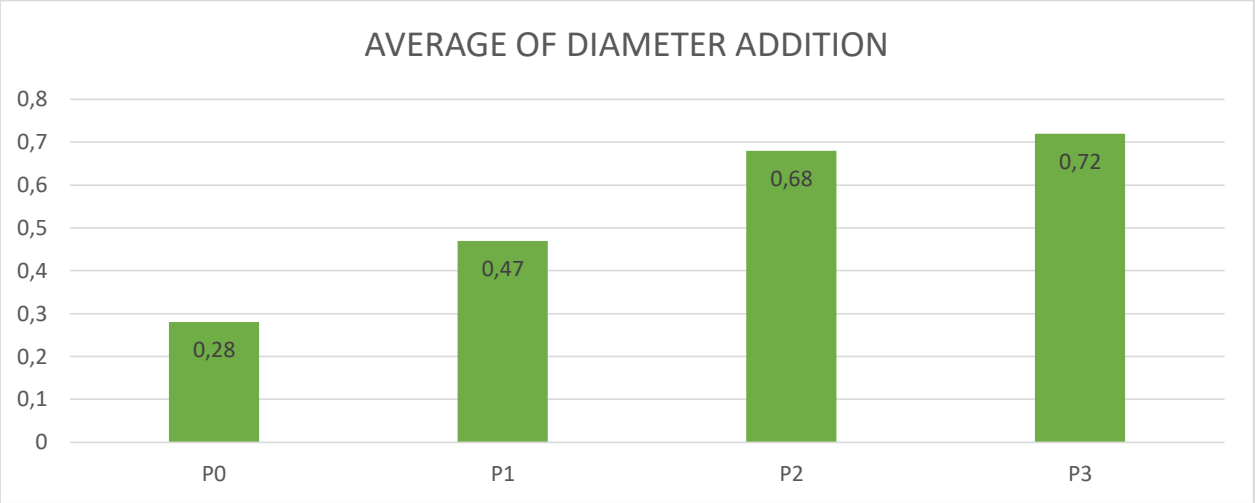

Figure 2. Average diameter Addition of turi seedlings

Number of Leaves Addition

To determine the effect of the treatment given on the increase in the number of turi seedling leaves, an analysis of variance was carried out which is presented in Table 5.

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Table 5. Results of analysis of various fingerprints for increasing the number of leaves of turi seedlings

SD	DF	SS	MS	CF	TF
					5%
Treatment	3	1053.63	351.21	317.67*	4.35
Error	36	39.8	1.10556		
Total	39	1093.43			
Information *= Significant				DC=23.62	

Information : SD (Source Of Diversity), DF (degrees of freedom), SS (squared sum), MS (Middle square), CF (Count Factor), TF (Table Factor), DC= Diversity Coeficient

Table 5 shows that applying cow manure to ex-mining soil has a significant effect on increasing the number of leaves of turi seedlings. Therefore, further tests were carried out using tukey test which is presented in table 6.

Table 6. Analysis Results of the tuket Test on the addition in the Number of Leaves (Strands) of Turi Seedlings

Treatment	Average	Tukey Test
P0	3.2^{c}	1.26
P1	4.1^{c}	
P2	5.1^{b}	
P3	7.4^{a}	

Note : Numbers followed by the same letter notation indicate that they are not significantly different at the 5% Tukey test (TS) level

Table 6 shows that treatment P3 is significantly different from P2, P1 and P0, P2 is significantly different from P1 and P0. Meanwhile, P1 is not significantly different from P0. The average increase in the number of leaves is P3= 7.4 (strands), P2= 5.1 (strands), P1= 4.1 (strands) and P0= 3.2 (strands). The average increase in height can be seen in Figure 3.

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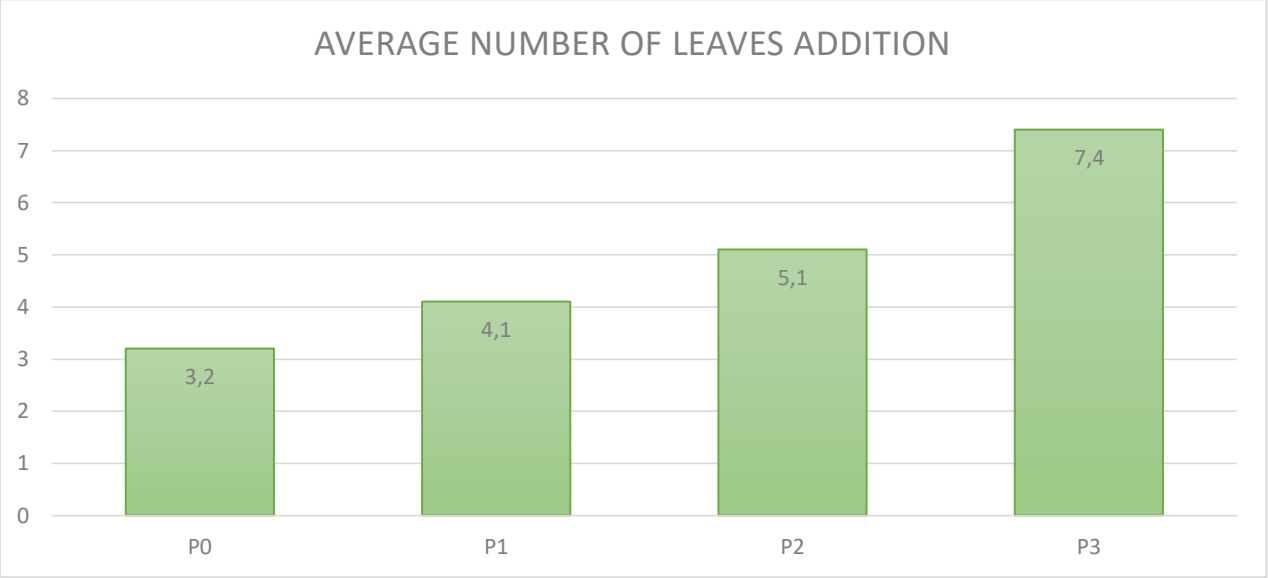

Figure 3. Average number of leaves addition

DISCUSSION

The results of research on applying cow manure to ex-mining soil on the growth of turi seedlings showed better results compared to plants that were not given manure. Based on analysis of variance, it has a significant effect on the increase in height, diameter and number of leaves. The highest average increase in height was in the P3 treatment with a value of 19.53. The highest average increase in diameter was in the P3 treatment with a value of 0.72. The highest average increase in number of leaves was also in the P3 treatment with a value of 7.4. This indicates that administering Cow Manure Fertilizer at this dose is the best and most appropriate, because in this treatment maximum growth has occurred. Fertilization is one way to overcome soil that is poor in nutrients, so that it becomes fertile soil and can stimulate the growth of plants on it. (Kamaludin, 2018). Based on research results (Kamaludin, 2017) that giving cow manure gave the best response at a dose of 450 gr, but in this study the best treatment was at a dose of 250 gr. This is thought to be due to differences in seed sources used in this study.

Fertilizers containing N, P, and K are very useful to increase plant height. The provision of element N at the stage of plant development will stimulate the growth and increase of plant height, while the presence of element K acts as a counterbalance to the influence of N and P and stimulates root growth.

Cow dung (feces) contains nutrient components needed by plants, namely 5-7% nitrogen, 3-6% phosphorus, and 1-6% potassium, but direct use of feces can cause plants to wilt and die, therefore it requires a composting process to change the use of feces directly. Decomposers are

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microorganisms that break down or renovate nitrogen and carbon from dead plant or animal tissue, so that the mineralization process runs faster and provides nutrients for plants better (Saraswati et al., 2006)

Not only the increase in height, the number of leaves is also influenced by the presence of the nutrient elements N, P and K in adequate amounts and this can be provided by cow manure. Leaf growth is important in the initial growth of seedlings because leaves are an organ that plays a role in photosynthesis, the results of which are needed for plants. (Tetelay, 2018). Leaves are plant organs that synthesize food for plant needs and as food reserves. So leaf growth is very necessary as an indicator of plant growth and can also be used as supporting data in explaining growth (Djuaja, 2012).

Fertilizing plants will be better if you use the right type of fertilizer, dose and fertilizer. Lack or excess of nutrients including NPK will have an adverse effect on growth and product (Zahrah, 2011).

4. CONCLUSION

Providing cow manure in the growing medium of ex-mining soil has a significant effect on the increase in height, diameter and number of leaves of turi seedlings. P3 treatment (250 gr of cow manure + 2 kg of ex-mining soil) had the best effect on the growth of turi seedlings with an average increase in height of 19.53 (cm), an average increase in diameter of 0.72 (mm) and an average increase in diameter of 0.72 (mm). increase in number of leaves by 7.4 (pieces)

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