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Effect of Compost Dosing on the Growth of Nyatoh (*Palaquium sp)* Seedlings in the Nursery

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Nyatoh (*Palaquium sp*) seedlings grow slowly, necessitating treatment to accelerate their growth in the field. Nyatoh (*Palaquium sp*) seeds are endemic to South Sulawesi and make good-quality wood for housebuilding materials. This research aims to determine and analyse the interaction of giving compost fertiliser on the growth of Nyatoh (*Palaquium sp*) seedlings in the nursery, as well as knowing and analysing the appropriate dosage according to the growth needs of Nyatoh (*Palaquium sp*) seedlings in the nursery.

The study employed a three-repetition experimental method. Nyatoh seeds, which are available in the form of polybags, are approximately 2 months old in the nursery, and then seeds with a uniform height of around 15 cm are selected for a total of 90 seedlings. Next, we prepare compost fertiliser from fermented cow dung and weigh it at 30 gr/seed (P1), 40 gr/seed (P2), and 50 gr/seed (P3). Initial growth measurements (first week) were carried out when the seeds were mixed with compost for each Nyatoh seedling. Then the next measurement was carried out in the 4th week (final measurement) on 90 Nyatoh seedlings in the nursery.

The research results demonstrated that the application of compost fertiliser to Nyatoh seedlings significantly influenced their height and number of leaves in the nursery, with a calculated F value of 14,955 surpassing the F table value of 4,459 and a calculated F value of 12,043 surpassing 4,459. The treatment of providing compost fertiliser at a dose of 40 gr/seed (P2) had a very significant effect on the increase in height and the increase in the number of leaves of Nyatoh seedlings in the nursery.

Keywords: Nyatoh (Palaquium sp), Effect, Growth, Compost, Seedlings.

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1. Introduction

Nyatoh (*Palaquium sp*) wood is good quality wood with good fiber and color so it is needed both for furniture and as building materials for houses. Nyatoh wood (*Palaquium sp*) is generally included in durable class III-IV, strong class II-III. Considering its potential and uses, nyatoh (*Palaquium sp*) has great potential to be developed and expanded in cultivation and to preserve its existence. Wardiana, et al. (2015) stated that apart from light intensity, the use of various mixtures of materials for planting media at the nursery level also plays an important role considering that at that stage the plants are in the early stages of root formation. Organic materials are materials that are commonly used as soil mixtures in making planting media at the nursery

level. The function of organic matter, apart from adding nutrients, also plays a role in improving soil structure and aeration so that it can facilitate root penetration.
One way to get good seeds is to carry out a suitable seedbed so that you get healthy seeds with optimal growth. The use of organic materials mixed with soil in certain proportions is expected to increase seedling growth. The addition of organic materials to seed planting media has a significant role in improving the physical, chemical and biological properties of the soil which will influence seedling growth. Apart from that, organic matter also acts as a source of energy and food for soil microbes, so that it can increase microbial activity in providing plant nutrients (Anisa, 2017).
Fertilization is one way to improve soil fertility levels and increase the fertility of plant production. Fertilization can be done through soil and leaves. Fertilizing via leaves is carried out due to the fact that fertilizing via soil is sometimes less profitable, because nutrients are often fixed, leached and interact with the soil so that these nutrients are relatively less available to plants (Jumini et al, 2012).
Fertilization that is commonly used only contains macro elements, namely N, P and K which are given through the soil (absorbed by the roots), while other nutrient elements which are no less important for plants are often not paid attention to. In fact, if one of these elements is absent, plant growth will be disrupted. Therefore, the use of N, P and K fertilizers given through the roots needs to be balanced with the use of foliar fertilizers which contain lots of micronutrients (Evita, 2022).
Providing compost fertilizer to Nyatoh (*Palaquium sp*) plants in the nursery is expected to provide even growth, and can grow quickly, because Nyatoh seedlings are endemic trees to Sulawesi, whose growth is slow if conditions are less favorable. However, the reality in the field shows that by giving compost fertilizer to Nyatoh, not all seedlings can grow and develop well, this is because the provision of compost fertilizer is not in accordance with the balanced nutritional needs of Nyatoh seedling growth in the nursery.
This research aims to determine and analyze the interaction of giving compost fertilizer on the growth of Nyatoh (*Palaquium sp*) seedlings in the nursery, as well as knowing and analyzing the appropriate dosage according to the growth needs of Nyatoh (*Palaquium sp*) seedlings in the nursery.

2. Method

The location of this research was carried out at the location of the Forest Plant Seedling Center (BPTH) Region II, Parangloe District, Gowa Regency, South Sulawesi Province.
Materials used in this research include: Polybags, Topsoil, Compost, Sample Labels, and Nyatoh (*Palaquium sp*) seedlings. The tools used include: scales, calipers, rulers, hoes/scoops, handsprayers, pipettes, cameras and stationery.
Nyatoh (*Palaquium sp*) seeds which are available in the form of polybags are approximately 2 months old in the nursery, then seeds with a uniform height of around 15 cm are selected for a total of 90 seedlings. Next, compost fertilizer is prepared from fermented cow dung, then weighed at a dose of 30 gr/seed coded (P1), 40 gr/seed (P2), and 50 gr/seed (P3).
For a dose of 30 grams, each is mixed into a polybag containing 10 Nyatoh (*Palaquium sp*) seeds as replication 1 (P1U1), then repeated again with the same dose in 10 polybag seedlings as replication 2 (P1U2), and the same dose in 10 10 polybags of Nyatoh seedlings as replication 3 (P1U3).
For a dose of 40 gr/seed, each is mixed into a polybag containing 10 Nyatoh (*Palaquium sp*) seedlings as replication 1 (P2U1), then repeated again with the same dose in 10 polybags of Nyatoh seedlings as replication 2 (P2U2), as well as the dose. the same on 10 polybags as replication 3 (P2U3).
For a dose of 50 gr/seed, each is mixed into a polybag containing 10 Nyatoh seedlings as replication 1 (P3U1), then repeated again with the same dose in 10 polybags of Nyatoh seedlings as replication 2 (P3U2), as well as the dose. The same mixture was mixed into 10 Nyatoh seedling polybags as replication 3 (P3U3). The total number of polybags tested for compost was 90 polybags for Nyatoh seedlings. For more details, you can see the research layout as follows:

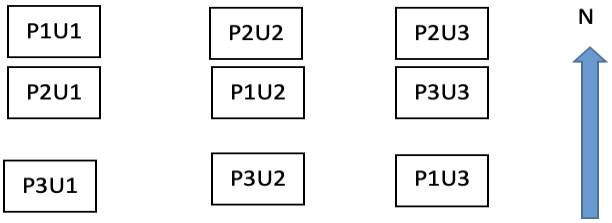


Figure 1. Layout of Field Research

Make observations in the field by visiting the nursery location and then recording field conditions such as temperature, humidity and sunlight.
Measurement of Nyatoh (*Palaquium sp*) seedling growth in each treatment tested in Nyatoh seedling polybags. The parameters for measuring Nyatoh seedling growth in the nursery are: measuring seedling height, number of leaves, and stem diameter. Initial growth measurements (first week) were carried out when the seeds were mixed with compost for each Nyatoh seedling. Then the next measurement was carried out in the 4th week (final measurement) on 90 Nyatoh seedlings in the nursery.
The data that has been collected is in the form of Nyatoh (*Palaquium sp*) seedling growth parameter data, namely the final measurement data (4th week) is subtracted from the initial measurement data (first week), then the data resulting from this reduction is then processed using the Completely Randomized Design (RAL) formula, namely:

$$Yij = \mu + \tau i + eij$$

Where:
i = Treatment
j = Deuteronomy
i,j = 1, 2, 3, n

Yij = Observations on the iIth treatment, jth replication
μ = General average
Ti = Effect of treatment i
eij = Experimental error for the ith and jth treatments

3. Result

1) Plant Height Growth

Based on observation data regarding plant height growth obtained in the field, the initial plant height growth measured in the first observation was different from the plant height growth data measured in the second observation. The measured differences in plant height growth were then processed using analysis of variance in a Completely Randomized Experimental Design (CRD). The results of data processing can be seen in Table 1.

Based on this data, it can be seen that the average plant height increase value for each treatment shows different values. The average value of increasing plant height from compost treatment with a dose of 30 gr/seed was 5.4 cm, then compost treatment with a dose of 40 gr/seed gave an average value of 10.77 cm, as well as the average value of increasing plant height from compost with a dose of 50 gr/seedling gave an average value of 4.60 cm. For more details, see Figure 2.

Table 1. Data on Nyatoh Plant Height Increase in Nursery

Treatment	Replication			Count of	Mean
	I	II	III		
Compos 30 gr	4.9	4.9	6.5	16.3	5.43
Compos 40 gr	12.9	10.7	8.7	32.3	10.77
Compos 50 gr	3.5	4.4	5.9	13.8	4.60
Count of	**21.3**	**20**	**21.1**	**62.4**	**6.93**

Source: Primary Data, 2023

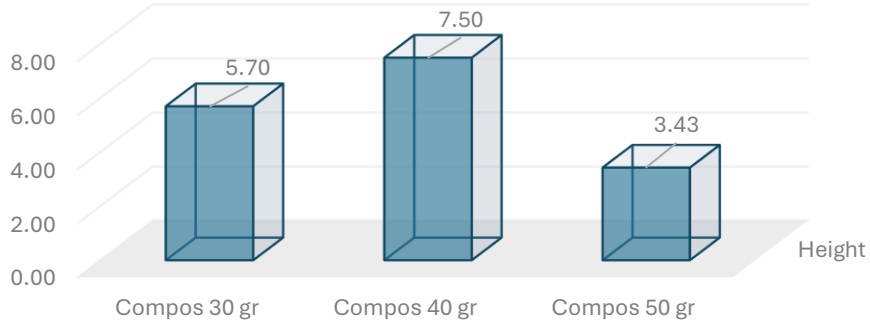


Figure 2. The effect of compost dosage on the height growth of Nyatoh (*Palaquium sp*) seedlings

Based on Figure 1, it can be seen that a compost doses of 40 gr provides the highest growth of Nyatoh seedlings compared to other compost doses.

To find out whether there is an effect of each treatment or not, the data is processed further in analysis of variance as presented in Table 2.

Based on the results of the analysis of variance (Anova) in Table 2, it can be seen that the treatment attempted gave a calculated F value greater than the F Table value at alpha 0.05, namely the calculated F value 14.956 > F Table value 4.459 in degrees of freedom (n-1) , and total diversity (n-1). This means that the treatment tried had a very real influence on the growth of Nyatoh plants in the nursery.

Table 2. Analysis of Variance in Plant Height Increase

Variety Source	DF	JK	KT	F	F table	
					5%	1%
Treatment	2	66.1667	33.583	14.956	4.459	5,539
Galat	6	13.473	2.246			
Total	**8**					

Source: Primary Data, 2023

To see which treatment had a very real influence on Nyatoh growth, the Least Significant Difference (BNT) test was carried out at alpha 0.05, df (n-1)=9-1=8. The BNT formula is:

$$BNT\alpha = (t\alpha.\,dfe)x\sqrt{\frac{2(KTE)}{r}}$$

$$BNT\alpha = 2{,}447x\sqrt{\frac{2(2{,}246)}{3}}$$

$$BNT\alpha = 2{,}994$$

Next, the average data is sorted from smallest to largest, namely by compost treatment with the following the table 3.

To find out which treatment has the most significant effect, a notation calculation of the average treatment value is carried out, namely: BNTα = 2.99 + 4.60 = 7.59, this value is compared with the average value of the compost treatment dose of 50 grm/ seedlings are smaller than the average value of the treatment, so the notation is given with the letter a. Likewise, add up the value BNTα = 2.99 + 5.40 = 8.94. The average value of the compost treatment of 30 gr/seed is smaller than the summed value of 8.94, so it is notated with the letter a. Next, add up the BNTα value = 2.99 + 10.77 = 13.76. The average value of the compost treatment dose of 40 gr/seedling is smaller than the sum of 10.77, so it is notated with the letter b.

Based on this data, it shows that of the 3 compost treatments that were tried, it turned out that only the compost treatment at a dose of 40 gr/seed had a very significant effect on the growth of Nyatoh (*Palaquium sp*) seedlings in the nursery.

Table 3. Effect of Treatment on Plant Height Growth

Treatment	Notation	Information
Compos 50 gr/bibit	$4{,}60_a$	The same letters have no real effect
Compos 30 gr/bibit	$5{,}40_a$	
Compos 40 gr/bibit	$10{,}77_b$	

Source: Primary Data, 2023

2) Increase in Number of Leaves

Based on the results of processing data on the increase in the number of leaves of Nyatoh (*Palaquium sp*) seedlings in the field, the average value of the increase in the number of leaves was obtained based on the interaction between treatments of giving compost fertilizer from various doses tested on Nyatoh (*Palaquium sp*) seedlings in the field. Data on the average value of the increase in the number of leaves is presented in Table 4. Based on the data on the increase in the number of leaves, it can be seen that giving compost at a dose of 30 gr/seedlings resulted in a number of leaves of 17.1 pieces, with an average number of leaves of 5.70 pieces, while the treatment giving compost at a dose of 40 gr/seedlings obtained a total of 22.5 leaves, with an average number of leaves of 7.50, and by administering compost treatment at a dose of 50 gr/seed, the number of leaves was 10.3, with an average number of leaves of 3.43. For more details, see Figure 3.

Table 4. Data on the increase in the number of leaves of Nyatoh (*Palaquium sp*) seedlings in the nursery

Treatment	Replication			Count of	Mean
	I	II	III		
Compos 30 gr	6.1	5	6	17.1	5.70
Compos 40 gr	7.4	9.1	6	22.5	7.50
Compos 50 gr	3.9	2.8	3.6	10.3	3.43
Count of	17.4	16.9	15.6	49.9	5.54

Source: Primary Data, 2023

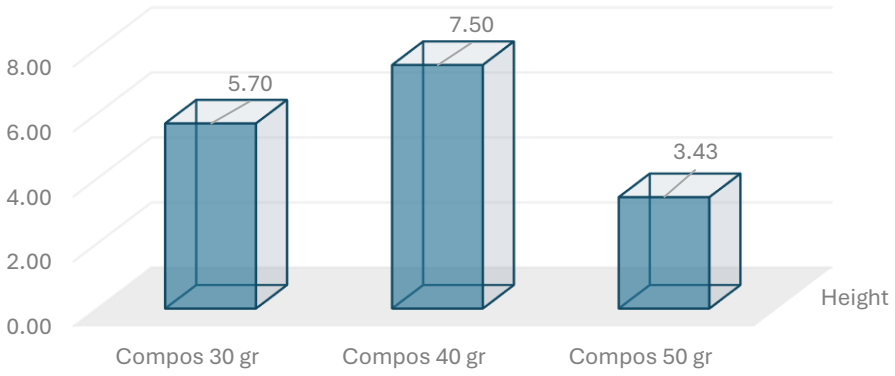


Figure 3. The effect of compost dosage on the increase in the number of Nyatoh (*Palaquium sp*) leaves

Based on Figure 2, it can be seen that a compost doses of 40 gr provides the increase in the number of Nyatoh leaves compared to other compost doses.
To find out whether there is an effect of giving each dose of treatment, the average value of the number of leaves of Nyatoh seedlings was processed in an analysis of variance (ANOVA), with the processing data presented in Table. Based on the data in Table 5, it can be seen that the F calculated value > F Table value, namely F Calculated 12.041 > F Table 4.459 on df (n-1), and alpha 0.05. This means that the administration of compost in various doses which was tested on Nyatoh seedlings in the nursery had a very real effect on the growth of Nyatoh seedlings in the nursery.
The results of the anova test had a very significant influence on the growth of Nyatoh seedlings in the nursery, so to find out which treatment had the most significant effect, further testing was carried out using the Least Significant Difference Test (BNTα). The BNTα further test aims to describe treatments that are significantly different among other treatments. The BNTα advanced test formula is:

$$BNT\alpha = (t\alpha.\,dfe)x\sqrt{\frac{2(KTE)}{r}}$$

$$BNT\alpha = 2{,}447x\sqrt{\frac{2(1{,}034)}{3}}$$

$$BNT\alpha = 2{,}032$$

Based on the results of the BNTα test, the average treatment value added to the BNTα value is described as follows:
2,032 + 3,430 = 5,465, value 5,465 < BNTα, 2,032, then given the letter a
2,032 + 5,700 = 7,732, value 7,732 < BNTα, 2,032, then given the letter a
2,032 + 7,500 = 9,532, value 9,532 < BNTα, 2,032, then given the letter b
Based on this data, it shows that treatments given the same letter notation have no significant effect, and different letter notations indicate that the treatment tried on the growth of Nyatoh seedlings has a very significant effect on their growth in the nursery

Table 5. Variance analysis of increase in the number of Nyatoh leaves

Variety Source	DF	JK	KT	F	F table	
					5%	1%
Treatment	2	24.915	12.458	12.041	4.459	5,539
Galat	6	6.206	1.034			
Total	8					

Source: Primary Data, 2023

3) Increase in Stem Diameter
Based on the results of data processing related to the increase in stem diameter of Nyatoh (*Palaquium sp*) seedlings due to the interaction of giving various doses of compost treatment in the nursery, the value of the increase in stem diameter of Nyatoh (*Palaquium sp*) seedlings with data on the increase in stem diameter is presented in Table 6.
Based on observation data in the field, it provides data on the increase in stem diameter of Nyatoh (*Palaquium sp*) seedlings. In the treatment, compost was given at a dose of 30 gr/seed with an increase in stem diameter of 0.53 cm, with an average increase of 0.18 cm, while compost given at a dose of 40 gr/seed resulted in an increase in stem diameter of 0.63. cm, with an average increase value of 0.21 cm, as well as giving compost at a dose of 50 gr/seedling, providing data on the amount of increase in stem diameter of 0.75 cm, with an average increase value of 0.25 cm. For more details, see Figure 3.
Based on Figure 3, it can be seen that a dose of 50 grams of compost increases Nyatoh's (*Palaquium sp*) stem diameter.

Table 6. Data on the increase in stem diameter of Nyatoh seedlings in the nursery

Treatment	Replication			Count of	Mean
	I	II	III		
Compos 30 gr	0.12	0.19	0.22	0.53	0.18
Compos 40 gr	0.28	0.17	0.18	0.63	0.21
Compos 50 gr	0.21	0.25	0.29	0.75	0.25
Count of	0.61	0.61	0.69	1.91	0.21

Source: Primary Data, 2023

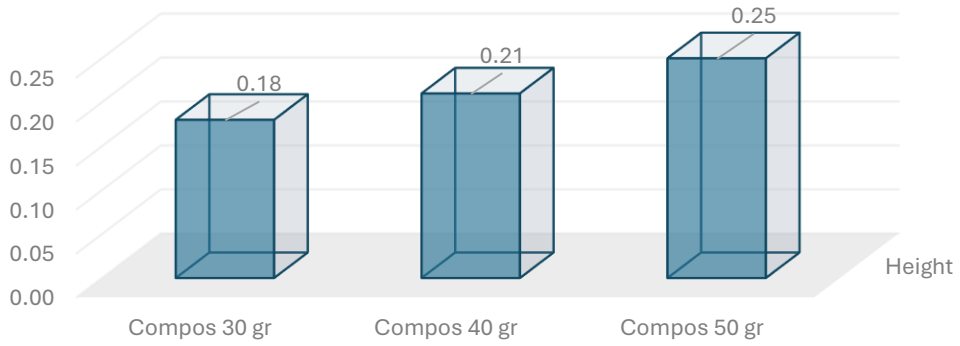


Figure 4. The effect of compost dosage on the increasing steam diameter of Nyatoh (*Palaquium sp*)

Table 7. Analysis of Variants for Increase in Nyatoh Stem Diameter

Variety Source	DF	JK	KT	F	F table	
					5%	1%
Treatment	2	0.0080	0.00040	1.529	4.459	5,539
Galat	6	0.0158	0.0026			
Total	8					

Source: Primary Data, 2023

To determine whether or not there was an effect of treatment with various interacting doses on the growth of Nyatoh (*Palaquium sp*) seedlings in the nursery, the data was processed using analysis of variance (ANOVA) on the increase in stem diameter of Nyatoh (*Palaquium sp*) seedlings. The data is presented in Table 7.

Based on the results of the variance analysis, it can be seen that the calculated F value < Table F value, namely 1.529 < 4.459. This means that the compost treatment of various doses interacted with the growth of Nyatoh seedlings in the nursery had no significant effect on the growth of Nyatoh seedlings in the nursery. Because the treatments tried did not have a real effect on the growth of stem diameter of Nyatoh seedlings in the nursery, there was no need to continue with further BNT tests.

4. Discussion

1) Increase in Plant Height

Based on the results of the variance analysis in Table 1, data obtained on the calculated F value for the increase in plant height, namely F calculated 8.308 > F table value 4.459. Based on this data, it provides information that the compost treatment at various doses tested on Nyatoh seedlings in the nursery showed a very significant effect on plant height growth.

Based on the data in Table 1, it can be seen that the provision of organic compost fertilizer has a very significant effect on the growth of Nyatoh seedlings in the nursery. This is caused by the compost having adequate nutrition, namely containing macro nutrients and micro nutrients, which function to provide food to Nyatoh seedlings, thereby stimulating their rapid growth. Because the compost moisturizes the plant growing medium so that the seeds can absorb nutrients well.

Compost is like a multivitamin for agricultural land, increasing soil fertility and stimulating healthy roots. Compost can improve soil structure by increasing organic matter, all at the same time increasing the soil's ability to hold water. The activity of beneficial plant microorganisms will also increase. These soil-decomposing microorganisms help plants absorb nutrients from the soil and produce compounds that stimulate plant growth. Compost can also help plants fight diseases that might attack plants. Another advantage of organic fertilizer is that it contains organic materials, especially humic acid and fulvic acid, which are useful for stimulating plant growth. In the short term, the use of organic fertilizer can improve the physical properties of the soil and increase the biological activity of the soil by supplying some of the nutritional needs of plants. In the long term, the use of organic fertilizer can restore soil fertility and productivity (Sukamto, 2007).

Compost that was interacted with Nyatoh (*Palaquium sp*) seedlings in the nursery showed good growth, which can be seen from the parameters of increasing plant height. Because compost has adequate nutrients that are absorbed by plants in amounts appropriate to plant needs.

Previous research conducted by Handayani (2009) provided the results of his research that a dose of 40 grams which was interacted with Nyatoh seedlings gave very real results on the height growth of Nyatoh seedlings. This proves that adding compost nutrients to Nyatoh seedling media can increase plant height growth. Compost helps nutrient-poor soil to provide the nutrients that seeds need properly. Can improve soil structure so that seedling roots can grow well

and can carry out their function of absorbing the nutrients that seedlings need normally.

2) Increase in Number of Leaves

Based on the results of the ANOVA analysis in Table 2, it shows that the calculated F value from the increase in the number of plant leaves is greater than the F table value, namely 12,043 > F table value 4.459. This happens because it is caused by providing compost at a dose that suits the plant's nutritional needs.

Plant growth as measured by the indicator of the increase in the number of leaves indicates that the compost applied to Nyatoh plants is in accordance with the plant's nutritional needs, because the plant needs to absorb the macro nutrients contained in the compost, apart from functioning as a nutrient, it also functions to decompose and moisten the soil so that The soil becomes an optimum medium for plant growth.

According to Isroi and Nurheti (2009) stated that aeration can be increased by rotating the air flow over the pile of composted organic material. Compost that contains sufficient moisture, namely between 40-60%, is the optimum range for microbial metabolism so as to create optimum conditions for plant growth.

3) Increase in Stem Diameter

Based on the data in Table 3, it shows that the value of the variance analysis results from the increase in stem diameter of Nyatoh plants in the nursery with the calculated F value is smaller than the F table value, namely 1.523 < 4.459, so this indicates that the application of compost with various doses was tested on the growth of Nyatoh plants. insignificant effect on the growth of Nyatoh (*Palaquium sp*) seedlings in the nursery.

This occurs because observations are made when the compost is applied for a short period of time, while the process of growing the diameter of the plant stem takes a long time. Refers to the theory that tree diameter growth occurs at 1 cm per year. while observations of the increase in stem diameter were carried out within one month. So the growth in stem diameter of Nyatoh (*Palaquium sp*) seedlings in the nursery during one month of observation did not show any increase in stem diameter.

5. Conclusion

Based on the results of research and discussion, it can be concluded as Providing compost fertilizer at a doses of 50 grams which was tested on Nyatoh (*Palaquium sp*) seedlings had a very real influence on the increase in height and increase in the number of leaves of Nyatoh seedlings in the nursery, with a calculated F value of 14.955 > F table value of 4.459 and F table of 4.459. calculated 12,043 > 4,459.

The treatment of providing compost fertilizer at a dose of 40 gr/seedling (P2) had a very significant effect on the increase in height and increase in the number of leaves of Nyatoh (*Palaquium sp*) seedlings in the nursery.

6. Author Contributions

The contribution of the first author is as a compiler and data analysis of scientific articles based on research results, while the contribution of the second author is to assist the first author in the formulation and methodology of research, assisting with data collection in the field, the contribution of the third author is assisting in collecting data in the field, and the collecting secondary data in the field.

7. Completing Interests

Writing scientific articles is based on the results of joint research, between the authors there is no conflict of interest because it is joint research and joint responsibility.

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Endnote/Zotero/Mandeley(RIS) BibTex