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Effects of Types and Compositions of Organic Fertilizers in Nursery Growing Media on the Growth of Vanilla Seedlings

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Abstract:
Background*: Vanilla seedling is one of the critical success factors in the cultivation and exploitation of vanilla plants. The generative propagation of vanilla using seedlings requires special technologies because the seedlings are small, hard-skinned, and have little food reserves. Research on the growth of vanilla seedlings using chicken and goat manure has not conducted and adapted for the capability of original soil.*
Materials and Methods*: This study was carried out in January-May 2020. The study aims to investigate the effects of each type and composition of organic fertilizer on the growth of vanilla seedlings in nursery growing media. A two-factor nested design with an environmental design in the form of a randomized block design (RBD) was employed in the study. The first factor was the type of organic fertilizer (J) with 4 levels of treatment, namely j1 (compost), j2 (cow manure), j3 (chicken manure), and j4 (goat manure). The second factor was the composition of fertilizer (K) which consisted of 3 levels of treatment, namely t1 (25%), t2 (50%) and k3 (75%). The observation parameters included the shoot opening width, number of shoots per stem, shoot length, shoot diameter, root length, number of roots, root fresh weight, and root dry weight.*
Results*: the best type of fertilizer for stem diameter was in the treatment of chicken manure.*
Conclusion: *The composition of fertilizer in the type of organic fertilizer at the composition of 75% gave the best response to the percentage of growing cuttings.*
Key Word*: vanilla seedling, fertilizer, composition, nursery media*

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I. Introduction

Vanilla (Vanilla planifolia Andrews) is one of the important plantation commodities with high economic value and good export value in international markets. One of the factors that causes Indonesian vanilla products to be very popular with foreign consumers is because they are known to contain high levels of vanilla ingredient[1]. This fruit has high economic value because of its extract which is known as a source of fragrance in foods and beverages. Vanilla fruit contains vanillin ($C_8H_3O_3$), which gives off a distinctive aroma. Vanilla is useful as an additive for food industry and in pharmaceutical fragrances (flavor and fragrance ingredients).

Data from the 2002 global demand for vanilla show that 2,500 to 3,000 tons of dry vanilla was requested per year, with the importing countries including the United States, Canada, European Union, Japan, Switzerland, and Australia. Indonesia is one of the countries that export vanilla products in the world, but the export development of Indonesian vanilla production fluctuates from year to year due to inadequate cultivation management and post-harvest handling. Based on the results of a study conducted by Balittro researcher, most of the vanilla business players and the use of seeds/seedlings are of unknown origin. The condition of vanilla cultivation in Indonesia is relatively unfavorable. This is due to the lack of cultivation technology application and vanilla harvesting that is not carried out as recommended.

Vanilla seedling is one of the critical success factors in the cultivation and exploitation of vanilla plants. The growth rate and the success rate of vanilla plant propagation in nurseries are the supporting factors in producing and providing seedlings. The generative propagation of vanilla using seedlings requires special technologies because the seedlings are small, hard-skinned, and have little food reserves. The propagation of vanilla can be done vegetatively using short and long stem cuttings. Ultisol soil has great potential to be developed for the expansion of agricultural land for food crops as long as it is balanced with proper plant and soil management. The suitable growing medium for vanilla plants with a mixture of soil media and manure in a ratio of 1: 1 was able to give results that tend to be better on the parameters of shoot length, growth percentage, root length and number of roots compared to other media[2]. Meanwhile, Research on the growth of vanilla seedlings using chicken and goat manure has not conducted and adapted for the capability of original

soil.Fertilization using organic matter is a system to improve Ultisol soil so that it is able to support plant growth.

II. Material And Methods

Study Design: This study was an experiment in polybags
Study Location: Banjarbaru Kalimantan Selatan.
Study Duration: January-May 2020.
Sample size: 144 polybags..
Sample size calculation: There were 12 treatments, and each treatment was repeated 3 times, so there were 36 experimental units. Each experimental unit contained 4 polybags, and each of the polybags consisted of cuttings from the tip, middle and base of vanilla plant.

Subjects & selection method: This study using a two-factor nested design of randomized block design (RBD) with four replications.
The first factor was the type of organic fertilizer (J) which consisted of four levels of treatments, namely:
j1 = compost
j2 = cow manure
j3 = chicken manure
j4 = goat manure
The second factor was the composition (K) of manure which consisted of 3 levels of treatments, namely:
k1 = 25%
k2 = 50%
k3 = 75%

Statistical analysis

Before conducting the analysis of variance, data were first tested for homogeneity of variance using the Bartlett test. If the analyzed data showed homogeneous, the data were analyzed using the analysis of variance (ANOVA). If the data tested by Bartlett were not homogeneous, the data transformation was carried out to obtain homogeneous data. When the results of the analysis of variance showed a significant effect, the data were compared to the mean value using the Duncan Multiple Range Test (DMRT) level 5%.

III. Result

Table no 1 Shows the average effect of the type of fertilizer on the width of the shoot opening of vanilla seedlings on the 1st, 2nd, 3rd, 4th, 5th, and 6th shoots. The table shows that the width of shoot openings on various types of organic fertilizers on the 1st, 2nd, 3rd, 4th, 5th, and 6th shoots, each ranged from 0.386 – 0.461 mm; 0.450 – 0.508 mm; 0.578 – 0.608 mm; 0.739 – 0.758 mm; and 1.004 – 1.018 mm, respectively.

Table no 1 : the average effect of the type of fertilizer on the width of the shoot opening of vanilla seedlings on the 1st, 2nd, 3rd, 4th, 5th, and 6th shoots.

Types of Organic Fertilizers	Shoot Opening Width (mm)					
	1	2	3	4	5	6
	---------- To ----------					
j1	0.414	0.478	0.578	0.714	0.822	0.933
j2	0.386	0.450	0.578	0.739	0.869	1.004
j3	0.419	0.494	0.583	0.735	0.865	1.018
j4	0.461	0.508	0.608	0.758	0.900	1.008

Table no 2: The average effect of fertilizer composition in the type of organic fertilizer on the width of the 1st, 2nd, 3rd, 4th, 5th, and 6th shoot openings. The table shows that the width of shoot openings on various effects of fertilizer compositions in the types of fertilizers on the 1st, 2nd, 3rd, 4th, 5th, and 6th shoots, each ranged from 0.415 – 0.444 mm; 0.469 – 0.508 mm; 0.550 – 0.625 mm; 0.763 – 0.921 mm and 0.871 – 1.069 mm, respectively.

Table no2 : The average effect of fertilizer composition in the type of organic fertilizer on the width of the 1st, 2nd, 3rd, 4th, 5th, and 6th shoot openings.

Fertilizer Composition in Type of Organic Fertilizer	Shoot Opening Width (mm)					
	1	2	3	4	5	6
	---------- To ----------					
k1 = 25 %	0.415	0.469	0.550	0.652	0.763	0.871
k2 = 50 %	0.401	0.471	0.585	0.743	0.909	1.033
k3 = 75 %	0.444	0.508	0.625	0.815	0.921	1.069

Table no3: Shows the average effect of the type of fertilizer and the composition of fertilizer in the type of organic fertilizer on the number of shoots per stem of vanilla plant seeds aged 90 days after planting. Table shows that the number of seedlings of vanilla plant that received the average type of fertilizer in the type of organic fertilizer ranged from 0.806 – 0.892; while the average composition of fertilizer on the number of shoots ranged from 0.771 to 0.940.

Table no 3 : The average effect of the type of organic fertilizer and the composition of fertilizer in organic fertilizer type on the number of shoots per stem

Type of organic fertilizer (J)	Composition of fertilizer (K)			Average type of fertilizer
	k1 = 25	k2 = 50	k3 = 75	
j1	0.750	1.000	0.667	0.806
j2	0.583	0.833	1.008	0.808
j3	0.917	0.917	0.750	0.861
j4	0.833	1.008	0.833	0.892
Average composition of fertilizer	0.771	0.940	0.815	-

Table no 4 Shows the average effect of the type of fertilizer on the shoot length of vanilla seedlings on the 1st, 2nd, 3rd, 4th, 5th, and 6th shoots. The table above shows that shoot length on various effects of fertilizer types on the 1st, 2nd, 3rd, 4th, 5th, and 6th shoots, each ranged from 0.389 – 0.456 cm; 0.489 – 0.611 cm; 0.531 – 0.839 cm; 0.692 – 1.014 cm; 0.794 – 1.047 cm and 0.917 – 1.386 cm, respectively.

Table no 4 : The average effect of the type of organic fertilizer and the composition of fertilizer in organic fertilizer type on the number of shoots per stem

Type of Organic Fertilizer	Shoot Length (cm)					
	1	2	3	4	5	6
	---------- To ----------					
j1	0.456	0.536	0.531	0.692	0.794	0.917
j2	0.442	0.489	0.639	0.792	0.892	1.139
j3	0.431	0.544	0.770	0.984	1.212	1.386
j4	0.389	0.611	0.839	1.014	1.047	1.356

Table no 5 Shows The average effect of fertilizer composistion on the shoot length of vanilla seedlings on the 1st, 2nd, 3rd, 4th, 5th, and 6th shoots. The table shows that the shoot length on various effects of fertilizer composition in the type of fertilizer on the 1st, 2nd, 3rd, 4th, 5th, and 6th shoots ranged from 0.381 – 0.459 cm, 0.466 – 0.604 cm; 0.592 – 0.796 cm; 0.748 – 1000 cm; 0.881 – 1.181 cm and 0.983 – 1.352 cm, respectively

Table no 5 : The average effect of fertilizer composition in the type of organic fertilizer on shoot length on the 1st, 2nd, 3rd, 4th, 5th, and 6th shoots

Composition of Fertilizer in Type of Organic Fertilizer	Shoot Length (cm)					
	1	2	3	4	5	6
	---------- To ----------					
k1 = 25 %	0.381	0.446	0.592	0.748	0.881	0.983
k2 = 50 %	0.459	0.585	0.697	0.863	0.897	1.263
k3 = 75 %	0.448	0.604	0.796	1.000	1.181	1.352

Table no 6 shows the average effect of the type of organic fertilizer on the shoot diameter of vanilla seedlings. Table shows that shoot diameter at the 1st, 2nd, 3rd, 4th, and 5th observations was not significantly different among types of organic fertilizers. The type of organic fertilizer gave a significantly different effect on the diameter of the 6th shoot. The type of chicken manure produced the highest shoot diameter of 1.128 mm compared to the type of organic compost, cow manure and goat manure.

Table no 6 : The average effect of the type of organic fertilizer on the shoot diameter of vanilla seedlings**.**

Type of Organic Fertilizer	Shoot Diameter (mm)					
	1	2	3	4	5	6
	---------- DAP----------					
j1	0.439	0.497	0.625	0.725	0.864	0.981 a
j2	0.483	0.558	0.644	0.761	0.900	1.006 a
j3	0.456	0.517	0.577	0.794	0.944	1.128 b
j4	0.419	0.489	0.586	0.728	0.836	0.986 a

Table no 7 shows The average shoot diameter of vanilla seedlings that received various compositions of organic fertilizers. Table shows that the average effect of fertilizer composition on the shoot diameter of vanilla seedlings on the 1st, 2nd, 3rd, 4th, 5th, and 6th shoots ranged from 0.423 – 0.475 mm, 0.502 – 0.540 mm; 0.596 – 0.621 mm; 0.719 – 0.785 mm; 0.848 – 0.921 mm and 1.008 – 1.046 mm, respectively.

Table no 7 : The average effect of fertilizer composition in the type of organic fertilizer on the shoot diameter of vanilla seedlings at the 1st, 2nd, 3rd, 4th, 5th, and 6th shoots

Composition of Fertilizer in Type of Organic Fertilizer	Shoot Diameter (mm)					
	1	2	3	4	5	6
	---------- To ----------					
k1 = 25 %	0.450	0.502	0.596	0.719	0.848	1.008
k2 = 50 %	0.423	0.504	0.608	0.752	0.889	1.021
k3 = 75 %	0.475	0.540	0.621	0.785	0.921	1.046

Table no 8 The average effect of the type of fertilizer on root length, number of roots, root wet weight of vanilla seedlings at 90 DAP (end of observations). Table shows that the root length, number of roots, and root wet weight at 90 DAP receiving various types of organic fertilizers in each type of fertilizer were not significantly different. The root length of vanilla seedlings on various types of organic fertilizers ranged from 8.783 – 9.393 cm; the number of roots of vanilla seedings on various types of organic fertilizers ranged from 1.083 – 1.556 cm; the root wet weight of vanilla seedlings on various types of organic fertilizers ranged from 2.254 – 3.274 cm. The highest root dry weight of vanilla seedlings that received goat manure was not significantly different from those receiving chicken manure, ranging from 1.731 – 1.766 cm; when compared to the root dry weight of the shortest vanilla plant provided with cow manure, 0.997 cm.

Table no 8 : The average effect of the type of organic fertilizer in the type of organic fertilizer on root length, number of roots, root wet weight, and root dry weight of vanilla plants

Type of organic fertilizer	Root length (cm)	Number of roots (strand)	Root wet weight (g)	Root dry weight (g)
j1	8.783	1.083	2.254	1.226 b
j2	9.246	1.236	1.802	0.997 a
j3	9,180	1.556	3.092	1.731 c
j4	9.393	1.319	3.274	1.766 c

Table no 9 show the average effect of fertilizer composition on root length, number of roots, root wet weight, and root dry weight of vanilla seedlings at 90 DAP. The average effect of fertilizer composition in the type of organic fertilizer on root length, number of roots, root wet weight, and root dry weight of vanilla plants. Data in the table shows that the root length, number of roots, root wet weight and root dry weight, which were observed at 90 DAP, receiving various compositions of organic fertilizer in each type of fertilizer were not significantly different. The root length of vanilla seedlings on various types of organic fertilizers ranged from 8.071 – 10.765 cm; the number of roots of vanilla seedlings on various types of organic fertilizers ranged from 1.010 – 1.604 cm; the root wet weight of vanilla seedlings on various types of organic fertilizers ranged from 2.344 – 2.760 cm; and root dry weight of vanilla plant in various compositions of organic fertilizer ranged from 1.352 – 1.484 cm.

Table no 9 : The average effect of fertilizer composition in the type of organic fertilizer on root length, number of roots, root wet weight, and root dry weight of vanilla plants

Composition of Fertilizer in Type of Fertilizer	Root length (cm)	Number of roots (strand)	Root wet weight (g)	Root dry weight (g)
k1 = 25 %	8.071	1,010	2.713	1.484
k2 = 50 %	8.616	1.281	2.760	1.453
k3 = 75 %	10.765	1.604	2.344	1.352

IV. Discussion

The width of shoot opening, shoot length and shoot diameter at 15-90 days after planting were not influenced by the type of organic fertilizer and the composition of fertilizer in type of fertilizer. It is suspected that the width of the shoot opening, shoot length and shoot diameter are strongly influenced by genetic factors. All vanilla plant cuttings were grown from the same variety. These results are in line with the explanation that stating that the plant growth of general variety is influenced by genetic factors and factors originating from the environment, such as the status of nutrient and water availability in the growing media[3]. Growing media greatly affects plant growth in terms of nutrient availability, water availability, and media friability. There are several factors that also affect the success of cuttings, namely the origin of the cuttings (the position of the cuttings on the parent plant), the length of the cuttings, and the environment (rooting media, temperature, humidity, and light). In addition to the availability of sufficient food for the growth of cuttings, the condition of environment is also assumed to influence the growth of cuttings[4].

The type of fertilizer and the composition in the fertilizer type did not affect the width of shoot opening, shoot length, and shoot diameter. The soil of the growing media had a high acidity level and the level of nutrient availability ranging from low to very low. Such a situation is thought to be very disturbing in providing better nutrients to plants, so the plants can take advantage of the nutrients found in organic fertilizers. The growth and development of plants provided with organic fertilizers are influenced by the nutrients of N, P and K which are contained in organic fertilizers. The application of organic fertilizers to the growing media is to create high levels of nutrients, and can increase the plant growth and development. The role of Nitrogen in NPK fertilizers can also increase overall plant growth, especially stems and leaves. Nitrogen is the element getting the most attention in relation to plant growth. This element is found in large numbers in the young tissue compared to the old tissues of the plant, mainly accumulating in the leaves and seeds. Nitrogen is a product of every living cell, so it is found in all parts of the plant. This element is also part of the assembly of enzymes and chlorophyll molecules. The N element plays an important role in the formation, growth and development of vegetative plant parts. The increase in plant height in the treatments provided with organic fertilizers was influenced by the N and P elements contained in organic fertilizers. The interaction between the N element and P element in the types of organic fertilizers had no significant effect on the observed parameters of shoot width, number of shoots and shoot length. It is suspected that the nutrient content in organic fertilizers is almost the same as that in types of organic fertilizers that work to increase plant growth and development so that there is no dominant function of the type of organic fertilizer.

It is suspected that the application of the composition of organic fertilizer in growing media did not affect the breaking of dormancy in the shoot width, number of shoots and the shoot length, but the effect of the composition of the organic fertilizer did not last long, so it was only able to have an effect on the width of the opening shoots, number of shoots and shoot length. This assumption is based on the use of organic fertilizer types in small quantities and only for a short time between 2-4 weeks. The use of large amounts of organic fertilizer type and composition in growing media, in which the organic fertilizer is able to store more water, will result in rotten roots, while the growing media that has holding capacity of low water will cause the growing media to dry out easily and the plant will die quickly. Good growing media must have the requirements as a place for plants to stand, have the ability to bind water and store nutrients needed by plants, be able to control excess water (drainage) and have good air availability (aeration), be able to maintain moisture around the plant roots, and is not easily weathered or brittle.

Organic fertilizers are fertilizers that are composed of the basic components of living things, such as the weathering of plant, animal, and organic wastes. Organic fertilizers can be solid or liquid which are used to improve the physical, chemical, and biological properties of the soil. Organic fertilizers contain a lot of organic matter rather than nutrient levels. Organic fertilizers really help prevent erosion of the topsoil, a layer containing a lot of nutrients. The use of organic fertilizers also plays an important role in maintaining/preserving soil fertility.

The slow release nature of organic fertilizer is a fertilizer with low nutrient solubility and can provide nutrients gradually (continuously) for a long time. With slow release, the efficiency of nutrient absorption will be high and nutrient loss due to washing will be low. Meanwhile, organic fertilizer is a result of a microbiological/composting process, namely the process by which organic matter is converted/decomposed into nutrients that can be absorbed by plants. The imperfect decomposition process in organic fertilizers allows the presence of organic acids and phenols which are toxic to plants. In organic fertilizers that are not fully ripe, microorganisms will produce ammonia (rotten smell) which is toxic to plants.

Apart from the nature of organic fertilizers, plant growth and development are also influenced by light and temperature, and in the study the plants got the same light intensity so that the compositions of organic fertilizers given did not show any significant difference to the growth and development of plant height. Plant growth is strongly influenced by environmental factors such as light and temperature, where these factors play an important role in the production and transportation of foodsstuffs[5]. This is in line with the opinion that the

availability of nutrients in sufficient and balanced quantities is the main factor that greatly determines the success rate of plant growth and development[6]. In addition, if the plant nutrient needs are met, the plants will be more optimal in utilizing sunlight and water in carrying out metabolic processes in tissues, namely in increasing the process. Photosynthesis thereby increases, which is useful in helping cell division and enlargement so that plants can grow and produce maximum plant growth and development which are indicated by the well development of plant organs[7].

The shoot diameter was influenced by the type of organic fertilizer at 90 DAP. The shoot diameter was influenced by the organic fertilizer type of chicken manure. It is suspected that chicken manure provides higher NPK nutrients, which is better than other organic fertilizers, because the composition of chicken manure contains manure, leftover feed and chicken urine carried in the manure material. This is in accordance that the value of chicken manure is influenced by the age of the animal, the method of fertilizer processing and the content of other materials (food residue and cage mats)[8]. The nutrient content depends on the food provided. In addition, the chicken manure is mixed with leftover chicken food and husks used as the base for the chicken coop. In several studies, organic chicken manure gave better results at the first planting because organic chicken manure was easily decomposed and had sufficient nutrient content compared to other animal manure fertilizers[9]; therefore, the plants can take advantage of the nutrients found in chicken manure. The increase in the diameter of plant shoot in the treatment with the composition of chicken manure was influenced by the N and P elements contained in the chicken manure fertilizer. If the P nutrient is good, the root development is also good, thus helping in the absorption of other macro and micro nutrients, especially N nutrients. The element N is needed in the formation of plant vegetative parts.

Chicken manure contains a higher K element than other organic fertilizers, where K nutrients function in helping root growth, strengthening plant stems and enhancing plant quality. The element K obtained from chicken manure plays a role in opening and closing stomata. This process influences the entry of CO_2 into plant tissues during the photosynthesis process. If the percentage of K is optimal, the cell turgor increases so that the stomata open. The incoming CO_2 will facilitate the photosynthesis process, which is clarified[4] that carbohydrates formed during the photosynthesis process are indispensable for cell division and cell extension. In addition, chicken manure also contains a fairly high P element. P element plays an important role in increasing the work efficiency of chloroplasts which function as the absorbers of solar energy in the photosynthesis process. Moreover, the P element also plays an active role in transferring energy in cells. The energy produced in the process of photosynthesis is very important in the process of cell division to form new shoots. The increased carbohydrates can increase the process of the cell growth in forming new cells, the enlargement of cells and the formation of plant tissues[4].

The length of the segment of vanilla seedlings, the type of organic fertilizer did not affect but was influenced by the composition of organic fertilizer type which gave a different response to the success of the length of the segment of the vanilla seedlings. The use of the soil media and the composition of organic fertilizer type (50%) had resulted in the highest values on all parameters of the percentage of growing cuttings. This is because the soil media and the composition of organic fertilizer type (50%) had the ability to meet water availability and maintain temperature and humidity, so that all observed parameters showed positive responses. The soil media and the composition of organic fertilizer type (50%) in this study had a porosity density and moderate amount of available water (not too dense, not too porous, and the amount of available water was sufficient) compared to the soil media and the composition of organic fertilizer type (25%). With the soil media and the composition of organic fertilizer type (75%) it showed that the conditions of growing media did not support the percentage of the growing cuttings of vanilla seedlings in the process of forming internodes on vanilla cuttings. Physical differences in the media were also seen through the conditions of the vanilla cuttings, both shoot cuttings and bottom cuttings. The soil media and the composition of organic fertilizer type (50%) resulted in the growing cuttings of vanilla seedlings, and until the end of the observation the plants were fertile and produced greener leaves.

The percentage of the growing cuttings of vanilla seedlings is one of the things that determines the success of cuttings and the indicator of the cutting growth. Although the concentration of organic fertilizers in organic fertilizers did not significantly affect the percentage of the growing cuttings of vanilla seedlings, the composition of organic fertilizers in organic fertilizers did affect the percentage of the cutting growth. The influence of cutting material was suspected because the difference in cutting material indicated that shoot cuttings had the ability to produce new leaf shoots faster than lower cuttings. The lower cutting had a larger stem diameter than the shoot cutting, so that the success of the growth ability from the lower cuttings is lower than the shoot cuttings allegedly due to the quality of the cutting material (top cuttings and bottom cuttings) with different levels of metabolism and growth abilities[9]. the quality of the cutting material is not only determined by the plant weight factor which is closely related to the starch content which can describe the amount of metabolic substrate, but also due to differences in the distribution of hormones such as auxin (which is synthesized in the meristematic part of the stem) and cytokinins (which are synthesized in the meristematic part

of the root) in every part of the plant[10]. This is in accordance with the results of the research stating that the larger the diameter of the base of the cuttings, the lower the percentage of life and the fewer the number of leaves and the shorter the roots formed[11]. However, the lower cuttings can still be used as cutting material with a fairly high percentage value of rooting (42.22%), so that the use of 1 year old vanilla plants as cutting material can be used up to the top 6 segments. "young plants are usually better than old plants". Through this statement it can be compared with the conditions of the stems that practitioners took as stem cutting material. Nitrogen is an element that receives the most attention in relation to plant growth. This element is found in greater quantities in the young than in the old tissues of plants, mainly accumulating in the leaves and seeds. Nitrogen is a constituent of every living cell, therefore it is found in all parts of plants. Nutrient N is available in sufficient quantities which is an important macro nutrient in the process of photosynthesis so that the plant growth can run smoothly. The N element is needed in the formation of vegetative parts of plants. In addition, organic fertilizers also contain a fairly high P element. The P element plays an important role in increasing the work efficiency of chloroplasts which function as absorbers of solar energy in the photosynthesis process. In addition, the P element also plays an active role in transferring energy in cells. The energy produced in the process of photosynthesis is very important in the process of cell division to form new shoots. With the increase in the amount of organic fertilizer applied to the soil, the amount of nutrients also increases, so that the availability of nutrients in the soil needed for plants to support their growth and development is fulfilled.

The percentage of the growing cuttings is not only influenced by the provision of ZPT and the number of shoots, but is also influenced by several other supporting factors. Factors that can affect the success of cuttings are the plant type, age of the cutting material, media, media drainage, light intensity, cutting techniques and hormone concentrations, which play an important role in the formation of green leaves very useful in the process of photosynthesis, forming proteins, fats, and various organic compounds, improving the quality of leaf-producing plants and increasing the proliferation of microorganisms in the soil.

The root dry weight of the vanilla plant seedlings at 90 DAP at the end of the observation was influenced by the development of the width of shoot opening and the intensity of the sun, the seedlings of vanilla plants which had narrower and elongated leaves could absorb sunlight effectively so that they could produce more photosynthate because they could carry out photosynthesis well. The provision of the organic fertilizer type gave a significantly different effect on the root wet weight. It is suspected that this is because the vanilla plant is a type of vine whose stems have no wood, but have little fiber and contain a lot of water and mucus so that the water content in the plant tissue is quite high. The provision of organic fertilizer in the type of organic fertilizer gave a significantly different effect on the root dry weight. Overall, from the observations for shoot width, number of shoots, shoot length, shoot diameter, internode length and percentage of the growing cuttings, root wet weight, root dry weight and number of vanilla seedlings showed that plants provided with fertilizer treatment yielded better results. The factors in the pattern of root distribution include the soil temperature, aeration, water availability, and nutrient availability. It is in line with the opinion that it is not enough for plants to only rely on nutrients from the soil. Therefore, plants need to be given additional nutrients from the outside, namely in the form of fertilizer[12]. The best dry root weight is in the organic fertilizer type of compost and the lowest is in the organic fertilizer type of cow manure.

V. Conclusion

Based on the results of the research that has been conducted, the following are some conclusions that can be inferred:

1. The organic fertilizer type in the type of organic fertilizer in nursery media on the growth of vanilla seedlings had no significant effect on the width of shoot openings, number of shoots per stem, shoot length and internode length.The type of organic fertilizer applied to the nursery media had a significant effect on the shoot diameter at the end of the observations, and the root dry weight at the end of the observation. The type of organic fertilizer that produces a larger diameter at the final observation is chicken manure, while the type of organic fertilizer that produces better root dry weight at the end of the observations is goat manure which is not significantly different from chicken manure.
2. The composition of organic fertilizer nested in the type of organic fertilizer had no significant effect on the width of shoot opening, number of shoots per stem, shoot length and shoot diameter on the 1st, 2nd, 4th, and 6th shoots and the growth of vanilla seedlings on the 2nd, 4th, 5th, and 6th shoots. The composition of fertilizers in organic fertilizer type had a significant effect on the internode length on the 1st, 2nd, 4th, and 5th shoots. The composition was the composition of 50%, which was not significantly different from the composition of 75%. Meanwhile, the composition that produced the growth of vanilla seedlings on the 2nd, 4th, 5th, 6th shoots was the composition of 75% which was not significantly different from the composition of 50%.

VI. Suggestions

Based on the results of the research that has been conducted, the following are some suggestions:

1. It is necessary to conduct further research, to strengthen the results of previous studies. We recommend that external and internal factors that influence the growth and development of plant seedlings must also be considered. Treatment with the addition of other components as a fixed variable is needed to see more thorough effects on the growth of vanilla seedlings in the future, and the importance of key research results of technological advances.
2. Supports of all parties are necessarily required for the success of a research.

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