

Effect Of Concentration And Frequency Of Goat Dung POC Application On Growth Of Vanilla (*Vanilla Planifolia* A.) Cuttings

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Abstract. Application of goat manure organic fertilizer in liquid form can optimize the growth of vanilla cuttings. The objective of the research was to obtain the best concentration and frequency of POC goat manure fertilization on vanilla cuttings. This study used factorial RBD which was repeated 3 times. The first factor was the concentration of goat manure liquid organic fertilizer consisting of K1 = 50 PPM, K2 = 100 PPM, K3 = 150 PPM and K4 = 200 PPM. The second factor was the frequency of fertilizing goat manure liquid organic fertilizer consisting of K1 = 1 time, K2 = 2 times, and K3 = 3 times. Observations were made on vine length, stem diameter, number of leaves, number of internodes, and degree of greenness of the leaves. The results showed that the best concentration of goat manure liquid organic fertilizer was at a concentration level of 200 PPM and the best frequency of goat manure liquid organic fertilizer was once a week for all research observation variables..

Keywords: concentration, frequency, Liquid organic fertilizer, vanilla seeds.

1 Introduction

Vanilla (*Vanilla planifolia* Andrews) is an introduced plant originating from Mexico and Central America with fruit yields used in the food and drink industry, pharmaceutical chemistry, and cosmetics because it contains vanillin (C₈H₈O₃) which has a specific aroma. The development of vanilla cultivation in Indonesia has positioned the plant as an export commodity with high value and potential for foreign exchange earnings [1]. Therefore, to develop the production and growth of vanilla plants can be done by using quality seeds.

Supporting factors that make the plant growth process good in vanilla cultivation are good and correct seed management [2]. Propagation of vanilla plants generally uses the vegetative method because it is easier in the nursery process compared to generative. the requirements for the use of valuation cuttings for the propagation process are that the mother plant is more than two years old, there is no poisoning or nutrient deficiency in the plant, not broodstock attacked by plant pests, dark green leaf color [3]. Planting media have different levels of fertility. Therefore, a supply of nutrients is needed in the nursery and propagation process, namely through the process of fertilization both organically and inorganically [4].

In nutrient deficient or nutrient-poor soils, fertilization is an important and essential factor for soil and plant nutrient fertility. The best fertilization process for increasing plant fertility but not leaving toxic residues in the soil is the use of organic fertilizers. Organic fertilizers applied in

liquid form will make it easier for plants to absorb the nutrients contained therein compared to granular or solid forms [4]. Another advantage is that liquid organic fertilizer is easier for plants to use because the nutrients contained in it have been decomposed so that the process of using it by plants can be seen more quickly [5]. The availability of nutrients in the soil is influenced by many factors, the factor of giving the right concentration of fertilizer will affect the crop yield of a plant. The results of research by [18] efforts to maintain the availability of nutrients in the soil apart from providing fertilizer concentrations can also be through the frequency of fertilizer application, the method of application of fertilizer and the form of fertilizer used appropriately. Therefore, it is necessary to test the growth parameters to obtain the best concentration and frequency of fertilizing liquid organic fertilizer on vanilla seeds.

2 Research Methods

2.1 Place and Time of Research.

This research was carried out in the nursery of the Plantation Cultivation Department of the Lampung State Polytechnic. The implementation time starts from January to June 2022.

2.2 Tools and materials

The tools that will be used in this study are machetes, hoes, buckets, drums, gembor, cutter, cutting shears, sickles, rulers, scales, sieves, digital caliper, chlorophyllometer (Minolta SPAD-502 plus), stationery, and documentation tools. . The materials to be used in this study were vanilla chili varieties, goat manure liquid organic fertilizer, fungicide with the active ingredient Propinep, roasted husks, water, paranet, bamboo, ZPT, insecticide with the active ingredient Alfamethrin, transparent plastic, raffia rope, polybags 7.5 cm x 25 cm, and topsoil.

2.3 RESEARCH DESIGN

This study used a factorial randomized block design (RBD) consisting of 2 factors. The first factor was the concentration of goat manure liquid organic fertilizer which consisted of 4 levels, namely: K1 = 50 PPM, K2 = 100 PPM, K3 = 150 PPM and K4 = 200 PPM. The second factor is the frequency of giving goat manure liquid organic fertilizer which consists of 3 levels, namely: K1 = 1 time, K2 = 2 times, and K3 = 3 times. So there were 12 treatments and each treatment was repeated 3 times. To calculate the concentration of the solution, it can be done by weighing liquid organic fertilizer in units of weight in ml according to the desired concentration, then after weighing, add a solvent, namely 1,000 milliliters (ml) of water. Each experimental unit was repeated 3 times so that there were 36 experimental units. Each experimental unit consisted of 2 seeds so there were 72 plants. Data analysis will be carried out using variance (F test) at the 5% significance level and if it is significantly different, it will be followed by a Significant Difference test (LSD).

2.4 Research Implementation

Preparation of tools and materials for liquid organic fertilizer

This stage is the initial stage of this research activity, where the tools and materials are adjusted to research needs and are included in the list of tools and materials that we have written in a book and then given a tick after being obtained. After the preparation of tools and materials is complete, it will be followed by the purchase of liquid organic fertilizer obtained through the market place, the liquid organic fertilizer has a nutrient content consisting of N = 1.19%, P205 = 0.92%, K20 = 1.58 % and other micro elements.

Preparation of land and planting media

The land used in this study measuring 3 x 3 m² was leveled and cleared of weeds and plant debris. The tools used are sickles, hoes, and machetes. Then the clean land is shaded using a paranet with a thickness of 50%, this shading is useful so that rainwater and sunlight don't directly hit the vanilla seeds to be planted. The planting media used topsoil and roasted husks and then sifted. Then the planting media mixture was put into polybags measuring 7.5 cm x 15 cm with a ratio of planting media and roasted husks of 2: 1 (v/v).

Preparation of planting material

The planting material used was the Chili variety obtained from the Natar Agricultural Technology Study Center. Vanilla seeds come from tendrils which consist of 1 node and are cut into 2 segments with a single leaf, then the lower surface is cut obliquely. The vanilla vines used for seeds should be chosen not too young or too old because this reduces the risk of cutting death.

Planting cuttings

Before the cuttings are planted, a planting hole is first made in the polybag to facilitate the process of planting the cuttings. Vanilla planting was carried out in the afternoon after the cuttings were taken. Before planting, the vanilla cuttings are first soaked using ZPT for 15 minutes (10 g l⁻¹ water). Then, the cuttings were transferred to the prepared beds. Cuttings planted in polybags are watered until saturated with the aim of maintaining moisture, after that the cuttings are given a fungicide with the active ingredient Propinep so that the seedlings are not attacked by diseases caused by fungi.

Application of treatment

This study consisted of two treatments, the first treatment was various concentrations of goat manure liquid organic fertilizer which consisted of 4 levels: K1 = Liquid organic fertilizer with a concentration of 50 ppm K2 = Liquid organic fertilizer with a concentration of 100 ppm. K3 = Liquid organic fertilizer with a concentration of 150 ppm. K4 = Liquid organic fertilizer with a concentration of 200 ppm. The second treatment is the administration of liquid organic fertilizer which consists of 3 levels of treatment, namely: F1 = once a week. F2 = once every 2 weeks. F3 = once every 3 weeks. For this study, the volume of liquid organic fertilizer flush with goat manure that will be given is 100 ml / vanilla seed.

Maintenance

Maintenance is one of the critical success factors in the nursery process. This maintenance activity will be carried out from the beginning of the goat manure liquid organic fertilizer fertilization treatment activities until the end of the research. The maintenance steps that will be carried out at the time of this research are plant watering, weed control, and pest and disease control.

2.5 Observation

Observations were made using quantitative data collection techniques with observation intervals of 4 weeks for approximately 3 months. The variables observed included the length of the tendrils (cm), the number of leaves (strands), the diameter of the stem (cm), the number of nodes, and the level of greenness of the leaves.

3 Result and Discussion

The results of the research on the application of goat manure liquid organic fertilizer to the seeds of vanilla plant stem cuttings showed a significant effect of each type of treatment used. Based on for 3 months, namely at 4 WAT (Weeks After Treatment), 8 WAT, At 12 WAT, differences were found in the growth of vanilla plant seedlings starting from the length of the

tendrils, the number of nodes, the number of leaves, the diameter of the stem, and the level of greenness of the leaves. The results of the recapitulation of the observation variable data are in Table 1.

Table 1. Recapitulation of the results of the analysis of variance on the observed variables

WAT	Treatment	Observational Variables				
		The length of the tendrils	Number of segments	Number of leaves	Stem diameter	The greenness of the leaves
4	POC concentration	219,9 *	49,7 *	51,68*	-	-
	Fertilization Frequency	128,52 *	26,9 *	37,72*	-	-
	Interaction	0,48 ^{tn}	0,0 ^{tn}	0,29 ^{tn}	-	-
8	POC concentration	175,83 *	47,5 *	53,43*	-	-
	Fertilization Frequency	137,66 *	2 *	39,31*	-	-
	Interaction	0,23 ^{tn}	0,2 ^{tn}	0,69 ^{tn}	-	-
12	POC concentration	150,78 *	61,4 *	36,7*	268,28 *	403 28 *
	Fertilization Frequency	118,05 *	47,9 *	20,84*	89,97 *	160 86 *
	Interaction	0,2 ^{tn}	0,2 ^{tn}	0,59 ^{tn}	1,35 ^{tn}	0 92 ^{tn}

Note: tn = not significant, (*) = significantly different, WAT: Weeks after treatment

Table 1 shows that the goat manure liquid organic fertilizer contains macro nutrients such as magnesium, calcium, potassium, nitrogen, sulfur, phosphorus and also micro nutrients such as copper, zinc, cobalt, barium, and iron even though these micro nutrients are relatively small in amount. . Both of these nutrients are needed by plants so that they can significantly affect growth. This is similar that the balance of nutrients in the soil and their availability for plants is the main factor for supporting optimal plant growth and production [6]. From the observation variable data recapitulation table above, it can be concluded that there is no interaction between POC concentrations and the frequency of giving goat manure liquid organic fertilizer to the observation variables. This is presumably because the two treatments did not work together in affecting the growth of the vanilla plant stem cuttings, or each treatment had a separate effect on all the growth of the vanilla plant stem cuttings.

3.1 The length of the tendrils

Based on the results of the research that has been done, the application of goat manure liquid organic fertilizer has a significant effect on the length of the tendrils of vanilla seedlings at 4 WAT (week after treatment), 8 WAT (week after treatment), and 12 WAT (week after treatment), this is suspected This occurs because the liquid organic fertilizer of goat manure provides the macro and micro nutrients that are needed by the seeds of the vanilla stem cuttings.), that if sufficient macro and micro nutrients are available for plants, then the process of formation and reshuffling in plant cells runs fast in actively growing plants, resulting in the formation of cells and tissues that are also characterized by rapid growth. with increasing plant height [7].

Table 2. The value of the effect of concentration and frequency of application of goat manure liquid organic fertilizer on the average vine length of vanilla stem cuttings

Treatment	The length of the tendrils (cm)		
	4 WAT	8 WAT	12WAT
POC concentration			
50 PPM	28,78 d	51,89 d	73,89 d
100 PPM	34,56 c	57,78 c	79,78 c
150 PPM	39,22 b	63,11 b	85,11 b
200 PPM	43,78 a	66,89 a	88,89 a
BNT α 5%	1,27	1,44	1,56
1 Week	30,5625 a	48,625 a	65,125 a
Once 2 Weeks	27,5625 b	45,0625 b	61,5625 b
Once 3 Weeks	24,1875 c	41,125 c	57,625 c
BNT α 5%	1,10	1,25	2,69

Note: Columns followed by different letters show significantly different results based on the BNT test at a 5%.

Based on the table of variance and observations of the length of the tendrils of the vanilla stem cuttings, it shows that each concentration of liquid organic fertilizer given by goat manure has a different effect on each concentration given to the vanilla stem cuttings. With the highest value in the application of liquid organic fertilizer with a concentration of 200 PPM at each WAT. This is in line with the results of [7] that the administration with the highest concentration gave the best cob weight in corn plants compared to the lowest concentration below it.

Based on the table above, the frequency of giving goat manure liquid organic fertilizer had a different effect on the length of the tendrils of vanilla stem cuttings at 4MSP, 8MSP, and 12WAT. The highest average value was obtained at the frequency of giving once a week with a value of 65.125 and the lowest value was at the frequency of giving once every 3 weeks with a value of 24.1875.

Based on these data, it can be concluded that if the more frequent application of goat manure liquid organic fertilizer once a week, it will speed up the process of increasing the length of the tendrils of the vanilla stem cuttings. This is in line with Ismail's opinion [8], which states that plant height is an indicator of plant growth that is often tested in every cultivation and fertilization research, because plant height can provide a rapid response to each treatment tested.

3.2 Number of Sections

Based on the results of the research that has been done, the concentration and frequency of goat manure liquid organic fertilizer has a significant effect on the number of seedlings of vanilla stem cuttings. This is similar to the statement of [9]), that the application of liquid organic fertilizer (POC) is expected to increase soil fertility and ultimately improve plant growth and yields. In the goat manure liquid organic fertilizer solution there are elements of N, P and K which are important nutrients needed by plants during vegetative growth. This is in accordance with the opinion of [10], that the nutrients N, P, and K function as the center of metabolic processes in plants which in turn will stimulate the division and elongation of plant cells.

Based on the table above, it was found that each concentration of goat manure liquid organic fertilizer given to the stem cuttings of the vanilla plant had an effect on the number of internodes. The highest mean value was obtained at a concentration of 200 PPM at each WAT and the lowest average value was obtained at a concentration of 50 PPM at each WAT. Based on the table of variance results above, it was found that each concentration and frequency of application of goat manure liquid organic fertilizer given to the seeds of vanilla stem cuttings had significant

differences. This also applies to the frequency of liquid organic fertilizer application where the highest value is obtained at a frequency of once a week with a value of 13.88 and the lowest value is at a frequency of once every 3 weeks with a value of 4.56. This is in accordance with the opinion of [11] that the concentration of liquid organic fertilizer has a very significant effect on plant height, number of branches/plants, length, fruit diameter, number of fruits/plant, fruit/plant weight, number of leaves, root length with the influence pattern is positive linear.

Table 3. The value of the effect of the concentration and frequency of application of goat manure liquid organic fertilizer on the average number of nodes of vanilla plant stem cuttings.

Treatment	Jumlah Ruas		
	4WAT	8WAT	12WAT
POC concentration			
50 PPM	5,33 c	10,11 c	15,44 c
100 PPM	6,67 b	11,44 b	16,56 b
150 PPM	7,33 b	12,33 b	17,33 b
200 PPM	9,11 a	14,22 a	19,44 a
BNT α 5%	0,65	0,73	0,63
Application frequency			
1 Weeks	6,06 a	9,88 a	13,88 a
Once 2 Weeks	5,38 ab	9,00 b	12,88 ab
Once 3 Weeks	4,56 c	8,19 c	11,94 b
BNT α 5%	0,56	0,63	0,55

Note: Columns followed by different letters show significantly different results based on the BNT test at α 5%.

3.3 Number of Leaves

From the results of the study, the concentration and frequency of liquid organic fertilizer given by goat manure had a significant effect on the number of leaves on the stem cuttings of the vanilla plant. Leaves are important plant organs, in the leaves the process of photosynthesis occurs which functions as a provider of food and energy for plants to continue to live. In the growth of the number of leaves it really needs nutrients such as nitrogen and phosphorus. The nutrients needed are found in goat manure liquid organic fertilizer. This is in accordance with the opinion of [12], that an element that can stimulate vegetative growth (green color) such as leaves which are very useful in the process of photosynthesis is nitrogen. With the absorption of nitrogen nutrients it will be able to increase the formation and growth of leaves for plants.

Table 4. Effect of concentration level and frequency of goat manure liquid organic fertilizer on the average number of leaves of vanilla cuttings.

Treatment	Number of Leaves (Stems)		
	4WAT	8WAT	12WAT
POC concentration			
50 PPM	5,44 c	7,22 c	9,22 c
100 PPM	6,67 bP	8,67 c	10,78 bc
150 PPM	7,56 b	10,00 b	12,11 b
200 PPM	8,78 a	11,56 a	13,89 a
BNT α 5%	0,57	0,74	0,96
Application frequency			
1 Weeks	6,13 a	8,06 a	9,63 a
Once 2 Weeks	5,31 b	7,00 b	8,56 b
Once 3 Weeks	4,56 c	6,00 c	7,69 c
BNT α 5%	0,50	0,64	0,83

Note: Columns followed by different letters show significantly different results based on the BNT test at α 5%.

Based on the table above, it was found that each concentration of goat manure liquid organic fertilizer given to the vanilla plant stem cuttings had an effect on the number of leaves on the vanilla plant stem cuttings. The highest mean value was obtained at a concentration of 200 PPM at each WAT and the lowest average value was obtained at a concentration of 50 PPM at each WAT. Based on the results of research that has been done, the frequency of application of goat manure liquid organic fertilizer has a significant effect on the growth of the number of leaves on the seedlings of vanilla plant stem cuttings. From the data above it can be concluded that each frequency of liquid organic fertilizer application gives an increase in the number of leaves in each WAT (week after treatment), the highest value for the increase in the number of leaves is obtained at the frequency of application with an interval of 1 week with an average value of 9.63 in 12 MSP, and the lowest mean value is at the frequency of giving 3 weeks once a week with a value of 4.56 at 4 MSP. This is in accordance with the opinion of [13], that the frequency of applying fertilizer with different doses causes the production of different numbers of leaves and the right frequency will accelerate the rate of leaf formation.

3.4 Stem Diameter

Based on the results of research that has been done, the concentration and frequency of goat manure liquid organic fertilizer has a significant effect on the stem diameter of the vanilla cuttings. This is thought to occur because goat manure liquid organic fertilizer contains a nutrient, namely N (nitrogen). One of the nutrients, namely nitrogen, is useful for stimulating the formation of leaves and the growth of plant stems. This is in accordance with the opinion of [14] that the availability of nutrients in sufficient quantities causes the metabolic activity of plants to increase, as well as the accumulation of assimilate in the stem area will increase, resulting in enlargement of the stem. In general, the stem has the function of connecting the roots, leaves and fruit, as well as supporting the plant body so that it remains upright. Based on the table below, we can see that the concentration level of goat manure liquid organic fertilizer has a significant effect on the stem diameter of the vanilla cuttings. The results of the study proved that giving a concentration of 200 PPM of goat manure liquid organic fertilizer produced the best value (1.25) among other liquid organic fertilizer concentrations of goat manure. Based on the results of the analysis of variance table above, it can be concluded that the best frequency of giving goat manure liquid organic fertilizer to the stem diameter of the vanilla cuttings seedling was obtained by giving concentrations at once a week intervals with a value of 0.87 which results were higher than the frequency with an interval of 2 once a week and once every 3 weeks.

Table 5. The value of the effect of the level of concentration and the frequency of application of goat manure liquid organic fertilizer on the average stem diameter of vanilla cuttings

Note:	Treatment	Stem diameter (Cm) 12WAT
	POC Concentration	
	50 PPM	0,87 d
	100 PPM	1,04 c
	150 PPM	1,14 b
	200 PPM	1,25 a
	BNT α 5%	
	Application frequency	
	1 Weeks	0,87 a
	Once 2 Weeks	0,81 b
	Once 3 Weeks	0,74 c
	BNT α 5%	
		0,02

Columns followed by different letters show significantly different results based on the BNT test at α 5%.

3.5 Levels of Greenness of Leaves

The results showed that the concentration and frequency of application of goat manure liquid organic fertilizer to the vanilla cuttings had a significant effect on the greenness of the leaves on the vanilla stem cuttings. The greenness of the leaves describes the level of chlorophyll contained in the leaves, the greener a leaf, the more chlorophyll in it and the higher the rate of photosynthesis [15]. The results showed that the highest leaf greenness was obtained at a concentration of 200 PPM with a value of 39.52%, while the lowest leaf greenness was obtained at a concentration of 500 PPM with a value of 29.90%. From these data it can be concluded that the more concentration of goat manure liquid organic fertilizer that we give, it will have an impact on the high level of greenness of the leaves of the seedlings of vanilla plant stem cuttings, and if the less concentration of liquid organic fertilizer is given, it will have an impact on the low level of green leaves on the seedlings. vanilla plant stem cuttings.

Based on the results of research that has been done, the highest leaf greenness level is obtained at the frequency of giving once a week with a value of 27.68% and the lowest leaf greenness level is obtained at the frequency of giving once every 3 weeks with a value of 24.25%. From the data above, it can be concluded that the faster the time for applying liquid organic fertilizer, in this case the frequency of application once a week, will increase the average level of greenness of the leaves on the vanilla stem cuttings. This is thought to occur because the goat manure liquid organic fertilizer contains a macro nutrient, namely N (nitrogen). Similar to the opinion of [16], that the N content can accelerate the formation of green leaves (chlorophyll) which is useful for the process of photosynthesis so as to spur vegetative growth such as height, number of leaves, leaf area and stem diameter.

Table 6. The value of the effect of the level of concentration and frequency of application of goat manure liquid organic fertilizer on the average level of greenness of the leaves of seedlings of vanilla plant stem cuttings.

Treatment	Leaf Greenness (%) 12WAT
POC Concentration	
50 PPM	29,90 d
100 PPM	32,56 c
150 PPM	36,07 b
200 PPM	39,52 a
BNT α 5%	
Application Frequency	
Once a week	27,68 a
Every 2 weeks	25,73 b
Every 3 weeks	24,25 c
BNT α 5%	
	0,53

Note: Columns followed by different letters show significantly different results based on the BNT test at a 5%.

4 Conclusion

From the results of the research that has been done, several conclusions are drawn as follows:

1. Concentration of 200 ppm in POC goat manure shows the best results on all research observation variables.
2. The frequency of fertilization once a week shows the best application time for all research observation variables.

3. There was no interaction between concentration treatment and also the frequency of application of goat manure liquid organic fertilizer on the growth of vanilla stem cuttings.

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