

Response of Organic Fertilizer of Bamboo and Vegetable Compost on Vegetative Growth of Robusta Coffee (*Coffea Canephora*)

Respon Pupuk Organik Kompos Bambu dan Sayur Terhadap Pertumbuhan Vegetatif Kopi Robusta (*Coffea Canephora*)

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ABSTRACT

*This research program aims to determine the response giving organic fertilizer to the vegetative growth of robusta coffee plants (*Coffea Canephora*). Using a 2 factorial Group Design (RAK), each treatment was given 3 replications. Factor 1 was liquid organic fertilizer for bamboo shoots (P0: control, P1: 200 ml + 1000 ml water, P2: 500 ml + 1000 ml water, and P3: 800 ml + 1000 ml water). Factor 2 is using vegetable compost (K0: control, K1: 10 grams/polybag, K2: 20 grams/polybag), K3: 30 grams/polybag). Parameters observed were plant height, number of leaves, stem diameter, and leaf width. Based on the data on the response variance of the application of liquid organic fertilizer (POC) for bamboo shoots, it was shown that there was no significant effect on the parameters of plant height, number of leaves, stem diameter, and leaf width at the ages of 2, 4, 6, 8, 10, 12 weeks after planting. The results of the response variance data for the application of vegetable compost showed no significant effect on the parameters of plant height, number of leaves, stem diameter, and leaf width at the ages of 2, 4, 6, 8, 10, 12 weeks after planting. And the results of the interaction of the two treatments showed no significant effect on the parameters of plant height, number of leaves, stem diameter, leaf width.*

Keywords: Organic Fertilizer, Robusta Coffee, Growth

INTRODUCTION

Indonesia is known as the largest coffee producing country (*Coffea sp*) in the world and managed to rank fourth after Brazil, Vietnam and Colombia. The coffee plant itself has been cultivated since the 15th century until now coffee has become one of the most widely consumed beverages and has even been considered a modern lifestyle (Putri, et al., 2017). The type of coffee that is widely cultivated is Robusta Coffee (*Coffea canephora*) and Arabica Coffee (*Coffea arabica*). Robusta coffee is a type of coffee that is widely produced in Indonesia, reaching 87.1% of the total coffee production in Indonesia (Hartatied and Kholilullah, 2018). Robusta coffee quality is below Arabica coffee with higher caffeine content, but robusta coffee is resistant to rust

and pests (Rahardjo, 2013). Robusta coffee production which is very high depends on the quality and quantity of the existing planting material (seeds). Therefore, during the nursery process, such as fertilization, it is very necessary to get maximum results in the future.

One way to increase nutrients is the use of fertilizers. Most of the fertilizers used are chemical fertilizers. However, chemical fertilizers that are used continuously can cause changes in soil structure, soil compaction, decreasing nutrient content in the soil, and environmental pollution which results in decreased land productivity. Besides the impact on the soil, the use of chemical fertilizers is also a lot of complaints due to the high selling price in the market compared to organic fertilizers.

Efforts made in agriculture to overcome the use of chemical fertilizers are to increase the use of organic fertilizers. The solid form of organic fertilizer uses market waste or waste from vegetables and fruit which is an excellent material because it can be processed into organic fertilizer because it contains nutrients N, P, K and other organic materials. The use of this waste can improve soil structure and quality. (Hadisuwito, 2007).

The use of fertilizers in the surrounding environment is very important. This is useful in reducing waste from agriculture. However, in the application of fertilizers, especially liquid fertilizers and solid fertilizers, of course there are differences in the effect on the growth of the coffee plants to be planted. Therefore, the author will conduct research on, "The Response of Liquid Organic Fertilizer for Bamboo Shoots and Vegetable Compost to the Vegetative Growth of Robusta Coffee Plants (*Coffea Canephora*).

MATERIALS AND METHODS

This research was conducted in Bange Village, Malintang Hill Subdistrict, Mandailing Natal Regency. The time of conducting the research starts from May to

July 2021. Materials used are bamboo shoots, rice washing water, polybags, rice husks, EM-4, plastic basin, soil, household organic waste, brown sugar. The tools used are: hoe, spayer, measuring cup, stationery, ruler, gembor, field fork, digital caliper, scales.

The method used in this research is the Randomized Block Design Method (RAK). Observation parameters, namely plant height, stem diameter, number of leaves, leaf width, were analyzed using the ANOVA technique at a level of 5%. . Factor 1: organic fertilizer (P) P0: control, P1: POC 200 ml + water 1000 ml, P2: POC 500 ml + water 1000 ml, P3: POC 800 ml + water 1000 ml. Factor 2: Response to fertilizer (K), K0: No fertilizer, K3: Compost 10 gr/polybag, K3: Compost 20 gr/polybag, K4: Compost 30 gr/polybag.

RESULTS AND DISCUSSION

Based on the Variety Print Table 1, the Liquid Organic Fertilizer treatment at the age of 2 weeks, 6 weeks, 8 weeks, 10 weeks, 12 weeks (week after planting) did not show a significant effect on plant height.

Table 1. Average Plant Height in POC Treatment on Several Robusta Coffee Plants At the age of 2, 4, 6, 8, 10 and 12 weeks after planting.

Treatment	Plant height (cm)					
	2 weeks	4 weeks	6 weeks	8 weeks	10 weeks	12 weeks
PO	12.41a	12.71a	13.64a	15.48a	18.05a	18.68a
P1	12.14a	12.24a	13.14a	15.86a	18.50a	19.48a
P2	12.51a	12.37a	13.63a	16.63a	18.75a	19.95a
P3	12.15a	12.16a	14.84a	15.82a	18.84a	19.75a

Note: Numbers followed by the same letter are significant not significantly different from the DMRT test at the level (5%).

Table 2. The average plant height in the treatment of giving compost fertilizer at the age of 2, 4, 6, 8, 10 and 12 weeks after planting.

Treatment	Plant height (cm)					
	2 weeks	4 weeks	6 weeks	8 weeks	10 weeks	12 weeks
K0	12.33a	12.35a	13.77a	15.57a	17.78a	18.68a
K1	12.43a	12.48a	13.96a	15.81a	17.96a	18.73a
K2	12.37a	12.37a	13.83a	16.43a	19.64a	20.42a
K3	12.08a	12.37a	13.69a	15.98a	18.76a	20.05a

Description: Numbers followed by letters the same means that it is not significantly different from the DMRT test at the level (5%).

Based on the Variety Print Table 2, the treatment of vegetable compost at 2, 4, 6, 8, 10 and 12 weeks after planting did not show an insignificant effect on plant height. The results of the Variety Print showed that the POC treatment of Bamboo Shoots and Vegetable Compost Fertilizer at 2, 4, 6, 8, 10 weeks after planting showed a significant

effect on plant height.

Based on Table 3, the results of the variance showed that the Liquid Organic Fertilizer treatment at 2, 4, 6, 8, 10, and 12 weeks after planting did not show a significant effect on the number of leaves. But there is an increase in each age of observation of the number of leaves.

Table 3. Average Number of Leaves in Treatment of Liquid Organic Fertilizer at the age of 2, 4, 6, 8, 10, and 12 weeks after planting.

Treatment	Number of Leaves					
	2 weeks	4 weeks	6 weeks	8 weeks	10 weeks	12 weeks
P0	0	5,17 a	11,08a	13,83a	18,08a	19,42a
P1	0	5,83a	11,83a	15,83a	17,83a	20,67a
P2	0	6,00a	10,83a	16,08a	17,92a	21,08a
P3	0	5,83 a	10,33a	14,50a	18,17a	21,00a

Note: Numbers followed by the same letter are not significantly different with DMRT test at level (5%).

Table 4. Average Number of Leaves in the Treatment of Vegetable Compost Fertilizer at the age of 2, 4, 6, 8, 10, and 12 weeks after planting.

Treatment	Number of Leaves					
	2 weeks	4 weeks	6 weeks	8 weeks	10 weeks	12 weeks

K0	0a	5.50 a	10.67a	14.25a	17.92a	19.53a
K1	0a	5.67a	11.58a	15.00a	17.583a	19.75a
K2	0a	5.67a	10.67a	15.33a	18.67a	22.00a
K3	0a	6.00a	11.17a	15.67a	17.83a	20.83a

Note: Numbers followed by the same letter are not significantly different from the test DMRT at the level (5%).

Based on Table 4 the results of the variance showed that the treatment of vegetable compost at 2, 4, 6, 8, 10, and 12 weeks after planting (weeks after planting) did not show an insignificant effect on the number of leaves. The results of the variance showed that Interaction of POC Bamboo Shoots and Vegetable Compost Fertilizer at

2, 4, 6, 8, 10 and 12 weeks after planting (weeks after planting) showed no significant effect on the number of leaves.

Based on the variance Table 5, that the Liquid Organic Fertilizer treatment at the ages of 2, 4, 6, 8, 10, and 12 weeks after planting (weeks after planting) did not show a significant effect on stem diameter.

Table 5. Average stem diameter in the treatment of liquid organic fertilizer application at age 2, 4, 6, 8, 10, and 12 weeks after planting.

Treatment	Rod Diameter (mm)					
	2 weeks	4 weeks	6 weeks	8 weeks	10 weeks	12 weeks
P0	5,20a	5,73a	6,06a	6,16a	6,16a	6,41a
P1	5,24a	5,54a	5,75a	5,99a	7,50a	7,84a
P2	5,23a	5,62a	5,74a	6,94a	6,17a	6,34a
P3	5,27a	5,66a	5,68a	5,84a	6,01a	9,45a

Description: The figures followed by the same letter means that it is not significantly different from the DMRT test at level (5%).

Table 6. Average Stem Diameter in Treatment of Vegetable Compost Fertilizer at 2, 4, 6, 8, 10, and 12 weeks after planting.

Treatment	Rod Diameter (mm)					
	2 weeks	4 weeks	6 weeks	8 weeks	10 weeks	12 weeks
K0	5,18a	5,59a	5,54a	5,98a	6,07a	7,88a
K1	5,27a	5,48a	5,98a	6,83a	6,07a	7,85a
K2	5,14a	5,50a	5,78a	6,13a	7,62a	7,85a

K3	5,34a	5,98a	5,93a	5,99a	6,02a	6,46a
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Remarks: followed by the same letter means that it is not significantly different from the DMRT test at level (5%).

Based on Table 6, the results of the variance showed that the treatment of vegetable compost at the age of 2, 4, 6, 8, 10, and 12 weeks after planting did not show a significant effect on stem diameter. The results of variance showed that the POC interaction treatment of Bamboo Shoots and Vegetable Compost Fertilizer at 2, 4, 6, 8,

10 and 12 (weeks after planting) showed no significant effect on the number of leaves.

Based on Table 7 variance, the results of variance indicate that the treatment Liquid Organic Fertilizer at 2, 4, 6, 8, 10, and 12 weeks after planting did not show a significant effect on leaf width.

Table 7. The mean leaf width in the treatment of liquid organic fertilizer application at the ages of 2, 4, 6, 8, 10, and 12 weeks after planting.

Treatment	Leaf Width (cm)					
	2 weeks	4 weeks	6 weeks	8 weeks	10 weeks	12 weeks
P0	0a	12,45a	13,28a	13,65a	14,04a	13,87a
P1	0a	12,97a	13,20a	13,36a	13,96a	13,49a
P2	0a	13,05a	13,21a	13,70a	13,68a	14,10a
P3	0a	13,48a	13,78a	13,68a	13,94a	14,04a

Table 8. Average Leaf Width in the Treatment of Vegetable Compost Fertilizer at the age of 2, 4, 6, 8, 10, and 12 weeks after planting.

Treatment	Leaf Width (cm)					
	2 weeks	4 weeks	6 weeks	8 weeks	10 weeks	12 weeks
K0	0a	12,76a	13,11a	13,59a	13,96a	13,96a
K1	0a	12,88a	13,42a	13,53a	13,89a	13,89a
K2	0a	12,94a	13,33a	13,70a	13,93a	14,00a
K3	0a	13,37a	13,62a	13,68a	13,84a	14,23a

Description: Numbers followed by the same letter are not different significantly with DMRT test at level (5%).

Based on Table 8, the results of the variance test showed that the treatment of

vegetable compost at the age of 2, 4, 6, 8, 10, and 12 weeks after planting did not show

a significant effect on leaf width.

Based on the results of variance showed that the effect of liquid organic fertilizer (POC) on bamboo shoots did not show a significant effect on the parameters of plant height, number of leaves, stem diameter, and leaf width. However, each plant parameter was able to show differences in growth every week.

The influencing factors are caused by several factors. Environmental factors such as humidity, temperature, intensity of sunlight and rainfall, as well as the efficiency of POC absorption by coffee seeds are less than optimal. At the time of the study, the intensity of rainfall was very high, this was due to the uneven application of fertilizers because it was suspected that the fertilizers applied were washed away by rainwater so that the fertilizers applied had not been absorbed by plants, resulting in nutrient leaching. This results in the application of fertilizer not being real.

It is also suspected that the presence of growth inhibiting factors is caused by genetic factors which include the cause of diversity in plant appearance or plant growth is not the same. This is in accordance with Lakitan (2004), which states that the occurrence of variations in one plant can be caused by environmental influences and hereditary or genetic factors. Differences in environmental conditions allow the emergence of variations where these variations can determine the final appearance of a plant.

The response of giving Vegetable Compost Fertilizer to the vegetative growth of Robusta Coffee (*Coffea Canephora*) garden

There is no effect of vegetable compost on some changes during the observation caused by several possibilities. The high rainfall that occurred at the time of the study resulted in damaged plants. The research was conducted using paranet so that it is protected from direct sunlight, and suppresses the amount and speed of rainwater that falls directly which can cause damage to coffee plant seeds.

Response of Liquid Organic Fertilizer to the Vegetative Growth of Robusta Coffee Garden (*Coffea Canephora*)

Based on the results of variance, it showed that the effect of Liquid Organic Fertilizer (POC) on Bamboo Shoots did not show a significant effect on the parameters of plant height, number of leaves, stem diameter, and leaf width. The influencing factors are caused by several factors, namely environmental factors such as humidity, temperature, intensity of sunlight and rainfall, and the efficiency of POC absorption by coffee seeds is not optimal. At the time of the study, the intensity of the rainfall was very high, this was due to the uneven application of fertilizers because it was suspected that the fertilizers applied were washed away by rainwater so that the fertilizers applied had not been absorbed by plants, resulting in nutrient leaching. This results in the application of fertilizer not being real.

In saturated conditions, the entire pore space of the soil is filled with water that moves relatively quickly, so it can wash the nutrients it passes through (Hanafiah, 2005). If this condition continues, it will have a negative impact on soil aeration, so that root respiration with aerobic microbial activity such as ammonification and nitrification bacteria will be disrupted.

Interaction Response of Liquid Organic Fertilizer and Compost Fertilizer on Robusta Coffee (*Coffea Canephora*)

Leaves growth, stem diameter, and leaf width show no significant effect on treatment. This is caused by environmental factors, namely erratic rainfall where at the beginning of the study it often rained so that the research area became very humid and the availability of water in the soil was quite high. Environmental conditions that are not suitable during growth will inhibit the vegetative growth process. From the results of the study, the interaction between the two treatments showed insignificant results in the observation parameters of plant height, number of leaves, plant diameter, and leaf width, it is suspected that the availability of nutrients for plants in the provision of

vegetable waste compost and POC takes a long time in the formation of nutrient solution ions that can be absorbed by plant roots. Application of solid organic fertilizer and liquid organic fertilizer

CONCLUSIONS

Based on the results of the variance on observations, the response to the application of Liquid Organic Fertilizer (POC) for Bamboo Shoots showed no significant effect on the measurement of plant height parameters, number of leaves, stem diameter, and leaf width. The results of the various treatments of Vegetable Compost Fertilizer showed no significant effect on the parameters of plant height, number of leaves, stem diameter and leaf width. The interaction of the two POC treatment factors for Bamboo Shoots and Vegetable Compost Fertilizer showed no significant effect on the vegetative growth of Robusta Coffee (*Coffea Canephora*). In the use of liquid organic fertilizer, bamboo shoots showed the highest value for each parameter. The highest value for the plant height parameter is P2, which is 19.95 cm. The highest value in the number of leaves parameter is P2, which is 21.08. The highest treatment on the stem diameter parameter is P3

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