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Applying coffee processing waste as an organic material against growth and yield of caisim plant (*Brassica chinensis var. parachinensis*)

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Original Article

Applying coffee processing waste as an organic material against growth and yield of caisim plant (*Brassica chinensis var. parachinensis*)

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Abstract
The research aimed to examine the quality of coffee waste in the form of solid and liquid material in promoting the growth and yield of caisim plants (*Brassica chinensis var. parachinensis*). This research was conducted from November until December 2023 in Sukabumi roadway, RT. 002 RW. 001 Ciwedus Village, Cilegon District, Cilegon city, Banten. The experimental design used in this study was a Randomized Block Design (RBD) consisting of one factor, which is the with 8 treatment levels: without fertilizer application (control) (P0), 10 g of solid coffee processing waste compost (P1), 20 g of solid coffee processing waste compost (P2), 30 g of solid coffee processing waste compost (P3), 100 ml liquid coffee processing waste compost (P4), 150 ml liquid coffee processing waste compost (P5), 200 ml liquid coffee processing waste compost (P6), and 250 ml liquid coffee processing waste compost (P7). The results showed that treatment P5, gave the best results in terms of growth in plant height (26.30 cm), number of leaves (9.00 leaves), plant fresh weight (43.23 g), root wet weight (4.03 g) and root length (17.80 cm). For solid coffee ground treatment, the P3 treatment has a significant effect on plant height (25.30 cm), number of leaves (7.00 leaves), plant wet weight (22.60 g) and root length (17.03 cm). The findings of this research theoretically support the theory proposed by Putri et al. in 2017, indicating that the application of 30g/150ml had the most favorable impact on the growth of lettuce plants (*Lactuca sativa* L.).
Keywords: Caisim, Coffee Processing Compost, Compost Dosage Types

1. Introduction

Coffee is one of the drinks that has been widely known in Indonesia. Since its seeds were first discovered in the highlands of Ethiopia, coffee has developed a fascinating story on its way from a small garden to becoming a bridge connecting people around the world. At this time, coffee beans became a trade commodity that was in demand by various countries in the world. According to information provided by the United States Department of Agriculture (USDA), global coffee production reached 170 million bags, weighing 60 kg per bag during 2022/2023. This figure shows an increase of around 2.8% compared to the previous period (year-on-year), where coffee production reached 165.37 million bags in 2021/2022. In the 2022/2023 period, Indonesia ranked third as the world's largest coffee producer, with a total production of 11.85 million bags. Data from the International Coffee Organization (ICO) says that Indonesia is ranked the eighth largest country in the world in terms of coffee consumption. The culture of drinking coffee is very attached to the social life of Indonesian people. Indonesian people usually enjoy hot and cold coffee by processing coffee plant beans through a roasting process (Zarwinda & Dewi, 2018).

Coffee processing waste significantly impacts the environment with various threats to sustainability. The coffee production process, from planting and harvesting to processing coffee beans, produces massive waste. This is in line with the statement of Rochmah et al. (2021) that both small-scale and industrial-scale coffee processing plants have by-products known as coffee waste. 45% of the processed coffee beans accounted as waste, which comes from the husk and the coffee parchment. According to Juwita et al. (2017), coffee processing produces very high

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amounts of solid and liquid waste. Khusna & Susanto (2015) suggest that 720 tons of coffee production has around 324 tons of coffee processing waste.

The amount of coffee waste misused in Indonesia is almost at the threshold point. According to the results of Tarmiji's analysis (2020), the potential capacity of the waste of robusta coffee husk reaches a monumental number, reaching 1.425,923 tons annually, while the arabica type produces 533,225 tons annually from 2021 to 2025. Furthermore, waste that needs to be appropriately managed will hurt the environment. The heaviest ecological consequences of unutilized coffee waste are organic pollution, and the most severe impacts are experienced by aquatic ecosystems where coffee waste is accumulated. This phenomenon is caused by the nature of the organic substance of coffee waste, which is difficult to dissolve in water, thus creating anaerobic conditions that inhibit oxygen circulation (Juwita et al., 2017). According to Sumadewi et al. (2020), residues from the coffee-making process carry a variety of harmful compounds, such as alkaloids, tannins, and polyphenolics, which makes the decomposition of organic materials more complex in terms of biological systems.

Considering the potential use of excess coffee waste, it is urgently required to manage it properly by turning it into organic compost. Using coffee waste as organic compost is an option with many benefits. In addition to its advantage of being fairly friendly to the environment, organic compost from coffee waste has many nutrients that plants need to grow and develop. Research by Siahaan & Suntari (2019) states that coffee waste contains C-organic components of 4.31%, total nitrogen (N-total) of 0.34%, potassium (K) as a whole reach 2.66%, and sodium (Na-total) of 0.04%. There is also a phosphorus (P) content of 0.079% and a carbon-to-nitrogen ratio (C/N ratio) of 13.9. The decomposition of organic matter from coffee processing will turn it into a variety of organic compounds, potentially increasing the Cation Exchange Capacity (CEC) in the soil. As stated by Siahaan & Suntari (2019), giving coffee processing compost into the soil significantly improves various aspects. This includes increased soil acidity, C-organic content, total amount of nitrogen (N), levels of phosphorus (P) available, growth in exchangeable potassium (K-dd) and exchangeable sodium (Na-dd) concentrations, and increased cation exchange capacity (CEC) values in soils.

Caisim or also known as mustard greens (*Brassica juncea* L.) is one type of plant that can be used as an indicator of plant growth. Another reason for using caisim as an indicator of plant growth is because it is sensitive to changes in nutrients, water, light, and other environmental factors. These plants can exhibit easily observable symptoms, such as leaf discoloration, decreased growth, or leaf shape changes when there is a nutrient imbalance or environmental change. Visual observations are the first stage in identifying nutritional problems in plants. Therefore, caisim is helpful to assess whether the organic compost of coffee processing waste to be tested is sufficient for plant nutritional needs. Lestari (2019) emphasized that plants generally show signs when experiencing a lack or excess of nutrients, which is a plant response to disturbances in physiological processes. Symptoms that often appear are changes in the shape and color of abnormal leaves, slowed growth, and other morphological changes. Based on research conducted by Putri *et al.* (2017) coffee waste in the form of solid and liquid coffee processing affects plant height, number of leaves, wet weight of plants, dry weight of plants, dry mass of roots, wet weight of roots, and length of roots of caisim plants.

Based on the description above, the research problem can be formulated as follows: Does the application of coffee processing waste significantly influence the growth and yield of bok choy plants (*Brassica chinensis var. parachinensis*)?

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2. Method

Research Design

This study was designed using a non-factorial Randomized Block Design (RBD), namely coffee processing (P) compost with two different types of compost, including solid and liquid coffee processing compost. The factor experimented with was coffee processing compost (P), which consisted of 8 levels and two types of coffee processing compost, namely:

P0 = No composting of coffee processing
P1 = Provision of 10 g solid coffee processing waste compost
P2 = Provision of 20 g of solid coffee processing waste compost
P3 = Provision of 30 g of solid coffee processing waste compost
P4 = Provision of 100 ml of liquid coffee processing waste compost
P5 = Provision of 150 ml of liquid coffee processing waste compost
P6 = Provision of 200 ml of liquid coffee processing waste compost
P7 = Provision of 250 ml of liquid coffee processing waste compost

From these factors, there are eight combinations of treatments; each treatment has three repetitions, so there are 24 experimental units and two plant reserves for each factor. The concentration of liquid coffee waste used is one level of 15 ml extracted in 1 liter of water by the Standard Operating Procedure (SOP) diluted to create liquid waste from PT. Sahabat Alam Nusantara (SAN). An analysis of variance was conducted with a significance level of 5%. A post hoc test using the DMRT at a 5% significance level will be carried out if there is a significant effect, ranging from substantial to highly significant.

Data Analysis

This research design used Randomized Block Design (RBD). The linear model of the experimental design used in this study is under the provisions written in the journal Adinugraha, et al. (2017).

$$Y_{ij} = \mu + \tau_i + \beta_j + \varepsilon_{ij}$$

Information:

I	=	1.2, ... , t and j = 1. 2, ... , r
Y_{ij}	=	Observation value in i-th treatment, j-th repeat
μ	=	General mean value or general middle value
τ_i	=	Effect of i-th treatment
β_j	=	Influence of the j-th group
ε_{ij}	=	Random effect on the treatment of the i-th j-repetition

Plant parameter measurements were analyzed using *Software Statistical Product and Service Solutions* (SPSS). Using *one way* ANOVA (*Analysis of Variance*) test at a significant level of 5% (α=0.05) and continued with *Duncan's Multiple Range Test* (DMRT) to see significant results from each treatment.

3. Results and Discussion

This study focuses on the test results of the effectiveness or absence of giving two types of coffee processing waste, namely, solid and liquid organic matter, with different doses. Coffee processing waste that has been tested for content is then tested on caisim plants as a growth indicator to see the difference between caisim plants given coffee processing waste and those that are not given coffee processing waste and see whether or not there is a significant difference from the use of coffee processing waste as solid or liquid organic matter.

The observation variables in this study are divided into growth components and yield components, where the growth components consist of Plant Height (cm) and Number of Leaves

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(strands). While the yield components include plant wet weight (g), root wet weight (g), and root length (cm). The results of the recapitulation of ANOVA carried out on all observation variables are shown in Table 1 as follows:

Table 1
Recapitulation of the Results of ANOVA of Growth and Yield of Caisim Plants (Brassica chinensis var. parachinensis) with the Application of Coffee Processing Waste as Organic Material

No	Observation Variables	WAP	Treatment of different types of fertilizers with different doses	KK (%)
		A. Growth Components		
1.	Plant Height (cm)	1	Mr	16,40
		2	Mr	14,81
		3	**	5,55
		4	**	4,28
2.	Number of leaves (strands)	1	Mr	16,97
		2	**	11.58
		3	*	14,00
		4	**	12,35
		B. Result Components		
3.	Plant Wet Weight (g)		**	17,68
4.	Root Wet Weight (g)		**	22,99
5.	Root Length(cm)		**	15,77

Information: * : Real Different
** : Very significant difference
Mr : Different Unreal
WAP : Week After Planting
KK : Coefficient of Diversity

Growth Components
Plant Height

Plant height is one of the growth components whose data is needed to see the effect of the treatment of coffee processing waste as solid and liquid organic matter on caisim plants. Plant height was observed at plant ages of 1 WAP, 2 WAP, 3 WAP, and 4 WAP. Observation data and test of plant height (cm) caisim (*Brassica chinensis var. parachinensis*) on the provision of coffee processing waste as solid and liquid organic matter at the age of 1. 2, 3, and 4 weeks after planting.

The average yield of plant height (cm) of caisim plant (*Brassica chinensis var. parachinensis*) against coffee processing waste as solid and liquid organic matter can be seen in Table 2. The results ANOVA showed that the provision of coffee processing waste as organic matter significantly affected the height growth of caisim plants (*Brassica chinensis var. parachinensis*) at the age of 3 WAP and 4 WAP.

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Table 2
Average Height of Caisim Plant (*Brassica chinensis var. parachinensis*) with Application of Coffee Processing Waste as Organic Material

Treatment	Plant Height (cm)			
	1 WAP	2 WAP	3 WAP	4 WAP
P0	5.50	8.66	10.73 c	15.60 e
P1	5.16	7.83	10.70 c	18.30 d
P2	5.33	8.83	11.20 bc	23.00 c
P3	5.83	8.33	11.96 b	25.30 ab
P4	5.50	9.33	10.43 c	23.70 bc
P5	6.66	10.16	14.00 a	26.30 a
P6	5.33	7.83	11.40 bc	19.40 d
P7	4.83	7.83	10.46 c	24.13 bc

Description: Numbers followed by the same letter in the same row or column show no real difference at the 5% level based on the DMRT test.

In Table 2, it can be explained that the treatment of coffee processing waste as solid and liquid organic matter has a very significant difference on caisim plants aged 3 and 4 WAP. In contrast, at the age of 1 and 2, WAP P0 has no significant difference from other treatments. Observation of claim plants at the age of 3 WAP, plant height with the highest average value was in P5 treatment, which is 14.00 cm, while the lowest value of the average height of claim plants was found in P4 treatment, which is 10.43 cm. In observing plant height at the age of 4 WAP, the best yield was found in the P5 treatment, with an average value of 26.30 cm, with the lowest average value found in the P0 treatment, which is 15.60 cm.

There are indications of no real difference in the treatment of P1. P2, P4, P6, and P7 with P0 treatment of caisim plant growth at the age of 3 WAP. This is thought to be because the coffee processing waste as solid and liquid organic matter has not worked optimally to meet the nutrient needs of caisim plants for growth and development. In line with the results of the research of Gubali et al. (2015), organic fertilizer made from organic material has a "slow release" nature, so the effect of giving it takes a long time in contrast to the treatment of P5 whose high growth of caisim plants is very different. This is because the dose of 150 ml per caisim plant is ideal, and the provision of coffee processing waste as liquid organic matter can facilitate the absorption of nutrients contained in liquid coffee processing waste by caisim plants. According to Pardosi et al. (2014), Liquid compost has the advantage that the nutrients contained are more easily absorbed by plant roots so that liquid organic matter can work optimally. Although different P3 treatments are significant for the growth of caisim plants aged 3 WAP, dosing 30 g of solid coffee processing waste is indicated to be the ideal dose to increase the height growth of caisim plants.

P5 and P3 treatments at the age of 4 WAP showed that plant height growth results were significantly different from the P0 treatment, but the P5 treatment was not significantly different from the P3 treatment. Different types of coffee processing waste, such as liquid and solid organic matter at certain doses, are similar and can provide nutrients to caisim plants optimally to increase the height growth of caisim plants. It was found that the provision of coffee processing waste as organic matter was not fixed on the type of organic matter given but referred to the accuracy of the dose of coffee processing waste per plant. According to the statements of Husnain et al. (2016), to maximize the quality of production of cultivated plants, aspects that need to be considered in the application of balanced fertilizers refer to the five right

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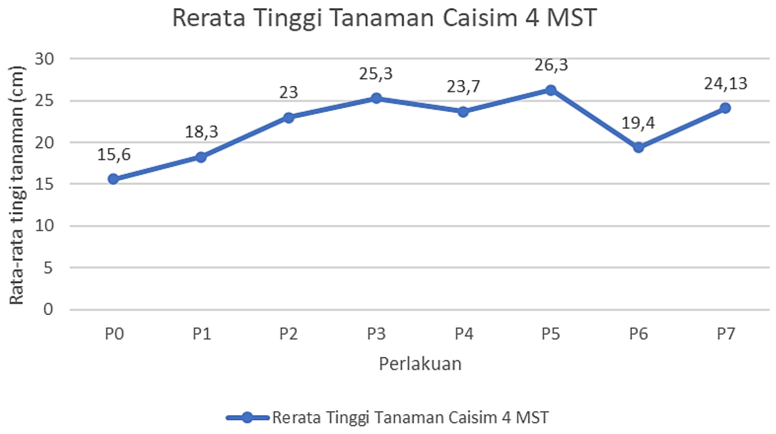
fertilization rules, including the right type of fertilizer, the right dose, right place, on time, and the right way.

The difference in dosing coffee processing waste as organic matter by Table 2 found noticeable differences in each treatment dose given to caisim plants. According to Daulay (2022), the more doses of coffee processing waste treatment given, the higher the height of cultivated plants. In Table 2, it is found that the provision of coffee processing waste as organic matter does not only refer to the amount of coffee processing waste given but must look at the aspect of the accuracy of the dose given to casino plants. It was found in Table 2 that the P5 treatment was the best treatment with a dose of 150 ml per plant and experienced a decrease in plant height at the age of 4 WAP in the treatment with more doses, namely P6 by 200 ml and P7 by 250 ml. This is because the accuracy of the dose of solid and liquid coffee processing waste must be considered to increase the growth of caisim plants.

Figure 1

Best Coffee Processing Waste Dosing Graph Planting Age 4 WAP



The supporting factor for P5 treatment dose of 150 ml liquid coffee processing waste and P3 treatment dose of 30 g solid coffee processing waste is the best treatment for high growth of caisim plants because the process of processing coffee processing waste as organic matter is done well. So, it was found that the content of coffee processing waste was good, including nitrogen 2.91%, phosphorus 2.97%, and potassium 2.18%, and had an acidity of 8.02%. This content is necessary for the growth and development of caisim plants; as explained by Pande (2019), the use of coffee-processing compost can increase the production of caisim plants, and there is an increase in the growth and development of cultivated plants.

Number of leaves

The yield of high growth of caisim plants is closely related to the number of leaves of caisim plants that grow. If the number of leaves does not develop properly, it will affect the high yield of caisim plants. As explained by Yulianto (2018), the number of leaves on plants affects plant height growth; the more leaves, the greater the photosynthesis produced, and the results of photosynthesis are very useful for plant height growth. Photosynthesis in leaves requires plants' nitrogen (N), obtained from soil and coffee processing waste as organic matter. Element N helps form chlorophyll in leaves. The process of photosynthesis requires chlorophyll to convert sunlight into energy. Coffee waste meets the needs of Nitrogen (N) elements in caisim plants, containing 2.91% of N elements in the coffee processing waste used. This figure meets the quality standards of organic fertilizer, so the average yield of the number of leaves of claim plants (*Brassica chinensis var. parachinensis*) with the application of coffee processing waste as organic matter is very significant can be seen in Table 3.

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Table 3
Average Number of Leaves of Caisim Plant (Brassica chinensis var. parachinensis) with Application of Coffee Processing Waste as Organic Material

Treatment	Number of Leaves (strands)			
	1 WAP	2 WAP	3 WAP	4 WAP
P0	5.00	3.33 b	4.66 bc	5.00 c
P1	5.66	4.33 b	4.33 c	6.33 bc
P2	5.00	4.33 b	4.66 bc	6.00 bc
P3	4.66	5.44 a	5.66 ab	7.00 b
P4	5.00	4.33 b	4.33 c	6.66 b
P5	4.66	5.66 a	6.00 a	9,00 a
P6	4.66	4.00 b	4.33 c	5,66 bc
P7	4.33	4.00 b	3.66 c	6,00 bc

Description: Numbers followed by the same letter in the same row or column show no real difference at the 5% level based on the DMRT test.

The number of leaves of caisim plants at the age of 1 WAP, the P0 treatment is not significantly different from other treatments. The results of ANOVA on the number of leaves of caisim plants showed a significant difference at 2 WAP and 4 WAP, but at 3 WAP the data showed a real difference. At the age of 2 WAP, the best treatment was found in the P5 treatment, with an average value of 5.66 strands, and the P5 treatment was not significantly different from the P3 treatment, with an average value of 5.44 strands. Despite other solid and liquid organic matter types, both treatments have the correct dose. Sebayang (2020) explained that excessive coffee processing will make it more difficult for plants to grow and develop because excess nitrogen will make it difficult for plants to absorb nutrients caused by the relatively narrow root system. So, this can be seen in the treatment of P6 and P7 at planting ages of 3 WAP and 4 WAP, which decreased the average number of leaves of casino plants. It is indicated that the treatment of P6 and P7 exceeds the capacity of nitrogen that can be absorbed by caisim plants.

In observing the number of leaves aged 4 WAP, the P5 treatment was significantly different from other treatments. This happens because the P5 treatment can provide enough nitrogen elements so that the chlorophyll content in the leaves is higher and produces more leaves than other treatments. It can be seen that the results of ANOVA on the number of leaves of caisim plants aged 4 WAP in P0 treatment are not real from P1, P2, P6, and P7 treatments. There is a major factor why the dose does not provide significant leaf growth, the nutrients absorbed by plants are very minimal because the dose is not able to produce the nutrients needed by caisim plants. In line with Sebayang's statement (2020), if coffee processing waste is given the correct dose, it will significantly affect leaf growth. Firmansyah et al. (2017) added that plants will be hampered by growth and development if the nutrients of nitrogen, phosphorus, and potassium plants are balanced and their availability is shorter.

Result Components

The yield component data includes Plant Wet Weight (g), Root Wet Weight (g), and Root Length (cm), which is used as a reference parameter for giving coffee processing waste with the best dose that offers the best results from caisim plants (*Brassica chinensis var. parachinensis*). The average yield of caisim plant yield components against coffee processing waste as solid and liquid organic matter can be seen in Table 4.

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Table 4
Average Yield Component of Caisim Plant (Brassica chinensis var. parachinensis) with Application of Coffee Processing Waste as Organic Material

Treatment	Result Component Parameters		
	Plant Wet Weight (g)	Root Wet Weight (g)	Root Length(cm)
P0	12.80 d	2.36 c	9.86 c
P1	19.26 bcd	3.60 ab	12.53 c
P2	22.03 bc	1.96 c	13.83 bc
P3	22.60 bc	2.63 bc	17.03 ab
P4	26.73 b	1.86 c	11.96 c
P5	43.23 a	4.03 a	17.80 a
P6	18.36 cd	2.00 c	11.80 c
P7	20.26 bcd	1.76 c	12.00 c

Description: Numbers followed by the same letter in the same row or column show no real difference at the 5% level based on the DMRT test.

Plant wet weights

Plant wet weight data is needed to see whether the treatment of coffee processing waste as organic matter can significantly increase the fertility of caisim plants. According to Asikin et al. (2013), The more fertile the caisim plants, the more the wet weight of the caisim plants produced will increase. As seen in Table 4, the addition of the dose of coffee processing waste as solid and liquid organic matter can produce claim plants with different significant weights. The average wet weight of caisim plants, treatment without giving coffee processing waste as organic matter (P0) found the wet weight of caisim plants 12.80 g, followed by the treatment of 10 g of solid coffee processing waste/plants (P1) with different results not real with P0 treatment of 19.26 g, treatment of 20 g solid coffee processing waste/plants (P2) found results of 22.03 g, giving 30 g of solid/plant coffee processing waste (P3) is the best provision of solid coffee processing waste with an average plant wet weight of 22.60 g.

The increase in the average wet weight yield of caisim plants reached the peak point in the P5 treatment, which decreased the average wet weight yield of caisim plants in the P6 and P7 treatments due to the inaccuracy of the coffee processing waste given. The highest average wet weight of caisim plants was found in the P5 treatment dose of 150 ml / liquid coffee processing waste plant with a yield of 43.23 g, this result was very different from other treatments. The administration of liquid coffee processing waste at a dose of 100 ml/plant (P4) found a result of 26.73 g, followed by P6 treatment with a dose of 200 ml/plant of 18.36 g, and the administration of 250 ml/plant in the P7 treatment found the wet weight of caisim plants of 20.26 g.

The results above show that giving coffee processing waste as liquid organic matter at a dose of 150 ml/plant (P5) is the best treatment. This dose already covers the needs of caisim plants' nitrogen elements so that caisim plants can thrive. According to the results of the research of Asikin et al. (2013), Proper nitrogen provision affects plant cells' growth and development; nitrogen is needed to increase the development of plant cells, which results in the number of cells growing. Thus, the size of the plant is getting bigger, affecting the plants' wet weight.

Root wet weight

Root wet weight is obtained by calculating the weight of roots after harvest by weighing roots fresh or wet using digital scales in grams. Good root weight growth affects the capacity of the roots to absorb water and nutrients so that the growth of caisim plants increases along

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with the fulfillment of water and nutrient needs. So, the results of caisim plants, such as the fresh weight of the plant, the number of leaves, and plant height, are closely related to the wet weight of the roots of the caisim plant. Akhlaq *et al.* (2017) states that the fresh weight of roots indicates the extent to which plants produce roots to absorb water and nutrients from the soil. As the number of roots in plants increases, the absorption of plants in obtaining water and nutrients from the growing medium will increase significantly.

Based on Table 4 of the average wet weight of the roots of caisim plants (*Brassica chinensis var. parachinensis*), the P5 treatment differs markedly from other treatments. The P5 treatment received the highest average value of 4.03 g, while the lowest average root wet weight result in the P7 treatment was 1.76 g. The treatment of P2, P3, P4, P6, and P7 was not significantly different from that of the P0 control. This is because the maro and micro nutrients contained in the soil with the addition of coffee processing waste as solid and liquid organic matter with various doses have no real different effect on the fresh bobor roots. The accuracy of the dose of solid and liquid coffee processing waste significantly affects several aspects of caisim plant growth, especially the growth of the roots of the caisim plant itself. It was found that giving 150 ml/plant (P5) is the correct dose to grow and develop the roots of the caisim plant.

Root Length

The length of the roots is an essential factor in seeing the extent to which plants reach water sources in the growing media. Root length is one of the observation variables to evaluate whether plants can respond to the treatment of coffee processing waste given. According to Ai et al. (2013) The ability of roots to absorb water optimally through full utilization of the root system is one of the main approaches in exploring the adaptability of plants to water shortage conditions. It can be seen in Table 4 of P5 treatment giving 150 ml/plant of coffee processing waste as liquid organic matter shows very different results from all treatments except P3 treatment giving 30 g of coffee processing waste as solid organic matter. The test results that gave the best average root length value were the P5 treatment of 17.80 cm, in contrast to the P3 treatment with an average root length of 17.03 cm. The treatment with the lowest average value is the P0 treatment of 9.86 cm.

The P0 treatment differs insignificantly from the P1. P2, P4, P6, and P7 treatments. The lowest average result was in the P0 treatment; other treatments showed that with root length above the average control number P0, it was able to grow caisim plants larger than the treatment without giving coffee processing waste as organic matter. In this case, Asikin et al. (2013) explained that the role of plant roots is vital because the roots function as nutrient absorbers and divert these elements from the roots to the stem, leaves, or fruits. The longer and more hair roots, the ability of plants to absorb elements or convert elements into forms that plants can use will increase.

4. Conclusion

Based on the results of research and discussion that have been described, it can be concluded that the P5 treatment of giving 150 ml of liquid coffee processing compost gives the best results on plant height growth, number of leaves, wet weight of plants, wet weight of roots, and root length. P3 treatment of 30 g of coffee processing compost is the best solid coffee processing waste and affects plant height, number of leaves, plant wet weight, and root length. Therefore, P5 treatment can be recommended as the best dose of liquid coffee processing compost, and P3 treatment can be recommended as the best dose of solid coffee processing compost for the growth and yield of caisim plants (*Brassica chinensis var parachinensis*). The findings of this research theoretically support the theory proposed by Putri et al. in 2017, indicating that

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the application of 30g/150 ml had the most favorable impact on the growth of lettuce plants (*Lactuca sativa* L.).

Based on the conclusion above, the suggestion for the development of this research is to conduct further investigation into the appropriate concentration to maximize the yield of Chinese flowering cabbage (caisim) and the use of the best growing medium. It is hoped that this research can provide essential macro and micro-nutrients that are lacking in coffee waste. By doing so, agricultural practitioners can optimize the cultivation of Chinese flowering cabbage through precise dosage, appropriate concentration, and the best growing medium for Chinese flowering cabbage (*Brassica chinensis var. parachinensis*).

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