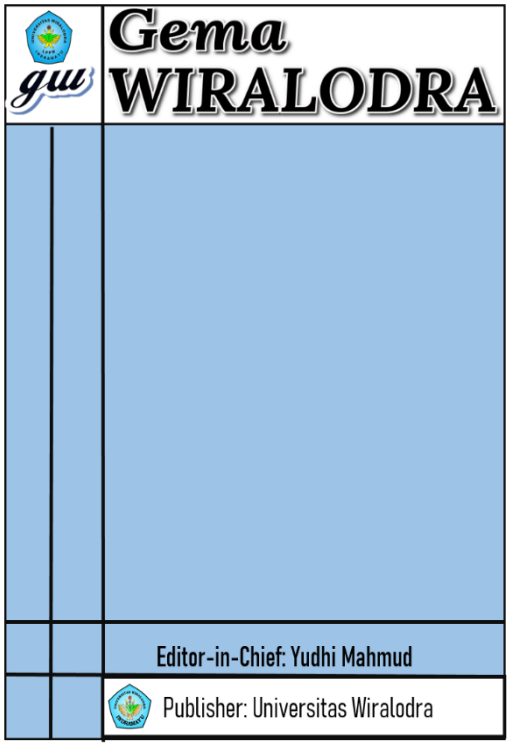
Gema Wiralodra

Publication details, including instructions for authors and subscription information:
https://gemawiralodra.unwir.ac.id



The effect of coffee grounds compost and planting media on the growth and yield of kailan plants (*Brassica oleracea* L.)

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To cite this article:
Hutomo, A.P, Ritawati, S., Roidelindho, K & Utama, P. (2024). The effect of coffee grounds compost and planting media on the growth and yield of kailan plants (Brassica oleracea L.). *Gema Wiralodra*, *15*(1), 167-180.
To link to this article:
https://gemawiralodra.unwir.ac.id/index.php/gemawiralodra/issue/view/24
Published by:
Universitas Wiralodra
Jln. Ir. H. Juanda Km 3 Indramayu, West Java, Indonesia

Gema Wiralodra, 15(1), 167-180
https://gemawiralodra.unwir.ac.id/index.php/gemawiralodra
p –ISSN: **1693 - 7945**
e –ISSN: **2622 - 1969**

Original Article

The effect of coffee grounds compost and planting media on the growth and yield of kailan plants (*Brassica oleracea* L.)

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Abstract
The research aimed to determine the effect of composting from coffee waste and planting media composition on the growth and yield of the kailan plant (*Brassica oleracea* L.). This research was conducted from June until September 2023 in Pagenjahan Village, Kronjo District, Tangerang Banten. The method used a Randomized Completely Block Design (RCBD) as factorial with two factors and analyzed using SPSS. The first factor was the Compost from Coffee Waste (K) which consisted of four levels namely; 0 g Coffee Waste (K1), 10 g Coffee Waste (K2), 20 g Coffee Waste (K3), and 30 g Coffee Waste (K3). The second factor was the Planting Media Composition (M) which consisted of three levels namely; Topsoil Planting Media (M1), Topsoil Planting Media + Rice Husk Charcoal 1:1 (M2), Topsoil Planting Media + Cocopeat 1:1 (M3). The results showed that compost from coffee waste with 20 g dose (K2) had the best effect on the number of leaves at 14 DAP (Days After Planting), leaf area, total fresh weight, fresh weight consumption, and dry weight parameters. Planting media composition with Topsoil Planting Media + Cocopeat 1:1 (M3) had the best effect on the leaf area parameter. There was an interaction between compost from coffee waste and planting media composition on plant height at 14 DAP and 28 DAP. Nasution (2014), coffee waste influences the growth and yield of long bean plants (*Vigna sinensis* L.) and the best concentration is 20 grams.
Keywords: Compost, kailan plant, planting media

1. Introduction

The demand for horticultural commodities, especially vegetables, continues to increase along with the increasing welfare and population, so horticultural production continues to increase. Based on data from the Badan Pusat Statistik (2020) that the productivity of kailan plants in Indonesia in 2017 was around 146.31 tons, then increased in 2018 to 148.411 tons and 2019 by 174.339 tons. Kailan (*Brassica oleraceae* L.) is a horticultural plant from the cabbage family (*Brassicaceae*) originating from China and entering Indonesia around the 17th century. Kailan has a fairly high nutritional content, namely in every 100 grams of raw materials, kailan contains 3500 IU of vitamin A, 0.11 mg of vitamin B1, 90 grams of water, 3.6 grams of fat, 1.6 mg of niacin, 78.0 mg of calcium, 1.0 mg of iron, 38.0 mg of magnesium and 74.0 mg of phosphorus (Oktaviani & Sholihah, 2018).

Kailan plants are vegetables that have thick, flat, shiny leaves, and have a slightly bluish-green color with alternating locations. The production of kailan crops itself is highly dependent on the use of fertilizers and pesticides. Unwise use of pesticides can cause negative effects, if used excessively and continuously can leave residues. These pesticide residues can pollute environmental biodiversity both in soil, water, plants and even human health (Mahmood, et al., 2016). One of the efforts to be able to increase the production of kailan crops and minimize the use of pesticides is by utilizing organic fertilizers derived from coffee. According to data from the International Coffee Organization (2019), coffee consumption in Indonesia reached 5 million bags measuring 60 kilograms in the 2020/2021 period. The frequent consumption of coffee has an impact on coffee waste that are discarded and not used. It is estimated that the

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e –ISSN: **2622 - 1969**

annual production of coffee waste worldwide is around 6 million tons (Santosa, 2018). One of the efforts made to utilize coffee waste so that they are not wasted is by utilizing the pulp as organic plant fertilizer. Organic fertilizers can be an alternative to the excessive use of inorganic fertilizers or chemical fertilizers. Excessive use of chemical fertilizers will make soil quality decrease, the continuous use of inorganic fertilizers will affect soil fertility, make soil acidity increase, reduce the availability of phosphorus for plants and eliminate soil microorganism life (Aman, 2018). Based on research conducted by Nasution (2014), coffee waste influences the growth and yield of long bean plants (Vigna sinensis L.) and the best concentration is in the application of fertilizer with a concentration of 20 grams.

The decreasing agricultural land results in the low quality of production of crops grown. The transfer of agricultural land to non-agricultural land such as industry causes reduced land availability for farmers. The demand for kailan crop products is getting higher, both in terms of quality and quantity. Efforts to increase production can be done through planting media. In general, the planting medium must be able to maintain the moisture of the area around the roots, provide enough air, and be able to withstand the availability of nutrients. The use of proper media will provide optimal growth for plants. Good growing media has the characteristics that can support plant growth, can absorb and deliver water and nutrients and does not contain organisms that cause pests and diseases. The addition of burnt husks to the growing medium can increase plant growth because burnt husks are porous and sterile. Element N is needed by plants, especially for the vegetative growth process of plants because kailan plants are plants that are taken leaves, so the role of nitrogen is very important for the formation of fresh green leaves and contains enough fiber. Low levels of N (Nitrogen) in the growing media greatly affect the growth of the vegetative phase. According to Naila (2018) in her research stated that the composition of planting media mixed with soil and husk charcoal can increase plant height and leaf area on kailan plant growth, compared to mixed soil and cocopeat planting media.

Based on the description above, the researcher can be formulated as follows: Does the application of coffee waste compost and growing media, as well as their interaction, impact the growth and yield of Kailan plants (*Brassica oleracea* L.).

2. Method

Research Design

This study was designed using factorial Randomized Block Design (RBD), consisting of two factors, namely coffee waste compost (K) and planting media composition (M). The layout of the study can be seen in Appendix 3.

The first factor is coffee waste compost (K), which consists of 4 levels of treatment, namely:

K0 = No coffee waste
K1 = Giving 10 grams of coffee waste
K2 = Giving 20 grams of coffee waste
K3 = Giving 30 grams of coffee waste

The second factor is the composition of the planting media (M), which consists of 3 levels of treatment, namely:

M1 = Topsoil medium
M2 = Topsoil soil media: husk charcoal 1:1
M3 = Topsoil soil media: *cocopeat* 1 :1

From these two factors, there are 12 treatment combinations, each with 3 repetitions so that there are 36 experimental units.
The combination of treatments can be seen in Table 1.

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Table 1
Combination of Coffee Waste Compost Treatment and Planting Media

Coffee Waste Fertilizer	Composition of Growing Media		
	M1	M2	M3
K0	K0M1	K0M2	K0M3
K1	K1M1	K1M2	K1M3
K2	K2M1	K2M2	K2M3
K3	K3M1	K3M2	K3M3

Data Analysis

This research design used Randomized Completely Block Design (RCBD). The linear model of the experimental design used in this study is in accordance with the provisions written in the journal Adinugraha et al. (2017) is as follows:

$$\mathbf{Yijk = \mu + ai + ßj + Tk + (aß)jk + \varepsilon ijk}$$

Information:

Yijk	=	Observation value from the –i replication of coffee waste fertilizer to the –j and the planting media composition to the –k
μ	=	General mean value or general middle value
ai	=	Effect of i-th treatment
ßj	=	Effect of j-th treatment
Tk	=	Influence of the k-th group
(aß)j	=	Effect of the interaction between coffee waste fertilizer at the i-th and planting media composition at the j-th.
i	=	1,2, ... , t and j = 1, 2, ... , r
εijk	=	Random effect on the treatment of the k-th replication of treatment, coffee waste fertilizer at the i-th, and planting media composition at the j-th.
i	=	1,2,3,4 (coffee waste fertilizer)
j	=	1,2,3,4 (planting media)
k	-	1,2,3 (group)

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 research on the effect of composting coffee waste and planting media on the growth and yield of kailan plants (*brassica oleracea* L.) has been carried out with seven observation parameters, namely Plant Height (cm), Number of Leaves (strands), Leaf Area (cm^2), Total fresh weight per plant (g), Fresh weight of consumption per plant (g), Root Length (cm) and Plant dry weight (g). Based on the results of statistical tests in this study, the diversity coefficient (KK) value was 8-18%.

The results of the observations show different growth in each parameter, so it shows real different results, very real differences, even unreal differences. Based on the results of ANOVA analysis, it can be seen that the treatment of coffee waste compost has a noticeable effect on the leaf count parameter at 14 HST. It provides a noticeable influence on the parameters of leaf area, fresh weight of consumption and dry weight. It exerts a very noticeable influence on the parameters of total fresh weight.

The use of various compositions of the growing medium has a noticeable influence on the parameters of the leaf area. There is an interaction between the treatment of coffee waste compost and the use of planting media on plant height parameters of 14 HST and 28 HST. The following table of ANOVA recapitulation results is in Table 2.

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Table 2
Recapitulation of the Results of ANOVA of the Effect of Composting Coffee Waste and Planting Media on the Growth and Yield of Kailan Plants (Brassica oleracea L.)

No	Observation Parameters	Treatment				
		Plant Age to/HST	Coffee Waste Compost (K)	Growing Media (M)	Interaction (K*M)	KK
1	Plant Height (cm)	7 HST	Mr	Mr	Mr	15.37 %
		14 HST	Mr	Mr	*	16.66 %
		21 HST	Mr	Mr	Mr	18.33 %
		28 HST	Mr	Mr	*	11.31 %
2	Number of Leaves (strands)	7 HST	Mr	Mr	Mr	16.72 %
		14 HST	*	Mr	Mr	11.44 %
		21 HST	Mr	Mr	Mr	13.23 %
		28 HST	Mr	Mr	Mr	16.12 %
3	Leaf Area (cm^2)	28 HST	*	*	Mr	15.25 %
4	Total Fresh Weight (g)	28 HST	**	Mr	Mr	7.95 %
5	Fresh Weight of Consumption (g)	28 HST	*	Mr	Mr	8.89 %
6	Root Length(cm)	28 HST	Mr	Mr	Mr	15.75 %
7	Dry Weight (g)	28 HST	*	Mr	Mr	11.07 %

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

Plant Height (cm)

Plant height is one of the growth variables in a plant that can be seen easily changes. This observation aims to determine the environmental response or certain treatment factors to plants, with the increase in height of a plant, there has been vegetative growth activity. Here the average plant height is presented in Table 3.

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Table 3
Average Plant Height (cm) on the Effect of Coffee Waste Compost and Planting Media on the Growth and Yield of Kailan Plants (Brassica oleracea L.)

Plant Age	Coffee Waste Compost (K)	Growing Media (M)			Average
		Soil	Soil: Husk Charcoal	Soil : Cocopeat	
		.....cm.....			
7 DAP	Control (K_0)	8.10	5.97	8.80	7.62
	10 g (K_1)	7.40	7.90	7.63	7.64
	20 g (K_2)	7.40	7.97	9.00	8.12
	30 g (K_3)	8.77	6.47	6.83	7.36
	Average	7.92	7.08	8.07	
14 DAP	Control (K_0)	12.23 a	8.57 cd	12.70 ab	11.17
	10 g (K_1)	11.03 bc	11.93 ab	11.60 b	11.52
	20 g (K_2)	11.50 b	12.97 ab	13.93 a	12.80
	30 g (K_3)	13.87 a	9.37 c	10.30 bc	11.18
	Average	12.16	10.71	12.13	
21 DAP	Control (K_0)	18.30	14.63	18.20	17.04
	10 g (K_1)	13.33	17.57	17.40	16.10
	20 g (K_2)	20.63	16.20	14.80	17.21
	30 g (K_3)	18.57	18.27	13.63	16.82
	Average	17.71	16.67	16.01	
28 DAP	Control (K_0)	24.57 ab	20.93 cd	23.43 ab	22.98
	10 g (K_1)	18.73 cd	24.33 ab	22.87 bc	21.98
	20 g (K_2)	26.30 a	21.80 c	22.13 bc	23.41
	30 g (K_3)	23.27 bc	24.60 a	19.80 cd	22.56
	Average	23.22	22.92	22.06	

Description: The numbers followed by letters on each line show a marked difference according to the DMRT follow-up test level of 5%.

Based on Table 5. What is presented shows that the effect of applying coffee waste compost and the use of planting media does not have a real effect on the increase in height of Kailan plants, it is suspected that the nutrients provided have not reached the roots, so the roots cannot absorb nutrients optimally and have an impact on the increase in height of Kailan plants. According to Sutarman & Agus (2019), states that if nutrients have reached the roots, nutrient ions are transported to the leaves through various stages, namely passive absorption, active absorption, and place switching. So based on this, it is suspected that coffee waste compost cannot reach the roots of kailan plants.

In addition, several factors affect the growth of kailan plants, one of which is external factors derived from the environment where the study is conducted, low rainfall and high enough temperatures can affect the growth of kailan plant height, poor drainage can also affect plant height, due to the lack of intensity of rain that falls, can make plants experience drought, thus making the texture of the planting media used dense so that it is difficult penetrated by roots, this is appropriate according to Wahyuni (2022), adding that external factors from these plants do not support the activity of both treatments, because the combination of these two specific treatments will not always have a good influence on plants. There are times when the combination will promote growth, inhibit growth, or not respond at all to plant growth and development.

Based on the results of ANOVAs, it shows that the treatment of coffee waste compost and planting media does not have a noticeable effect on the height parameters of kailan plants, but

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there is an interaction between the two treatments at 14 HST and 28 HST. From Table 2. It can be seen that the best interaction at 14 HST occurred in the treatment (K2M3) of coffee waste compost treatment of 20 g / plant with topsoil and cocopeat soil planting media with a ratio of 1: 1 with an average plant height of 13.93 cm and at 28 HST occurred in the treatment (K2M1) of 20 g dose treatment and the use of topsoil soil planting media with an average plant height of 26.30 cm. It is suspected, that coffee waste compost with a dose of 20 g / plant can have a real effect on the increase in height of kailan plants, at this dose fertilizer has a real effect on kailan plants because the fertilizer contains substances needed by plants. Coffee waste contain nutrients such as nitrogen, phosphorus, potassium, magnesium, and various other minerals that can provide additional nutrients for kailan plants. In addition, fatty acids from coffee waste can also help stimulate plant height growth.

This is by Nasution's research (2014), that coffee waste fertilizer can increase the growth of long beans with the best dose of 20 g / plant, and also Sebayang's research (2020), the treatment dose of coffee waste fertilizer 20 g / plant can provide optimal results for the growth and yield of land kale plants with an average plant height of 33.92 cm and the number of leaves of 12.25 strands.

The use of topsoil and *cocopeat* soil planting media composition with a ratio of 1: 1 also has a real influence, it is suspected that the use of planting media is a good planting media composition for kailan plants, the two media have a positive influence and complement each other to meet the needs of kailan plants. Soil planting media contains the main source of nutrients and minerals needed by plants for growth, and nutrient content in the soil, such as nitrogen, phosphorus, and potassium. This is in line with Handayanto *et al*. (2017), who state that soil is a food provider for plants, and plant growth is related to available nutrients.

Cocopeat planting media also makes a significant contribution to growing media. *Cocopeat* is made from coconut fiber which has a high ability to hold water and improve soil drainage. This is in line with Irawan & Hidayah (2014), stating that *cocopeat* can absorb water and loosen the soil. This allows kailan plants to get an adequate supply of water, which can help reduce the risk of root disease. Thus, the combination of soil and cocopeat can provide ideal growing media conditions for the growth of kailan plants. Although both factors did not show a single noticeable effect, they showed a significant interaction with plant height parameters.

Number of Leaves (strands)

The most important photosynthetic organ of plants is located on the leaves. Photosynthesis in plants can affect the growth and productivity of a plant. This is in line with Andrian *et al*., (2022), stating that leaves are an important plant part and in general each plant has several leaves. Leaves are only found on the stem and never found on other parts of the plant body. The meaning of leaves is as one of the organs that are important plant parts. Leaves are the main organs where the photosynthesis process is because adult leaves contain hundreds of chloroplasts that play a role in the process of photosynthesis. Plant leaves as a place for the processing of light energy into chemical energy and carbohydrates (glucose) which are realized in the form of dry matter so that leaf development is feasible as the main parameter in the analysis of plant growth. The large role of leaves in plant growth is what causes differences in plant biomass production caused by differences in the ability of leaves to produce reduced carbon to produce plant biomass. The following average number of leaves is presented in Table 4.

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Table 4
Number of Leaves (Strands) on the Effect of Composting Coffee Waste and Planting Media on the Growth and Yield of Kailan Plants (Brassica oleracea L.)

Plant Age	Coffee Waste Compost (K)	Growing Media (M)			Average
		Soil	Soil : Husk Charcoal	Soil: Cocopeat	
		.....sheet.....			
7 DAP	Control (K_0)	4.67	4.67	4.67	4.67
	10 g (K_1)	5.00	5.00	5.00	5.00
	20 g (K_2)	5.33	6.00	5.00	5.44
	30 g (K_3)	4.67	5.00	5.00	4.89
	Average	4.92	5.17	4.92	
14 DAP	Control (K_0)	4.33	5.67	5.00	5.00 ab
	10 g (K_1)	4.33	4.33	4.67	4.44 b
	20 g (K_2)	5.67	5.00	5.33	5.33a
	30 g (K_3)	5.33	5.00	5.67	5.33 a
	Average	4.92	5.00	5.17	
21 DAP	Control (K_0)	5.67	6.00	6.00	5.89
	10 g (K_1)	6.67	5.67	6.00	6.11
	20 g (K_2)	6.00	6.00	6.67	6.22
	30 g (K_3)	6.00	5.00	5.67	5.56
	Average	6.08	5.67	6.08	
28 DAP	Control (K_0)	7.33	7.00	7.67	7.33
	10 g (K_1)	7.67	6.67	7.33	7.22
	20 g (K_2)	7.00	7.00	8.33	7.44
	30 g (K_3)	7.67	6.33	7.33	7.11
	Average	7.42	6.75	7.67	

Remarks: The numbers followed by letters on each line show a marked difference according to the DMRT follow-up test level of 5%.

Based on Table 6. What is presented can be seen that the effect of applying coffee waste compost has a real influence on the parameters of the number of leaves of Kailan 14 HST plants. It is alleged, that the coffee waste compost used contains nutrients such as organic C 49.06%, total N 1.32%, Phosphorus 0.06%, and Potassium 0.25%. A good total N content can play a role in the formation of chlorophyll which is very important for photosynthesis and leaf growth. With the use of coffee waste compost containing nitrogen, plants can produce greener and more lush leaves, the phosphorus content in coffee waste compost can help increase leaf growth and strengthen the root system of plants. Coffee waste compost contains nutrients that are important for plant leaf growth. With proper application, coffee waste compost can help plants produce healthy, lush, and strong leaves. This is in line with Pradnyawan et al. (2015), stating that the element nitrogen functions as a chlorophyll former. The more chlorophyll is formed, the photosynthetic will increase and be used by plants in plant growth and development, one of which is the formation of the number of leaves on kailan plants. The application of coffee waste compost has a real influence on the parameters of the number of leaves of kailan plants, the best results are through K2 treatment with a dose of 20 g / plant, with an average number of leaves (5.33 strands).

While the use of planting media does not have a real influence on the growth of the number of leaves of kailan plants, it is suspected that there are factors that influence it such as the presence of nutrients in the growing media not balanced or not the needs of kailan plants, then the growth of leaves will be inhibited. If a plant is attacked by pests and diseases, its growth will be hampered and its productivity can decrease. Wiratama et al. (2023), Growth and

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development stimulating factors of a plant are under genetic control, but climatic, soil, and biological elements such as pests, diseases, and weeds and competition, both intra-species and inter-species competition are in the environment, and the yield growth of each variety has different genetic traits. If the plant is constantly disturbed by pests and diseases, then its growth will be hampered and the number of leaves produced will not be maximal.

Based on Table 6. The average increase in the number of leaves of kailan plants shows an increase with increasing plant age, but there is no interaction between the two treatments, so that the use of coffee waste compost is not interrelated with the use of planting media, each treatment tends to give better leaf count results singly.

Leaf Area (cm2)

Extensive observation of the leaves of kailan plants is carried out to monitor plant health. If the leaf area of a plant decreases, it indicates a problem with the plant, such as disease or nutritional deficiencies. Through extensive observation of leaves can also find out the interaction that occurs between plants and the environment. The following table of average leaf area is presented in Table 5.

Table 5

Leaf Area (cm2) on the Effect of Coffee Waste Compost and Planting Media on the Growth and Yield of Kailan Plants (Brassica oleracea L.)

Coffee Waste Compost (K)	Growing Media			Average
	Soil	Soil : Husk Charcoal	Soil : Cocopeat	
	.....cm^2.....			
Control ($K0_)$	68.92	92.45	82.76	81.38 b
10 g (K1)	72.31	85.21	108.87	88.80 ab
20 g (K2)	96.74	91.90	114.52	101.05 a
30 g (K3)	85.72	100.39	87.73	91.28 ab
Average	80.92 b	92.48 ab	98.47 a	

Remarks: The numbers followed by letters on each line show a marked difference according to the DMRT follow-up test level of 5%.

Based on Table 5. What is presented can be seen that the effect of applying coffee waste compost has a real influence on leaf area parameters, this is suspected because coffee waste fertilizer contains several important nutrients such as nitrogen, potassium, phosphorus, and other elements needed by plants for optimal growth. These nutrients can help plants to produce bigger and more leaves. In addition, the presence of organic matter in coffee waste can improve soil structure and increase the availability of nutrients for plants. This is appropriate according to Juliani (2017), which states that coffee waste can be applied to soil, gardens and pots that have plants in them so that they can remove substances slowly, the coffee waste contain magnesium, sulfur, and calcium which are beneficial to plants.

The application of coffee waste compost has a real influence on the parameters of the leaf area of kailan plants, the best results are through K2 treatment with a dose of 20 g / plant, with an average leaf area of 101.05 cm^2. At a dose of 20 g/plant, it responds well to leaf area parameters, so this dose is an effective dose for kailan plants.

The use of planting media has a real influence on the leaf area of kailan plants, this is suspected because the planting media used contains sufficient nutrients and has a good aeration system, to accommodate these factors that it affects the area of kailan plants. In addition, the potassium content in coffee waste can help plants regulate osmotic pressure, reduce stress of environmental conditions, and support the growth of strong and disease-resistant leaves. Based

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on Table 7. What was presented showed that the best results of planting media treatment were soil M3 and cocopeat with a ratio of 1: 1 with an average value of 98.47 cm^2.

Based on the results of ANOVA analysis, it shows that the application of coffee pulp fertilizer given to kailan plants using different planting media has a noticeable effect, but there is no interaction between the two. It is suspected that each treatment tends to give the best results singly, so it is unable to cooperate between coffee waste compost and planting media on leaf area parameters.

Total Fresh Weight (g)

The total fresh weight of the crop is a parameter observed at harvest before the crop experiences wilting and water loss, this parameter is used to indicate the metabolic activity of the plant. The value of the total fresh weight of the plant is influenced by the water content in the tissues, nutrients, and the metabolic yield of the plant. The more fertile a plant is, the fresher its weight will increase. The following table averages the total fresh weights are presented in Table 6.

Table 6

Total Fresh Weight (g) on the Effect of Coffee Waste Compost and Planting Media on the Growth and Yield of Kailan Plants (Brassica oleracea L.)

Coffee Waste Compost (K)	Growing Media			Average
	Soil	Soil : Husk Charcoal	Soil : Cocopeat	
	.....g.....			
Control ($K0_)$	54.02	55.69	57.47	55.72 b
10 g (K1)	55.25	55.27	55.15	55.22 b
20 g (K2)	63.14	62.81	62.51	62.82 a
30 g (K3)	59.75	60.36	48.83	56.31 b
Average	58.04	58.53	56.00	

Remarks : The numbers followed by letters on each line show a marked difference according to the DMRT follow-up test level of 5%.

The leaves are the part of the plant that gives the highest percentage of fresh weight of the plant than other parts, this is in line with Medayanti et al. (2022), states that each increase in the number of leaves can increase the wet weight of the plant. Based on Table 8. What is presented can be seen that the effect of applying coffee waste compost has a very real influence on the total fresh weight parameter per plant, this is suspected because coffee waste fertilizer contains a pH that is suitable for kailan plants, this is proven by the fertilizer tests carried out, it can be known that the coffee waste compost used contains a pH of 5.2. According to Stek & Sukun (2017), states that kailan plants can grow with loose and fertile soil conditions and soil types with pH ranging from 5.0 – 6.5.

The pH content of fertilizers is interrelated in plant growth and nutrient availability. The relationship between the two is that the pH of fertilizer can affect the absorption of nutrients by plants which ultimately affects the growth and fresh weight of plants. When nutrient availability is affected by soil pH, this will also affect plant growth. Plants that lack nutrients will grow more slowly and have a lower fresh weight. Conversely, plants that get adequate or optimal nutrition will grow better and have a greater fresh weight. Based on Table 8. What was presented showed that the best results of coffee waste fertilizer treatment were K2 treatment or a dose of 20 g / plant with an average total fresh weight of 62.82 g.

While the treatment of the growing media does not have a real effect on the total fresh weight parameter of the plant, this is thought to be because the environmental factors that influence such as temperature, light and humidity have a greater influence on the growth of

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plants than the growing media. So that the planting media does not have a significant influence. The environmental conditions of the research site can determine the value of the total fresh weight produced. The fresh weight can also determine the quality of the crops that have been harvested and help determine how the plants get good nutrition and aeration. If the water content in the kailan plant is high, the weight of the kailan plant will also be high, while if the weight of the plant is low, the water content in the plant is low.

Based on the ANOVA analysis table on the average parameter of the total fresh weight of kailan plants, it shows that the dose treatment of coffee waste compost has a noticeable effect. In contrast, planting media does not have a real effect. So, that there is no interaction between the combination of coffee waste compost treatment and planting media, because each treatment is unrelated.

Fresh Weight of Consumption (g)

The fresh consumption weight is one of the parameters used to study plant growth. The fresh weight of consumption is the weight of plants without roots after harvesting and before the plant experiences wilting and water loss.

The fresh weight of consumption is the total weight of plants without roots, which shows the results of the metabolic activity of the plant itself and is the harvest that will be sold in units of weight so that if the higher the fresh weight, the economic value will be higher. Fresh weight also indicates the accumulation of plant photosynthates and indicates the water content of the plant crown tissue. The following table of average fresh weights of consumption is presented in Table 7.

Table 7

Fresh Weight of Consumption (g) on the Effect of Coffee Waste Compost and Planting Media on the Growth and Yield of Kailan Plants (Brassica oleracea L.)

Coffee Waste Compost (K)	Growing Media			Average
	Soil	Soil : Husk Charcoal	Soil : Cocopeat	
	.....g.....			
Control ($K0_)$	50.74	49.84	51.71	50.76 b
10 g (K1)	49.72	51.27	53.08	51.36 b
20 g (K2)	56.81	59.08	57.66	57.85 a
30 g (K3)	55.75	57.03	44.93	52.57 b
Average	53.25	54.30	51.84	

Remarks : The numbers followed by letters on each line show a marked difference according to the DMRT follow-up test level of 5%.

Based on Table 9. What is presented can be seen that the effect of applying coffee waste compost has a real influence on the fresh weight of consumption per plant, it is suspected that coffee waste compost contains nutrients that can meet the needs of kailan plants. Nutrients such as nitrogen, phosphorus, and potassium can have a direct effect on the growth of plant canopy and ultimately affect the fresh weight of consumption of these plants. This is in line with Afriyanti et al. (2019), which states that plants need nutrients to be absorbed by plants such as N, P, and K. Element N is an important ingredient that makes up amino acids and essential elements for cell division, cell enlargement and plant growth. N is needed in large quantities in every plant growth, especially in vegetative growth stages such as increasing the number of leaves. The availability of nutrients N and P will affect the leaves. The number of leaves is affected by the height growth of the plant. The number of leaves on a plant greatly affects the fresh weight of consumption of a plant. The best results were using K2 treatment at a dose of 20 g /plant with an average weight of 57.85 g.

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While the treatment of planting media does not have a real effect on the fresh weight parameters of plant consumption, this is suspected because of pest attacks, if a planting medium attacks pests, such as insects or pathogenic fungi, there can be detrimental damage to the growing media. Pest attacks can damage the nutritional quality of the growing medium. Like armyworms that can steal important nutrients from plants and cause nutrient deficiencies in the growing media. This results in weak and less fertile plant growth, thus affecting the fresh weight of kailan plant consumption. Pest attacks can also disrupt the balance of microbes in the growing media. Plants require balanced microbes to help the process of organic matter decomposition and nutrient cycling. Pest attacks can disrupt this balance, thereby reducing the efficiency of organic matter decomposition and plant nutrient cycling. According to Hartatik *et al*. (2015), states that increasing the population and microbial activity in the soil can be done by adding organic matter to the soil so as to improve the biological properties of the soil.

Although statistically there was no response, there was an increase in each treatment observed, but there was no interaction between the two treatments, so that the use of coffee waste compost was not interrelated with the use of planting media, each treatment tended to give better leaf count results singly.

Root Length (cm)

Plants that have deep root systems generally have the potential to reach deeper sources of water and nutrients in the soil, whereas plants with shallow root systems usually rely on sources of water and nutrients available in the upper soil layer. So that the growth of the root length of kailan plants is influenced by several factors of water availability, adequate nutrients and good growing media conditions. The following table of average root lengths is presented in Table 8.

Table 8

Root Length (cm) on the Effect of Coffee Waste Compost and Planting Media on the Growth and Yield of Kailan Plants (Brassica oleracea L.).

Coffee Waste Compost (K)	Growing Media			Average
	Soil	Soil : Husk Charcoal	Soil : Cocopeat	
		.....Cm.....		
Control (K0)	22.87	20.90	20.13	21.30
10 g (K1)	19.33	20.83	23.43	21.20
20 g (K2)	21.60	20.10	23.00	21.57
30 g (K3)	17.33	18.50	19.27	18.37
Average	20.28	20.08	21.46	

Remarks : The numbers followed by letters on each line show a marked difference according to the DMRT follow-up test level of 5%.

Based on Table 8. What was presented showed that the use of compost, coffee waste and planting media did not have a noticeable effect and there was no interaction with root length parameters. It can be seen that the application of coffee waste compost does not have a noticeable effect on root length parameters with average values ranging from 18.37 cm to 21.57 cm. The use of planting media does not have a noticeable influence on root length parameters with average values ranging from 20.08 cm to 21.45 cm.

The absence of this real influence is thought to be due to insufficient composition and availability of nutrients to complete the root needs of kailan plants, such as less phosphorus content. Phosphorus deficiency in the soil can significantly affect root growth. This is in line with Sitio *et al*. (2015), which states that the phosphorus content in coffee waste plays a role in stimulating plant growth and rooting. Phosphorus is part of the cell nucleus which is very important in cell division and development of meristem tissue. The roots absorb nutrients in the soil and are transported to the plant crown through xylem vessels used for photosynthesis.

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In addition, environmental factors where cultivation has air humidity of 76.40%, low air humidity for kailan plants can affect water absorption by the roots. Low air humidity can result in water loss through transpiration, so plants develop deeper roots to absorb water. This is in line with Valladares et al (2016), which states that environmental factors that affect the growth process are temperature, duration of irradiation, light, growing media and humidity. In addition, genetic factors of kailan plants can also affect the growth of root length.

Dry weight of plants (g)

Dry weight measures plant growth and development because dry weight reflects the accumulation of organic compounds successfully synthesized by plants. The dry weight of plants reflects the nutritional status of a plant. It is also an indicator that determines whether or not a plant grows and develops so that it is closely related to nutrient availability (Sitorus, 2014). The following table of average dry weights of plants is presented in Table 9.

Table 9

Plant Dry Weight (g) on the Effect of Coffee Waste Compost and Planting Media on the Growth and Yield of Kailan Plants (Brassica oleracea L.).

Coffee Waste Compost (K)	Growing Media			Average
	Soil	Soil : Husk Charcoal	Soil : Cocopeat	
		.....g.....		
Control (K0)	16.17	15.96	18.18	16.77 b
10 g (K1)	15.67	15.44	18.37	16.49 b
20 g (K2)	18.21	20.60	18.95	19.25 a
30 g (K3)	17.61	17.98	15.05	16.88 b
Average	16.92	17.49	17.64	

Remarks : The numbers followed by letters on each line show a marked difference according to the DMRT follow-up test level of 5%.

Based on Table 9. presented shows that the use of coffee waste compost has a real influence on the dry weight of Kailan plants, it is suspected that the nutrients contained in the fertilizer can be absorbed directly by Kailan plants and used for their growth, plants that have sufficient nutrients such as N, P and K, tend to have higher dry weights because of good and optimal growth. The dry weight of a plant is also related to water absorption in the wet weight of plants, the amount of water absorption has a direct effect on the sustainability of plant photosynthesis. Thus, plants can absorb more nutrients contained in the media used for the process. This is in line with Putri *et al*. (2017), adding that coffee waste contain 1.2% Nitrogen, 0.02% Phosphorus, and 0.35% Potassium. Nitrogen is the main nutrient for plants that are good for vegetative growth such as leaves, stems, and roots. If the nitrogen element in the soil is sufficient, the amount of chlorophyll will increase so as to increase photosynthetic activity. Phosphorus affects metabolism so that cell division, cell enlargement, and cell differentiation run smoothly. Meanwhile potassium is beneficial in enzyme activation, photosynthesis, sugar transport, and protein formation. The best results with coffee waste compost treatment dose 20 g /plant or K2 with an average weight of 19.25 g.

While the use of planting media does not have a real effect on the dry weight of kailan plants, this is suspected because the intensity of rainfall at the research site is low at only 560 mm / month and high temperatures of 33 ° C make the planting media dry kailan. High light intensity can increase the rate of respiration which can reduce dry weight and kailan plants experience water loss. Lack of water can inhibit plant growth so as to reduce its weight. According to Felania (2017), lack of water in plants affects cell turgor which results in cell development, protein synthesis, and decreased cell wall synthesis. Cell growth is the growing process that is most sensitive to drought or lack of water in plants.

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Based on ANOVA analysis, it does not show the interaction that occurs between the two treatments. This is thought to be due to external environmental factors that affect the dry weight of kailan plants. This is in line with Fajri (2020), stating that external factors do not support both treatment combinations, so they do not have the best influence on the plants themselves.

4. Conclusion

Based on the results and discussion, it can be concluded as follows: (1) Coffee waste compost dose of 20g/plant has the best influence on the parameters Number of leaves 14 HST (5.33 cm), Leaf area (101.05 cm2), Total fresh weight (62.82 g), Fresh weight of consumption (57.85 g) and Dry weight (19.25 g). (2) Topsoil and cocopeat soil planting media have the best influence on the parameter of leaf area (98.47 cm2). (3) There is an interaction between 20g/plant coffee waste compost and topsoil and cocopeat soil planting media at plant height parameters of 14 HST (13.93 cm) and 28 HST (26.30 cm). Therefore, the treatment of applying coffee waste compost at a dose of 20g/plant can be recommended as the optimal dose for coffee waste compost and the treatment of using a mixture of topsoil and cocopeat as the planting media can be recommended as the best planting media mixture for the growth and yield of kailan plants (*Brassica oleracea* L.).

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