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The Effect of Guano Fertilizer Application and Poc Super Bionik Concentration on the Growth and Yield of Pagoda Mustard (*Brassica Narinosa* L.)

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Abstract. This study aims to determine the effect of the interaction between guano fertilizer and super bionic POC on the growth and yield of pagoda mustard plants grown on land in Ketapang Suko Village from December to February. This study was designed as a factorial design in a randomized block design (RBD). The first factor was the application of guano fertilizer, which consisted of three levels: 0, 5, and 10 g/plant. The second factor was the application of POC Super Bionik with three treatment concentrations, namely: 0, 2, and 4 ml/L, resulting in 9 treatment combinations repeated 3 times. The variables observed were plant height, number of leaves, leaf area, wet weight, dry weight, vitamin C test, and harvest index. The data were analyzed using analysis of variance followed by BNJ test. The results showed that there was no significant interaction between guano fertilizer application and POC Super Bionik concentration. Guano fertilizer application had a significant effect on plant height, number of leaves, wet weight, dry weight, and vitamin C test, while it had no significant effect on leaf area and harvest index. Guano fertilizer at a dose of 10 g/plant produced the highest wet weight. The application of POC Super Bionik on pagoda mustard plants had a significant effect on plant height, number of leaves, wet weight, and vitamin C test, while it had no significant effect on dry weight, leaf area, and harvest index. POC Super Bionik at a concentration of 2 ml/L produced the highest wet weight compared to other treatments. In conclusion, the application of Guano fertilizer had a significant effect on plant height, number of leaves, wet weight, dry weight, and vitamin C test, while POC Super Bionik had a significant effect on plant height, number of leaves, wet weight, and vitamin C test.

Keywords: Pagoda Cabbage, Guano Fertilizer, POC Super Bionik

1 Introduction

Pagoda cabbage (Brassica narinosa L) is a type of plant that is rich in nutrients and has a delicious taste and crisp texture. Its leaves are unique, convex, and curled from the top. Pagoda cabbage, a nutrient-rich vegetable, is very popular in Indonesia. Pagoda cabbage is very rich in iron, vitamin C, vitamin A, and protein, all of which support growth. Pagoda mustard has a nutritional content of 969 mg/g of vitamin A, 0.09 mg/g of vitamin B, 102.00 mg/g of vitamin C, 210 mg of calcium, 11 mg of magnesium, and 449 mg of potassium. It helps balance blood pH, treat intestinal inflammation, maintain and improve digestive health, boost energy, prevent cataracts, reduce the risk of diabetes, and help prevent respiratory disorders. Demand for pagoda mustard greens in the market continues to increase, but frequent declines in production have caused market prices to skyrocket. In 2022, mustard production in Indonesia was recorded at 706,305 tons, a decrease of 2.9% compared to 2021, which reached 727,467 tons (BPS, 2022). One solution to increase pagoda mustard production is to provide proper fertilization for the plants[1] .

Pagoda mustard seeds are small and round, dark brown in color. They are characterized by their shiny, smooth surface and hard texture. These seeds are similar to mustard seeds in general. Pagoda mustard is a plant that is resistant to rainfall, so it can be cultivated throughout the year. The ideal rainfall for its growth ranges from 1000 to 1500 mm per year, although this plant cannot grow well if it is flooded. For optimal growth, the required humidity is between 80 and 90%. Excessive humidity, above 90%, can interfere with plant growth because it can close the stomata of the leaves, which inhibits the exchange of carbon dioxide (CO_2) gases. Fertilization is an important step to meet the plant's nutrient requirements that cannot be met by the soil. Fertilizer is a material added to the soil to provide essential elements such as nitrogen, phosphorus, potassium, and other nutrients needed

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for plant growth. The fertilizer used can be organic or inorganic. Pagoda mustard plants require sufficient nitrogen to support their growth, especially in the vegetative phase[2] .

Guano fertilizer is a solid organic fertilizer made from animal manure and is highly effective due to its high phosphorus and nitrogen content. Organic guano fertilizer consists of 14% phosphate (P2O5), 10% phosphate (P2O5) dissolved in citric acid, 1-2% nitrogen (N2), 1% potassium (K), 24% organic matter, 5% water content, and microelements such as Mg, Al, Fe, and so on. Guano fertilizer contains macro and micro nutrients that are beneficial for plant growth. Guano fertilizer, which is made from bat droppings, contains 7.5 percent nitrogen (N), 8.1 percent phosphorus (P), and 2.7 percent potassium (K) macro nutrients. In addition, guano organic fertilizer also contains micro nutrients such as Mg, Mn, Fe, Zinc, Chlorine, and Cu, which remain in the soil, increasing productivity[3] . Guano fertilizer is a fertilizer derived from wild bird droppings, including bats. The nutrients contained in guano fertilizer include 9-13% N, 5-12% P, 1.5-2.5% K, 7.5-11% Mn, 0.5-1% Mg, and 2-3.5% S (Misra et al., 2019). Bat guano fertilizer can improve soil fertility, as it contains N, P, and K. N plays an important role in supporting the vegetative growth of plants. Bat droppings contain at least 5% nitrogen, which is higher than manure, which only contains around 1%. In fact, fresh guano (less than one year old) has an N content of 7% (PT. Petrokimia Gresik Laboratory Test Results 2015). According to S. Tangguda and R. Y. Valentine(2022) , guano fertilizer contains phosphate and nitrate levels that can be used as a source of nutrients for plants[4] . Research also found that guano fertilizer can enhance the growth of sea grapes (C. racemose) by increasing their length and weight, as well as the number of ramuli[5] According to R. Syofiani and G. Oktabriana, (2017) , the research results obtained were (1). The application of guano fertilizer can increase the N, P, K nutrients in gold mine tailings[6] . The application of guano fertilizer can enhance soybean plant growth in gold mine tailings as a growing medium. [7]

Super bionic liquid organic fertilizer is a liquid organic fertilizer (POC) that is applied by spraying or watering plants to provide additional nutrients that are easily absorbed by the roots. Leaf fertilizer, known as *foliar fertilizer*, generally comes in liquid form[8] . This makes it easier to apply so that it can directly reach the mouth of the leaf or stomata. This fertilizer is widely chosen because it contains more dominant micro nutrients. The content of super bionic POC can stabilize soil pH, reduce chemical residues in plants and growing media, and provide the potassium needed during the growth phase. The purpose of this study was to determine the effect of the interaction between guano fertilizer and POC concentration on the growth and yield of pagoda mustard plants. According to(2015) , the application interval of super bionic liquid fertilizer affects the growth of lettuce plants. An application interval of every 5 days yields the best results for the observed variables of stem diameter, plant height, and number of leaves[9] .

2 Method

This study was conducted on land in Suko Village, Sukodono District, Sidoarjo. The experimental requirements were supported by the Chemistry and Soil Laboratory of Muhammadiyah University Sidoarjo. This study was conducted from December to February 2025. The materials used in this study were pagoda mustard seeds, guano fertilizer, and super bionic liquid organic fertilizer. The tools used were buckets, sprayers, rulers, scales, writing instruments, and cameras. The experiments in this study were arranged factorially in a Randomized Block Design (RBD). The first factor was the application of guano fertilizer, which consisted of three levels: no guano fertilizer application (0g/plant) (G0), guano fertilizer application at a treatment level of 5g/plant (G1), equivalent to 1.25 kg/hectare, application of guano fertilizer at a treatment level of 10 g/plant (G2), equivalent to 250 kg/hectare. This was done every week at 7 hst, 14 hst, 21 hst, 28 hst, and 35 hst. The second factor was the application of super bionic poc with a treatment concentration without fertilizer of 0 ml/L of water (S0), the application of super bionic poc with a treatment concentration of 2 ml/L of water (S1), and the application of super bionic poc with a treatment concentration of 4 ml/L of water (S2). This was done every week at 7 days after sowing, 14 days after sowing, 21 days after sowing, 28 days after sowing, and 35 days after sowing. The experiment was repeated three times, resulting in 27 experimental units with nine treatment combinations. This study began with sowing pagoda mustard seeds in seedling trays filled with medium. The seeds began to sprout within 2–4 days.

Prepare the growing medium using 30 x 30 polybags. Plant mustard seeds at 7 days old or after 3-4 leaves have grown. Guano fertilizer was applied at rates of 0 g/plant (no fertilizer) (G0), 5 g/plant (G1), 10 g/plant (G2), and poc super bionik was applied at concentrations of 0 ml/L water (no fertilizer) (S0), 2 ml/L water (S1), 4 ml/ L water (S2), and applied by drenching the plants at 7 days after sowing (DAS), 14 DAS, 21 DAS, 28 DAS, and 35 DAS. Plant maintenance was carried out by watering sufficiently in the morning and evening, weeding by pulling out weeds around the plants while loosening the soil around them. Pests can be controlled by spraying insecticide for insect attacks and acaricide for mite attacks if severe pest attacks occur in the field. Plant diseases are controlled by spraying fungicide every week according to the condition of the plants in the field due to severe attacks. Pagoda mustard can be harvested 40-45 days after planting, when the stems are upright or half-horizontal and arranged in a tight spiral. The observation variables in this study were plant height (cm), number of leaves

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(pieces), leaf area (cm^2), wet plant weight (g), dry plant weight, vitamin C content test, and harvest index. All quantitative data from the observations were analyzed using analysis of variance according to the Randomized Block Design (RBD). If there was a significant or highly significant effect, the BNJ test was performed.

3 Results and Discussion

3.1 Plant Height

The results of the analysis of variance in Table 1 show that there was no significant interaction between the application of guano fertilizer and the concentration of poc super bionik. The application of guano fertilizer and the concentration of poc super bionik had a significant effect on the height of pagoda mustard plants at 35 days after sowing. The results are presented in Table 1.

Table 1. Results of the Analysis of Variance Test

Observation Period	F CALCULATED		
	Interaction	G	S
7 HST	0.0903 tn	2.9940 tn	0.0942 tons
14 HST	0.1308 tons	0.4813 tons	0.3598 tons
21 HST	0.0427 tons	1.0237 tons	0.1183 tons
28 HST	0.2442 tons	2.7037 tons	1.6746 tons
35 HST	0.2058 tons	4.3011 *	4.0083 *

tn (not significant), *(significant), **(very significant)

Table 2, the data below shows that the application of guano fertilizer at a dose of 0 g/plant resulted in the lowest plant growth with a yield of 8.21 cm. The best plant growth with a yield of 9.50 cm was achieved with a treatment of 10 g/plant. The application of poc super bionik showed that the application of poc super bionik at a concentration of 4 ml/L of water resulted in the lowest plant growth with a result of 8.09 cm. However, in the observation without the application of poc super bionik at a concentration of 0 ml/L of water, the best plant growth was achieved with a result of 9.37 cm in plant height.

Table 2. Average Effect of Guano Fertilizer and Super Bionic Poc Application on Plant Height (cm)

Treatment	**Plant Height**				
	7 HST	**14 HST**	**21 HST**	**28 HST**	**35 HST**
G0	2.68	5.79	7.40	7.76	8.21 a
G1	2.32	5.45	7.22	7.96	8.56 ab
G2	2.81	5.42	7.92	8.73	9.50 b
BNJ 5%	**tn**	**tn**	**tn**	**tn**	**1.17**
S0	2.56	5.45	7.61	8.49	9.37b
Bachelor's	2.63	5.46	7.57	8.26	8.82ab
S2	2.64	5.76	7.38	7.71	8.09 a
BNJ 5%	**tn**	**tn**	**tn**	**tn**	**1.17**

Numbers followed by the same letter in the same column are not significant at the 5% BNJ test.

Guano fertilizer contains high levels of phosphorus (P) and nitrogen (N), which play an important role in vegetative growth, including plant height. Meanwhile, according to (Hadi et al., 2021), the phosphorus and nitrogen contained in guano fertilizer help the early growth of pakcoy plants, especially in the formation of roots and leaves[10] . However, the significant effect of guano fertilizer application on plant height was only noticeable at 35 days after sowing. This indicates that plants need time to absorb and utilize the nutrients from guano fertilizer, which ultimately results in a significant increase in plant height.

3.2 Number of Leaves

The results of the analysis of variance in Table 3 show that the application of guano fertilizer and the concentration of poc super bionik did not have a significant effect on the number of leaves. Meanwhile, there was a significant interaction effect at 28 HST and 35 HST. The average interaction effect between the application of guano fertilizer and the concentration of poc super bionik is presented in Table 3.

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Table 3. Results of the Analysis of Variance Test

Observation Age	F CALCULATED		
	Interaction	G	S
7 HST	0.3127 tn	1.4749 tn	2.0328 tons
14 HST	0.5705 tons	0.2709 tons	1.0901 tons
21 HST	0.3618 tons	1.9439 tons	0.5544 tons
28 HST	1.0947 tons	4.3397 *	2.1051 tons
35 HST	0.3372 tn	14.7299 **	8.2524 **

tn (not significant), *(significant), **(highly significant)

Table 4 shows that the treatment without guano fertilizer and the treatment without poc super bionik resulted in the lowest plant growth in terms of the number of leaves. However, there was a significant interaction at 28 DAP and 35 DAP. The results of the guano fertilizer treatment showed the highest plant growth with a result of 39.426 at a dose of 10 g/plant, equivalent to 2.50 kg/ha. The treatment with super bionic poc resulted in a higher number of leaves with the highest result of 38.89, with an application concentration of 4 ml/L of water, and there was a significant interaction at 35 days after sowing.

Table 4. Average Effect of Guano Fertilizer and Poc Super Bionik Application on the Number of Leaves (Pieces)

Treatment	Number of Leaves				
	7 HST	14 HST	21HST	28HST	35HST
G0	4.83	7.97	11.75	20.03 a	32.09 a
G1	4.61	7.91	11.02	20.53 ab	36.13 b
G2	5.18	7.63	11.88	22.80 b	39.42 b
BNJ 5%	**tn**	**tn**	**tn**	**2.58**	**3.49**
S0	4.69	8.14	11.28	20.28	33.49 a
Bachelor's Degree	4.67	7.44	11.75	20.83	35.28 a
Master's	5.27	7.94	11.64	22.27	38.89 b
BNJ 5%	**tn**	**tn**	**tn**	**tn**	**3.49**

Numbers followed by the same letter in the same column are not significant at the 5% BNJ test

These results are consistent with the findings of a study (Oktarina, 2017) showing that the application of various concentrations of Super Bionik liquid organic fertilizer can increase the rate of leaf growth in strawberries at 2, 4, and 6 weeks after planting. At 2, 4, and 6 MST, the rate of leaf growth in each treatment increased, and in the treatment combining Super Bionik liquid organic fertilizer at 3 ml/l water, the highest number of leaves reached 2.8 leaves[11] . The concentration of liquid organic fertilizer at 3 ml/l water appears to have met the nutrient requirements of strawberry plants.

This is also related to this study, which concluded that at 14, 21, and 28 days after planting (DAP), there was a significant interaction in the number of leaves, with the best combination obtained in the butter lettuce variety using 50 ml of POC. This study found that at 14, 21, and 28 days after planting (DAP), there was a significant increase in the number of leaves. The krop lettuce variety, which was given 50 milliliters of POC, grew better than the green and red curly lettuce varieties, respectively. The krop variety showed superior performance in growth compared to the green curly lettuce and red lettuce varieties[12] . The application of 50 ml of POC significantly affected the number of leaves at 14, 21, and 28 days after sowing (DAS), leaf area at 21 DAS, as well as the wet and dry weight of the upper part of the plant.

3.3 Leaf Area

The results of the variance analysis in Table 5 indicate that the application of guano fertilizer and the concentration of super bionic POC did not interact, and the treatment of guano fertilizer and super bionic POC concentration did not affect leaf area measurements. Presented in Table 5

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Table 5. Results of the Analysis of Variance Test

TREATMENT	F CALCULATED		
	Interaction	G	S
Leaf Area	0.4060 tn	1.8561 tn	0.3375 tn

tn (not real)

Table 6. The observed data show that guano fertilizer and super bionic poc concentration treatments did not have a significant effect on leaf area growth in pagoda mustard plants. Furthermore, the application of guano fertilizer and super bionic poc concentration resulted in the lowest leaf area of 4.146 cm in the treatment with guano fertilizer at a dose of 5 g/plant, equivalent to 1.25 kg/ha. The highest leaf area was observed in the treatment with super bionic poc concentration of 2 ml/L of water, which resulted in 4.41 cm. This is consistent with the research findings indicating that the application of various types fertilizers organic liquid does not have a significant effect on leaf area in plants [13]

Table 6. Average Effect of Guano and Poc Super Bionik Fertilizer Application on Leaf Area (cm)

LEAF AREA	
Treatment	**Leaf Area**
	cm
G0	4.60
G1	4.14
G2	4.21
BNJ 5%	**tn**
S0	4.20
S1	4.41
S2	4.36
BNJ 5%	**tn**

Numbers followed by the same letter in the same column are not significantly different in the 5% BNJ test

The application of Super Bionik liquid fertilizer is essential for the availability of phosphorus (P) in Super Bionik organic liquid fertilizer, which is crucial for plant fruit formation. According to Sumpena (2001), phosphorus functions in plants to form ATP, which plays a role in metabolic reactions such as the translocation of photosynthates from leaves to fruit[14] . In addition, the magnesium contained in Super Bionik liquid fertilizer greatly assists in the uptake of nutrients, especially phosphorus. This indicates that Super Bionik liquid fertilizer contains the macro and micro nutrients needed by plants[15] .

3.4 Wet Weight

The results of the variance analysis in Table 7 show that there is no interaction between the application of guano fertilizer and the concentration of Super Bionik liquid fertilizer. The application of guano fertilizer and Super Bionik liquid fertilizer has a significant effect, as presented in Table 7.

Table 7. Results of the Analysis of Variance Test

Observation Variable	F Calculated		
	Interaction	**G**	**S**
Wet Weight (g)	0.803 tons	23,453 **	4,610 *
Dry Weight (g)	0.266 tn	3,831 *	1,355 tn
Vitamin C Test	0.341 tn	4,893 *	3,893 *
Harvest Index (HI)	0.345 tn	3,196 tons	0.312 tn

tn (not significant), *(significant), **(very significant)

Table 8 shows that the application of Guano Fertilizer and Poc Super Bionik has a significant effect on the wet weight of pagoda mustard plants. The application of Guano Fertilizer at a dose of 10 g/plant resulted in a

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higher weight compared to the other treatments. The application of Poc Super Bionik at a concentration of 2 ml/L of water resulted in a heavier wet weight with an average weight of 34.71 g compared to other treatments.

Table 8. Average effect of guano fertilizer and Poc Super Bionik application on wet weight (g)

Fresh Weight	
Treatment	**Fresh Weight**
G0	26.10 a
G1	36.16 b
G2	36.29 b
BNJ 5%	4.40
S0	29.89 a
S1	34.71 b
S2	33.94 b
BNJ 5%	4.40

Numbers followed by the same letter in the same column are not significantly different at the 5% BNJ test

3.5 Dry Weight

The results of the analysis of variance in Table 7 show that there was no interaction between the application of guano fertilizer and the concentration of poc super bionik, while the application of guano fertilizer had a significant effect on the dry weight variable. Presented in Table 9.

Table 9. Average Effect of Guano Fertilizer and Poc Super Bionik Application on Dry Weight (g)

Dry Weight	
Treatment	**Dry Weight**
G0	5.20 a
G1	7.25 b
G2	6.88 ab
BNJ 5%	2.04
S0	5.79
S1	7.10
S2	6.46
BNJ 5%	tn

Numbers followed by the same letter in the same column are not significantly different at the 5% BNJ level.

The data observed shows that the application of guano fertilizer has a significantly different effect on the dry weight yield of pagoda mustard plants. The data above shows that the application of guano fertilizer at a dose of 5 g/plant had a significantly higher effect compared to the application of guano fertilizer at doses of 0 g/plant and 10 g/plant. Meanwhile, the application of poc super bionik at concentrations of 0 ml/L, 2 ml/L, and 4 ml/L had no effect on the dry weight of pagoda mustard plants.

3.6 Vitamin C Content Test

The analysis of variance in Table 7 shows that the observed data on guano fertilizer and Poc Super Bionik application did not interact. Meanwhile, the application of guano fertilizer and Poc Super Bionik had a significant effect on the vitamin C test variable, as presented in Table 10.

Table 10 explains the observed data, showing that the interaction between guano fertilizer application and Poc concentration has a significant effect on the vitamin C test in pagoda mustard plants. The treatment of applying 5 g of guano fertilizer per plant and a concentration of 2 ml/L of water of Poc Super Bionik with the code (G1S1) had a significantly higher effect compared to other treatment combinations. The nutrients contained in guano fertilizer and Poc Super Bionik can meet the needs and influence the vitamin C test results of pagoda mustard plants.

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Table 10. Average Effect of Guano and Poc Super Bionik Fertilizer Application on Vitamin C Content Test

Vitamin C	
Treatment	**Vitamin C**
G0	10.65 a
G1	16.09 b
G2	14.28 ab
BNJ 5%	4.58
S0	10.98 a
S1	15.84 b
S2	14.21 ab
BNJ 5%	4.58

Numbers followed by the same letter in the same column are not significant in the BNJ 5% test

Element N for protein (P) formation to improve skin and meat color , fruit hardness, and vitamin C. Needs and affects crop yields. Guano fertilizer contains more phosphorus nutrients than other nutrients. This explains that phosphorus plays an important role in plant metabolism, energy production, and also positively influences root growth because the expansion of plant roots increases the amount of nutrients absorbed, thereby promoting growth and production of plants and making them better.[16] .

3.7 Harvest Index

The results of the analysis of variance in Table 7 show that there was no interaction between the application of guano fertilizer and the concentration of poc super bionik. The application of guano fertilizer and poc super bionik had no significant effect on all observation periods. This is presented in Table 11.

Table 11. Average Effect of Guano Fertilizer and Poc Super Bionik on the Harvest Index

Harvest Index	
Treatment	**Harvest Index**
G0	0.45
G1	0.50
G2	0.52
BNJ 5%	tn
S0	0.48
S1	0.50
S2	0.49
BNJ 5%	tn

Numbers followed by the same letter in the same column are not significantly different in the 5% BNJ test

Table 11 shows that the data observed in the application of guano fertilizer and poc super bionik concentration showed no interaction, and the application of guano fertilizer at a dose of 10 g/plant produced the highest harvest index of 0.52 compared to other treatments. The application of super bionic poc at a concentration of 2 ml/L produced the highest harvest index with an average of 0.50 compared to other treatments.

3.8 Discussion

According to the results of the analysis of variance shown in the table, the application of guano fertilizer had a significant effect on plant height at 35 days after planting, the number of leaves at 28 and 35 days after planting, wet weight, dry weight, and vitamin C content. The application of POC Super Bionik on pagoda mustard plants showed a significant effect on plant height, number of leaves, wet weight, and vitamin C test[17] . Table 2 shows that guano fertilizer treatment with a dose of 0 g/plant resulted in the lowest plant growth with a height of 8.217 cm. while the POC Super Bionik treatment with a concentration of 4 ml/L of water produced the best plant growth with a height of 9.50 cm. Conversely, guano fertilizer at 10 g/plant produced the highest number of leaves (39.426). The POC Super Bionik treatment with a water concentration of 4 ml/L also produced the highest number

of leaves (38.89) at 35 days after planting. Table 6 shows the results of the study indicating that doses of 5 g/plant s of guano fertilizer and POC Super Bionik had no effect on the leaf area of pagoda mustard. A dose of 5 g/plant of guano fertilizer produced the lowest leaf area of 4.146 cm2, while a dose of 2 ml/L of POC Super Bionik produced the lowest leaf area of 4.146 cm2. Table 8 shows that guano fertilizer at a dose of 10 g/plant increased the wet weight of the plant compared to other methods. At a water concentration of 4 ml/L, POC Super Bionik produced the highest wet weight, averaging 73.83 g[18] . A dose of 5 g/plant produced a greater dry weight than doses of 0 g/plant and 10 g/plant, according to the analysis of variance in Table 7. However, the application of POC Super Bionik at concentrations of 0 ml/L, 2 ml/L, and 4 ml/L had no effect on plant dry weight. Pagoda mustard plants fertilized with 10 g/plant of guano and 2 ml/L of POC Super Bionik (code G2S1) produced higher levels of vitamin C than other treatment combinations, as shown in Table 10. This indicates that the nutrients in guano and POC Super Bionik help increase vitamin C levels in plants. There was no relationship between guano fertilizer and POC Super Bionik in terms of harvest index, as indicated by the results of the analysis of variance in Table 11. However, the use of guano fertilizer at a dose of 10 g/plant produced the highest harvest index (0.536), and the use of POC Super Bionik at a water concentration of 0 ml/L also produced the highest harvest index, with an average of 0.54.

4 Conclusion

The application of Guano Fertilizer and Super Bionic POC on pagoda mustard plants showed no significant interaction in affecting plant height, number of leaves, leaf area, harvest index, wet weight, dry weight, and vitamin C test. However, the application of guano fertilizer had a significant effect on the observed variables of plant height at 35 days after sowing (DAS), number of leaves at 28 and 35 DAS, wet weight, dry weight, and vitamin C test, while it had no significant effect on the other variables. The highest number of leaves was achieved with guano fertilizer at 10 g/plant and POC Super Bionik at 4 ml/L. Leaf area and harvest index were not significantly affected by either treatment. Guano fertilizer significantly affected plant dry weight, with 5 g/plant producing higher dry weight compared to 0 g/plant and 10 g/plant. POC Super Bionik significantly affected plant wet weight, with 4 ml/L producing the highest wet weight. Guano fertilizer and POC Super Bionik affected vitamin C content, with the combination of 10 g/plant and 2 ml/L producing the highest vitamin C levels.

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