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Growth and yield response of cucumber (Cucumis sativus L.) To administering bokashi fertilizer and cow manure

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ABSTRACT

This research was carried out in the experimental field of the Faculty of Agriculture, Indonesian Community Development University (UPMI), Medan. Jalan Waqf, Pasar 12, Marindal 2, Patumbak District, Deli Serdang Regency, at a height of 40 m above sea level in May–July 2023. The experimental design used in this research was a factorial randomized group design (RAK) consisting of two factors. namely Factor I: Provision of Bokasi Fertilizer (B), which consists of 3 levels, namely: B0 = 0 (control), B1 = 4 tons/ha (8 kg/plot), and B2 = 6 tons/ha (12 kg/plot). Factor II: Provision of Cow Manure (K), which consists of 3 levels, namely: K0 = 0 kg/plot; 0 gr/plant; K1 = 2.5 kg/plot; 416.6 gr/plant, K2 = 3.5 kg/plot ; 583, 3 gr/plant. The parameters observed were plant height (cm), number of fruits per sample plant (fruit), fruit weight per sample plant (g), and stem diameter (mm). The results of the study showed that the single effect of giving cow manure had a significant effect on plant height at the age of 2 WAP and the number of fruit in the second harvest, but had no significant effect on plant height at the age of 1 WAP, 3 WAP, number of fruit in the I harvest, III harvest, weight. fruit in harvests I, II, and III, as well as fruit diameter in harvests I, II, and III; The single effect of giving cow manure had a significant effect on plant height at the age of 2 WAP and the number of fruit at harvest II, but had no significant effect on plant height at age 1 WAP, 3 WAP, number of fruit at harvest I, harvest III, weight of fruit at harvest. I, II, and III, as well as fruit diameter at harvest I, II, and III; The interaction effect of giving bokashi fertilizer and cow manure on the growth and development of cucumber plants had a significant effect on plant height at 2 days after planting, number of fruit at harvest II, and fruit weight at harvest II, but had no significant effect on plant height at 1 day after planting. 3 WAP, number of fruit in harvests I and III, fruit weight in harvests I and III, and fruit diameter in harvests I, II, and III.

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1. INTRODUCTION

The cucumber plant (Cucurmis sativus L.) is a type of vegetable from the gourd family which is widely cultivated throughout the world.(Toding et al., 2021). Cucumber production results In Indonesia, cucumber farming is mostly still considered a side business, so the average production

yield is still low, namely between 3.5-4.8 tonnes/ha. Seeing that the large demand for cucumbers nationally is not directly proportional to the production results which are still said to be low(Astuti & Respatie, 2022).

In the process of plant growth and development, there are 2 factors that influence the process of plant growth and development. These factors are internal factors in the form of genetics and hormones and external factors in the form of light, temperature, water and soil. An important environmental factor for growth is the planting medium. Good planting media will provide optimal growth for plants(Saijo et al., 2021).

The need for cucumbers in Indonesia tends to continue to increase in line with population growth, increasing living standards, education levels and public awareness of the importance of nutritional value. Cucumber cultivation on a long and intensive production scale has not been widely carried out, in general cucumber plants are planted only as intercrops. So the researchers saw that the production results had not been achieved so they added bokashi fertilizer and cow manure(Ivana et al., 2021).

In this case it can be seen that cultivation of cucumber plants is still rarely done, so cucumber production is said to be low. Therefore, a solution is needed to overcome the low production of cucumbers by using bokashi fertilizer as a solution that can be done to increase the production of cucumber plants. Bokashi was first popularized in Japan as an organic fertilizer that can be made quickly and effectively. The terminology bokashi is taken from a Japanese term which means gradual change. Meanwhile, to make bokashi fertilizer, EM4 is needed, which is a type of decomposer microorganism as the basic ingredient for bokashi fertilizer. Bokashi is an organic fertilizer whose use does not damage soil fertility because it is environmentally friendly, apart from being affordable and can be made by farmers themselves. This is in line with the statement(E, 2013)which states that bokashi increases the availability of N, P and K nutrients for plant growth. To make bokashi fertilizer, what is prepared is the beneficial bacterial inoculant Effective Microorganism 4 (EM4) which functions as a bokashi decomposer. By using EM4, making bokashi fertilizer can be faster than usual. In other words, organic fertilizer using EM4 is often called Bokashi fertilizer(Andriani et al., 2021).

Providing bokashi fertilizer has a significant effect on plant growth and fruit weight compared to using manure. Using bokashi fertilizer mixed with NPK fertilizer produces 3 times more fruit weight per hectare than using manure mixed with NPK fertilizer. Beneficial microorganisms and other organic compounds contained in bokashi fertilizer can increase the diversity and activity of microbes in the soil, thereby increasing nutrients and supporting plant growth.(Fitriany & Abidin, 2020).

Cow manure is an organic fertilizer that is useful for improving the physical, chemical and biological properties of soil. Because it comes from organic material which contains all kinds of elements, this fertilizer also contains almost all elements (both micro and micro). However, the availability of these elements is usually in small quantities(Dewanti et al., 2021). Manure is processed livestock manure that has gone through a fermentation period and will be given to agricultural land to improve soil fertility and structure. The nutrients contained in manure depend on the source of the raw material. Livestock manure is rich in nitrogen and metallic minerals, such as magnesium, potassium and calcium. However, the main benefit of manure is that it maintains the physical structure of the soil so that roots can grow well(Sumbayak, 2022). This is in line with opinion(Dewanti et al., 2021)that cow manure is an organic fertilizer that is useful for improving the physical, chemical and biological properties of soil. Because it comes from organic material which contains all kinds of elements, this fertilizer also contains almost all elements (both micro and micro). However, the availability of these elements is usually in small quantities.

Cow manure is an organic fertilizer that has a relatively higher P content than other manures and functions as a provider of macro and micro nutrients. These nutrient levels depend on the food given. Apart from that, the cow dung is mixed with the remains of the cow's food and the husks used as bedding for the cow pen. In several studies, cow manure gives better results at first planting because cow manure decomposes easily and has sufficient nutrient content compared to other manure.(Hariyadi et al., 2021).

2. METHOD

This research was carried out at the experimental field of the Faculty of Agriculture, Indonesian Community Development University (UPMI) Medan. Jalan Waqf, Pasar 12, Marindal 2,

Patumbak District, Deli Serdang Regency with a height of 40 m above sea level in May-July 2023. The tools used in this research include: hoe, bucket, machete, gembor, tape measure, ropes, bamboo calipers, writing tools, books and other tools that support this research; Meanwhile, the materials used in this research include cucumber seeds, bokasi fertilizer, cow manure and other materials that support this research.

This research was carried out using the factorial Randomized Block Design (RAK) method which consisted of 2 factors, namely the administration of Bokasi fertilizer and Cow Manure fertilizer, where each treatment was repeated 3 (three) times. Factor I: Provision of Bokasi Fertilizer (B) which consists of 3 levels, namely: B0 = 0 (Control), B1 = 4 Tons / ha (8 Kg / Plot); B2 = 6 Tons / ha (12 Kg/Plot); Factor II: Provision of Cow Manure (K) which consists of 3 levels, namely: K0= 0 Kg / Plot; 0 gr / plant, K1 = 2.5 Kg / Plot ; 416.6 gr / plant, K2 = 3.5 Kg / plot ; 583.3 gr/plant. So, for the accuracy of this research, this research was repeated 3 times so that the number of experimental units was 9 x 3 = 27 experimental units.

3. RESULTS AND DISCUSSION

Based on the results of research carried out in the field, data was obtained based on the parameters of plant height (cm), number of fruit per sample plant (fruit), fruit weight per sample plant (g), stem diameter (mm), with treatment with bokashi fertilizer and cow manure . From the results of the ANOVA test, the various treatments that had a significant effect were continued with the Duncan DMRT test at the 5% level.

3.1 Plant Height (cm)

The following are the results of the analysis of plant height according to the treatment of Bokashi (B) fertilizer which had a significant effect on observations at 2 WAP, but had no real effect on observations at 3 WAP. It can be seen in the following table.

Table1. Average plant height when applied with Bokashi fertilizer at the age of 2 and 3 WAP

Treatment	Plant Height (cm)	
Bokashi Fertilizer (B)	2 mst	3 mst
B0	36.74 a	157.00
B1	150.50 d	160.07
B2	138.70 BC	117.67

Note: Numbers followed by different lowercase letters in columns indicate very significant differences at the 5% test level (DMRT)

Table 1 above can be seen that there is an increase each time the bokashi fertilizer is applied to plant height at the age of 2 and 3 WAP. It can be said that applying bokashi fertilizer at level B1 = 14 Tons / ha (8 Kg/Plot) gives the highest average yield compared to levels B0 = 0 (Control) and B2 = 6 Tons / ha (12 Kg/Plot) . This is in accordance with opinion(Fitriany & Abidin, 2020)that the use of bokashi fertilizer on plants can increase plant growth because the nutrients needed by plants can be fulfilled. Bokashi fertilizer is a type of organic fertilizer made from organic materials that are fermented with the help of microorganisms. Bokashi fertilizer has several important functions in agriculture and environmental maintenance, including: increasing soil fertility, improving soil quality, increasing soil microbial life, reducing organic waste, reducing the use of chemical fertilizers, increasing plant productivity, controlling plant diseases, and restoring polluted soil. The graph of the average plant height at the ages of 2 and 3 WAP can be seen in Figure 1. Meanwhile, the results of the treatment of giving cow manure had a very significant effect on observations at 2 WAP. Data on average plant height when applied with cow manure can be seen in table 2 and figure 2.

Table 2. Average plant height when given cow manure at the age of 2 and 3 WAP

Treatment	Plant Height (cm)	
Cow Manure (K)	2 mst	2 mst
K0	73.90 a	116.87
K1	101.91 BC	172.07
K2	129.10 d	166.83

Note: Numbers followed by different lowercase letters in columns indicate very significant differences at the 5% test level (DMRT)

Table 2 above can be seen that there was an increase in each treatment of giving cow manure at the age of 2 and 3 WAP. It can be said that the application of cow manure (K) to plant height at

the level K1 = 2.5 Kg / Plot; 416.6 gr / plant gives the highest average yield compared to the level K0 = 0 Kg / Plot; 0 gr / plant and K2 = 3.5 Kg / plot ; 583.3 gr/plant. Due to the influence or response to plant growth, it is suspected that the macro nutrients contained in bokashi fertilizer influence and support plant vegetative growth. Likewise, the nutrient content contained in the planting medium also supports the growth of cucumber plants(Ahmad, 2020).

Nutrients that are around the root surface can be absorbed by plants through two processes, namely the active process and the selective process. This is in accordance with the opinion of (Advinda, 2018) which states that if the plant gets enough nutrients it will result in photosynthesis taking place well, so it is necessary to add more organic material to the plant tissue and plant growth will be better. Flowering, fertilization and seeds are important events in the production of cultivated plants. These processes are controlled both by the environment, especially photoperiod and temperature, as well as by genetic or internal factors, especially growth regulators resulting from photosynthesis and the supply of mineral nutrients, for example nitrogen.

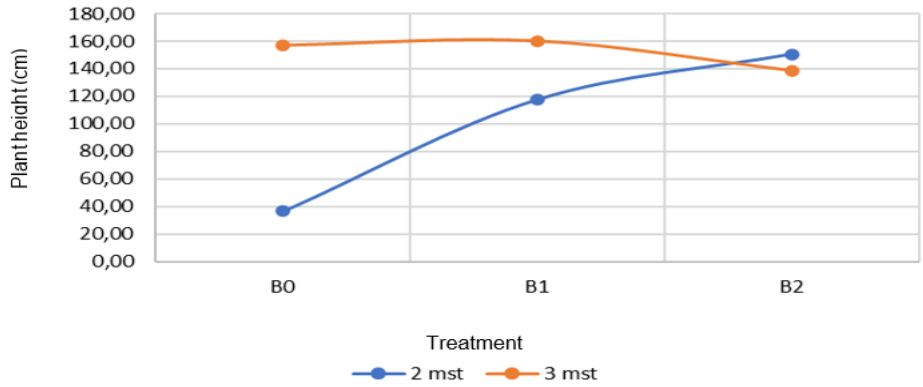

Figure 1. Graph of average plant height against the application of bokashi fertilizer (B)

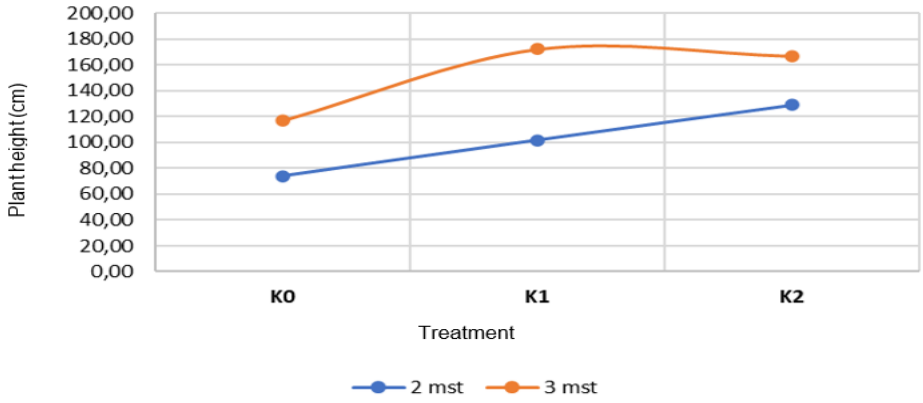

Figure 2. Graph of average plant height against the application of cow manure (K)

3.2 Number of Fruits (fruit)

The following are the results of the analysis of the number of fruits (fruit) according to the treatment of bokashi fertilizer which had a significant effect on the observations. It can be seen in the following table.

Table 3. Average number of fruit for bokashi fertilizer application

Treatment Bokashi Fertilizer (B)	Number of Fruits (fruit)
B0	3886.67 a
B1	4183.85 b
B2	4487.33 c

Note: Numbers followed by different lowercase letters in columns indicate very significant differences at the 5% test level (DMRT)

Table 3 above can be seen that there are significant differences in each level of bokashi fertilizer application on the number of fruits. It can be said that applying bokashi fertilizer at level B2 = 6 Tons / ha (12 Kg/Plot) gives the highest results in observing the number of fruit compared to levels B0 = 0 (Control) and B1 = 14 Tons / ha (8 Kg/ Plot). Based on the research results, it is clear that at each growth phase, different fertilizer requirements are required. This is in accordance with several research results showing that the higher the level of fertilizer given, the higher the nutrient content received by the plant, likewise, the more frequently fertilizer is given to plants, the higher the nutrient content.(Ahmad, 2020). The graph of the average number of fruit can be seen in Figure 3. Meanwhile, the results of the treatment of giving cow manure (K) did not have a significant effect on the observation of the number of fruit. Data on the average number of fruit for giving cow manure can be seen in table 4 and figure 4.

Table 4. Average number of fruit for cow manure

Treatment Cow Manure (K)	Number of Fruits (fruit)
K0	3590.52
K1	4830.67
K2	4136.67

Table 4 above can be seen that there is a significant influence on the provision of cow manure on observing the number of fruit. It can be said that the application of cow manure (K) to the number of fruit at the level K1 = 2.5 Kg / Plot; 416.6 gr / plant gives the highest average yield compared to the level K0 = 0 Kg / Plot; 0 gr / plant and K2 = 3.5 Kg / plot ; 583.3 gr/plant.

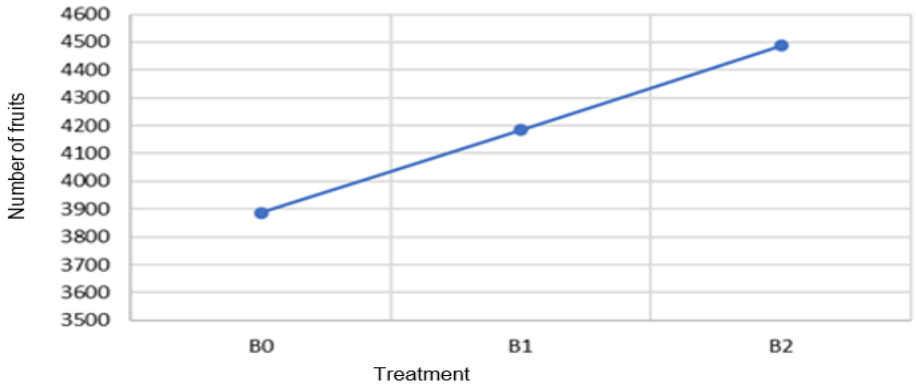

Figure 3. Graph of the average number of fruit against the application of bokashi fertilizer

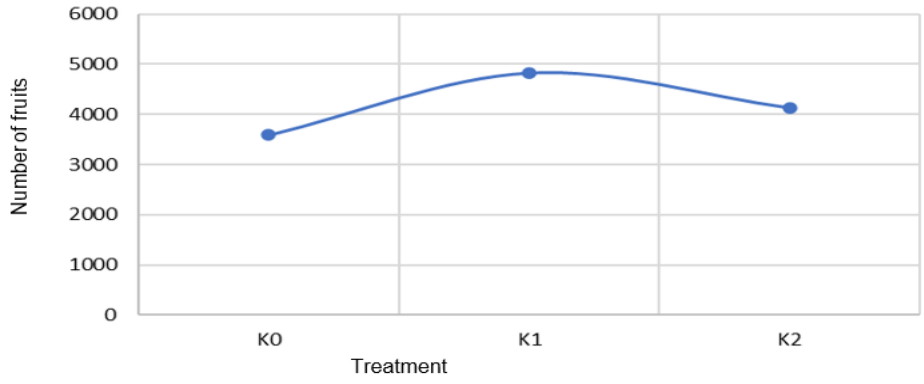

Figure 4. Graph of the average number of fruit compared to the provision of cow manure

3.3 Fruit Diameter (mm)

The following are the results of the analysis of fruit diameter according to the treatment of bokashi fertilizer which did not have a significant effect on the observation of fruit diameter, this is

in line with the statement(Fajri et al., 2021)that the application of municipal waste bokashi showed no real effect on the diameter of cucumber fruit. The results of the analysis of fruit diameter according to the treatment of bokashi fertilizer can be seen in the following table.

Table 5. Average fruit diameter when applying bokashi fertilizer

Treatment Bokashi Fertilizer (B)	Fruit Diameter (mm)
B0	157.34
B1	176.14
B2	458.32

Table 5 above can be seen that there are significant differences in each level of bokashi fertilizer application on fruit diameter. It can be said that applying bokashi fertilizer at level B2 = 6 Tons / ha (12 Kg/Plot) gives the highest results in observing fruit diameter compared to levels B0 = 0 (Control) and B1 = 14 Tons / ha (8 Kg/ Plot). The graph of the average fruit diameter can be seen in Figure 5. Meanwhile, the results of the treatment with cow manure (K) did not have a significant effect on the observation of fruit diameter. Data on average fruit diameter for cow manure application can be seen in table 6 and figure 6.

Table 6. Average fruit diameter when applying cow manure

Treatment Cow Manure (K)	Fruit Diameter (mm)
K0	137.55
K1	189.88
K2	464.37

Table 6 above can be seen that there is a significant influence on the application of cow manure on observing fruit diameter. It can be said that the application of cow manure (K) affects fruit diameter at levelsK2 = 3.5 Kg / plot ; 583.3 gr / plant gives the highest average yield compared to the level K0 = 0 Kg / Plot; 0 gr / plant and K1 = 2.5 Kg / Plot ; 416.6 gr/plant.

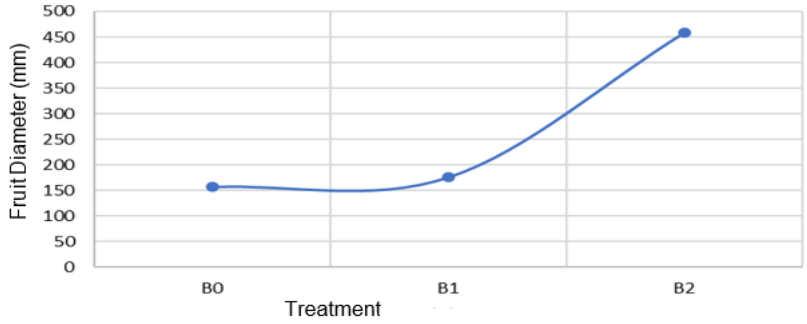

Figure 5. Graph of average fruit diameter against bokashi fertilizer application

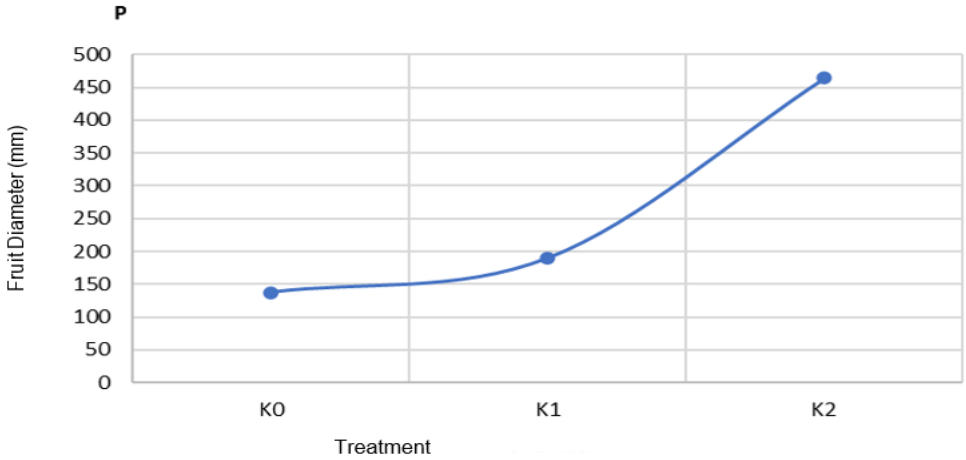

Figure 6. Graph of average fruit diameter against cow manure application

3.4 Fruit Weight Per Sample Plant (g)

The following are the results of the analysis of fruit weight according to the treatment of bokashi fertilizer which did not have a significant effect on the observation of fruit weight (g). This is in line with the statement(Rahma & Masrury, 2021)that the results of the analysis of various treatments of Cow Manure, Coconut Fiber POC and the interaction between the two had no significant effect on the fruit weight of cucumber plants. The results of the fruit weight analysis according to the bokashi fertilizer treatment can be seen in the following table.

Table 7. Average fruit weight when applying bokashi fertilizer

Treatment Bokashi Fertilizer (B)	Fruit Weight per Sample Plant (g)
B0	3590.52
B1	4830.67
B2	4136.67

Table 7 above can be seen that there are significant differences in each level of bokashi fertilizer application on fruit weight. It can be said that applying bokashi fertilizer at level B1 = 14 Tons / ha (8 Kg/ Plot) gives the highest results in observing fruit weight compared to levels B0 = 0 (Control) and B2 = 6 Tons / ha (12 Kg/Plot). According to Hafizah and Mukarrah (2017) in(Ahmad, 2020)The use of cow manure in the cultivation of cayenne pepper (Capsicum annum L.) in lowland swamp land with a dose of cow manure of 15 tons per ha gives the best results in terms of fruit weight. This is of course related to the role of goat manure in improving the soil structure to make it loose so that soil aeration becomes better. Good soil structure is important for plant growth and development because it influences soil aerase, root penetration and soil resistance to erosion which can be obtained if soil aggregation is well formed.(Marsuhendi et al., 2021). According to(Saptorini, 2018)that organic matter in the soil is very beneficial for the development of micro organisms. The graph of the average fruit weight can be seen in Figure 7. Meanwhile, the results of the treatment with cow manure (K) did not have a significant effect on the observation of fruit weight. Data on average fruit weight for cow manure application can be seen in table 8 and figure 8.

Table 8. Average fruit weight on cow manure application

Treatment Cow Manure (K)	Fruit Weight per Sample Plant (g)
K0	3886.67
K1	4183.85
K2	4487.33

Table 8 above can be seen that there is a significant influence on the provision of cow manure during observationsfruit weight. It can be said that the application of cow manure (K) to fruit weight at the level of K2 = 3.5 Kg / plot; 583.3 gr / plant gives the highest average yield compared to the level K0 = 0 Kg / Plot; 0 gr / plant and K1 = 2.5 Kg / Plot ; 416.6 gr/plant.

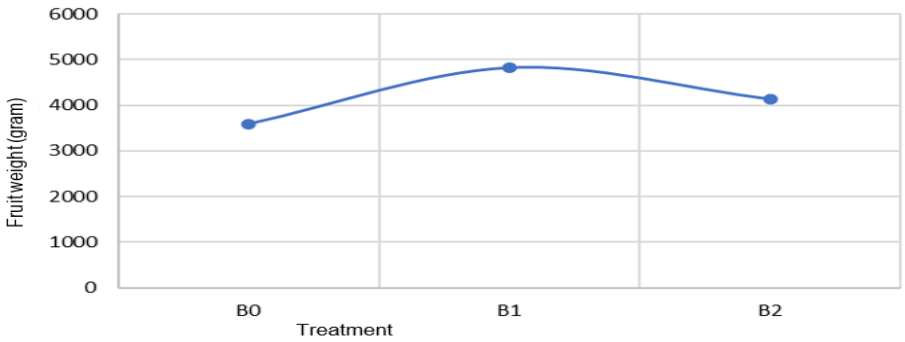

Figure 7. Graph of average fruit weight against bokashi fertilizer application

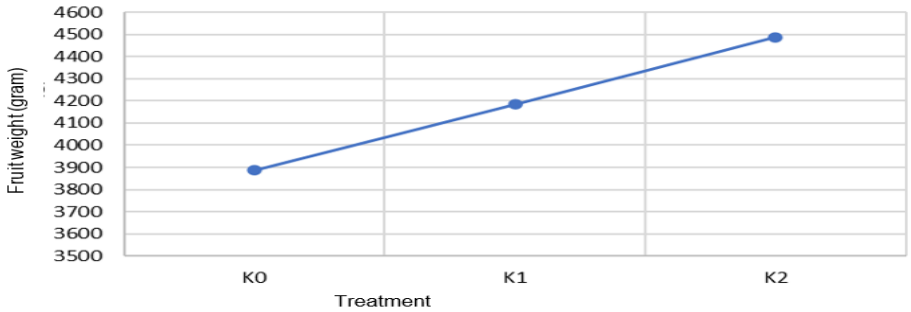

Figure 8. Graph of average fruit weight against cow manure application

4. CONCLUSION

From the results of this research, it can be concluded that Influencesingle application of bokashi fertilizer had a significant effect on plant height at the age of 2 WAP, number of fruit, but had no significant effect on plant height at the age of 1 WAP, 3 WAP, fruit weight and fruit diameter; The single effect of giving cow manure had a significant effect on plant height at the age of 2 WAP, but had no significant effect on plant height at the age of 1 WAP, 3 WAP, number of fruit, fruit weight and fruit diameter; and The interaction effect of giving bokashi fertilizer and cow manure on the growth and development of cucumber plants has a significant effect on plant height at the age of 2 WAP, but has no significant effect on plant height at the age of 1 WAP, 3 WAP, number of fruit, fruit weight and fruit diameter.

Further research is necessary Pay attention to the time of fertilization, the dose given, both in the vegetative phase and in the generative phase so that it can provide better results for the growth and development of cucumber plants.

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