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RESPONSE TO APPLYING COW DUNG BOKASHI FERTILIZER AND LIQUID ORGANIC FERTILIZER HOUSEHOLD WASTE TOWARD GROWTH AND PRODUCTION CUCUMBER PLANTS (Cucumi sativus L.)

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Abstract.

Cucumber (Cucumis sativus L.) has a very high economic value because cucumbers are widely consumed by people, so the need for cucumbers continues to increase every year. The nutritional value of cucumbers is quite good because this vegetable or fruit is a source of minerals and vitamins. The purpose of the study was to determine the application of cow dung bokashi fertilizer and liquid organic fertilizer for household waste and its interaction with the growth and production of cucumber plants. This research method uses a Factorial Randomized Group Design (RAK), which consists of 2 (two) factors. The first factor is the application of cow dung bokashi fertilizer which is divided into 4 levels, namely S0 = 0.00 kg/plot (control), S1 = 2.16 kg/plot S2 = 4.32 kg/plot, and S3 = 6.48 kg/plot. The second factor is that liquid organic fertilizer household waste is divided into 4 levels, namely L0 = 0 cc/liter of water/plant (control), L1 = 100 cc/plant, L2 = 200 cc/plant, and L3 = 300 cc/plant. The parameters observed are plant length (cm), number of fruits per sample (fruit), number of fruits per plot (fruit), fruit diameter (cm), fruit length per plot (cm), fruit weight per sample (grams) and fruit weight per plot (grams). From the results of statistical analysis, it shows that the application of cow dung bokashi fertilizer and liquid organic fertilizer from household waste does not affect plant length (cm), but has an influence on the number of fruits per sample (fruit), the number of fruits per plot (fruit), the diameter of the fruit (cm), the length of the fruit per plot (cm) the weight of the fruit per sample (grams, and the weight of the fruit per plot (grams). The interaction of the treatment of applying organic fertilizer bokashi cow dung and liquid organic fertilizer household waste has no effect on plant length (cm), number of fruits per sample (fruit), number of fruits per plot (fruit), fruit diameter (cm), fruit length per plot (cm), fruit weight per sample (grams) and fruit weight per plot (grams)

Keywords: Fertilizers, bokashi, cow dung, organics, waste, cucumbers.

INTRODUCTION

Cucumber is one of the types of vegetables that are popular with the public. One type of cucumber that has high economic value and is sought after is cucumber (Cucumis sativus L.) so the need for cucumbers continues to increase. The nutritional value of cucumbers is quite good because this fruit vegetable is a source of minerals and vitamins. Cucumber fruits contain

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saponins, proteins, fats, calcium, phosphorus, iron, sulfur, and vitamins A, B1, and C. Unripe cucumbers lower body heat, also increase stamina. The content of 100 g of cucumber consists of 15 calories, 0.8 g of protein, 0.19 g of starch, 3 g of carbohydrates, 30 mg of phosphorus, 0.5 mg of iron, 0.02 g of titanium, 0.05 g of riboflavin, 14 mg of acid (Wijoyo, 2012).

In Indonesia, the prospects for the cultivation of cucumber plants are very good because Cucumbers are much loved by the public. Generally consumed cucumbers in fresh processed form such as pickles, pickles, salads and lalap in addition to the purpose of cucumber consumption can also be used as a cosmetic ingredient and Treatment. The nutritional value of cucumbers is quite good because this fruit vegetable is a sources of minerals and vitamins (Muttaqin, 2010).

The cucumber is one type of vegetable that is quite popular in almost all countries. Cucumber comes from the highlands of the Himalayas and by this time its cultivation is already widespread throughout the tropics. In Indonesia, cucumbers are widely grown in Java and Sumatra. Advances in the field of beauty technology reveal that cucumbers can be used as cosmetic ingredients for beauty treatments by being processed using modern technology. From an economic point of view, cucumbers have fairly good prospects because they are in demand in many countries (Zulyana, 2011).

Bokashi is a type of fertilizer that can replace the presence of chemical (inorganic) fertilizers in increasing soil fertility while repairing physical, chemical, and biological damage to the soil due to excessive use of fertilizers. Bokashi is the result of the fermnettation of organic matter from agricultural waste (manure, rice straw, and sawdust husks) using EM4 (Gao et al., 2021).

Waste treatment technology until now has not been able to overcome problems in waste management and treatment, especially household waste. In addition to the quite expensive costs and very difficult implementation, the thoughts and assumptions of most people that disposing of the household waste directly into the environment or burning it around the house will not have a serious impact on health (Riswan, et al., 2011).

Based on the above to produce the cucumbers that consumers expect, and increase knowledge in cucumber cultivation, the author conducted a study with the title **"Response of Applying Bokashi Fertilizer to Cow Dung and Household Waste Liquid Organic Fertilizer to Cucumber Plant Growth and Production (Cucumis sativus L.) "**

LITERATURE REVIEW

Cucumber Plant Classification

According to (Wijoyo, 2012) cucumbers can be classified as follows :

Kingdom : Plantae
Division : Spermatophyta
Subdivision : Angiosperms
Class : Dicotyledonae
Family : Cucurbitaceae
Genus : Cucumis
Species : Cucumis sativus L

Morphology of cucumber plants

The cucumber plant (Cucumis sativus L.) is a vegetable commodity that has begun to enter the export market, as a vegetable in the form of fresh fruit. The spread and production of cucumbers in Indonesia from year to year continue to increase (Wijoyo, 2012).

Root
The root is the place where minerals (nutrients) enter the soil to all parts of the plant. Cucumbers have a taproot and root hairs, but their penetrating power is relatively shallow, that is, at a depth of about 30-60 cm. Therefore cucumbers include sensitive to the lack and excess of moisture (Wijoyo, 2012)

Trunk
The stems of cucumber plants are creeping or climb with the intermediary of the holders in the form of a volute (spiral). The stems are wet, hairy as well as bookish. The length or height of the plant can reach 50-250 cm, branching and creeping that grow on the side of the petiole (Wijoyo, 2012)

Leaf
The leaves are single leaves, interspersed, long-stemmed and green. It is wide round, heart-like in shape, and the tips of the leaves are tapered and the edges of the leaves are jagged. 7-18 cm long, and 7-15 cm wide, these leaves grow crisscrossed out of the books (internodes) of the stem (Wijoyo, 2012).

Flower
Cucumber flowers are yellow, trumpet-shaped, and small in size with a length of 2-3 cm. Flowers consist of flower stalks, 5 petals, green in color, slender in shape, and are at the bottom of the base of the flower, the corolla of hand flowers 5-6 pieces, bright yellow in color, and spherical in shape. Cucumber flowers that have bloomed with a diameter between 30-35 mm (Manalu,2013).

Fruit
The young fruits of cucumbers have a varied colors of the skin of the fruit. Among them are green, dark green, light green, whitish-green to white, and tergantug varieties. Similarly, the length and diameter of the fruit vary between 12-15 cm with a diameter of 2-5 cm depending on the variety (Manalu, 2013).

Seed
Cucumber seeds are white to yellowish-white, oval-shaped, and flattened. Cucumber seeds are covered with mucus and attached, neatly arranged, and in large quantities. These seeds can be used as seeds (Wijoyo, 2012).

Bokashi Cow dung Fertilizer
Bokashi is a type of fertilizer that can replace the role of chemical (inorganic) fertilizers in adding and maintaining soil fertility and repairing physical, biological, and chemical damage to the soil caused by excessive fertilization processes. In addition, cow fecal bokation can provide benefits in providing macronutrients and micronutrients for plants. Based on the source of organic matter, there are several types of bokashi fertilizer that can be applied by farmers, namely, cage bokashi fertilizer, bokashi from straw, and charcoal cage bokashi fertilizer (Raksun, 2018).

Liquid Organic Fertilizer Household

Waste Household waste is waste consisting mainly ofeasily rotting litter, as it consists of the remnants of food stuffs,vegetables, fruit peels, wrapping marks, and food processing waste. Household waste is also defined as a material that is wasted as the result of human activities that do not yet have economic value and can even have a negative economic value because it pollutes the environment. Garbage It comes from a residential or residential environment, either in an urban area as well as rural. This waste is generally in the form of kitchen waste such as leftover fruits, wrapping paper, plastic, cans, and so on (Sofyan, 2012).

MATERIALS & METHODS

Time and Place

This research was conducted in Jati Utomo village, North Binjai district, Binjai city, North Sumatera province. The height of the place ± 28 meters above sea level. This implementation is carried out from January to March 2021.

Materials and Tools

The materials to be used in this study are cucumber seeds, cow dung bokashi fertilizer, bran, rice straw, started, urea, household waste liquid organic fertilizer, EM4, water, granulated sugar, vegetable waste, fruit-Boban peel, and top soil.

The tools to be used in this study are hoes, croquet, machetes, wood, plastic ropes, meters, drills, cameras, stationery, and others.

Trial Method

This study used a Factorial Randomized Group Design (RAK), which consisted of 2 treatment factors, 16 treatments, and 3 tests, namely:

The factor I is Cow Dung Bokashi Fertilizer (S)

S0 = 0.00 kg/plot (control)

S1 = 2.16 kg/plot

S2 = 4.32 kg/plot

S3 = 6.48 kg/plot

Factor II is Household Waste Liquid Organic Fertilizer (L)

L0 = 0 cc/plant (control)

L1 = 100 cc/plant

L2 = 200 cc/plant

L3 = 300 cc/plant

Combination of treatments:

S_0L_0	S_1L_0	S_2L_0	S_3L_0
S_0L_1	S_1L_1	S_2L_1	S_3L_1
S_0L_2	S_1L_2	S_2L_2	S_3L_2
S_0L_3	S_1L_3	S_2L_3	S_3L_3

Statistical Analysis

Data Analysis Methods

The data analysis methods used in this study to conclude using a linear model assumed for Factorial Group Randomized Design (RAK) are:

$$\acute{Y}ijk = \mu + \rho i + \alpha j + \beta k + (\alpha\beta)jk + \varepsilon ijk$$

Ýijk = The results of observations on the i-th block, the factor of applying cow dung bokashi fertilizer to the j level, and household waste to the k level

μ = Mediate-value effect

ρ i = The effect of the i- block

αj = The effect of the treatment of cow dung bokashi fertilizer level ke- j

βk = Effects of the treatment of liquid organic fertilizer of household waste k-level

(αβ)jk = The interaction effect of the treatment of cow dung bokashi fertilizer of the j level and the liquid organic fertilizer of household waste of the k level

εijk = Error effect on i-th block, factor of cow dung bokashi fertilizer j and liquid organic fertilizer household waste level k (Hanafiah, 2010).

RESULT

Plant Length (cm)

Table 1. Average Plant Length (cm) of Cucumbers Due to the Response to Applying Bokashi Fertilizer Cow Manure (S) and Liquid Organic Fertilizer Household Waste (L)

Treatment	Plant Length (cm)	
Bokashi Cow dung (S)		
S0 = 0.0 kg/plot	133.7	aA
S1 = 2.16 kg/plot	141.4	aA
S2 = 4.32 kg/plot	144.2	aA
S3 = 6.48 kg/plot	146.1	aA
Household Waste (L)		
L0 = 0 cc/plant	135.3	aA
L1 = 100 cc/plant	135.6	aA
L2 = 200 cc/plant	136.1	aA
L3 = 300/plant	158.4	aA

Description: The numbers in the same column followed by the same letter mean that they are not real differences at the level of 5% (lowercase) and at the level of 1% (uppercase)

Table 1 can be explained that the response to applying the longest cucumber plant long cow dung bokashi fertilizer was found in the S3 treatment = 6.48 kg/plot which was 146.1 cm, and the shortest was found in the S0 treatment = 0.0 kg/plot which was 133.7 cm. The response to the application of liquid organic fertilizer for household waste, the longest length of cucumber plants was found in the L3 treatment = 300 / plant, which was 158.4 cm and the shortest was found in the L0 treatment = 0 cc/plant, which was 135.3 cm.

Number of Fruits per Sample (fruit)

Table 2. Average Number of Fruits per Sample (fruit) of Cucumber Plants Due to Application of Bokashi Fertilizer Cow Dung (S) and Liquid Organic Fertilizer Household Waste (L)

Treatment	Number of Fruits per Sample (fruit)	
Bokashi Cow dung (S)		
S0 = 0.00 kg/plot	6.8	bA
S1 = 2.16 kg/plot	6.9	bA
S2 = 4.32 kg/plot	6.9	bA
S3 = 6.48 kg/plot	7.6	aA
Household Waste (L)		
L0 = 0 cc/plant	6.8	bA
L1 = 100 cc/plant	6.8	bA
L2 = 200 cc/plant	7.0	abA
L3 = 300/plant	7.6	aA

Description: The numbers in the same column followed by unequal letters mean that they are significantly different at the 5% level (lowercase) and differ very noticeably at the 1% level (uppercase)

From Table 2 above, it can be explained that the response to applying cow dung bokashi fertilizer influences the number of fruits per sample (fruit) of cucumber plants, where the highest number of fruits per sample of cucumber plants is found in the S3 treatment = 6.48 kg/plot, which is 7.6 pieces which are significantly different from the S2 treatment = 4.32 kg/plot which is 6.9 pieces, S1 treatment = 2.16 kg/plot which is 6.9 pieces, and treatment S0 = 0.00 kg/plot i.e. 6.8 pieces. S2 treatment = 4.32 kg/plot i.e. 6.9 pieces differs unnoticeably from S1 treatment = 2.16 kg/plot i.e. 6.9 pieces, and S0 treatment = 0.00 kg/plot i.e. 6.8 pieces.

Treatment S1 = 2.16 kg/plot i.e. 6.9 pieces differs unnoticeably from treatment S0 = 0.00 kg/plot i.e. 6.8 pieces

Fruit Weight per Sample (grams)

Table 6. Average Fruit Weight per Sample (g) of Cucumber Plants Due to Application of Bokashi Fertilizer Cow Dung (S) and Liquid Organic Fertilizer Household Waste (L)

Treatment	Fruit Weight per Sample (grams)	
Bokashi Cow dung (S)		
S0 = 0.00 kg/plot	163.542	bB
S1 = 2.16 kg/plot	171.875	bAB
S2 = 4.32 kg/plot	187.500	bA
S3 = 6.48 kg/plot	270.833	aA
Household Waste (L)		
L0 = 0 cc/tanaman	162.500	bA
L1 = 100 cc/tanaman	169.792	abA
L2 = 200 cc/tanaman	204.167	aA
L3 = 300/tanaman	257.292	aA

Description: The numbers in the same column followed by unequal letters mean that they are significantly different at the 5% level (lowercase) and differ very noticeably at the 1% level (uppercase)

Table 6 above can be explained that the response of applying cow dung bokashi fertilizer has an influence on fruit weight per sample (gram) of cucumber plants, where the weight of the fruit per sample (gram) of the heaviest cucumber plants is found in the S3 treatment = 6.48 kg/plot which is 270,833 grams which are significantly different from the S2 treatment = 4.32 kg/plot which is 187,500 grams, and the S1 treatment = 2.16 kg/plot which is 171,875 grams, however, it differs very markedly from the treatment S0 = 0.00 kg/plot which is 163,542 grams. The treatment of S2 = 4.32 kg/plot i.e. 187,500 grams differs unnoticeably from the treatment of S1 = 2.16 kg/plot which is 171,875 grams but differs markedly from the treatment of S0 = 0.00 kg/plot i.e. 163.542 grams. The treatment S1 = 2.16 kg/plot i.e. 171.875 grams differs insignificantly from the treatment S0 = 0.00 kg/plot i.e. 1163.542 grams.

Fruit Weight per plot (kg)

Table 7. Average Fruit Weight per Plot (kilograms) of Cucumber Plants Due to Application of Bokashi Fertilizer Cow Dung (S) and Liquid Organic Fertilizer Household Waste (L)

Treatment	Fruit Weight per Sample (g)	
Bokashi Cow dung (S)		
S0 = 0.00 kg/plot	0.750	bB
S1 = 2.16 kg/plot	0.869	bAB
S2 = 4.32 kg/plot	0.954	bA
S3 = 6.48 kg/plot	1.338	aA
Household Waste (L)		
L0 = 0 cc/plant	0.819	bA
L1 = 100 cc/plant	0.842	bA
L2 = 200 cc/plant	0.908	bA
L3 = 300/plant	1.342	aA

Description: The numbers in the same column followed by unequal letters mean that they are significantly different at the 5% level (lowercase) and differ very noticeably at the 1% level (uppercase)

Table 7 above can be explained that the response to applying cow dung bokashi fertiliz influence on fruit weight per plot (kilogram) of cucumber plants, where the weight of fruits (kg) of the heaviest cucumber plants is found in the S3 treatment = 6.48 kg/plot which kilograms which are significantly different from the S2 treatment = 4.32 kg/plot which kilograms, and the S1 treatment = 2.16 kg/plot which is 0.832 kilograms, however, it dif markedly with the treatment S0 = 0.00 kg/plot which is 0.796 kilograms. The treatment of S kg/plot i.e. 0.917 kilograms is not really different from the treatment S1 = 2.16 kg/plot which kilograms, but it is significantly different from the treatment S0 = 0.00 kg/plot which kilograms. The treatment S1 = 2.16 kg/plot i.e. 0.832 kilograms differs insignificantly treatment S0 = 0.00 kg/plot i.e. 0.796 kilograms.

DISCUSSION

Response of Bokashi Manure Fertilizer Application to Cucumber Plant Growth and Production (Cucumis sativus L.)

The long growth of cucumber plants indicates sluggishness to growth from the treatment of cow dung bokashi fertilizer. At the doses given, macronutrients Nitrogen, Phosphore, and Potassium are not yet available, causing the leaves to turn yellow and there is no photosynthesis in the high growth of cucumber plants (Tufaila, 2013).

Sadjadi et al., (2017), stated that when Nitrogen is given in sufficient quantities to plants, the need for such as Phosphore increases to keep up with the high growth rate of plants quickly, whereas the availability of nutrients contained in the compost is neither more nor deficient so that plant growth is faster and optimal.

Cow dung is a waste product from the digestive tract of animals in the form of feces that contain very high nitrogen, manure has a chemical content in the form of Nitrogen 0.4-1%, Phosphorus 0.2 -0.5%, Potassium 0.1-1.5%, Water Content 85,-92% and several other nutrients (Ca, Mg, Mn, Fe, Cu, Zn) (Dewi et. al, 2017).

In addition, cow fecal bokashi can provide benefits in providing macro nutrients and micronutrients for plants, can, improve soil structure, improve soil physique, and loosen the soil, thereby facilitating root growth in plants in the absorption of elements and nutrients (Efendi et.al, 2017).

Response of Household Waste Liquid Organic Fertilizer Application to Cucumber Plant Growth and Production (Cucumis sativus L.)

The response to the application of liquid organic fertilizer to household waste has an unreal influence on plant length (cm). This causes slow growth to occur at 100% fertilizer levels due to excessive fertilizer levels that are applied, causing acidic soil pH. Plants fed with excessive doses of fertilizer will damage the plant.

According to (Sofyan, 2012) Household waste is waste consisting of waste that is easy to rot, such as the remains of foodstuffs, vegetables, and fruit peels that are discarded and no longer used. So that it can be used and processed into liquid compost. The processing of household waste into liquid compost that will be studied is vegetable waste (mustard greens, cabbage, bean sprouts, kale, and tomatoes) and fruit peels (bananas and pineapples).

Interaction of Response to Application of Bokashi Fertilizer Cow Manure and Liquid Organic Fertilizer of Household Waste to Cucumber Plant Growth and Production (Cucumis sativus L.)

Based on the results of statistical analysis, it is known that the interaction between the application of cow dung bokashi fertilizer and liquid organic fertilizer household waste on the growth and production of cucumber plants (Cucumis sativus L.) does not influence the parameters of plant length (cm), number of fruits per sample (fruit), number of fruits per plot (fruit), fruit diameter (cm), fruit length per plot (cm) fruit weight per sample (grams, and fruit weight per plot (grams).

The treatment interaction between the type of cow dung bokashi fertilizer and the dose of liquid organic fertilizer of household waste did not give any noticeable results, it is suspected that each of the levels of treatment factors did not interact with each other.

CONCLUSION

From the results of the research and discussion carried out, it can be concluded as follows:

The application of cow dung bokashi fertilizer does not affect the length of the plant (cm), but influences the number of fruits per sample (fruit), the number of fruits per plot (fruit),

the diameter of the fruit (cm), the length of the fruit per plot (cm) the weight of the fruit per sample (g), and the weight of the fruit per plot (g).

The application of liquid organic fertilizer from household waste shows an unreal influence on plant length parameters (cm), but influences the number of fruits per sample (fruit), the number of fruits per plot (fruit), the diameter of the fruit (cm), the length of the fruit per plot (cm) the weight of the fruit per sample (g), and the weight of the fruit per plot (g).

The interaction of the application of cow dung bokashi fertilizer and liquid organic fertilizer of household waste has no effect on plant length (cm), number of fruits per sample (fruit), number of fruits per plot (fruit), fruit diameter (cm), fruit length per plot (cm) fruit weight per sample (g), and fruit weight per plot (g).

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