

Growth response and production of cucumber plants (Cucumis sativus L.) due to the application of cow manure and SP-36 fertilizer

Faris Yanto Laia¹, Rahmaniah Harahap², Dora Silvia Dewi³

^{1,2,3}Department of Agrotechnology, Faculty of Agriculture, Universitas Pembinaan Masyarakat Indonesia, Medan, Indonesia

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ABSTRACT

Cucumber (*Cucumis sativus* L.) is a horticultural plant from the gourd family that is widely known in various countries. This research will be carried out in the practicum area of the Faculty of Agriculture, Indonesian Community Development University (UPMI), Medan. Jalan Wakaf, Pasar 12, Marendal, Patumbak Kampung, Deli Serdang, with an altitude of ± 40 m above sea level. It will be carried out from June to August 2023. This research design uses a randomized group design (RAK) with two factor treatments, namely: Factor I: Giving Cow Manure (P), consisting of 3 levels of treatment, namely: P0: without giving fertilizer cow pen; P1: dose of cow manure 10 tons/ha equivalent to 1 kg/plot; and P2: dose of cow manure 20 tons/ha equivalent to 2 kg/plot. Factor II: Application of SP-36 (S) fertilizer consists of 3 treatment levels, namely: S0: without SP-36 fertilizer (S0), S1: SP-36 fertilizer concentration 10 grams per plot, and S2: SP-36 fertilizer concentration 20 grams per plot. Based on the research conducted, it can be concluded that the single effect of giving cow manure on the number of leaves of cucumber plants is significantly different at the ages of 6 WAP and 8 WAP but is not significantly different at the ages of 1 WAP and 4 WAP, plant height, and plant fruit production. samples and root volume. The single effect of giving SP-36 fertilizer was not significantly different on plant height, number of leaves, fruit production of the sample plants, and root volume. The interaction effect of giving cow manure and SP-36 fertilizer was significantly different on the number of leaves at the age of 6 WAP but was not different. real at the ages of 2 WAP, 4 WAP, and 8 WAP, plant height, fruit production of sample plants, and root length.

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Corresponding Author:

Faris Yanto Laia

Department of Agrotechnology, Faculty of Agriculture, Universitas Pembinaan Masyarakat Indonesia

Jl. Teladan No.15, Teladan Bar., Kec. Medan Kota, Kota Medan, Sumatera Utara 20214

Email: farisyantolaia@gmail.com

1. INTRODUCTION

Indonesia is a fertile country and rich in agricultural and plantation products. The existing potential can be a source of income for the people of Indonesia. Many Indonesians make the agricultural sector a source of livelihood. In addition, this agricultural sector can provide markets and raw materials for production for the industrial sector and generate foreign exchange that can be used for development (Isbah & Iyan, 2016).

Cucumber plants (*Cucumis sativus* L.) is one type of vegetable from the pumpkin family that has been widely cultivated almost throughout the world (Toding *et al.*, 2021). In Indonesia, cucumber farming is still mostly considered a side business, so the average production is still low, which is between 3.5-4.8 tons / ha. Seeing the large demand for cucumbers nationally which is not directly proportional to production yields which are still said to be low (Astuti & Respatie, 2022).

In the process of plant growth and development, there are 2 factors that affect the process of growth and development in plants. 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 growing medium. Good planting media will provide optimal growth in plants (Saijo *et al.*, 2021).

The need for cucumber fruit in Indonesia tends to continue to increase in line with population growth, improvement in living standards, level of education and public awareness of the importance of nutritional value (Rubatzky & Yamaguchi, 2012). Cucumber cultivation on a long and intensive production scale has not been widely done, in general cucumber plants are planted only as salingan plants. So the researchers saw from the production results that had not been achieved so they added bokashi fertilizer and cow manure (Ivana *et al.*, 2021).

Cucumber (*Cucumis sativus* L) is one of the horticultural crops is a horticultural plant from the pumpkin family that has been widely known in various countries. Cucumber has various benefits and uses in terms of beauty and medicine. Cucumber production in Indonesia for 4 years has decreased, namely in 014 by 477,989 tons, in 015 by 447,696 tons, in 016 by 430,218 tons, and in 017 by 424,918 tons (BPS, 018). This is because cultivation activities in the field still have many obstacles and low selling prices. Constraints in cultivation activities experienced by farmers are starting from seed procurement, plant maintenance, harvest and post-harvest handling, and low land productivity (Amen, 2018).

Some cultivation efforts to increase cucumber production can be done through fertilization. According to Arlyani *et al.*, (2022) Fertilization carried out must pay attention to the preservation of nature and the environment. Organic fertilizer is good for long-term use because it can loosen the soil and increase the water retention capacity of the soil, so that soil fertility is maintained. At the same time, although synthetic chemical fertilizers react quickly, they will harden the soil and decrease soil fertility in the long run.

According to Wibowo *et al.*, (2016) Manure is one of the organic fertilizers derived from animal manure of livestock mammals. Manure contains nutrients and can also function as an enhancer of organic matter and play a role in improving the physical properties of the soil to make it more friable. Biochar and cow manure have the ability to retain water in the soil so as to help prevent nutrient loss due to leaching (*leaching*).

Cow manure is an organic fertilizer that is useful for improving the physical, chemical and biological properties of the soil. Because it comes from organic matter that contains all kinds of elements, this fertilizer also contains almost all elements (both mikro and mikro). It's just that, the availability of these elements is usually in small quantities (Dewanti *et al.*, 2021). Manure is processed manure of livestock that has gone through the 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 raw material impurities. Manure of cattle is rich in nitrogen, and metallic minerals, such as magnesium, potassium and calcium. This is in line with opinion Goddess (2018) which says that cow dung is a waste product from the digestive tract of animals in the form of feces that contain very high nitrogen, cow dung has 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).

Cow manure is an organic fertilizer that has a relatively higher P content than other manure and functions as a provider of macro and micro nutrients. This nutrient content depends on the food given. In addition, in the cow dung mixed with the remnants of cow food and husks used as a base for cowsheds. In some studies, cow manure gives better results at the first planting because cow manure is easily decomposed and has sufficient nutrient content when compared to other manure (Hariyadi *et al.*, 2021).

Based on the description in the background above, the author is interested in examining the effect of applying cow manure and SP-36 fertilizer on the growth and production of cucumber plants and at what doses cucumber plants grow well.

2. METHOD

This research was carried out in the experimental field of the Faculty of Agriculture, Indonesian Community Development University (UPMI) Medan. Waqf road, market 12, Marindal 2, Patumbak District, Deli Serdang Regency with an altitude of 40 m above sea level in May-July 2023. The tools used in the research are hoes, machetes, buckets, sprayers, raffia ropes, gauges, bamboo, tugal, watering buckets, stationery, wood, and other tools needed; while the materials used in this study were Harmony Plus variety cucumber seeds, cow manure, and SP36 fertilizer and ingredients that support the growth of cucumber plants.

This study was conducted using the factorial Group Random Design (RAK) method consisting of 2 factors, namely the application of Bokasi fertilizer and Cow Manure, where each treatment was repeated 3 (three) times. Factor I: Cow Manure (P), consists of 3 treatment levels, namely: P0: without cow manure, P1: dose of cow manure 10 tons/ha equivalent to 1 kg/plot, P2: dose of cow manure 20 tons/ha equivalent to 2 kg/plot; Factor II: SP-36 (S) fertilizer consists of 3 treatment levels, namely: S0: without SP-36 fertilizer, S1: SP-36 10gram / plot, S2 : SP-36 20gram / plot. So for the accuracy of this study, this study was repeated 3 times so that the number of experimental units was $9 \times 3 = 27$ experimental units. The parameters observed in this study are Plant Length (cm), Number of leaves (strands), Fruit production (g), and Root Volume (mm).

After the research data is obtained, data analysis will be carried out using a factorial random group design (RAK) with the formula:

$$Y_{ijk} = \mu_0 + \rho_i + \alpha_j + \beta_k + (\alpha\beta)_{jk} + \epsilon_{ijk}$$

Information:

- Y_{ijk} : Observation results from experimental plots that received j-level treatment and k-level II factors and were placed in the i-th repetition
 μ_0 : Effect of middle value (NT) / general average
 ρ_i : Influence of the i-th group
 α_j : Influence of factor I j-level
 β_k : Influence f actor II k-th level
 $(\alpha\beta)_{jk}$: Effect of combined treatment between factor I level j and factor II level k
 ϵ_{ijk} : Effect of error due to factor I of j-th level and factor II of k-th level placed in i-th group

Data analysis for the fingerprint test is used to test the effect of treatment on the tested parameters. If it shows a real effect, then a further test is carried out with Duncan's Multiple Range Test (DMRT) at a significance level of 95%.

3. RESULTS AND DISCUSSION

The results of Cow Manure (P) and SP-36 (S) Fertilizer on the growth of Cucumber plants (*Cucumis sativus* L.) with the observed parameters Plant Length (cm), Number of leaves (strands), Fruit production (g), and Root Volume (mm) are described as follows:

3.1 Plant Length (cm)

The following results of the analysis of plant length according to the treatment of cow manure (P) had no real effect on the observation of 2, 4, 6, and 8 mst. The average length of the plant can be seen in table 1.

Table 1. Average Length of Plants Against Cow Manure Application

Treatment	Plant Length (cm)			
	2 mst	4 mst	6 MST	8 mst
P0	51,50	96,22	208,00	283,89
P1	53,39	111,94	208,78	295,00
P2	56,67	115,83	226,56	292,22

Table.1 above can see an increase in each time of application of cow manure to plant length at the age of 2, 4, 6, and 8 mst. It can be said that the application of cow manure at the level of P1 = 1 kg / plot gives the highest average yield compared to the level of P0 = without the application of cow manure and P2 = 2 kg / plot. While the results of SP-36 fertilizer treatment did not have a real effect on plant length observations. Data on the average length of plants affected by SP-36 fertilizer application, can be seen in table 2.

Table 2. Average Length of Plants Against Fertilizer Application SP-36

Treatment	Plant Length(cm)			
	2 mst	4 mst	6 MST	8 mst
S0	51,94	106,44	205,22	290,56
S1	53,39	106,67	219,44	291,11
S2	56,22	110,89	218,67	289,44

Table.2 above can show an increase in each treatment of SP-36 fertilizer application at the age of 2, 4, 6, and 8 mst. It can be said that the application of SP-36 (S) manure to the length of the plant at the level of S2 = SP-36 20gram/ plot gave the highest average yield on plant length observations at 2 and 4 mst compared to the level S0 = 0 gr / plant and S1 = SP-36 10gram/ plot. While at the age of 6 and 8 mst the application of SP-36 (S) fertilizer to plant length at the level of S1 = SP-36 10gram/ plot gives the highest average yield on observation of plant length compared to grade S0 = 0 gr / plant and S2 = SP-36 20gram/ plot. The influence or response of plant growth, it is suspected that macronutrients contained in bokashi fertilizer affect and support plant vegetative growth. Similarly, the nutrient content contained in the growing media, also supports the growth of cucumber plants (Ahmad, 2020).

Nutrients that have been around the surface of the roots can be absorbed by plants through two processes, namely the active process and the selective process. This is in accordance with the opinion (Advinda, 2018) which suggests that if plants obtain enough nutrients will cause photosynthesis to take place properly, it is necessary to add more organic matter to plant tissues and plant growth becomes better. Flowering, fruiting and seeds are important events in the production of cultivated plants. These processes are controlled both by the environment, especially the photoperiod and temperature, as well as by genetic or internal factors, especially the growth regulators of photosynthesis and the supply of mineral nutrients, such as nitrogen.

3.2 Number of Leaves (strands)

Observation of the number of leaves is carried out by counting the entire number of perfectly open leaves in the sample plant. Leaf count observations began when plants were 2 mst, 4 mst, 6 mst and 8 mst in Table 3. From the results of statistical tests, the effect of single application of cow manure had a significant effect on the number of leaves at the age of 6 mst and 8 mst, but did not have a real effect on the age of 2 mst and 4 mst. The single effect of SP-36 fertilizer application did not differ markedly on the number of leaves on the observation of the number of leaves.

Table 3. The Average Number of Leaves Against The Application of Cow manure

Treatment	Number of Leaves (strands)			
	2 mst	4 mst	6 MST	8 mst
P0	7,67	20,22	35.78 b	67.22 b
P1	7,78	18,89	50.44 ab	81.33 AB
P2	7,67	19,67	54.89 a	94.11 a

Noted : Numbers followed by unequal lowercase letters in the column show a very noticeable difference at the 5% test level (DMRT)

Table.3 above can see a significant difference in each difference in the level of application of cow manure to the number of leaves. It can be said that the application of bokashi fertilizer at the level of P2 = 2 kg/plot gives the highest results on the observation of the number of leaves compared to the level P0 = without the application of cow manure and P1 = 1 kg/plot. Based on the results of the study, it is clear that at each phase of growth, different fertilizer needs are needed. This is in accordance with several research results showing that the higher the fertilizer given, the higher the nutrient content received by plants, as well as the more often fertilizer is applied to plants, the higher the nutrient content (Ahmad, 2020). While the results of SP-36 (S) fertilizer treatment did not have a real effect on the observation of the number of leaves. Data on the average number of leaves against SP-36 fertilizer application, can be seen in table 4.

Table 4. The Average Number of Leaves Against The Application of SP-36 Fertilizer

Treatment	Number of Leaves (strands)			
	2 mst	4 mst	6 MST	8 mst
S0	8,00	19,33	46,56	81,67
S1	7,33	20,33	44,78	81,89
S2	7,78	19,11	49,78	79,11

Table.4 above can be seen a significant effect on the application of SP-36 fertilizer on the observation of the number of leaves. It can be said that the application of SP-36 (S) fertilizer to the number of leaves at the level of $S_0 = 0$ gr / plant gives the highest average yield compared to the level of $S_1 =$ SP-36 10 grams / plot and $S_2 =$ SP-36 20 grams / plot.

3.3 Fruit Production (g)

Observation of fruit production is carried out by weighing the amount of fruit weight at harvest on sample plants. Observations of fruit production carried out at harvests 1, 2, and 3 can be seen in Table 5. From the results of statistical tests, the effect of applying cow manure has no real effect on fruit production, data on average fruit production.

Table 5. Average Fruit Production Against Cow Manure Application

Treatment	Fruit Production (fruit)		
	Harvest 1	Harvest 2	Harvest 3
P0	427,78	466,67	1077,78
P1	344,44	577,78	1177,78
P2	588,89	722,22	1166,67

Table.5 above can show that there are significant differences in each harvest for each level of cow manure application to fruit production. It can be said that the application of cow manure at the level of $P_2 = 2$ kg / plot gives the highest results on the observation of fruit production compared to the level of $P_0 =$ without the application of cow manure and $P_1 = 1$ kg / plot. While the results of SP-36 (S) fertilizer treatment did not have a real effect on the observation of fruit production. Data on the average fruit production of SP-36 fertilizer application can be seen in table 6.

Table 6. Average Fruit Production Against SP-36 Fertilizer Application

Treatment	Fruit Production (fruit)		
	Harvest 1	Harvest 2	Harvest 3
S0	466,67	566,67	1322,22
S1	505,56	566,67	1177,78
S2	388,89	633,33	922,22

Table.6 above can show a significant influence on the application of SP-36 fertilizer on fruit production observations. It can be said that the application of SP-36 (S) fertilizer to fruit production at the level of $S_1 =$ SP-36 10 grams / plot gives the highest average yield compared to $S_0 = 0$ gr / plant and $S_2 =$ SP-36 20 grams / plot.

3.4 Root Volume (ml)

Observation of root volume carried out at the final harvest after harvest can be seen in table 7. From the results of statistical tests, a single effect of applying cow manure has no real effect on the volume of roots.

Table 7. The Average Volume of Roots Against The Application Of Cow Manure

Treatment	Root Volume (ml)
P0	43,33
P1	37,22
P2	44,00

Table.7 above can show a significant difference in each difference in the level of application of cow manure to the volume of roots. It can be said that the application of cow manure at the level of $P_2 = 2$ kg/plot gives the highest results on fruit weight observations compared to the level $P_0 =$ without the application of cow manure and $P_1 = 1$ kg/plot. According to Hafizah and Mukarrah (2017) in (Ahmad, 2020) The use of cow manure in the cultivation of cayenne pepper plants (*Capsicum annum* L.) in lebak swampland with a dose of cow manure of 15 tons per ha gives the best results on fruit weight. This is certainly related to the role of goat manure in improving soil structure to become loose so that soil aerase becomes better. Good soil structure is important for plant growth and development because it affects soil aerase, root penetration as well as soil resistance to erosion that 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 favorable for the development of microorganisms. While the results of SP-36 (S) fertilizer treatment did not have a real effect on the observation of root volume. Data on the average volume of roots against SP-36 fertilizer application, can be seen in table 8.

Table 8. Average Volume of Roots Against Application of Fertilizer SP-36

Treatment	Root Volume (ml)
S0	34,33
S1	41,33
S2	48,89

Table.8 above can be seen a significant influence on the application of SP-36 fertilizer on the observation of root volume. It can be said that the application of SP-36 (S) fertilizer to root volume at the level of S2 = SP-36 20 grams / plot gives the highest average yield compared to S0 = 0 gr / plant and S1 = SP-36 10 grams / plot

4. CONCLUSION

From the results of this study, it can be concluded that The single effect of cow manure application on the number of leaves of cucumber plants was significantly different at the age of 6 mst and 8 mst, but did not differ markedly at the age of 1 mst, and 4 mst, plant height, fruit production of sample plants and root volume. Single application of SP-36 fertilizer did not differ markedly from plant height, number of leaves, fruit production of sample plants, and root volume. The effect of the interaction of cow manure and SP-36 fertilizer was significantly different on the number of leaves at the age of 6 mst, but did not differ significantly at the age of 2 mst, 4 mst and 8 mst, plant height, fruit production of sample plants and root length.

SUGGESTION

Before applying SP-36 fertilizer or cow manure, conduct a soil test first. This test will provide information about the nutrients required by your plants so that you can properly regulate the dose of fertilizer. Apply cow manure and SP-36 fertilizer in a timely manner according to the plant growth cycle. Applying fertilizer when plants need it can optimize crop yields.

REFERENCES

- Ahmad, F. (2020). Pengaruh Pemberian Dosis Pupuk Bokasi terhadap Pertumbuhan dan Hasil Tanaman Mentimun. *BIOEDUSAINS:Jurnal Pendidikan Biologi Dan Sains*, 3(2), 102–110. <https://doi.org/10.31539/bioedusains.v3i2.1657>
- Amin, A. R. (2018). Mengenal Budidaya Tanaman Mentimun Melalui Pemanfaatan Media Informasi. *Jupiter*, 14(1), 66–71.
- Arlyani, F., Rustianti, S., & Purwanto, A. (2022). Budidaya Tanaman Mentimun (Cucumis Sativus.L) Pada Media Tanam Arang Sekam Bakar. *Jurnal Pengabdian Masyarakat Bumi Raflesia*, 5(1), 832–836. <https://doi.org/10.36085/jpmbr.v5i1.1868>
- Astuti, W. Y., & Respatie, D. W. (2022). Kajian Senyawa Metabolit Sekunder pada Mentimun (*Cucumis sativus* L.). *Vegetalika*, 11(2), 122. <https://doi.org/10.22146/veg.60886>
- Dewanti, A. P., Munawaroh, A., & Karenina, A. (2021). Profil Penggunaan Pupuk Organik terhadap Tingkat Kesuburan Tanah dan Hasil Panen Sebagai Referensi Media Pembelajaran IPA Terpadu. *Proceeding of Integrative Science Education Seminar (PISCES)*, 1, 441–448.
- Dewi, W. W. (2018). RESPON DOSIS PUPUK KANDANG KAMBING TERHADAP PERTUMBUHAN DAN HASIL TANAMAN MENTIMUN (*Cucumis sativus* L.) VARIETAS HIBRIDA. *VIABEL: Jurnal Ilmiah Ilmu-Ilmu Pertanian*, 10(2), 11–29. <https://doi.org/10.35457/viabel.v10i2.140>
- Hariyadi, H., Sih Winarti, & Basuki, B. (2021). Kompos dan pupuk organik cair untuk pertumbuhan dan hasil cabai rawit (*Capsicum frutescens*) di tanah gambut. *Journal of Environment and Management*, 2(1), 61–70. <https://doi.org/10.37304/jem.v2i1.2660>
- Isbah, U., & Iyan, R. Y. (2016). Analisis Peran Sektor Pertanian dalam Perekonomian dan Kesempatan Kerja di Provinsi Riau. *Jurnal Sosial Ekonomi Pembangunan, Tahun VII(19)*, 45–54.
- Ivana, T., Martini, M., & Christine, M. (2021). Pengaruh Pemberian Jus Mentimun Terhadap Tekanan Darah Pada Lansia Hipertensi Di Pstw Sinta Rangkang Tahun 2020. *Jurnal Keperawatan Suaka Insan (Jksi)*, 6(1), 53–58. <https://doi.org/10.51143/jksi.v6i1.263>
- Marsuhendi, R., Okalia, D., & Sasmi, M. (2021). PENGARUH PEMBERIAN BERBAGAI PUPUK KANDANG TERHADAP PERTUMBUHAN DAN PRODUKSI TANAMAN MENTIMUN (*Cucumis sativus* L.) PADA TANAH ULTISOL. *Jurnal Green Swarnadwipa*, 10(2), 300–306.
- Rubatzky, V. E., & Yamaguchi, M. (2012). *World vegetables: principles, production, and nutritive values*. Springer Science & Business Media.
- Saijo, S., Alfianto, F., & Saputera, D. A. (2021). Efektifitas Aplikasi Pupuk Kandang Ayam dan Bokashi

- Kayambang terhadap Pertumbuhan dan Hasil Mentimun (*Cucumis sativus* L.) di Lahan Berpasir
Effectiveness of Chicken Manure and Bokashi Kayambang Application on Growth and Yield of
Cucumber (*Cucumis sativus*). *Jurnal Planta Simbiosis*, 3(2), 2021.
- Saptorini, S. (2018). MENTIMUN (*Cucumis sativus* L.) PADA KOMBINASI PERLAKUAN BHOKASHI DAN
PUPUK NPK. *Jurnal Agrinika: Jurnal Agroteknologi Dan Agribisnis*, 2(1), 27–40.
<https://doi.org/10.30737/agrinika.v2i1.399>
- Toding, A., Tanan, A., & Thana, D. P. (2021). Respon Tanaman Mentimun (*Cucumis sativus* L.) Terhadap
Pemberian Bokashi Jerami Padi. 12, 83–94.
- Wibowo, W. A., Hariyono, B., & Kusuma, Z. (2016). Terhadap Pencucian Nitrogen Tanah Berpasir. 3(1), 269–
278.