

Growth and Yield Response of Cucumber (*Cucumis Sativus* L.) Plants Due to Coffee Grounds and NPK Fertilizer Application

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Abstract: Cucumber plants originate from Asia, many mention the origin of cucumber plants in North Asia, cucumbers are included in the cucurbit family (Cucurbitaceae). The purpose of this study was to see the provision of coffee grounds compost and NPK and to see the interaction of the two treatments tested. This study used a Randomized Block Design (RAK) consisting of 2 treatment factors on cucumber plants which were repeated 3 times. The first factor is coffee grounds compost with 4 treatment levels, namely: K_0 = control, K_1 = 150 gr / polybag, K_2 = 300 gr / polybag and K_3 = 450 gr / polybag. The second factor is NPK with 4 treatment levels, namely: N_0 = control, N_1 = 2 gr / polybag, N_2 = 4 gr / polybag and N_3 = 6 gr / polybag. Data analysis used analysis of variance (ANOVA). The results of the study stated that the best provision of coffee grounds compost was at K_3 = 450 gr/polybag for all parameters tested, while the best provision of NPK was at N_2 = 4 gr/polybag for all parameters tested. The results of the interaction of the combination of providing coffee grounds compost in the treatment with a concentration of K_3 = 450 gr/polybag and providing NPK in the treatment N_3 = 6 gr/polybag (K_3N_3) had a significant effect on the fruit length parameter with an average root length of 23.77 cm.

Keywords: coffee, compost, NPK, growth, cucumber.

1. Introduction

Cucumbers originate from Asia, with many citrons locating North Asia as their origin. Cucumbers belong to the gourd family (*Cucurbitaceae*). Cucumbers are annual plants that grow by climbing. Cucumbers (*Cucumis sativus* L.) are considered early-maturing (fast-growing) plants, as they can be harvested 60 to 70 days after planting. Besides their early maturity, cucumbers are a popular vegetable crop (Lestari, 2022). Besides being used as a vegetable and food supplement, cucumbers also offer numerous health and beauty benefits. Cucumbers are also quite nutritious, as they are a source of vitamins and minerals needed by the body for smooth digestion and healthy skin. Per 100 grams of cucumber contains 15 grams of calories, 0.8 grams of protein, 0.1 grams of starch, 3 grams of carbohydrates, 30 mg of iron, and vitamins A, B1, and B2 (Lestari, 2022).

Using coffee grounds as an organic fertilizer can increase the productivity of plants such as cucumbers. Coffee grounds contain various essential nutrients, such as nitrogen, phosphorus, potassium, and magnesium, which are essential for plant growth. Furthermore, coffee grounds help improve soil texture, improve water retention, and encourage the activity of soil microorganisms that play a role in the decomposition process. Their use as an organic fertilizer sustainably improves soil fertility (Akmal, 2024). In addition to using organic coffee grounds, inorganic fertilizers such as Mutiara NPK are also needed to provide a sufficient supply of N, P, and K to the soil. Applying NPK fertilizer containing N, P, and K will support plant growth and production. The composition of nutrients contained in NPK 16:16:16 compound fertilizer means 16% nitrogen (N) 16% Phosphorus Oxide (P_2O_5), 16% Potassium Oxide

(K²O), 1.5% Magnesium Oxide (MgO), 5% Potassium Oxide (CaO) (Sinaga 2012). NPK 16:16:16 fertilizer has several advantages, including its slow-dissolving nature so it can reduce the loss of macro and micro nutrients due to leaching, evaporation, and absorption by soil colloids (Herdiman, 2021).

2. Literature Review

For optimal growth, cucumber plants thrive in soil temperatures between 18-30°C. Temperatures below or above this range will result in suboptimal growth. However, for seed germination, the optimal temperature required is between 25-35°C. Light is a crucial factor in cucumber growth. Nutrient absorption will be optimal if lighting lasts 8-12 hours per day. The relative humidity required for cucumber growth is between 50-85%. Meanwhile, the optimal rainfall for this vegetable is between 200-400 mm per month (Ahmad, 2022).

Coffee grounds themselves have potential because they contain nutrients needed by plants. The agronomic relationship between coffee grounds as an organic material and plants is expected to raise awareness among urban communities about using coffee grounds as fertilizer. Farming with these organic grounds is not only healthier and more environmentally friendly, but also supports sustainable Indonesian agriculture, moving towards organic farming on a national scale (Pakpahan *et al.*, 2023).

In addition to organic fertilizers, inorganic fertilizers are also needed to meet the chemical properties of the soil, such as adding nutrients available in the soil. However, excessive use of inorganic fertilizers will have an impact on the decline in soil quality and the environment. One type of inorganic fertilizer commonly used in plant cultivation is NPK Mutiara 16:16:16 fertilizer (Kaharuddin *et al.*, 2016).

3. Method

This experiment was conducted on the Blang Bintang field. This research will be conducted from February to April 2025, at the Abulyatama Faculty of Agriculture, Aceh Besar. The tools used in this study were a hoe, scissors, a watering can, a scale, a tarp, a bucket, a measuring tape, wood, rope, 10 kg polybags, stationery, and a camera for documentation. The materials used in this study were Zatavy F1 cucumber seeds, Mutiara NPK fertilizer, EM4, coffee grounds obtained from coffee shops around Aceh Besar, and soil from the research field.

This study used a factorial Completely Randomized Design (RBD), consisting of two factors. The first factor was coffee grounds (K), with four treatment levels. The second factor was Mutiara NPK fertilizer (N), with four treatment levels. 16 experimental polybags were obtained which were repeated 3 times so that there were 48 experimental factors used were:

The first factor, the coffee grounds compost dosage (K), was:

K0 = control

K1 = 150 g/polybag

K2 = 300 g/polybag

K3 = 450 g/polybag

The second factor, the NPK fertilizer dosage (N), was:

N0 = control

N1 = 2 g/polybag (400 kg/ha)

N2 = 4 g/polybag (800 kg/ha)

N3 = 6 g/polybag (1200 kg/ha)

Observation data were analyzed using ANOVA. If a significant effect was found, further analysis was performed using an honestly different test at a 5% probability level (LSD 0.05%) to compare the treatment averages. The LSD 0.05% formula is as follows:

$$BNJ_{0,05} = q_{0,05}(p; db_A) \times \sqrt{\frac{KTA}{r}}$$

4. RESULTS AND DISCUSSION

The Effect of Coffee Grounds Compost on Plant Growth and Yield

1. Cucumber Plant Height (cm)

The results of the analysis of variance test showed that the provision of coffee grounds had a very significant effect on the height of cucumber plants at 21 days after planting, but had no significant effect at the ages of 14 and 28. The average height of cucumber plants at the ages of 14, 21 and 28 days after planting due to the provision of coffee grounds is presented in Table 1.

Table 1. Average height of cucumber plants at the age of 14, 21 and 28 days after planting due to the provision of coffee grounds compost.

Treatment	Plant Height (cm)		
	14 HST	21 HST	28 HST
K ₀ (Tanpa Ampas Kopi)	10,42 ^a	46,05 ^b	105,12 ^a
K ₁ (150 gr/polybag)	10,47 ^a	43,18 ^b	103,60 ^a
K ₂ (300 gr/polybag)	10,70 ^a	45,65 ^b	103,58 ^a
K ₃ (450 gr/polybag)	10,31 ^a	36,41 ^a	101,03 ^a
BNJ	-	6.21	-

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

Table 1 shows that the highest cucumber plant height at 14 days after planting (DAP) was found in the K₂ treatment (300 g coffee grounds/polybag), with a value of 10.70 cm. The highest cucumber plant height at 21 days after planting was found in the K⁰ treatment (control: without coffee grounds), with a value of 46.05 cm. This was significantly different from the K³ treatment (450 g coffee grounds/polybag), but not significantly different from the other treatments. The highest cucumber plant height at 28 days after planting was found in the K⁰ treatment (without coffee grounds), with a value of 105.12 cm.

The application of coffee grounds significantly affected plant height at 21 days after planting because the coffee grounds compost provided sufficient nutrients for cucumber growth. However, the control (without coffee grounds) performed better than the one with coffee grounds. This is likely

due to the plants' roots functioning to absorb the optimum nutrients needed by the plants. Maharani (2025) explained that this was thought to be because the use of coffee waste as an additional organic planting medium had not been fully implemented. Coffee waste undergoes decomposition, and the pH is 5.9, which falls within the slightly acidic criteria. Using organic materials that haven't decomposed properly can hinder the pH increase process, thus hindering nutrient absorption.

2. Number of Fruits Per Plant

The results of the analysis of variance test showed that the addition of coffee grounds had no significant effect on the number of fruits per cucumber plant. The average number of fruits per cucumber plant resulting from the addition of coffee grounds compost is shown in Table 2.

Table 2. Average number of cucumber fruit per plant due to the application of coffee grounds compost fertilizer.

Treatment	Number of fruits (cm)
K ₀ (kontrol)	3,58
K ₁ (150 gr/polybag)	3,33
K ₂ (300 gr/polybag)	3,58
K ₃ (450 gr/polybag)	3,42
BNJ	-

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

Table 2 shows that the highest average number of fruits per plant was found in the K₀ treatment (control: without coffee grounds), with an average fruit production of 3.58. This is suspected because the phosphorus (P) in the coffee grounds was used during the cucumber plant's growth period and requires further decomposition to be reused for maximum fruit production. This is consistent with research by Febriani *et al.* (2021), which explains that diphosphorus pentoxide (P₂O₅) was used during the vegetative period and requires time to decompose before it can be reused.

3. Fruit Length

The results of the analysis of variance test showed that the addition of coffee grounds had a very significant effect on the length of cucumber fruit. The average length of cucumber fruit resulting from the addition of coffee grounds compost is shown in Table 3.

Table 3. Average length of cucumber fruit due to the provision of coffee grounds compost (cm).

Treatment	fruit length (cm)
K ₀ (kontrol)	22,73 b
K ₁ (150 gr/polybag)	21,73 ab
K ₂ (300 gr/polybag)	21,44 a
K ₃ (450 gr/polybag)	21,64 ab
BNJ	0,47

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

Table 3 shows that the best average fruit length for cucumber plants was found in the K₀ treatment (control: without coffee grounds), with an average fruit length of 22.73 cm, significantly

different from all other treatments tested. It is suspected that the nutrients in the coffee grounds were not readily available and could not be absorbed by the plants. Maharani (2025) explained that coffee grounds compost cannot optimally meet the nutrient requirements for fruit length. This is likely due to the phosphorus (P) present in the coffee grounds being utilized during the cucumber plant's growth period.

The Effect of NPK Fertilizer Dosage on Cucumber Plant Growth and Yield

1. Cucumber Plant Height (cm)

The results of the analysis of variance test showed that the application of NPK fertilizer had a very significant effect on plant height at 14, 21, and 28 days after planting (DAP). The average height of cucumber plants at 14, 21, and 28 days after planting (DAP) due to the application of NPK fertilizer is shown in Table 4.

Table 4. Average height of cucumber plants aged 14, 21, and 28 days after planting (DAP) due to NPK administration.

Treatment	Plant Height (cm)		
	14 HST	21 HST	28 HST
N ₀ (kontrol)	6,69 ^a	23,23 ^a	63,24 ^a
N ₁ (2 gr/polybag)	10,98 ^b	43,66 ^b	109,50 ^b
N ₂ (4 gr/polybag)	12,28 ^b	52,58 ^c	122,75 ^c
N ₃ (6 gr/polybag)	11,93 ^b	51,83 ^c	117,83 ^b
BNJ	2,02	6,21	10,45

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

Table 4 shows that the highest cucumber plant height at 14 days after planting was found in the N₂ treatment (4 g NPK fertilizer/polybag), with a value of 12.28 cm, which was significantly different from all other treatments. The highest cucumber plant height at 21 days after planting was found in the N₂ treatment (4 g NPK fertilizer/polybag), with a value of 52.58 cm, which was not significantly different from N₃ (6 g NPK fertilizer/polybag), but significantly different from the other treatments. The highest cucumber plant height at 28 days after planting was found in the N₂ treatment (4 g NPK fertilizer/polybag), with a value of 122.75 cm, which was significantly different from all other treatments. NPK application is suspected to increase plant growth. Azzamy (2015) stated that N, P, and K are essential for photosynthesis and respiration, which in turn influence plant growth by determining plant height. NPK fertilizer plays a crucial role in plant growth and production. These three elements integrate with each other to support plant growth.

2. Number of Fruits Per Plant

The results of the analysis of variance test showed that NPK application significantly affected the number of cucumber fruit. The average number of cucumber fruit resulting from NPK application is shown in Table 5.

Table 5. Average number of fruits per cucumber plant due to the application of NPK fertilizer.

Treatment	Number of fruits (cm)
K ₀ (kontrol)	3,00 ^a
K ₁ (2 gr/polybag)	3,42 ^{ab}
K ₂ (4 gr/polybag)	3,42 ^{ab}
K ₃ (6 gr/polybag)	4,08 ^b
BNJ	0,52

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

Table 5 shows that the average number of fruits was 4.08 in the N3 treatment (NPK fertilizer at 6 g/polybag), which is significantly different from the N0 treatment (control: 0 NPK), but not significantly different from the N1 (2 g/polybag) and N2 (4 g/polybag) treatments. This difference is due to the P element in the NPK applied as a treatment, which functions as a protein component, which is needed for flower, fruit, and seed formation. This is consistent with the opinion expressed by Mangoendidjojo (2010), who stated that P element functions as a protein component needed for flower, fruit, and seed formation.

According to Zulyana (2011), the number of fruits per plant is closely related to the number of female flowers per plant. However, the relationship between fruit number and female flower number is not absolute, as many factors can hinder the development of flowers into fruit during the flower-to-fruit development period. These factors include pest and disease attacks, flower drop, and pollination. The results of Alpani's research (2017) stated that giving NPK fertilizer at a dose of 6 gr/polybag to cucumber plants had a significant effect on the number of fruit.

3. Fruit Length Per Plant

The results of the analysis of variance test showed that NPK administration had a very significant effect on the length of cucumber fruit. The average length of cucumber fruit due to NPK administration is shown in Table 6.

Table 6. Average fruit length (cm) of cucumber plants due to the application of NPK fertilizer.

Treatment	fruit length (cm)
K ₀ (kontrol)	19,60 ^a
K ₁ (2 gr/polybag)	21,68 ^b
K ₂ (4 gr/polybag)	23,02 ^c
K ₃ (6 gr/polybag)	23,24 ^c
BNJ	0,47

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

Table 6 shows that the best average fruit length for cucumber plants was found in the N3 treatment (NPK fertilizer 6 g/polybag), with a value of 23.24 cm. This was not significantly different from the N2 treatment (NPK fertilizer 4 g/polybag), but significantly different from the other treatments. Research by Alpani (2017) indicated that applying NPK fertilizer at a dose of 6 g/polybag to cucumber plants significantly affected fruit length. Sitompul and Guritno (2015) stated that larger cell numbers and sizes require more photosynthetic products to be translocated into the fruit. Photosynthesis requires sufficient nutrients for growth and will lead to an increased rate of

photosynthesis. A relative high increase in photosynthesis will affect the fruit and lead to increased fruit length.

Conclusion

The application of coffee grounds significantly affected cucumber plant height at 21 days after planting, fruit length, fruit diameter, and fruit weight, but had no significant effect on the number of fruits per plant at 14 and 28 days after planting. NPK application significantly affected plant height at 14, 21, and 28 days after planting, fruit number, fruit length, fruit diameter, and fruit weight.

Suggestion

Further research is needed on the use of coffee grounds and NPK fertilizer using different commodities, with a dose of 450 grams of coffee grounds compost per polybag and 6 grams of NPK fertilizer per polybag.

BIBLIOGRAPHY

- Akmal, A. 2024. Pengaruh Kompos Ampas Kopi terhadap Pertumbuhan Bibit Kopi Liberika Tungkal Komposit (*Coffea Liberica W.Bull ExHiern*). <https://Repository.Unja.Ac.Id/63650/>.
- Aldin, N. 2021. Respon Pemberian Pupuk Kompos Kulit Kopi Dengan Waktu Inkubasi Yang Berbeda Terhadap Pertumbuhan Dan Produksi Tanaman Mentimun (*Cucumis sativus*L.). <https://Repository.Uma.Ac.Id/Handle/123456789/15143>.
- Amin, A. R. 2015. Mengenal Budidaya Mentimun Melalui Pemanfaatan Media Informasi. Dalam *Andi Rusdayani Amin / Jupiter* (Nomor 1).
- Ayu, J., Sabli, E., & Sulhaswardi, D. 2017. Jurnal Dinamika Pertanian Volume Xxxiii Nomor 1april 2017 (103-114) Universitas Islam Riau Jl Kaharudin Nasution No.113 Pekanbaru. *Diterima: Maret*.
- Alpani, A., & Taher, Y. A. (2017). Pengaruh Pemberian Pupuk Npk Terhadap Pertumbuhan dan Hasil Tanaman Mentimun (*Cucumis sativus* L). *UNES Journal Mahasiswa Pertanian*, 1(1), 021-033.
- Ahmad Alpani, Yonny Arita Taher, & Syamsuwirman. (2017). Pengaruh Pemberian Pupuk Npk Terhadap Pertumbuhan Dan Hasil Tanaman Mentimun (*Cucumis Sativus* L) . *Unes Journal MahasiswaPertanian* , 1(1),021-033.Retrievedfrom .
- Fitasari, D., Ramadani, H. R., Fitasari, D., Hanika, D., & Ramadani, R. (T.T.). *Indonesian Chemistry And Application Journal Hidrochar Ampas Kopi Termodifikasi H₂ O₂ Sebagai Adsorben Untuk Ion Logam BeratCd(II)*.5(1).<https://Doi.Org/10.26740/Icaj.V5i1.20823/>.
- Hartanto, H. (2024). Pengaruh Kombinasi Porasi Kotoran Ayam dan Pupuk Organik Cair terhadap Pertumbuhan dan Hasil Tanaman Mentimun Jepang (*Cucumis sativus*, L.) VarietasRonaldo.Dalam.<http://Repository.Unsil.Ac.Id/13916/>.
- Herdiman, H. 2021. Pengaruh Pupuk Kascing dan NPK 16:16:16 Terhadap Produksi Tanaman Mentimun (*Cucumis Sativus* L.). <https://Repository.Uir.Ac.Id/13953/>.
- Juliani, V. 2017. Pengaruh Pemberian Kompos Ampas Kopi Terhadap Pertumbuhan Tanaman Merah Keriting (*Capsicum Annum Var. L.*) dan Pengarangnya Di SMA Negeri 5 Palembang. Skripsi. Fakultas Ilmu Keguruan Dan Ilmu Pendidikan. Universitas Muhammadiyah Palembang. Palembang.

- Kurniawati, H, Y. Karyanto, A. Dan Rugayah. 2015. Pengaruh Pemberian Pupuk Organik Cair Dan NPK (16:16:16) Terhadap Pertumbuhan dan Produksi Tanaman Mentimun (*Cucumis Sativus* L.). Jurnal Tropika. Fakultas Pertanian Universitas Lampung, Lampung. 3 (1) : 30-35.
- Lestari, T. 2022. Ta : Produksi Benih Tanaman Mentimun (*Cucumis sativus* L.) Pt East West Seed Indonesia. Dalam <https://Repository.Polinela.Ac.Id/3482/>.
- Mahharani, A. A. I., Syah, B., & Laksono, R. A. (2025). Pengaruh Penambahan Limbah Kulit Ari dan Ampas Kopi Pada Beberapa Media Tanam Terhadap Pertumbuhan dan Hasil Tanaman Melon (*Cucumis melo* L.) Golden Varietas Alisha F1 Pada Hidroponik Sistem Wick. *Jurnal Ilmiah Respati*, 16(1), 26-39.
- Madyaratri, R. L., & Suntari, R. (2014). Pengaruh aplikasi kompos campuran ampas kopi dan tepung cangkang telur terhadap kadar nitrogen dan kalsium tanah regosol serta pertumbuhan dan hasil tanaman okra (*Abelmoschus esculentus* L.). *Jurnal Tanah dan Sumberdaya Lahan*, 10(2), 297-306.
- Narka. W. 2016. Pemberian Kombinasi Dosis Pupuk Hayati Evagrow dan Pupuk Kimia NPK Terhadap Pertumbuhan Tanaman Bunga Gumitir. Skripsi. Universitas Udayana.
- Nasution, A. F. 2014. Pengaruh Pemberian Kompos Ampas Kopi terhadap Pertumbuhan dan Hasil Tanaman Kacang Panjang (*Vigna sinensis* L.). Skripsi Fakultas Pertanian Universitas Negeri Medan. Medan.
- Putra, E. Y., Putri, I. M., Sibagariang, M. I. B. A., Mey, N. A., Kusumo, P., Hutagalung, R. M., & Mahendra, R. A. (2023). Pupuk Bubuk Kopi (Pubuk) Ide Bisnis Sosial Daur Ulang Ampas Kopi. *Jurnal Ilmiah Manajemen, Bisnis Dan Kewirausahaan*, 3(2), 35–46. <https://doi.org/10.55606/Jurimbik.V3i2.448>
- Pakpahan, S., Sulistiyanto, Y., Sinaga, S., Tinting, R. S., Amelia, V., Studi Agroteknologi, P., & Budidaya Pertanian, J. (2023). The Effect Of Giving Coffee Grounds On Growth And Yield Of Caisim Plants (*Brassica Chinensis* L.) In Spodosol Soil. Dalam *Jurnal Agri Peat* (Vol. 24, Nomor 2). Elektronik.
- Program, R. B., Agroteknologi, S., Pertanian, F., Riau, I., & Kaharuddin Nasution, J. (2016). *Jurnal Dinamika Pertanian Volume Xxxii Nomor 2 Agustus*. 115–124.