Growth Of Robusta Coffee Beans (Coffea Robusta L.) Through The Application Of Organic Fertilizer With A System Environmentally Friendly

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Keywords:
Coffee , Nursery, Organic, Eco Friendly

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Abstract: The specialty coffee market, including organic coffee, is a great opportunity for Indonesia. Organic coffee is produced with the principle of sustainable agriculture, paying attention to the preservation of natural resources, environmental security, and human health. Coffee nurseries aim to provide high-quality coffee seeds. This study aims to determine the response of coconut shell biochar production with a retort system and the application of cow kohe fertilizer to the growth of Robusta coffee plant seedlings (Coffea robusta L.). This research method uses a randomized design of factorial groups (racks) consisting of 2 factors with 16 treatment combinations and 2 replicates so that 32 research plots are obtained. The factors studied were coconut shell biochar with the symbol "B", namely B0 = no biochar, B1 = 20% dose, B2 = 30% dose, B3 = 40% dose. The treatment factors of Cow Fertilizer with the symbol "S" are Control (S0) = no Cow Fertilizer, S1 = gram dose of 10 tons/ha, S2 = 20 tons/ha, S3 = 30 tons/ha. The parameters measured in this study were plant height, number of leaves, Stem Diameter, Wet Weight of Roots, Dry Weight of Roots

INTRODUCTION

Robusta coffee is a type of coffee plant that can grow optimally at an altitude of 400 – 700 meters above sea level with rainfall of 2,000 – 3,000 mm/year (Najiyati & Danarti, 2012). Robusta coffee can be produced at a plant age of 2.5 – 3 years (Suwarto et al., 2014). This coffee is grown at high altitudes around 1350-1850 m above sea level, while in Indonesia this coffee can grow at an altitude of 1000-1750 m above sea level (Najiyati and Danarti, 2012).

The specialty coffee market, including organic coffee, is a great opportunity for Indonesia. Organic coffee is produced with the principle of sustainable agriculture, paying attention to the preservation of natural resources, environmental security, and human health. Organic coffee cultivation is expected to increase farmers' income as consumer awareness of food safety increases. The coffee association continues to

develop organic coffee for the welfare of farmers and maintain the competitiveness of Indonesian coffee products in the world market (Irwansyah, 2019).

Organic farming is a cultivation system that relies on natural ingredients without synthetic chemical mixtures, providing economic, environmental, and social benefits. From an economic point of view, organic farming can reduce production costs and increase farmers' income. Environmentally speaking, this system maintains biodiversity and restores soil damaged by the use of chemicals (Basuni, 2012).

Coffee nurseries aim to provide high-quality coffee seeds. Quality seeds are the main investment in determining plant productivity. Several things that must be considered in coffee nurseries, including the use of superior planting materials, the determination of the location and place of the nursery, containers and planting media (Rahardjo, 2012).

RESEARCH METHODS

Materials and tools. This research will be carried out in Blankahan Village, Kuala District, Langkat Regency with an altitude of +/- 30 meters above sea level. November 2023 to March 2024. Research Methodology. The study was conducted using the 2-factor Group Random Design (RAK) method: The first factor was the dose of coconut shell biochar which consisted of 4 levels of treatment, namely: B0 = No Biochar, B1 = dose of 200 gr/polybag, B2 = dose of 300 gr/polybag, B3 = dose of 400 gr/polybag. The second factor is the dose of cow KOHE fertilizer which consists of 4 levels of treatment, namely: S0 = no cow KOHE, S1 = dose of 300 gr/polybag S2 = dose of 400 gr/ polybag S3 = dose of 500 gr/polybag **.** Observation parameters. Measurement of parameters is carried out when the plants are 14.16,18,20,22 and 24 Weeks. Measurements are carried out using a ruler and wood. How to measure it by making a standard wood count coupled with the highest leaf length. Standard wood has a length of 6 cm. 3 cm below ground level and 3 cm above ground level. The parameters observed are Plant Height (cm), Number of Leaves (Leaves), Stem Diameter (mm), Wet Weight of Roots (gr), Dry Weight of Roots (gr).

RESULTS AND DISCUSSION

Diameter Batang (mm)

The application of Different Biochar is very evident at 300 gr at the Stem Diameter. According to (Liu et al., 2024) this shows that Biochar is effective for resource utilization due to its stability and high carbon content.

The application of biochar is very different in each treatment of biochar application on the Trunk Diameter. In diameter, it can be seen that the fertilization given to biochar has a larger diameter than that that is not fertilized with biochar, which is in accordance with the statement (Sajar et al., 2024) that the use of biochar as an improver and energy source, can increase soil fertility by increasing cation exchange capacity and soil retention, which leads to an increase in land productivity.

Table 1. Average Stem Diameter Response of Coconut Shell Biochar Administered by Retort System and Application of Cow Kohe Fertilizer on the Growth of Robusta Coffee Plant Seedlings (Coffea robusta L.) at 24 Weeks After Planting

Biochar	Kohe sapi				Rataan
	S0	S1	S2	S3	
B0	2,9	3,3	3,5	3,8	3,4ab
B1	2,8	3	3,25	3,4	3,1a
B2	3,4	3,5	3,7	3,9	3,6b
B3	3,3	3,4	3,8	4,1	3,6b
Rataan	3,1a	3,3ab	3,5bc	3,8c	

Description: Numbers in the same column followed by letters that are not the same are significantly different at the 5% level (upper letters) based on the Duncan Distance Test (DMRT)

Wet Weight (gr)

From the results of the study after statistical analysis, it shows that there is an interaction with the Wet Weight parameter. This is because Coconut Shell Biochar fertilizer and Cow Shell fertilizer affect each other in increasing the growth of Coffee Seeds, so the use of Coconut Shell Biochar fertilizer and Cow Shell fertilizer have an effect on each other. So that there is an interaction between one factor and another. This is affirmed by Sarief (1998) who states that two factors are said to interact if one of these factors affects each other

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Table 2. Average Wet Weight Response to Application of Coconut Shell Biochar produced using a retort system and application of Cow Kohe Fertilizer on the Growth of Robusta Coffee Plant Seedlings (Coffea robusta L.) at 24 Weeks After Planting

Biochar	Kohe sapi	Rataan

	S0	S1	S2	S3	
B0	0,9	1,0	1,0	1,1	1,0a
B1	0,8	0,85	1,35	1,55	1,1b
B2	1,0	1,3	1,2	1,7	1,3b
B3	1,5	1,6	1,8	2,3	1,8c
Rataan	1,0a	1,2ab	1,3b	1,6c	

Description: Numbers in the same column followed by letters that are not the same are significantly different at the 5% level (upper letters) based on the Duncan Distance Test (DMRT)

Dry Weight

The results of the analysis of variance stated that the application of Biochar and cow urine had an influence on the dry weight of the roots of coffee plants aged 24 weeks after planting.

The effect of giving Biochar and cow urine on the dry weight of the roots of coffee plants aged 24 weeks after planting which had been tested by Duncan's distance can be seen in Table 3.

Table 3. Average Dry Weight Response to Application of Coconut Shell Biochar produced using a retort system and application of Cow Kohe Fertilizer on the Growth of Robusta Coffee Plant Seedlings (Coffea robusta L.) at 24 Weeks After Planting

Biochar	Kohe sapi				Rataan
	S0	S1	S2	S3	
B0	0,5	0,6	0,5	0,9	0,6a
B1	0,5	0,55	1	1,15	0,8b
B2	0,6	0,9	0,9	1,3	0,9b
B3	1,1	1,3	1,4	1,9	1,4c
Rataan	0,7a	0,8b	0,9b	1,3c	

Description: Numbers in the same column followed by letters thatthe same shows unreal differences at the 5% level (lowercase) and very noticeable differences at the 1% level (uppercase letters).

CONCLUSIONS

The application of Coconut Shell biochar fertilizer with a retort system has a very real effect on the parameters of plant height and diameter. The application of Coconut Shell biochar fertilizer with a retort system has a real effect on the Leaf Count parameter. The application of Kohe Cow fertilizer has a very real effect on the parameters of plant height, stem diameter, and number of leaves. There was an interaction between Coconut

Shell Biochar fertilizer and the retort system with Cow Kohe fertilizer on the parameters of plant height, stem diameter, number of leaves, wet weight, dry weight.

References

Basuni, S. (2012). Konsepsi Pengelolaan Lestari. *IPB Press. Bogor*.

Hermawan, Maman dan Bambang Eka Tjahjana. 2012. Bunga Rampai Inovasi Teknologi Tanaman Kopi Untuk Perkebunan Rakyat. Sukabumi : Unit penerbitan dan Publikasi Balitri.

Hidayat., dan Darwin. 2008. Pengaruh Dosis Kompos Pupuk Kandang Sapi Terhadap Pertumbuhan Dan Produksi Buah Tomat. Fakultas Pertanian Lampung. Lampung.

Irwansyah B. (2019). Persepsi Petani dalam Budidaya Kopi Organik di Kecamatan Pematang Sidamanik Kabupaten Simalungun. *Skripsi : Politeknik Pembangunan Pertanian Medan*

Liu, C., Chen, T., Zhang, F., Han, H., Yi, B., & Chi, D. (2024). Soil carbon sequestration increment and carbon-negative emissions in alternate wetting and drying paddy ecosystems through biochar incorporation. *Agricultural Water Management*, *300*. https://doi.org/10.1016/j.agwat.2024.108908

Luta, D. A., Siregar, M., Fariz. H. S. (2022). Pengaruh Perlakuan Media Tanam dan Ekoenzim terhadap Produksi Tanaman Bawang Merah. Agrosains. 119-123.

Najiyati, S., & Danarti. (2012). Kopi budi daya dan penanganan pascapanen (Ed. rev.). Penebar Swadaya. https://opac.perpusnas.go.id/DetailOpac.aspx?id=627862

Prasetyowati, S. E., Sunaryo, Y., Suyanto, I. E. 2019. Pengaruh Macam Amelioran Lokal dan Biofertilizer Terhadap Pertumbuhan dan Hasil Tanaman Koro Pedang di Lahan Marjinal Tanah Grumusol. Jurnal Pertanian Agros 21 (1) :129-135

Purba, I. G., Warsito, K., & Refnizuida, R. (2023). Escalation Of Coffee Plant (Coffea arabica L) By Addition Of Microcapsules From IAA (Indole Acetic Acid) Producing-Endophytic Bacteria. *JURNAL PEMBELAJARAN DAN BIOLOGI NUKLEUS*, *9*(1), 181–191. https://doi.org/10.36987/jpbn.v9i1.3907Rahardjo, P. 2012. Panduan Budi Daya dan Pengolahan Kopi Arabika dan Robusta. PenebarSwadaya. Jakarta. 2012 halamanLiu, C., Chen, T., Zhang, F., Han, H., Yi, B., & Chi, D. (2024). Soil carbon sequestration increment and carbon-negative emissions in alternate wetting and drying paddy ecosystems through biochar incorporation. *Agricultural Water Management*, *300*. https://doi.org/10.1016/j.agwat.2024.108908

Purba, I. G., Warsito, K., & Refnizuida, R. (2023). Escalation Of Coffee Plant (Coffea arabica L) By Addition Of Microcapsules From IAA (Indole Acetic Acid) Producing-Endophytic Bacteria. *JURNAL PEMBELAJARAN DAN BIOLOGI NUKLEUS*, *9*(1), 181–191. https://doi.org/10.36987/jpbn.v9i1.3907

Sajar, S., Setiawan, A., & Tri Anzani, A. (2024). Effect of Various Biochar Materials and Levels of Chicken Manure Fertilizer on Soil Chemical, Growth and Yield

of Soybean (Glycine max L Merrill). *International Journal of Research and Review*, *11*(8), 279–293. https://doi.org/10.52403/ijrr.20240830

Sarief. 2016. Kesuburan dan Pemupukan Tanah Pertanian. Pustaka Buana. Bandung.

Sitepu, S. M., Refnizuida. (2023). Peningkatan Produksi Bawang Merah (Allium asclonicum L.) Akibat Pemberian NPK Fermentasi Berbagai Jenis Limbah Tanaman. Jurnal Agroplasma. 345-350.

Somporn, dkk C,. Kamtuo A., Theerakulpisut, P., & siriamornpun, S. (2012). Effect of shadingon yield, suger content, phenolic acids and antionxidant property of coffe beans (Cofffea arabica L. Cv. Catimor) harvested from north-eastern Thailand. J. Sci. Food.

Sulardi, S., Hakim, t. (2022). Uji POC Urin Sapi dan Cocopeat Terhadap Pertumbuhan Bibit Kakao (Theobroma cacao L). Jurnal Pembelajaran dan Biologi Nukleus. 781-794.

Suwarto, Octavianty, Y., & Hermawati, S. (2014). Top 15 Tanaman Perkebunan (S. Nugroho (ed.); 1st ed.). Penebar Swadaya. https://books.google.co.id/books?id=iRWrCQAAQBAJ&printsec=frontcover#v=onepage&q&f=false

Zulkarnain. 2009. Kultur Jaringan Tanaman : Solusi Perbanyakan Tanaman BudiDaya. Bumi Aksara. Jakarta. 249 hal