DOI :https://doi.org/10.36378/juatika.v6i2.3660
JUATIKA
JURNAL AGRONOMI TANAMAN TROPIKA
VOL. 6 NO. 2 May 2024
eissn 2656-1727
pissn 2684-785X
Hal : 616 – 621

Increasing the Growth and Production of Eggplant (*Solanum melongena* L) by Providing Wood Biochar

Reza Gilang Ramadhan*, Dini Hariyati Adam, Novilda Elizabeth Mustamu, Hilwa Walida
Labuhanbatu University
Jl. SM Raja No. 126 A KM 3.5 Aek Tapa, Labuhanbatu Regency, Sumatera Utara 21418, Indonesia
*Email : ramadhan112201@gmail.com

ABSTRACT

The cultivation of eggplant (*Solanum melongena* L.) is a significant aspect of horticultural production in Indonesia. However, the productivity of eggplant remains minimal due to inadequate cultivation practices. An encouraging approach involves utilizing wood biochar as a supplement to improve soil fertility and promote plant development. This study aimed to assess the impact of varying levels of wood biochar application on the development and productivity of eggplant. The study utilized a Randomized Block Design (RBD) to investigate the effects of four different treatments: no biochar (B0), 50 g of biochar per polybag (B1), 100 g of biochar per polybag (B2), and 150 g of biochar per polybag (B3). The findings indicated that the incorporation of wood biochar had a notable impact on the growth and yield of the plants, as evidenced by the increase in plant height, leaf width, fruit weight per fruit, number of fruits per plant, and fruit weight per plant. Among the different treatments, B3 exhibited the most favorable outcomes. The analysis of variance (ANOVA) revealed that there were statistically significant differences between the various treatments ($p < 0.05$). In summary, using wood biochar has proven to successfully improve eggplant yield in Indonesian soil.

Keywords: *Crop Yield, Eggplant, Plant Growth, Solanum melongena L., Wood Biochar*

1. INTRODUCTION

Eggplant (*Solanum melongena* L) represents a significant horticultural commodity with considerable development potential in Indonesia. It is frequently consumed in various forms, including fresh and processed varieties. To attain optimal cultivation outcomes, it is essential to implement appropriate agricultural techniques and meet specific technical requirements (Fadil & Sutejo, 2020). This approach facilitates continuous eggplant production throughout the year while maximizing yield quality. The adaptability of eggplant plants is noteworthy, allowing for cultivation across diverse regions in Indonesia, from lowland areas to highlands at elevations of up to 1000 meters above sea level. The ideal temperature range for eggplant growth is between 22° and 30°C, with optimal soil acidity (pH) levels between 5 and 6 (Marewa, 2020). Despite the promising prospects for eggplant cultivation, farmers currently experience relatively low production yields, primarily due to suboptimal cultivation practices (Raksun et al., 2019).

Effective cultivation efforts are necessary to address various challenges encountered in cultivating eggplants, particularly those pertaining to growth and production. An action that can be taken is incorporating wood biochar into the soil as a supplementary organic material or fertilizer. Biochar is a dark charcoal created through biomass heating in a low-oxygen environment, or in the absence of oxygen. Biochar provides numerous advantages, such as serving as a carbon source, replacing organic matter, preserving soil moisture, and aiding in water retention and nutrient absorption. Furthermore, biochar enhances micro and macronutrient availability, and creates a conducive environment for the proliferation of soil microorganisms.

Incorporating biochar into the soil has been shown to enhance the availability of soil cations and phosphorus, total nitrogen, and soil cation exchange capacity (CEC). This, in turn, can lead to increased eggplant production, as biochar has the potential to mitigate nutrient leaching, particularly potassium and nitrogen in the form of ammonium (N-NH4) (Hidayah et al., 2022).

The utilization of biochar as a soil amendment has been documented for millennia, as evidenced by its presence in the Amazon region, known as terra preta. Biochar offers numerous advantages in enhancing soil quality, including increased water retention, improved soil structure, heightened cation exchange capacity, and enhanced fertilization efficiency (Karamina, 2022). Furthermore, biochar also aids in the reduction of greenhouse gas emissions, such as methane and carbon dioxide, which are typically produced during conventional waste processing and recycling procedures. In the context of eggplant cultivation, biochar can substantially enhance plant growth and production by improving soil quality and reducing reliance on irrigation and chemical fertilizers. Consequently, further investigation into the optimal biochar dosage for eggplant cultivation is imperative to maximize its benefits in agricultural practices (Liang et al., 2021).

This study aims to assess the impact of wood biochar on the growth and yield of eggplant crops, as well as to identify the optimal dosage of wood biochar for promoting the growth and yield of these crops. This research aims to yield informative insights into the impact of wood biochar fertilizer on the growth of eggplants and to determine the most effective dosage of wood biochar for maximizing harvest outcomes.

2. MATERIAL AND METHODS

The study was conducted in Lingga Tiga Sigambal, Labuhanbatu Regency, situated at geographical coordinates 2.1168° North Latitude and 99.8315° East Longitude, with an elevation of 30 meters above sea level. The research was conducted between February and May 2024.

The materials utilized comprised eggplant seeds (*Solanum melongena* L.), homemade wood biochar, water for irrigation, soil as a growth medium, and 10 kg polybags as planting containers. The equipment employed included hoes, plastic buckets, machetes, measuring cups, watering cans, hand sprayers, scissors, meters, scales, stationery, and data books for documenting observation findings..

The research employed an experimental approach utilizing a single-factor Randomized Block Design (RAK) with four treatment levels, each being replicated five times, resulting in 20 experimental units of eggplant plants treated with wood biochar (D et al., 2019). The treatments investigated were B0 (control without biochar), B1 (50 grams of wood biochar per polybag), B2 (100 grams of wood biochar per polybag), and B3 (150 grams of wood biochar per polybag). The parameters observed included plant height, leaf width, fruit weight per fruit, number of fruits per plant, and fruit weight per plant.

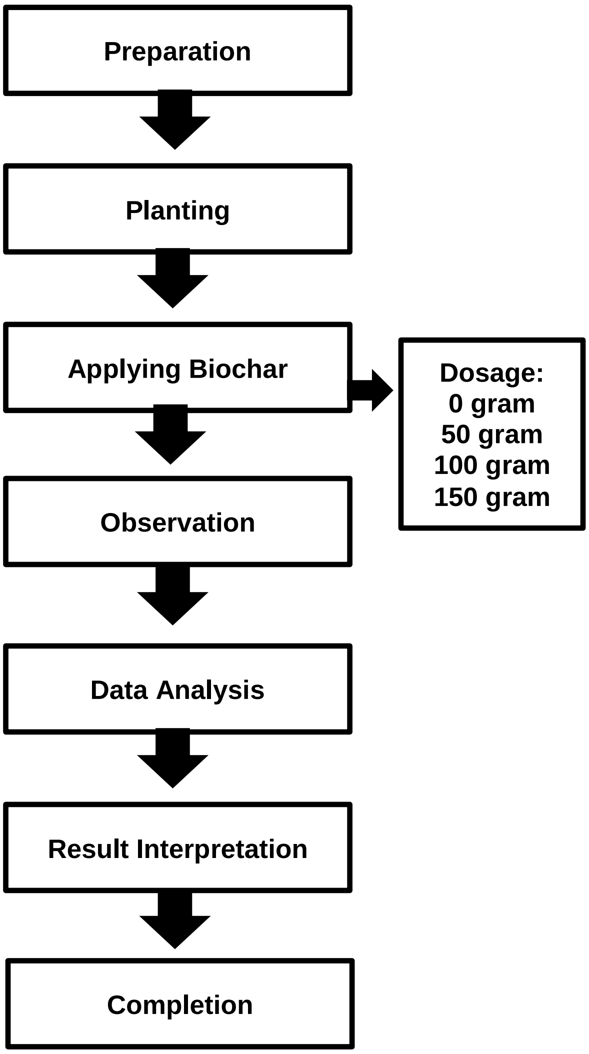

Figure 1. Research flow diagram

The data from the study underwent analysis of variance (ANOVA) to assess the treatment's impact (Hasdar et al., 2021). In the event of a significant difference, the analysis proceeded with applying the Duncan Test using SPSS Version 23 (Avivi et al., 2022). The equation represents the single-factor RAK model employed: $Yij = \mu + Ti + Bj + \epsilon ij$, where Yij denotes the observation value, µ signifies the general mean value, Ti indicates the treatment effect, Bj represents the block effect, and єij stands for the experimental error. The hypothesis was evaluated based on Ftable < Fcount 5% criteria, with H1 being accepted if a significant difference between the treatments was observed.

3. RESULT AND DISCUSSION

This research investigated the impact of wood biochar application on the growth and yield of eggplant (*Solanum melongena* L.) by assessing various parameters, including plant height, leaf width, individual fruit weight, fruit count per plant, and total fruit weight per plant. The collected data were systematically analyzed and organized into multiple tables to elucidate the influence of each treatment on the measured parameters.

Table 1. Plant Height (cm) in Various Wood Biochar Treatments

Treatment	14 DAP	21 DAP	28 DAP	42 DAP
0 g Polybag^{-1}	20.5 ± 1.2	30.8 ± 1.3	40.3 ± 1.4	50.6 ± 1.5
50 g Polybag^{-1}	22.3 ± 1.1	32.7 ± 1.2	42.9 ± 1.3	53.2 ± 1.4
100 g Polybag^{-1}	24.1 ± 1.2	34.6 ± 1.1	45.5 ± 1.2	55.8 ± 1.3
150 g Polybag^{-1}	25.9 ± 1.1	36.5 ± 1.3	48.1 ± 1.4	58.4 ± 1.5

The data presented in the table indicates a positive correlation between plant height and the amount of wood biochar applied. For instance, at 14 days after planting (DAP), plants in treatment B0 (no biochar) had a height of 20.5 cm, whereas those in treatment B3 (150 g/polybag) measured 25.9 cm. This trend continued up to 42 DAP, with plants in treatment B3 growing to a height of 58.4 cm, surpassing the heights of plants in the other treatments.

Table 2. Leaf Width (cm) in Various Wood Biochar Treatments

Treatment	4 WAP	8 WAP	10 WAP
0 g Polybag-1	8.5 ± 0.5	12.3 ± 0.6	15.2 ± 0.7
50 g Polybag-1	9.3 ± 0.4	13.1 ± 0.5	16.0 ± 0.6
100 g Polybag-1	10.1 ± 0.5	13.9 ± 0.6	16.8 ± 0.7
150 g Polybag-1	10.9 ± 0.4	14.7 ± 0.5	17.6 ± 0.6

From this table, it can be seen that the leaf width increases along with the increasing dose of wood biochar. In the fourth week after planting (WAP), the leaf width in the B0 treatment was 8.5 cm, while in the B3 treatment, it reached 10.9 cm. This increase was also consistent until the 10th week, when the leaf width in the B3 treatment reached 17.6 cm.

Table 3. Fruit Weight Per Fruit (g) in Various Wood Biochar Treatments

Treatment	Fruit Weight Per Fruit (g)
0 g Polybag-1	50.2 ± 2.1
50 g Polybag-1	55.7 ± 2.3
100 g Polybag-1	61.2 ± 2.4
150 g Polybag-1	66.7 ± 2.5

The weight of fruit per individual fruit also increased with the application of wood biochar. The results of treatment B0 indicated an average fruit weight of 50.2 g, whereas treatment B3 resulted in an average fruit weight of 66.7 g, demonstrating the positive impact of wood biochar on fruit weight enhancement.

Table 4. Number of Fruits Per Plant in Various Wood Biochar Treatments

Treatment	Number of Fruits Per Plant
0 g Polybag-1	4.2 ± 0.3
50 g Polybag-1	4.8 ± 0.4
100 g Polybag-1	5.4 ± 0.4
150 g Polybag-1	6.0 ± 0.5

Adding wood biochar doses resulted in a substantial increase in the quantity of fruits per plant. The average number of fruits per plant in treatment 0 was 4.2, whereas in treatment 150, the number of fruits per plant increased to 6.0. This indicates that the use of wood biochar has the potential to enhance fruit yield.

Table 5. Fruit Weight Per Plant (g) in Various Wood Biochar Treatments

Treatment	Fruit Weight Per Plant (g)
0 g Polybag-1	210.8 ± 10.4
50 g Polybag-1	240.6 ± 11.5
100 g Polybag-1	270.4 ± 12.6
150 g Polybag-1	300.2 ± 13.7

Fruit weight per plant also increased with the addition of wood biochar doses. In the B0 treatment, the average fruit weight per plant was 210.8 g, while in the B3 treatment, the fruit weight per plant reached 300.2 g. This shows that wood biochar can increase the total fruit yield per plant. The documentation of this study is presented in the image below:

Figure 2. Eggplant plant nursery

Figure 3. Observing Plant Height

Figure 3. Observation of leaf height, width and number of leaves

Figure 4. Eggplant

4. CONCLUSION

The research findings indicated that using wood biochar led to a substantial enhancement in the growth and yield of eggplant (*Solanum melongena* L.). Applying the highest biochar dose (150 g/polybag) resulted in the most favorable outcomes across all measured parameters: plant height, leaf width, fruit weight per fruit, number of fruits per plant, and fruit weight per plant. Wood biochar improves soil water retention capacity and nutrient availability, promoting plant growth and fruit quality. Statistical analysis using Analysis of Variance (ANOVA) revealed significant differences among the treatments, underscoring the positive impact of wood biochar on eggplant growth and productivity. Consequently, the adoption of wood biochar is recommended as an efficient method to enhance agricultural output, particularly in eggplant cultivation in Indonesia, with the optimal recommended dose being 150 g/polybag. This study establishes a robust scientific foundation for the integration of wood biochar as a sustainable soil enhancer in agricultural operations.

REFERENCES

Avivi, S., Mufidah, A. I., Siswoyo, T. A., & Restanto, D. P. (2022). Pengaruh cekaman genangan terhadap pertumbuhan dan hasil beberapa varietas tomat (*Lycopersicum esculentum* Mill.). *Agrovigor: Jurnal Agroekoteknologi*, *15*(1), 1–5.

D, A., Ezward, C., & Mashadi, M. (2019). Uji Pemberian Pupuk Iskandar Muda (Pim) Organik Terhadap Pertumbuhan Dan Produksi Tanaman Sawi (*Brassica Juncea*. L). *Jurnal Agronomi Tanaman Tropika (Juatika)*, *1*(1), 1–11.

Fadil, M., & Sutejo, H. (2020). Pengaruh Jenis Dan Dosis Pupuk Organik Terhadap Pertumbuhan Dan Hasil Tanaman Terong (*Solanum melongena* L.) Varietas Milano. *Agrifor*, *19*(1), 87.

Hasdar, M., Wadli, W., & Meilani, D. (2021). Rancangan Acak Lengkap Dan Rancangan Acak Kelompok Pada pH Gelatin Kulit Domba Dengan Pretreatment Larutan NaOH. *Journal of Technology and Food Processing (JTFP)*, *1*(01), 17–23.

Hidayah, A. N., Budiyanto, S., & Purbajanti, E. D. (2022). Evaluasi Kesesuaian Lahan Kecamatan Karangreja Kabupaten Purbalingga Jawa Tengah Sebagai Upaya Peningkatan Produktivitas Komoditas Sayuran. *Jurnal Tanah Dan Sumberdaya Lahan*, *9*(2), 395–404.

Karamina, H. (2022). Dampak Penggunaan Biochar Setelah Lima Tahun pada Vertisol dan Pemupukan NPK Terhadap Hasil Bawang Merah (*Allium ascalonicum* L.) Impact of Biochar Use After Five Years in Vertisol and NPK Fertilization on Yield of Shallot (*Allium ascalonicum* L.). *Terakreditasi RISTEKBRIN Peringkat SINTA*, *18*(1), 2020.

Liang, M., Lu, L., He, H., Li, J., Zhu, Z., & Zhu, Y. (2021). Applications of biochar and modified biochar in heavy metal contaminated soil: A descriptive review. *Sustainability (Switzerland)*, *13*(24), 1–18. https://doi.org/10.3390/su132414041

Marewa, J. B. (2020). Pengaruh Pemberian Air Cucian Beras Terhadap Tanaman Terong. *AgroSainT*, *11*(2), 92–99. https://doi.org/10.47178/agro.v11i2.1267

Raksun, A., Japa, L., & Mertha, I. G. (2019). Pengaruh Jenis Mulsa Dan Dosis Pupuk Npk Terhadap Pertumbuhan Dan Hasil Tanaman Terong Hijau *(Solanum melongena L)*. *Jurnal Biologi Tropis*, *19*(2), 142–146. https://doi.org/10.29303/jbt.v19i2.1115