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# Effects of Bokashi and NPK on the Growth and Yield of Purple Eggplant Plants

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**Abstract:** This study evaluated the effect of bokashi from slaughterhouse waste and NPK compound fertilizer on the growth and yield of purple eggplant (*Solanum melongena* L.). The experiment was conducted in Sambaliung, Berau, for 4 months with a factorial Completely Randomized Design (CRD). Bokashi was given in five doses: B0 (control), B1 (5 MgHa$^{-1}$), B2 (10 MgHa$^{-1}$), B3 (15 MgHa$^{-1}$), and B4 (20 MgHa$^{-1}$). NPK fertilizer was applied in four doses: P0 (control), P1 (5 gr/polybag), P2 (10 gr/polybag), P3 (15 gr/polybag), and P4 (20 gr/polybag). The parameters observed included plant height, flowering age, and fruit weight per plant. Data were analyzed using ANOVA and Duncan's test at the 5% level. The results showed that the combination of bokashi and NPK had a significant effect on plant height, but not significant on flowering age and fruit weight. The use of bokashi and NPK effectively increases the growth of purple eggplant, so it can be an alternative for farmers to reduce dependence on NPK chemical fertilizers and switch to organic methods sustainably.

**Keywords:** Bokashi; Harvest results; NPK fertilizer; Plant growth; Purple eggplant

## Introduction

Purple eggplant (*Solanum melongena* L.) is one of the important vegetables in daily consumption and has high economic value (Selvi et al., 2023; Silva et al., 2020). This plant is widely cultivated in various regions in Indonesia because market demand continues to increase along with public awareness of the importance of vegetable consumption (Azis et al., 2023; Aisyah et al., 2021). In addition, purple eggplant also contains various important nutrients such as fiber, vitamins, and minerals that are good for health (Sharma & Kaushik, 2021; Quamruzzaman et al., 2020). Despite its great potential, purple eggplant production in Indonesia still faces various obstacles, including less than optimal fertilization practices (Majola et al., 2021). One of the main problems in purple eggplant cultivation is low productivity and quality of harvest results (Arisona et al., 2022). This is often caused by the lack of availability of nutrients in the soil that are essential for plant growth and development (Ramli, 2023; Nuraida et al., 2022). Improper fertilization, both in terms of type, dose, and application time, can result in plants not getting enough nutrients so that growth and yields are not optimal.

The low productivity and quality of purple eggplant can have an impact on the welfare of farmers, especially those who depend on this plant as their main source of income (Mahendra et al., 2023; Wulandari et al., 2023a). In addition, the lack of supply of quality purple eggplant can also affect the availability and price on the market, thus affecting consumers (Rahayu et al., 2021; Di Miceli et al., 2024; Radicetti et al., 2016). Therefore, an effective solution is needed to increase the productivity and quality of purple eggplant crops (Hoq et al., 2021; Warsanga & Evans, 2018).

This study was conducted to overcome the problem of low productivity and quality of purple eggplant plants through the application of the right fertilization

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method. By finding an effective combination of fertilization, it is expected to increase the growth and yield of purple eggplant plants so that it has a positive impact on farmer welfare and the availability of supply in the market.

This study aims to solve the problem of low growth and yield of purple eggplant plants by evaluating the effect of giving bokashi slaughterhouse waste and NPK compound fertilizer. The combination of these two types of fertilizers is expected to provide complete and balanced nutrients for plants, so that it can increase productivity and quality of the harvest.

The importance of this topic to discuss because effective solutions in fertilization can have a significant impact on increasing agricultural yields. In addition, the use of slaughterhouse waste bokashi is also a step towards sustainable agriculture by utilizing organic waste as fertilizer, which can reduce negative impacts on the environment. This problem will be addressed by conducting a systematic study to evaluate the effect of giving slaughterhouse waste bokashi and NPK compound fertilizer on the growth and yield of purple eggplant plants. This study will compare various fertilization treatments to find the most effective combination.

This study was conducted to identify and evaluate the effectiveness of the combination of organic and inorganic fertilization in increasing the growth and yield of purple eggplant plants. Thus, the results of the study are expected to provide practical recommendations for farmers in implementing more effective and efficient fertilization techniques. This study contributes to filling the knowledge gap regarding the effectiveness of using slaughterhouse waste bokashi and NPK compound fertilizer on purple eggplant plants. Although there have been many studies on the use of organic and inorganic fertilizers, this specific combination has not been explored in depth, especially in the local context of Indonesia.

Currently, many studies have shown the benefits of using organic and inorganic fertilizers in increasing crop yields. However, research that combines bokashi from slaughterhouse waste with NPK fertilizer on purple eggplant plants is still limited. The state of the art of this research is the combination of fertilization approaches that have not been widely applied, as well as the potential environmental benefits of using waste from slaughterhouses. The innovation proposed in this study is the use of bokashi from slaughterhouse waste as a source of organic fertilizer combined with NPK compound fertilizer to increase the growth and yield of purple eggplant plants. This approach is expected to provide dual benefits: increasing plant productivity and reducing organic waste.

## Method

The research design used was a factorial Completely Randomized Design (CRD) with two factors, namely the provision of bokashi fertilizer from Slaughterhouse waste and NPK compound fertilizer. The provision of bokashi from Slaughterhouses consisted of 5 treatments, namely:

B0: No treatment (control)
B1: Bokashi Fertilizer 5 $MgHa^{-1}$
B2: Bokashi Fertilizer 10 $MgHa^{-1}$
B3: Bokashi Fertilizer 15 $MgHa^{-1}$
B4: Bokashi Fertilizer 20 $MgHa^{-1}$

While the provision of NPK compound fertilizer doses, namely:

P0: No treatment (Control)
P1: 5 gr/polybag
P2: 10 gr/polybag
P3: 15 gr/polybag
P4: 20 gr/polybag. The treatment was repeated 3 times.

Plant growth and yield data will be collected and analyzed using analysis of variance (ANOVA) and Duncan's advanced test to determine significant differences between treatments. Parameters observed include plant height, flowering age and fruit weight per plant.

## Result and Discussion

The results showed that the provision of bokashi gave significantly different results. The treatment that gave the best results was B4, B2 and B3. In the provision of NPK fertilizer that gave the best results was P4. While the combination of treatments gave the best results in the B4P4 treatment.

From the results of the Duncan test, observations of plant height in the combination of treatments showed significantly different results. The results of observations of plant height are visualized in Figure 1. The treatment of bokashi on plant height parameters gave the best results in B4, B2 and B3. Meanwhile, the treatment of NPK fertilizer that gave the best results was in P4. The combination of treatments that gave the best results was in the B4P4 treatment.

Bokashi from RPH waste contains various organic nutrients that are slowly available (Kakar et al., 2019; Maass et al., 2020; Wulandari et al., 2023). During the decomposition process, microorganisms in bokashi help break down organic matter into nutrients that can be absorbed by plants (Durrer et al., 2021). Bokashi also increases soil microbiological activity, which contributes to increased nutrient availability (Phooi et al., 2022; Quiroz & Céspedes, 2019). Bokashi can also improve soil structure, increase aeration and the soil's ability to store water. This helps plant roots absorb nutrients and water

more efficiently, which can encourage higher plant growth.

NPK fertilizer provides inorganic nutrients that are easily soluble and quickly available to plants. Nitrogen in NPK in particular plays an important role in vegetative growth, including increasing plant height (Nuraida et al., 2022; Ramadhan et al., 2022; Vitco et al., 2022).

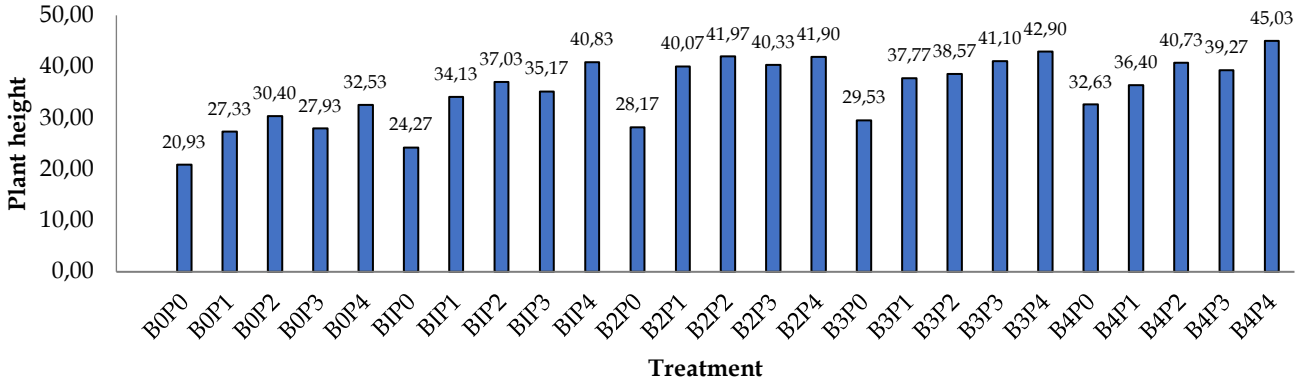


**Figure 1.** Effect of Bokashi and NPK on plant height

The combination of bokashi and NPK can provide dual benefits, where bokashi improves the physical and biological conditions of the soil (Iswahyudi et al., 2020; Makaruku & Wattimena, 2022), while NPK provides nutrients that are quickly available (Ramadhan et al., 2022). This synergy can produce better growth compared to using only one type of fertilizer.

The parameters of flowering age and yield weight per plant did not show significant results. The parameters of flowering age can be seen in Figure 2.

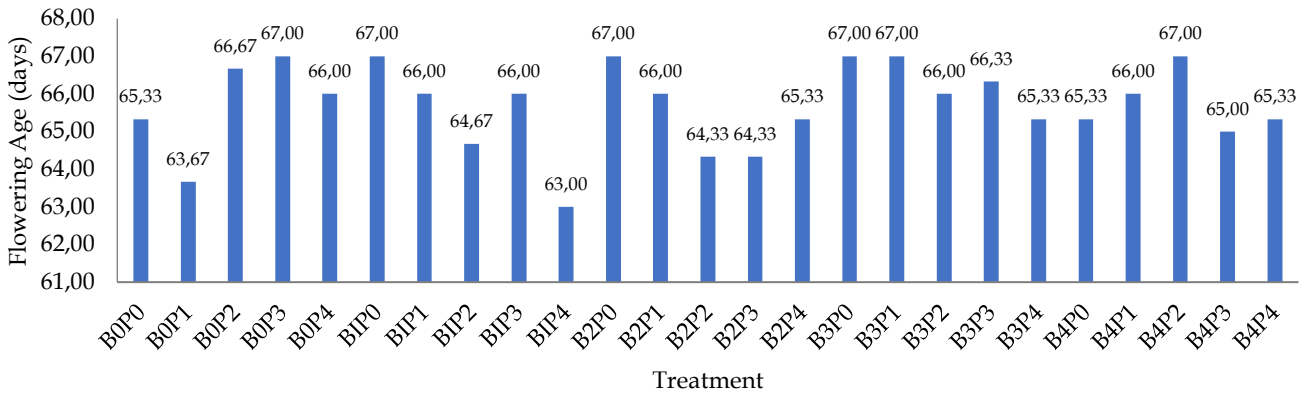


**Figure 2.** Effects of Bokashi and NPK on flowering age

The results of the study showing that the flowering age did not differ significantly between treatments could be caused by several factors related to the provision of bokashi waste from slaughterhouses and NPK fertilizer. Bokashi provides nutrients gradually and continuously, but the concentration of key nutrients that promote flowering, such as phosphorus and potassium, may not differ enough in the short term to significantly affect flowering time (Liana et al., 2023; Rosiman et al., 2020).

NPK fertilizer provides nutrients in the right amount and is quickly available (Ramadhan et al., 2022; Wuriesyliane & Saputro, 2021). However, if all treatments provide sufficient nutrients needed for flowering, then there will be no significant difference in flowering age. The fruit weight parameter per plant can be seen in Figure 3.

Bokashi is an organic fertilizer made from fermented organic materials, such as straw, rice husks, livestock manure, and crop residues (Quiroz & Céspedes, 2019; Wulandari et al., 2023). The main content of bokashi is organic matter that helps improve soil and increase soil microbial activity (Selvi et al., 2023; Simbolon et al., 2024). However, the macronutrient content (N, P, K) in bokashi is usually lower and is released slowly compared to synthetic chemical fertilizers (Iswahyudi et al., 2020). NPK fertilizers

provide nutrients that are immediately available and in the right amounts needed for plant growth (Aminah et al., 2023). If the nutrients provided by bokashi and NPK are both sufficient for plant needs, there will be no significant difference in the weight of the fruit produced.

The morphology of eggplant plants includes parts such as roots, stems, leaves, flowers, and fruits (Arisona et al., 2022). The growth and development of each of these parts are greatly influenced by availability (Mahendra et al., 2023; Prasetya et al., 2021; Simbolon et al., 2024). Providing bokashi rich in organic matter can improve soil structure and increase water and nutrient absorption by the roots. However, if bokashi does not provide enough macronutrients directly, fruit formation may not be optimal.

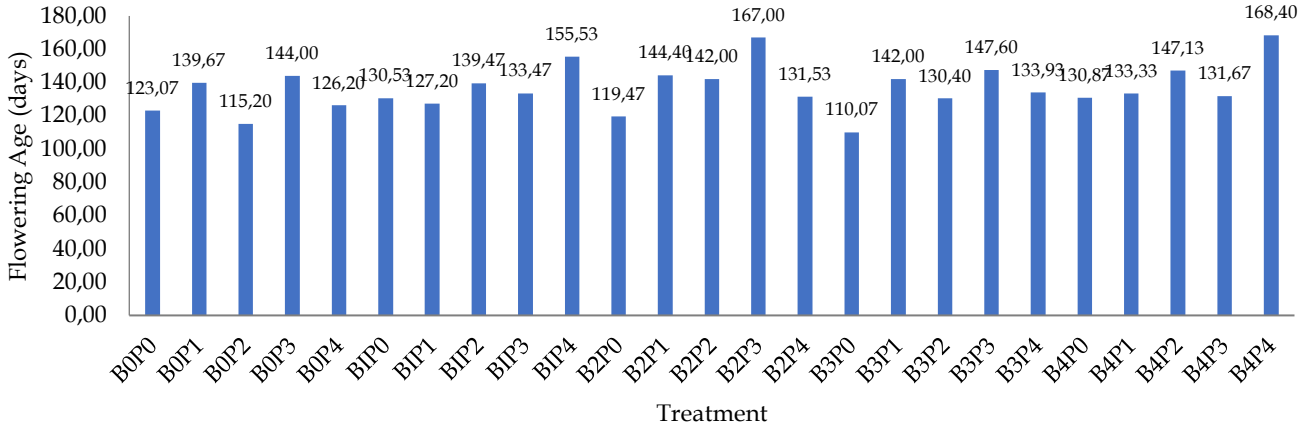


**Figure 3.** Effect of Bokashi and NPK on fruit weight per plant

Nitrogen in NPK is essential for chlorophyll formation and photosynthesis, Phosphorus for energy transfer (ATP), and Potassium for water balance and stomata opening (Kadafi et al., 2023; Pangaribuan et al., 2022; Putra et al., 2024). If the provision of NPK is unbalanced or excessive, it can disrupt the physiological processes of the plant and inhibit fruit formation.

## Conclusion

Of the three parameters observed, the provision of bokashi was able to provide significantly different results on plant height. Likewise with the factor of NPK fertilizer provision. However, each of these factors did not show significant differences in the parameters of flowering age and fruit weight per plant. The combination of bokashi from slaughterhouse waste and NPK compound fertilizer was able to increase plant growth significantly, but did not provide significant results on the flowering age and fruit weight of purple eggplant (*Solanum melongena* L.) plants.

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**Author Contributions**
Conceptualization; S. AS. NS.; methodology.; AS. NS.; validation; NS.; formal analysis; AS.; investigation.; S. AS.; resources; S. AS. NS.; data curation: S. AS. NS.; original draft writing: NS.; review and editing: AS.; visualization: S. AS. NS. All authors have read and approved the published version of the manuscript.

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**Conflicts of Interest**
The researchers in this study were assigned by each institution with the aim of improving the lecturers' resources.

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