



## The Effectiveness Of Organic Fertilizer And Micoriza Arbuscula On Growth And Productivity Green Eggplant (*Solanum Melongena* L.)

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### Abstract

Green eggplant (*Solanum melongena* L.) is a food plant grown for its fruit. The fruit of the eggplant depends on the fruit stalk and is a single true fruit, thick, soft, and juicy. This study was a completely randomized design with a three-treatment pattern. The first is a combination of organic fertilizer and arbuscular mycorrhizal fungi, the second is a positive control, namely using NPK fertilizer, the third is a negative control, namely without treatment. Each treatment was repeated three times and each repetition consisted of 3 plants. Plant growth parameters consist of plant height and number of leaves. Plant productivity parameters consist of the number of fruit, fruit wet weight, and dry weight. Based on the results of the study, it was obtained data that the combination of organic fertilizer and Arbuscular Mycorrhizal Fungi had better growth and productivity results compared to other treatments with an average plant height of 44.46; the average number of leaves 11.12; the average number of fruits was 5.51; mean fruit wet weight 106; and the average dry weight of fruit 84. The results of the Anova statistical test showed that the significance value of plant height and a number leaves was 0.000 ( $\alpha < 0.05$ ), and the significance value for the number of fruits was 0.006 ( $\alpha < 0.05$ ), while the significance value of weight wet and dry weight of fruit is 0.000 ( $\alpha < 0.05$ ), this indicates that the combination of organic fertilizer and Arbuscular Mycorrhizal has a significant effect on the growth and productivity of green eggplant plants.

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### Introduction

Organic fertilizers are fertilizers from organic materials, namely from plant residues, green manure, manure, including microbes such as bacteria and fungi. Organic fertilizers have the advantage of increasing crop production and maintaining soil fertility in a sustainable manner (Suliasih, 2015). Fertilizers of biological organisms as inoculants with active ingredients of living organisms that function to block certain nutrients or facilitate the availability of nutrients in the soil for plants. Facilitating the availability of these nutrients can take place through increasing plant access to nutrients (Purnomo et al., 2014).

Arbuscular mycorrhizal fungi are one of the fungi that live in the soil. This fungus is always associated with higher plants and both provide mutual benefits. The benefits of Arbuscular mycorrhizal fungi can be grouped into three, namely for plants, ecosystems, and

humans. For plants, Arbuscular mycorrhizal fungi are very useful for increasing nutrient uptake, especially elemental phosphate (P). The rate of entry of P nutrients into the Arbuscular mycorrhizal fungi hyphae can be up to six times faster in the roots of plants infected with Arbuscular mycorrhizal fungi compared to those not infected with Arbuscular mycorrhizal fungi. This happens because the external Arbuscular mycorrhizal fungi hyphae network can expand the absorption field (Musfal, 2010).

Eggplant or Eggplant (*Solanum melongena* L.) is a food plant grown for its fruit. Eggplant is a type of vegetable that contains a variety of nutrients. The nutritional composition of eggplant per 100 grams is 92.7 grams of water; iron 0.4 mg; carbohydrates 5.5 grams; 0.2 grams of fat; calories 24.00 cal; phosphorus 37 mg; calcium 15 mg; 1.1 grams of protein; sodium 4.00 mg; vitamin B1 0.04 mg; vitamin A 30 S.I; vitamin C 5.00 mg (Haryoto, 2013: 13).

The market potential for eggplant can also be seen in terms of prices that are affordable to all levels of society, thus opening up greater opportunities for market and farmer absorption. Based on the results of a market survey, it shows that the eggplant plant is one of the most sought after vegetables by the community. The amount of eggplant consumption has increased every year, but this is not accompanied by an increase in production. This is because the majority of farmers use chemical fertilizers for growth. The current availability of chemical fertilizers is very limited and the price is also expensive, so this is what makes farmers reluctant to grow green eggplant because the price is cheap, not comparable to the price of expensive chemical fertilizers. To increase the growth and productivity of green eggplant plants, a combination of organic fertilizers and Arbuscular Mycorrhizal Fungi are used which are cheap and easy to obtain, thereby increasing the amount of green eggplant production and meet market needs.

## Materials and Methods

The materials used in this study were the seeds of green eggplant (*Solanum melongena* L.), water for watering plants, and Organic fertilizer obtained from the laboratory Biology of the Islamic University of Jember, Arbuscular Mycorrhizal Fungi obtained from the Botani Laboratory of LIPI. This type of research is an experimental study using a completely randomized design with a three-treatment pattern. First, using a combination of organic fertilizer and arbuscular mycorrhizal fungi, the second was positive control (K +), namely NPK fertilizer, and the third was negative control (K-), which was without treatment. Each treatment was repeated three times, where each repetition consisted of three plants. Growth observation parameters include plant height and number of leaves. Retrieval of plant growth data began when the plants were 7 days after planting (planting cuttings) until the plants were 45 days old. Plant growth data were collected every 7 days. Productivity observation parameters include the Number of fruits per crop, planting wet weight, and dry weight. Productivity measurements are carried out during the first harvest, which is 70-80 days after the seeds are planted. Furthermore, harvesting is done every 3-7 days. Productivity measurements were carried out for 5 harvests.

Growth and productivity data of eggplant (*Solanum melongena* L) obtained were statistically analyzed using SPSS 21 through normality and homogeneity tests. If the data is normal and homogeneous, then the data is analyzed using one-way ANOVA (Analysis of Variance). If the results have a significant effect, it will be continued with the Duncan Test to compare the results between treatments.

## Results and Discussion

### Chemical Speciation of Heavy Metals in Bioaugmented and Non- Bioaugmented Soils from TB Landfill

This research was conducted to determine the effect of a combination of organism fertilizer, and Arbuscular Mycorrhizal Fungi on the growth and productivity of green eggplant plants. The results showed that the best average growth and productivity of green eggplant was found in the treatment of the combination of organism fertilizer, and Arbuscular Mycorrhizal Fungi compared to other treatments. This can be observed in the Figure below:

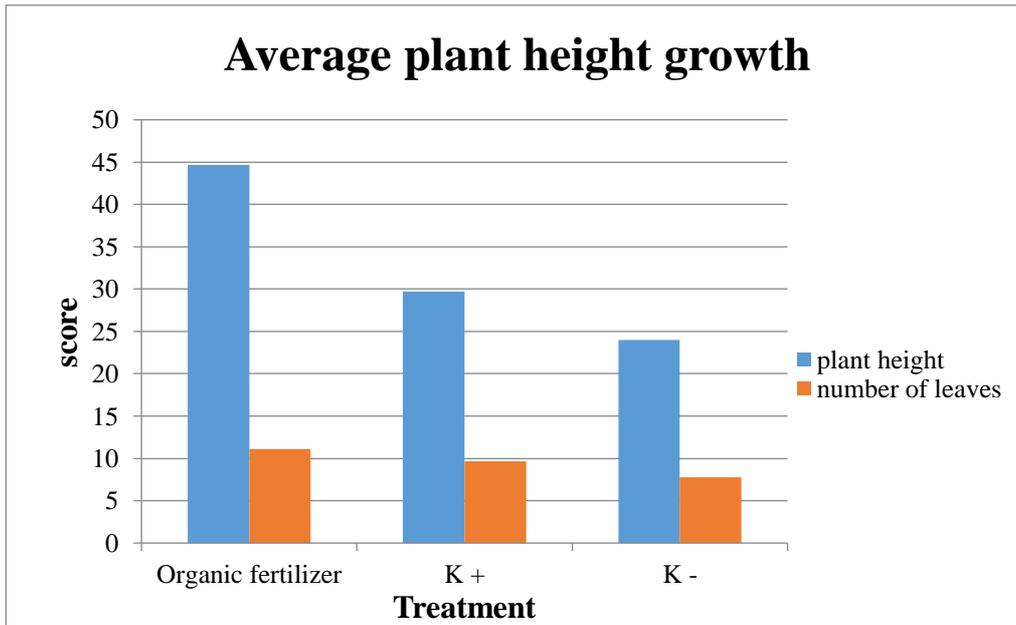


Figure 1. Graph of the average growth of green eggplant plants

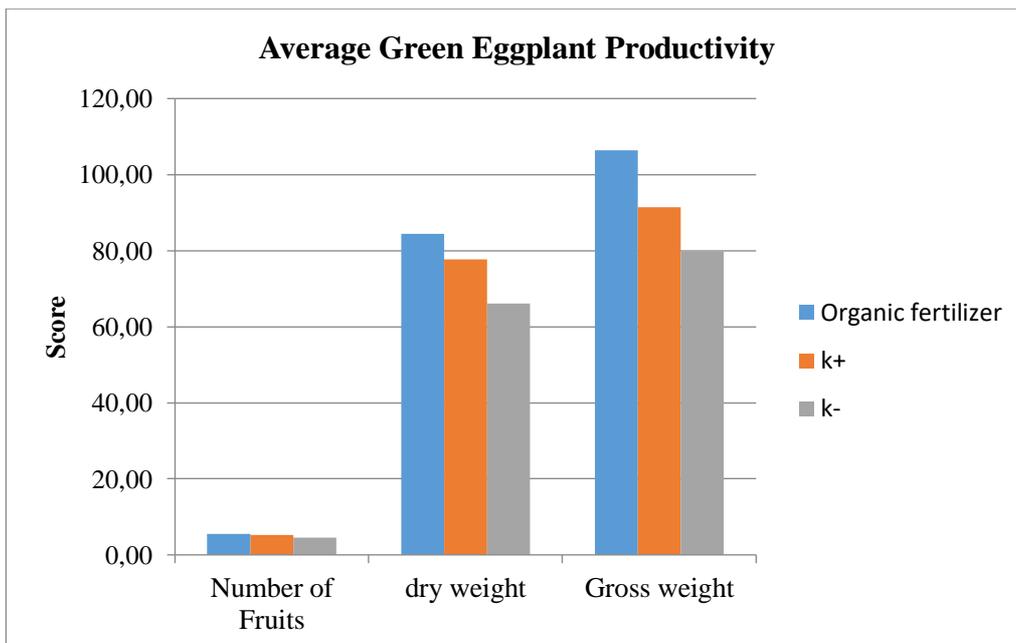


Figure 1. Graph of the average productivity of green eggplant plants

The figure shows a significant difference in the graph between the combination of organic fertilizer, and Arbuscular Mycorrhizal Fungi with chemical fertilizers (K +) and without fertilizers (K-), both in terms of plant height, the number of leaves, the number of fruits, dry weight, and fruit wet weight. Then the data is analyzed statistically, the results of the statistical analysis can be observed in the table below:

**Table 1. Statistical test results on the growth and productivity of green eggplant**

Perlakuan	Number of fruit	dry weight	fruit wet weight	Plant height	Number of leaves
Organic fertilizer	5,51±0,54 <sup>b</sup>	84±3 <sup>b</sup>	106±5,03 <sup>c</sup>	44,66±3,51 <sup>c</sup>	11,12±0,56 <sup>c</sup>
k+	5,19±0,40 <sup>b</sup>	78±7 <sup>a</sup>	91±2,91 <sup>b</sup>	29,69±0,72 <sup>b</sup>	9,67±0,04 <sup>b</sup>
k-	4,60±0,58 <sup>a</sup>	66±3 <sup>a</sup>	80±4,3 <sup>a</sup>	24±1,80 <sup>a</sup>	7,76±0,08 <sup>a</sup>

Note: Numbers followed by the same letter are not significantly different, while numbers followed by a different letter mean significantly different.

This research consisted of three treatments, namely, application of a combination of organic fertilizer and arbuscular mycorrhizal fungi, positive control (NPK fertilizer), and negative control (without fertilizer) on the growth and productivity of eggplant plants. Based on the results of the analysis, it is known that the combination of organic fertilizer and arbuscular mycorrhizal fungi has a significant effect on the growth and productivity of green eggplant, then to determine the difference, the Duncan test was performed. From the Duncan test, it was found that organic fertilizer and arbuscular mycorrhizal fungi were significantly different from other treatments both in terms of plant height and number of leaves. Meanwhile, plant productivity data showed that the application of organic fertilizer and arbuscular mycorrhizal fungi was significantly different from other treatments for wet weight and dry weight of fruit, while for the number of fruits it showed that the combination of organic fertilizer and arbuscular mycorrhizal fungi was not significantly different from the positive control (NPK fertilizer).

In previous trials, arbuscular mycorrhizal fungi were used for the process of rice plant seeding, and organic fertilizer was used for the growth of rice plants. From these trials, it was found that the results of the process of rice seedlings given arbuscular mycorrhizal fungi had better results, namely, the number of roots was more and longer than rice seeds without being given arbuscular mycorrhizal fungi. The growth of rice plants given organic fertilizer had better results compared to chemical fertilizers. Besides previous research conducted by Sudiarti, Diah (2018) entitled "The Effect of Giving Arbuscular Mycorrhizal Fungi (CMA) on the Growth of Edamame Soybean (*Glycin max*)" shows that giving arbuscular mycorrhizal fungi affect the growth of edamame soybean plants. So this research can be said to be in line with previous research, that the application of organic fertilizer and arbuscular mycorrhizal fungi affect the growth and productivity of green eggplant plants.

Organic fertilizer is a homemade fertilizer consisting of a consortium of several microbes and fermented using natural ingredients that are around. The microbes used in organic fertilizer are known to be able to fix nitrogen free from air and can provide P elements that can be directly used by plants. Besides, some microorganisms play an important role because the organic waste that has died is broken down into elements that are returned to the soil (N, P, K, Ca, Mg, etc.) and the atmosphere (CH<sub>4</sub> or CO<sub>2</sub>). ) as nutrients that can be reused by plants, so that the nutrient cycle runs as it should and life

processes on earth can take place, the activity of organic matter decomposing organisms such as microbes and mesofauna (invertebrate animals) supports the continuity of the nutrient cycle process in the soil, (Widowati, et al. 2005).

Arbuscular mycorrhizal fungi have a positive influence on growth and other physiological processes in plants. The beneficial effect of arbuscular mycorrhizal fungi on plant growth is often associated with increased uptake of nutrients that are not available, especially phosphorus, (Rosliani et al. 2009). So that the results of this study are similar to the theory that the use of a combination of organic fertilizers and Arbuscular Mycorrhizal Fungi can increase the growth and productivity of green eggplant plants. So it can be said that the combination of organic fertilizers and Arbuscular Mycorrhizal Fungi is effective on the growth and productivity of green eggplant plants.

## **Conclusions**

Based on the results of the study, it was obtained data that the combination of organic fertilizer and Arbuscular Mycorrhizal Fungi had better growth and productivity results compared to other treatments with an average plant height of 44.46; the average number of leaves 11.12; the average number of fruits was 5.51; mean fruit wet weight 106; and the average dry weight of fruit 84. The results of the Anova statistical test showed that the significance value of plant height and the number of leaves was 0.000 ( $\alpha < 0.05$ ), and the significance value for the number of fruits was 0.006 ( $\alpha < 0.05$ ), while the significance value of weight wet and dry weight of fruit is 0.000 ( $\alpha < 0.05$ ), this indicates that the combination of organic fertilizer and Arbuscular Mycorrhizal Fungi has a significant effect on the growth and productivity of green eggplant plants.

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