

## Increasing the Yield of Purple Corn (*Zea mays* L.) through the Application of Compost Organic Fertilizer Enriched with Trichoderma

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### ABSTRACT

Purple corn has many benefits for body health so it is necessary to develop research related to this plant. This research aims to obtain information on the effect of giving trichocompost on the production of purple corn plants as well as the recommended dosage of trichocompost fertilizer based on research results. The design method used was Randomized Block Design with treatment in the form of different doses of trichocompost fertilizer (0 tons/ha, 20 tons/ha, 25 tons/ha, 30 tons/ha, and 35 tons/ha). Analysis of variance and the Least Significant Difference (LSD) test showed that the application of trichocompost doses had a significant effect on cob length, cob diameter, and purple corn plant yield. An application of 25 tons/ha of trichocompost can be used as the most efficient recommended dose.

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## INTRODUCTION

Corn/maize is one of the important crops in Indonesia. Indonesia's population continues to increase in line with the increasing demand for corn. Corn as a staple food has sufficient nutritional and fiber content. The development of research on corn continues to be carried out so that now there is purple corn which is beneficial for body health.

Purple corn has a higher concentration of anthocyanins compared to several other varieties of corn (Sheng et al., 2018). Anthocyanins have antioxidant and anti-inflammatory properties. Consuming foods containing anthocyanins can prevent and treat inflammation (Speer et al., 2020). Anthocyanins are antioxidants in the form of important bioactive substances which are very good for health (Tian et.al., 2020). Purple corn also contains other compounds which are certainly very beneficial.

Development regarding purple corn should continue, including conducting research related to the cultivation of this plant. This type of purple corn has not yet been widely cultivated but has succeeded in attracting the attention of the Indonesian government and fully supports research related to purple corn.

Nutrients are factors that must be considered in the plant cultivation process. The previous habit of farmers was to use chemical/inorganic fertilizers which had a negative impact on the soil. Excessive and continuous use of inorganic materials on soil can have a negative impact due to reducing the quality of soil fertility (Syamsiyah et.al., 2021). Poor soil conditions will result in lower crop production.

Improving soil quality can be done by using organic materials such as compost with additional technology so that it becomes trichocompost, namely compost containing the fungus *Trichoderma* sp. Organic fertilizer added to compost can increase soil fertility and optimize plant growth and production (Gofat et.al., 2023).

Application of trichocompost fertilizer in previous research using sweet corn cultivar Talenta provided information that doses of trichocompost fertilizer up to 25 tons/ha could increase sweet corn production by 38.33% compared to the control. The suggestion from this research is that research be carried out with doses of more than 25 tons/ha to determine the optimum dose for trichocompost application (Rinata, 2016).

Based on this, research was carried out regarding the application of trichocompost fertilizer with several fertilizer doses up to more than 25 tons/ha on corn plants. The research uses antioxidant purple corn as a step in developing purple corn research. The research aims to obtain information on the effect of giving trichocompost on the production of purple corn plants as well as the recommended dosage of trichocompost fertilizer based on the research results.

## LITERATURE REVIEW

Research conducted using two purple corn cultivars, namely INIA-601 and MM, showed that both have high anthocyanin concentrations. Cyanidin-3glucoside in the INIA-601 cultivar was 7.9 mg g<sup>-1</sup> in the ear and 4.53 mg g<sup>-1</sup> in the bracts, while the MM cultivar showed a yield of 7.2 mg g<sup>-1</sup> in the ear and 2.1 mg g<sup>-1</sup> in the bracts. This data indicates that there are export and import opportunities for purple corn (Atalaya and Hoyos, 2022).

Efforts to increase crop yields can be made through fertilization (Ishfaq et.al.,2023). Fertilizer application in plant cultivation to obtain optimal production by integrating inorganic and organic nutrient sources. This combination of fertilizers can help maintain soil fertility and save fertilizer costs (Goda, 2019).

One type of organic fertilizer that is widely known is compost (Pratiwi et.al., 2023). Adding *Trichoderma* sp to the process of making compost from pineapple litter showed a real effect on reducing C-Organic levels and the C/N ratio (Irawan et.al., 2023). Compost with the addition of *Trichoderma* not only controls plant diseases but also acts as a plant growth promoter (Talukdar et.al., 2017). The application of trichocompost to tomato plants shows results in a significant increase in the number of leaves, plant height, primary and secondary branches, number of flowers and fruit and ultimately increases fruit production (Abedin et.al., 2018).

## METHODOLOGY

### Research Methodology

The research used a Randomized Block Design with treatment in the form of different doses of trichocompost fertilizer, namely:

- t0 : 0 kg
- t1 : 20 tons/ha
- t2 : 25 tons/ha
- t3 : 30 tons/ha
- t4 : 35 tons/ha

Each treatment was repeated 5 times. The research data obtained were analyzed using variance and continued with the Least Significant Difference (LSD) Test.

### Research Implementation

#### *Making Trichocompost Fertilizer*

Organic materials and *Trichoderma* are needed to make trichocompost fertilizer. Organic material in the form of compost from tea dregs, kettle ash, livestock manure, agricultural lime, burnt husks, and EM4. 100 grams of *Trichoderma* mixed with every 50 kg of compost,

#### *Land Preparation and Planting*

Land clearing and tillage aim to make the soil loose. Trichocompost application according to the treatment dose is carried out one week before planting. Purple corn seeds are planted with a soil distance of 25 cm x 75 cm.

### **Maintenance**

Maintenance includes watering, replanting, fertilizing, and weeding. Inorganic fertilizer according to the recommended dose, namely 300 kg urea/ha, 200 kg SP36/ha, and 100 kg KCl/ha. Plant maintenance ensures that plants grow and develop well to support the research process and data collection.

### **Observation**

Observation parameters consist of leaf greenness level (unit), number of rows per cob (row), cob length (cm), cob diameter (cm), and yield (tons/ha).

## **RESULTS**

### **Leaf Greenness Level**

The treatment with various doses of trichocompost did not have a significant effect on the average level of leaf greenness. The highest level of leaf greenness in Figure 4 is shown by plants treated with 25 tons/ha (53.6 units).

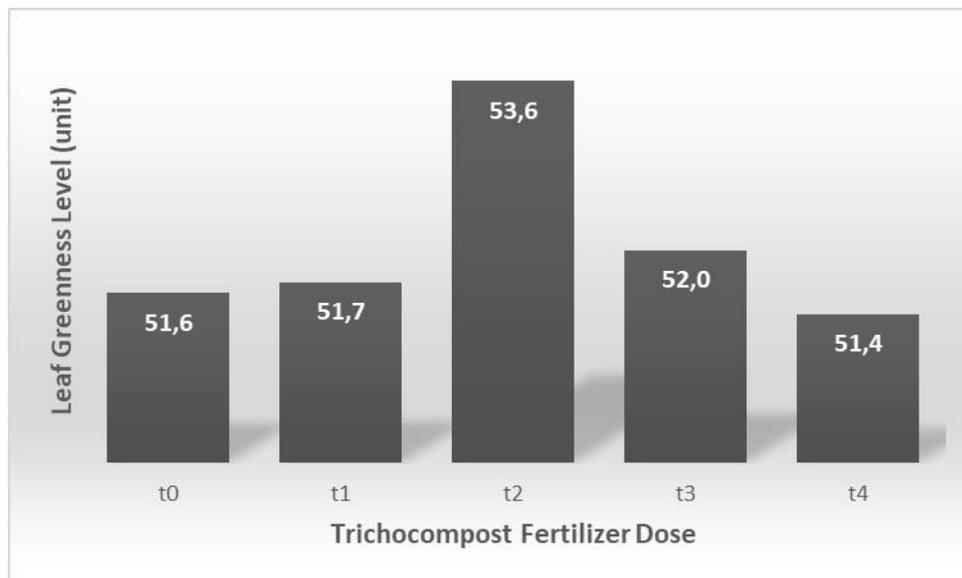


Figure 1. Level of Leaf Greenness (Units) in the Treatment Dose of Trichocompost Fertilizer

### **Number of Rows per Cob**

The trichocompost dosage treatment had no significant effect on the number of rows per cob. Figure 2 shows that the 30-tons/ha trichocompost treatment had the highest average number of rows per cob, namely 14.5 rows.

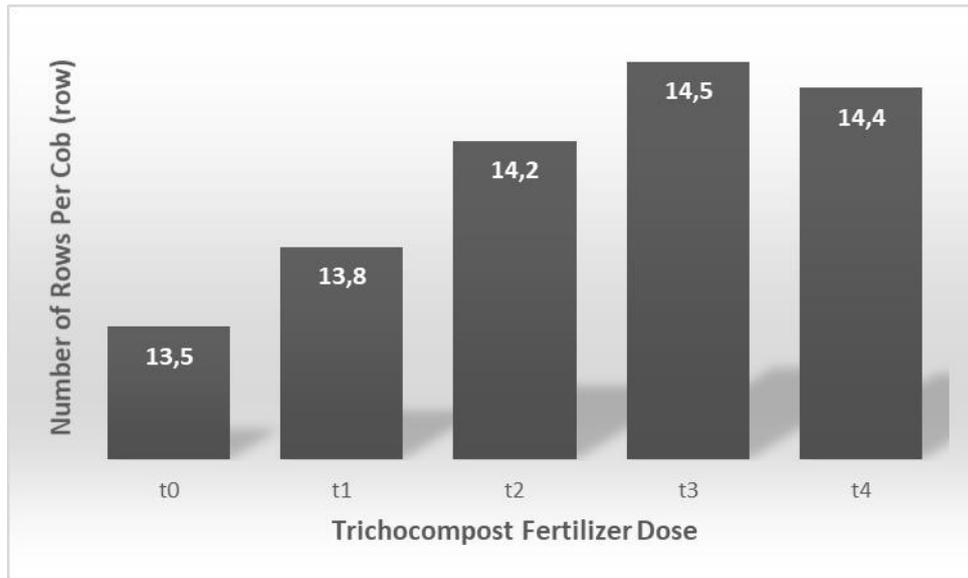


Figure 2. Number of rows per cob (row) in the trichocompost fertilizer dose treatment

### Cob Length

The dose of trichocompost added had a significant effect on cob length parameters. Table 1 shows that trichocompost 25 tons/ha gave the highest average cob length of 16.4 cm followed by doses of 30 tons/ha, 35 tons/ha, 20 tons/ha, and 0 tons/ha.

Table 1. Average Cob Length in the Trichocompost Fertilizer Dose Treatment

Trichocompost Dosage	Cob Length (cm)
t0 (0 tons/ha)	14,9 b
t1 (20 tons/ha)	15,2 ab
t2 (25 tons/ha)	16,4 a
t3 (30 tons/ha)	16,1 ab
t4 (35 tons/ha)	15,7 ab

Note: Numbers followed by the same letter in the same column indicate an insignificant difference in the LSD Test at the 0.05 level

### Cob Diameter

A significant effect based on the BNJ test can also be seen in the results of observations of cob diameter and the average value is presented in Table 2. The highest average cob diameter value was in the trichocompost application of 25 tons/ha (4.2 cm) and was significantly different from the control treatment.

Table 2. Average Cob Diameter in the Treatment Dose of Trichocompost Fertilizer

Trichocompost Dosage	Cob Diameter (cm)
t0 (0 tons/ha)	3,8 d
t1 (20 tons/ha)	3,9 cd
t2 (25 tons/ha)	4,2 a

t3 (30 tons/ha)	4,1 ab
t4 (35 tons/ha)	4,0 bc

Note: Numbers followed by the same letter in the same column indicate an insignificant difference in the LSD Test at the 0.05 level

### Yield

The application of trichocompost fertilizer to purple corn plants has a significant effect on yield parameters. The highest yield value was in the 25 tons/ha (9.6 tons/ha) treatment.

Table 3. Average Yield in the Trichocompost Fertilizer Dose Treatment

Trichocompost Dosage	Yield (tons/ha)
t1 (0 tons/ha)	7,8 d
t2 (20 tons/ha)	8,3 c
t3 (25 tons/ha)	9,6 a
t4 (30 tons/ha)	9,4 ab
t5 (35 tons/ha)	9,2 b

Note: Numbers followed by the same letter in the same column indicate an insignificant difference in the LSD Test at the 0.05 level

### DISCUSSION

Trichocompost fertilizer dose treatment had a significant effect on cob length, cob diameter, and yield. The 25 tons/ha treatment showed the highest values for all these parameters. This indicates that a dose of 25 tons/ha of trichocompost for purple corn plants is the optimal dose with the highest yield value. According to Santosa et.al. (2022), if the nutrient content in the soil is high and then fertilizer is added, the plants cannot absorb it optimally.

Trichocompost dosage treatment had a significant effect on cob length and diameter where these two parameters were interrelated. According to Suryani et.al. (2023), trichocompost contains nutritional variants including P which can influence the increase in cob diameter. Hatibie et.al. (2022) stated that the cob diameter becomes larger if the P nutrient is sufficient, thus influencing the formation of seed cobs. This explanation is relevant to the results obtained where different doses of trichocompost also had a significant effect on cob length. According to Meena et.al. (2023), cob diameter and cob length are components of the physical characteristics of corn plants at harvest time.

The yield of purple corn plants applied with 25 tons/ha of trichocompost fertilizer reached 9.6 tons/ha, exceeding the description of purple corn yield without the addition of trichocompost. The supply of N, P, and K fertilizer is more complete and stimulates plant growth and yield with the addition of Trichoderma to the compost. According to Syamsiyah et.al. (2020), the application of Trichoderma fertilizer doses can increase the productivity of corn plants.

Trichoderma can increase metabolism in general, characterized by an increase in fresh weight and dry weight of plants. Trichoderma application is the right choice because it can reduce the input of growth regulators, thereby

reducing production costs, and is beneficial for the environment (Kribel et.al., 2020). Syahfari et.al. (2023) suggested that growth-promoting hormones could be produced from Trichoderma.

## CONCLUSIONS AND RECOMMENDATIONS

Application of trichocompost fertilizer at different doses had a significant effect on cob length, cob diameter and purple corn yield. Application of 25 tons/ha of trichocompost can be used as the best and most efficient dose.

## FURTHER STUDY

Further research can be carried out by reducing the dose of inorganic fertilizer in the cultivation of purple corn plants. Observations on the effect of trichocompost dosage can be carried out in subsequent years to obtain information on the effect of trichocompost fertilizer application over time.

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