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Effects of varying compost amounts on the yield of Tomato (*Solanum lycopersicum* L.)

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Abstract
This study examines the impact of different compost dosages on the productivity of tomato plants (*Solanum lycopersicum* L.). Using a randomized complete block design, tomato plants were treated with four different levels of compost: 0 kg/m², 5 kg/m², 10 kg/m², and 15 kg/m². The study aimed to determine optimal compost usage that maximizes yield without adverse environmental effects. Results indicate a significant increase in tomato yield with increased compost up to 10 kg/m², beyond which the yield plateaued.

Keywords: Tomato (*Solanum lycopersicum* L.), food and agriculture organization, global agriculture

Introduction
Tomatoes (*Solanum lycopersicum* L.) are a cornerstone of global agriculture, valued not only for their culinary versatility but also for their nutritional benefits, including high levels of vitamins A and C, and antioxidants. According to the Food and Agriculture Organization (FAO), tomatoes are the world's largest vegetable crop with an annual production exceeding 180 million tons, grown on about 4.8 million hectares globally. The versatility of tomatoes extends from fresh market consumption to various processed forms such as sauces, juices, and pastes, which underscores their economic significance.

However, achieving optimal tomato yields is a complex challenge influenced by various factors including genetics, agronomic practices, and environmental conditions. Among these, soil health emerges as a crucial element. Soil fertility, particularly the availability of organic matter, plays a vital role in supporting tomato plant health and productivity. Compost, as a source of organic matter, not only improves soil structure and fertility but also enhances soil microbial activity, which in turn supports plant growth.

Recent studies suggest that appropriate compost application can significantly increase crop yield by improving soil moisture retention, providing a slow-release source of nutrients, and enhancing soil structure. However, the relationship between the amount of compost applied and the yield of tomato plants is not linear. While some compost improves yield, too much can hinder plant growth due to factors such as nitrogen immobilization and decreased soil aeration.

Objective
The primary objective of this study is to determine the optimal compost application rate that maximizes the yield of tomato plants (*Solanum lycopersicum* L.)

Materials and Methods
The experiment was conducted at the agricultural reseaarch facility of Mwanga University in Tanzania. The soil type was loam with a pH of 6.5. Tomato seedlings (variety 'Heirloom') were planted at a spacing of 50 cm x 50 cm in plots measuring 2 m x 1 m. Compost was mixed into the top 20 cm of soil at rates of 0 kg/m² (control), 5 kg/m², 10 kg/m², and 15 kg/m² before planting. Each treatment was replicated five times in a randomized complete block design. Irrigation was applied equally to maintain soil moisture at optimal levels. Plant height and health were monitored weekly. At the end of the growing season, tomatoes were harvested, and yield was measured as the total weight of ripe tomatoes per plot.

Results

Table 1: Average yield of ripe tomatoes

Compost Amount (kg/m²)	Average Yield per Plot (kg)	Standard Deviation (kg)
0 (Control)	5.0	0.6
5	6.8	0.5
10	8.4	0.4
15	8.6	0.3

Data analysis showed that tomato yield increased with compost amount. The yield was significantly higher in plots treated with 10 kg/m² of compost compared to the control ($p<0.05$). The yield differences between 10 kg/m² and 15 kg/m² were not statistically significant, indicating a plateau effect beyond 10 kg/m² of compost.

Discussion

The results of this study provide compelling evidence that compost application enhances the yield of tomatoes, with the most significant increases observed at the 10 kg/m² treatment level. This suggests that compost contributes essential nutrients and improves soil structure, which are critical for the growth and productivity of tomato plants. The observation from the experiment is the plateau in yield increase beyond 10 kg/m² of compost. This phenomenon may be attributed to the point at which additional compost no longer contributes to yield enhancement, possibly due to nutrient saturation or other limiting factors such as decreased soil aeration. It's also plausible that beyond a certain compost threshold, the benefits in terms of nutrient availability are offset by detrimental effects on root oxygenation and moisture balance, which are crucial for optimal plant health and productivity. The findings align with other research indicating that excessive application of organic materials can lead to nutrient imbalances, particularly with nitrogen and phosphorus, which can not only stifle growth but also lead to environmental issues such as leaching and runoff. Therefore, the non-significant difference in yield between the 10 kg/m² and 15 kg/m² compost treatments can be interpreted as an indicator of reaching an optimal application rate for maximizing yield without the negative consequences of over-fertilization. This study underscores the importance of determining the appropriate amount of compost for specific crop species and soil types to ensure environmental sustainability and economic viability. Future studies could explore the long-term effects of repeated compost application at these optimal levels on soil health and structure, further informing sustainable agricultural practices. Additionally, investigating the response of different tomato varieties to varying compost amounts could provide more tailored guidelines for growers aiming to optimize yields and resource use. The broader implication of this research is that sustainable farming practices like compost application not only enhance crop yields but also contribute to soil health, which is fundamental for the long-term sustainability of agricultural systems. This highlights the need for integrated nutrient management strategies that consider both crop needs and environmental impact, ensuring that agricultural practices contribute positively to ecosystem services and food security.

Conclusion

This study conclusively demonstrates that compost application significantly enhances the yield of tomato plants, with an optimal compost amount of 10 kg/m² providing the maximum yield benefits. This amount supports improved plant growth and productivity without the diminishing returns observed at higher levels of compost application. The findings emphasize the importance of precise compost management to maximize agricultural output while maintaining soil health and minimizing environmental impacts. Future research should focus on the long-term effects of compost use at this optimal level, exploring impacts on soil quality and the efficacy of compost in different agricultural settings. Moreover, expanding the scope to include various tomato varieties could help tailor compost application recommendations more accurately, ensuring that all farmers can achieve sustainable and economically viable production.

References

1. Jayasinghe HA, Weerawansha AN. Effect of compost and different NPK Levels on growth and yield of three tomato (*Solanum lycopersicum*) varieties in Sri Lanka. Journal of Advanced Agricultural Technologies Vol. 2018 Jun;5(2).
2. Abafita R, Shimbir T, Kebede T. Effects of different rates of vermicompost as potting media on growth and yield of tomato (*Solanum lycopersicum* L.) and soil fertility enhancement. Sky Journal of Soil Science and Environmental Management. 2014;3(7):73-7.
3. Baldantoni D, Bellino A, Alfani A. Soil compost amendment enhances tomato (*Solanum lycopersicum* L.) quality. Journal of the Science of Food and Agriculture. 2016 Sep;96(12):4082-8.
4. Baldantoni D, Bellino A, Alfani A. Soil compost amendment enhances tomato (*Solanum lycopersicum* L.) quality. Journal of the Science of Food and Agriculture. 2016 Sep;96(12):4082-8.
5. Kalbani FO, Salem MA, Cheruth AJ, Kurup SS, Senthilkumar A. Effect of some organic fertilizers on growth, yield and quality of tomato (*Solanum lycopersicum*). International Letters of Natural Sciences; c2016, 53.
6. Khan AA, Hamida Bibi HB, Zahid Ali ZA, Muhammad Sharif MS, Shah SA, Haroon Ibadullah HI, *et al*. Effect of compost and inorganic fertilizers on yield and quality of tomato.
7. Mehdizadeh, Mohammad, *et al*. Growth and yield of tomato (*Lycopersicon esculentum* Mill.) as influenced by different organic fertilizers; c2013. p. 734-738.
8. Ilodibia CV, Chukwuma MU. Effects of application of different rates of poultry manure on the growth and yield of tomato (*Lycopersicum esculentum* Mill.). Journal of Agronomy. 2015;14(4):251-3.