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Effect of Farming Methods on Solanum Lycopersicum Plant

Khandare AD*

Post-graduate Student, MGMU-Institute of Bioscience and Technology, India

***Corresponding author:** Akshay Dattarav Khandare, Post-graduate Student, MGMU-Institute of Bioscience and Technology, Chhatrapati Sambhajinagar, India, Tel: 9689844352; Email: akhandare877@gmail.com

Research Article

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Abstract

The cultivation of *Solanum lycopersicum*, commonly known as tomato, is a critical aspect of global agriculture, with various farming methods employed to enhance plant growth and yield. This project investigates the effect of different farming methods, including organic and conventional practices, on the growth, development, and yield of *Solanum lycopersicum* plants. The study utilizes a comparative approach, analyzing key parameters such as plant height, leaf area, fruit weight, and nutrient content. The results demonstrate that organic farming methods significantly influence the growth and yield of *Solanum lycopersicum* plants compared to conventional methods. Organic farming promotes sustainable agricultural practices, enhances soil health, and reduces environmental impact. The findings of this study contribute to the ongoing discourse on sustainable farming practices and their impact on crop productivity, highlighting the importance of organic farming in ensuring food security and environmental sustainability.

Keywords: *Solanum Lycopersicum*; Solanaceae; Polyhouse

Abbreviations

RBD: Randomized Block Design.

Introduction

Tomato (*Solanum lycopersicum* 2n = 2 × = 24), one of the important species of the Solanaceae family that first appeared in the region of Andes Mountains in South America, is one of the most cultivated vegetables in the world. India is the second largest producer of tomatoes in the world. Of all the climatic factors affecting vegetable production, temperature is considered very important. Temperature affects growth and development of vegetables in terms of seed germination, development of economic parts, flowering, pollination, fruit set, quality of produce, seed production, seed storage, seed dormancy and occurrence of disease and pests [1]. The growth and development of most vegetable crops are adversely affected at temperatures less than 5°C.

Tomato is a warm season crop requiring a temperature from15° to 30°C. Nimje S, et al. [2] reported poor yield in tomato under greenhouse as compared to open field crop because of higher temperature during growth, flowering and fruiting period in the green house. Tomato is one of the most important protective food crops of India. India ranks second in the area as well as production of tomato next to China.

Tomato (*Solanum lycopersicum*) belongs to the genus Lycopersicon under Solanaceae family. Tomato is rich source of vitamins A, C, potassium, minerals and fibers. Tomato is one of the most important protective food crops of India. Of all the climatic factors affecting vegetable production, temperature is considered very important. Temperature affects growth and development of vegetables in terms of seed germination, development of economic parts, flowering, pollination, fruit

set, quality of produce, seed production, seed storage, seed dormancy and occurrence of disease and pests.

Polyhouse farming elevates tomato cultivation to new heights, where innovative techniques yield high-value crops even during off-seasons. The synergy of polythene and agro shed nets within a well-ventilated polyhouse creates an optimal environment for your tomato plants to thrive. Controlled factors such as light, temperature, humidity, and water 5 usage lead to premium produce and increased rewards. average fruit yield of around 120- 140 q can be realized in 1000 m2 area of polyhouse. polyhouse farming is the process of growing crops in an environment where the temperature, humidity, and fertilizers are all controlled by automated equipment.

Review of Literature

Ganesan M [3] studied the effects of temperature on plant growth and yield of tomato in poly-greenhouses and open field condition. The air temperature in the open field condition was lower than in the poly-greenhouse treatments throughout the growth period. Poly-greenhouse with ventilation gaps in the triangular roof and four sidewalls was found more suitable for better plant growth and yield of tomato than those with the other ventilation gaps in poly-greenhouses and open field condition. Air temperature in the open field condition was lower than in the polygreenhouse treatments throughout the period.

Chauhan R [4] revealed that the tomato cultivation under poly houses has significantly contributed to the yield. The reasons for higher total cost were high price of seed/ seedlings, large number of labour required and depreciation and interest on fixed cost which increases the total cost of tomato cultivation under poly houses.

Boyaci S , et al. [5] used in greenhouses covered with polyethylene film were Fog and natural ventilation (Fog+NV) system in the first greenhouse, a Fan and pad cooling (FP) system in the second greenhouse, and natural ventilation (NV) system in the third greenhouse. The systems started to be operated in cases where the temperature exceeded 28°C and the natural ventilation was insufficient to reduce the internal temperature.

Jain S, et al. [6] Production and marketing constraints under poly house cultivation have also been identified. Simple statistical tool like Averages and percentages were used to compare, contrast and interpret the results properly. Comparative economic analysis of tomato cultivation under poly houses and open field conditions were made on per acre b [7].

Materials and Methods

Materials:

Field:

- Normal farming.
- Polyhouse farming.

Methods:

- Morphological study of crop: Morphological study of crop such as plant height, morphological features, leaf size, fruit size, etc was measured from both polyhouse plants as well as non-polyhouse plants.
- Observation: Plants were observed carefully for the presence of diseases, determination of plant health, irrigation parameters, etc.
- Pest management: diseased fruits and plants were observed and information of various Traps for pest management was collected.
- Environmental condition: environmental conditions such as temperature, amount of water supply, biotic and abiotic stress were monitored.
- Microbial analysis: Soil samples from both the polyhouse and non-polyhouse were observed for microbial analysis on the Nutrient Agar plate.

Results

The observation and result obtained from the present study are described below. Efforts made to justify objectives of study, has showed significant outcome.

	R1	R2	R3	R4	Average
Plant height	5.1ft	5.2ft	4.10ft	5ft	5ft
Number of Leaves	62	55	63	59	60
Number of fruits	70	68	72	70	70
Weight of fruits	85gm	88gm	95gm	92gm	90gm
Length of Leaves	8in	8in	8in	8in	8in
Width of Leaves	3in	3in	3in	3in	3in

Table 1: Harvesting Stage of Polyhouse Method.

	R1	R2	R3	R4	Average
Plant height	3.1ft	3.7ft	3.4ft	3.5ft	3.5ft
Number of Leaves	50	53	50	57	50
Number of fruits	57	52	53	58	55
Weight of fruits	90gm	92gm	91gm	87gm	90gm
Length of Leaves	8in	8in	8in	8in	8in
Width of Leaves	3in	3in	3in	3in	3in

Table 2: Harvesting Stage of Normal Method.

Results of the observation are as stated in the tables above, Effect of farming methods showed changes in Plant heights, Number of leaves, Number of fruits and weight of fruits, while the Length and width of leaves showed no changes as the average size of the leaves was same in both the methods.

Experimental Design: Randomized Block Design (RBD).

One factor analysis , commonly referred to as one way analysis of variance is a statistical method used to compare the methods of polyhouse farming and normal farming method on determine the methods on compare the one factor analysis.

Source of Variation	DF	Sum of Squares	Mean Squares	F-Calculated	Significance
Replication	3	28.169			
Treatment	5	29,661.43	5,932.29	1,150.39	0.00000
Error	15	77.351	5.157		
Total	23	29,766.95			

Table 3: Analysis of Variance Table in Polyhouse Method.

Treatment	Character 1	
	Mean	S.E.
1	4.850	0.25
2	59.750	1.8
3	70.000	0.82
4	90.000	2.2
5	8.000	0.000
6	3.000	0.000
C.D	3.454	
SE(m)	1.135	
SE(d)	1.606	
C.V.	5.783	

Table 4: Table of Mean, Standard Errors and C.D.

Source of Variation	DF	Sum of Squares	Mean Squares	F-Calculated	Significance
Replication	3	5.680			
Treatment	5	25,922.451	5,184.490	1,151.984	0.00000
Error	15	67.507	4.500		
Total	23	25,995.639			

Table 5: Analysis of Variance Table in Normal Method.

Treatment	Character 1	
	Mean	S.E.
1	3.425	0.125
2	52.500	1.658
3	55.000	1.472
4	90.000	1.080
5	8.000	0.000
6	3.000	0.000
C.D	3.227	
SE(m)	1.061	
SE(d)	1.500	
C.V.	6.006	

Table 6: Table of Mean, Standard Errors and C.D.

Figure 1A

Figure 1B

Figure 1C

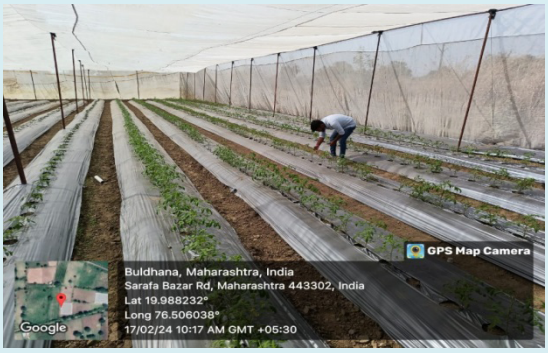

Figure 1D

Figure 1E

Figure 1F

Mulching Paper Parameters:

Per row length	2ft bed
	2.5ft furrow
Distance between bed	1 meter wide
Length of bed	800 meter
Distance between plants	1.5ft

Table 7: Mulching Paper is used in Both Farming Methods.

Different Types of Traps Observed in Both Farming Methods:

- Delta traps: tomato leaf minor, diamond back moth.
- Water traps: tomato leaf minor, brinjal shoot fruit borer.
- Funnel trap: help in reducing the damage to the crop.

Identified Disease on the Plants:

- Blossom End Rot
- Leaf Mold of Tomato

Figure 2A

Figure 2B

Microbial Analysis: Colonies Observed on the Nutrient Agar Plate Inoculated with Soil Samples:

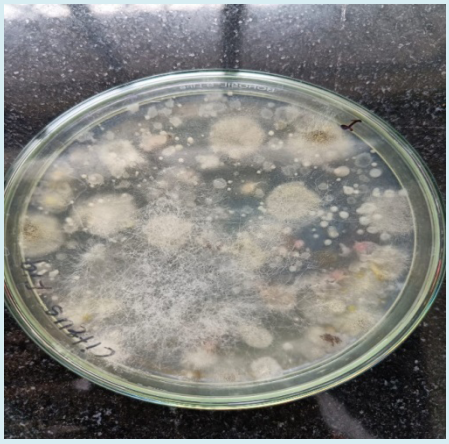

Figure 3A: Polyhouse Soil Sample.

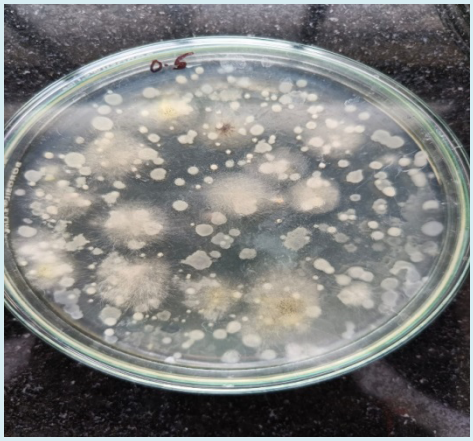

Figure 3B: Non-Polyhouse Soil Sample.

Discussion

The results of this study indicate that farming methods have a significant impact on the growth and yield of *Solanum lycopersicum* plants. Organic farming practices, characterized by the use of natural fertilizers, crop rotation, and biological pest control, promote plant growth and development compared to conventional methods that rely on synthetic fertilizers and pesticides. One key finding is the higher nutrient content in tomatoes grown using organic methods, which is consistent with previous research demonstrating the nutritional benefits of organic produce. The increased nutrient content in organic tomatoes is attributed to the use of organic fertilizers, which enhance soil fertility and promote nutrient uptake by plants. Another important finding is the positive effect of organic farming on soil health. Organic farming practices improve soil structure, increase

microbial diversity, and enhance nutrient cycling, leading to healthier soil and sustainable agricultural production. In contrast, conventional farming methods often degrade soil quality over time, leading to erosion, nutrient depletion, and reduced crop yields.

The findings of this study support the growing body of evidence that organic farming is a viable and sustainable alternative to conventional agriculture. Organic farming promotes biodiversity, reduces the use of synthetic chemicals, and enhances soil health, contributing to long-term environmental sustainability. However, further research is needed to fully understand the mechanisms underlying the beneficial effects of organic farming on crop growth and yield.

Conclusion

This study investigates the impact of farming methods on *Solanum lycopersicum* (tomato) plants, focusing on organic and conventional farming practices. The research compares plant growth, development, yield, and nutrient content between the two farming methods. The results show that organic farming methods significantly enhance the growth and yield of *Solanum lycopersicum* plants compared to conventional methods. Organic farming promotes sustainable agricultural practices, improves soil health, and increases the nutrient content of tomatoes. These findings contribute to the ongoing discourse on sustainable agriculture and highlight the benefits of organic farming for food security and environmental sustainability.

The study concludes that organic farming methods have a positive impact on *Solanum lycopersicum* plant growth, development, and yield compared to conventional methods. Organic farming promotes sustainable agricultural practices, enhances soil health, and increases the nutrient content of tomatoes. The findings underscore the importance of organic farming in ensuring food security, promoting environmental sustainability, and improving the nutritional quality of crops. Further research is needed to fully understand the mechanisms underlying the beneficial effects of organic farming on crop growth and yield.

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