International Journal of Advanced Biochemistry Research

ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating (2025): 5.29
IJABR 2025; 9(7): 1276-1278
www.biochemjournal.com
Received: 02-05-2025
Accepted: 05-06-2025

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Effect of organic amendments on growth of tomato under terrace farming

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DOI: https://www.doi.org/10.33545/26174693.2025.v9.i7p.4923

Abstract
An investigation was carried out to study the Effect of organic amendments on growth of tomato under terrace farming during *Kharif* 2024, at Terrace Farming Facility, Department of Agronomy, PGI, Dr. PDKV, Akola, in Randomized Block Design with six treatments and four replications. The growth attributing characters like plant height (cm), number of branches plant^{-1} and Leaf area (cm^2) were increased significantly due to application of conventional fertilizer through RDF over other treatments. However, Among organic and natural farming highest growth attributing characters were found with application of vermiwash at 20, 40 and 60 DAP and application of jeevamrut at 20, 40 and 60 DAP, compared to control treatment.

Keywords: Terrace farming, organic amendments, tomato

Introduction
A terrace farming is a garden on the roof of a building. Besides the decorative benefits, roof plantings may provide food, temperature control, hydrological benefits, architectural enhancement, habitats or corridors for wildlife, recreational opportunities, and, on a large scale, may even have ecological benefits (Oberndorfer *et al.* 2007) [8]. As a result, in order to feel more connected to nature from the comfort of their homes, the citizens of this modern, fastpaced city have to take porch gardening. In a city like Bangalore, a porch garden would obviously not be as natural as one you would create on the ground in your Terrace. Additionally, there is a restriction in the apartments and on the kind of plants that can be included in a porch garden, primarily due to a lack of space, soil erosion (Rao *et al.* (2022) [11]. Due to how much energy and resources buildings use, a number of environmentally friendly strategies and energyefficient technologies have been proposed and implemented to create low-energy buildings (Zhou *et al.*, 2014; Ghaffarian Hoseini, 2013) [14, 3].

Container gardening is the practice of growing plants in containers instead of planting them in the ground. This gardening may also be known as pot cultivation. This type of cultivation reduces the risk of soil-borne diseases, virtually eliminates weed problems, and gives gardeners more control over moisture, temperature, and sunlight. The method of cultivating food on the rooftop is referred to as rooftop farming. Rooftop cultivation can also provide more opportunities for growing fresh produce for populations that have little ground area for crops, which can help reduce food shortages in poor, urban areas (Azad *et al.* (2019)) [1].

Organic farming is the practice of agriculture that emphasizes the health of the soil, plants, food, and environment over crop yield. Organic farming, which uses no or only natural pesticides and organic fertilizers, is seen as a more environmentally friendly option (Gong *et al.*, 2022) [4].

Jeevamrutha, organic liquid manure. It's made with native cow's urine, dung, horse gram, and jaggery, and using cow-based products is a time-honored agricultural tradition (Bharadwaj, 2021) [2]. Organic manure, as well as liquid manure like jeevamrutha, results in significantly increased crop growth, yield, and quality (Hameedi *et al.*, 2018) [5]. They are rich in beneficial microflora, macronutrients, essential micronutrients, many vitamins, essential amino acids, and growth-promoting factors like IAA and GA (Nitin & Purohit, 2021) [7].

Vermiwash in a liquid fertilizer used in organic agriculture both as replacement and supplement for solids and for their unique capacity to provide effective and quick nutrients.

Vermiwash generally used as a foliar spray, is a liquid bio-fertilizer collected by the passage of water through a column of worm activation (Jagre *et al.* 2023) [6].

Tomato (*Lycopersicon esculentum*) is one of the most important and widely grown vegetable crop of the world. This popular vegetable crop has wider adaptability and can be grown in a wide range of soils and agro-climatic conditions. Tomato is a major source of vitamins and minerals in the human diet. This cash crop has a great demand in the international market owing to its many culinary and dietary uses. The pigments present in ripened fruits of tomato such as β-carotene are important sources of antioxidants in human diet. Ripened fruits of tomato are also cooked with vegetables to enhance the taste and flavour of Indian curries. Tomato is also utilized in the preparation of some value-added products such as juice, ketchup, sauce, puree, soup and canned whole fruits (Panda *et al.* 2020) [9].

Materials and Methods

A field experiment was conducted to study the "effect of organic amendments on growth of tomato under terrace farming" during *Kharif* season of 2024 at Terrace Farming Facility, Department of Agronomy, Dr. Panjabrao Deshmukh Krishi Vidhyapeeth, Akola (M.S). The experiment was laid out in Randomized Block Design with six treatments and four replications. The experiment site is situated at 307.42 meters above from mean sea level with 20.42^0N latitude and 72.02^0E longitude. The climate of the place is semi-arid and characterized by three distinct seasons viz., hot and dry summer from February to May, warm and rainy monsoon from June to September and moderate cold winter from October to January. All agronomical practices were carried out whenever necessary. Five plants per genotype in each replication were randomly selected for recording the observations on different characters and their averages were used in statistical analysis.

Table 1: Treatment details

Symbol	Details
T_1	Application of Jeevamrut at 10, 20, 30, 40, 50 and 60 DAP
T_2	Application of Jeevamrut at 20, 40 and 60 DAP
T_3	Application of Vermiwash at 10, 20, 30, 40, 50 and 60 DAP
T_4	Application of Vermiwash at 20, 40 and 60 DAP
T_5	Conventional (Application of RDF through Fertilizers)
T_6	Control (Only media)

Results and Discussion

Data on plant height at various growth stages as influenced by different treatments are presented in Table 2. The mean plant height was 13.08, 26.66, 42.20, 61.68 and 74.54 cm 15, 30, 45, 60 DAP and at harvest in *Kharif* season, respectively. Among the different treatments, conventional treatment (T_5) at 15, 30, 45, 60 DAP and at harvest recorded significantly highest plant height (13.96, 30.49, 46.06, 65.05 and 81.20 cm in *Kharif* season, respectively). Among the natural farming and organic farming treatments, application of vermiwash at 20, 40 and 60 DAP (T_4) and application of jeevamrut at 20, 40 and 60 DAP (T_2) recorded the higher plant height (13.14, 28.89, 43.52, 63.38 and 76.34 cm in T_4 and 13.09, 27.91, 42.63, 62.28 and 74.73 cm in T_2 treatment in *Kharif* season, respectively) compared to the control treatment (T_6) (12.36, 22.56, 38.41, 57.80 and 68.80 cm) in *Kharif* season, respectively.

The conventional treatment resulted in taller plant heights at all growth stages because of nutrients provided through inorganic sources are readily available to plants, supporting rapid cell division and internode elongation. Similar results were also reported by Parmar *et al.* (2019) [10].

Table 2: Plant height (cm) as influenced by different treatments

Treatments	Plant height (cm)				
	Kharif season				
	Day After Planting				At harvest
	15	30	45	60	
T_1	12.96	24.73	40.99	60.36	72.61
T_2	13.09	27.91	42.63	62.28	74.73
T_3	12.98	25.40	41.66	61.25	73.57
T_4	13.14	28.89	43.52	63.38	76.34
T_5	13.96	30.49	46.06	65.05	81.20
T_6	12.36	22.56	38.41	57.80	68.80
SE(m) ±	0.30	0.47	0.70	0.95	1.07
CD (P=0.05%)	0.91	1.42	2.11	2.88	3.21
GM	13.08	26.66	42.20	61.68	74.54

Data on no. of branches at various growth stages as influenced by different treatments are presented in Table 3. The mean no. of branches was 3.06, 6.41, 8.99, 11.46 and 12.30 cm at 15, 30, 45, 60 DAP and at harvest in *Kharif* season, respectively. Among the different treatments, conventional treatment (T_5) at 15, 30, 45, 60 DAP and at harvest recorded significantly highest no. of branches (3.21, 8.06, 9.89, 12.50 and 13.84 cm in *Kharif* season, respectively). Among the natural farming and organic farming treatments, application of vermiwash at 20, 40 and 60 DAP (T_4) and application of jeevamrut at 20, 40 and 60 DAP (T_2) recorded the higher plant height (3.06, 6.73, 9.64, 11.97 and 12.25 cm in T_4 and 3.05, 6.41, 8.72, 11.37 and 12.36 cm in T_2 treatment in *Kharif* season, respectively) compared to the control treatment (T_6) (2.99, 4.95, 8.13, 9.99 and 10.93 cm) in *Kharif* season, respectively.

conventional treatment (T6) produced more branches than the control at all growth stages, reflecting the immediate availability of nutrients that stimulate axillary bud break. Similar results were also reported by Sepat *et al.* (2012) [12].

Table 3: Number of branches plant^{-1} as influenced by different treatments

Treatments	No. Of branches plant^{-1}				
	Kharif season				
	Day After Planting				At harvest
	15	30	45	60	
T_1	3.04	6.15	8.89	11.22	12.32
T_2	3.05	6.41	8.72	11.37	12.36
T_3	3.07	6.19	8.71	11.75	12.12
T_4	3.06	6.73	9.64	11.97	12.25
T_5	3.21	8.06	9.89	12.50	13.84
T_6	2.99	4.95	8.13	9.99	10.93
SE(m) ±	0.04	0.11	0.17	0.18	0.22
CD (P=0.05%)	0.11	0.33	0.51	0.55	0.65
GM	3.06	6.41	8.99	11.46	12.30

Data on leaf area at various growth stages as influenced by different treatments are presented in Table 4. The mean leaf area was 252.04, 545.34, 1018.95, 2867.75 and 1637.13 cm^2 at 15, 30, 45, 60 DAP and at harvest in *Kharif* season, respectively. Among the different treatments, conventional treatment (T_5) at 15, 30, 45, 60 DAP and at harvest recorded significantly highest leaf area (284.83, 697.86, 1312.55,

3554.4 and 1844.34 cm^2 in *Kharif* season, respectively). Among the natural farming and organic farming treatments, application of vermiwash at 20, 40 and 60 DAP (T_4) and application of jeevamrut at 20, 40 and 60 DAP (T_2) recorded the higher leaf area (253.48, 566.41, 992.27, 2945.42 and 1724.79 cm^2 in T_4 and 249.41, 542.73, 1062.18, 2983.38 and 1815.46 cm^2 in T_2 in *Kharif* season respectively) compared to the control treatment (T_6) (234.44, 439.34, 666.86, 2014.81 and 1251.60 cm^2 in *Kharif* season respectively).

Leaf area development, an essential indicator of photosynthetic capacity and crop vigour, increased progressively with crop age, peaking at 60 DAP before declining toward harvest due to leaf senescence. Due to conventional application of fertilizers or rapid availability of nutrients to plant, highest leaf area observed. Similar response was also found by Sharma *et al.* (2023) [13].

Table 4: Leaf area (cm^2) of tomato plant as influenced by different treatments

Treatments	Leaf area (cm^2)				
	Kharif season				
	Day After Planting				At harvest
	15	30	45	60	
T_1	244.59	523.66	1047.17	2920.28	1519.51
T_2	249.41	542.73	1062.18	2983.38	1815.46
T_3	245.56	502.11	1032.71	2787.92	1667.14
T_4	253.48	566.41	992.27	2945.42	1724.79
T_5	284.83	697.86	1312.55	3554.74	1844.34
T_6	234.44	439.34	666.86	2014.81	1251.60
SE(m) ±	2.94	8.45	12.11	31.63	12.73
CD (P=0.05%)	8.86	25.47	36.49	95.35	38.38
GM	252.04	545.34	1018.95	2867.75	1637.13

Conclusion

This experimental study revealed conventional nutrient management led to higher growth parameters in tomatoes under a rooftop terrace farming scenario. However, among the organic and natural farming practices, application of vermiwash at 20, 40, and 60 DAP and application of jeevamrut at 20, 40, and 60 DAP resulted in higher growth parameters compared to control.

Acknowledgments

I am grateful to the Head of the Department of Agronomy, Post Graduate Institute, Akola for providing all the necessary facilities for conducting the research work.

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