Int.J.Curr.Microbiol.App.Sci (2026) *15*(1): 76-81

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 15 Number 1 (2026)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2026.1501.009

Evaluation of Tomato Genotypes Under High Temperature Stress for Biochemical Traits

M. A. Kharat[1*], V. S. Khandare[1], R. L. Chavan[2], V. S. Jagtap[3], A. T. Daunde[4], D. K. Dakhore[5] and P. Akhilasrinidhi[6]

[1]*Department of Horticulture, College of Agriculture Parbhani, VNMKV, Parbhani, Maharashtra, India*
[2]*Vilasrao Deshmukh College of Agricultural Biotechnology, Latur, Maharashtra, India*
[3]*Department of Horticulture College of Agriculture, Latur, Maharashtra, India*
[4]*Department of Plant Pathology, College of Horticulture, VNMKV Parbhani, Maharashtra, India*
[5]*Agrometrologist, AICRP on (Agrometrology) VNMKV, Parbhani, Maharashtra, India*
[6]*Department of Horticulture, College of Agriculture, VNMKV Parbhani, Maharashtra, India*

**Corresponding author*

A B S T R A C T

The present investigation was carried out in the open field condition at Horticulture Research Scheme (Vegetable), Vasantrao Naik Marathwada Krishi Vidyapeeth Parbhani, in the summer season 2023-24 and 2024-25. The fourteen genotypes of tomato namely T13, T16, T17, T27, T30, T48, T76, T82, T92, T96, T246, T301, T312, T337 were analysed at ripening stage. Tomato genotypes with successive ripening stage were grown in Randomized Block Design with two replications. Tomato fruit have been collected separately and analysed for biochemical parameter. The biochemical parameter was studied for the determination of lycopene, ascorbic acid, Titrable acidity, total soluble solid. The data collected from the experiment showed the highest ascorbic acid content (43.85, 43.65, 43.75) for first year (2024), second year (2025) and pooled at ripening stage was found in genotype T-27. Maximum total soluble solid (6.90, 7.10, 7.00) for first year (2024), second year (2025) pooled found in genotype T-27, genotype T-27 has highest Titrable acidity (%) for both the year & pooled (1.00,0.95,0.92). Maximum lycopene content was found in genotypes T-337 (30.18, 30.70,30.42) for both the year & pooled at harvesting stage.

Keywords

Tomato, Genotypes Biochemical parameter, Lycopene content, Acidity

Article Info

Received: 20 November 2025
Accepted: 24 December 2025
Available Online: 10 January 2026

Introduction

One of the most popular and extensively consumed fresh vegetables in the industrialized world is the tomato (*Lycopersicon esculentum* Mill.). The tomato is a member of the Solanaceae family and has two diploid chromosomes (2n=24). Although it leads the list of canned vegetables, it is the largest vegetable crop in the world, second only to potatoes and sweet potatoes. It is a cheap source of vitamins and antioxidants and a crucial condiment in most diets. It also has a lot of water, calcium, and niacin, all of which are crucial for human metabolism. Vitamins A, C, and E as well as minerals that are beneficial to the body and guard against illness can be found in tomatoes.

A wide range of climates, from the tropics to a few degrees from the Arctic Circle, are suitable for tomato cultivation. Despite its wide range of adaptability, production is focused in a few warm, somewhat arid regions. Although it grows as an annual in North America, it is a perennial in tropical regions. Ketchup, sauces, pastes, and juice are just a few of the many processed and fresh applications for tomatoes. According to Naika *et al.* (2005), tomatoes are regarded as a significant cash-generating crop for small and medium-sized commercial growers, offering job opportunities in the production and processing industries.

One of the main sources of antioxidants in everyday meals is tomatoes. Potassium, phosphorus, magnesium, and iron—all essential for healthy neuron and muscle function—are found in tomatoes. Because they contain beta-carotene, often known as pro-vitamin A, tomatoes are the fourth source of vitamin A and the third source of vitamin C. Folic acid, which aids in the removal of homocysteine, an amino acid whose metabolism depends on the metabolism of vitamins from the B complex, particularly folic acid, and phytosterols, substances that help manage cholesterol. The tomato has a distinct nutritional and phytochemical profile due to its composition.

Carotenoids, which make up 60–64% lycopene, 10–12% phytoene, 7–9% neurosporene, and 10–15% carotenes, are the main phytochemicals found in tomatoes. The world's most abundant source of lycopene is diets based on tomatoes (Sgherri *et al.,* 2008). On a fresh weight basis, tomatoes have an average lycopene content of 35 mg/kg; red cultivars have an average lycopene content of 90 mg/kg, while yellow cultivars have an average of just 5 mg/kg. The lycopene content in processed tomatoes (sauce, paste, juice, and ketchup) is two to forty times higher than that of raw tomatoes.

Materials and Methods

Experiment was conducted at Horticulture Research Station (Vegetable) and laboratory work at Department of Horticulture, College of Agriculture, VNMKV, Parbhani, during the summer season, 2023-2024 and 2024-2025. Each genotype was sown 60 x 45 cm accommodating 25 plants in each plot with two replications. The observation was recorded from 5 selected fruits from both replication on ascorbic acid content, total soluble solid, titrable acidity and lycopene content.

Results and Discussion

Table1 displays the results of the analysis of variance for ascorbic acid for first year (150.19) and for second year (138.08), lycopene content (76.36) for first year and (83.18) for second year, acidity (0.050) and (0.040) for first year & second year, total soluble solid (2.43) and (2.52) for first year & second year, Similar result in different character was observed by Raj *et al*. (2018).

During S_1, S_2 & pooled, among the 14 genotype T-27 (43.85, 43.65, 43.75 respectively) had recorded maximum ascorbic acid content followed by T-13(41.00, 40.00, 40.50 mg/100gm respectively). Whereas minimum ascorbic acid content was found in T-96 (21.70, 20.59, 21.14 mg/100gm) followed by T-16 (21.73, 21.78, 21.75mg/100gm). Similar observation was also observed by Sherpa *et al.,* (2014) and Dharva *et al*., (2018).

During S_1, S_2 & pooled, among the 14 genotype T-27 (6.90, 7.10, 7.00 ^{0}Brix respectively) had recorded maximum total soluble solid content followed by T-30 (6.25, 6.45, 6.35 ^{0}Brix respectively). While minimum total soluble solid was found in T-96 (3.20, 3.15, 3.17^{0}Brix). followed by T-92 (3.25, 3.30, 3.27^{0}Brix). The findings are consistent with the earlier research conducted by Kumar *et al.,* (2018) and Vekariya *et al.,* (2019).

During S_1, S_2 & pooled, among the 14 genotype T-27 (1.00, 0.92, 0.95% respectively) had recorded maximum titrable acidity content followed by T-17 (0.95, 0.90, 0.92% respectively). Minimum titrable acidity found in genotype T-13 (0.45, 0.40, 0.42%) followed by T-30 (0.50, 0.60, 0.55%) Similar findings were also observed by Sherpa *et al*., (2014) and Dharva *et al*., (2018).

During S_1, S_2 & pooled, among the 14 genotype T-27 (30.18, 30.65, 30.41mg/100gm respectively) had recorded maximum lycopene content followed by T-301 (28.50, 28.80, 28.65 mg/100gm respectively). Minimum lycopene content was found in T-312 (15.05, 15.10, 15.07mg/100gm) followed by T-96 (16.60, 16.20, 16.40mg/100gm). Similar findings were also observed by Sherpa *et al.,* (2014) and Dharva *et al*., (2018).

Table.1 ANOVA for various characters studied in two seasons

Source of variation	Mean sum of square					
	D.F.	Season	Total Soluble Solid	Titrable Acidity	Ascorbic Acid	Lycopene Content
			5	6	7	8
Replications	1	S_1	0.00	0.09**	0.08**	0.26**
		S_2	0.06**	0.00	0.04	0.17
Treatments	13	S_1	2.43**	0.050**	150.19**	76.36**
		S_2	2.52**	0.040**	138.08**	83.18**
Error	13	S_1	0.06	0.016	0.93**	0.14**
		S_2	0.03	0.02	0.91**	0.04**

Figure.1 Mean Performance of tomato genotype for Ascorbic Acid Content

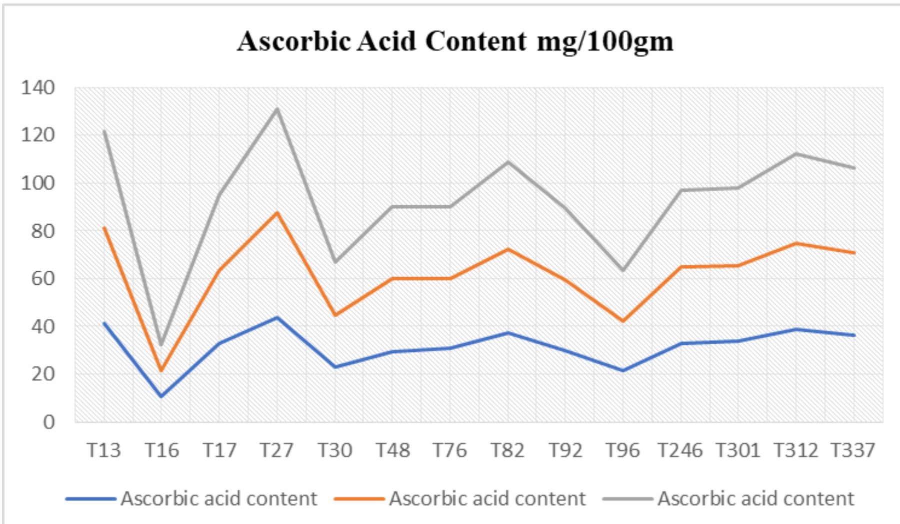

Figure.2 Mean Performance of tomato genotype for Total Soluble Solid

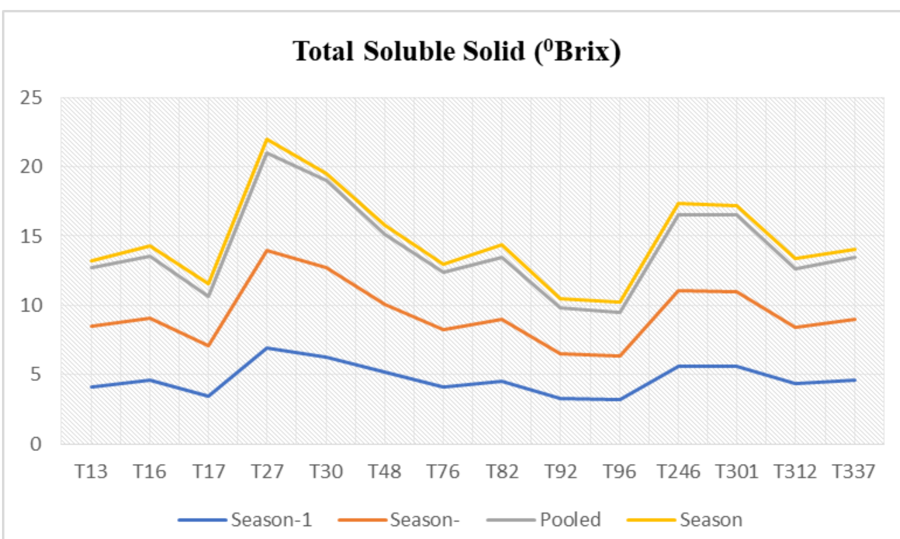

Figure.3 Mean Performance of tomato genotype for Titrable Acidity

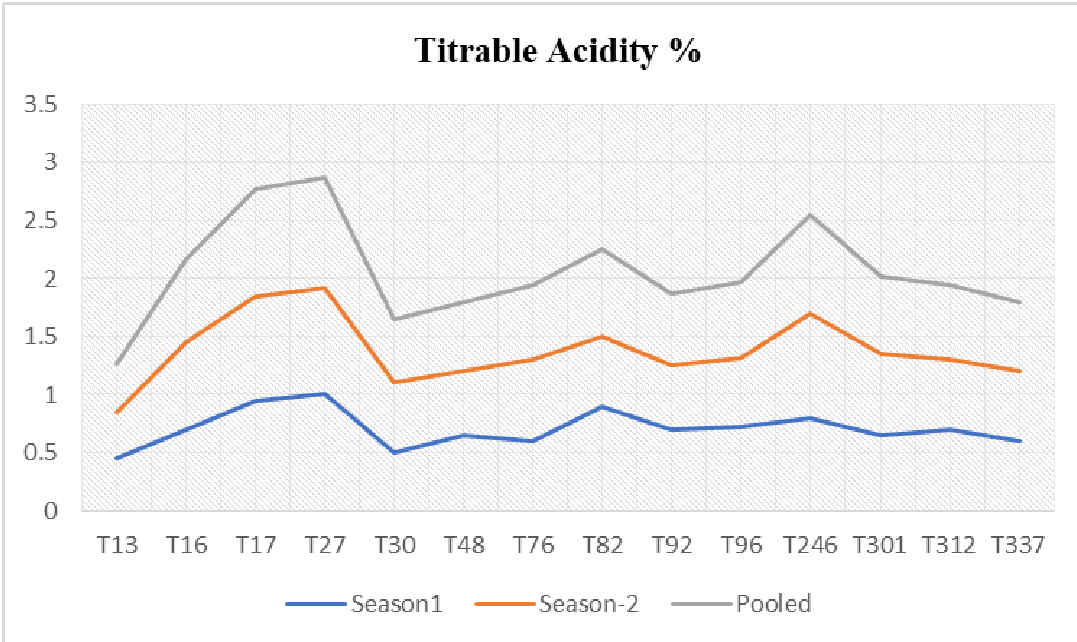

Figure.4 Mean Performance of tomato genotype for Lycopene Content

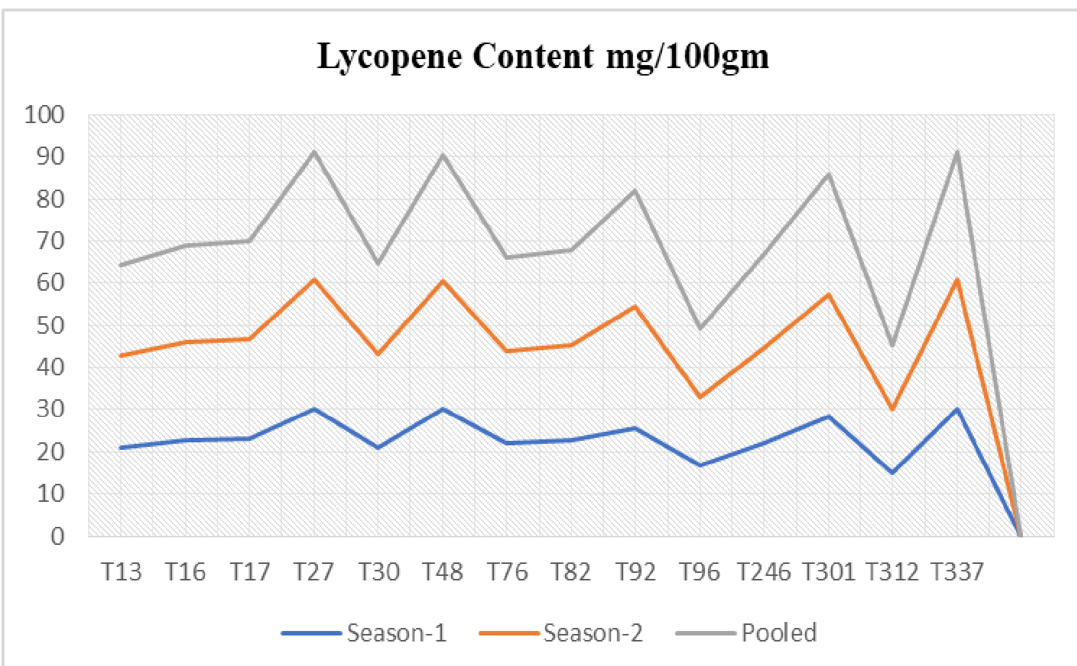

Table.2 Mean performance of tomato genotypes over two seasons and pooled for different characters.

Treatments	Ascorbic acid content			Total Soluble Solid			Titrable acidity			Lycopene Content		
	Season -1	Season-2	Pooled	Season-1	Season-2	Pooled	Season -1	Season-2	Pooled	Season -1	Season -2	Pooled
T13	41.00	40.00	40.50	4.10	4.40	4.25	0.45	0.40	0.42	20.90	21.90	**21.40**
T16	21.73	21.78	21.75	4.60	4.45	4.52	0.70	0.75	0.72	22.80	23.10	**22.95**
T17	32.80	30.60	31.70	3.45	3.65	3.55	0.95	0.90	0.92	23.20	23.40	**23.30**
T27	43.85	43.65	43.75	6.90	7.10	7.00	1.00	0.92	0.95	30.18	30.65	**30.41**
T30	22.80	21.88	22.34	6.25	6.45	6.35	0.50	0.60	0.55	21.10	21.95	**21.52**
T48	29.55	30.60	30.07	5.20	4.90	5.05	0.65	0.55	0.60	30.10	30.25	**30.17**
T76	31.00	29.00	30.00	4.15	4.10	4.12	0.60	0.70	0.65	22.20	21.80	**22.00**
T82	37.50	35.05	36.27	4.55	4.45	4.50	0.90	0.60	0.75	22.75	22.55	**22.65**
T92	30.10	29.55	29.82	3.25	3.30	3.27	0.70	0.55	0.62	25.65	28.90	**27.27**
T96	21.70	20.59	21.14	3.20	3.15	3.17	0.72	0.60	0.65	16.60	16.20	**16.40**
T246	33.00	31.75	32.37	5.60	5.45	5.52	0.80	0.90	0.85	22.15	22.30	**22.22**
T301	34.00	31.45	32.72	5.62	5.40	5.50	0.65	0.70	0.67	28.50	28.80	**28.65**
T312	38.95	36.05	37.50	4.35	4.10	4.22	0.70	0.60	0.65	15.05	15.10	**15.07**
T337	36.30	34.50	35.40	4.61	4.35	4.47	0.60	0.60	0.60	30.18	30.70	**30.42**
Mean	31.66	30.38	31.02	4.70	4.66	4.67	0.70	0.66	0.68	22.24	22.68	**22.45**
S.E.	0.68	0.67	0.75	0.17	0.12	0.13	0.08	0.12	0.07	0.27	0.15	**0.61**
C.D.5%	**2.08**	**2.06**	**2.20**	**0.53**	**0.37**	**0.38**	**0.27**	**0.25**	**0.22**	**0.83**	**0.45**	**1.77**

In conclusion, a cumulative study on biochemical parameters of fruits chosen from high temperature stress conditions has been evaluated. Changes in fruit biochemical parameters in fourteen different genotypes under high temperature stress were examined.

Through distinct mechanisms, tolerant genotypes successfully maintained the qualitative traits under stress.

Genotypes that are vulnerable. In comparison to other genotypes, T-27 and T-337 were found to be adept at preserving all quality criteria at high temperatures. Therefore, these genotypes could be cultivated at high temperatures.

Authors Contributions

M.A. Kharat : Investigation, analysis, writing original draft. V. S. Khandare: Methodology, investigation, writing-reviewing. R. L. Chavan: Conceptualization, methodology, writing and funding acquisition protocol validation. V. S. Jagtap : Formal analysis, writing—review and editing, A. T. Daunde: Resources, investigation writing—reviewing. D. K. Dakhore : Validation, formal analysis, writing—Reviewing.P. Akhilasrinidhi: writing—reviewing the final version of the manuscript.

Declarations

Ethical Approval Not applicable.

Consent to Participate Not applicable.

Consent to Publish Not applicable.

Conflict of Interest The authors declare no competing interests.

References

Dharva, P. B., Patel, A. I., Vashi, J. M. & Chaudhari, B. N. (2018). Combining ability analysis for yield and yield attributing traits in tomato (Solanum lycopersicum L.). International Journal of Chemical Studies. 6(3), 2342-2348.

Kumar, R., Sharma, H. R. & Thakur, A. (2018). Combining ability and gene action studies of some post- harvest and nutritional quality traits in tomato (Solanum lycopersicum L). Agricultural international. 5(2), 17-22.

Naika, S., Jeude, J.L., Goffau, M., Hilmi, M.and Dam, B. (2005). Cultivation of tomato production processing and marketing, Agromisa Foundation and CTA. Wageningen,

Raj, T., Bhardwaj, M. L. & Pal, S. (2018). Estimation of heterosis for quality traits in tomato (Solanum lycopersicum L.). Journal of Pharmacognosy and Phytochemistry. 7(1), 2401-2404.

Sgherri, C., Kadlecova, Z., Pardossi, A., Navari, I. F. and Izzo, R. (2008). Irrigation with diluted seawater improves the nutritional value of cherry tomatoes, j. agric. food chem.56: 3391-3397.

Sherpa, P., Seth, T., Shende, V. D., Pandiarana, N., Mukherjee, S. & Chattopadhyay, A. (2014). Heterosis, dominance estimate and genetic control of yield and post-harvest quality traits of tomato. Journal of Applied and Natural Science. 6(2), 625-632.

Vekariya, T. A., Kulkarni, G. U., Vekaria, D. M., Dedaniya, A. P. & Memon, J. T. (2019). Combining ability analysis for yield and its components in tomato (Solanum lycopersicum L.). Acta Scientific Agriculture. 3(7), 185-191.

How to cite this article:

Kharat, M. A., V. S. Khandare, R. L. Chavan, V. S. Jagtap, A. T. Daunde, D. K. Dakhore and Akhilasrinidhi, P. 2026. Evaluation of Tomato Genotypes Under High Temperature Stress for Biochemical Traits. *Int.J.Curr.Microbiol.App.Sci.* 15(1): 76-81. **doi:** https://doi.org/10.20546/ijcmas.2026.1501.009