

## Performance of Advanced Tomato (*Solanum lycopersicum* L.) Lines for Different Quality Parameters of Fruits in Northern Dry Zone of Karnataka

N. Kavyashree, Revanappa, S. Gururaj,  
 B. M. Ranjitha, D. R. Jhanvi

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**Abstract** Twenty tomato advanced lines, with a check variety (Megha), were evaluated during *khariif*, 2014 in the Northern Dry Zone (Zone 3) of Karnataka to study the yield performance of advanced tomato lines in Northern Dry Zone of Karnataka. The analysis of variance indicated significantly higher amount of variability among the genotypes for all the 17 characters studied. The advanced line DTR<sub>1</sub> had shown maximum total soluble solids, where DTR-8 had maximum ascorbic acid content. The maximum pH was found in DTR-1 and DTO-2 had maximum juice recovery percent. So these different lines can be used for processing purposes.

**Keywords** Quality parameters, Advanced lines, Tomato, Performance.

### Introduction

Tomato (*Solanum lycopersicum* L.) is one of the most important, popular and extensively used vegetable as fresh fruit (Toor and Savage 2005) which belongs to the family Solanaceae. It is widely grown all over the world (mainly tropics and subtropics). Tomato is the world's largest grown vegetable crop after potato and onion. It is universally treated as protective food. Tomato forms an essential part of human diet. It is an important source of vitamin A and C as well as minerals and carotenoids. Among the carotenoids, lycopene is a powerful antioxidant which is synthesized in tomato. As reported by WH Foods (2013), lycopene has many human health benefits as it reduces the risks of nervous system problems, heart disease, cancer and obesity. It is reported by many researchers that lycopene has potential human health benefits. Lycopene prevents skin disease induced by UV-light (Aust et al. 2003). Lycopene protects from various cancers and cardiovascular disease (Teta et al. 2005) also. As reported by Giovannucci (2002), high tomato or lycopene consumption reduces the risk of prostate cancer. Tomato (*Solanum lycopersicum* L.) is one of the important crops used as a fresh vegetable as well as in a variety of processed products such as ketchup, sauce, juice, puree, pasta sauce, salsa, tomato-based powders, sun-dried tomatoes, curries and ready-to-eat products. On a global scale, more than 163 million tonnes (MT) of tomatoes were produced in 2014, or about

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N. Kavyashree,\* Revanappa, S. Gururaj, B. M. Ranjitha,  
 D. R. Jhanvi  
 Assistant Horticulture Officer,  
 Deputy Director of Horticulture Office,  
 Department of Horticulture, Chikmagalore 577168,  
 Karnataka, India  
 e-mail : kavyackm373@gmail.com  
 \*Corresponding Author

**Table 1.** Analysis of variance for different characters of advanced tomato lines. \*Significant at 5% probability level, \*\*Significant at 1% probability level.

Sl.No.	Characters	Replication	Genotypes	Error	SEm±	CD @1%	CD @5%
1	Plant height (cm)	5.94	190.55*	68.20	5.901	–	17.40
2	No. of primary branches	1.52	1.62**	0.46	0.50	1.93	1.41
3	Stem thickness (cm)	0.019	0.065**	0.011	0.074	0.323	0.232
4	Days to first flowering	50.38	25.83*	11.83	2.43	–	7.19
5	Days to 50% flowering	841.52	62.51**	14.32	2.67	10.56	7.89
6	No.of flowers per cluster	3.72	1.92**	0.32	0.404	1.62	1.187
7	No.of fruits per cluster	0.27	0.96**	0.059	0.16	0.694	0.507
8	Per cent fruit set	193.80	62.84**	16.45	2.86	11.54	8.46
9	No.of fruits per plant	197.16	276.05**	10.36	2.22	8.963	6.57
10	Average fruit weight (g)	80.95	184.06**	20.49	3.2	12.87	9.44
11	Shape index	0.004	0.023**	0.0009	0.067	0.086	0.068
12	Dry matter content (%)	9.81	29.37**	1.06	0.72	2.93	2.15
13	Pericarp thickness (mm)	0.002	0.014**	0.0003	0.038	0.054	0.031
14	<b>Fruit firmness(kg/cm)</b>	0.184	0.237**	0.017	0.094	0.376	0.273
15	TSS(°Brix)	0.073	0.251**	0.005	0.06	0.21	0.16
16	Shelf life	237.19	121.75**	1.26	0.268	3.19	2.347
17	Fruit yield per plant (g)	3010	5617**	5238	161.8	651.1	477.4

15% of total global vegetable production. In 2012, tomato production had a net value of US\$59 billion, the eight most valuable agricultural product worldwide. Global fresh tomatoes exports totaled US\$8.4 billion in 2015. Global tomato production has increased by nearly 40% since 2002. FAO statistics show that the increase has been distributed evenly across the top 10 producing countries. While China is the leading producer with a share of 31%, India has consistently produced more tomatoes than third-ranked USA since 2008 with global share of 11% of production (Anonymous 2014). Thus, tomatoes are an important crop for both the farmer and the consumer in India. Amongst vegetable crops, tomato ranks third in priority after potato and onion in India as reflected in the tonnage produced. With an estimated production of 19.4 MT, India ranks second behind China in tomato production as well as in the area planted to the crop. Trends in tomato production in India show a strong expansion of production since 2010 largely due to an expansion in the area under cultivation in view of increasing market demand and a differential higher rate of return for farmers as compared with other crops. Karnataka is the second largest tomato producing state after Andhra Pradesh and accounts for 11.4% of total production. The state produced 2.07 MT of tomatoes from a cultivated area of about 61,000 ha.

Karnataka's tomato productivity average is estimated at 34 tonnes/ha, the highest achieved amongst leading Indian tomato producing states. Kolar district produces some 28% of total state tomato production while Belgaum, Haveri and Mandya districts each have a share of between 8-10%. Irrigation remains a critical bottleneck for growers in several districts. Access to markets has also encouraged growers to cluster around the central and southern districts. Though quality of the fruit is important for consumption it is mainly influenced by different traits. The plants which shows good fruit characters viz., total soluble solids, ascorbic acid content, pH of juice and juice recovery percent of fruits shows superior quality fruits. So this present investigation done to check performance of advanced tomato (*Solanum lycopersicum* L.) lines in Northern Dry Zone of Karnataka.

### Materials and Methods

A field experiment was conducted during *kharif*, 2014 at Regional Horticultural Research and Extension Center (RHREC), University of Horticultural Sciences, Bagalkot, situated in the Northern Dry Zone (Zone 3) of Karnataka. It is located at 75°42' East longitude and 16°10' North latitude at an altitude of 542 m above Mean Sea Level (MSL). The

total rainfall of 249.5 mm was received in 17 rainy days during crop growth period from August to December 2014. Mean maximum and minimum relative humidity were 78.79 and 60.87%, respectively. The mean maximum temperature was 31.25°C and the mean minimum temperature was 19.75°C. The soil of the experimental area was sandy loam having good physical and chemical properties. Tomato seeds were sown in pro-trays filled with coco-peat growing media. Recommended cultural practices and plant protection measures (drenching with Dithane M-45 2g/l two times) were carried out to raise healthy seedlings. Five plants were tagged at random in each replication and observations were recorded on growth parameters. Treatments of the experiment involved advanced lines (The pre-released genotypes have been developed by the plant breeder for use in modern scientific plant breeding and are under pipeline to release to farmers). Such 20 advanced lines of tomato viz., DTR-1, DTR1-1, DTR-3, DTR-4, DTR-5, DTR-6, DTR-7, DTR-8, DTO-1, DTO-2, DTO-3, DTO-4, DTO-5, DTO-6, DTO-7, DTO-8, DTO-9, DTO-10, DTO-11, DTO-12 from Horticultural Research Station, Haveri (Devihossur) with Megha, a variety released by USA, Dharwad as check constituted 21 treatments for the present investigation. Randomized complete block design was adopted with two replications with 20 plants in each replication. The experimental data collected were statistically analyzed using Fisher's method of analysis of variance as outlined by Sundararaj et al. (1972). Five fruits were collected at random from the tagged fruits and juice was extracted and used in the refractometer to assess TSS. It was expressed in °Brix. Ascorbic acid content of known weight of fruit sample was extracted using 4% oxalic acid determined by titrating against the 2, 6-dichlorophenol indophenols dye. The ascorbic acid content was quantified using the standard formula. The pH was recorded with the help of Toshniwal digital pH meter (Model DI 707). Juice recovery percent is calculated by finding the ratio of weight of juice to the weight of sample taken.

## Results and Discussion

Result from analysis of variance showed highly significant difference among the genotypes ( $p < 0.0001$ )

**Table 2.** TSS (°Brix), ascorbic acid (mg/100g) and juice recovery (%) of different advanced tomato lines. \* Significant at 5% probability level.

Sl. No.	Treatments	TSS (°Brix)	pH	Ascorbic acid (mg/100 g)	Juice recovery (%)
1	DTR-1	4.67	4.44	23.33	62.5
2	DTR <sub>1-1</sub>	5.20	3.97	31.66	75.0
3	DTR-3	4.57	4.02	36.66	76.5
4	DTR-4	4.6	3.96	30.00	80.0
5	DTR-5	4.72	3.96	23.33	81.5
6	DTR-6	4.23	4.12	26.66	78.5
7	DTR-7	4.78	4.00	21.00	78.0
8	DTR-8	4.42	3.93	48.33	79.5
9	DTO-1	4.85	4.32	21.66	80.0
10	DTO-2	3.90	4.22	21.66	88.0
11	DTO-3	4.89	4.27	31.66	79.0
12	DTO-4	4.29	4.30	19.00	80.0
13	DTO-5	4.48	4.27	41.66	76.5
14	DTO-6	4.25	4.12	30.00	74.5
15	DTO-7	3.94	4.08	26.66	78.5
16	DTO-8	3.92	4.14	21.66	77.0
17	DTO-9	4.17	4.29	43.33	76.5
18	DTO-10	4.94	4.43	46.66	79.5
19	DTO-11	4.53	4.30	31.66	82.0
20	DTO-12	4.66	4.00	26.66	76.5
21	Megha (L 15)	4.69	3.90	21.66	75.5
	F test	*	*	*	*
	SEm	0.06	0.059	0.30	1.81
	CD(0.05)	0.16	0.178	0.883	5.35
	CV(%)	1.70	1.989	1.425	3.29

for the characters evaluated (Table 1). Similar findings were reported by Pradeepkumar et al. (2001) and Fekadu et al. (2003) for the tomato characters studied. Statistically total soluble solids (TSS) contents showed significant differences among the genotypes. The standard check Megha had mediocre performance for this parameter (4.69 °Brix). Although, six lines had better values compared to check only three lines had significantly higher TSS and the highest among which was with DTR<sub>1-1</sub> (5.2 °Brix (Table 2)). Many lines had significantly lower TSS than Megha and the least was in DTO-2 (3.90 °Brix) similar results find with Madan et al. (2011). The advanced tomato lines varied significantly with respect to ascorbic acid also. Megha had 21.66 mg/100 g of ascorbic acid. Almost 15 lines had significantly higher content and only one line was found to have significantly lower content over Megha. Out of 21 lines, the highest ascorbic acid content of 48.33

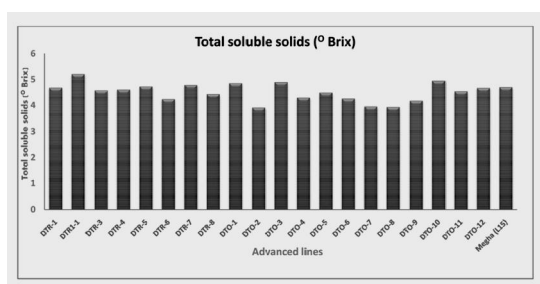


Fig. 1. Total soluble solids of different advanced tomato lines.

mg/100g was in DTR-8 and lowest of 19 mg/100g was in DTO-4. The earlier findings of Falak et al. (2011) are in line with the present findings. The genotypes were noticed to have significant differences with respect to pH of fruit juice (Fig. 1). Among the 21 genotypes evaluated, it was Megha which had least pH of juice (3.90). With respect to this parameter although, all the lines had higher values and among which thirteen lines had significantly higher pH than Megha. However, the pH of juice was highest (4.44) in DTR-1 followed by DTO-10 (4.43). The results of Shiva et al. (2015) are in agreement with the obtained results. Juice content of fruits registered significant differences within the genotypes evaluated. The juice content of standard check, Megha was 75.5%. Most of the genotypes evaluated for this parameter were on par with Megha and three genotypes recorded significantly higher recovery. Significantly highest juice recovery was in DTO-2 (88.00%) followed by DTO-11 (82.00%) and DTR-5 (81.5%). The only line, DTR-1 was found to contain significantly lower juice content (62.5%) than Megha. Lines DTO-5, 9, 12 and DTR-3 had 76.5% while, DTO-4, DTO-11 and DTR-4 had 80% of juice recovery the results were in accordance with earlier reports of Amira et al. (2013). So from all these the advanced line DTR<sub>1</sub> had shown maximum total soluble solids, where DTR-8 had maximum ascorbic acid con-

tent. The maximum pH was found in DTR-1 and DTO-2 had maximum juice recovery percent. So these different lines can be used for processing purposes.

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