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

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**Abstract** Twenty tomato advanced lines, with a check variety (Megha), were evaluated during *kharif,* 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 DTO-6 had shown maximum pericarp thickness hence it also shown good firmness. The maximum number of locules per fruit is found in DTR-6 and DTR-3 had maximum number of seeds per fruit. So these different lines can be used for different purpose viz., processing and seed production.

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

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## 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 haspotential 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 15% of total global vegetable production. In 2012, tomato production had a net value in US$59 billion, the eighth 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. Which 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 2004). 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 triats. The plants which shows good characters viz, pericarp thickness, number of locules per fruit, number of seeds per fruit and firmness 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 $75^0$ 42´ East longitude and $16^0$ 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 $31.25^0$C and the mean minimum temperature was $19.75^0$C. The soil of the experimental area was sandy loam having good physical and chemical properties. Tomato seeds were sown in prot-rays filled with cocopeat 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, DTR $_{1-1}$, 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 UAS, 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). The fruits were cut at the equatorial plane and the pericarp thickness was measured with the help of vernier calipers and expressed in millimeters. Fruits were cut in horizontal axis and number of locules were counted. Five fruits were squeezed and seeds were extracted. From the extract seeds it was counted and the average number of seeds per fruit was worked out. Fruit firmness was determined by using fruit penetrometer. The red ripe fruits were punctured at two places opposite to each other in radial axis with a plunger and the pressure required was recorded and expressed in kg/cm$^2$.

**Results and Discussion**

Results from analysis of variance showed highly sig-

**Table 1.** Analysis of variance for different characters of advanced tomato lines. *Significant at 5% probability level, **Significant at 1% probanility 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 | Fruit firmness (kg/cm$^2$) | 0.184 | 0.237** | 0.017 | 0.094 | 0.376 | 0.273 |
| 15 | TSS ($^0$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 | 56.17** | 5238 | 161.8 | 651.1 | 477.4 |

nificant difference among the genotypes ($p<0.0001$) 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. The pericarp thickness of fruit also varied significantly within the genotypes (Table 2). The significantly highest pericarp thickness of 0.75 cm was recorded by two genotypes, DTO-6 and DTO-11 followed by DTO-10 (0.74 cm) over Megha (0.62 cm) (Fig. 1). Most of the lines had significantly thicker pericarp than Megha and only three lines (DTR-8, DTO-9 and DTO-12) recorded significantly lower pericarp thickness compared to Megha. Singh et al. (2014) also in same line in their experiments. The difference among treatments varied significantly with respect to number of locules per fruit (Table 2). The maximum number of locules i.e. 2.7 was recorded in DTR-6 as well as DTR-7 and DTR-8. These lines were significantly superior over Megha which had only 2.5 locules. Most of the lines also had significantly minimum number of locules per fruit over Megha, the standard check. Similar results also noticed by Biswas et al. (2015). Significant differences were noticed for fruit firmness among the lines studied (Table 2). DTO-6 had the significantly highest fruit firmness of 2.26 kg/cm$^2$ followed by DTR-4 and DTO-1 both had a firmness of 2.06 kg/cm$^2$. Most of the lines had higher firmness compared to Megha (1.48 kg/cm$^2$). Only three lines out of 21 had significantly lower firmness and of which the lowest fruit firmness was recorded seen in DTO-12 (0.92 kg/cm$^2$). Alam Patwary et al. (2014) also found same results statistical analysis revealed significant differences among the treatments for number of seeds per fruit (Table 2). Only two lines, DTR-3 (189.3) and DTR-7 (160) were found to have significantly more number of seeds per fruit compared to Megha (107.3). Eight lines had significantly less number of seeds than Megha and the least were in DTO-4 (19.3). These results also found by Shiva et al. (2015). So it can be concluded that the advanced line DTO-6 had shown maximum pericarp thickness hence it also shown good firmness. The maximum number of locules per fruit is found in DTR-6 and DTR-3 had maxi-

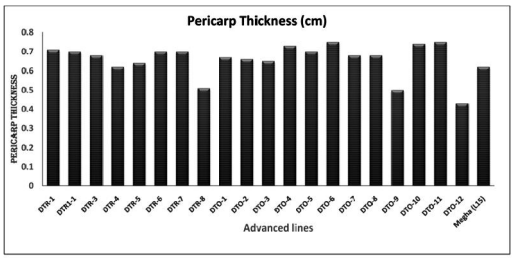


**Fig. 1.** Pericarp thickness of different advanced tomato lines.

**Table 2.** Locule number, number of seeds per fruit, pericarp thickness (cm) and fruit firmness (kg/cm$^2$) of different advanced tomato lines. *Significant at 5% probability level.

| Sl. No. | Treatments | Locule number | Number of seeds per fruit | Pericarp thickness (cm) | Fruit firmness (kg/cm$^2$) |
|---|---|---|---|---|---|
| 1 | DTR-1 | 2.20 | 88.0 | 0.71 | 1.42 |
| 2 | $DTR_{1-1}$ | 2.40 | 68.6 | 0.70 | 1.90 |
| 3 | DTR-3 | 2.20 | 189.3 | 0.68 | 1.14 |
| 4 | DTR-4 | 2.30 | 95.3 | 0.62 | 2.06 |
| 5 | DTS-5 | 2.30 | 87.6 | 0.64 | 1.64 |
| 6 | DTR-6 | 2.70 | 80.0 | 0.70 | 1.80 |
| 7 | DTR-7 | 2.70 | 160 | 0.70 | 1.50 |
| 8 | DTR-8 | 2.70 | 95.3 | 0.51 | 1.04 |
| 9 | DTO-1 | 2.00 | 64.0 | 0.67 | 2.06 |
| 10 | DTO-2 | 2.10 | 100 | 0.66 | 1.86 |
| 11 | DTO-3 | 2.25 | 84.0 | 0.65 | 1.72 |
| 12 | DTO-4 | 2.20 | 19.3 | 0.73 | 1.80 |
| 13 | DTO-5 | 2.20 | 85.3 | 0.70 | 2.04 |
| 14 | DTO-6 | 2.30 | 97.0 | 0.75 | 2.26 |
| 15 | DTO-7 | 2.18 | 100 | 0.68 | 1.76 |
| 16 | DTO-8 | 2.45 | 45.6 | 0.68 | 1.56 |
| 17 | DTO-9 | 2.32 | 36.6 | 0.50 | 1.42 |
| 18 | DTO-10 | 2.10 | 62.3 | 0.74 | 1.70 |
| 19 | DTO-11 | 2.20 | 115.3 | 0.75 | 1.52 |
| 20. | DTO-12 | 2.50 | 114.6 | 0.43 | 0.92 |
| 21 | Megha (L 15) | 2.50 | 107.3 | 0.62 | 1.48 |
| | F test | * | * | * | * |
| | SEm | 0.05 | 7.68 | 0.038 | 0.094 |
| | CD (0.05) | 0.10 | 22.66 | 0.031 | 0.273 |
| | CV (%) | 2.19 | 12.03 | 2.854 | 8.097 |

mum number of seeds per fruit. So these different lines can be used for different purpose viz., processing and seed production.

## References


Alam Patwary MM, Mizanur Rahman M, Shahabuddin Ahmad, Khaleque Miah MA, Rahman MH (2014) Performance of some tomato (*Solanum lycopersicum* L.) genotypes in summer and winter seasons. Scient J Kri Found 12 (2) : 64—73.

Anonymous (2014) Indian Horticulture Database, National Horticulture Board, February, pp 177—257.

Aust O, Stahl W, Tronnier H, Henrich U (2003) Supplementation with tomato-based products increase lycopene, phytofluene and phytosene levels in human serum and protects against UV light-induced erythema. Int J Vitam Nutr Res 3 (224) : 1—7.

Biswas M, Sarkar DR, Asif MI, Mehraj RKH, Jamal Uddin AFM (2015) Comparison of growth and yield characteristics of BARI tomato varieties. J Bio Sci Agric Res 3 (1) : 1—7.

Fekadu M, Ravvishankar H, Lema D (2003) Study on variability in tomato germplasms under conditions of central Ethiopia. Veg Crops Res Bull 58 : 41—49.

Giovannucci J (2002) A review of epidemiologic studies of tomatoes, lycopene and prostate cancer. Exp Bio and Med 227 : 852—859.

Pradeepkumar T, Bastian D, Joy M, Radhakrishnan NV, Aipe KC (2001) Genetic variability in tomato for yield and resistance to bacterial Wilt. J Trop Agric 39 : 157—158.

Shiva Ghasemi, Mostafa Ghasemi, Khadijeh Abbaszadeh, Morteza Salari (2015) Evaluation of some quantitative and qualitative characteristics of 5 cultivars of tomato *(Lycopersicum esculentum)* grown in Hormozgan Province. Int J Agro Agric Res 6 (5): 62—65.

Singh V, Naseeruddin Shah KH, Rana DK (2014) Phenotypic evaluation of tomato genotypes suitable for sub tropical conditions. Sci Par Res 2 (In press).

Sundararaj N, Nagaraju S, Venkataramu MN, Jaganath MK (1972) Design and analysis of field experiments.

Teta T, Teta K, Sutton J (2005) Tomatoes and tomato products as medicine, Naturopathic clinic of north Carolina. www.naturopathichealth performances clinic. com.

Toor RK, Savage GP (2005) Antioxidant activity and total phenolics in selected fruits, vegetables and grain products. J Agric Food Chem 46 : 4113—4117.

WH Foods (2013) The World's Healthiest Foods. Tomatoes: Free Weekly Newsletter. http:// www.whfoods.com/genpage.php?tname=foo dspice and dbid=44.