

Performance of tomato (*Solanum lycopersicum* L.) genotypes for growth, yield and quality

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Received: March, 2021; Revised accepted: June, 2021

ABSTRACT

The experiment was carried out at B.B.A. University, Lucknow (UP), India during rabi season of 2017-18 and 2018-19 to study the performance of tomato genotypes for growth and yield. The twenty genotypes were evaluated in randomized block design with three replications. Among the genotypes, Pusa Sadabahar proved superior for growth and yield contributing characters i.e. plant height (30.9 cm), number of branches per plant (7.0), number of cluster per plant (20.4), number of flower per cluster (9.8), number of fruits per cluster (5.0), number of fruits per plant (18.3), average fruit weight (53.0 g), fruit yield per plant (974.8 g), fruit yield (15.1 kg/plot) and fruit yield (36.1 t ha⁻¹), followed by Selection -7. On the other hand, minimum values of these parameters were recorded in Toleu-32, i.e. plant height (25.1cm), number of branches per plant (4.5), number of cluster per plant (5.4), number of flower per cluster (5.6), number of fruits per cluster (3.1), average fruit weight (41.9 g), fruit yield per plant (550.8 g), fruit yield (8.8 kg/plot) and fruit yield (20.4 t ha⁻¹). The genotype Toleu-32 was significantly superior for days to 50 % flowering (41.9). The accession H-86 was found to be superior for TSS (5.4 °Brix). The check variety VRT-50 was found to be superior for vitamin C (27.7mg) followed by TLCV-16.

Keywords- Tomato, genotypes, quality, growth, yield

INTRODUCTION

Tomato (*Solanum lycopersicum* L.) belongs to the family Solanaceae with chromosome number $2n = 24$ and originated from South America. Tomato is one of the most popular and widely grown vegetable in the world ranking second in importance only next to potato in many countries and ranked first in preserved and processed vegetables. Tomato is widely consumed vegetable crop throughout the world both for fresh fruit market and processed food industries. Tomato is protective supplementary food and used in preserved products like ketchup, sauce, chutney, soup, paste, puree etc. Tomato is a typical day neutral plant and belongs to warm season crop reasonably resistant to hot and drought. The present demand for tomato is based on the industrial requirement and ultimately the consumer's preference. So there is an immediate need for further improvement of this crop through development of superior varieties and hybrids in order to meet most of the present day requirement. The basic tool to bring genetic improvement in a crop is to utilize the available genetic variability. If the variability with the population is largely due to the genetic cause with least environment

effect, the probability of obtaining superior genotype is so visible. Yield improvement in tomato is a polygenic character and it is associated with agronomic, morphologic and physiologic traits. The crop has wide acceptance among plains farmers due to its high market value and constant demand throughout the year. Farmers fetch remunerative return by sending their produce to the plains from June to September as this is the lean period of tomato production in plains due to prevalence of high temperature and rainfall along with the occurrence of leaf curl disease which makes crop cultivation very difficult during this period. Considering the importance of this crop there is a need for improvement and development of varieties suitable for different agro-ecological conditions with specific end use. But before coming out with any superior variety with better yield and quality traits there is need to periodically check the performance of available germplasm in comparison to best performing variety of that agro-climatic region. Therefore the present study was undertaken to evaluate the performance of twenty genotypes of tomato for yield and quality traits under plains conditions of Lucknow.

MATERIALS AND METHODS

A field experiment was conducted at Babasaheb Bhimrao Ambedkar University, Lucknow (UP) India during rabi season of 2017-18 and 2018-19. The experimental site is situated at 26°50' N latitude, 80°52' E longitude and altitude of 111 meter above mean sea level (MSL). The area receives average rainfall of 750 mm with annual and maximum temperature ranging from 15 to 30°C. The experimental material comprising of twenty diverse genotypes were transplanted on 29 November in both the years. Plants of each genotype were planted at a spacing of 60x45 cm in a plot of 2.40 m x 1.80 m. Twenty genotypes of tomato namely LA-3957, Rio-Grande, Punjab Barkha Bahar-2, Kashi Aman, Solan Vojr, IIHR-2202, VRT-103-6-1, Kalyanpur type-1, Switizar Land, Pusa Sadabahar, VRT-02 (Pe), TLCV-16, VRT-50, Selection-7, Toleu-32, VRT-01, H-86, KT-8, TLCV-28 and VRT-51 were evaluated in randomized block design with three replication. Recommended dose of N, P₂O₅ and K₂O was supplied through urea, single superphosphate and muriate of potash, respectively. Appropriate management practices were adopted to raise the crop. Observations were recorded on plant

height, number of branches/plant, days to 50% flowering, number of clusters per plant, number of flower per cluster, number of fruit per plant, average fruit weight, number of locules per fruit, pericarp thickness, fruit length, fruit width, fruit yield per plant (g), fruit yield (t ha⁻¹), Total soluble solids (°Brix) and vitamin C (mg/100g) were determined by adopting standard procedures. All the parameters were recorded from randomly selected plants of each treatment. Observation on vegetative parameters were recorded at proper stage and statistically analyzed.

RESULTS AND DISCUSSION

Growth and yield attributes

Plant height differed significantly among the genotype at maturity stage due to varied genetic makeup of different tomato genotype. The plant height of all the twenty genotypes ranged between 25.1 and 30.9 cm (Table 1). Pusa Sadabahar recorded maximum plant height of (30.9 cm) followed by Selection-7 (29.5 cm), Punjab Barkha Bahar-2 (28.3 cm), Kashi Aman (27.4 cm) and IIHR-2202 (27.0 cm). The genotype Toleu-32 recorded least height of (25.12 cm). Similar observations

Table 1: Mean performance of twenty genotypes of tomato with respect to various traits

Genotypes	Plant height (cm)	No. of branches per plant	Days to 50% flowering	No. of clusters per plant	No. of flowers per cluster	No. of fruits per cluster	Avg. fruit weight (g)	No. of locules per fruit
LA-3957	26.0	5.7	33.7	17.5	7.3	3.9	46.5	4.1
Rio-Grande	26.8	5.7	39.6	16.8	6.9	3.9	46.8	3.5
Punjab Barkha Bahar-2	28.3	6.2	30.9	18.8	8.3	4.3	50.6	5.5
Kashi Aman	27.4	6.0	31.4	18.0	8.2	3.9	50.1	4.2
Solan Vojr	25.4	5.4	41.4	15.7	5.8	3.4	42.3	4.5
IIHR-2202	27.0	6.0	32.1	18.4	8.1	3.8	49.2	4.6
VRT-103-6-1	26.5	5.0	37.7	16.1	7.0	4.2	46.9	4.7
Kalyanpur typ-1	25.7	5.6	34.9	17.1	7.1	4.2	43.9	3.9
Switizar Land	27.0	5.3	37.3	17.8	6.8	4.4	45.9	4.6
Pusa Sadabahar	30.9	7.0	29.6	20.4	9.8	5.0	53.0	4.6
VRT-02 (Pe)	26.0	5.2	35.1	16.9	7.1	3.6	43.4	4.3
TLCV-16	26.0	5.7	35.9	17.1	7.2	4.0	45.0	3.7
VRT-50	26.1	5.1	38.6	17.9	7.0	3.4	46.7	3.9
Selection-7	29.5	6.3	30.5	19.9	8.5	4.4	51.9	4.8
Toleu-32	25.1	4.5	41.9	15.4	5.6	3.1	41.9	5.3
VRT-01	26.2	5.7	36.1	17.8	6.9	3.6	47.6	5.3
H-86	26.2	5.0	33.3	17.8	7.3	3.7	47.9	4.0
KT-8	25.7	4.9	38.1	17.6	7.1	3.5	44.4	4.5
TLCV-28	26.6	5.8	33.9	17.8	7.5	3.5	45.4	4.3
VRT-51	25.8	5.3	36.9	17.0	6.9	3.5	44.9	3.8
SE _M ±	0.96	0.32	1.77	0.90	0.40	0.21	2.35	0.22
CD (P=0.05)	2.82	0.93	5.22	2.64	1.18	0.61	6.82	0.65

in tomato were also reported by Mohammed *et al.* (2012) and Narolia *et al.* (2012). Number of branches per plant ranged from 4.5 to 7.0. The genotype Pusa Sadabahar exhibited maximum number of branches per plant (7.0) followed by Selection-7 (6.3), Punjab Barkha Bahar-2 (6.2), Kashi Aman (6.0) and IIHR-2202 (6.0) whereas, minimum number of branches per plant was observed in genotype Toleu-32 (4.5). Days to 50 % flowering ranged from 29.6 to 41.9 and highest days to 50 % flowering was observed in Toleu-32 (41.9) pursued by Solon Vojr (41.4). The genotype Pusa Sadabahar exhibited least days to 50 % flowering (29.6). The number of cluster ranged from 15.4 to 20.4. The maximum number of cluster per plant was observed in genotype Pusa Sadabahar (20.4) followed by Selection-7 (19.9). However, minimum number of cluster per plant had taken in genotype Toleu-32 (15.4). Number of flower per cluster ranged from 5.6 to 9.8 and genotype Pusa Sadabahar recorded maximum number of flower per cluster (9.8) which was statistically at par with Selection-7 (8.5). Minimum number of flower per cluster

(5.6) was recorded in Toleu-32. The results of present investigation could also be compared with the findings of Shankar *et al.* (2013), Cheema *et al.* (2013).

Number of fruits per cluster ranged from 3.1 to 5.0 and maximum value (5.0) was recorded in Pusa Sadabahar while, minimum was recorded in Toleu-32 (3.1). The results were in accordance with those reported by Sekhar *et al.* (2009), Singh *et al.*, (2013), Saleem *et al.* (2013) and Cheema *et al.* (2013). Data recorded for average fruit weight showed significant variation among all genotypes. Its value ranged from 41.9 to 53.0 g and maximum value of average fruit weight (53.0 g) was recorded in Pusa Sadabahar which was statistically superior to all other genotypes. However the lowest average fruit weight (41.9 g) was recorded in Toleu-32. The number of locules per fruit ranged between 3.5 and 5.5 and Punjab Barkha Bahar had maximum value (5.5) and minimum number of locules per fruit (3.5) was recorded in the genotype Rio-Grande. The pericarp thickness ranged from 2.9 to 4.6 mm.

Table 2: Mean performance of twenty genotypes of tomato with respect of yield and quality (mean of two years)

Genotypes	Pericarp thickness (mm)	Fruit length (cm)	Fruit width (cm)	Fruit yield per plant (g)	Fruit yield (t ha ⁻¹)	T.S.S (°Brix)	Vitamin-C (mg/100)
LA-3957	4.5	5.3	7.9	711.2	26.3	4.1	23.9
Rio-Grande	3.9	5.7	6.9	733.0	27.1	5.0	24.9
Punjab Barkha Bahar-2	4.4	6.0	5.1	899.6	33.3	4.9	24.6
Kashi Aman	3.4	6.5	4.6	853.1	31.5	4.9	25.0
Solan Vojr	4.1	5.3	7.7	571.2	21.1	5.2	25.1
IIHR-2202	3.8	5.7	7.1	812.3	30.0	5.1	24.7
VRT-103-6-1	4.6	6.0	4.9	716.6	26.5	5.2	25.2
Kalyanpur typ-1	3.7	5.3	7.6	658.4	24.3	5.4	24.8
Switizar Land	4.4	5.8	6.8	691.5	25.6	5.2	24.8
Pusa Sadabahar	3.9	5.8	6.9	974.8	36.1	5.3	25.2
VRT-02 (Pe)	3.7	5.5	6.9	617.8	22.8	5.0	25.0
TLCV-16	4.2	5.9	5.2	681.4	25.2	6.1	27.4
VRT-50	3.6	5.2	7.9	729.2	27.0	5.2	27.7
Selection-7	3.9	6.1	5.4	944.6	34.9	5.3	25.3
Toleu-32	4.4	5.9	6.4	550.8	20.4	5.0	25.5
VRT-01	3.8	6.5	7.1	734.3	27.2	4.7	26.1
H-86	3.9	5.9	4.7	755.2	27.9	5.4	26.2
KT-8	3.6	5.7	5.1	667.6	24.7	5.1	25.7
TLCV-28	2.9	5.3	7.5	683.2	25.3	5.4	26.5
VRT-51	3.8	5.3	7.5	682.8	25.2	5.2	26.1
SEM ±	0.21	0.28	0.36	37.38	13.85	0.36	0.62
CD at 5%	0.59	0.83	1.05	110.26	40.84	0.99	1.79

Maximum pericarp thickness was observed in VRT-103-6-1 (4.6 mm). However, minimum pericarp thickness (2.9 mm) was recorded in TLCV-28. Fruit length ranged from

5.2 to 6.5 cm. The genotype Kashi Aman exhibited highest fruit length (6.5 cm) followed by VRT-01 (6.5 cm). whereas, least fruit length was observed in genotype VRT-50 (5.2 cm). The fruit

width ranged between 4.6 to 7.9 cm. The genotype LA-3957 exhibited highest fruit width (7.9 cm) followed by VRT-50 (7.9 cm). However, least fruit width was observed in genotype Kashi Aman (4.6 cm).

Yield and quality attributes

Fruit yield per plant varied significantly among all the tomato genotype. The fruit yield per plant ranged from 550.8 to 974.8 g. It was observed maximum in genotype Pusa Sadabahar (974.8 g) followed by Selection-7 (944.6 g). However, minimum fruit yield per plant was recorded in genotype Toleu-32 (550.8 g). Sharma *et al.* (2013), Singh *et al.* (2013), Saleem *et al.* (2013) and Shankar *et al.* (2013) also reported similar results. Fruit yield exhibited a wide range of variability which ranged from 20.4 to 36.1 t ha⁻¹. The maximum fruit yield (36.1 t ha⁻¹) and, minimum values

were recorded in Toleu-32 (20.4 t ha⁻¹). These finding were in accordance with the results obtained by Narolia *et al.* (2012), Jogi *et al.* (2008) and Joshi and Kohli (2005) in tomato. Among the twenty genotypes tested, the total soluble solids ranged from 4.17 to 5.49^o Brix. The genotype H-86 (5.49^o Brix) recorded significantly higher amount of total soluble solids and minimum was observed in LA-3957 (4.17^o Brix). Ascorbic acid content in tomato genotypes ranged from 23.95 to 27.77 mg/100g of pulp. The genotype VRT-50 (27.77 mg/100g) recorded significantly higher ascorbic acid content compared to the best checks (TLCV-16) and lower ascorbic acid was found in LA-3957 (23.95 mg/100). This study's findings can be used to aid in the development of a tomato breeding programme. In genotype Pusa Sadabahar, the highest growth characters, yield, and yield attributing characters were recorded.

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