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## Performance of tomato germplasms for growth, yield and quality under Lucknow conditions

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### Abstract

The present research work on evaluation of some tomato germplasms for horticultural traits under Lucknow conditions was carried out at the Horticulture Research Farm of Department of Applied Plant Science, Babasaheb Bhimrao Ambedkar University, Vidya Vihar, Rae Bareli Road, Lucknow (U.P.), India, during Rabi season of 2015-16. The research material comprised of sixteen diverse genotypes of tomato collected from different sources. All the genotypes were grown in Randomized Block Design with three replications in 2.4x 1.0 m<sup>2</sup> plant keeping 60 cm distance between the row and distance of plant to plant was maintained 45 cm. They were evaluated for growth and yield attribute for the all the traits. On the basis of overall findings of the present research study it was concluded that there is wide range of variation in tomato strain for all the characters studied. The strain PT-11 is highly significant for Days to marketable picking, Number of flower per cluster, Number of fruit per cluster, Number of fruit per plant, Fruit weight per cluster and for Fruit weight and the biochemical traits TSS and ascorbic acid found highest PH-2 strain of tomato except acidity (Pusa Rohini).

**Keywords:** tomato, genotypes, quality, evaluation, growth and yield

### Introduction

Tomato (*Lycopersicon esculentum* Mill. 2n=2x=24) is one of the most important "protective foods" because of its special nutritive value. It is one of the most versatile vegetable with wide usage in Indian culinary tradition. Tomato is one of the most popular and widely grown vegetables in the world. It belongs to the family *Solanaceae*. It is world's largest vegetable crop after potato. Tomato has become an important vegetable of the world in view of the increasing demand for fresh consumption as well as processing industry. Fresh fruits of tomato are in great demand round the year and throughout the country. Large quantities of tomato are used to produce ketchup, paste, puree, juice and soup. According to Aykroyd (1966) [1] tomato fruit contain 93.1 g water, protein 19 g, fat 0.1 g, carbohydrate 3.6 g, mineral matter 0.6 g, calcium 20 mg, phosphorous 36 mg, iron 0.8 mg, carotene (as vitamin A) 320 I U, thiamine 2.27 mg, nicotinic acid 0.4 mg, riboflavin 0.01 mg and ascorbic acid 31 mg per 100 g of pulp of fruit. It also contains folic acid, vitamin K and inhibitors which are related to vitamin E. Thus, the biometrical information gathered on genetic architecture of attributes related to fruit yield and productivity would be great utility in planning of an efficient breeding programme for the improvement of tomato crop in order to develop promising genotypes/ cultivars. The breeding strategy involves assembling or generating variable germplasm with different source of resistance and selection of superior genotype for using hybridization. Thus, the present study was conceived with objective to examine the cultivars and lines of diverse origin were evaluated for yield and quality content and identify/developing superior genotypes for obtaining higher yield with good quality traits in tomato.

### Materials and Methods

The present investigation for growth, yield and quality traits in tomato was conduct at the Horticultural research farm of Department of Applied Plant Science (Horticulture) Babasaheb Bhimrao Ambedkar University (A Central University) Vidya Vihar, Rae Bareli Road, Lucknow Utter Pradesh during Rabi season (2015-16). The material for the present study consisted of sixteen diverse genotypes of tomato. The genotypes were collected from IIVR Varanasi, Kanpur and IARI New Delhi. The details of which are given in Table 1. Which was received from the various Institute. The experimental material comprising of sixteen diverse genotypes was transplanted on 15 December, 2016 in randomized block design with three replications. Plants of each genotype were planted at a spacing of 60x45 cm in a plot of 2.40 m x 1.0 m. Standard cultural practices (Operations & Protection measures) were adopted to

ensure a healthy crop growth. The genotypic were evaluated for some important character viz., plant height (cm), number of branch per plant, first flowering, 50% flowering, number of flower per plant, number of cluster per plant, number of fruit per cluster, number of fruit per plant, fruit width (cm), fruit length (cm), intermodal length (cm), day to fruit set, number of flower per cluster, number of locules per plant, yield/ ha, acidity (%), ascorbic acid and T.S.S. (<sup>0</sup>Brix). The data was analysed as per the method given by (Panse and Sukhatme, 1967) [5]. Least significant difference at 5% level was used for finding the significant differences among the treatment means.

## Results and Discussion

### Morphological traits

The results obtained during the investigation in respect to biochemical parameters viz., plant height (cm), number of branch per plant, first flowering, 50% flowering, number of flower per plant, number of cluster per plant, number of fruit per cluster, number of fruit per plant, fruit width (cm), fruit length (cm), intermodal length (cm), day to fruit set, no. of flower per cluster, no. of locules per plant and Yield /ha. etc discussed as below. The analysis of variance for different characters is presented in Table1. In order to evaluate the listed genotypes the mean of sixteen genotypes including check for eighteen characters. Wide range of variation in mean performance of genotypes was observed for all characters under study. The mean sum of squares due to treatments were highly significant for all characters. In other words, the performance of the genotypes with respect to these characters were statistically significant, suggesting that there is ample scope for selection in different traits for the improvement of tomato. The mean performance, general mean and range of 16 entries for 18 characters are presented in Table 1. The ranged for plant height varied from maximum 78 cm (PH-2) to minimum 38.7 cm (Arka Saurabh). The analysis of variance indicated not more significant difference among the genotype for number of branches per plant. The number of branches per plant, ranged from maximum in 11.67 (PH-2) to minimum 5.67 in Panjab Chuhhara. The grand mean 8.21. Data recorded on fruit width per plant showed significant variation among the genotypes. The highest fruit

width was recorded in the strain (PH-2) the width is (5.47cm) and minimum width is recorded in the strain Kashi Sarad the width is (3.67cm). Analysis of variance showed significant variation for this variation for trait among the genotype studied. The mean values of genotypes revealed maximum fruit length is observed in the strain (4.72 cm) in PH-2, which was significantly higher in comparison to all other genotypes minimum fruit length (3.75cm) in the strain of NDT-7. The flower open after (39.67 days) sowing, the strain is that Arka saurabh and the longest time is taken by the strain Pusa Seetal (45days). The grand mean of first flower opening is 41.96. The early 50% flower opening is observed in NDT-1 (59.33 days) and the delayed 50% flower opening is found in the strain of Pusa Rohini (65 days). The observation of day to fruit set maximum in NDT-314 (73.00) and minimum in NDT-7 (68.67). The maximum number of flower per plant was observed in the strain PH-2 162.67 and minimum number of flower is observed in strain Panjab Chuhhara (41.33). The highest number of cluster per plant present in (Table 2) was found in maximum variety PH-2 (39.66) and lowest one in NDT-2 (14.33). The mean performances of genotypes indicated that maximum number of flower per cluster (162.00) was recorded in PH-2 strain. Minimum number of flowers per cluster (133.00) was observed in Pusa Ruby. The maximum number of fruits per cluster was found in PH-2 (5.33) and minimum in C-10-4 (3.33). The grand mean (3.92) showed that majority of the entries were producing less number of fruits per cluster. The highest number of fruits per plant was recorded in PH-2 (35.33) and minimum in C-10-4 (18.67). The range of number of locules/ fruit started from highest PH-2 (5.67) and minimum in Arka Saurabh, NDT-4 and C-10-4 (3.00). The highest fruit yield in (58.52 tonn) was observed in PH-2 and lowest found in the strain NDT-1 the found yield/ ha. (16.52). These finding were in accordance with the result obtained by Narolia *et al.*, (2012) [4], Jogi, *et al.*, (2008) [2] and Joshi and Kohli (2005) [3] in tomato. The high yielding genotype PH-2 (58.52 tonns) also showed high mean performance for average yield per hectare. These results suggested that above mentioned high yielding genotypes may be considered in varietal improvement programme of tomato for desired characters.

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

S. No	Germplasm	Plant height (cm)	No. of branches/plants	Intermodal length (cm)	Fruit width (cm)	Fruit length (cm)	First flower opening	Days to 50% flowering	Day to fruit set	Number of flower per plant
1	NDT-1	47.2	9.33	4.48	4.68	4.05	41.00	59.33	69.67	99.33
2	NDT-2	52.12	6.67	5.30	4.40	4.00	43.00	61.00	72.33	91.67
3	NDT- 4	56.72	8.67	4.37	4.47	4.58	40.33	63.67	69.67	90.67
4	NDT-7	62.85	7.67	5.37	4.23	3.88	43.00	63.00	68.67	73.67
5	NDT-8	56.90	7.00	5.05	4.35	3.75	43.67	60.33	72.00	82.33
6	NDT-312	49.28	7.33	3.65	4.00	4.45	40.67	62.33	71.67	98.00
7	NDT-314	67.23	8.33	4.58	4.32	4.25	44.00	64.33	73.00	90.33
8	Arka Saurabh	38.68	10.00	4.25	3.35	4.13	39.67	60.67	71.67	87.00
9	Pusa Rohini	71.27	9.00	4.42	4.75	4.58	40.67	65.00	70.67	103.33
10	Pusa Hybrid-2	77.95	11.67	5.78	5.47	4.72	40.33	64.67	69.00	162.67
11	Pusa Ruby	73.97	10.00	4.47	4.88	4.70	43.33	64.00	71.33	133.00
12	Pusa Seetal	71.47	7.67	6.45	4.38	3.85	45.00	62.67	70.33	101.67
13	Azad T-6	47.25	6.00	5.35	3.68	3.93	44.00	61.00	72.33	95.33
14	Kashi Sharad	54.78	6.33	4.55	3.67	3.77	40.00	61.33	70.00	69.67
15	Punjab Chuhhara	55.62	24.58	5.83	3.78	3.83	42.00	60.33	71.00	41.33
16	C-10-4	63.99	10.00	4.60	3.57	4.26	40.67	62.00	71.33	84.33
	Mean	59.20	9.39	4.91	4.25	4.17	41.96	62.23	70.92	94.02
	SEm±	0.24	0.883	0.370	0.917	0.164	0.366	0.865	0.326	1.693
	CD (P=0.05)	2.40	0.883	1.073	2.660	0.477	1.062	2.511	0.945	4.913

### Biochemical characters

The results obtained during the investigation in respect to biochemical parameters viz., acidity (%), ascorbic acid and T.S.S. present in (Table 2). Significant variation was observed for total soluble solid among the genotypes. The mean values of genotypes indicates maximum total soluble solids in PH-2 (5.70) and the minimum total soluble solids was recorded in

the strain NDT-314 the value is that the (4.15). The observation titratable acidity in recorded maximum Pusa Rohini value is (0.76) and minimum in Kashi Sarad, Panjab Chuhhara 0.34. The ascorbic acid highest found in PH-2 (50.52) and lowest in NDT-1 (19.83). These findings are in conformity with the reports of (Reddy *et al.*, 2013)<sup>[7]</sup> and (Prema *et al.*, 2011)<sup>[6]</sup> in tomato.

**Table 2:** Mean performance of different tomato genotypes with respect to various traits

Sr. No.	Germplasm	Number of cluster per plant	Number of flower per cluster	Number of fruits per cluster	Number of fruits per plant	Number of locules per fruit	Fruit yield (tonne)/hector	Total soluble solids (°B)	Titratable acidity (%)	Ascorbic acid (mg/100g)
1	NDT-1	19.33	5.33	4.00	23.33	4.00	16.52	4.95	0.37	19.83
2	NDT-2	14.33	8.00	3.67	22.67	4.67	19.39	4.70	0.44	22.15
3	NDT- 4	19.67	5.00	3.67	23.67	3.00	23.44	4.65	0.28	21.60
4	NDT-7	19.00	5.67	3.67	24.67	4.00	33.52	4.56	0.40	26.18
5	NDT-8	21.00	7.67	3.33	21.67	3.33	25.45	4.35	0.45	30.88
6	NDT-312	22.33	6.67	4.33	22.33	3.00	34.95	4.28	0.52	25.78
7	NDT-314	26.33	8.00	3.00	20.67	4.00	38.02	4.15	0.50	45.68
8	Arka Saurabh	17.33	5.33	4.00	25.67	3.00	47.47	4.31	0.61	48.05
9	Pusa Rohini	33.67	8.33	4.67	32.33	4.33	52.96	4.62	0.76	50.26
10	Pusa Hybrid-2	35.33	10.67	5.33	35.33	5.67	58.52	5.70	0.71	50.52
11	Pusa Ruby	32.33	10.00	4.33	34.00	4.67	56.18	4.78	0.68	49.75
12	Pusa Seetal	23.67	6.33	4.00	26.33	4.00	38.77	4.29	0.65	44.79
13	Azad T-6	25.33	6.00	3.67	24.33	3.67	35.06	4.26	0.55	35.61
14	Kashi Sharad	19.33	5.00	4.00	19.00	4.67	43.27	4.48	0.41	29.37
15	PunjabChuhhara	17.67	7.00	3.67	20.67	3.33	30.62	4.38	0.34	26.71
16	C-10-4	18.67	6.67	3.33	18.67	3.00	29.31	4.22	0.34	24.53
	Mean	22.83	6.98	3.92	24.71	3.90	36.42	4.54	0.50	34.48
	SEm±	1.436	0.324	0.319	1.038	0.321	0.94	0.101	0.024	1.070
	CD (P=0.05)	4.167	0.941	0.926	3.014	0.933	2.747	0.101	0.069	3.105

### Conclusion

On the basis of overall findings of the present research study it was concluded that there is wide range of variation in tomato strain for all the characters studied. The strain PT-11 is highly significant for days to marketable picking, number of flower per cluster, number of fruit per cluster, number of fruit per plant, fruit weight per cluster and for fruit weight. However, since this is based on experiment, further trials may be needed to substantiate the results in tomato.

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