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Original Article

Phenotypic Evaluation of Tomato Genotypes Suitable for Sub Tropical Conditions

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ABSTRACT

The research work was done in tomato (*Lycopersicon esculentum* Mill.) to identify the suitable genotypes with good quantitative and qualitative traits, under subtropical conditions at Horticultural Research Farm, Department of Applied Plant Science (Horticulture) B. B. A. University, Lucknow during rabi season. Therefore, sixteen genotypes of tomato were evaluated for their fruit yield using Randomized Block Design with three replications under field condition. The present investigation revealed that the analysis of variance was highly significant for all the traits. Mean performance showed that genotype EC-620-445 registered the highest fruit yield per plant (1009.51 g) followed by EC-620-442 (894.50 g). Day of marketable picking is an important criteria for a selection of superior tomato genotypes, which ranged from 62.67 days (EC-620-438) to 76.67 days (EC-620-434). For the quality point of view, the genotype EC-620-432 recorded highest T.S.S (5.08 ° Brix) followed by EC-620-435. Hence these genotypes could be better utilized for further breeding programme for improvement of fruit yield and other traits.

Keywords:
Phenotypic Evaluation ,Tomato Genotypes , Tropical Conditions.

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Introduction

Tomato is one of the important edible and nutritious fruit vegetable crops in the world. It belongs to Solanaceae family. It is widely cultivated in tropical, sub-tropical and temperate climates and ranks thirds in the term of world vegetable production (FAO 2006). The leading tomato producing countries are China, United State of America, India and Egypt. It is one of the most economically important vegetable crop, in India, it ranks second among vegetables next to potato with an area of 8649 lakh hectare and 16826.4 million tones and productivity is 19.5 MT/ha. In U.P. tomato is grown in 829.4 MH with annual production of 176794.4 MT (NHB 2011).

Tomato is most frequently consumed vegetable in India, becoming the main supplier of several plant nutrients and providing important nutritional value to human diet (Willcox et al. 2003). The crop generally requires warm weather and abundant sunsine for best growth and development. In tomato vegetative and reproductive growth at lower temperature are very limited, and an extended period of plant growth at 12°C or less can result in chilling injury. Moreover, the plant grows best when provided with uniform moisture and well drained soil (Gould, 1992).

The climate and soil condition of North India allow the cultivation of wide range of vegetable crops including tomato, which are grown in almost all part. But the tomato production and productivity is very low compare to other countries especially in productivity due to several reasons, including poor irrigation system, lack of information on soil fertility, high post harvest loss, lack of awareness of existing improved technology and one the most valuable reason is shortage of superior genotypes. Therefore, the main objective of this study was to find out the suitable genotypes for quantitative and qualitative

traits for future improvement programmes.

Materials And Methods

Sixteen tomato genotypes were collected from IIVR Varanasi (U.P.) and evaluated for nineteen characters in a Randomized Block Design (RBD) each in three replications at Horticultural Research Farm, Department of Applied Plant Science (Horticulture) B. B. A. University, Lucknow during rabi season, 2011. The study site was situated at latitude of 26.50° North, 80.50° East longitude and 123 m MSL, which fall in the sub-tropical zone of Uttar Pradesh. The temperature during the cropping period lies between 9°C to 35.5°C and relative humidity 49.6% to 76.8%. The entries experimental field was divided into three blocks of equal size and each block possessed 16 plots. Each plot measured 2.40 x 1.80 m area. The seedlings of 30 days old were transplanted to the main field for screening under natural condition at spacing of 60 × 45 cm. All the recommended agronomic practices were followed to raise a healthy crop (Choudhury, 2000). Observations were recorded from 10 randomly selected plants from each plot viz., plant height (cm), number of branches per plant, internodal length (cm), number of leaf per plant, days to first flowering after sowing, number of flower per plant, day to 50% flowering, number of flower per cluster, number of cluster per plant, number of fruits per cluster, number of fruits per plant. Days to marketable picking, fruit length (cm), fruit width (cm), pericarp thikness (mm), number of locules per fruit, average fruit weight, yield per plant, total soluble solids. The data were analyzed according to the methods outlined by Panse and Sukhatme (1967).

Results And Discussion

The success of crop improvement lies in the selection of suitable parents. While evaluating the genotypes, high mean value is considered as the acceptable procedure for a long time among the breeders. The analysis of variance (Table 1) revealed highly significant difference among the genotypes for all the traits. Mean performance of all 16 tomato genotypes were given in Table 2. Maximum plant height was observed in EC-620-444 (81.12 cm) and minimum in EC-620-439 (38.94 cm). This finding was also similar with those of Khokhar *et al.*, 2001; Monhanty and Prusti, 2001 and Khah et al., 2006. Number of flower per cluster also affected the yield, so that maximum number of flower per cluster was recorded in EC-620-445 (9.75) and minimum in EC-620-432 (5.82). This finding was also similar to those of Agong *et al.*, 2001 and Khoh *et al.*, 2006. Significant variation was observed for days to first flower opening and it ranged from 43.70 (EC-620-448) to 50.66 (EC-620-431).The similar result was also found by Peires (2002). So, earlier flowering genotypes can be used in the breeding programme. Plant height is considered as one of the important traits for growth and vigour of the plants. Number of branches per plant is another yield increasing trait in tomato. Here, the genotype EC-620-44 (10.33) recorded maximum followed by EC-620-445, and minimum in EC-620-448 (7.51). The range for number of fruits per plant was minimum in 19.10 (EC-620-434) and maximum in 35.20 (EC-620-445). This finding was agreed with other researchers (Khokhar *et al.*, 2001 and Eshteshabad et al., 2010)

The yield being polygenic traits, it is a result of component characters like number of fruits per plant and fruit weight. Table 3. showed the mean performance of yield and quality traits. Days to marketable picking was minimum recorded in the EC-620-445 (59.67 days) and maximum in EC-620-434 (76.67 days). The top ranked genotypes in terms of yield per plant is EC-620-445 (1 kg) followed by EC-620-442 (894.50 g) and EC-620-446 (892.33 g). While EC-620-440 showed the least yield (736.25 g).The similar result was also found by (Khokhar et al., 2001; Znidarcic et al., 2003 and Fayaz et al., 2007). The average fruit length and fruit width in 16 genotypes was 3.35 cm (EC-620-447) to 4.39 cm (EC-620-431) and 3.55 cm (EC-620-431) to 4.90 cm (EC-620-432) respectively. The similar result was also found by (Khokharet et al., 2001; Znidarcic et al., 2003 and Eshteshabal et al., 2010). The genotype EC-620-432 recorded highest T.S.S 5.08° Brix followed by EC-620-435 and EC-620-448.

Conclusion

Tomato is one of the most widely accepted fruit in the world. As more tomatoes are being consumed, growers have to grow the crops with high yield and good quality and adapted to their environment. The results of the present study show that high-yielding and good quality tomato genotypes are available in the Northern India. Selected promising

genotypes collections are being tested in replicated elite variety trials to determine their adaptability and yield stability.

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Table 1. Analysis of variance (ANOVA) for sixteen characters in tomato (Lycopersicon esculentum Mill.)

Source	Degree of freedom (d.f)	Mean squares																	
		Plant height(cm)	Number of branches	Internodal length	Number of leaves/plant	Days to first flower opening	Number of flower/plant	Days to 50% flowering	Number of flower/cluster	Number of cluster/plant	Number of fruit/cluster	Number of fruit/plant	Days to marketable Picking	Fruit weight/cluster	Fruit weight (g)	Fruit length (cm)	Fruit width (cm)	Number of Locules/fruit	Pericarp thickness (mm)	TSS
Rep.	2	2.489	0.01$	0.019	107.642	0.044	1.319	1.447	0.946	4.364	0.053	2.319	4.126	73.339	191.122	0.007	0.027	0.004	0.001	0.002
Treat.	15	224.996**	2.095**	1.328**	806.5120**	12.056**	217.369**	5.917**	3.132**	131.007**	0.696**	38.450**	78.157**	665.845**	15005.951**	0.230**	0.638**	0.781**	0.229**	0.173**
Error	30	2.312	0.104	0.047	46.444	0.306	19.466	0.633	0.237	1.62	0.020	4.351	2.599	34.012	1016.835	0.009	0.022	0.006	0.002	0.002
Total	47																			

* - significant at P = 0.05
**- Highly significant at P = 0.01

Table 2. Mean performance of different genotypes of tomato (Lycopersicon esculentum Mill.) with respect to growth parameters.

Genotypes	Plant height (cm)	No. of branches/plants	Internodal length(cm)	No. of leaves/ plant	First flower opening after sowing	No. of flower /plant	Day to 50% flowering	No. of flowers/ cluster	No. of cluster /plant	No. of fruit/ cluster	No. of fruit/ plant
EC-620-449	53.67	9.67	4.99	311.72	46.87	99.83	59.42	5.84	19.33	3.25	22.88
EC-620-448	51.45	7.51	5.43	306.03	43.70	91.50	61.83	8.20	14.00	3.33	27.93
EC-620-447	53.23	8.33	4.34	334.00	49.41	90.72	63.08	6.67	18.33	3.33	22.17
EC-620-446	57.07	8.78	5.95	225.50	46.71	73.94	63.66	7.70	20.67	3.34	25.67
EC-620-445	52.77	10.31	4.54	399.92	47.17	162.33	61.88	9.75	35.58	4.88	35.20
EC-620-444	81.12	10.33	3.88	389.58	43.91	134.42	63.32	8.25	33.78	3.98	31.63
EC-620-443	56.95	9.59	4.80	333.58	43.78	83.17	62.67	6.58	17.26	2.95	19.17
EC-620-442	57.00	8.36	4.77	390.67	46.91	102.83	63.33	7.00	18.65	2.88	21.25
EC-620-440	52.11	8.08	4.45	393.58	48.03	69.38	62.80	6.67	24.11	3.26	21.58
EC-620-439	38.94	9.33	4.80	333.50	44.40	38.40	62.16	7.37	28.62	3.08	23.92
EC-620-438	54.96	9.73	5.70	333.83	45.69	98.32	62.65	6.33	32.93	3.73	20.83
EC-620-437	58.03	9.93	4.29	294.67	47.55	91.49	64.47	6.57	22.43	3.76	22.42
EC-620-435	48.75	8.59	6.00	307.83	47.91	101.66	62.53	6.59	22.64	3.73	21.50
EC-620-434	53.65	9.37	5.98	314.67	47.68	85.67	63.90	6.26	18.98	3.70	19.10
EC-620-432	57.12	8.45	4.77	246.25	47.40	86.98	60.27	5.82	16.70	3.37	21.83
EC-620-431	64.78	8.62	5.45	312.33	50.66	98.32	64.95	6.87	18.40	3.75	22.33

Table 3. Mean performance of different genotypes of tomato (Lycopersicon esculentum Mill.) with respect to yield and quality parameters.

Genotypes	Days to marketable picking	Fruit wt./cluster (gm)	Fruit width (cm)	Fruit length (cm)	Fruit wt. / plant (gm)	No. of locules / fruit	Pericarp thickness (mm)	T.S.S. (^{0}Brix)
EC-620-449	72.33	69.75	4.07	3.84	873.00	3.08	3.60	4.83
EC-620-448	69.33	75.54	4.54	3.40	873.58	3.92	3.37	4.42
EC-620-447	62.92	69.17	4.45	3.35	861.17	4.67	3.23	4.33
EC-620-446	74.67	68.67	4.34	3.70	892.33	4.67	3.61	4.42
EC-620-445	59.67	117.14	4.00	3.92	1009.51	3.92	3.79	4.67
EC-620-444	68.33	97.98	3.99	3.91	858.67	4.50	3.34	4.75
EC-620-443	73.00	58.17	4.29	3,99	776.67	4.08	3.84	4.58
EC-620-442	73.67	71.25	4.58	3.51	894.50	4.50	3.60	4.50
EC-620-440	65.67	67.92	4.10	3.48	736.25	4.50	3.34	4.58
EC-620-439	63.33	76.00	3.95	3.69	831.99	367	4.03	4.83
EC-620-438	62.67	71.89	5.69	4.30	816.83	3.67	3.72	4.92
EC-620-437	65.33	68.50	3.78	4.12	851.67	3.92	3.69	4.25
EC-620-435	71.67	70.12	4.09	3.44	776.25	3.50	3.92	4.92
EC-620-434	76.67	93.25	4.17	3.90	830.57	3.25	3.53	4.50
EC-620-432	72.00	83.00	4.90	3.55	768.33	4.58	3.56	5.08
EC-620-431	72.67	90.92	3.55	4.39	825.50	3.83	4.26	4.83

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