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Evaluation of tomato (*Solanum lycopersicum* L.) Hybrids for quality parameter in Allahabad agro climatic condition

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Abstract
The experiment was conducted under Randomized Block Design with three replications during winter season of the year 2017-18 in Departmental Research field of Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agricultural Technology and Sciences, Allahabad. Twenty-five hybrid varieties of tomato were evaluated for quality parameters under total soluble solids, acidity, ascorbic acid and fruit shape index. Hybrid H_{20} (Excel - 204) is found to be best for most of the quality parameters such as it had maximum ascorbic acid (26.900 mg) and total soluble solids (6.073° Brix). Fruit shape index was high in hybrid H_{10} (CHAITANYA) (1.053) and acidity was minimum in hybrid H_{24} (Arka Rakshak) (0.740 %).

Keywords: Tomato, quality parameters, total soluble solids

Introduction
Tomato (*Solanum lycopersicum* L.) Wettsd, (2n = 2x = 24) is one of the most popular and widely grown vegetable crops of the world next to potato. The genus Solanum consists of annual or short lived perennial herbaceous, typical day neutral plant and warm season crops. Tomato is reasonably susceptible to frost as well as high temperature but it is grown in a variety of climatic conditions. Tomato (*Solanum lycopersicum* Mill.) is one of the most important and popular Solanaceous vegetable crops grown in wide climatic regions of the world. It is believed to be of Peru-Ecuador origin (Rick, 1969) [1]. Tomato is presumed to have been brought in India during the second half of the 16th century through Far Eastern countries. Nineteenth century plant explorers in India noted the plant to be very common, highly variable and growing as a cultivated crop. These materials formed the base of the first indigenous selections released as improved cultivars in the middle of the 20th century. Major boost to tomato cultivation in the country was provided by the introduction of high yielding exotic cultivars like Sioux, Roma and Marglobe from 1950 onwards. Over the years, indigenous high-yielding cultivars have been bred from the old local cultivars, early introductions and, more significantly, the newly introduced cultivars and breeding lines. Majority of these new and now popular cultivars have come from three breeding centres –Indian Agricultural Research Institute, New Delhi (Pusa cultivars) and Punjab Agricultural University, Ludhiana (Punjab cultivars) in north India; and Indian Institute of Horticultural Research, Bangalore (Arka cultivars) in south India.

India is the fourth largest tomato producer in the world after China, USA and Turkey, accounting for about 6.5% of the world tomato production. In terms of area, it occupies second place after potato (Bose *et al*., 2002) [4]. In the year 2011 it was grown over an area of 865 thousand hectares in India with an annual production of 16826 thousand m tonnes accounting to an average productivity of 19.5 m tonnes per hectare. In India, it occupies 10.2% of total vegetable area and accounts for 11.5% of total vegetable production. Major tomato growing states in India are Bihar, Karnataka, Uttar Pradesh, Orissa, Andhra Pradesh and Maharashtra. Exploitation of hybrid vigour and selection of parents on the basis of combining ability have been important breeding approaches in crop improvement. The combining ability is essentially useful in connection with testing procedures in which it is desired to study and compare the performance of a line in hybrid combination. GCA effects are due to additive type of gene action and SCA effects are due to non-additive (dominant or epistatic) gene action.

Tomato is universally treated as 'Protective Food' since it is a rich source of minerals, vitamins and organic acids (Hari, 1997) [2]. In many countries it is considered as "poor man's orange" because of its attractive appearance and nutritive value (Singh *et al*., 2004) [4]. It is high in nutritional value; one medium fresh tomato (135g) provides 47% Recommended Dietary

Allowance (RDA) of vitamin C, 22% RDA of vitamin A and 25% calories. It contributes significantly to the dietary intake of vitamins A and C as well as essential minerals and other nutrients. Tomatoes are used as raw vegetable in sandwiches, salad etc. and in processed forms like paste, puree 2 syrup, juice, ketchup, whole peeled tomato, etc. (Bose *et al*., 2002) [4]. Tomato is a very good appetizer and its soup is said to be a good remedy for patients suffering from constipation (Kalloo *et al*., 2001) [5]. Tomato is an important source of lipid-soluble antioxidants in the human diet because of their relatively high content of carotenoids. Lycopene presence in plasma in tomato is valued for its anti-cancer property (Bose *et al*., 2002) [4]. It acts as an antioxidant and scavenger of free radicals, which is often associated with carcinogenesis. Thus, lycopene has got great beneficial effects on human health (Khachik *et al*., 1995) [6]. It may also interfere with oxidative damage to DNA and lipoproteins and inhibits the oxidation of LDL (low density lipoprotein) cholesterol (Gester, 1997) [7]. Other carotenoids present in ripe tomato fruits include α-carotene and small amounts of phytoene, phytofluene, β-carotene, neurosporene and lutein.

Materials & Methods

The present experiment was carried out under randomized block design (RBD) at Departmental research field, Department of Horticulture, Sam Higginbottom University of Agriculture, Technology and Sciences, during 2017 – 2018. The material for the study comprised of 25 tomato hybrid varieties, of which 2 were collected from IIVR, Varanasi, 2 were collected from IIHR, Banglore and 21 were collected locally. Quality data were collected throughout the experimental period from five randomly selected plants from each plot. Following observation were recorded total soluble solids (° Brix), acidity (%), ascorbic acid and fruit shape index. The analysis of variance technique was applied for drawing conclusions from the data. The recorded value of F was compared with tabulated value of F 5% level of probability for the appropriate degree of freedom. If calculated value exceeded the table value, the effect was considered to be significant.

Results & Discussion

The present investigation was carried out entitled "Evaluation of Tomato (*Solanum Lycopersicum* L.) Hybrids for Quality Parameter in Allahabad Agro Climatic Condition". The mean replicated data collected on twenty-five hybrid varieties of Tomato were subjected to the appropriate statistical analysis for drawing valid conclusions. Table 1: The maximum Total Soluble Solids (°Brix) (6.073 °Brix) was found in H_{20} (Excel – 204), followed by H_{12} (Rishabh) with (5.967 °Brix) and minimum Total Soluble Solids (3.913 °Brix) was recorded in H_4 (Hybrid Taj). The maximum Ascorbic acid (mg/100 g) (26.900 mg) was found in H_{20} (Excel – 204), followed by H_{14} (Abhilash) with (26.633 mg) and minimum Ascorbic acid (22.880 mg) was recorded in H_1 (LHT Angle). The minimum Acidity (%) (0.740 %) was found in H_{24} (Arka Rakshak), followed by H_{25} (Arka Samrat) with (0.760 %) and maximum Acidity (1.040 %) was recorded in H_4 (Hybrid Taj). The fruit shape index was recorded high in H_{10} (Chaitanya) with (1.053) followed by H_4 (Hybrid taj) and H_{24} (Arka Rakshak) with (1.023) and minimum fruit shape index (0.887) was recorded in H_5 (Sampurna).

Table 1: Mean performance of Tomato hybrid for quality parameters

S. No.	Hybrid symbol	Hybrid name	Total soluble solids (°Brix)	Ascorbic Acid (mg/100 g)	Acidity (%)	Fruit shape index
01	H1	LHT-ANGEL	5.30	22.88	0.87	0.92
02	H2	LHT-ANMOL	4.87	24.44	0.84	0.94
03	H3	LHT-1486	5.24	24.92	0.82	0.94
04	H4	HYBRID TAJ	3.91	26.09	1.04	1.02
05	H5	SAMPURANA	5.56	25.33	0.81	0.88
06	H6	RAKSHAK	4.90	26.37	0.91	0.99
07	H7	VNR-3348	5.23	24.84	0.79	0.98
08	H8	NHT-2802	5.60	25.26	0.81	0.91
09	H9	BSS-1004	4.97	25.68	0.82	0.94
10	H10	CHAITANYA	5.53	23.34	0.87	1.05
11	H11	INDAM-3001	4.78	24.97	0.85	0.94
12	H12	RISHABH	5.96	25.71	0.91	1.00
13	H13	TO-3038	5.40	25.52	0.90	0.99
14	H14	ABHILASH	5.80	26.63	0.95	0.95
15	H15	LUCKY-939	5.57	25.86	0.93	0.99
16	H16	NS-585	5.26	23.54	0.87	1.00
17	H17	NAMDHARI SEEDS	5.23	24.50	0.80	1.01
18	H18	NS-524	5.13	25.23	0.78	0.98
19	H19	NS-5007	5.31	24.90	0.81	0.99
20	H20	EXCEL-204	6.07	26.90	0.79	0.96
21	H21	ROSHAN	5.81	26.05	0.85	0.91
22	H22	KASHI AMRIT	5.30	24.96	0.84	0.94
23	H23	KASHI HEMANT	5.66	25.66	0.87	0.97
24	H24	ARKA RAKSHAK	5.56	26.07	0.76	1.02
25	H25	ARKA SAMRAT	5.20	24.51	0.74	0.95
26		Mean	5.32	25.21	0.85	0.96
27		Results	S	NS	S	NS
28		SE.d	0.37	1.15	0.07	0.06
29		CD (5%)	0.78	N/A	0.14	N/A

Conclusion

From the present experimental findings it is concluded that in quality parameters Hybrid H_{20} (Excel - 204) is found to be best for most of the quality parameters, and lowest readings was recorded in Hybrid H_4 (Hybrid Taj), H_{14} (Abhilash) and H_{16} (NS - 585).

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