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Research Paper

Development of F_1 hybrids in tomato for yield, quality and field tolerance to bacterial wilt

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ABSTRACT

Thirty two F_1 hybrids developed as a result of line x tester design involving 8 lines and 4 testers were evaluated with three replications during 2005-2006 at Horticulture department, Gandhi Krishi Vignyan Kendra, Bangalore. The data pertaining to yield, quality, field tolerance to bacterial wilt were recorded. Three hybrids *viz.*, Vybhav x Arka Alok (L_2 x T_2), PKM-1 x Arka Abha (L_4 x T_1) and Hissar Anmol x Sankranthi (L_3 x T_3) were found to be moderately resistant to bacterial wilt and with yield as 3.04 kg per plant 960.80 t/ha), 3.00 kg per plant (60.00 t/ha) and 2.96 kg per plant (59.20 t/ha), respectively. The quality of the fruit was also satisfactory. Arka Abhijith was used as commercial check to asses yield, quality and field tolerance to bacterial wilt for all the hybrids developed.

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Key words : Tomato, F_1 hybrids, Bacteria wilt, Field tolerance

INTRODUCTION

Tomato (*Lycopersicon esculentum* Mill.) is one of the most important, extremely popular and extensively grown vegetables around the world and belongs to the family Solanaceae. Due to its high nutritional values, there is ever increasing demand for this vegetable. To meet this demand there is a need for development of hybrids with improved yield, quality and tolerance to diseases and pests. Developing commercially acceptable tomato varieties and hybrids with good horticultural qualities and tolerance to bacterial wilt has been the objective of many breeding programmes. In view of this a study was conducted at Department of Horticulture, University of Agricultural Sciences, Bangalore during 2005 – 2006.

MATERIALS AND METHODS

The experiment material consisted of eight lines and four testers to develop 32 F_1 hybrids. F_1 hybrids, parents along with commercial check Arka Abjijith (Table 1)were assessed for yield, quality and field tolerance to bacterial wilt in a Randomized Complete Block Design with three replications. A spacing of 100 x 50 cm was adopted and the plants were provided with simple staking. The observations were recorded for yield, quality and disease parameters on five plants selected at random in each cross

Table 1: Details of lines, testers and commercial check used for linex tester analysis

Sr. No.	Details	Devloped by
Lines		
L_1	L-15 (Megha)	UAS Dharwad
L_2	Vybhav	UAS Bangalore
L_3	Hissar Anmol	HAU-Hissar.IARI,New Delhi
L_4	PKM-1	TNAU-Coimbatore
L_5	Pusa Ruby	IARI,New Delhi
L_6	Arka vikas	IIHR, Bangalore
L_7	Arka Meghali	IIHR, Bangalore
L_8	Arka Sourabh	IIHR, Bangalore
Testers		
T_1	BWR-1 (Arka Abha)	IIHR, Bangalore
T_2	BWR-1 (Arka Alok)	IIHR, Bangalore
T_3	Sankranthi	UAS Bangalore
T_4	Nandi	UAS Bangalore
Commercial Check	Arka Abhijith.	IIHR, Bangalore

Table 2: Yield performance of hybrids and commercial check for various quantitative and qualitative characters in tomato

Crosses	Plant height (cm)	No. of primary branches	No. of secondary branches	Days to 75% first flowering	Days to first fruit maturity	No. of fruits per plant	Av. fruit weight (g)	Per cent fruit set	Total yield per plant (kg)	TSS (Brix)	Pericarp thickness (mm)	No. of locules	Firmness (kg/cm^2)
Lines													
L1	86.5	4.33	6	31.5	64.16	25.36	53.66	66.26	1.46	4.08	4.81	3.56	2.82
L2	80.03	3.66	6.56	28.83	63.66	29.02	66	61	2.33	4	4.06	3.48	3.25
L3	79.16	3	5.66	31.16	63	30.86	71.33	70	1.56	4.03	5.01	4.03	2.26
L4	81.33	3.66	6.33	32	69.66	33.9	45	66.66	1.63	4.06	3.41	4.8	3.36
L5	90.83	5	5.66	31.1	68.66	29.3	54.33	65.33	1.56	4.02	4.85	4.56	3.16
L6	91.83	4.33	6.33	33.13	69	28.16	59.66	70	1.83	3.93	3.23	4.33	2.9
L7	91.33	4	6.33	31.53	62.33	21.3	45	63.66	1.8	4.01	3.03	4.2	2.8
L8	90.5	3.33	5.33	32.53	63.33	23.83	46.33	70.66	1.83	3.93	2.88	4.6	3.13
Mean	87.18	4.1	6.02	31.5	65.71	28.1	52.28	61.32	1.66	4.02	4.1	4.19	3.2
Testers													
T1	86.83	5.33	5.66	30.53	61	28	42.66	65.33	1.81	4.08	4.03	4.26	3.6
T2	89.66	4	6.33	31.13	63.66	25	46.33	45	1.76	3.93	3.8	4.2	3.1
T3	91	5.66	6.66	28.16	61.66	25	69.33	63.33	1.73	4.06	5.51	4.2	2.73
T4	92.26	5	5	26.5	67	26.33	65.66	62.66	1.66	4.1	5.21	3.26	3.13
Mean	89.93	5.19	5.91	29.8	65.58	26.08	70.99	66.58	1.71	4.07	4.63	3.89	3.36
Mean of	88.55	4.91	5.96	30.65	63.52	27.07	61.63	66.95	1.71	3.71	4.3	3.83	3.16
Hybrids													
L1 x T1	99.5	6.33	7.00	29.16	64.00	21.00	64.00	68.33	2.11	4.33	3.86	3.80	3.60
L2 x T2	100.73	6.00	7.66	30.00	61.00	21.00	68.66	70.00	2.10	4.25	3.91	4.46	3.70
L3 x T3	100.66	5.33	7.66	28.00	66.00	31.00	45.66	66.66	1.86	4.11	2.98	2.98	3.80
L4 x T4	102.26	7.66	7.00	28.83	63.00	29.33	58.66	61.33	2.30	4.16	3.00	3.00	2.90
L5 x T1	105.16	6.33	8.33	27.00	63.33	33.66	63.66	76.33	2.46	4.23	3.70	3.70	3.33
L6 x T2	101.03	5.66	7.00	28.83	64.66	32.00	66.00	79.66	3.07	4.33	3.60	3.70	3.50
L7 x T3	101.23	5.00	8.33	29.00	62.66	26.66	65.00	72.00	2.55	4.30	4.26	4.26	3.30
L8 x T4	99.6	6.00	7.33	30.36	63.33	26.00	64.66	73.33	2.53	4.10	3.96	3.96	3.10
L1 x T2	99.8	5.33	8.00	21.66	61.66	26.00	62.00	75.00	2.40	4.23	4.03	4.03	3.16
L2 x T3	102.83	6.00	6.00	21.66	63.66	21.33	61.66	71.66	2.16	4.36	4.20	4.20	3.16
L3 x T4	102.16	5.61	7.00	30.90	63.33	30.33	60.1	78.00	2.96	4.15	3.23	3.23	3.80
L4 x T1	99.5	6.33	6.66	30.00	61.66	28.66	58.00	75.00	2.46	4.16	4.16	4.16	2.10
L5 x T2	97.3	6.33	7.33	21.00	62.33	31.66	61.00	76.8	3.00	4.23	4.23	4.46	3.13
L6 x T3	101.3	6.33	7.33	21.66	64.00	28.00	63.33	75.88	2.20	4.30	4.30	4.60	3.20
L7 x T4	99.16	6.00	8.33	32.10	64.33	30.33	52.00	70.33	2.10	4.93	4.93	3.25	3.16

Contd.....Table 2

Table 2 Contd.....

$L_4 \times T_4$	101.1	5.33	6.66	30.80	63.66	30.33	42.66	70.00	2.33	4.16	4.16	4.88	3.53
$L_5 \times T_1$	100.76	5.67	7.00	28.00	65.00	27.66	54.00	66.66	2.03	4.56	4.26	4.43	3.00
$L_5 \times T_2$	98.83	5.67	7.66	27.66	67.33	26.66	61.66	68.00	1.96	4.93	4.43	3.66	3.03
$L_5 \times T_3$	99.86	6.33	7.00	31.50	68.66	31.33	64.66	67.66	2.16	4.70	5.83	6.16	2.90
$L_5 \times T_4$	103.50	6.00	6.00	32.83	70.33	26.66	63.00	67.33	1.83	4.40	5.12	5.10	3.50
$L_6 \times T_1$	104.10	6.67	8.00	28.00	62.55	27.00	64.00	66.66	2.03	4.40	4.73	4.06	3.60
$L_6 \times T_2$	106.73	6.00	7.66	29.33	66.66	26.00	67.00	69.00	1.86	4.76	4.40	4.06	3.13
$L_6 \times T_3$	105.90	6.00	7.66	31.16	63.66	27.66	54.66	66.00	1.80	4.60	4.41	4.56	3.06
$L_6 \times T_4$	101.70	5.00	7.00	30.00	65.33	28.33	57.33	65.33	1.73	4.50	4.90	3.56	3.13
$L_7 \times T_1$	97.53	6.00	8.00	29.33	63.00	26.66	64.00	64.00	2.23	4.70	4.33	3.10	3.2
$L_7 \times T_2$	101.80	6.00	8.33	30.00	65.66	26.63	67.00	67.00	2.13	4.63	4.20	3.10	3.23
$L_7 \times T_3$	102.30	5.33	7.00	26.86	64.66	29.00	55.00	55.00	1.96	4.23	4.93	3.80	2.6
$L_7 \times T_4$	104.50	4.33	6.33	28.6	62.66	30.00	64.00	64.00	1.86	4.63	4.00	4.20	2.73
$L_8 \times T_1$	98.66	6.00	7.00	28.66	62.33	27.00	64.00	64.00	1.96	4.66	4.20	3.10	3.20
$L_8 \times T_2$	97.40	5.33	8.33	29.00	64.00	24.66	67.00	67.00	1.83	4.10	4.20	3.00	3.40
$L_8 \times T_3$	104.5	4.67	8.00	28.86	61.33	30.00	55.00	55.00	1.87	3.97	4.13	2.83	3.13
$L_8 \times T_4$	102.66	4.67	7.00	28.00	58.66	31.00	31.00	64.00	1.76	3.85	4.05	3.33	3.20
Commercial	110.00	6.66	8.66	29.40	63.00	66.66	67.00	69.00	2.43	4.33	4.63	3.43	3.66
Check													
Hybrid Mean	101.83	5.64	7.35	29.13	66.08	28.50	60.66	71.00	2.19	4.38	4.20	4.20	3.22
Grand Mean	98.21	5.43	7.02	29.62	64.56	27.84	60.23	69.5	2.01	4.34	4.20	4.20	3.20
SEM	0.43	0.44	0.43	0.71	0.43	0.69	1.71	0.81	0.11	0.10	0.14	0.08	0.11
C.D.	1.23	1.25	1.21	2.00	1.23	1.95	4.82	2.29	0.30	0.30	0.40	0.22	0.30
(P 0.05)													
CV	2.03	14.17	10.62	4.16	1.17	4.32	4.90	1.15	4.39	4.49	6.37	4.33	4.39

in each replication. Data were recorded on plant height (cm), number of primary branches, number of secondary branches, days to 50 per cent flowering, days to first fruit maturity, number of fruits cluster per plant, average fruit weight (g), total yield per plant (kg), TSS (^{O}Brix), pericarp thickness (mm), number of locules per unit and fruit firmness (kg/cm^2). Statistical as per Singh and Choudary (1977). Diseases parameters were recorded as per cent incidence of diseases based on the survival of plants in the field.

RESULTS AND DISCUSSION

The observations recorded for different yield and quality parameters are expressed in Table 2. The salient results of the investigation area:

The analysis of variance, mean sum of squares due to genotypes was significant for all the characters studied. The mean performance of hybrids was superior over mean performance of parents for days to fifty per cent flowers, days to first fruit maturity, plant height, primary branches among morphological characters, number of fruit cluster per plant average fruit weight and yield per plant among yield parameters and was superior for fruit firmness, less locule number and total soluble solids (TSS) among the fruit quality traits.

The bacterial wilt disease scoring was done based on the survival percentage in the field. All F_1 hybrids with resistant and moderately resistant parents showed high degree of survival in the field. Three hybrids *viz.,* Vybhav x Arka Alok (L_2 x T_2), PKM-1 x Arka Abha (L_4 x T_1) and Hissar Anmol x Sankranthi (L_3 x T_3) found to be moderately resistant to bacterial wilt and with yield as 3.04 kg per plant (960.80 t/ha), 3.00 kg per plant (60.00 t/ha) and 2.96 kg per plant (59.20 t/ha), respectively the quality of the fruit was also satisfactory. The hybrids L_2 x T_2, L_4 x T_1 and L_3 x T_3 were found to be most promising and can be exploited for hybrids vigour, disease tolerance and for commercial exploitation. These results corroborate with the findings of Dundi (1991), Ashok *et al.* (2004) and Bosch *et al.* (1985).

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