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STUDIES ON YIELD AND YIELD CONTRIBUTING CHARACTERS IN SOME HYBRIDS OF TOMATO (*LYCOPERSICON ESCULENTUM* MILL.)

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Abstract

The present study was undertaken to study the performance of hybrids and specific combining ability for yield and yield contributing characters through a line x tester (6 × 3) analysis. Among the eighteen hybrids, three hybrids exhibit positive significant *sca* are, EC-461070 × MTM Local, PKM-1 × EC-461057 and EC-461018 × EC-461035. Among the hybrids, EC – 461070 × MTM Local recorded maximum fruit yield per plant, which has higher than the maximum value observed among the parents.

Key words: Tomato, *sca*, *gca*, combining ability.

Introduction

Tomato (*Lycopersicon esculentum* Mill.) belongs to the family Solanaceae. It ranks second among vegetables in commercial importance in many countries including India. It is a rich source of Vitamin A, Vitamin C and minerals. Now-a-days cultivation of tomato is the focus of horticulture industry, there is a necessity to improve the productivity to achieve the increased production from a limited land. Improving the productivity through traditional plant breeding methods is sustainable, affordable and ecofriendly. In recent years public institutions and private companies introduced many hybrid varieties one after other for commercial cultivation and selection of newer parents for higher heterosis is a continuous process. Keeping in view the above facts, the present study was undertaken to identify the promising hybrids to boost the productivity of tomato.

Materials and Methods

The study was carried out at Research Farm, College of Agriculture, Kerala Agricultural University, Vellayani, Thiruvananthapuram. The details of the parental materials are EC-461070(L_1), EC-461018(L_2), EC-461078(L_3), Arka Alok (L_4), PKM-1(L_5), Mukthi(L_6), MTM Local (T_1), EC-461035 (T_2), EC-461057(T_3). Eighteen F1 hybrids were obtained by crossing six lines and three testers. Six lines were selected based on high yield and quality using selection index method. Three testers were selected based on fruit borer (*Helicoverpa armigera* Hubner) resistance. The exotic genotypes were introduced from AVRDC (Asian Vegetable Research and Development Centre), Taiwan. The hybrids along with their parents were raised in randomized block design with three replications. Well developed good quality seeds of nine parents and eighteen hybrids were sown in nursery. Twenty five days after showing the seedlings were transplanted in the main field. The plot size is 1.8 m × 3m. The seedlings were planted at a spacing of 60 cm × 60 cm. The cultural and management practices were done as per package of practices recommendations (KAU, 1996) were followed. The data recorded in randomly selected plants in each replication for yield and its component traits were subjected to statistical analysis.

Results and Discussion

Data obtained on yield and yield contributing characters of eighteen hybrids and their parents are presented in table 1. Significant differences were detected among the parents and hybrids with respect to all the

Table 1: Mean performance of parents and hybrids for yield traits in tomato.

S. No.	Characters / Parents/ Hybrids	Plant height (cm)	Number of branches per plant	Spread of the plant (cm)	Number of days to first flowering	Number of days to first fruit harvest	Number of fruits per plant	Weight of individual fruit (g.)	Weight of fruits per plant (g.)
1	L_1	112.33	24.67	78.10	52.27	95.07	48.80	70.38	3052.90
2	L_2	84.66	14.73	53.47	43.56	75.67	32.93	83.26	2381.46
3	L_3	64.87	12.71	33.26	47.18	77.17	21.97	61.28	1236.91
4	L_4	103.54	19.03	67.49	52.17	96.20	21.17	63.67	1217.38
5	L_5	63.67	15.53	62.92	49.68	83.57	27.23	39.67	995.74
6	L_6	83.43	12.77	57.93	50.61	93.53	18.10	65.87	1084.14
7	T_1	84.07	14.17	56.95	50.71	93.23	28.00	79.75	2004.62
8	T_2	81.07	13.03	61.19	49.05	81.30	20.53	70.00	1319.68
9	T_3	71.65	13.27	52.96	51.95	80.03	31.33	36.12	1030.00
10	$L_1 \times T_1$	121.87	25.80	81.87	47.40	91.03	50.43	90.01	3994.58
11	$L_1 \times T_2$	100.54	21.03	70.73	50.95	86.47	27.33	71.63	1778.71
12	$L_1 \times T_3$	84.94	18.47	69.02	48.81	77.73	23.73	69.73	1087.92
13	$L_2 \times T_1$	90.03	15.47	60.62	43.97	91.13	32.90	90.37	2714.82
14	$L_2 \times T_2$	90.82	15.57	64.22	41.96	77.13	34.67	88.59	2578.90
15	$L_2 \times T_3$	80.34	11.40	53.23	52.08	75.10	32.23	52.43	1302.00
16	$L_3 \times T_1$	81.95	14.70	48.24	51.46	85.33	29.07	70.72	1866.15
17	$L_3 \times T_2$	73.55	13.80	46.48	50.75	76.60	24.46	71.34	1595.98
18	$L_3 \times T_3$	71.08	14.67	44.20	49.92	78.53	21.53	49.28	934.97
19	$L_4 \times T_1$	86.54	20.27	65.71	47.68	86.03	23.97	71.86	1588.53
20	$L_4 \times T_2$	93.80.	17.50	67.45	48.34	77.17	22.37	75.50	1526.88
21	$L_4 \times T_3$	76.06	16.37	64.49	52.43	75.97	26.47	45.92	1111.68
22	$L_5 \times T_1$	87.97	16.57	61.93	47.74	83.27	33.17	76.52	2267.86
23	$L_5 \times T_2$	79.42	16.73	65.03	49.74	80.27	22.57	52.95	1071.94
24	$L_5 \times T_3$	66.61	16.90	63.82	51.57	89.03	32.87	54.96	1647.07
25	$L_6 \times T_1$	87.76	15.30	60.28	52.66	86.20	22.30	70.21	1439.68
26	$L_6 \times T_2$	87.10	15.53	62.96	49.42	90.13	23.23	72.19	1534.04
27	$L_6 \times T_3$	85.29	16.20	63.36	47.41	75.57	28.80	42.56	1127.48
	F	23.77	19.51	20.23	5.77	47.44	8.89	58.34	20.03
	SE	2.76	0.77	2.26	1.17	0.99	2.59	2.01	164.31
	CD	7.85	2.10	6.42	3.32	2.82	7.32	5.73	467.08

SE – Standard Error; CD-Critical difference

characters studied. The plant height is an important trait by which growth and vigour of plants are measured. Indeterminate varieties or hybrids are generally preferred due to longer harvest duration and high yield. Among the parents, the maximum plant height was recorded in EC-461070 (112.33cm). Among the F_1's maximum plant height was recorded in EC-461070 x MTM Local (121.87 cm). Similar results were also reported by Santhosh Kumari and Manisharma, (2011). The number of fruits per plant is a major yield contributing character and it was found maximum in EC-461070 (48.80) among the parents. Among the crosses, EC-461070 x MTM Local had maximum number of fruits per plant. These results are in line with the findings of Mrshamssi *et al*., (2006), Rani and Veeraragavathatham, (2008).

High average fruit weight is prime importance in breeding of high yielding cultivars or hybrids. The parents showed significant differences in mean weight of individual fruit ranging from 36.12 g in EC-461057 to 83.26g in EC-461018. Among the hybrids maximum fruit weight was recorded in EC-461018 × MTM Local (90.37g). Higher fruit weight over the parents was also reported by Santhosh Kumari and Manish Sharma, (2011). High fruit yield per plant is the ultimate goal of any breeding programme, so requires higher consideration. The minimum weight of fruits per plant among the parents was exhibited by PKM-1 (995.74g) and maximum by EC-461070 (3052.90g).

Among the hybrids the minimum was recorded by EC-461078 × EC-461057 (934.97g) and maximum by EC-461070 × MTM Local (3994.58g), which was higher than the maximum value observed among the parents.

Table 2: Specific combining ability effects (*sca*) of line ? tester hybrids for eight characters.

S. No.	Characters / Hybrids	Plant height (cm)	Number of branches per plant	Spread of the plant (cm)	Number of days to first flowering	Number of days to first fruit harvest	Number of fruits per plant	Weight of individual fruit (g.)	Weight of fruits per plant (g.)
1	$L_1 \times T_1$	12.607**	2.809*	6.755**	-1.013	1.161	13.077**	1127.195**	7.760**
2	$L_1 \times T_2$	-3.849	0.098	0.019	-1.398	5.217**	-3.889	-64.069	1.446
3	$L_1 \times T_3$	-0.392	-0.913	0.695	1.390	0.383	0.525	-179.866	-4.856*
4	$L_2 \times T_1$	-5.743*	0.998	-1.411	-1.162	1.517	-3.823	-400.814*	-4.360*
5	$L_2 \times T_2$	3.581	-1.391	-2.903	-1.283	-5.717**	0.111	25.256	3.247
6	$L_2 \times T_3$	-5.776*	-1.602*	-3.156	3.467**	-2.561*	-6.001*	-507.702**	-3.237
7	$L_3 \times T_1$	-3.581	-0.635	-4.084	2.493*	2.467*	-3.821	-457.84**	-4.374*
8	$L_3 \times T_2$	2.091	1.520	3.923	-3.448**	-2.911**	4.079	430.875*	5.915**
9	$L_3 \times T_3$	-3.643	-0.491	-0.771	0.637	-2.478*	2.117	180.828	2.016
10	$L_4 \times T_1$	6.666*	-0.446	0.623	-0.549	-1.478	0.779	168.394	5.527**
11	$L_4 \times T_2$	-0.247	0.098	0.494	0.680	-2.844**	-4.288	-539.803**	-14.074**
12	$L_4 \times T_3$	-1.286	-0.046	-0.185	0.187	7.244**	1.134	217.519	4.989*
13	$L_5 \times T_1$	-9.026**	-2.174**	-2.671	-1.480	-3.628**	-9.256**	-669.381**	-3.387
14	$L_5 \times T_2$	1.758	-1.619*	-3.943	4.846**	-2.306*	-0.189	-366.806**	-7.361**
15	$L_5 \times T_3$	4.035	1.404	0.076	-2.027	2.094*	-2.642	-0.962	2.840
16	$L_6 \times T_1$	-0.923	-0.552	0.787	1.711	-0.039	3.044	232.420	-1.167
17	$L_6 \times T_2$	-2.906	1.293	2.408	0.603	8.561**	4.177	514.547**	10.827**
18	$L_6 \times T_3$	7.062*	1.648*	3.342	-3.653**	4.683**	4.866	290.182	-1.751
	SE	2.76	0.77	2.26	1.17	0.99	2.59	164.32	2.01

**Significance at 1 per cent level; *Significance at 5 per cent level

Similar results were also reported by Harer *et al.,* (2006).

Specific combining ability (SCA) reveals the best cross combination among the genotypes which can be useful for developing hybrids with high vigour for the traits. Specific combining ability is the manifestation of non-additive component of genetic variance and associated with interaction effects, which may be due to dominance and epistatic component of genetic variation that are non-fixable in nature. Among the eighteen hybrids, only three hybrids viz., EC-461070 × MTM Local (1127.20), EC-461018 × EC- 461035 (430.88) and PKM -1 × EC-461057 (514.55) expressed significant positive *sca* effects for weight of fruits per plant. This result getting support from the findings of Premalakshmi *et al.,* (2006) and Basauvaraj *et al.,* (2016). The best specific combination for total yield per plant *viz.*, EC-461070 × MTM Local recorded the desirable significant *sca* effects for traits plant height, number of branches, spread of the plant, number of fruits per plant and weight of individual fruit. The second best cross is PKM-1 × EC-461057 had desirable significant *sca* effects for weight of individual fruit. Whereas, the third best cross EC-461018 × EC-461035 had significant *sca* effects for number of days to first flowering, number of days to first fruit harvest and individual fruit weight.

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