

## Studies on gene action in tomato (*Lycopersicon esculentum* Mill.)

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### SUMMARY

The variance due to GCA were higher than that of the variance due to SCA for days to 50 per cent flowering and plant height, whereas for the remaining five traits the SCA variance were higher than the corresponding GCA variance. The variance due to dominance was much pronounced than that of additive genetic variance for all the seven traits of interest. The study revealed the importance of both dominance and epistasis for evolving genotypes with higher fruit yield. It may be achieved by resorting to population improvement programme.

**Key words :** Tomato, Line x tester analysis, Fruit yield

The genetic control of characters related to fruit yield the *per se* performance is important in any systematic crop improvement programme. A plant breeder must possess adequate knowledge on gene action of fruit yield and its component characters. The present study was formulated to find out the gene action governing fruit yield and its component characters in tomato.

### MATERIALS AND METHODS

Eight lines viz., L<sub>1</sub>) EC 5888, L<sub>2</sub>) EC 10662, L<sub>3</sub>) EC 6053-1, L<sub>4</sub>) EC 8591, L<sub>5</sub>) EC 2517, L<sub>6</sub>) EC 25265, L<sub>7</sub>) EC 521083 and L<sub>8</sub>) EC528373, were crossed with five testers viz., T<sub>1</sub>) CO-1, T<sub>2</sub>) PMK-1, T<sub>3</sub>) Arka abha, T<sub>4</sub>) Hisar lalit and T<sub>5</sub>) Arka saurabh. The resulting 40 hybrids along with 12 parents were evaluated in a randomized block design with three replications, during 2005-2008. The crop was planted at a spacing of 60 x 45 cm. Recommend agronomic practices and need based plant protection measures were undertaken. Data were recorded on (i) Days to 50 per cent flowering, (ii) Plant height, (iii) Number of lateral branches per plant, (iv) Number of flower clusters per plant, (v) Number of flowers per cluster, (vi) Number of fruits per plant and (vii) Single plant yield. The data were subjected to statistical analysis given by Kempthorne (1957).

### RESULTS AND DISCUSSION

The variance due to lines were significant for six out

of the seven traits studied (Table 1). The variance due to testers and line x tester interaction were significant for all the seven characters studied. This indicated that there existed significant differences among lines, testers and hybrids. Therefore, further analysis is appropriate.

The variance due to GCA were higher than due to SCA variance for days to 50 per cent flowering and plant height (Table 2). It indicated that these two traits were under the control of additive gene action and could well be improved by resorting to simple selection. On the other hand, the variance due to SCA were higher than the variance due to GCA for number of lateral branches, number of flower clusters, number of flowers/cluster, number of fruits and single plant yield. This indicated that these characters were largely controlled by dominance and non-additive epistasis. The result is in collaboration with the findings of Dholaria and Quadri (1983) Kanthasamy and Balakrishnan (1989) and Bora *et al.* (1993). These characters could well be improved by delaying the selection to later segregating generations and resorting to intermating of represents followed by recurrent selection (Delogu *et al.*, 1981). Diallel selective mating design as suggested by Jensen (1970) can also be adopted.

The contribution of line x tester interaction to the total variance were higher for number of flowers clusters per plant and single plant yield (Table 3). The contribution of lines to the total variance was higher for days to 50 per cent flowering and number of fruits per plant. The contribution of testers to the total variance was higher for plant height, number of lateral branches per plant and number of flowers per cluster. It indicated the importance of lines, testers and line x tester interaction. The result is in agreement with the earlier reports of Kanthasamy and Balakrishnan (1989).

The magnitude of dominance variance was much

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**Table 1 : Analysis of variance**

Sr. No.	Characters	Hybrid Df= 39	Lines Df= 7	Tester Df= 4	Linex tester Df= 28	Error Df= 104
1.	Days to 50% flowering	5.8468**	13.0234**	12.5846**	3.0901**	0.8401
2.	Plant height	204.8373**	217.2702**	945.1823**	95.9655**	22.6546
3.	Number of laterals/branches per plant	1.0530**	1.9139**	4.064**	0.4161**	0.1609
4.	Number of flower clusters per plant	1.5110**	2.3920*	3.0772*	1.0670*	0.2847
5.	Number of flowers per cluster	1.6910**	1.9813**	8.4726**	0.6496**	0.2332
6.	Number of fruits per plant	53.7685**	112.575**	171.661**	22.224**	8.079
7.	Single plant yield (gm)	180017.17**	111649.82	732307.83**	118210.35**	4258.61

\* and \*\* indicate significant of values at P=0.05 and 0.01, respectively

**Table 2 : Estimate of combining ability variance**

Sr. No.	Characters	$\sigma^2$ GCA	$\sigma^2$ SCA	GCA/ SCA
1.	Days to 50% flowering	12.1211	0.0078	1553.98
2.	Plant height	2169.0391	286.9375	7.559
3.	Number of laterals/ branches per plant	1.8553	4.0857	0.4540
4.	Number of flower clusters per plant	1.6864	1.9484	0.8655
5.	Number of flowers per cluster	2.9554	4.5322	0.6521
6.	Number of fruits per plant	5.436	149.212	0.0364
7.	Single plant yield (gm)	299211.50	472526.00	0.6332

**Table 3 : Proportional contribution by lines, testers and line x tester interaction to the total variance**

Sr. No.	Characters	Lines	Tester	Line x tester
1.	Days to 50% flowering	39.98	22.08	37.94
2.	Plant height	19.04	47.33	33.64
3.	Number of laterals/ branches per plant	32.62	39.01	28.34
4.	Number of flower clusters per plant	28.41	20.89	50.70
5.	Number of flowers per cluster	21.03	51.39	27.58
6.	Number of fruits per plant	37.58	32.74	29.68
7.	Single plant yield (gm)	11.13	41.72	47.14

**Table 4 : Estimate of additive and dominance for seven characters in tomato**

Sr. No.	Characters	Additive variance		Dominance variance	
		F= 0	F= 1	F= 0	F= 1
1.	Days to 50% flowering	0.1945	0.0973	3.0001	0.7500
2.	Plant height	7.6816	3.8408	97.7479	24.4370
3.	Number of laterals/branches per plant	0.0449	0.0225	0.3403	0.0851
4.	Number of flower clusters per plant	0.0313	0.0157	1.0431	0.2608
5.	Number of flowers per cluster	0.0735	0.0367	0.5553	0.1388
6.	Number of fruits per plant	2.2256	1.1128	18.8609	4.7152
7.	Single plant yield (gm)	4360.86	2180.43	151965.64	37983.91

pronounced for all the seven characters of interest both when F = 0 and F = 1 (Table 4). The result confirmed the presence of excess of dominance variance for most of the traits investigated. The result is in corroboration with

the findings of Chaudhary and Khanna (1972) Kanthasamy and Balakrishan (1989) and Bora *et al.* (1993).

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