

Genetic analysis in tomato (*Lycopersicon esculentum* Mill.)

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Abstract : A 5 x 5 diallel cross was conducted in tomato to study the genetic components of variance. Variation due to both additive and non-additive effects were important for days to first flowering, plant height, number of laterals per plant, fruit weight and number of locules per fruit. Overdominance was observed in plant height, days to first flowering, number of fruits per plant, fruit weight, yield per plant, pericarp thickness and pH of the juice. Estimate of heritability ranged from 0.17 percent (yield per plant) to 0.88 (number of clusters per plant). Breeding approaches like biparental mating, triple test cross followed by modified recurrent selection has been suggested for greater genetic improvement in the segregating generations. (*Key words : Additive and non additive effects, Heritability, Recurrent selection*)

Tomato is one of the most popular vegetables being grown all over the world. Formulation of a comprehensive breeding programme for the improvement of any crop largely depends upon the nature of gene action involved for any particular trait to be improved. Diallel analysis is one of the useful bio-metrical technique for such studies. Therefore, keeping in view of the importance of the crop and the utility of diallel analysis, the present investigations were undertaken to study the type of gene action involved in respect of yield and its components.

Materials and Methods

A complete diallel set was made involving five genetically divergent parents, selected through line x tester analysis, viz. AVRDC-5, Sel-11, Sel-674, EC 130039 and Courdibue. The five parents and their 20 F₁s were raised in a randomised block design with three replications, in the Department of Horticulture, Faculty of Agriculture, Annamalai University. The data were recorded on days to first flowering, plant height, number of laterals per plant number of clusters per plant, number of fruits per plant, fruit weight, yield per plant, number of locules per fruit, pericarp thickness, total soluble solids and pH of the juice.

The components of genetic variances (d, F, H₁, H₂, h² and E) were computed by the method given by Hayman (1954) which makes use of Vr, Wr, Vp, Vr and E statistics. Further, ratios by using significant components of variance were computed for these characters.

Results and Discussion

The genotypic components of variance (Table 1) revealed that both additive and non-additive gene

effects were important in the expression of days to first flowering plant height, number of laterals per plant, number of fruits per plant, fruit weight. Incase of number of clusters per plant and TSS, additive genetic variance was in preponderance. The H₁ and H₂ components of dominance and non-additive gene effects were significant for number of fruits per plant, yield per plant. Both additive and non additive effects have been reported to be important for days to first flowering, number of laterals per plant, fruit weight (Jawaharlal, 1994) number of locules per fruits (Sidhu *et al.* (1981), total soluble solids (Harkirat Singh and Nandpuri, 1975) and pH of the juice (Peter and Rai, 1980). The estimates of F were significant and positive for number of clusters per plant and number of locules per fruit. The estimate of F for days to first flowering was significant and negative, while it was non significant in others.

The genetic ratio computed from components of variance are presented in Table 2. The average degree of dominance (H₁/D)⁹⁵ were more than unity for days to first flower, plant height, number of laterals per plant, number of fruits per plant, fruit weight, yield per plant, number of locules per fruit, pericarp thickness and pH of the juice, indicating overdominance. The mean degree of dominance was partial for total soluble solids and number of clusters per plant.

The direction of dominance (h²) was positive for days to first flowering, number of laterals per plant, number of clusters per plant, number of fruits per plant, fruit weight, yield per plant, number of locules per fruit and total soluble solids suggesting that using parents dominant for these characters would result in improvement of this trait in the positive direction. The direction of dominance was negative for plant height, pericarp thickness and pH of the juice.

Table 1. Estimates of various components of variance for different characters in tomato

Characters	D	F	H ₁	H ₂	h ²	E
Days of first flowering	44.83*	-4.38*	123.14*	85.69*	57.81*	2.60
	9.34	23.32	25.21	22.87	15.41	3.89
Plant height	143.52*	-94.97	316.27*	235.80*	-0.95	4.28
	52.63	131.48	142.15	128.93	86.91	21.49
No. of laterals per plant	0.38*	-0.10	0.44*	0.38*	0.07*	0.09*
	0.08	0.19	0.21	0.19	0.13	0.03
No. of clusters/plant	20.18*	4.24*	2.71	2.45	3.97*	0.48
	0.75	1.87	2.02	1.84	1.24	0.31
No. of fruits/plant	37.09	-30.53	329.21*	314.11*	480.94*	2.88
	40.48	101.11	109.32	99.15	66.84	16.53
Fruit weight	29.86*	-11.62	41.47*	28.40*	2.54*	1.56
	5.50	13.73	14.85	13.47	9.08	2.25
Yield per plant	0.02	-0.04	1.02*	0.98*	1.18*	0.01
	0.05	0.11	0.12	0.11	0.07	0.02
No. of lacules/fruit	0.46*	0.68*	1.03*	0.65*	0.26*	0.01
	0.07	0.17	0.18	0.17	0.11	0.03
Pericarp thickness	0.01*	0.003	0.01*	0.01*	-0.01	0.01
	0.01	0.012	0.01	0.01	0.01	0.0
T.S.S.	0.45*	0.05	0.11	0.12*	0.16*	0.01*
	0.01	0.03	0.03	0.03	0.02	0.01
pH of the juice	0.01*	0.01	0.01*	0.01*	-0.01	0.01*
	0.01	0.01	0.01	0.01	0.01	0.01

* Significant at 5% level

Table 2. Genetic ratio of various characters in tomato

Characters	(H ₁ /D) ^{1/2}	(H ₂ /4H ₁)	KD/KR	h ² /H ₂	h ² /(ns)
Days of first flowering	1.65	0.17	0.94	0.68	0.64
Plant height	1.48	0.19	0.64	0.01	0.72
No. of laterals per plant	1.08	0.22	0.78	0.17	0.60
No. of clusters/plant	0.37	0.22	1.80	1.62	0.88
No. of fruits/plant	2.98	0.24	0.76	1.53	0.34
Fruit weight	1.18	0.17	0.72	0.09	0.76
Yield per plant	7.17	0.24	0.75	1.21	0.17
No. of lacules/fruit	1.49	0.16	2.96	0.31	0.31
Pericarp thickness	1.19	0.19	2.36	0.03	0.35
T.S.S.	0.50	0.26	1.24	1.41	0.83
pH of the juice	1.11	0.21	1.77	0.09	0.37

Proportion of genes ($H^2/4H$) with positive and negative alleles was less than 0.25 for all characters except total soluble solids indicating asymmetrical distribution of positive and negative alleles in parents. The KD/KR ratio for number of clusters per plant, number of locules per fruit, pericarp thickness, total soluble solids and pH of the juice was more than one indicating the preponderance of dominant alleles.

The h^2/H estimates detected one effective factor for days to first flower, plant height, number of laterals per plant, number of clusters per plant, fruit weight, number of locules per fruit, pericarp thickness and pH of the juice. More than one effective factor was observed in number of clusters per plant, number of fruits per plant, yield per plant and total soluble solids.

The estimates of heritability (in narrow sense) varied from 0.17 per cent (yield per plant) to 0.88 per cent (number of clusters per plant). High heritability was observed for days to first flower, plant height, number of laterals per plant, number of clusters per plant, fruit weight and TSS. The high heritability noted was supported by earlier workers (Rattan and Saini, 1976; Dudi *et al.* 1983).

Additive as well as non-additive gene effects were prevalent for days to first flowering, plant height, number of laterals per plant, fruit weight and number of locules per fruit. These effects can most efficiently be used by way of intermating the most desirable segregants followed by selection. Keeping in view the low heritability estimate for yield, breeding approaches like biparental crossing, triple test cross followed by modified recurrent selection would result in greater

genetic improvement in the segregating generations.

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Effect of micronutrients (zinc and boron) on growth and yield of grapes (*Vitis vinifera* L.) cv. Muscat

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Abstract : An experiment was conducted with grapes (*Vitis vinifera* L.) cv. Muscat at Mathampatti, Coimbatore during 2000, to find out the effect of micronutrients namely Zn and B applied either individually or in combination through soil or foliage on the growth and yield characters of grapes. The results revealed that foliar application of $ZnSO_4$ 0.5 per cent + borax 0.2 per cent combination excelled others in increasing the shoot length, number of internodes shoot⁻¹, number of leaves shoot⁻¹ and yield. (*Key words :* Muscat, Zinc, Boron, Shootlength, Yield)

Grape is a subtropical fruit but adapted to tropical conditions. Fifty per cent of the total production of fruits in the world is contributed by grapes. The

climatic conditions are favourable in parts of Tamil Nadu and it is grown with an area of nearly 2475 ha, with an annual production of 0.5 lakh tonnes. As