number, coupled with boll weight, high ginning out turn and more no. of locks/boll.

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GENETICS OF YIELD AND ITS COMPONENTS IN TOMATO UNDER MOISTURE STRESS

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ABSTRACT

The nature of gene action for yield and its component characters in tomato under moisture stress was studied in a six parent full diallel cross. Presence of additive gene action for days to flowering and number of fruits set per cluster and additive and non-additive genetic systems for number of fruits per plant, mean fruit weight and yield per plant was indicated. High heritability estimates were observed for days to flowering, mean fruit showed partial dominance. All the traits except number of fruits per plant showed partial dominance. Asymmetrical distribution of genes with positive and negative effects was noticed. The number of genes controlling inheritance of the traits was established.

Tomato (*Lycopersicon esulentum Mill.*) production is affected by various environmental stresses, the major limiting factor being the moisture stress. Yield is a complex trait and depen dent on many attributes. A knowledge of nature of gene action is a pre-requisite in breeding programmes. Though gene action has been reported in tomato under irrigation, genetic information under moisture stress is scanty. Hnece, studies were under taken to elicit information on the genetics of yield and its attributes in tomato under moisture stress.

MATERIALS AND METHODS

The investigations were carried out at the Agricultural College and Research Institute, Madurai during 1986. Six homozygous lines of tomato exhibiting different magnitudes of resistance and varied *per se* performance under moisture stress viz., resistant with high yield (LE 3, LE 75 and LE 76), moderately resistant with moderate yield (LE 74), moderately resistant with low yield (LE 22) and susceptible with low yeild (LE 11) were selected from the germplasm of diverse origins. The lines wee inovlved in full diallel mating and hybrids of direct and reciprocal crosses along with the parents were evaluated in pot-culture under simulated soil moisture stress condition. The seeds were sown in seed pans and 25- day old seedlings were planted in full size earthern pots filled with pot mixture consisting of 1:1:1 red earth, sand and powdered farmyard manure. The pots were arranged in randomised block design with two replications and twenty plants were maintianed for each parent and hybrid in each replication.

Moisture stress was included uniformly by watering to field capacity and withholding water till soil moisture depleted to the level of 25 per cent of available moisture (Dastane, 1972). The soil moisture content was estimated periodically by thermogravimetric method. Observations on days taken for first flowering, number of fruits set per cluster, number of fruits per plant, mean fruit weight and yield per plant were made on ten randomly selected plants in each replication. The data were subjected to analysis of variance (Panse and Sukhatme, 1967) and the genetic components of variation were worked out following the methods of Hayman (1954 a,b).

RESULTS AND DISCUSSION

The estimates of genetic parameters and their ratios for yield and its components are presented in Table. The data showed that days to flowering and number of fruits set per cluster were governed by additive factors as evident from the significant D and the results are in conformity with the findings of Anand (1977) and Singh and Singh (1980). The significant D, H_1 and h^2 components for number of fruits per plant, mean fruit weight and yield per

Table 1. Estimates of genetic parameters and their ratios in tomato under moisture stress

	Days to flowering		No. of fruits set / cluster		No. of fruits / plant		Mean fruit weight		Yield / plant	
D	6.906**	±0.342	0.201**	±0.034	2.146*	±0.842	83.225**	±3.202	0.026**	±0.005
F	-0.148	±0.834	0:156	±0.083	-2.344	±2.056	37.949**	±7.821	-0.016	±0.012
H_1	0.659	±0.867	0.027	±0.087	15.072**	±2.136	45.564**	±8.127	0.024*	±0.012
H_2	0.522	±0.775	-0.10	±0.077	14.906**	±1.908	24.100**	±7.260	0.019	±0.011
h^2	0.244	±0.521	-0.035	±0.052	56.107**	±1.284	13.502**	±4.886	0.040**	±0.007
E	1.361**	±0.129	0.071**	±0.013	2.521**	±0.318	2.532*	±1.211	0.004*	±0.002
$(H_1/D)^{1/2}$	0.309		0.367		2.650		0.740		0.951	
$H_2/4H_1$	0.198		-0.095		0.247		0.132		0.202	
$\frac{(4DH_1)^{1/2}+F}{(4DH_1)^{1/2}-F} = (K_D/K_R)$	0.933		-35.848		0.658		1.891		0.521	
h^2/H_2	0.467		3.346		3.764		0.560		2.091	
Heritability (ns)	0.725		0.367		0.480		0.929		0.845	
t^2	0.020		0.321		1.489		1.533		1.051	
r (Yr, (Wr + Vr)	0.202		0.139		0.169		0.039		0.376	

* Significant at 0.05 ** Significant at 0.01

plant exhibited the role of both additive and dominance factors for these traits. Similar results were reported by Anand (1977) for number of fruits per plant and mean fruit weight and by Kalf-Allah and Kassem (1985) for yield.

The ratio $(H_1/D)^{1/2}$ provides an overall measure of the mean degree of dominance over all the loci. The estimated value of less than one suggested partial dominance for all the traits except number of fruits per plant which showed overdominance and Anbu (1986) observed similar results for number of fruits per plant. The distribution of genes with positive and negative effects was asymmetrical as shown by the ratio $H_2/4H_1$ of less than 0.25. The proportion of recessive alleles was high for days to flowering, number of fruits per plant and yield per plant as evidenced by the K_D/K_R ratio of less than unity and negative F value, while the ratio of more than one and positive F for number of fruits set per cluster and mean fruit weight revealed high frequency of dominant alleles. The ratio h^2/H_2 indicated that inheritance of days to flowering and mean fruit weight appeared to be controlled by single gene or one group of genes. The ratio also showed that the traits, number of fruits set per cluster and number of fruits per plant were controlled by more than three groups, while yield per plant by 2-3 groups of genes.

The heritability estimates in narrow sense were high for days to flowering, mean fruit weight and yield per plant establishing the importance of additive genetic system, while low and moderate heritability for number of fruits set per cluster and number of fruits per plant, respectively lent support to the role of non- additive gene action. The analysis of test of homogenity (t^2) was non-significant for all the traits and thus indicated that the data fulfilled the basic assumptions of Hayman (1954 a,b) for diallel analysis. The order of dominance was not unidirectional for all the traits as revealed by the non-significant correlation (r) between parental measurement (Y_r) and parental order of dominance ($W_r + V_r$).

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