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(Received: December 1993 Revised: May 1995)

Madras Agric. J., 82(9, 10): 536-539 September, October 1995
https://doi.org/10.29321/MAJ.10.A01258

ASSOCIATION AMONG YIELD COMPONENTS IN TOMATO

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ABSTRACT

The present study was undertaken on 34 genotypes of tomato (*Lycopersicon esculentum* Mill) to furnish the information of the nature of association among different yield attributes and their direct and indirect contribution towards yield. The coefficient of variation was high for plant height, number of fruits per plant and yield per plant in 34 accessions of tomato. Number of fruits perplant showed high heritability. There was a positive and significant association between yield per plant and number of fruits per plant. Path co-efficient analysis revealed that the direct effects via number of primary branches per plant, number of fruit clusters per plant and number of fruits per plant were positive but for number of primary branches per plant was of low magnitude. Hence it would be worth laying stress on number of fruit clusters per plant and number of fruits per plant while formulating selection programme in tomato.

KEY WORDS : Tomato, Yield Components

Fruit yield is a complex trait and is the sum total of a number of components. Therefore, improvement in components may be an effective way to improve yield. The relative contribution of different characters towards yield must be estimated. Information on the genotypic and phenotypic associations among various yield attributes and their direct and indirect effect on yield in tomato (*Lycopersicon esculentum* Mill) with particular reference to hilly conditions are very few. Hence, a study was conducted to gain a better understanding of nature of association between yield and yield contributing characters in tomato using the techniques of correlation as well as path analysis.

MATERIALS AND METHODS

An experiment was conducted with 34 indigenous and exotic genotypes of tomato at the Defence Agricultural Research Laboratory field station, Pithoragarh with three replications in the *kharif* season of 1985-86. Each entry was sown in a plot of 3 rows, each 3 m long. The plant to plant and row to row distance was 50 cms. On 10 random plants, data were collected on individual plant basis for plant height, primary branches per plant, number of fruit clusters per plant, number of fruits per cluster, number of fruits per plant, number of fruits per kilogram and yield per plant. The genotypic and phenotypic correlations were calculated. Path coefficient were calculated as suggested by Dewey and Lu (1959).

RESULTS AND DISCUSSION

There was a wide range of genetic variability for various morphological and quantitative attributes (Table 1). The coefficient of variation was high at genotypic and phenotypic levels for plant height, number of fruits per plant, number of fruit clusters per plant, and yield per plant, but number of primary branches and number of fruits per cluster had low coefficient of variability at both genotypic and phenotypic levels. Heritability was high for number of fruits per plant as suggested by Singh *et al.* (1974), Johnson and Hernandez (1980) and Khalil *et al.* (1986).

Result on correlation coefficient at the phenotypic and genotypic levels, are presented in Table 2. A perusal of the data indicates that in general the estimates of genotypic correlation coefficient were slightly higher than the corresponding phenotypic level. This suggests that inspite of being strong inherent association between the character pairs their expression is reduced

Table 1. Estimates of genetic variability parameter in tomato

Parameter	Plant height (cm)	Primary branches	No. of fruits clusters per plant	No. of fruit per cluster	No. of fruits per plant	No. of fruits per kg	Fruit yield per plant (kg)
Mean	57.14	6.86	12.03	2.55	31.54	19.83	1.45
Range :							
Minimum	43.80	5.06	7.00	2.00	21.00	10.14	0.88
Maximum	88.40	8.46	16.00	3.43	42.67	48.67	2.08
Variance :							
Genotypic	57.75	0.27	3.08	0.07	22.08	29.17	0.05
Phenotypic	147.96	1.51	8.68	0.13	24.15	88.43	0.40
Coefficient of Variation :							
Genotypic	101.06	4.06	25.60	2.82	70.01	13.55	18.57
Phenotypic	258.91	22.60	72.19	5.18	76.53	23.59	52.52
Heritability (%)	39.03	17.99	35.47	54.57	91.48	32.98	12.50
Genetic Advance	9.78	1.79	2.16	0.39	9.26	6.39	0.16
Genetic Advance as % of mean	17.12	26.09	17.95	15.29	29.35	32.22	11.03

under the environmental influence. Number of fruits per plant seemed to be most important character, as its correlation coefficient is high in comparison to other correlation coefficient. These results clarify that an increase in number of fruits per plant may consideraly increase the yield of the plant. This character therefore, will, form a sound basis for selection as has been suggested by Prasad and Prasad (1977), Murtazor and Ivanova (1979), Singh and Singh (1980), Bamidela (1981), Rattan *et al* (1983), Gonzalez (1985) and Raijadhav *et al* (1986).

The correlation coefficients *inter se* were also important. A positive significant correlation was recorded amongst number of primary branches with number of fruit clusters per plant with number of fruits per plant and number of fruits per kilogram. The negative significant association between number of fruits per plant and number of fruits per kg indicated that the maximum utilisation of

Table 2. Genotypic and phenotypic correlations between the plant characters in tomato

Character	Primary branches	No. of fruits clusters per plant	No. of fruit per cluster	No. of fruits per plant	No. of fruits per kg	Fruit yield per plant
Plant height						
P	0.070	0.071	0.107	0.108	0.033	0.119
G	-0.302	-0.203	0.199	0.211	0.105	0.227
Primary branches						
P		0.085	0.036	-0.014	0.013	-0.021
G		0.437**	0.187	0.016	-0.100	0.259
No. of fruit cluster per plant						
P			0.095	0.315	0.238	0.110
G			0.133	0.595**	0.382**	0.221
No. of fruits per cluster						
P				0.268	0.109	0.245
G				0.402**	0.146	0.414**
No. of fruits per plant						
P					-0.748**	0.416**
G					-0.810**	0.429**
No. of fruits per kilogram						
P						-0.100
G						-0.222

*, ** Significant at 5% and 1% levels of probability, respectively; P = Phenotypic correlation; G = Genotypic correlation.

Table 3. Path coefficient analysis showing the direct and indirect effect of characters

Character	Plant height (cm)	Primary branches per plant	No. of fruit clusters	No. of fruits per cluster	No. of fruits per plant	No. of fruits per kilogram	Genotypic correlation with fruit
Plant height	-0.047	-0.098	0.115	-0.028	0.463	-0.176	0.227
Primary branches per plant	0.014	0.324	-0.248	-0.027	0.014	0.181	0.259
No. of fruit cluster per plant	0.011	0.142	0.5567	-0.019	1.300	-0.644	0.221
No. of fruits per cluster	-0.011	0.060	-0.075	-0.144	0.879	-0.247	0.414
No. of fruits per plant	-0.010	0.002	0.338	-0.058	2.185	-1.365	0.429
No. of fruits per kilogram	-0.005	-0.035	-0.216	-0.021	1.771	-1.684	-0.222

Residual component = 0.002

nutrient is for the formation of number of fruits per plant and caused the above association. These results are in confirmity with the findings of Griffing (1954, Nandpuri *et al.* (1973), Stefanova and Steva (1979) and Alvarez and Torres (1985).

Data on the total genotypic correlation with seed yield as well as the direct and indirect effects of different attributes are given in Table 3. Out of six variables studied, only the number of fruits per plant had high direct effect on yield. The residual coefficient of determination was 0.002. The number of fruits per plant had a high positive direct effect, but its indirect effect through number of fruits per kilogram was negative. The indirect effect of the number of fruits per plant through other factors was negligible. The number of fruits per cluster showed a positive genetic correlation with fruit yield, but the partitioning of the correlation coefficient indicated that its direct effect was negative, but the indirect effect through the number of fruits per plant was higher and positive. Therefore, the over all correlation between the number of fruits per cluster and fruit yield become positive. Plant height had only little direct effect, but its major contribution was through the number of fruits per plant and number of fruit clusters per plant. Similarly the primary branches per plant, number of fruit clusters per plant and number of fruits per cluster had very little direct effect but their indirect effect, through the number of fruits per plant was quite pronounced. Similar results were also reported by Srivastava and Sachan (1973), Nandpuri *et al.* (1977), Gorbatenko and Gorbatenko (1985) and Patil (1985)

In tomato, there may be one direct yield component *viz.*, the number of fruits per plant. The number of fruits per plant in turn depends on two components *viz.*, primary branches per plant and number of fruit clusters per plant. The remaining attributes would obviously affect yield through these primary components. Path analysis showed that in this population the major yield contributing character was the number of fruits per plant. The direct contribution of number of fruits per kilogram was negligible, but it contributed indirectly through number of fruits per plant. This is expected on the basis of biological deduction, since the number of fruits per plant is always negatively associated with size of the fruit. Plant height and the number of primary branches accounted for the total number of clusters which bear fruits as well as leaves. These leaves in turn provide energy for the growth and development of the plant. Number of fruits per cluster exerted negative indirect effects through size of the fruit. Such negative indirect effects may result because of number of fruits cluster per plant and number of fruits per cluster indirectly facilitate more number of fruits production and thereby reduction in the size of fruit.

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(Received: October 1988 Revised: May 1995)

Madras Agric. J., 82(9, 10): 539-544 September, October 1995

TRANSPIRATION REGULATION IN SOME LEGUME CROPS UNDER DIFFERENT FERTILITY LEVELS IN SEMIARID FARMING

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ABSTRACT

To develop a mathematical model which can be used for prediction, one needs to have an assess of all variable pertaining to that system function. For water relation studies and to develop models, parameters like flow, leaf temperature, relative humidity, light intensity, diffusive resistance so also water/osmotic potential of leaf and soil, total transpiring area, their dynamics are prerequisites. However, during the present study, due to the lack of compatible apparatus to suit other measurements, no record could be made on a few parameters. And thus, a complete prediction equations could not be developed. Despite this fact, this investigation identified that flow and resistance have commendable relationship with transpiration than quantum and leaf temperature, changes in fertility levels bring non significant changes (*sensu lato*) intranspiration regulation, mothbean by exhibiting random variability indicates a complex mechanism involved in its transpiration regulation, warranting a detailed investigation.

KEY WORDS : Transpiration, Fertility Levels, Moongbean, Clusterbean, Mothbean

Leaves are most directly exposed to variation in light, temperature and moisture deficit in atmosphere and hence indicative of the evolution of adaptation to environment (Larcher, 1983; Sen and Lekhak, 1984). The crops cultivated in arid and semiarid regions are confronted to maintain a favourable balance between absorption and transpiration under the adverse conditions of environment. The hot and dry atmosphere demands excessive transpiration , while deficient