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Determination of Association of Yield Components in Tomato (*Solanum lycopersicum* L.)

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

The present investigation was conducted in Randomized Block Design with 38 genotypes (including three checks) of tomato in three replications for thirteen quantitative traits. The objectives were to assess the correlation for fruit yield and yield contributing characters. The association studies showed that fruit yield per plant had highly significant and positive correlation with marketable fruit yield per plant, average fruit weight, equatorial diameter, unmarketable fruits yield per plant and number of fruits per plant at both phenotypic and genotypic levels.

Keywords: Tomato; randomized block design; Solanum lycopersicum; protective food.

1. INTRODUCTION

Tomato is universally treated as "Protective food" and considered as "Poor man's Orange". Tomato is a native of Peru Equador region (Rick, 1969) and having chromosome number 2n=24. Tomato fruits are consumed raw or cooked. It is grown at farm and kitchen garden for slice, soup, sauce,

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ketchup, cooked vegetable etc. It is a rich source of vitamins A, B and C. It has taproot and growth habit of the plant is determinate and indeterminate. In the determinate types, plants are dwarf wherever growth is restricted with the appearance of terminal flower, whereas in indeterminate plant, growth is sustained and there is less initiation of flower and fruit on the stem.

Yield is a complex character controlled by a large number of contributing characters and their interaction. An analysis of correlation between different quantitative characters provides an understanding of association that could be effectively exploited to work out selection strategies for improving yield components. For any successful selection programme, it would be desirable to evaluate the relative magnitude of association of different characters with yield. Correlation coefficient analysis measures the mutual relationship between various plant characters and determines the component characters on which selection can be done for improvement in yield. The present study was carried out to get the information for character association for yield in thirty-eight genotypes of tomato.

2. MATERIALS AND METHODS

The experiment was conducted at Main Experimental Station, Department of Vegetable Science, Acharya Narendra Deva University of Agriculture and Technology, Narendra Nagar (Kumarganj), Ayodhya, Uttar Pradesh, India during Rabi 2019. The experimental material for study consisted of thirty-eight genotypes including three checks (Arka Vikas, Kashi Aman and DVRT-2). The experiment was conducted in Randomized Block Design with three replications. Each genotype consisted of two rows spaced 60 cm apart with plant to plant spacing of 50 cm. Observation were recorded for thirteen different characters of tomato *i.e*. days to 50% flowering, plant height(cm), locules per fruit, pericarp thickness (mm), polar diameter of fruit (cm), equatorial diameter of fruit (cm), number of fruits per cluster, average fruit weight (g), number of fruits per plant, marketable fruit yield per plant, unmarketable fruit yield per plant, total fruit yield per plant and total soluble solids (°Brix). The simple correlation between different characters at genotypic and phenotypic levels were worked out as suggested by Searle [1].

3. RESULTS AND DISCUSSION

Correlations between character pairs are due to linkage or pleiotropy of genes. Therefore, selection of one traits influence has been attached to correlation studies in the plant improvement because they are helpful in making effective selection.

The correlation coefficients at phenotypic and genotypic level were computed for thirteen characters for thirty-eight genotypes (including checks). The results are given in table 1 and 2. The nature and magnitude of association between yield and its component traits is necessary for effective selection in advance generations. Nature of population beneath consideration and the magnitude of correlation coefficient could often be influenced by the choice of the individuals upon which the observations are made.

In general genotypic correlation were higher than the phenotypic once for all the characters except few exception. This indicated a strong genetic association between these traits and the phenotypic expression was suppressed due to environmental influence. Similar results were observed by Rathod *et al.* [2] and Behera *et al.* [3].

The most important trait, total fruit yield per plant had highly significant and positive phenotypic correlation coefficient with marketable fruit yield per plant (0.963) followed by average fruit weight (0.723), equatorial diameter of fruit (0.557), unmarketable fruit yield per plant (0.554), polar diameter of fruit (0.391) and number of fruits per plant (0.382). Total soluble solids had highly significantly and negative correlation with plant height (-0.326).

Unmarketable fruit yield per plant had highly significant and positive correlation with number of fruits per plant (0.542), locules per fruit (0.480), marketable fruit yield per plant (0.474) and average fruit weight (0.359) while it correlated significantly and negatively with days to 50% flowering (-0.339).

Marketable fruit yield per plant had highly significant and positive correlation with average fruit weight (0.762), equatorial diameter of fruit (0.618), polar diameter of fruit (0.460) and number of fruits per plant (0.326). Numbers of fruits per plant had highly significant and negative correlation with days to 50% flowering

Table 1. Estimates of phenotypic correlation coefficient for different characters in tomato

Characters	**Days to 50% flowering**	**Plant height(cm)**	**Locules per fruit**	**Pericarp thickness (mm)**	**Polar diameter (cm)**	**Equatorial diameter (cm)**	**Number of fruits Per cluster**	**Average fruit weight (g)**	**Number of fruits per plant**	**Marketable fruit yield per plant**	**Unmarketable fruit yield per plant**	**Total soluble solids**	**Total fruit yield per plant**
Days to 50% flowering	1	0.364*	0.072	0.210	0.452**	0.369*	0.090	0.335*	-0.512**	0.035	-0.339*	0.009	-0.071
Plant height (cm)		1	0.396**	0.283	0.224	0.298	0.093	0.304	-0.122	0.238	0.156	-0.326*	0.165
Locules per fruit			1	0.142	-0.009	0.000	0.245	0.072	0.141	0.206	0.480**	-0.208	0.177
Pericarp thickness (mm)				1	0.073	0.081	0.073	0.094	-0.126	0.086	-0.149	0.094	-0.012
Polar diameter					1	0.796**	0.018	0.810**	-0.498**	0.460**	-0.129	0.041	0.391*
Equatorial diameter (cm)						1	0.119	0.850**	-0.277	0.618**	0.049	0.030	0.557**
Number of fruits per cluster							1	0.116	0.195	0.267	0.359*	-0.223	0.292
Average fruit weight (g)								1	-0.307	0.762**	0.185	-0.048	0.723**
Number of fruits per plant									1	0.326*	0.542**	-0.057	0.382*
Marketable fruit yield per plant										1	0.474**	-0.075	0.963**
Unmarketable fruit yield per plant											1	-0.085	0.554**
Total soluble solids												1	-0.019
Total fruit yield per plant													1

, Significant at 5% and 1%, respectively*

Table 2. Estimates of genotypic correlation coefficient for different characters in tomato

Traits	**Days to 50% flowering**	**Plant height (cm)**	**Locules per fruit**	**Pericarp thickness (mm)**	**Polar diameter (cm)**	**Equatorial diameter (cm)**	**Number of fruits per cluster**	**Average fruit weight (g)**	**Number of fruits per plant**	**Marketable fruit yield per plant**	**Unmarketable fruit yield per plant**	**Total solubke solids**	**Total fruit yield per plant**
Days to 50% flowering	1	0.415**	0.083	0.238	0.505**	0.398*	0.103	0.372*	-0.632**	0.006	-0.383*	0.012	-0.103
Plant height (cm)		1	0.414**	0.290	0.223	0.300	0.100	0.302	-0.139	0.248	0.153	-0.345*	0.164
Locules per pruit			1	0.150	-0.009	0.003	0.284	0.078	0.142	0.223	0.505**	-0.216	0.181
Pericarp thickness (mm)				1	0.073	0.086	0.081	0.097	-0.136	0.094	-0.155	0.096	-0.014
Polar diameter (cm)					1	0.794**	-0.056	0.806**	-0.566**	0.458**	-0.161	0.010	0.382*
Equatorial diameter (cm)						1	0.062	0.851**	-0.329*	0.624**	0.025	0.000	0.556**
Number of fruits per cluster							1	0.060	0.170	0.242	0.347*	-0.306	0.287
Average fruit weight (g)								1	-0.366*	0.773**	0.163	-0.085	0.727**
Number of fruits per plant									1	0.295	0.555**	-0.087	0.368*
Marketable fruit yield per plant										1	0.478**	-0.109	0.996**
Unmarketable fruit yield per plant											1	-0.109	0.556**
Total soluble solids												1	-0.044
Total fruit yield per plant													1

, Significant at 5 % and 1 %, respectively*

(-0.512) and polar diameter of fruit (-0.498). Average fruit weight had highly significant and positive correlation with equatorial diameter of fruit (0.850), polar diameter of fruit (0.810) and days to 50% flowering (0.335). Equatorial diameter of fruit had significant and positivel correlation with polar diameter of fruit (0.796) and days to 50% flowering (0.369). Polar diameter of fruit had high significant and positively correlated with days to 50% flowering (0.452). Locules per fruit had highly significant and positive correlation with plant height (0.396). Plant height had significant and positive correlation with days to 50% flowering (0.364).

Thus, these characters emerged as most important associated traits of fruit yield in tomato. Seghal *et. al.* [4], Mishra *et al.* [5] and Basavaraj *et al.* [6] have also indicated positive correlation between total fruit yield per plant and marketable fruit yield per plant, average fruit weight, equatorial diameter of fruit, unmarketable fruit yield per plant, polar diameter and number of fruits per plant in tomato**.**

4. CONCLUSION

Thus, on the basis of above discussion it can be concluded that selection for polar and equatorial diameter, average fruit weight and marketable fruit yield per plant would be effective for yield improvement in tomato.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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