Determination of association of yield components in tomato

(*Solanum lycopersicum* L.)

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 analysis for fruit yield and yield contributing characters. The association studies showed that fruit yield per plant was highly significant and positive correlated with marketable fruit yield per plant, average fruit weight, equatorial diameter and unmarketable fruits yield per plant, number of fruits per plant at both phenotypic and genotypic levels.

Keywords:Tomato,Correlation :

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, 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 based for improvement in yield. The present study was carried out to get the information for character

UNDER PEER REVIEW

association for yield in thirty-eight genotypes of tomato.

Material 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 row 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, 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 between characters as suggested by **Searle (1965).**

Result 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) and their significance was tested at 5 per cent and 1 per cent probability level of significance. The result is 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 there traits and the phenotypic expression was suppressed due to environmental influence. Similar results were observed by **Rathod *et al.* (2018) and Behera *et al.* (2020).**

The most important trait, total fruit yield per plant had exhibited highly

UNDER PEER REVIEW

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 negatively correlated with plant height (-0.326).

Unmarketable fruit yield per plant had highly significantly and positively correlated 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 significantly and negatively correlated with days to 50% flowering (-0.339).

Marketable fruit yield per plant had highly significant and positively correlated 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 negatively correlated with (-0.512) and polar diameter of fruit (-0.498). Average fruit weight had highly significant and positively correlated 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 highly significant and positively correlated with polar diameter of fruit (0.796) and days to 50% flowering (0.369). Polar diameter of fruit had highly significant and positively correlated with days to 50% flowering (0.452). Locules per fruit had highly significant and positively correlated with plant height (0.396). Plant height had highly significant and positively correlated with days to 50% flowering (0.364).

Thus, these characters emerged as most important associated traits of fruit yield (q/ha) in tomato. The available literature has 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 **Seghal *et. al.* (2018), Mishra *et al.* (2019) and Basavaraj *et al.* (2021).**

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.

UNDER PEER REVIEW

Table 1: Estimates of phenotypic correlation coefficients among thirteen characters in tomato

Traits	Days to 50% Flowering	Plant Height	Locules Per Fruit	Pericarp Thickness	Polar Diameter	Equatorial Diameter	Number of Fruits Per Cluster	Average fruit weight	Number of fruits per plant	Marketable Fruit Yield Per Plant	Unmarketable Fruit Yield Per Plant	TSS	Total Fruit Yield Per Plant
Days to 50% Flowering	1	0.364*	0.072	0.21	0.452**	0.369*	0.09	0.335*	-0.512**	0.035	-0.339*	0.009	-0.071
Plant Height		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	0.245	0.072	0.141	0.206	0.480**	-0.208	0.177
Pericarp Thickness				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						1	0.119	0.850**	-0.277	0.618**	0.049	0.03	0.557**
Number of Fruits Per Cluster							1	0.116	0.195	0.267	0.359*	-0.223	0.292
Average Fruit Weight								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*

UNDER PEER REVIEW

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Marketable Fruit yield Per Plant										1	0.474**	-0.075	0.963**
Unmarketable Fruit yield Per Plant											1	-0.085	0.554**
TSS												1	-0.019
Total fruit yield per plant													1

*,** **Significant at 5% and 1%, respectively**

UNDER PEER REVIEW

Table- 2: Estimates of genotypic correlation coefficient among thirteen characters in tomato

Traits	Days to 50% Flowering	Plant Height	Locules Per Fruit	Pericarp Thickness	Polar Diameter	Equatorial Diameter	Fruits Per Cluster	Average fruit weight	Number of fruits per plant	Marketable Fruit Yield Per Plant	Unmarketable Fruit Yield Per Plant	TSS	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		1	0.414**	0.29	0.223	0.3	0.1	0.302	-0.139	0.248	0.153	-0.345*	0.164
Locules Per Fruit			1	0.15	-0.009	0.003	0.284	0.078	0.142	0.223	0.505**	-0.216	0.181
Pericarp Thickness				1	0.073	0.086	0.081	0.097	-0.136	0.094	-0.155	0.096	-0.014
Polar Diameter					1	0.794**	-0.056	0.806**	-0.566**	0.458**	-0.161	0.01	0.382*
Equatorial Diameter						1	0.062	0.851**	-0.329*	0.624**	0.025	0	0.556**
Number of Fruits Per Cluster							1	0.06	0.17	0.242	0.347*	-0.306	0.287
Average Fruit Weight								1	-0.366*	0.773**	0.163	-0.085	0.727**

UNDER PEER REVIEW

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**
TSS												1	-0.044
Total fruit yield per plant													1

*,** Significant at 5 % and 1 %, respectively

UNDER PEER REVIEW

Reference-

Basavaraj, P.B.; Ambresh; Ganiger, V.M.; Hongal, S.; Mahesh, Y.S. and Patil, B.B. 2021. Correlation and path coefficient analysis in superior recombinant lines of tomato (*Solanum lycopersicum* L.). *Int. J. Curr. Microbiol. App. Sci.* 10(1): 404-412.

Behera, M.; Jagadev, P.N.; Das, S.; Pradhan, K. and Sahoo, B.B. 2020. Character association and path coefficient studies in tomato. *Int. J. Curr. Microbiol. App. Sci.* 9(9): 2770-2775.

Mishra, A.; Nandi, A.; Das, A.K.; Das, S.; Mohanty, I.C.; Pattanayak, S.K.; Sahu, G.S. and Tripathy, P. 2019. Correlation and path analysis studies for yield in tomato (*Solanum lycopersicum* L.). *Int. J. Curr. Microbiol. App. Sci.* 8(9): 489-497.

Rathod, N.V.K.; Suresh, B.G. and Reddy, S.M. 2018. Correlation and path coefficient analysis in tomato (*Solanum lycopersicum* L.). *Int. J. Curr. Microbiol. App. Sci.*7(10): 203-210.

Seghal, N.; Chadha, S.; Kumar, N.; Kaur, M. and Kanwar, S. 2018. Correlation and Path Coefficient Analysis for Fruit Yield and its component traits among bacterial wilt resistant F_4 progenies of tomato (*Solanum lycopersicum* L.). *Int. J. Curr. Microbiol. App. Sci.* 7(2): 1052-1059.

Searle, S. R. 1965. The value of endive of selection I. Mass selection. *Biomet.* 21: 682-709.

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