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Assessment of Correlation coefficients among the Yield related Traits in Tomato (*Solanum lycopersicum* L.) Germplasm

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ABSTRACT: Present investigation was conducted 32 genotypes of tomato at the Main Experimental Station, Department of Vegetable Science, Acharya Narendra Deva University of Agriculture and Technology, Narendra Nagar (Kumarganj), Ayodhya (U.P.) during *Rabi* 2020-21. The investigation was carried out in randomized block design with three replications to find out correlation coefficient among fourteen characters. In general, genotypic correlation coefficients were higher than the corresponding phenotypic correlation coefficients suggesting strong inherent relationship in different pair of traits. The most important trait, total fruit yield per plant had significant and positive phenotypic correlation coefficient with marketable fruit yield per plant, average fruit weight, equatorial diameter of fruit, polar diameter of fruit and number of fruits per plant. The findings revealed that selection for these traits would be effective for yield improvement.

Keywords: Tomato, germplasms, correlation coefficients.

INTRODUCTION

Tomato (*Solanum lycopersicon* L.) is an important fruit vegetable crop belonging to the family Solanaceae and the genus *Solanum.* It is a herbaceous plant, annual to perennial in nature and sexually propagated with perfect flowers. It is a day neutral plant and mainly self-pollinated but a certain percentage of cross-pollination also occurs. All the species of tomato are native to Western South America (Rick, 1976).

It is one of the most popular and widely cultivated vegetables in the world, and in India, it is the second most important vegetable after potato. Globally, 4.85 million hectares area is under tomato crop cultivation, with a total yield of 179.51 million tonnes and a productivity of 37.05 tonnes per hectare. India's overall tomato area is 0.789 million hectares, with a production of 19.75 million tonnes and productivity of 21.36 tonnes per hectare, which is exceedingly low when compared to global productivity averages.

The red colour of tomatoes is caused by lycopene, which is properly formed at a temperature range between 21°C and 24°C. Tomato soup is a tasty starter and is said to be a helpful constipation treatment for those who need it. Tomatoes are renowned for their high nutritional content. 100g of edible tomato fruit contains 93.10g of hydration, 3.60g of carbohydrates, 1.90g of protein, 0.10g of fat, 0.60g of minerals, 0.70g of fiber and 320 I.U. of vitamin C. (Ascorbic acid). Lycopene, a significant carotenoid found in tomatoes, is responsible for the nutraceutical impact of tomato. Tomato fruits have definitely assumed the status of a functional food considering the overwhelming epidemiological evidence for its reducing risk of certain types of cancers (Nguyen and Schwartz 1999).

Planning of the breeding programme would benefit from knowledge of the correlation among the characters in the available germplasms especially those that affect yield and quality is a prerequisite of any crop improvement. Wright (1921) established the route coefficient technique, which aids in determining the direct and indirect contributions of individual components in constructing the overall correlation towards yield. These studies indicate the relative value of a particulars character to make the selecting process easier and produce better results. Keeping in view the above facts the present study was under taken to assess the correlation among the different characters in available germplasms.

MATERIALS AND METHOD

The site of experiment was Main Experimental Station, Department of Vegetable Science, Acharya Narendra Deva University of Agriculture and Technology, Narendra Nagar (Kumarganj), Ayodhya, which is geographically situated at 25.56 N latitude, 82.12 E longitude and at an elevation of 113 m above the mean sea level. This area falls in sub-tropical area of Eastern India.

The experimental material of the investigation consisted of thirty-two genotypes including two checks (NDT-4 and NDT-7). The experiment was sown in Randomized Block Design with three replications. Observations were recorded on thirteen quantitative characters *viz.*, days to 50% flowering, days to first fruit harvest, plant height (cm), number of primary branches per plant, polar diameter of fruit (cm), equatorial diameter of fruit (cm), locules per fruit, pericarp thickness (mm), total soluble solids, ascorbic acid (mg/100 g), average fruit weight, number of fruits per plant, marketable fruit yield per plant (kg) and total fruit yield per plant (kg). To find out correlation coefficient among the yield related traitsamong the thirty-two genotypes of tomato were carried out by using procedure suggested by Searle (1961).

RESULTS AND DISCUSSION

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

The correlation coefficients at phenotypic and genotypic level were computed for fourteen traits of thirty two 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 and 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.* (2018); Behera *et al.* (2020).

The most important trait, total fruit yield per plant had significant and positive phenotypic correlation coefficient with marketable fruit yield per plant (0.930), average fruit weight (0.682), equatorial diameter of fruit (0.593), polar diameter of fruit (0.539) and number of fruits per plant (0.368).

Days to 50 % flowering had positive and significant correlation with number of fruits per plant (0.451) at phenotypic level. Days to first fruit harvest significantly and negatively associated with polar diameter of fruit (-0.482), equatorial diameter of fruit (-0.450), ascorbic acid content (-0.359) and average fruit weight (-0.357) at phenotypic level. Polar diameter of fruit had significant and positive association with average fruit weight (0.914), equatorial diameter of fruit (0.852) and marketable fruit yield per plant (0.543) at phenotypic level.

Average fruit weight had significant and positive correlation with marketable fruit yield per plant (0.664) and number of fruits per plants also showed significant and positive correlation with marketable fruit yield per plant (0.486) at phenotypic level.

Thus, these characters emerged as most important associated traits of fruit yield in tomato. The available literature (Seghal *et al.*, 2018; Mishra *et al.*, 2019; Basavaraj *et al.*, 2021; Kumar *et al.*, 2014; Singh *et al.*, 2015; Singh *et al.*, 2017) has also indicated positive correlation with marketable fruit yield per plant, average fruit weight, equatorial diameter of fruit, polar diameter and number of fruits per plant in tomato Thus, on the basis of above discussion it can be concluded that selection for average fruit weight, equatorial diameter of fruit, polar diameter and number of fruits per plant would be effective for yield improvement in tomato.

Table 1: Phenotypic correlation coefficients between different characters in tomato germplasm.

Characters	Day to 50% flowering	Day to first fruit harvest	Plant height	Primary branches per plant	Polar diameter of fruit	Equatorial diameter of fruit	Pericarp thickness	Locules per fruit	TSS	Ascorbic acid (mg/100g)	Average fruit weight	Number of fruits per plant	Marketable fruit yield per plant(kg)	Total fruit yield per plant
Days to 50% flowering	1	0.229	-0.192	0.132	-0.2	-0.179	0.141	-0.01	-0.036	-0.107	-0.127	0.451**	0.264	0.164
Days to first harvest		1	-0.074	-0.126	-0.482**	-0.450**	0.009	0.048	0.034	-0.359*	-0.357*	0.297	-0.056	-0.028
Plant height(cm)			1	0.048	0.139	0.309	-0.001	0.107	0.112	0.243	0.208	-0.08	0.173	0.19
Number of primary branches per plant				1	0.048	0.118	0.137	0.295	-0.058	0.234	0.161	0.13	0.273	0.286
Polar diameter of fruit(cm)					1	0.852**	-0.048	-0.229	0.198	0.226	0.914**	-0.332	0.543**	0.539**
Equatorial diameter of fruit(cm)						1	0.014	-0.131	0.338	0.353*	0.843**	-0.197	0.625**	0.593**
Pericarp thickness(mm)							1	0.101	0.082	-0.035	0.035	0.188	0.135	0.13
Locules per fruit								1	0.216	0.067	-0.303	0.187	-0.093	-0.131
TSS (°brix)									1	-0.039	0.182	-0.204	0.005	-0.047
Ascorbic acid(mg/100g)										1	0.156	-0.143	0.059	0.042
Average fruit weight(g)											1	-0.294	0.664**	0.682**
Number of fruits per plant												1	0.486**	0.368*
Marketable fruit yield per plant(kg)													1	0.930**

Table 2: Genotypic correlation coefficient between different characters in tomato germplasm.

Characters	Day to 50% flowering	Day to first fruit harvest	Plant height (cm)	Primary branches per plant	Polar diameter of fruit(cm)	Equatorial diameter of fruit(cm)	Pericarp thickness(mm)	Locules per fruit	TSS (brix)	Ascorbic acid(mg/100g)	Average fruit weight(g)	Number of fruits per plant	Marketable fruit yield pe plant(kg)	Correlation with fruit yield per plant(kg)
Days to 50% flowering	1	0.296	-0.3	0.234	-0.293	-0.26	0.328	-0.036	-0.156	-0.288	-0.202	0.757**	0.448**	0.281
Days to first harvest		1	-0.067	-0.126	-0.497**	-0.457**	0.014	0.051	0.024	-0.380*	-0.369*	0.312	-0.059	-0.026
Plant height(cm)			1	0.05	0.142	0.312	0	0.113	0.123	0.25	0.212	-0.074	0.174	0.195
Number of primary branches per plant				1	0.049	0.118	0.138	0.298	-0.064	0.238	0.164	0.131	0.274	0.291
Polar diameter of fruit(cm)					1	0.859**	-0.05	-0.233	0.2	0.232	0.937**	-0.339	0.548**	0.547**
Equatorial diameter of fruit(cm)						1	0.01	-0.133	0.353*	0.360*	0.864**	-0.202	0.631**	0.605**
Pericarp thickness(mm)							1	0.095	0.089	-0.032	0.037	0.187	0.136	0.134
Locule per fruit								1	0.219	0.062	-0.314	0.185	-0.095	-0.134
TSS (°brix)									1	-0.054	0.196	-0.216	0.005	-0.048
Ascorbic acid(mg/100g)										1	0.165	-0.154	0.06	0.051
Average fruit weight(g)											1	-0.303	0.675**	0.699**
Number of fruits per plant												1	0.496**	0.375*
Marketable fruit yield per plant(kg)													1	0.943

CONCLUSION

Based on overall findings of the present study, it can be concluded that there is significant correlation of different traits with fruit yield per plant. Hence there is great scope of improvement in fruit yield by performing selection of related traits in tomato.

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Conflict of Interest. None.

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