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Research Article

To Study of Estimate the Correlation Coefficient Among the Traits in Tomato (Solanum lycopersicum L.)

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Abstract: Correlation evaluation in tomato found out that according to cent fruit set, range of number one branches, range of culmination according to plant, common fruit weight, overall soluble solids, fruit length, fruit firmness, range of flower trusses according to plant and pericarp thickness had been definitely and considerably related to yield according to plant. Path evaluation found out that common fruit weight had the excessive superb direct impact on yield according to plant accompanied via way of means of range of culmination according to plant. Traits viz., fruit diameter and fruit form, fruit index had bad direct impact on fruit yield according to plant. Most of the alternative developments had oblique impact through fruit weight, culmination according to plant, fruit diameter and fruit form index. Hence, those characters must accept extra weight age in choice programme of excessive yielding genotypes in tomato.

Keywords: Coefficient of variation, genetic advance, tomato, correlation, correlation Coefficient.

Introduction

Tomato (Solanum lycopersicum L.) is one of the maximum famous and broadly grown vegetable withinside the global rating 2d in significance most effective subsequent to potato in many nations and ranked 1st in preserved and processed vegetables. The own circle of relatives belongs to Tomato is Solanaceae and the local of Peru. The tomato crop is of latest starting place and the primary record turned into grown from Italy in 1544. It's being a self-pollinated crop; it has an awesome ability for heterosis breeding and its miles utilized in distinctive breeding programme for genetic studies. Potent variability may be anticipated in tomato with recognize to plant stature, fruit shape, size, amount and quality [1]. Optimum temperature of tomato is 15-20°C. The genus is Solanum includes annual or quick lived perennial herbaceous plants. Tomato is an afternoon impartial plant. It is specifically self-pollinated crop; however, a positive percent of cross-pollination additionally occurs. It is a groovy season crop fairly proof against warmness and drought and grows beneath Neath extensive variety of soil and climatic conditions [2].

Tomato is a real diploid with 2n=24. Plant is annual with herbaceous prostrate stem having determinate or indeterminate boom habit. In the determinate boom, terminal bud leads to a floral bud and in addition boom in arrested ensuing in dwarf and furry stature. The correlation coefficient measures the mutual courting among diverse characters and determines the factor characters on which choice can be made for genetic development for yield and yield contributing traits. The route coefficient evaluation affords a powerful suggest for partitioning of direct and oblique purpose of association. Hence, there may be pre-considered necessary for initial investigations of characters withinside the genotypes for the improvement of advanced hybrids in tomato.

Methods and Materials

The observe become evaluated at an experimental farm of the Department of Horticulture, Integral Institute of Agricultural Science & Technology, Integral University, Lucknow (U.P.) at some point of 2020- 2021.The fabric for the prevailing examine made out of 35 genotypes of tomato viz., NDT-1, NDT-2, NDT-3 (C), NDT-4 (C), NDT-five NDT-6, NDT-8, Arka Ahuti, Arka Abhijit, Arka Rakshak, Arka Samrat, Arka Vikas, Angurlata, WS42 Hybrid, Darsh Hybrid, Lakshmi Hybrid, WS1508 Hybrid, Him-Sohna, Verito Hybrid, HS-101, Arka Vardan, H-24, Punjab Chuara (C), H-86, DVRT-1, DVRT-2, Him-shikhar, Kamarkhi, Kanak, Mansoori Hybrid, Manik, Ayushman, US-2853, Cherry tomato, Nagpur desi. Tomato seedlings of 30 days vintage have been transplanted withinside the major discipline with spacing of 60 x 50 cm (Row x Plant) at some point of Kharif, 2020-21. The test become specified in a Randomized Block Design (RBD) with 3 replications. The advocated cultural practices have been observed for elevating properly crop. Five randomly decided on aggressive vegetation from every row in every replication have been tagged for the reason of recording the observations on sixteen characters viz. Days to 50 % flowering, Plant height (cm), Number of number one branches according to plant, Fruit diameter (cm), Fruit length (cm), Number of locules per fruit, Pericarp thickness (mm), Average fruit weight (g), Total soluble solids (T.S.S), Number of end result according to plant, Number of marketable per plant, Number of unmarketable per plant, Fruit yield per plant (g). Correlation coefficient become done as according to the same old procedure.

Results and Discussion

The courting among the characters inside the hybrids rely upon the affiliation present with inside the parents. The genotypic and phenotypic correlation coefficients predicted among yields and inter correlation the various extraordinary yield additives are supplied and most effective significant correlations are mentioned here. In general, the significance of genotypic correlation coefficient turned into better than the corresponding phenotypic coefficient indicating thereby a sturdy inherent affiliation among diverse developments below study.

In the present investigation Days to 50% flowering exhibited positive and significant correlation with plant height (0.019 & 0.023), number of locules per fruit (0.002 & 0.002)and fruit yield per plant (0.002 & 0.001), while negative association was noticed with days of 50% flowering (-0.101 & 0.062), primary branches per plant (-0.030 & -0.962), fruit diameter (-0.001 & -0.004), fruit length (-0.005 & -0.021), average fruit weight (-0.002 & -0.114) and number of locules per fruit (0.112 & -0.507), at genotypic and phenotypic level, respectively.

Plant height was found to be positive and significantly correlated with pericarp thickness (0.001 & 0.034), total soluble solids (0.002 & 0.298), at genotypic and phenotypic level, respectively and significant negative association with number of primary branches per plant (-0.019 &-0.841), fruit diameter (-0.036 & -0.080), average fruit weight (-0.003 & -0.182), number of marketable fruit per plant (-0.038 & -0.063), and fruit yield per plant (-0.014 & -0.053), at genotypic and phenotypic level, respectively.

Primary branches per plant exhibited positive and significant correlation with plant height (0.046 & 0.587), pericarp thickness (0.007 & 0.049), at genotypic and phenotypic level, respectively.

Number of marketable fruits per plant was found to be positive and significant correlation with fruit diameter (0.038 & 0.187), and fruit yield per plant (0.247 & 0.639) at genotypic and phenotypic level, respectively.

Average fruit weight was found to be positive and significant correlation with number of primary branches per plant (0.003 & 0.222), fruit diameter (0.103 & 0.335), fruit length (0.026 & 0.246), total soluble solids (0.002 & 0.205), and fruit yield per plant (0.129 & 1.047) at genotypic and phenotypic level, respectively.

Fruit diameter exhibited positive and significant correlation with number of primary branches per plant (0.005 & 0.154), average fruit weight (0.009 & 0.313), number of marketable fruits per plant (0.037 & 0.040) and fruit yield per plant (0.440 & 0.720) at genotypic and phenotypic level, respectively.

Number of locules per fruit exhibited positive and significant correlation with number of primary branches per plant (0.008 & 0.683), fruits diameter (0.070 & 0.424), total yield per plant (0.143 & 0.114) and pericarp thickness (0.001 & 0.197). Fruits per cluster positively significant correlated with pericarp thickness (0.001 & 0.197). at genotypic and phenotypic level respectively.

Number of unmarketable fruits per plant exhibited positive and significant correlation with plant height (0.008 & 0.081), primary branches per plant (0.001 & 0.105), fruit diameter (0.018 & 0.037), fruit length (00.19 & 0.362), average fruit weight (0.001 & 0.212), total soluble solids (0.018 & 1.897), and fruit yield per plant (-0.086 & -0.215) while negative significant correlation with pericarp thickness (0.015 & -0.440) at genotypic and phenotypic level respectively.

On the basis of the value of phenotypic correlation coefficient depicted for all the ten-character, fruit yield per plant exhibited high positive correlation with number of primary branches, number of fruits per plant and average fruit weight at both phenotypic and genotypic levels. This suggests that fruit yield can be increased whenever there is an increase in characters that showed positive and significant association with yield per plant. Hence these characters can be considered as criteria for selection for higher yield as these are mutually and directly associated with fruit yield. Similar type of association was reported [3,4,5,6,7].

Traits	Mean	Range	Coefficient of variability (%)		Heritability (%)	Genetic Advance	GA as % of mean
			Phenotypic	Genotypic			
D50%F	24.0810	21.000-27.000	07.4929	07.2213	92.8800	03.45240	14.336700
PH (cm)	82.66290	39.130-06.4700	29.71210	28.46870	91.8100	46.449400	56.191400
NPBP	08.2343	04.40-10.730	31.21460	23.84790	58.3700	03.09060	37.532800
FD (cm)	04.3421	03.29-05.630	14.79480	10.71350	52.4400	00.69390	15.981600
FL (cm)	04.091	03.39-04.720	12.16750	02.3243	03.6500	00.03740	00.91460
NLF	03.76	03.27-04.730	13.30490	07.0683	28.2200	00.29090	07.73550
PT (mm)	00.5594	00.43-00.690	16.46130	08.1962	24.7900	00.0470	08.40680
AFW (g)	65.02860	047.73-88.80	22.6430	10.73150	22.4600	06.81330	10.477300
TSS (0Brix)	04.0663	03.45-04.85	12.25180	10.48210	73.200	00.75120	18.47200
NMFP	21.91620	014.00-32.27	32.99960	11.03980	11.1900	01.66740	07.60820
NUFP	32.27810	010.40-72.53	74.27930	71.54430	92.7700	45.820300	141.95500
FYP (g)	4781.6860	3183.330-6763.530	20.03050	10.7030	28.5500	563.33300	11.781100

Table-1: Summary of genetic parameters of 14 quantitative and qualitative characters in tomato

Characters		Days to 50% Flowering	Plant Height (cm)	No. of Primary Branches per Plant	Fruit diameter (cm	Fruit length (cm)	No. of Locules per Fruit	Pericarp thickness (mm)	Average fruit weight (g)	Total soluble solids (T.S.S)	No. of Marketable fruits per Plant	No. of unmarketable fruits per Plant	Fruit yield per Plant (g)
Days to 50% Flowering	P	**-0.101**	0.019	0.015	-0.001	-0.005	0.002	0.008	-0.002	-0.008	-0.003	0.000	0.002
	G	**0.062**	0.023	-0.047	-0.004	-0.021	0.002	-0.139	-0.114	0.023	-0.898	-0.137	0.001
Plant Height (cm)	P	0.009	**0.072**	-0.019	-0.036	-0.001	-0.025	0.001	-0.003	0.002	-0.038	0.034	-0.014
	G	-0.006	**0.672**	-0.841	-0.080	0.129	0.213	0.034	-0.182	0.298	-0.063	-0.233	-0.053
No. of Primary Branches per Plant	P	0.013	0.046	**-0.030**	-0.054	-0.021	-0.031	0.007	-0.003	0.000	0.030	-0.014	-0.069
	G	-0.011	0.587	**-0.962**	-0.134	0.173	0.360	0.049	-0.180	-0.119	-0.038	0.211	-0.053
Fruit diameter (cm)	P	0.001	-0.007	0.005	**0.356**	0.018	0.022	-0.012	0.009	0.000	0.037	0.016	0.440**
	G	-0.001	-0.065	0.154	**0.836**	-0.220	-0.257	0.056	0.313	-0.052	0.040	-0.085	0.720**
Fruit length (cm)	P	-0.005	0.000	0.004	0.042	**0.148**	-0.017	-0.004	0.005	0.003	-0.101	0.041	0.121
	G	0.003	0.183	-0.350	-0.388	**0.474**	0.704	-0.868	0.405	0.916	-0.180	-1.475	-0.580**
No. of Locules per Fruit	P	-0.004	-0.016	0.008	0.070	-0.022	**0.112**	0.001	0.002	-0.005	0.054	-0.061	0.143
	G	0.004	-0.282	0.683	0.424	-0.657	**-0.507**	0.197	0.099	-0.808	0.237	0.730	0.114
Pericarp thickness (mm)	P	-0.023	-0.001	0.003	0.072	0.010	-0.002	**-0.062**	0.006	-0.004	0.045	-0.077	-0.010
	G	0.032	0.027	-0.057	0.056	-0.496	-0.120	**0.830**	-0.229	-0.938	0.130	1.023	0.227*
Average fruit weight (g)	P	0.014	-0.008	0.003	0.103	0.026	0.007	-0.013	**0.030**	0.002	-0.028	0.008	0.129
	G	-0.022	-0.156	0.222	0.335	0.246	-0.065	-0.243	**0.781**	0.205	0.247	-0.525	1.047**
Total soluble solids (T.S.S)	P	-0.010	-0.007	0.000	0.005	-0.023	0.023	-0.011	-0.003	**-0.022**	0.145	-0.250	-0.143
	G	0.009	-0.101	-0.058	0.022	-0.220	-0.208	0.395	-0.081	**-1.973**	0.231	1.858	-0.136
No. of Marketable fruits per Plant	P	0.003	-0.008	-0.003	0.038	-0.044	0.018	-0.008	-0.002	-0.009	**0.343**	-0.078	0.247*
	G	-0.004	-0.235	0.205	0.187	-0.473	-0.666	0.598	1.070	-2.527	**0.180**	2.300	0.639**
No. of unmarketable fruits per Plant	P	0.000	0.008	0.001	0.018	0.019	-0.022	0.015	0.001	0.018	-0.086	**0.311**	0.283**
	G	0.000	0.081	0.105	0.037	0.362	0.192	-0.440	0.212	1.897	-0.215	**-1.932**	0.300**

Table-2: Genotypic (G) and phenotypic (P) correlation coefficients among yield and yield contributing traits in tomato

Correlation among quality characters is presented in Table-2. Ascorbic acid positively significant correlated with total soluble solids (-0.022 and -1.973) at genotypic and phenotypic level respectively. The correlation of yield with most of the quality traits indicated that simultaneous improvement of yield and quality traits was not possible because of negative correlation of yield with such quality traits similar result were reported by [8,9,10,11,12].

Positive relationships of plant height, number of branches per plant, number of fruits per plant and average fruit weight with total yield per plant with adequate availability of genetic variability for these traits in tomato indicate considerable scope of plant canopy modification in tomato leading to higher yield and days to flowering negatively correlated with yield which is desirable character. Increasing plant height will certainly require additional crop caring practices through staking and other canopy supporting measures to get higher harvest per unit area.

Conclusion

The correlational analysis has also evinced strong genetic and phenotypic linkage between different yield attributes and fruit quality factors in tomato plants. Hero, plant height, primary branches per plant, number of fruits and average fruit weight showed positive significant correlation with total yield per plant and can be used for selection for yield improvement. Of special interest is the negative correlation between days to 50% flowering and yield since the latter is desirable where earlier harvesting is wanted. The negative associations found between yield and ascorbic acid content and total soluble solids, suggest there could be a yield constraint trade off and raises the possibility that there are some fundamental difficulties in improving both yield and quality characteristics at the same time. However, the positive relationships combined with the amount of genetic variability observed may mean that the canopy characteristics can be adjusted to maximise yield. The next steps could aim at maintaining these interrelationships whilst integrating staking and other crop management activities that could lead to increase the height of the plant and consequently productivity. These conclusions may serve a starting point for the basic breeding of superior yielding and quality tomatoes.

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