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Correlation and path coefficient analysis in tomato (*Solanum lycopersicum* L.)

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Abstract
The field experiment of this investigation was conducted at Vegetable Research Farm, Kalyanpur, Department of Vegetable Science, C. S. Azad University of Agriculture & Technology, Kanpur during rabi season 2019-20. The experimental materials consisted of forty (40) genotypes of tomato. These genotypes were selected out of the germplasm collection being maintained at Department of Vegetable Science, C.S. Azad University of Agriculture & Technology, Kanpur. The investigation was statistically laid out in the field adopting Randomized Block Design (RBD) with forty (40) genotypes in replicated thrice. Positively and highly significant correlation showed by number of fruit per plant with fruit weight per plant and days to flowering with days to maturity. Positively significant correlation showed by plant height with fruit weight per plant and days to maturity with number of fruit cluster and fruit width. Path coefficient analysis indicated that the number of fruit per plant, fruit width, plant height, fruit length, days to maturity showed maximum positive direct effect on yield and days to flowering showed minimum positive direct on yield. Number of branch per plant, number of locule per fruit showed negative direct effect on yield. Number of locule per fruit show maximum negative direct effect on yield and Number of branch per plant showed minimum negative direct effect on yield.

Keywords: Correlation, coefficient analysis, tomato, *Solanum lycopersicum* L.

Introduction
Tomato is universally treated as 'protective food'. It is considered as "Poor man's orange" in India and 'love apple' in England. The English word 'tomato' came from the Spanish word 'tomato' derived from 'Nahuatl' (Aztec language) word 'tomatl'.Cultivated tomato is related to wild tomatoes originating from Peru, Ecuador and other parts of South America including the Galapagos Islands. The centre of its domestication and diversification is Mexico (Rick, 1978; Jenkins, 1948; Peralta, Spooner and Knapp, 2008) [11, 3, 10]. In India tomato was brought by Portuguese during the early 16th century.

Pietro Andrea Matthioli (1544) [5] described tomatoes for the first time with the common name "Pomid'oro" (Golden Apple). Tournefort (1694) [13] was the first to name cultivated tomatoes as *Lycopersicon* (wolf peach). Linnaeus (1753) [4] placed the tomato in the genus *Solanum*as *Solanum lycopersicum*. On the other hand Miller (1754) [6] proposed the genus name *Lycopersicon* and afterward proposed the name as *Lycopersicon esculentum* for cultivated tomato and *Lycopersicon pimpinellifolium* for wild tomato (Miller, 1768) [7]. While many other classification system have been proposed since then (Peralta and Spooner, 2000) [8]. Terrell *et al.*, (1983) [12] suggested that the Miller"s classification turn out to be the standard due to its common usage. A number of classical and modern authors recognized tomatoes under *Lycopersicon*, but other taxonomists included tomatoes in *Solanum*. Today, based on evidence from phytogenetic studies using DNA sequences and more in-depth studies of plant morphology and distribution, there is general acceptance of tomatoes in the genus *Solanum* by both taxonomists and breeders alike.

Materials and Methods
The field experiment of this investigation was conducted at Vegetable Research Farm, Kalyanpur, Department of Vegetable Science, C. S. Azad University of Agriculture & Technology, Kanpur during *rabi* season 2019-20.

The experimental materials consisted of forty (40) genotypes of tomato. These genotypes were selected out of the germplasm collection being maintained at Department of Vegetable Science, C.S. Azad University of Agriculture & Technology, Kanpur. The investigation was statistically laid out in the field adopting Randomized Block Design (RBD) with forty (40) genotypes in replicated thrice. The observations were recorded on five randomly selected plants from each treatment and each replication. The observations were recorded on characters *viz*, Plant height at maturity (cm), Number of primary branch per plant, Number of days to flower initiation, Number of fruit cluster per plant, Number of days to first fruit maturity, Polar diameter of fruit (cm), Equatorial diameter of fruit (cm), Number of locule per fruit, number of fruit per plant, fruit weigt per plant. Correlation coefficient analysis was done as per Al-Jibouri *et al*. (1958) [1] and the path coefficient analysis was estimated according to the formulae suggested by Dewey and Lu (1959) [2].

Results and Discussion

The estimate of correlation coefficient presented in (Table 1) described that number of fruit per plant showed positive and highly significant correlation with fruit weight per plant. Fruit width showed positive correlation with number of locule per fruit and fruit weight per plant. Fruit length showed positive correlation with number of locule per fruit and fruit weight pre plant. Number of primary branch per plant showed positive correlation with fruit weight per plant and number of fruits per plant. Plant height showed positively significant correlation with fruit weight per plant, positive with number of primary branch per plant, fruit length, fruit width and number of locule per fruit. Days to maturity showed positively significant correlation with number of fruit cluster and fruit width, positive with plant height, number of locule per fruit and fruit weight per plant. Days to flowering showed positive and highly significant correlation with days to maturity, positive significant with number of locule per fruit, positive with fruit height, number of primary branch per plant, number of fruit cluster, fruit length, fruit width and fruit weight per plant. Number of fruit cluster showed positive correlation with fruit length, fruit width and fruit weight per plant. Number of locule per fruit showed negative correlation with number of fruits per plant and fruit weight per plant. Fruit width showed negative correlation with number of fruit per plant. Number of primary branch per plant showed negative correlation with number of fruit cluster, fruit length, fruit width and number of locule per fruit. Plant height showed negative correlation with number of fruit cluster and number of fruit per plant. Days to maturity showed negatively highly significant correlation with number of fruits per plant and negative with number of primary branch per plant and fruit length. Days to flowering showed negatively highly significant with number of fruit per plant, negative with number of primary branch per plant and fruit length. Fruit length showed negative correlation with fruit width and number of fruit per plant. Number of fruit cluster showed negative correlation with number of locule per fruit and number of fruit per plant which indicated that selection for fruit yield can be informed through improving these characters. In present study the path coefficient analysis has taken to determine the direct and indirect effect on of fruit yield per plant *via.*, days to flowering, days to maturity, plant height, number of primary branch per plant, number of fruit cluster, fruit length (cm), fruit width (cm), number of locule per fruit and number of fruit per plant. The partitioning of genotypic path into direct and indirect effect revealed (Table 2) that number of fruit per plant have highest positive direct effect (0.568) followed by number of primary branch per plant (0.765), plant height (0.448), fruit length (0.172), days to maturity (0.115), number of fruit cluster (0.060), fruit width (cm) (0.035), the minimum positive direct effect of days to flowering (0.024) on fruit yield per plant. Similar findings have been reported by Padma and Ravishankar (2002) [9].

The maximum negative direct effect on fruit weight per plant or yield per plant shown by number of branch per plant (-0.037) and minimum negative direct effect on yield or fruit weight per plant was shown by number of locule per fruit (-0.125). While the maximum positive indirect effect on yield *viz*., shown by plant height (cm) (0.119) and days to flowering (0.076) which revealed that these two characters influenced fruit yield indirectly.

Table 1: Genotypic (upper) and phenotypic (lower) correlation coefficient for 10 characters in tomato

S. No.	Characters	Days to flowering	Days to maturity	Plant height	Number of primary branch/ plant	Number of fruit cluster/plant	Fruit length	Fruit width	Number of locule/fruit	Number of fruit/plant	Fruit weight/plant
1.	Days to flowering	G/P	0.663**	0.227	0.083	0.091	0.108	0.036	0.329*	-0.231	0.052
2.	Days to maturity	0.665**	G/P	0.227	-0.007	0.352*	-0.007	0.335*	0.141	-0.402**	0.018
3.	Plant height	0.238	0.241	G/P	0.265	-0.007	0.142	0.120	0.249	-0.125	0.395*
4.	Number of primary branch per plant	0.105	0.027	0.279	G/P	-0.110	-0.071	-0.117	-0.057	0.161	0.159
5.	Number of fruit cluster per plant	0.120	0.367*	0.025	-0.034	G/P	0.230	0.293	-0.281	-0.145	0.027
6.	Fruit length	0.129	0.018	0.158	-0.035	-0.165	G/P	-0.180	0.230	-0.115	0.126
7.	Fruit width	0.049	0.346*	0.131	-0.086	0.296	-0.159	G/P	0.218	-0.243	0.008
8.	Number of locule per fruit	0.334*	0.169	0.262	0.001	-0.209	0.239	-0.175	G/P	-0.238	-0.105
9.	Number of fruit per plant	-0.220	-0.383*	-0.115	0.171	-0.119	-0.102	-0.230	-0.205	G/P	0.447**
10.	Fruit weight per plant	0.054	0.028	0.393*	0.163	0.032	0.120	0.015	-0.077	0.446**	

Table 2: Direct and indirect effect at phenotypic level of different quantitative traits on yield in tomato

S. No.	Characters	Days to flowering	Days to maturity	Plant height	Number of primary branch per plant	Number of fruit cluster per plant	Fruit length	Fruit width	Number of locule per fruit	Number of fruit per plant	Phenotypic correlation with yield
1.	Days to flowering	0.010	0.086	0.106	-0.006	0.003	0.018	0.001	-0.043	-0.122	0.054
2.	Days to maturity	0.007	0.129	0.107	-0.001	0.009	0.002	0.009	-0.022	-0.212	0.028
3.	Plant height	0.002	0.031	0.445	-0.015	0.001	0.022	0.004	-0.034	-0.064	0.393
4.	Number of primary branch per	0.001	0.004	0.124	-0.053	-0.001	-0.005	-0.002	0.000	0.095	0.163

	plant										
5.	Number of fruit cluster per plant	0.001	0.047	0.011	0.002	0.025	-0.023	0.008	0.027	-0.066	0.032
6.	Fruit length	0.001	0.002	0.070	0.002	-0.004	0.140	-0.004	-0.031	-0.057	0.120
7.	Fruit width	0.000	0.045	0.058	0.005	0.007	-0.022	0.027	0.023	-0.128	0.015
8.	Number of locule per fruit	0.003	0.022	0.117	0.000	-0.005	0.033	-0.005	-0.129	-0.114	-0.077
9.	Number of fruit per plant	-0.002	-0.49	-0.051	-0.009	-0.003	-0.014	-0.006	0.026	0.555	0.446

Residual effect = 0.5545 ** Significant at p = 0.01 Bold digit show direct effect

Conclusion

The results obtained in this investigation revealed the occurrence of considerable positive as well as negative direct and indirect effects by various characters on the fruit yield of tomato through one or other characters. Thus, it can be concluded that the characters mentioned above should be duly considered at the time of formulation of selection strategy to develop high yielding varieties in tomato.

References

1. Al-Jibouri A, Miller PA, Robinson HF. Genotype and environmental variation and correlation in an upland cotton crops of the interspecific origin. Agronomy Journal 1958;50:626-636.
2. Dewey DR, Lu KH. A correlation and path coefficients analysis of crested wheat grass seed production. Agronomy Journal 1959;51:515-518.
3. Jenkins JA. The origin of the cultivated tomato, Economic Botany 1948;2/4:379-392.
4. Linnaeus C. *Species plantarum*, 1st ed. Stockholm: L. Salvius 1753.
5. Matthioli PA. Di Pedacio Dioscoride Anazarbeolibricinquedellahistoria, et material medicinal etrodotti in lingua Volgare Italiana. Venice: N. de Bascarini 1544.
6. Miller P. The gardener's dictionary, Abridged 4th ed. London: John and James Rivington 1754.
7. Miller P. The gardener's dictionary, Abridged 8th ed. London 1768.
8. Peralta IE, Spooner DM. Classification of wild tomatoes: A review. Kurtziana 2000;28:45-54.
9. Padma E, Ravishankar C, Srinivasulu R. Correlation and path coefficient studies in tomato (*Lycopersicon esculentum* Mill.). Journal of Research, ANGRAU 2002;30(4):68-71.
10. Peralta IE, Spooner DM, Knapp S. Taxonomy of Wild Tomatoes and Their Telatives (*Solanum sect. Lycopersicoides, sect. Juglandifolia, sect. Lycopersicon; Solanaceae*), Systematic Botany Monographs, the American Society of Plant Taxonomists 2008;84:186.
11. Rick CM. The tomato, Scientific American 1978;239:77-87.
12. Terrell EE, Broome CR, Reveal JL. (695) Proposal to Conserve the Name of the Tomato as *Lycopersicon esculentum* P. Miller and Reject the Combination *Lycopersicon lycopersicum* (L.) Karsten (Solanaceae). Taxon 1983, 310-314.
13. Tournefort JP de. Elemens de Botanique. Paris: Imprimerie Royale 1694.