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Research Paper

Study of genetic variability and correlation analysis of quantitative traits in tomato *(Solanum lycopersicum L.)*

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ABSTRACT

The present study was carried out with 58 genotypes of tomato during *Kharif* 2021 at Vegetable Experimental Field, Sher-e-Kashmir University of Agricultural Science and Technology-Kashmir, Shalimar, Srinagar. The experiment was conducted in Randomized Block Design with three replications. Observations were recorded on five randomly selected competitive plants per replication for each entry on nineteen quantitative traits. The results revealed significant variation among genotypes for all the characters studied. Among all the genotypes, EC-165690 exhibited the highest fruit yield per hectare (q) and genotype EC-914109 exhibited the highest average fruit weight (kg). Average fruit weight (kg), fruit yield per plant (kg) and fruit yield per hectare (q) all had expected higher phenotypic and genotypic coefficients of variation (PCV and GCV). Fruit length (cm), fruit diameter (cm), days to first flowering, pericarp thickness (mm), average fruit weight (kg), fruit yield per hectare (q), and fruit yield per plant (kg) all had high heritability and genetic advance as percent of mean. Fruit yield per hectare (q) displayed positive correlation with pericarp thickness (mm), plant height (cm), average fruit weight (kg) and fruit yield per plant (kg). Average fruit weight (kg) displayed positive and significant correlation with fruit yield per plant (kg) and fruit yield per hectare (q). The findings suggested that average fruit weight (kg), fruit yield per plant (kg), pericarp thickness (mm), plant height (cm) and fruit yield per plant (kg) should be considered as important characters for improvement of tomato through selection.

Key words: Correlation, genetic advance, heritability, variability

Tomato (*Solanum lycopersicum* L.) is the vegetable of utmost importance. Because of its wider adaptability, high yielding potential, and suitability, tomato is one of the most economically important and widely grown vegetables in the Solanaceae family, second only to potato. Tomato has a chromosome number of 2n=24 and is a significant vegetable crop with special economic importance in the horticultural industry worldwide. All the species of tomato are native to Western South America (Rick, 1969). It is the most widely grown warm-season fruit vegetable on the planet. The total world area under tomato cultivation is 50, 30545 hectares, with a production of 18,07,66,329 tonnes (Anonymous, 2020a). It is grown on 812 thousand hectares in India, with a production of 20,573 thousand metric tonnes and an average yield of 18.61 tonnes per hectare (Anonymous, 2020b). It is grown as annual or perennial herbaceous plants with a short life span. It has a taproot and a determinate, semi-determinate or indeterminate growth habit. They are an important source of vitamin A and C in diets due to their popularity as fresh and processed crop.

Tomato has received attention from vegetable breeders all over the world. The magnitude of genetic variability in economic characters determines crop improvement, so evaluating and utilising genetic variability in the desired direction is critical in any yield improvement programme (Allard, 1960). A crop breeding programme aimed at increasing plant productivity must take into account not only yield but also the components

of yield that have a direct or indirect impact on yield. With parameters like phenotypic and genotypic coefficients of variation, heritability, and genetic advance, it is necessary to partition observed phenotypic variability into heritable and non-heritable components. Genetic advance can be used to determine the efficiency of selection. Correlation analysis provides insight into the genetic variability present in populations by measuring the mutual relationship between various plant characters and identifying the component characters on which yield improvement can be based. In a self-pollinated crop like tomato, an increase in yield and quality is usually achieved by selecting genotypes with desirable character combinations found in nature or by hybridization. The prerequisite for framing any selection programme is in the knowledge of the nature and extent of variability present in genetic stocks, heritability, genetic advance, and interrelationships among various characters. Hence, present study was undertaken to assess the extent of genetic diversity in tomato.

MATERIALS AND METHODS

The experiment was conducted in Randomized Block Design with three replications during *Kharif* 2021 at Vegetable Experimental Field, Sher-e-Kashmir University of Agricultural Science and Technology, Kashmir, Shalimar, Srinagar. The experimental material consisted of 58 genotypes collected from various agricultural regions of India. A spacing of 45cm × 30cm was adopted and all the standard practices and plant protection measures were timely adopted to raise the crop successfully. Observations were recorded on five randomly selected competitive plants per replication for each entry on nineteen quantitative traits viz., number of days to first flowering, number of days to first fruit set, number of days to first fruit harvest, duration of fruiting, number of pickings, number of fruits per plant, fruit length (cm), fruit diameter (cm), average fruit weight (g), number of locules per fruit, pericarp thickness (mm), number of fruits per cluster, plant height (cm), number of primary branches per plant, fruit yield per plant (kg), fruit yield per hectare (q), seed yield per fruit (g), seed yield per plant (g) and 100-seed weight (g). The data regarding above mentioned characters were averaged and subjected to analysis of variance suggested by Panse and Sukhatme (1984). The genotypic coefficient of variation were calculated according to the formula given by Burton (1952). Correlation coefficient were worked out as per formulae suggested by Searle (1961).

RESULTS AND DISCUSSION

Analysis of variance showed that the genotypes were significantly different for all the characters studied. This indicates presence of sufficient genetic variability to be exploited in a breeding programme and was reflected in the broad range observed for each trait. The genotype EC-159053 (39.33) had the highest number of days to first flowering, while the genotype EC-162516 had the lowest (21.26). The genotype EC-151568 (41.66) had the longest duration of harvest, while the genotype EC-163711 had the shortest (27.66). The genotype EC-620401 (26.46) produced highest number of fruits per plant followed by EC-620639 (26.06). The genotype EC-914109 (81.28 g) had the highest average fruit weight (g) followed by EC-162515 (65.80g) and EC-521067-B (60.86g). The genotype EC-165690 (1.15 kg) had the highest fruit yield per plant (kg) followed by EC-162518(1.10kg) and EC-157568 (1.09kg). The genotype EC-165690 (860.38 q) had the highest fruit yield per hectare (q) followed by EC-162518 (820.63q) and EC-157568 (813.60kg) (Table 1).

Heritability is used in predicting the expected progress achievable through selection (Burton and De Vane, 1953). In the present study, the high heritability was noticed for average fruit weight (99.78%), fruit diameter (99.72%), fruit length (99.6%), pericarp thickness (97.62%), days to Ist flowering (97.14%), days to Ist fruit set (96.44%) and plant height (94.54%). High heritability can be attributed to the greater role of additive gene and additive x additive gene action, which can be exploited by following simple selection. In the present study, the high heritability was observed in all traits except for number of locules, number of fruits per cluster, number of pickings and number of primary branches per plant. High heritability can be attributed to the greater role of additive gene and additive x additive gene action, which can be exploited by following simple selection.

Genetic advance is the improvement over the base population that can potentially be made from selection for a character. The fact that the phenotypic coefficient of variation was higher than the genotypic coefficient of variation indicated that the environment played a more important role in the expression of traits, which is consistent with the findings of Asati *et al.,* 2008 and Mohamed *et al.,* 2012. Average fruit weight (PCV= 45.92 %; GCV= 45.87 %), fruit yield per plant (PCV= 38.05 %; GCV= 34.63 %), and fruit yield per hectare (PCV= 38.47 %; GCV= 35.02 %) depicted higher phenotypic and genotypic coefficients of variation (PCV and GCV) (Table 2). Kumar (2013) and Kaushal *et al.,* (2017) reported similar findings. Average fruit weight (94.40 %), fruit yield per hectare (65.89 %), fruit yield per plant (64.91 %), seed yield per plant (5812), pericarp thickness (52.17 %), and fruit diameter (50.12 %) depicted high genetic advance as percent of mean. This is consistent with the findings of Kaushal *et al.,* (2017). For estimating the true effects of selection, heritability alone is not enough.

Table 1: Mean performance of different genotypes of tomato (*Solanum lycopersicum* L.)

Treatment	DTFF	DTFFS	DTFFH	NOL	PH (cm)	NOFPC	PT (mm)	FL (cm)	FD (cm)	SYPF (g)	100SW (g)	AFW (g)	DOF/H	NOP	NOPBPP	NOFPP	FYPP (Kg)	FYPH (q)	SYPP (g)
EC 914106	22.47	32.40	75.60	3.73	113.63	4.93	2.22	5.49	4.50	0.25	0.41	36.37	40.80	5.73	5.33	21.07	0.77	569.61	5.20
EC 914093	35.93	42.40	84.80	4.27	123.42	5.27	3.22	5.20	4.76	0.17	0.36	47.41	37.00	5.67	5.67	18.93	0.90	669.45	3.24
EC 620402	34.40	46.67	86.40	3.73	104.63	5.67	3.71	5.72	6.03	0.18	0.34	70.89	35.33	5.73	4.27	14.53	1.03	767.81	2.60
IARI 7	36.60	45.80	86.47	3.13	91.05	4.07	3.19	3.56	4.13	0.25	0.33	24.96	38.13	5.40	4.73	16.80	0.42	311.68	4.23
EC 617047	31.67	43.47	88.27	3.87	81.03	4.27	2.17	3.49	4.17	0.16	0.26	19.04	32.40	5.33	4.33	14.40	0.27	204.09	2.25
EC 914114	30.40	40.67	83.13	3.73	104.99	4.13	3.23	4.32	5.13	0.26	0.44	41.02	39.07	5.20	4.40	16.53	0.68	504.90	4.19
Kashi Chayan	25.27	36.33	82.27	3.73	125.87	4.87	2.69	5.06	6.74	0.16	0.26	70.94	32.07	5.07	3.60	12.13	0.86	641.17	1.94
EC 914109	21.67	34.33	83.40	2.57	114.14	4.93	4.51	5.03	6.05	0.29	0.44	81.29	32.20	4.67	4.73	12.00	0.98	726.65	3.51
EC 620401	32.53	45.20	84.33	3.13	125.99	5.00	3.57	2.85	3.18	0.17	0.29	19.87	33.13	4.67	4.20	26.47	0.53	391.13	4.51
EC 914107	22.47	32.73	78.00	3.20	90.05	4.20	3.54	4.07	4.04	0.18	0.26	26.99	37.87	5.13	4.27	19.80	0.54	398.39	3.49
EC 914101	38.00	48.40	86.07	4.47	79.38	4.73	4.27	5.37	4.37	0.26	0.39	30.94	32.33	5.20	4.93	22.13	0.68	509.30	5.65
EC 914091	29.47	40.47	82.93	3.20	103.29	3.87	2.23	2.82	3.15	0.16	0.24	26.97	29.60	5.13	4.20	21.40	0.58	429.21	3.31
EC 914105	22.33	35.07	81.93	2.93	128.30	5.33	4.41	3.27	3.56	0.31	0.45	20.63	35.60	4.80	5.53	25.60	0.53	393.75	7.83
EC-241140	27.33	38.80	82.93	2.87	102.65	5.20	3.71	5.81	5.62	0.26	0.41	46.63	39.07	4.67	4.80	18.80	0.88	654.52	4.76
EC-165690	21.53	33.27	79.73	4.87	124.28	4.87	2.40	5.37	3.59	0.26	0.35	60.82	32.20	5.20	5.73	19.00	1.15	860.39	5.14
EC-145054	25.33	37.07	79.53	2.80	117.22	5.27	3.33	4.26	3.38	0.25	0.33	22.30	31.80	5.53	4.27	23.27	0.52	386.54	5.73
EC-164656	31.20	42.20	85.00	3.00	88.38	4.67	2.55	4.89	4.32	0.27	0.36	21.51	34.73	3.87	5.67	24.80	0.53	397.56	6.68
EC-144681	31.20	41.67	85.27	2.87	79.48	3.80	3.69	5.19	4.31	0.32	0.42	30.88	34.47	4.27	5.60	25.40	0.78	583.63	8.09
EC-145622	27.00	41.60	82.73	3.53	114.71	3.87	2.23	4.12	5.07	0.25	0.35	45.46	35.00	5.60	5.93	18.07	0.82	612.68	4.53
EC-157568	29.33	39.47	82.33	4.27	126.30	3.80	5.07	4.87	5.89	0.20	0.33	57.13	37.87	4.80	4.13	19.13	1.09	813.61	3.78
EC-620557	36.87	47.47	86.07	4.87	95.44	4.00	5.17	4.86	4.91	0.18	0.27	55.42	32.20	5.53	5.80	11.27	0.63	465.24	2.00
EC-162518	31.47	41.40	82.27	3.60	123.88	5.07	4.60	4.79	3.94	0.25	0.37	57.70	30.60	5.00	5.53	19.07	1.10	820.63	4.75
EC-620395	22.20	39.67	81.50	3.27	114.26	4.13	3.46	3.81	3.72	0.18	0.27	21.89	29.87	4.93	4.60	24.80	0.54	404.78	4.55
EC-620639	26.33	40.00	81.33	3.73	84.73	4.67	5.21	4.12	3.65	0.27	0.35	25.30	35.07	4.80	4.87	26.07	0.66	491.65	7.05
EC-249515	36.87	47.27	81.33	2.67	109.83	5.07	5.17	3.60	5.06	0.25	0.36	26.31	36.73	5.80	5.47	20.13	0.53	393.97	5.04
EC-241148	36.20	46.00	87.93	2.80	117.05	4.73	3.44	4.06	3.51	0.25	0.34	41.22	36.87	4.93	4.13	21.53	0.89	660.43	5.35
EC-163711	24.47	33.33	86.47	4.13	84.49	3.93	3.47	4.05	4.25	0.19	0.35	24.08	27.67	4.33	3.53	24.07	0.58	432.28	4.51
EC-521067	37.60	48.27	78.33	2.93	81.40	4.67	3.20	4.25	4.58	0.19	0.34	43.19	36.40	5.53	5.27	21.00	0.91	676.38	4.03
Shopian Sel-1	22.20	36.33	86.20	4.80	109.20	3.53	4.59	4.44	3.53	0.24	0.36	21.35	34.73	4.07	4.07	25.53	0.54	405.41	6.03
EC-521067-B	22.23	39.40	87.67	3.40	128.40	3.73	4.37	4.94	6.09	0.31	0.43	60.86	33.60	4.67	4.13	11.93	0.73	541.14	3.74
EC-367855	35.47	46.53	87.07	2.87	124.49	4.67	3.11	3.45	3.64	0.17	0.25	23.27	35.93	5.13	5.60	23.07	0.54	400.47	3.82
EC-159041	29.33	35.13	81.27	2.87	112.57	4.80	3.23	4.83	3.63	0.32	0.43	26.02	34.87	3.87	5.40	24.40	0.64	472.90	7.71
EC-274122	37.67	47.27	88.33	4.67	111.74	3.60	3.69	4.04	3.84	0.18	0.25	29.36	32.13	4.00	5.47	23.93	0.70	524.62	4.43

Table 1: Continued

EC-620389	27.00	39.40	79.47	2.87	96.60	3.67	4.07	4.15	4.47	0.18	0.25	28.29	40.00	5.73	4.80	19.13	0.54	403.72	3.43
EC-620372	31.47	43.20	83.40	3.40	89.59	3.67	3.40	6.42	4.53	0.25	0.34	53.08	40.67	5.00	4.33	19.27	1.02	761.42	4.80
EC-620373	38.93	49.13	88.67	3.93	111.43	4.73	4.17	4.93	6.15	0.34	0.42	47.80	38.07	5.00	5.13	18.53	0.89	659.07	6.21
EC-620775	39.27	48.27	87.53	3.07	82.66	4.93	3.74	3.82	4.03	0.26	0.37	29.83	33.87	5.13	5.07	18.13	0.54	402.86	4.73
EC-528368	23.20	34.93	75.47	4.73	97.52	4.07	4.16	3.77	3.37	0.24	0.33	17.92	40.07	5.40	3.80	18.53	0.33	247.19	4.41
EC-164625	35.33	43.87	86.67	3.20	108.15	4.07	2.19	5.68	4.15	0.33	0.42	25.78	37.40	4.13	5.53	22.87	0.59	439.50	7.56
EC-3176	25.27	38.33	78.27	3.07	98.21	4.67	4.45	3.36	3.14	0.32	0.42	17.93	39.00	5.13	4.73	17.60	0.32	235.74	5.65
EC-632943	21.93	32.13	76.40	2.80	92.04	3.80	3.39	5.86	4.43	0.17	0.25	41.87	40.00	5.13	5.33	17.67	0.74	554.15	2.93
EC-162516	21.27	29.40	74.07	3.40	125.16	3.53	4.16	4.67	4.79	0.25	0.36	39.47	39.80	4.93	4.27	24.40	0.96	717.18	6.15
EC-151568	23.13	36.07	75.40	4.73	108.33	3.93	4.17	6.07	6.75	0.26	0.35	43.04	41.67	4.73	4.93	21.93	0.94	702.67	5.60
EC-514109	31.33	41.53	81.40	3.80	94.15	3.80	4.23	3.56	4.44	0.25	0.36	41.94	41.53	5.53	4.60	18.47	0.78	577.58	4.60
EC-163605	33.53	41.73	82.33	2.60	84.65	3.67	2.14	6.14	3.17	0.27	0.36	23.11	39.40	5.33	4.40	13.87	0.32	239.26	3.71
EC-177343	24.20	31.73	75.13	3.33	127.29	4.07	3.45	4.07	3.79	0.18	0.29	16.62	36.87	5.80	5.13	23.80	0.40	294.37	4.22
KSP-5	30.27	39.40	79.53	3.93	110.72	3.53	4.55	5.16	3.55	0.32	0.41	25.58	37.53	5.20	4.33	15.80	0.40	301.04	5.05
TIH-611	30.13	41.73	84.67	2.60	110.01	3.73	2.67	2.52	2.54	0.23	0.37	17.70	39.60	5.20	5.87	15.00	0.33	224.89	3.46
TBR-2	27.47	38.60	77.67	2.80	94.89	4.20	1.24	3.23	2.93	0.19	0.32	16.74	41.40	4.80	5.60	18.47	0.31	229.17	3.54
LVR-7	27.27	37.00	76.73	3.40	82.17	4.60	3.51	3.14	2.46	0.17	0.25	19.32	39.53	5.73	5.13	16.73	0.37	223.88	2.88
R-ZT-2	24.20	35.60	72.73	2.93	129.62	4.67	3.56	3.18	3.27	0.34	0.42	16.84	39.60	4.87	5.47	18.47	0.31	232.24	6.24
VN-1	25.33	36.33	74.13	3.33	106.71	4.93	3.59	4.57	3.28	0.24	0.38	30.87	40.27	3.73	4.27	12.87	0.40	295.53	3.05
CLN-1621-L	23.80	35.40	78.47	2.67	94.96	3.80	3.11	3.16	3.08	0.25	0.37	39.33	40.00	5.07	5.53	22.87	0.90	669.63	5.82
EC-62038	29.00	38.60	79.40	4.07	84.63	5.20	2.61	2.77	3.38	0.19	0.35	14.85	37.87	5.67	5.40	22.53	0.33	249.14	4.31
EC-160194	32.27	43.87	85.33	2.87	125.99	3.60	5.18	4.92	4.12	0.34	0.44	37.21	38.40	4.07	6.00	22.60	0.84	627.11	7.67
EC-159053	39.33	49.07	88.13	2.80	115.26	4.07	5.21	4.78	3.58	0.23	0.35	34.87	34.87	4.80	5.53	25.53	0.89	663.40	5.81
EC-145057	35.00	43.73	85.67	4.60	105.08	3.60	5.30	5.31	4.52	0.23	0.37	32.75	34.80	5.80	4.40	24.20	0.80	592.06	5.67
EC-162515	27.73	39.60	82.67	3.07	84.88	4.67	3.73	5.10	6.31	0.17	0.27	65.80	36.13	3.73	4.67	12.47	0.82	610.80	2.12
Mean	29.36	40.25	82.18	3.46	105.12	4.35	3.63	4.42	4.25	0.24	0.35	35.11	36.31	5.00	4.91	19.81	0.67	494.30	4.71
C.V.	3.25	2.42	1.22	16.89	3.56	14.85	4.00	1.22	1.30	7.92	5.10	2.15	3.76	10.17	14.67	13.96	15.78	15.80	14.43
F ratio	102.87	82.29	53.67	3.99	52.91	2.44	123.99	917.38	063.58	24.88	34.09	374.05	18.71	3.73	2.42	6.86	15.44	15.78	14.93
F prob	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SE	0.55	0.56	0.58	0.34	2.16	0.37	0.08	0.03	0.03	0.01	0.01	0.44	0.79	0.29	0.42	1.60	0.06	45.10	0.39
C.D. 5%	1.54	1.58	1.63	0.95	6.05	1.05	0.24	0.09	0.09	0.03	0.03	1.22	2.21	0.82	1.17	4.48	0.17	126.51	1.10
CD 1%	2.03	2.08	2.15	1.24	7.99	1.38	0.31	0.11	0.11	0.04	0.03	1.61	2.92	1.08	1.53	5.91	0.22	167.07	1.45
Range Lowest	21.26	29.40	72.73	2.56	79.38	3.53	1.23	2.52	2.45	0.15	0.24	14.84	27.66	3.73	3.53	11.26	0.27	204.09	1.93
Range Highest	39.33	49.13	88.66	4.86	129.62	5.66	5.30	6.42	6.74	0.34	0.44	81.28	41.66	5.80	6.00	26.46	1.15	860.38	8.09

(**DTFF**-Number of days to 1st flowering, **DTFFS**-Number of days to 1st fruit set, **DTFFH**-Number of days to 1st fruit harvest, **NOL**-Number of locules per fruit, **PH**-Plant height, **NOFPC**-Number of fruits per cluster, **PT**- Pericarp thickness, **FL**- Fruit length, **FD**- Fruit diameter, **SYPF**-Seed yield per fruit, **100SW**-100-seed weight, **AFW**-Average fruit weight, **DOF**/H-Duration of fruiting or harvest, **NOP**- Number of pickings, **NOPBPP**-Number of primary branches per plant, **NOFPP**-Number of fruits per plant, **FYPP**-Fruit yield per plant, **FYPH**- Fruit yield per hectare, **SYPP**- Seed yield per plant.)

Table 2: Range, general mean and variability parameters in tomato (*Solanum lycopersicum* L.)

Character	Range	General Mean GM	Standard Error Mean SEM	Coefficient of variation		Heritability in broad sense h^2 (%)	Genetic Advance GA	Genetic Advance as per cent of mean (%)
				PCV (%)	GCV (%)			
DTFF	21.26-39.33	29.35	0.54	19.18	18.91	97.14	11.27	38.39
DTFFS	29.40-49.13	40.25	0.55	12.81	12.58	96.44	10.24	25.45
DTFFH	72.73-88.66	82.17	0.57	5.29	5.14	94.61	8.47	10.31
NOL	2.56-4.86	3.45	0.3341	23.86	16.86	49.93	0.84	24.54
PH(cm)	79.38-129.62	105.12	2.13	15.20	14.78	94.54	31.13	26.61
NOFPC	3.53-5.66	4.35	0.36	18.07	10.31	32.54	0.52	12.11
PT(mm)	1.23-5.30	3.63	0.08	25.94	25.63	97.62	1.89	52.17
FL(cm)	2.52-6.42	4.42	0.03	21.57	21.53	99.67	1.95	44.29
FD(cm)	2.45-6.74	4.25	0.03	24.40	24.36	99.72	2.13	50.12
SYPF (g)	0.15-0.34	0.23	0.01	23.69	22.33	88.84	0.10	43.36
100SW(g)	0.24-0.44	0.34	0.01	17.68	16.93	91.69	0.11	33.40
AFW(g)	14.84-81.28	35.11	0.43	45.92	45.87	99.78	33.14	94.40
DOF/H	27.66-41.66	36.30	0.78	9.89	9.14	85.52	6.32	17.42
NOP	3.73-5.80	4.99	0.29	14.05	9.70	47.68	0.68	13.80
NOPBPP	3.53-6.0	4.90	0.41	17.80	10.09	32.13	0.57	11.78
NOFPP	11.26-26.46	19.80	1.58	23.99	19.51	66.16	6.47	32.70
FYPP (kg)	0.27-1.15	0.66	0.06	38.05	34.63	82.81	0.43	64.91
FYPH (q)	204.09-860.38	494.30	44.70	38.47	35.02	83.13	325.72	65.89
SYPP(g)	1.93-8.09	4.71	0.38	34.29	31.10	82.29	2.73	58.12

(DTFF-Number of days to 1st flowering, DTFFS-Number of days to 1st fruit set, DTFFH-Number of days to 1st fruit harvest, NOL-Number of locules per fruit, PH-Plant height, NOFPC-Number of fruits per cluster, PT- Pericarp thickness, FL- Fruit length, FD- Fruit diameter, SYPF-Seed yield per fruit, 100SW-100-seed weight, AFW-Average fruit weight, DOF/H-Duration of fruiting or harvest, NOP- Number of pickings, NOPBPP-Number of primary branches per plant, NOFPP-Number of fruits per plant, FYPP-Fruit yield per plant, FYPH- Fruit yield per hectare, SYPP- Seed yield per plant.)

Table 3: Estimation of genotypic (above diagonal) correlation coefficients among different characters in tomato (*Solanum lycopersicum* L.)

	DTFF	DTFFS	DTFFH	NOL	PH	NOFPC	PT	FL	FD	SYPF	100SW	AFW	DOF/H	NOP	NOPBPP	NOFPP	FYPP	FYPH	SYPP
DTFF	**1**	0.937**	0.643**	0.009	-0.199	0.112	0.102	0.045	0.019	-0.021	-0.013	-0.009	-0.114	0.132	0.321*	0.018	0.064	0.065	0.005
DTFFS		**1**	0.720**	-0.013	-0.178	0.093	0.159	-0.006	0.080	-0.003	-0.032	0.045	-0.192*	0.097	0.285	-0.019	0.078	0.080	-0.017
DTFFH			**1**	0.107	-0.051	-0.043	0.112	0.099	0.197*	0.019	0.042	0.186	-0.523**	-0.227*	0.019	0.033	0.197*	0.200*	0.037
NOL				**1**	0.004	-0.158	0.247*	0.248*	0.251*	-0.195	-0.117	0.174	-0.199	0.088	-0.245*	-0.007	0.215	0.216	-0.139
PH					**1**	0.155	0.166	0.008	0.116	0.176	0.194	0.211	-0.090	-0.079	0.093	-0.108	0.273*	0.278*	0.160
NOFPC						**1**	-0.132	-0.083	0.099	-0.038	0.183	0.187	-0.193	0.128	0.160	-0.088	0.071	0.069	-0.056
PT							**1**	0.139	0.235	0.250*	0.215	0.194	-0.067	-0.67	-0.152	0.108	0.264*	0.264*	0.236
FL								**1**	0.561**	0.220	0.237	0.560	0.055	-0.199	-0.086	-0.169	0.588**	0.593**	0.083
FD									**1**	-0.0004	0.097	0.754	-0.051	-0.046	0.245*	-0.374*	0.613**	0.618**	-0.212
SYPF										**1**	0.907**	-0.023	0.211	-0.340	0.284*	0.117	0.073	0.080	0.777**
100SW											**1**	0.085	0.192	-0.268*	0.216	0.052	0.154	0.161	0.663**
AFW												**1**	-0.145	-0.029	-0.126	-0.529**	0.843**	0.842**	-0.323**
DOF/H													**1**	0.194	0.199	-0.153	-0.118	-0.124	0.055
NOP														**1**	0.046	-0.198	-0.077	-0.085	0.394**
NOPBPP															**1**	0.225	0.041	0.036	0.386**
NOFPP																**1**	0.532**	0.621**	0.698**
FYPP																	**1**	0.999**	0.443**
FYPH																		**1**	0.512**
SYPP																			**1**

*(**DTFF**-Number of days to 1st flowering, **DTFFS**-Number of days to 1st fruit set, **DTFFH**-Number of days to 1st fruit harvest, **NOL**-Number of locules per fruit, **PH**-Plant height, **NOFPC**-Number of fruits per cluster, **PT**- Pericarp thickness, **FL**- Fruit length, **FD**- Fruit diameter, **SYPF**-Seed yield per fruit, **100SW**-100-seed weight, **AFW**-Average fruit weight, **DOF/H**-Duration of fruiting or harvest, **NOP**- Number of pickings, **NOPBPP**-Number of primary branches per plant, **NOFPP**-Number of fruits per plant, **FYPP**-Fruit yield per plant, **FYPH**- Fruit yield per hectare, **SYPP**- Seed yield per plant.)*

Genetic advance combined with heritability is more useful. Fruit length, fruit diameter, days to first flowering, pericarp thickness, average fruit weight, fruit yield per hectare, and fruit yield per plant showed high heritability and genetic advance as percent of mean. Haydar *et al.*, 2007 and Mohamed *et al.*, 2012 made similar observations. Thus, suggesting that these traits could be used as reliable selection indices, with higher responses expected as a result of selection.

Genotypic correlation coefficients were found higher than the corresponding phenotypic correlation coefficients for all characters. This might be due to the masking effect of environment in the total expression of the genotypes resulting in the reduced phenotypic association. Fruit yield per hectare displayed positive correlation with pericarp thickness (r_g = 0.264), plant height (r_g = 0.273), average fruit weight r_g = (0.842) and fruit yield per plant (r_g = 0.999) (Table 3). Similar correlation of yield per plant was also reported by Maurya *et al*., 2011. Average fruit weight showed positive and significant correlation with fruit yield per plant (r_g = 0.843) and fruit yield per hectare (r_g = 0.842). Similar correlations were reported by Kumar *et al*., 2014. However, Average fruit weight exhibited negative and significant correlation with number of fruits per plant (r_g = -0.529) and seed yield per plant (r_g = -0.323) both at phenotypic and genotypic level as was also reported by Tripathy and Mallikarjunarao (2020).

Table 4: Analysis of variance (ANOVA) for growth, maturity and yield attributing in tomato (*Solanum lycopersicum* L.)

Source of variation	Replication	Treatments	Error
Degrees of freedom	2	57**	114
DTFF	4.96	93.37**	0.9
DTFFS	0.73	77.88**	0.94
DTFFH	1.01	54.69**	1.01
NOL	0.14	1.36**	0.34
PH(cm)	2.05	738.91**	13.96
NOFPC	0.07	1.02**	0.42
PT(mm)	0.0007	2.62**	0.02
FL (cm)	0.009	2.72**	0.002
SYPP(g)	0.13	6.9**	0.46
FD(cm)	0.007	3.22**	0.003
SYPF(g)	0.001	0.008**	0.0003
100SW(g)	0.0002	0.012**	0.0003
AFW(g)	0.99	779.12**	64.64
DOF/H	14.92	34.96**	1.86
NOP	0.39	0.96**	0.26
NOPBPP	0.32	1.25**	0.52
NOFPP	5.76	52.48**	7.64
FYPP(Kg)	0.005	0.17**	0.01
FYPH(q)	!746.97	96319.91**	6101.03

CONCLUSION

Based on the findings of this study, it can be concluded that there was presence of wide variability among genotypes for all of the characters, indicating that there is a sufficient scope for tomato cultivar improvement through selections. Out of 58 genotypes of tomato, EC-162516 exhibited lowest days to first flowering, EC-

151568 showed longest duration of harvest, EC-620401 produced highest number of fruits per plant, EC-914109 had the highest average fruit weight, EC-165690 had the highest fruit yield per plant and highest fruit yield per hectare. These superior genotypes need to be evaluated further for use in future breeding programmes.

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