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Genetic variability, heritability and correlation studies on tomato (*Solanum lycopersicum* L.)

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Abstract
Twenty five tomato genotypes were studied for genetic variability, heritability and correlation studies on tomato (*Solanum lycopersicum* L.) at field experimentation center of department of Horticulture, Naini Agricultural Institute, SHUATS, Prayagraj, Uttar Pradesh, India during *kharfi* 2018-19 in Randomized Block Design. The data was record for nineteen different characters to study genetic variability, heritability, genetic advance, correlation and, analysis of variance among 25 tomato genotypes showed highly significant differences for all the characters indicated the presence of substantial amount of genetic variability. On the basis of mean performance highest fruit yield per plant was exhibited by genotypesPKM-1 followed by Arka rakshak, Pusa hybrid-4 and Arka abha. Highest genotypic coefficient of variance (GCV) and phenotypic coefficient variance (PCV) was observed for plant height followed by fruit weight, number of fruits per plant indicating that these characters could be used as selection for crop improvement. High estimates of heritability were observed for the characters plant height, number of fruits per cluster, days to 50% flowering, fruit length, number of fruits per plant, number of branches per plant, fruit weight. High heritability coupled with high genetic advance were observed for plant height, number of primary branches, days to 50% flowering, fruit length, fruit weight indicating predominance of additive gene effects and the possibilities of effective selection for the improvement of these characters. Correlation study revealed that fruit yield per plant at genotypic and phenotypic level was positively correlated with fruit weight, number of fruits per plant, number of primary branches per plant, number of flowers per cluster, number of locules per fruit. positive non-significant genotypic correlation is seen in fruit width, days to 50% flowering and fruit length.

Keywords: Tomato genotypes, genetic variability, heritability, correlation

Introduction
Tomato (*Solanum lycopersicum* L.) is one of the most important Solanaceous vegetable crops grown widely all over the world. It is a very versatile vegetable for culinary purposes. Ripe fresh tomato in the preparation of range of processed products such as puree, paste, powder, ketchup, sauce, soup and canned whole fruits. Unripe green fruits are used for preparation of pickles and chutney. Tomatoes are important source of lycopene (an antioxidant), ascorbic acid and ß-carotene and valued for their colour and flavour.

In India, it occupies in area of 0.54 million hectares with a production of 7.60 million tonnes with an average yield of 14.074 tonne per hectare. Karnataka is one of the major tomato growing states covering an area of 0.4 million hectare with a production of 1.14 million tonne and an average yield of 2.85 t per ha (Anonymous, 2006) [10].

Tomato belongs to the family Solanaceae and is native of Peru Equator region (Rick, 1969). The genus Lycopersicon consists of annual or short lived perennial herbaceous plants. Tomato is a typical day neutral plant and is mainly self-pollinated, but a certain percentage of cross-pollination also occurs. It is a warm season crop reasonably resistant to heat and drought and grows under wide range of soil and climatic conditions.

The tomato crop is being produced in most of the countries with an estimated global production of over 163 million metric tons from an area of 4.81 million hectares (FAO, 2017) where India (11.5%) stands second in position next to China (30.7%) in production. The United States of America (8.1%), Turkey (7.0), Egypt (5.3%), Iran (3.7%), Italy (3.1%), Spain (2.5%), Brazil (2.4%) and Mexico (2.1%) are the other major producers of tomato According to the latest estimates (by the review committee meeting, National Horticultural Board (NHB for the year 2017-18) tomato is cultivated in area of 0.809 million hectares with a production of 19.700 million metric tonnes at a productivity of 24.35 MT/ha in India. where Andhra Pradesh (17.9%) stands first in position followed by Karnataka (11.0%), Madhya Pradesh (10.3%), Telangana (7.9%), Odissa (7.4%), Gujarat (6.72%), Maharashtra (6.4%), West Bengal (6.0%), Bihar (5.67%), Chhattisgarh (4.3%) Uttar Pradesh (4.19%) and Himachal Pradesh (3.3%).

University of Agriculture, Technology and Sciences, Prayagraj (U.P.) India. The results of The Present Investigation "Genetic Variability, Heritability and Correlation Studies on Tomato (*Solanum lycopersicum* L.)" have been discussed and interpreted in the light of previous research work done in India and abroad. The experiment was conducted in Completely Randomized design with 7 treatments, and three replications.

Materials and Methods

The experiment was conducted in Randomized Block Design with three replication during the *KHARIF* season of 2018 at Sam Higginbottom University of Agriculture Technology and Science, Prayagraj, UP. The experimental material comprised of 25 genotypes, details of germplasms given in (table -1). A spacing of 60 cm ×45 cm was adopted and all the standard practices and plant protection measures were timely adopted to rise the crop successfully. Observations were recorded on five randomly selected competitive plants per replication for each entry on five randomly selected competitive plants per replication for each entry on nineteen quantitative and qualitative traits *viz.*, Days to first flowering, days to 50% flowering, plant height (cm), number of branches per plant, number of flowers per plant, number of flowers pre cluster, days to first fruit set, number of frit cluster per plant, number of fruits per cluster, number of fruits per plant, fruit yield per plant (kg), fruit yield per plot, total yield (kg), average fruit weight (g), fruit length (cm),fruit diameter (cm),total soluble solids (brix), ascorbic acid (mg), pericarp thickness (mm), number of locules per fruit. The data regarding above mentioned characters were averaged and subjected to analysis of variance. The genotypic and the phenotypic coefficients of variation were calculated according to the formula given by. H eritability in broad sense and genetic advance as per cent of mean were computed by following the methods of respectively.

Table 1: List of genotypes in the present investigation

Sl. No.	Genotype	Source
1	ARKA ABHA	IIHR, Bangalore
2	ARKA VIKAS	IIHR, Bangalore
3	ARKA RAKSHAK	IIHR, Bangalore
4	ARKA SAMRAT	IIHR, Bangalore
5	VYBHAV	UAS, Bangalore
6	SAKATA	UAS, Bangalore
7	SWEKARA	UAS, Bangalore
8	PKM-1	TNAU, Coimbatore
9	CO-3	TNAU, Coimbatore
10	PUSA HYBRID-4	IARI, New Delhi
11	PUSA RUBY	IARI, New Delhi
12	PUSA ROHINI	IARI, New Delhi
13	EC-66883	WVC, Taiwan
14	VRT-32-1	WVC, Taiwan
15	RIO GRAND	UAS, Bangalore
16	ECS2007	WVC, Taiwan
17	HISSAR ARUN	HAU, Hisar
18	KASI ANUPAM	IIVR, Varanasi
19	ARKA VISAL	IIHR, Bangalore
20	CO-1	TNAU, Coimbatore
21	TRIPUR SMAL	TNAU, Coimbatore
22	NAVEEN	IIHR, Bangalore
23	C-H-115	IIHR, Bangalore
24	C-L-N1621	IIHR, Bangalore
25	BHARAT RATNA-22	UAS, Bangalore

Results and discussion

The number of days of first flowering in the genotypes ranged from 28.00 to 30.27 with a grand mean of 29.25 (Table 2). The genotype ArkaRakshak took only 28.00 days and ArkaSamrat took 30.27 days to reach first flowering. Similar results were reported by Chattopadhyay, A. and Paul, a 2012 International journal of Horticulture 405-410

The number of days to fifty per cent flowering in the genotypes ranged from 48.40 to 50.60 with a grand mean of 49.40 (Table 2). The genotype Vybhav took only 48.40 days, while the genotype ArkaSamrat were found to be late 50.60 days. Among all genotypes tested for above trait, twenty five genotypes were significantly higher wear as fifth genotypes reported lower when compared to grand mean (49.40) respectively. Similar results were reported by Padma, E., Ravishankar, C. and Srinivasulu, R. (2002) [14]. Singh, J.K, Singh, J.P, Jain, S.K. and Aradhana, J. 2004 [13]. Ara, A., Rajnarayan, Nazeer Ahmed and Khan, S. H (2009) [8].

Plant height of genotypes ranged from 58.80 cm to 139.13 cm with a grand mean of 85.90 cm (Table 2). Among all the genotypes, PUSA Hybrid-4 (139.13 cm) recorded maximum followed by ArkaRakshak (126.87 cm), while minimum plant height was observed in genotype C-L-N1621 (58.80 cm). A total of twelve genotypes recorded significantly higher values than grand mean (85.90 cm). The results are in concurrence with the findings of Padma, E., Ravishankar, C. and Srinivasulu, R. (2002) [14]. Singh, J.K, Singh, J.P, Jain, S.K. and Aradhana, J. 2004 [13]. Ara, A., Rajnarayan, Nazeer Ahmed and Khan, S. H (2009) [8].

The mean values for number of primary branches per plant in the genotypes range from 5.33 to 12.60 (Table 2) with a grand mean of 8.74. The genotype CO-1 (12.60) recorded more number of primary branches per plant followed by Arka Vishal (11.80), while two genotypes KasiAnupam and HissarArun were recorded same number of branches that is 10.20 respectively. Whereas less number of primary branches per plant was recorded in Tripur Small (5.33). Thirteen genotypes were significantly higher when compared to grand mean (8.74). The present results are in close conformity with the findings of Padma, E., Ravishankar, C. and Srinivasulu, R. (2002) [14]. Singh, J.K, Singh, J.P, Jain, S.K. and Aradhana, J. 2004 [13]. Ara, A., Rajnarayan, Nazeer Ahmed and Khan, S. H (2009) [8].

Among the genotypes, number of flowers per cluster varied from 4.40 to 6.0 with a grand mean of 5.26Highest number of flowers per cluster was recorded in the genotype Sakata & EC66883 (6.00) followed by ArkaRakshak (5.60), while lowest number was found in HissarArun (4.40). A total of nineteen genotypes were significantly higher when compared to grand mean (5.26). The present results are supported Singh, J.K, Singh, J.P, Jain, S.K. and Aradhana, J. 2004 [13].

Days to first fruit set ranged from 48.73 to 50.47 days with a grand mean of 49.33 (Table 2). Among the genotypes, less number of days taken for first fruit set was recorded in CO-3 (48.73 days) followed by ArkaRakshak & Pusa Hybrid-4 (48.80 days), whereas more number of days for first fruit set was recorded in PKM-1 (50.47). Half of the genotypes *i.e.*, 15 genotypes were significantly higher when compared to grand mean (49.33). The findings are in agreement with the reports Singh, D.N, Sahu, A. and Parida, A.K. 1997 [15]. of Padma, E., Ravishankar, C. and Srinivasulu, R. (2002) [14].

The mean values for the number of fruits per cluster ranged from 2.47 to 4.07 with a grand mean of 2.91 (Table 2). The genotype PKM-1 (4.07) recorded higher number of fruits per cluster followed by ArkaVikas (4.00), whereas, the genotype

C-L-N1621 (2.47) recorded lower number of fruits per cluster. A total of six genotypes were significantly superior to the grand mean (2.91). The results are in concurrence with the findings of Singh, D.N, Sahu, A. and Parida, A.K. 1997 [15]. Ara, A., Rajnarayan, Nazeer Ahmed and Khan, S. H (2009) [8].

The number of fruit cluster per plant ranged from 4.47 to 15.47 with overall mean of 9.08. (Table 2). The highest number of fruit cluster per plant was noted in PKM-1 (15.47) followed by CO-3 (13.33) and the minimum number of fruit cluster per plant was observed in Pusa Rohini (4.47). A total number of 11 genotypes were showing more number of fruit cluster per plant then grand mean (9.08).Similar findings were observed Singh, D.N, Sahu, A. and Parida, A.K. 1997 [15].

The number of fruit per plant ranged from 7.53 to 31.40 with overall mean of 15.31. (Table 2).The highest number of fruit per plant was noted in PKM-1 (31.40) followed by ArkaVikas (27.53) and the minimum number of fruits per plant was observed in Naveen (7.53). A total number of 10 genotypes were showing more number of fruits per plant then grand mean (15.31).Similar findings were observed by Nair, P.I. and Thambu Raj, S. 1995 [16]. Padma, E., Ravishankar, C. and Srinivasulu, R. (2002) [14].

The fruit yield per plant varied from 1.07 kg to 2.87 kg with a grand mean of 1.83 kg (Table 2). The genotype PKM-1 (2.87 kg) was observed with maximum fruit yield per plant followed by ArkaRakshak & Pusa Hybrid-4 (2.80 kg) while, the genotype Tripur Small (1.07 kg) recorded minimum fruit yield per plant among all the genotypes studied. A total of eleven genotypes were recorded to be significantly wider fruits when compared to the grand mean (1.83 kg).Similar results were reported by Singh, J. P. Singh, D. K. and Lal, G. 2000. Nair, P.I. and Thambu Raj, S. 1995 [16]. Padma, E., Ravishankar, C. and Srinivasulu, R. (2002) [14].

The total yield per plot varied from 3.60 kg to 13.33 kg with a grand mean of 7.53 kg (Table 2). The genotype PKM-1(13.33 kg) was observed with maximum total yield per plot followed by Arka Rakshak & CO-3 (12.00 kg) while, the genotype EC66883 (3.60 kg) recorded minimum yield per plot among all the genotypes studied. A total of ten genotypes were recorded to be significantly wider fruits when compared to the grand mean (7.53 kg).Similar results were reported Nadeem, K., Munawar, M., and Chishti, S.A.S. (2013) [17]. Prashanth, S.J., Jaiprakashnarayan, R.P., Mulge, R. and Madalageri, M.B. (2008) [18].

The mean values for fruit weight in the genotypes ranged from 25 g to 119.33 g with a grand mean of 60.80 g (Table 2). Among the genotypes evaluated, more fruit weight was recorded in Pusa Hybrid-4 (119.33g) followed by Pusa Ruby (114.33 g) while less average fruit weight was recorded in Tripur Small (25g). A total of twelve genotypes were significantly superior to the grand mean (60.80 g). Results are underpinned with the findings of Prashanth, S.J., Jaiprakashnarayan, R.P., Mulge, R. and Madalageri, M.B. (2008) [18]. Padma, E., Ravishankar, C. and Srinivasulu, R. (2002) [14]. Singh, J.K, Singh, J.P, Jain, S.K. and Aradhana, J. 2004 [13]. The trait fruit length varied from 3 cm to 5.87 cm with a grand mean of 4.12 cm (Table 2). The genotype Pusa Hybrid-4 (5.87 cm) was observed with maximum fruit length followed by Pusa Ruby (4.57 cm) while, the genotype Tripur Small (3cm) recorded minimum fruit length among all the genotypes studied. A total of twelve genotypes were recorded to be significantly wider fruits when compared to the grand mean (3.30 cm). Similar results were reported Prashanth, S.J., Jaiprakashnarayan, R.P., Mulge, R. and Madalageri, M.B. (2008) [18]. Padma, E., Ravishankar, C. and Srinivasulu, R. (2002) [14].

The trait fruit diameter varied from 2.10 cm to 4.60 cm with a grand mean of 3.30 cm (Table 2). The genotype Swekara (4.60 cm) was observed with maximum fruit width followed by ArkaAbha (4.20 cm) while, the genotype CO-1 (2.10cm) recorded minimum fruit diameter among all the genotypes studied. A total of twelve genotypes were recorded to be significantly wider fruits when compared to the grand mean (3.30 cm).Similar results were reported Singh, D.N, Sahu, A. and Parida, A.K. 1997 [15]. Ara, A., Rajnarayan, Nazeer Ahmed and Khan, S. H (2009) [8].

The trait total soluble solids among the genotypes evaluated varied from 3.12 to 4.73 °Brix with grand mean of 3.90°Brix (Table 2). The genotype, ArkaRakshak (4.73 °Brix) recorded maximum values followed by ArkaAbha (4.70°Brix) whereas, the genotype

Swekara (3.12°Brix) recorded minimum values. A total of sixteen genotypes were significantly higher when compared to the grand mean (3.90°Brix). These results are in correspondence to Verma, S.K. and Sarnaik, D.A. (2000) [19]. Padma, E., Ravishankar, C. and Srinivasulu, R. (2002) [14]. Singh, J.K, Singh, J.P, Jain, S.K. and Aradhana, J. 2004 [13].

Mean vitamin c content varied from 28.30 (Tripur small) to 38.41(PKM-1) with over all mean of 32.65.The highest amount of vitamin c content was found to be in PKM-1 (38.41) and the least amount of vitamin c content was found to be in Tripur Small (28.30). Similar findings were reported Nair, P.I. and Thambu Raj, S. 1995 [16]

The Pericarp thickness per fruit varied from 2.50 (Sakata) to 8.10 (Rio Grand) with over all mean of 5.03. The second highest Pericarp thickness Swekara & HisarArun (8.00) followed by Rio Grand. The findings are analogous to the results of Choudhary, B., Punia, R.S and Sangha, H.S 2005Indian J. Hort.., 22:52-59.

The mean values for number of locules per fruit varied from 2 to 5 with a grand mean of 3.60 (Table 2). The genotype Rio Grand, Vybhav, EC66883, CLN1621 (5) recorded more number of locules followed by ArkaVikas, PKM-1, Pusa Hybrid-4, Pusa Ruby, ECS2007, KasiAnupam, CO-1, Tripur Small, C-H-115, Bharat Ratan-22 (4) recorded the same number of locules respectively and the less number of locules were recorded in Sakata &ArkaSamrat, Arka Vishal (2). Among the genotypes evaluated, fourteen genotypes were significantly higher when compared to the grand mean (3.60). The findings are analogous to the results of Singh, J. P. Singh, D. K. and Lal, G. 2000. Nair, P.I. and Thambu Raj, S. 1995 [16]. Padma, E., Ravishankar, C. and Srinivasulu, R. (2002) [14].

The total yield varied from 11 kg (EC66883 & VRT-32-1) to 40 kg (PKM-1) with over all mean of 22.60 kg. The second highest total yield was CO-3 (36.00 kg) followed by PKM-1.

Lakshmi kanth and mani, V. P 2004. Association and contribution of different characters towards fruit yield in tomato *(lycopersicon esculentum mill.)*. Indian j. Horti. 61 (4):327-330.treatment T_7 (Custard Apple 600g +Apple 400g) with (6.67, 6.55, 6.43 and 6.24) during 90 days storage. The texture is directly related to the setting of product and setting is a result of good pectin content Custard Apple 200g +Apple 800g was judged best for consistency of value added Apple and Custard Apple cheese from it. There results coincide with the Studies conducted by Padma, E., Ravishankar, C. and Srinivasulu, R. (2002) [14]. Singh, J.K, Singh, J.P, Jain, S.K. and Aradhana, J. 2004 [13]. Ara, A., Rajnarayan, Nazeer Ahmed and Khan, S. H (2009) [8].

Table 2: Genotypic correlation coefficient for 25 characters for tomato genotypes

Characters	days of first flowering	days for 50% flowering	plant height	number of branches per plant	no. of flowers per cluster	days to first fruit set	no of fruits per cluster	no of fruit ciusters per plant	number of fruit per plant	fruit yield per plot	total yield per plot(kg)	fruit weight (g)	Fruit Length (cm)	fruit diameter (in cm)	TSS (BRIX)	Ascorbic acid (in mg)	pericarp thickness (mm)	No of locules per fruit	total yield
1	1.00	0.069NS	-0.235*	-0.031NS	-0.466**	-0.759**	-0.662**	0.201NS	-0.378**	-0.252*	-0.106NS	0.194NS	0.183NS	-0.413**	-0.259*	0.112NS	0.219NS	0.134NS	-0.126NS
2		1.00	0.306**	0.185NS	-0.151NS	-0.221NS	0.187NS	0.325**	0.072NS	0.103NS	0.158NS	0.020NS	-0.075NS	-0.423**	0.174NS	0.039NS	0.064NS	-0.294**	0.149NS
3			1.00	0.319**	-0.314**	-0.473**	0.630**	0.276*	0.264*	0.428**	0.325**	0.292**	0.263*	0.044NS	0.344**	0.026NS	0.326**	-0.084NS	0.320**
4				1.00	-0.014NS	-0.001NS	0.239*	0.680**	0.583**	0.692**	0.713**	0.492**	0.549**	-0.084NS	0.511**	0.568**	0.103NS	-0.331**	0.712**
5					1.00	1.581**	0.059NS	0.115NS	0.358**	0.099NS	0.083NS	0.084NS	0.142NS	0.134NS	0.382**	-0.112NS	-0.197NS	0.273*	0.084NS
6						1.00	0.011NS	0.082NS	0.584**	0.300**	0.168NS	0.121NS	0.248*	0.235*	0.597**	-0.211NS	-0.310**	0.396**	0.126NS
7							1.00	0.374**	0.812**	0.711**	0.512**	0.256*	0.259*	0.510**	0.569**	0.126NS	-0.021NS	-0.244*	0.509**
8								1.00	0.818**	0.690**	0.811**	0.444**	0.577**	0.193NS	0.720**	0.292**	0.081NS	-0.262*	0.815**
9									1.00	0.917**	0.804**	0.434**	0.537**	0.404**	0.767**	0.374**	-0.013NS	-0.262*	0.786**
10										1.00	0.873**	0.626**	0.723**	0.184NS	0.678**	0.514**	0.101NS	-0.170NS	0.873**
11											1.00	0.390**	0.672**	0.086NS	0.757**	0.559**	0.099NS	-0.114NS	1.015**
12												1.00	0.733**	-0.053NS	0.380**	0.274*	0.100NS	-0.070NS	0.379**
13													1.00	0.061NS	0.390**	0.597**	0.341**	0.007NS	0.663**
14														1.00	0.154NS	-0.024NS	0.209NS	-0.124NS	0.085NS
15															1.00	0.154NS	0.096NS	-0.067NS	0.728**
16																1.00	0.081NS	-0.328**	0.542**
17																	1.00	-0.005NS	0.095NS
18																		1.00	-0.121NS
19																			1.00

Table 3: Phenotypic correlation coefficient for 25 characters for tomato genotypes

Characters	days of first flowering	days for 50% flowering	plant height	number of branches per plant	no. Of flowers per cluster	days to first fruit set	no of fruits per cluster	no of fruit ciusters per plant	number of fruit per plant	fruit yield per plot	total yield per plot(kg)	fruit weight (g)	Fruit Length (cm)	fruit diameter (in cm)	TSS(BRIX)	Ascorbic acid (in mg)	pericarp thickness (mm)	No of locules per fruit	total yield
1	1.00	0.052NS	-0.161NS	-0.017NS	-0.162NS	-0.120NS	-0.384**	-0.050NS	-0.226*	-0.195NS	-0.116NS	0.153NS	0.138NS	-0.259*	-0.153NS	0.099NS	0.149NS	0.121NS	-0.089NS
2		1.00	0.289*	0.177NS	-0.109NS	-0.098NS	0.146NS	0.249*	0.050NS	0.103NS	0.134NS	0.029NS	-0.066NS	-0.395**	0.154NS	0.038NS	0.061NS	-0.264*	0.149NS
3			1.00	0.314**	-0.238*	-0.207NS	0.516**	0.211NS	0.263*	0.379**	0.308**	0.285*	0.255*	0.052NS	0.306**	0.024NS	0.323**	-0.081NS	0.317**
4				1.00	0.001NS	-0.016NS	0.214NS	0.576**	0.550**	0.609**	0.695**	0.462**	0.515**	-0.065NS	0.442**	0.529**	0.100NS	-0.324**	0.696**
5					1.00	0.782**	0.110NS	0.066NS	0.242*	0.064NS	0.060NS	0.049NS	0.115NS	0.113NS	0.255*	-0.085NS	-0.148NS	0.191NS	0.058NS
6						1.00	0.136NS	0.112NS	0.179NS	-0.040NS	0.021NS	0.048NS	0.074NS	0.072NS	0.205NS	-0.044NS	-0.122NS	0.176NS	0.050NS
7							1.00	0.414**	0.598**	0.517**	0.434**	0.193NS	0.176NS	0.447**	0.484**	0.147NS	-0.003NS	-0.143NS	0.439**
8								1.00	0.604**	0.514**	0.685**	0.337**	0.419**	0.179NS	0.554**	0.243*	0.067NS	-0.198NS	0.678**
9									1.00	0.763**	0.719**	0.411**	0.507**	0.401**	0.677**	0.336**	-0.011NS	-0.259*	0.752**
10										1.00	0.755**	0.514**	0.570**	0.186NS	0.502**	0.405**	0.087NS	-0.172NS	0.755**
11											1.00	0.354**	0.623**	0.080NS	0.629**	0.501**	0.089NS	-0.123NS	0.971**
12												1.00	0.704**	-0.051NS	0.344**	0.264*	0.097NS	-0.062NS	0.374**
13													1.00	0.058NS	0.328**	0.539**	0.322**	-0.017NS	0.640**
14														1.00	0.154NS	-0.022NS	0.205NS	-0.118NS	0.083NS
15															1.00	0.217NS	0.116NS	0.019NS	0.679**
16																1.00	0.091NS	-0.229*	0.531**
17																	1.00	0.008NS	0.097NS

18																		1.00	-0.108NS
19																			1.00

Mean performance for fruit yield and its components along with quality traits in tomato

Genotypes	days of first flowering	days for 50% flowering	plant height (cm)	number of branches per plant	No. Of flowers per cluster	days to first fruit set	no of fruits per cluster	no of fruit clusters per plant	number of fruit per plant	fruit yield per plant(kg)	total yield per plot(kg)	fruit weight (g)	Fruit Length (cm)	fruit diameter (in cm)	TSS (BRIX)	Ascorbic Acid (in mg)	pericarp thicknes s (mm)	No of locules per fruit	total yield (kg)
ARKA ABHA	28.20	49.40	93.87	7.27	5.60	50.47	2.60	12.93	23.80	2.73	10.67	69.67	4.33	4.20	4.70	28.96	5.00	3.00	32.00
ARKAVIKAS	29.20	49.27	86.27	9.33	5.60	49.53	4.00	12.40	27.53	2.53	10.33	65.67	4.40	4.07	4.61	36.35	4.10	4.00	31.00
ARKARAKSHAK	28.00	50.07	126.87	11.27	4.60	48.80	3.93	9.80	21.27	2.80	12.00	62.67	4.07	3.57	4.73	33.49	6.20	3.00	36.00
ARKA SAMART	30.27	50.60	95.60	11.33	5.60	49.07	3.20	12.33	21.60	2.07	9.33	61.33	4.20	3.40	4.10	34.35	6.30	2.00	28.00
VYBHAV	29.40	48.40	84.00	9.27	4.40	49.87	2.60	8.13	14.67	1.53	5.33	56.67	4.03	3.37	3.90	29.45	5.00	5.00	16.00
SAKATA	28.87	50.27	75.60	7.80	6.00	48.93	2.87	6.13	12.73	1.53	4.33	48.00	3.43	2.93	3.13	34.55	2.50	2.00	13.00
SWEKARA	28.87	48.73	81.40	8.33	5.60	49.27	2.80	5.27	12.07	1.58	3.67	38.33	3.77	4.60	3.12	31.42	8.00	3.00	11.00
PKM-1	29.07	49.20	68.53	10.87	4.80	50.47	4.07	15.47	31.40	2.87	13.33	61.33	5.63	3.17	4.25	38.41	5.50	4.00	40.00
CO-3	29.07	48.47	70.67	10.73	5.40	48.73	2.87	13.33	19.80	1.87	12.00	38.00	4.00	3.70	4.12	34.12	4.00	3.00	36.00
PUSA HYBRID-4	29.27	49.47	139.13	11.67	5.60	48.80	3.67	12.80	19.93	2.80	11.33	119.33	5.87	3.27	3.91	36.01	6.00	4.00	34.00
PUSA REBY	29.67	49.40	71.93	10.00	4.80	49.53	2.67	13.13	18.80	2.47	7.33	114.33	4.57	3.13	4.10	29.34	4.00	4.00	22.00
PUSA ROHINI	29.33	48.67	75.33	9.13	5.00	49.67	2.80	4.47	16.67	2.07	6.33	96.00	4.10	3.03	4.30	35.15	4.00	3.00	19.00
EC66883	28.67	49.20	73.33	6.27	6.00	49.53	2.73	4.87	10.07	1.27	3.67	42.00	3.10	3.17	3.20	29.63	3.41	5.00	11.00
VRT-32-1	29.40	49.33	86.93	6.40	5.00	48.13	2.73	4.87	9.67	1.47	3.67	35.33	3.73	2.93	3.20	32.56	5.00	3.00	11.00
RIO GRAND	29.67	50.27	98.53	6.13	5.60	49.40	2.60	6.67	8.73	1.20	5.67	55.67	4.00	2.50	4.12	29.20	8.10	5.00	17.00
ECS2007	28.53	49.33	91.00	7.53	5.40	50.27	3.00	7.47	10.00	1.13	4.33	34.67	3.33	3.43	3.96	31.22	4.00	4.00	13.00
HISSAR ARUN	29.87	49.33	95.00	10.20	4.40	48.27	2.47	11.93	13.93	2.00	8.67	79.33	4.47	3.40	4.10	34.61	8.00	3.00	26.00
KASI ANUPAM	29.47	49.67	74.40	10.20	5.40	49.40	2.73	10.60	14.93	1.67	8.67	85.33	4.50	3.40	4.02	33.01	4.00	4.00	26.00
ARKA VISHAL	29.07	49.73	87.60	11.80	5.60	49.93	2.60	10.80	15.00	1.33	7.00	70.00	4.30	2.83	4.13	33.46	5.00	2.00	21.00
C0-1	29.53	50.13	85.33	12.60	5.60	49.27	2.67	9.87	15.60	2.47	11.33	52.33	3.90	2.10	3.90	34.32	4.10	4.00	34.00
TRIPUR SMALL	29.47	49.93	83.40	5.33	5.40	49.13	2.60	10.67	9.20	1.07	5.67	25.00	3.00	3.23	4.00	28.30	3.50	4.00	17.00
NAVEEN	29.33	49.33	59.20	6.27	5.20	49.27	2.67	6.07	7.53	1.27	5.33	58.33	4.13	3.00	3.30	31.33	5.00	3.00	16.00
C-H-115	29.47	48.87	104.47	7.07	4.80	48.87	2.87	4.87	9.87	1.47	6.33	44.00	3.77	3.17	3.60	29.32	4.00	4.00	19.00
C-L-N1621	29.67	49.07	58.80	6.20	5.00	49.40	2.47	5.33	8.07	1.13	6.00	39.00	4.10	3.40	3.70	34.22	6.00	5.00	18.00
BHARAT RATAN -22	30.00	48.87	80.33	5.53	5.20	49.33	2.60	6.73	9.87	1.53	6.00	67.67	4.30	3.43	3.30	33.42	5.00	4.00	18.00
Mean	29.25	49.40	85.90	8.74	5.26	49.33	2.91	9.08	15.31	1.83	7.53	60.80	4.12	3.30	3.90	32.65	5.03	3.60	22.60
SE	0.38	0.16	1.96	0.34	0.19	0.38	0.23	1.73	1.51	0.27	0.68	3.13	0.14	0.13	0.1687	0.5774	0.11	0.23	0.45
CD5%	0.77	0.31	3.95	0.68	0.38	0.76	0.47	3.48	3.04	0.55	1.37	6.29	0.28	0.26	0.3393	1.1608	0.23	0.45	0.91
CV	1.60	0.39	2.80	4.74	4.35	0.94	9.85	23.34	12.10	18.28	11.06	6.30	4.12	4.76	5.2990	2.1659	2.75	7.69	2.45
Max	30.27	50.60	139.13	12.60	6.00	50.47	4.07	15.47	31.40	2.87	13.33	119.33	5.87	4.60	4.73	38.41	8.10	5.00	40.00
Min	28.00	48.40	58.80	5.33	4.40	48.13	2.47	4.47	7.53	1.07	3.67	25.00	3.00	2.10	3.12	28.30	2.50	2.00	11.00

Conclusion

As performance of genotype for the different parameters for growth, quality and yield, genotype PKM-1was superior in terms of fruit yield per hectare and followed by ARKA RASHAK. Large amount of variability was observed in the experiment for selection.

The highest heritability coupled with highest genetic advance were observed for characters viz., radial diameter followed by frit weight, polar diameter, yield per plant, fruit set (%), number of fruits per plant, plant height, yield per hectare. Therefore these characters should be given importance while selection. Further positive correlation of these characters with yield and high direct effect proved their genetic variability for selection and improvement of tomato.

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