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## Genetic evaluation of different varieties of tomato (*Solanum lycopersicum* L.) under Prayagraj agro-climatic conditions

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**Abstract**

A field experiment was conducted during August to December 2019 at the Horticulture Research Farm, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology & Sciences, Prayagraj to study the "Genetic evaluation of different varieties of Tomato (*Solanum lycopersicum* L.) under Prayagraj Agro-climatic conditions". The experiment was conducted in Complete Randomized Block Design having 15 various Varieties/Treatments in three replications. The allocation of treatments of the individual plots using random number in each replication. The plant height ranged from 92.98 to 177.46 cm. The minimum plant height (92.98 cm) was recorded in Pusa Hybrid (F1) which was significantly over all other treatments. Based on the results obtained, Days for 50 per cent flowering (31.92 days), maximum number of Fruit setting (66.18), maximum number of Cluster's per plant (5.36) and maximum number of Fruits per plant (29.47) and maximum TSS (Brix) is (4.48) and maximum value of Ascorbic acid and acidity is (23.94) (0.214) and maximum fruit yield per hectare (17.42 ton/ha).

**Keywords:** Tomato genotypes, genetic variability, heritability, correlation, randomized block design

**1. Introduction**

Botanically, Tomato belongs to the genus *Solanum* and species *Lycopersicum*, which is further divided into two sub-families Solanoideae and Cestoidean. The Tomato *S. lycopersicum* L.  $2n=2x=24$ . The Tomato is also known as the Wolf peach and Love of Apple is one of the most important vegetable in the world. It is a perennial herbaceous crop of the family Solanaceae. The primary center of *Lycopersicum* species is in the Andes Mountains in Peru- Ecuador-Bolivia region and eastern Andes is secondary region. Tomato is a warm season crop and both self- & cross-pollinated crop which is harvested at different stages of maturity depending upon the distance of the market and their utilization and consumed fresh or preserved through canning.

India ranks second world wide shares 8.6% of vegetable production. Agriculture and allied sectors accounted for 15.0% of the GDP in 2010 (Economic Survey of India, 2011). In India vegetables are grown in 7.96 million hectares with a production of 133.70 million tones with productivity of 16.79tonnes/hectare. (Indian Horticulture Database, NHB, 2010)

Tomato (*Lycopersicon esculentum* Mill.), Nutrition value per 100 g. in Tomato fruit, Principle Nutrient Value Percentage of Energy 18 Kcal 1%, Carbohydrates 3.9 g, 3%, Protein 0.9 g 1.6%, Total Fat 0.2 g 0.7%, Vitamins Folate 15 mcg 4%, Vitamin A 833 IU 28%, Vitamin C 13 mg 21.5%, Vitamin E 1.54 mg 4%, Phyto-nutrients Carotene- $\beta$  449 mcg --, Carotene- $\alpha$  101 mcg, Lycopene 2573 mcg. (USDA National Nutrient data base, 2009-10)

**2. Objectives**

- To find out the most suitable genotypes for fruit yield and quality of tomato.
- To access the qualitative and quantitative attributes of tomato.
- Estimation of genetic variability, heritability, genetic diversity for yield and its component characters in tomato.
- To study the correlation and estimate the direct and indirect effects of various yield components of tomato genotypes.

### 3. Materials and Methods

#### 3.1 Experimental sit

The experiment was conducted at Vegetable Research Farm, Department of Horticulture, Naini, Agricultural Institute, Sam Higgin bottom University of Agriculture, Technology & Sciences, PRAYAGRAJ (UP) during 2019-2020. All the facilities necessary for cultivation, including labor were made available in the department.

#### 3.2 Experimental Material

The experimental plot was ploughed twice, harrowed and planked to remove weeds and crush the clods. Then it was made into required size plots and leveled after incorporation of FYM at the rate of 25 tons/ha. Then the individual plots of scheduled size are laid out as per the plan design (R.B.D) with intermittent bunds and irrigation channels. The spacing maintained between rows was 45cm and between plants was 30cm.

#### 3.3 Seeds of tomato of different varieties are:

- i. Arka Rakshak (F1 hybrid)
- ii. Arka Sourabh
- iii. Arka Vikas
- iv. Arka Alok
- v. Arka Meghali
- vi. Kashi Abhiman (F1 hybrid)
- vii. Kashi Amrit
- viii. Kashi Vishesh
- ix. Kashi Anupam
- x. Kashi Aman
- xi. Kashi Adarsh
- xii. Pusa hybrid-4
- xiii. Pusa Ruby
- xiv. Pusa Rohini
- xv. P.K.M- 1.

### 4. Results and Discussion's

The experiment results of the present investigation entitled "Genetic evaluation of different varieties of Tomato (*Solanum lycopersicum* L.) under Prayagraj Agro climatic conditions" have been presented and the result obtained for genotypic and phenotypic coefficient of variation, heritability in broad sense, genetic advance, advance, genetic advance, genetic as percent of mean, correlation coefficient Genetic diversity (D2) analysis of these traits with yield have been discussed in light of research work reported with suitable cause of and effect reasoning

#### 4.1 Analysis of variance

Analysis of variance showed significant differences among the genotypes for the 15 characters studied. Analysis of variance showed significant difference among the genotypes for the different characters at 0.1% and 1% significance. The mean sum of squares due to genotype for different characters are presented in (Table 4.1).

#### 4.2 Mean performance of the genotypes

The mean of the different traits for 15 genotypes of tomato have been presented in Table 4.2.

##### 4.2.1 Plant height (cm)

The character plant height exhibited a wide range of variation 92.98 to 177.46 with a grand mean of 133.194. The highest plant height of genotype Arka Meghali (177.46). While

lowest plant height was observed for Pusa Hybrid (F1) (92.98).

##### 4.2.2 Number of primary branches

The character number of primary branches exhibited a wide range of variation 11.00 to 19.23 with a grand mean of 16.63. The highest number of primary branches of genotype Arka Meghali (19.23). While lowest number of primary branches was observed for PKM-1 (11.00).

##### 4.2.3 Number of primary branches

The character number of primary branches exhibited a wide range of variation 11.00 to 19.23 with a grand mean of 16.63. The highest number of primary branches of genotype Arka Meghali (19.23). While lowest number of primary branches was observed for PKM-1 (11.00)

##### 4.2.4 Days to first flowering

The character days to first flowering exhibited a wide range of variation 21.69 to 28.37 with a grand mean of (23.69). The highest days to first flowering Pusa Ruby (28.37). While lowest days to first flowering was observed for Arka Meghali (21.69)

##### 4.2.5 Days to 50% flowering

The character days to 50% flowering exhibited a wide range of variation 29.44 to 33.74 with a grand mean of 31.92. The highest days to 50% flowering of genotype Kashi Abhiman (F1) (33.74). While lowest days to 50% flowering was observed for Arka Meghali (29.44)

##### 4.2.6 Days to fruit setting

The character days to fruit setting exhibited a wide range of variation 52.20 to 72.66 with a grand mean of 66.18. The highest days to fruit setting of genotypes Arka Vikas (72.66). While lowest days to fruit setting was observed for Kashi Adarsh (52.20).

##### 4.2.7 No. of fruit per cluster

The character no. of fruit per cluster exhibited a wide range of variation 10.53 to 18.78 with a grand mean of 12.56. The highest no. of fruit per cluster of genotypes Arka Meghali (18.78). While lowest no. of fruit per cluster was observed for PKM-1 (10.53)

##### 4.2.8 No. of cluster per plant

The character No. of cluster per plant exhibited a wide range of variation 4.37 to 6.66 with a grand mean of 5.36. The highest No. of cluster per plant of genotypes Arka Meghali (6.66). While lowest No. of cluster per plant was observed for Pusa Ruby (4.37).

##### 4.2.9 No. of fruit per plant

The character No. of fruit per plant exhibited a wide range of variation 19.12 to 42.94 with a grand mean of 29.47. The highest No. of fruit per plant of genotypes Arka Meghali (42.94). While lowest No. of fruit per plant was observed for Kashi Amrit (19.12).

##### 4.2.10 Fruit set per cluster

The character fruit set per cluster exhibited a wide range of variation 3.92 to 6.24 with a grand mean of 5.43. The highest fruit set per cluster of genotypes Arka Meghali and Kashi Anupam (6.24). While lowest fruit set per cluster was observed for Kashi Amrit (3.92).

**4.2.11. Fruit weight (gm)**

The character fruit weight (gm) exhibited a wide range of variation 54.23 to 81.37 with a grand mean of 63.55. The highest fruit weight (gm) of genotypes Arka Meghali (81.37). While lowest fruit weight (gm) was observed for Pusa Ruby (54.23).

**4.2.12 TSS (OBrix)**

The character TSS (OBrix) exhibited a wide range of variation 3.81 to 5.05 with a grand mean of 4.48. The highest TSS (OBrix) of genotypes Arka Meghali (5.05). While lowest TSS (OBrix) was observed for Pusa Ruby (3.81).

**4.2.13 Ascorbic acid**

The character ascorbic acid exhibited a wide range of variation 20.05 to 26.29 with a grand mean of 23.94. The highest ascorbic acid of genotypes Arka Rakshak (F1) (26.29). While lowest ascorbic acid was observed for Kashi Amrit (20.05).

**4.2.14 Acidity**

The character acidity exhibited a wide range of variation 0.150 to 0.253 with a grand mean of 0.214. The highest acidity of genotypes Pusa Rohini (0.253). While lowest acidity was observed for Arka Rakshak (0.150).

**4.2.15 Fruit yield per plot**

The character fruit yield per plot exhibited a wide range of variation 10.60 to 32.58 with a grand mean of 17.41. The highest fruit yield per plot of genotypes Arka Meghali (32.58). While lowest fruit yield per plot was observed for Kashi Amrit (10.60).

**4.2.16. Fruit yield per plant**

The character fruit yield plant exhibited a wide range of variation 1.17 to 3.62 with a grand mean of 1.935. The highest total fruit yield plant of genotypes Arka Meghali (3.62). While lowest fruit yield plant was observed for Kashi Amrit (1.17).

**Table 1:** Analysis of variance for 15 characters in tomato genotypes

Sl. No	Source of variation / characters	Mean sum of squares		
		Replication D.f=2	Treatments D.f=14	Error D.f=28
01	Plant height (cm)	280.286	2038.61**	970.57
02	Number of primary branches per plant	2.862	11.09**	4.59
03	Days to first flowering	5.47	12.59**	4.59
04	Days to 50% flowering	0.94	4.22**	1.782
05	Days to fruit setting	38.42	66.280**	27.50
06	No. of flowering per cluster	3.14	16.90**	13.45
07	No. of cluster per plant	0.778	1.61**	0.757
08	No. of fruit per plant	31.75	115.78**	69.79
09	Fruit set per cluster	0.664	1.058**	0.955
10	Fruit weight	5.989	139.98**	90.42
11	TSS	0.228	0.342**	0.232
12	Ascorbic acid	1.34	7.52**	4.88
13	Acidity	0.001	0.0024**	0.0017
14	Fruit yield per plot (kg)	18.88	96.80**	57.92
15	Fruit yield per plant (kg)	0.233	1.195**	0.715

\* Significant at 1%, \*\* Significant at 0.1%

**Table 2:** Mean performance of different genotypes various character

Genotypes	Plant height (cm)	Number of primary branches	Days to first flowering	Days to 50% flowering	Days to fruit setting	No. of fruit per Cluster	No. of Cluster per Plant	No. of Fruit per Plant
Arka Rakshak(F1)	149.227	18.813	22.510	31.063	69.600	13.720	6.539	37.939
Arka Sourabh	119.760	17.520	24.420	32.260	68.800	11.070	6.393	34.731
Arka Vikas	113.683	16.667	24.583	33.417	72.667	10.767	5.493	27.285
Arka Alok	135.825	15.667	24.187	32.950	67.867	13.503	4.970	24.407
Arka Meghali	177.467	19.233	21.693	29.443	61.200	18.783	6.663	42.942
Kashi Abhiman(F1)	149.800	15.933	22.150	33.747	65.733	10.910	5.040	28.377
Kashi Amrit	157.493	16.467	23.367	31.720	65.267	12.243	4.817	19.124
Kashi Vishesh	116.403	18.677	21.717	31.637	67.400	16.480	5.977	31.622
Kashi Anupam	147.083	17.000	22.563	30.497	68.067	10.877	5.109	30.832
Kashi Aman	156.200	16.773	22.210	31.827	64.400	12.343	5.147	30.459
Kashi Adarsh	137.013	17.217	22.608	30.803	52.200	12.323	5.623	33.165
Pusa Hybrid(F1)	92.983	15.800	25.620	32.657	67.000	10.560	4.832	27.571
Pusa Ruby	95.693	15.733	28.377	32.570	65.133	10.940	4.375	22.264
Pusa Rohini	153.570	16.950	22.193	31.253	67.733	13.350	5.127	28.478
P.K.M-1	95.710	11.000	27.280	33.063	69.667	10.533	4.395	22.901
Mean	133.194	16.630	23.699	31.927	66.182	12.560	5.367	29.473
C.V.	23.390	12.892	9.048	4.182	7.925	29.205	16.214	28.347
F ratio	2.100	2.413	2.739	2.373	2.410	1.256	2.127	1.659
F Prob.	0.046	0.023	0.011	0.025	0.023	0.293	0.043	0.124

S.E.	17.987	1.238	1.238	0.771	3.028	2.118	0.502	4.824
C.D. 5%	52.106	3.586	3.587	2.233	8.772	-	1.455	-
C.D. 1%	70.290	4.837	4.838	3.012	11.833	-	1.963	-
Range Lowest	92.983	11.000	21.693	29.443	52.200	10.533	4.375	19.124
Range Highest	177.467	19.233	28.377	33.747	72.667	18.783	6.663	42.942

Table 2(a): Mean performance of different genotypes various character

Genotypes	Fruit set/ Cluster	Fruit weight (g)	TSS (0Brix)	Ascorbic acid	Acidity	Fruit yield per Plot	Fruit yield per plant
Arka Rakshak(F1)	5.770	71.355	4.810	26.297	0.150	24.993	2.777
Arka Sourabh	5.393	66.505	4.363	25.033	0.183	21.327	2.370
Arka Vikas	4.963	61.890	4.373	22.643	0.177	15.218	1.691
Arka Alok	4.893	65.483	4.303	22.683	0.207	14.325	1.592
Arka Meghali	6.243	81.370	5.050	26.200	0.227	32.585	3.621
Kashi Abhiman(F1)	5.660	66.970	4.253	23.327	0.203	17.175	1.908
Kashi Amrit	3.927	62.493	4.387	20.053	0.200	10.602	1.178
Kashi Vishesh	5.180	57.937	5.040	24.357	0.233	18.299	2.033
Kashi Anupam	6.240	58.200	4.553	25.007	0.213	16.123	1.791
Kashi Aman	5.893	65.720	4.510	24.617	0.230	18.228	2.025
Kashi Adarsh	5.887	62.327	4.620	23.743	0.220	18.764	2.085
Pusa Hybrid(F1)	5.657	54.513	4.413	23.743	0.250	13.665	1.518
Pusa Ruby	5.103	54.237	3.813	22.763	0.223	10.870	1.208
Pusa Rohini	5.487	64.237	4.730	25.060	0.253	16.771	1.864
P.K.M-1	5.227	60.150	4.037	23.707	0.247	12.335	1.371
Mean	5.435	63.559	4.484	23.949	0.214	17.419	1.935
C.V.	17.984	14.961	10.748	9.226	19.679	43.693	43.693
F ratio	1.108	1.548	1.474	1.542	1.398	1.671	1.671
F Prob.	0.393	0.158	0.185	0.160	0.218	0.120	0.120
S.E.	0.564	5.490	0.278	1.276	0.024	4.394	0.488
C.D. 5%	-	-	-	-	-	-	-
C.D. 1%	-	-	-	-	-	-	-
Range Lowest	3.927	54.237	3.813	20.053	0.150	10.602	1.178
Range Highest	6.243	81.370	5.050	26.297	0.253	32.585	3.621

## Conclusion

On the basis of per se performance of 15 genotypes of Tomato, Arka Meghali (32.58 and 3.62) genotypes was found superior in terms of fruit yield per plot and plant. Large amount of variability existed in the genotypes for selection. Significant differences were recorded for all the characters. Like qualitative and quantitative character. However, since this is based on one-year experiment, further trials may be needed to substantiate the results.

## References

1. Agong SGS. Schittenhelm and Friedt, W., Genotypic variation of Kenyan tomato (*Lycopersicon esculentum* Mill.) germplasm. PGR Newsletter, FAO Biodiversity 2000;123:61-67.
2. Al-Jibouri A, Miller PA, Robison HF. Genotypic and environmental variation and covariation in upland cotton crops of interspecific origin. Agron. J 1958;50:626-636.
3. Anita Pedapati, Reddy RVSK, Dilip Babu J, Sudheer Kumar S, Sunil N. Genetic diversity analysis in Tomato (*Solanum lycopersicum* L.) 2014.
4. Ansary SH, Thapa U. Effect of planting seasons on fruit quality of five varieties of tomato. Haryana J Hort Sci 2006;35(12):146-147.
5. Arias Y, Peteira B, Gonzalez I, Martinez Y, Miranda I. Genetic variability among tomato promissory genotypes obtained in improvement programs in front of TYLCV. [Spanish] Revista de Proteccion Vegetal 2010;25(3):190-193.
6. Arya Widura Ritonga, Muhamad Syukur M, Achmad Chozin, Awang Maharijaya, Sobir. Genetic variability, heritability, correlation, and path analysis in tomato (*Solanum lycopersicum*) under shading condition. Biodiversitas 2018, 19(4).
7. Ashish K, Singh SS, Solankey, Shirin Akhtar, Preeti Kumari, Jagdeep Chaurasiya. Correlation and Path Coefficient Analysis in Tomato (*Solanum lycopersicum* L.). Int. J Curr Microbiol App Sci 2018;7:4278-4285.
8. Brar GS, Singh Surjan, Cheema DS, Dhaliwal MS. Studies on variability, heritability and genetic advance for yield and component characters in tomato (*Lycopersicon esculentum* Mill). J of Res Punjab Agricultural University 2000;37(3, 4):190-193.
9. Burton, Devane. Estimating heritability in tall Fesscuc from replicated clonal marterial. Agron. J 1953;45:474-481.