"Assessment of Genetic Variability in Tomato" (*Lycopersicon esculentum* M.)

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Abstract- To find superior parents to achieve these objective parents during grown the *rabi* 2022-23. Six parents were obtained and grown at Department of Agril. Botany, College of Agriculture, GHRU Saikheda, Dist, Chhindwara, Madhya Pradesh in randomized block design with two replications. Spacing of 60 X 60 cm^2 was kept between row to row and plant to plant and 15 plants were raised in each row. Observations were made in days leading up to 50% flowering, days to 1st flowering, plant height, No. of flower per inflorescence, No. of flower per Cluster, Fruit length, Fruit diameter, Average fruit weight, Total yield per plant and TSS. The results obtained were subjected to statistical analysis. The means square due to parent exhibited significant difference for all the characters. The mean square due to genetic variability significant for all characters studied and mean square due to reciprocal combining ability significant for all characters except fruit diameter and days to 50% flowering.

Key words: Tomato, yield, GCA, PCA)

INTRODUCTION

Tomato (*Solanum Lycopersicon* L.) is the second-most significant vegetable crop with origins in Peru and Ecuador (Singh *et al*. 1969) next to potato. In terms of nutrition, tomatoes are an excellent source of vitamins A and C (Gould et al. 1983).The tomato is a fruit that is essential to human nutrition. It contains 22 calories, 310 I.U. of vitamin A, 1.07 mg of vitamin B1, 94.1% of water, 2.9% of protein, 0.4g of fat, 0.8% of fiber, 3.46% of carbohydrates, 0.71 mg of vitamin B2, 31 mg of vitamin C, 20 mg of calcium, 36 mg of phosphorus, and 0.8 mg of iron. In addition to being valued for their flavor and color, tomatoes are also an excellent source of the antioxidants beta-carotene, ascorbic acid, and lycopene. With an output of 18,227.0 thousand metric tons and an average productivity of 20.7 metric tonnes / hec, it covers an area of 879.6 thousand hectares in India. India's principal tomato-growing states are Karnataka, Bihar, and Andhra Pradesh, Maharashtra, and Odisha. It is cultivated on 62.59 thousand h of land in Madhya Pradesh, where it yields 1845.0 thousand metric tonnes of output per year and 29.5 metric tonnes hec^{-1} of productivity (Annonymous 2014). The quality of tomatoes varies depending on genotype in addition to their morphological characteristics. (Abhusita *et al.* 1997). The majority of the quality features in tomatoes are continuously variable and greatly impacted by the environment. (Lecome *et al.* 2004). Unless the information is supported by a significant degree of genetic advancement, high heritability alone is insufficient to perform effective selection for generational segregation. Breeders can choose progenies from the previous generation thanks to improved mean genotypic values of chosen families compared to the base population or genetic progress.

MATERIALS AND METHODS

Experiment will be conducted at department of genetics and plant breeding School ofagricultural Science, Saikheda. During *kharif* 2023, were obtained study by 6 parental inbred line in full diallel mating design were planted in randomized block design with 3 replications in *kharif* 2023 for evaluation having spacing 90 cm X 45 cm. The recommended cultural practices were followed to raise the healthy crop. The statistical analysis carried out as per Panse and Sukhatme (1965). Average annual rainfall is 1,183 mm. Minimum temperature during winter is 4 to 6 degrees Celsius while maximum temperature during summer is 38 to 42 degrees Celsius.

RESULT AND DISCUSSION

Estimation of Phenotypic and genotypic coefficient of variation, heritability & genetic advance

1. Plant height

The trait related to plant height (Table No.1) exhibited a high PCV (28.78%) & GCV (28.30%), indicating substantial phenotypic and genotypic variations (994.66 and 961.95, respectively). Moreover, the trait showed a high genetic advance (62.83), genetic heritability (96.70%), and the proportion of genetic advancement to the mean (57.34).

With the findings of Sajjan et al. (2016), Somraj et al. (2017), Vijay Bahadur et al. (2017), Kumar Nitish et al. (2018), and Sritama Kundu et al. (2018), the outcome for the trait plant height is demonstrated.

2. No. of branches / plant

There were low genotypic & phenotypic variances of 4.83 & 4.71, respectively, and high GCV (36.86%) & PCV (37.30%) for the no. of major branches / plant. In addition, the characteristic displayed low genetic advance (4.42), strong genetic advance as a proportion of the average (75.05), and high heritability (97.70%). Mehta and Asati (2008), Anitha et al. (2013), Arun et al. (2016), Shankar et al. (2016) all reported findings that were similar.

3. Fruit girth (cm)

The amount of fruit girth had moderate PCV & GCV (26.36% & 17.80%), with high phenotypic and genotypic variation values (0.03 and 0.07, respectively). The characteristic also showed significant genetic advance as a fraction of the average (20.05), moderate genetic advance (0.25), and very high heritability (45.61%).

4. Days of 1st flowering

For the trait "days to first flowering," substantial genotypic variations (14.26) and phenotypic variances (22.45) were noted, coupled accompanied by mild PCV (14.98%) and GCV (11.94%). In addition, the characteristic displayed low genetic advance (6.20), modest genetic progress (19.61%) relative to the mean, and high heritability (63.50%).

Table No. 1 Estimation of genetic variability parameters for twelve characters

Sr.No	Character	Mean	GCV %	PCV %	Hb (%)	GAM %
1	Plant height	109.56	28.30	28.78	96.70	62.83
2	No. of branches per plant	5.89	36.86	37.30	97.70	4.42
3.	Fruit Girth	1.03	17.80	26.36	45.61	0.25
4.	Days of 1st flowering	31.62	11.94	14.98	63.50	6.20
5.	Days to 50% flowering	37.13	12.59	13.98	81.10	8.67
6.	No. of flower per inflorescence	17.45	50.47	50.76	98.85	20.83
7.	No. of fruit per cluster	4.00	25.65	27.97	84.12	1.72
8.	Fruit length (cm)	4.47	14.71	15.59	89.10	3.24
9.	No. of fruit per plant	4.67	12.32	13.46	83.70	3.44
10.	Average fruit weight (g)	53.87	74.82	75.29	98.80	82.53
11.	Total yield per plant	54.45	142.54	142.69	99.80	159.75
12.	TSS (mg/100 g)	3.76	16.33	17.52	86.90	1.18

5. Days to 50 % flowering

Days to 50% flowering data showed moderate GCV (13.98%) & PCV (12.59%), together with significant differences in genotype and phenotype (26.94 and 21.85, respectively). Estimates of moderate genetic advance (8.67), high heritability (81.10%), and high GA as a percent mean (23.35) were recorded for this variable. The findings agree with the conclusions of Anitha et al. (2013) & Arun et al. (2016)

6. Fruit length (cm)

Fruit length data showed extremely large genotypic and phenotypic variations (3.71 & 3.83, respectively), with very high GCV & PCV (15.59% and 14.71%) reported. For this characteristic, extremely high genetic advance (3.24%), very high heritability (89.10%) & very high GA as a percentage average (28.60) were observed.

7. No. of flowers / inflorescence

The no. of flowers / inflorescence data demonstrated extremely high differences between phenotype and genotype, with corresponding values of 50.76 and 103.39, and extremely high PCV and GCV of 50.76% and 50.47%. For this variable, extremely high heritability (98.85%), very high level of genetic

advancement (1.72), and very high GA as a percentage mean (23.23) were noted.

8. Total yield per plant

The results on the With a very high PCV & GCV of 142.69% and 142.54% reported, the quantity of fruits /plant showed extremely considerable genotypic & phenotypic diversity of 6038.11 & 6026.12, respectively. For this variable, there was a strong genetic advance of 159.75, an extraordinarily high heritability of 99.80%, and an extremely high GA as a percent mean of 293.35. The outcomes correspond with the study carried out by Vinod Kumar and colleagues. (2013), Sajjan et al. (2016), and Kumari and Sharma (2013).

9. Average fruit weight (g)

Based on the average weight of the fruit, significant variations were found in its phenotype and genotype (1645.41 and 1625.22), high GCV (74.82%) and PCV (75.29%), exceptional heritability (98.80%), notable genetic advancement (82.53), and noteworthy GA as a percent mean (153.19). Lal et al. (1991), Mohamed et al. (2012), and Islam et al. (2012) studies, Mohanty (2002), Sharma et al. (2006), Brar and Singh (1998), and Mohanty (2002) have indicated similar outcomes.

10. No. of fruit / cluster

The information on the no. of fruits in each cluster showed very low genotypic & phenotypic variances (0.99 and 0.83), high heritability (84.12%), PCV (27.97%), and GCV (26.65%), but low genetic advance (1.72%) & high GA as a average of percentage (91.38). The findings concur with the research conducted by Shankar et al. (2016), Dixit & Pandey et al. (2017), Umesh et al. (2015).

11. No. of fruit / plant

The information on the no. of fruits produced exhibited extraordinarily high PCV and GCV of 13.46% and 12.32%, respectively, along with extraordinarily high genotypic and phenotypic variability of 4.03 and 3.93 / plant. Very high genetic advance (3.44), very high heritability (83.70%) & extremely high GA with a mean of 6.27% were noted for this variable.

12. TSS (%)

The TSS findings indicated that this feature exhibited large genotypic and phenotypic variability (0.43 and 0.38), high PCV (17.52%) and GCV (16.33%), very high heritability (86.90%), considerable genetic progress (2.18) & significant GA a percent

CONCLUSION

The estimation of Phenotypic and Genotypic over all parents revealed that the response of genetic variability for every character took classes. In general, Compared to their respective genotypic estimations, the phenotypic coefficient of variation had a somewhat larger magnitude in both generations, indicating the expression of true genetic potential of the population. High (>20%) Plant height, no. of branches, no. of fruits /plant, average fruit weight & yield / plant were shown to have genotypic coefficient of GCV and PCV, or phenotypic coefficient variation, among enlargement & yield characteristics. Fruit diameter, fruit length, and phenol content all exhibit high (>20%) phenotypic coefficient of variation (PCV) & genotypic coefficient of variation (GCV) among quality indicators, suggesting the greatest potential for selection and character enhancement. The estimate of high GCV & moderate PCV was noted in relation to fruit length & fruit diameter in Aarya and Abhilasha, suggesting influence of environment. These characters are not expression its genetic potential.

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