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Evaluation and Variability of Some Genotypes of Tomato (*Lycopersicon esculentum* Mill) for Horticultural Traits

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ABSTRACT

The present experiment to estimate the Evaluation and Variability of Some Genotypes of Tomato (Lycopersicon esculentum Mill) for Horticultural Traits was carried out at Horticulture Research Farm, Department of Applied Plant Science (Horticulture), Babasaheb Bhimrao Ambedkar University, Lucknow (U. P.) during 2011-12. In present study, sixteen genotypes of tomato were evaluated for sixteen quantitative and qualitative characters. The phenotypic variance for all the nineteen characters was found to be higher than the genotypic variance. High phenotypic coefficients and genotypic of variation were observed for Plant height, number of leaves per plant, number of flower per plant, number of cluster per plant, number of fruit weight per plant, number of fruit per plant, pericap thickness, T.S.S. High heritability coupled with high genetic advance observed for these characters imply the potential for crop improvement through selection.

Key words: *Tomato, Genetic variability, heritability and genetic advance.*

INTRODUCTION

Tomato (*Lycopersicon esculentum* Mill) is one of the most important vegetable crops, which belongs to family *Solanaceae* and believed to be the native of Peru Equador region. Tomato is one of the most popular and widely grown vegetable in the world. It is grown extensively in tropical and subtropical areas. It is planted 4.39 million hectares of with a total production of 150.51 million ton[8]. India is the second largest tomato producer in the world after china accounting for about 11 percent of the world tomato production (NHB, Database, 2011). The present demand for tomato is based on the industrial requirement and ultimately the consumer preference. So there is an immediate need for further improvement of this crop through development of superior varieties and hybrids in order to meet the present day requirements. The efficiency of selection depends on the extent of genetic variability and degree of transmissibility of characters. Since the quantitative characters are influenced by the environment a study under different locations and years is likely to bring out the genotype-environment interaction for the precise estimation of genetic parameters and predicting the process of selection.

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Moreover acknowledge about association of various characters and their relative contribution to yield is helpful for multiple trait selection. The present investigation was conducted to generate this information in a collection of some indigenous genotype of tomato in order to estimating genetic variability, heritability and genetic advance to formulate a sound breeding plan for its improvement.

MATERIALS AND METHODS

The experimental material for the present study consisted of sixteen genotypes of tomato obtained from Indian institute of vegetable research, Varanasi (U.P.). The experiment was conducted using randomized block design (RBD) with three replication at Horticulture Research Farm of Department of Applied Plant Science, Babasaheb Bhimrao Ambedkar University, Vidya-Vihar, Rae Bareli Road, Lucknow (U.P.) during Rabi season. Observation were recorded from five randomly selected plants of each genotypes of each replication for nineteen characters *viz.* plant height, days to marketable picking, number of branches per plant, intermodal length, number of leaves per plant, days to first flower opening, number of flower per plant, days to 50% flowering, number of flower per cluster, number of cluster per plant, number of fruit per cluster, number of fruit per plant, fruit weight per cluster, fruit length (cm), fruit width (cm), number of locules, pericap thickness, T.S.S and fruit weight. The data generated was subjected to analysis the variability through genotypic coefficient of variation (GCV) phenotypic coefficient of variation (PCV) and genetic advance as suggested by Burton and D-vane[3] and Johnson *et al*[4].

MATERIALS AND METHODS

The analysis of variance showed highly significant difference among the genotypes for all the characters studied in (Table 1). This indicated presence of substantial amount all the characters. These results are an agreement with findings of Kale *et al*[5].

A wide range of variation (Table 2) was observed for plant height at the time of last harvesting ranged from 51.45 cm for EC-620-448 to 81.12cm for EC-620-444. The number of branches per plant ranged from 8.08 for EC-620-440 to 10.33 for EC-620-444. Days to marketable picking ranged from 59.67 for EC-620-445 to 76.67 for EC-620-434. The intermodal length ranged from 3.88 cm for EC-620-444 to 6.00 cm for EC-620-435. The number of leaves per plant from 225.50 for EC-620-446 to 393.58 for EC-620-440. Opening of First flower after sowing ranged from 43.70 for EC-620-448 to 50.66 for EC-620-431. Number of flower per plant ranged from 73.94 for EC-620-446 to 162.33 for EC-620-445. Days to first flowering ranged from 59.42 for EC-620-449 to 64.65 for EC-620-431. Number of flower per cluster ranged from 5.84 for EC-620-449 to 9.75 for EC-620-445. Number of cluster per plant ranged from 14.00 for EC-620-448 to 35.58 for EC-620-445. This result is according to Bora *et al.*[2] and Kala *et al*[5].

The number of fruit per cluster ranged from 2.88 for EC-620-442 to 4.88 for EC-620-445. Number of fruit per plant ranged from 19.10 for EC-620-434 to 35.20 for EC-620-445. Fruit weight per cluster ranged from 58.17 for EC-620-443 to 117.14 for EC-620-445. Fruit width ranged from 3.55 for EC-620-431 to 5.69 for EC-620-438. The length of fruit ranged from 3.35 for EC-620-447 to 4.39 for EC-620-431. Number of locules per fruit ranged from 3.08 for EC-620-449 to 4.67 for EC-620-446. Pericarp thickness ranged from 3.23 for EC-620-447 to 4.26 for EC-620-431. The T.S.S ranged from 4.25 for EC-620-437 to 5.08 for EC-620-432. The fruit weight per plant ranged from 736.25 gm for EC-620-440 to 1009.51 gm for EC-620-445.

The range, mean and other genetic parameter estimated are presented in (Table 3). A wide range of variability was observed for fruit weight (736.25-1009.51), number of flower per plant (38.40-162.33), number of leaves per plant (233.58-399.62), plant height (38.94-81.12), fruit weight per cluster (58.87-117.14), pericarp thickness (3.23-4.26) and

total soluble solids (4.25-5.08) . The traits showing wide range of variability have ample scope of selections for the desirable genotypes.

The phenotypic coefficient of variation (PCV) was higher than the genotypic coefficient of variation (GCV) for all the characters (Table 3). The genotypic coefficient of variation ranged from 0.05% for total soluble solids to 4663.03 for fruit weight. High GCV was observed for fruit weight 4663.03 number of leaves per plant (2672.19), number of flower per plant (718.07) and fruit weight per cluster (210.61).

The high phenotypic coefficient of variation ranged from 0.05% for total soluble solids to 5679.87 for fruit weight. High PCV was observed for fruit weight 5679.87, number of leaves per plant 2719.33, number of flower per plant 737.53 and fruit weight per cluster 244.62 indicating the substantial modifying effect of environment in the expression of all traits Bhutani *et al.*[1], also reported similar results in tomato and Phookan *et al.*[7], had obtained similar results under plastic house condition.

In the present study the highest heritability (broad sense) was observed for number of eaves per pant (98.38%), number of locues (97.80%), TSS (97.10%), plant height (97.00%), number of flower per plant (97.40) and pericarp thickness (96.80%) indicating the least influence of environment in their expression. High genetic advance as percentage of mean observed for number of cluster per plant (58.62%), number of flower per plant (57.75%), fruit weight per cluster (35.52%), and number of fruit per plant (35.12%). High genetic advance coupled with high heritability could be considered for selection among genotypes.

Therefore, the selection based on the phenotypic performance of these characters would be useful for achieving desirable results. High heritability and moderately high genetic advance for, number of leaves per plant, number of locules and height of plant was recorded by Bora *et al*[2]. Thus the strain EC 620-445 is highly significant for Days to marketable picking, Number of flower per cluster, Number of fruit per cluster, Number of fruit per plant, Fruit weight per cluster and for Fruit weight. All these characters can be effectively used as criteria for selection of the present materials for further desired improvement in tomato.

Table 1: Analysis of variance for quantative and qualitative traits in tomato

S.NO.	Source of Variance	Replication (2)	Treatments (15)	Error (30)
1.	Plant height(cm)	2.489	224.996	2.312
2.	Days to marketable picking	4.126	78.157	2.599
3.	Number of branches	0.018	2.095	0.104
4.	Internoodal length	0.019	1.328	0.047
5.	Number of leaves/plant	107.642	8065.120	46.444
6.	Days to first flower opening	0.044	12.056	0.306
7.	Number of flower/plant	1.319	2173.695	19.46
8.	Days to 50%flowering	1.447	5.917	0.633
9.	Number of flower/cluster	0.946	3.132	0.237
10.	Number of cluster/plant	4.364	131.007	1.62
11.	Number of fruit/cluster	0.053	0.696	0.020
12.	Number of fruit/plant	2.319	58.450	4.351
13.	Fruit weight/cluster	73.339	665.845	34.012
14.	Fruit length (cm)	0.007	0.230	0.009
15.	Fruit width (cm)	0.027	0.638	0.022
16.	Number of locules/fruit	0.004	0.781	0.006
17.	Pericarpthickness (mm)	0.001	0.229	0.002
18.	T.S.S.	0.002	0.173	0.002
19.	Fruit weight (g)	191.122	15005.951	1016.835

***Significant at 5% probability level**

Table 2: Mean performance of different genotypes of tomato for quantative and qualitative traits

Genotypes	Characters																		
	Plant hieght (cm)	Days To Marketable Picking	No. of Branches/ Plants	Inter-Nodal Length (cm)	No. of Leaves/plant	First Flower Opening After Showing	No. of flower /plant	Day of 50% Flowering	No. of Flowers / Cluster	No. of Cluster /Plant	No. of Fruit / Cluster	No. of Fruit/ Plant	Fruit weight/ Cluster in (g)	Fruit width in (cm)	Fruit length in (cm)	No. of locules / fruit	Pericarp thickness in (mm)	T.S.S.	Fruit Wt. / Plant in (g)
EC-620-449	53.67	72.33	9.67	4.99	311.72	46.87	99.83	59.42	5.84	19.33	3.25	22.88	69.75	4.07	3.84	3.08	3.60	4.83	873.00
EC-620-448	51.45	69.33	7.51	5.43	306.03	43.70	91.50	61.83	8.20	14.00	3.33	27.93	75.54	4.54	3.40	3.92	3.37	4.42	873.58
EC-620-447	53.23	62.92	8.33	4.34	334.00	49.41	90.72	63.08	6.67	18.33	3.33	22.17	69.17	4.45	3.35	4.67	3.23	4.33	861.17
EC-620-446	57.07	74.67	8.78	5.95	225.50	46.71	73.94	63.66	7.70	20.67	3.34	25.67	68.67	4.34	3.70	4.67	3.61	4.42	892.33
EC-620-445	52.77	59.67	10.31	4.54	399.92	47.17	162.33	61.88	9.75	35.58	4.88	35.20	117.14	4.00	3.92	3.92	3.79	4.67	1009.51
EC-620-444	81.12	68.33	10.33	3.88	389.58	43.91	134.42	63.32	8.25	33.78	3.98	31.63	97.98	3.99	3.91	4.50	3.34	4.75	858.67
EC-620-443	56.95	73.00	9.59	4.80	333.58	43.78	83.17	62.67	6.58	17.26	2.95	19.17	58.17	4.29	3,99	4.08	3.84	4.58	776.67
EC-620-442	57.00	73.67	8.36	4.77	390.67	46.91	102.83	63.33	7.00	18.65	2.88	21.25	71.25	4.58	3.51	4.50	3.60	4.50	894.50
EC-620-440	52.11	65.67	8.08	4.45	393.58	48.03	69.38	62.80	6.67	24.11	3.26	21.58	67.92	4.10	3.48	4.50	3.34	4.58	736.25
EC-620-439	38.94	63.33	9.33	4.80	333.50	44.40	38.40	62.16	7.37	28.62	3.08	23.92	76.00	3.95	3.69	367	4.03	4.83	831.99
EC-620-438	54.96	62.67	9.73	5.70	333.83	45.69	98.32	62.65	6.33	32.93	3.73	20.83	71.89	5.69	4.30	3.67	3.72	4.92	816.83
EC-620-437	58.03	65.33	9.93	4.29	294.67	47.55	91.49	64.47	6.57	22.43	3.76	22.42	68.50	3.78	4.12	3.92	3.69	4.25	851.67
EC-620-435	48.75	71.67	8.59	6.00	307.83	47.91	101.66	62.53	6.59	22.64	3.73	21.50	70.12	4.09	3.44	3.50	3.92	4.92	776.25
EC-620-434	53.65	76.67	9.37	5.98	314.67	47.68	85.67	63.90	6.26	18.98	3.70	19.10	93.25	4.17	3.90	3.25	3.53	4.50	830.57
EC-620-432	57.12	72.00	8.45	4.77	246.25	47.40	86.98	60.27	5.82	16.70	3.37	21.83	83.00	4.90	3.55	4.58	3.56	5.08	768.33
EC-620-431	64.78	72.67	8.62	5.45	312.33	50.66	98.32	64.95	6.87	18.40	3.75	22.33	90.92	3.55	4.39	3.83	4.26	4.83	825.50
GM(X)	55.72	68.99	9.06	5.01	322.35	46.74	94.31	62.62	7.03	22.65	3.52	23.71	78.08	3.75	4.33	4.02	3.67	4.65	848.55
SEm±	0.878	0.931	0.186	0.126	3.935	0.319	2.547	0.459	0.281	0.737	0.081	1.204	3.367	0.054	0.086	0.044	0.029	0.024	18.41
CD at 5%	2.535	2.688	0.536	0.363	11.364	0.922	7.356	1.327	0.812	2.130	0.235	3.478	9.725	0.155	0.250	0.127	0.083	0.069	53.17

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Table 3: Estimate of range, mean coefficient of variation, heritability and genetic advance in tomato

Characters	Mean	Range		Coefficient of variation (%)		Heritability (%)	Genetic advance	Genetic advance in percentage of mean
		Max.	Min.	Genotypic	phenotypic			
Plant height (cm)	55.72	81.12	38.94	74.28	76.54	97.00	17.47	31.36
Days to marketable picking	68.99	76.67	59.67	25.18	27.78	90.60	9.84	14.26
Number of branches/plant	9.06	10.33	7.51	0.66	0.76	86.50	1.56	17.22
Intermodal length	5.01	6.00	3.88	0.42	0.47	90.00	1.17	25.49
Number of leaves/plant	322.35	399.92	233.58	2672.19	2719.33	98.30	105.58	32.75
Days to first flower opening after sowing	46.74	50.66	43.70	3.91	4.22	92.80	3.92	8.40
Number of flower/plant	94.31	162.33	38.40	718.07	737.53	97.40	54.46	57.75
Days to 50% flowering	62.62	64.95	59.42	1.76	2.39	73.60	2.34	3.74
Number of flower/cluster	7.03	9.75	5.82	0.96	1.20	80.80	1.81	25.79
Number of cluster/plant	22.65	35.58	14.00	43.12	44.75	96.40	13.27	58.62
Number of fruit/cluster	3.52	4.88	2.88	0.22	0.24	91.90	0.93	26.62
Number of fruit/plant	23.71	35.20	19.10	18.03	22.83	80.60	7.85	33.12
Fruit weight/cluster	78.08	117.14	58.87	210.61	244.62	86.10	27.74	35.52
Fruit length (cm)	3.75	4.30	3.35	0.07	0.08	89.50	0.53	14.13
Fruit width (cm)	4.33	5.69	3.78	0.20	0.22	90.20	0.88	20.45
Number of locules	4.02	4.67	3.08	0.25	0.26	97.80	1.03	25.79
Pericarp thickness	3.67	4.26	3.23	0.07	0.07	96.80	0.55	15.17
T.S.S	4.65	5.08	4.25	0.05	0.05	97.10	0.48	10.42
Fruit weight	848.55	1009.51	736.25	4663.03	5679.87	82.10	127.45	15.01

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CONCLUSION

On the basis of overall findings of the present research study it was concluded that there is wide range of variation in tomato strain for all the characters studied. The strain EC 620-445 is highly significant for days to marketable picking, number of flower per cluster, number of fruit per cluster, number of fruit per plant, fruit weight per cluster and fruit weight.

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REFERENCES

1. Bhutani, R. D. Kalioo, G. and Paudita, M. L., Genetic Variability Studies for yield and physic-chemical traits of tomato (*Solanum lycopersicon*. Mill). *Harayana J. Hort. Sci.* **12 (1-2):** 96-100 (1983).
2. Bora, G. C. Shadeque, A. Bora, L. C. and Phookan, A. K. Evalution of some tomato genotype for variability and bacterial wilt resistance. *Veg. Sci.* **20(1):** 44-47 (1993).
3. Burton, G. W. and D-Vane, E. H., Estimating heritability in tall fescue from replicated clonal material. *Agron. J.* **45:** 48-481 (1953).
4. Johnson, H. W. Robinson, H. F. and Comstock, R. E., Estimate of genetic and environment variability in soyabean. *Agron. J.* **47:** 314-318 (1955).
5. Kale, P. B. Dod, V. N. and Supe, V. S., Genetic variability and correlation studies in tomato. *PKV Res. J.* **12 (2):** 115-118 (1988).
6. Nair, P. I. and Thamburaj, S., Variability, heritability and genetic advance in tomato. *South Indian Hort*. **43(3-4):** 77-79 (1995).
7. Phookan, D. B. Talukdar, P. Shadeque, A. and Chakravarty, B. K., Genetic-variability and heritability in tomato (*Solanum lycopersicon*. Mill) genotypes during summer season under plastic-house condition. Indian J. Agric. Sci. **68(6):** 304-306 (1998).
8. FAO STAT database (2012). www.fao.org
9. Horticulture database (2011). www.nhb.gov.in