www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2021; 10(10): 914-916

www.thepharmajournal.com
Received: 03-08-2021
Accepted: 28-09-2021

Anshu Kumari
PG Student, Department of Horticulture, NAI, SHUATS, Allahabad, Uttar Pradesh, India

Anita Kerketta
Assistant Professor, Department of Horticulture, NAI, SHUATS, Allahabad, Uttar Pradesh, India

Vijay Bahadur
Associate Professor, Department of Horticulture, NAI, SHUATS, Allahabad, Uttar Pradesh, India

Corresponding Author:
Anshu Kumari
PG Student, Department of Horticulture, NAI, SHUATS, Allahabad, Uttar Pradesh, India

Studies on genetic variability, heritability on growth, yield and fruit quality in tomato (*Solanum lycopersicum* L.) hybrid

Anshu Kumari, Anita Kerketta and Vijay Bahadur

Abstract
Research was carried out at Vegetable Research Farm, Department of Horticulture, SHUATS, Prayagraj (U.P.) during winter season of 2020 – 2021. To evaluate the genetic analysis for yield and its component traits of 18 Hybrids, with three replications in Randomized Block Design (RBD). Hybrid H- S-22 X Kashi Vishesh (7.41 kg) followed by Azad T-6 X Kashi Aman (6.72 kg) and Pant T-7 X Kashi Aman (6.70 kg) higher fruit yield per plant, days to first flowering was recorded minimum in the hybrid hybrid H- Azad T-5 X Kashi Aman (31.57 days) and days to 50% flowering was minimum in the hybrid (Check) Kashi Abhiman (36.66 days). The highest magnitude of coefficient of variation at phenotypic as well as genotypic levels was observed among the hybrids. The presences of high heritability in broad sense (h2bs) along with high genetic advance in percent of mean were observed for the characters like days to first flowering fruit weight, days to 50% flowering. whereas high heritability in broad sense (h2bs) were observed for days to first flowering followed by fruit weight and days to 50% flowering and in case of high genetic advance in per cent of mean were observed for fruit weight (g) followed by fruit yield per plant and number of locules per fruit.

Keywords: Heritability, yield, genetic advance

Introduction
India has predominantly an agriculture-based country and was continue to be so for a pretty long time. Among the agriculture; horticulture plays a significant role in Indian economy. Recently, horticulture in India is recognized as one of the fastest growing sector of the world. Progressive organization, increase spendable income and awareness for balanced and nutritious food have contributed to all increasing demand of horticultural produce. Tomato (*Solanum lycopersicum* L.) is belongs to the nightshade family Solanaceae with chromosome number 2n=2x=24. It is an herbaceous, annual to perennial, prostrate, sexually propagated, and typical day neutral plant, It is self-pollinated crop but a certain percentage of cross-pollination also occurs. It has taproot and growth habit of the plant is determinate or indeterminate. Scientific information indicates that the cultivated tomato originated in a wild in the Peru-Ecuador-Bolivia area of the Andes (South American).Tomato stands unique and highly praised vegetable because of its high nutritive values and myriad uses and is referred as “Protective Food” and it is known as “love apple”. It is grown worldwide for its edible fruit which can be consumed either fresh or cooked and also in the form of various processed products like juice, ketchup, sauce, puree, powder, essence, cocktail etc. Tomato pulp and juice is digestible mild aperients, a promoter of gastric secretion and blood purifier. Red colour of tomato is due to the presence of pigment “Lycopene” ranges from 30 - 50 mg/100g of edible part.

Materials and Methods
Research was carried out at Vegetable Research Farm, Department of horticulture, SHUATS, Prayagraj (U.P.) during winter season of 2020 - 2021, to evaluate the genetic analysis for yield and its component traits of 18 Hybrids, (Hybrid check) with three replications in Randomized Block Design (RBD) with the spacing of row to row spacing of 90 cm and plant to plant spacing of 75 cm. The experimental material comprised of eighteen hybrid including check, which were collected from different source (Table 1). Five competitive plants were selected at randomly tagged from each plot to record observation on various characters *viz*., plant height, days to first flowering, days to 50% flowering, number of branches per plant, number of

flowers per cluster, number of flower cluster per plant, number of flower cluster per plant, number of fruits per plant, days to first fruit set, fruit yield per plot, fruit weight, fruit length, fruit diameter, TSS, ascorbic acid, pericarp thickness, number of locules per fruit, fruit yield per plant.

Results and Discussion

Analysis of variance showed non- significant differences among the 18 hybrids for the 21 characters studied. Analysis of variance showed non-significant differences among the hybrids at 1% and 5% level of significance. The mean sum of squares due to hybrid for different characters is presented in table 2, indicating the ample scope for selection of promising hybrids from the present gene pool. Data were recorded on 18 hybrids *viz*. plant height, days to first flowering, days to 50% flowering, number of branches per plant, number of flowers per cluster, number of flower cluster per plant, number of flower cluster per plant, number of fruits per plant, days to first fruit set, fruit yield per plot, fruit weight, fruit length, fruit diameter, TSS, ascorbic acid, pericarp thickness, number of locules per fruit, fruit yield per plant were subjected to analysis of variance to test the significance of difference among the hybrids. Analysis of variance presented in showed that the hybrids differed significantly for all the 21 characters and the mean performance of 18 hybrids of tomato are depicted in Table 4.2a. These findings are in general agreement with the findings of Singh and Cheema (2005) [7], Mahesh *et al*. (2006) and Basavaraj *et al. (*2010) [2].

Table 1: Experimental materials for this study consist of 18 hybrid of tomato collected from different sources

Sl. No	Hybrid Name	Hybrid Symbol	Source
1	Kashi Sharad X Kashi Vikash	H1	Department of Horticulture, NAI SHUATS
2	Angoorlata X Kashi Vikash	H2	Department of Horticulture, NAI SHUATS
3	Azad T-6 X H-88-75-5	H3	Department of Horticulture, NAI SHUATS
4	Angoorlata X Kashi Aman	H4	Department of Horticulture, NAI SHUATS
5	Azad T-5 X Kashi Vikash	H5	Department of Horticulture, NAI SHUATS
6	Azad T-6 X Kashi Aman	H6	Department of Horticulture, NAI SHUATS
7	Azad T-6 X Kashi Vikash	H7	Department of Horticulture, NAI SHUATS
8	S-22 X H-88-75-5	H8	Department of Horticulture, NAI SHUATS
9	Pant T-5 X Kashi Vikash	H9	Department of Horticulture, NAI SHUATS
10	S-22 X Kashi Aman	H10	Department of Horticulture, NAI SHUATS
11	Pant T-5 X Kashi Vikash	H11	Department of Horticulture, NAI SHUATS
12	S-22 X Kashi Vikash	H12	Department of Horticulture, NAI SHUATS
13	Azad T-5 X Kashi Aman	H13	Department of Horticulture, NAI SHUATS
14	Pant T-7 X Kashi Vikash	H14	Department of Horticulture, NAI SHUATS
15	Arka Abha X Kashi Aman	H15	Department of Horticulture, NAI SHUATS
16	Hisar Lalit X Kashi Vikash	H16	Department of Horticulture, NAI SHUATS
17	Arka Vikash X Kashi Aman	H17	Department of Horticulture, NAI SHUATS
18	(Check) Kashi Abhiman	H18	Department of Horticulture, NAI SHUATS

Table 2: Estimation of Genetic variability parameters for growth and yield attributes of Tomato

Traits	Var Environmental	Var Genotypical	GCV	Var Phenotypical	PCV	h2 (Broad sense)	Genetic Advancement 5%	Gen. Adv as % of mean 5%
Plant height (cms)	30.05	820.56	28.41	850.61	28.92	96.50	57.96	57.47
No. Of branches per plants	1.60	21.17	31.38	22.77	32.55	93.00	9.14	62.35
Days of first flowering	3.38	8.75	7.38	12.13	8.69	72.10	5.17	12.91
Days of 50% flowering	3.59	4.44	4.77	8.02	6.42	55.30	3.23	7.31
No. Of flower per cluster	0.34	0.61	10.37	0.95	12.93	64.30	1.29	17.12
No. Of flower cluster per plant	16.91	52.33	36.27	69.24	41.72	75.60	12.96	64.96
Days to first setting	2.73	5.78	5.04	8.51	6.12	67.90	4.08	8.56
Days to first fruit picking	5.40	28.38	5.16	33.78	5.63	84.00	10.06	9.75
No. Of fruit set per cluster	0.36	0.66	17.39	1.02	21.55	65.10	1.35	28.90
No. Of fruit per plant	118.89	1411.07	39.32	1529.97	40.94	92.20	74.32	77.79
Fruit weigt in gram	38.98	187.38	23.19	226.36	25.49	82.80	25.66	43.47
No. Of locule per plant	0.22	0.53	18.96	0.75	22.51	70.90	1.26	32.89
Fruit shape index	0.00	0.04	23.57	0.05	23.72	98.80	0.43	48.26
Pericarp thickness in mm	0.22	0.74	17.54	0.95	19.95	77.30	1.56	31.78
Total soluble solid	0.01	0.34	13.75	0.35	14.04	95.90	1.18	27.75
Acidity	0.01	0.11	40.13	0.12	41.33	94.30	0.67	80.25
Ascorbic acid (mg/100g)	0.06	1.55	8.52	1.61	8.69	96.20	2.51	17.22
Self life in days	0.34	3.65	23.33	3.98	24.38	91.60	3.77	46.00
Leaf curl incidence in%	288.29	24.34	31.87	312.62	114.23	7.80	2.84	18.32
Leaf curl severity	0.11	29.68	28.88	29.79	28.93	99.60	11.20	59.38
Fruit yield per plants in kg	0.307	1.778	25.36	2.086	27.465	85.3	2.536	48.238

The mean performance of various hybrids has also showed good range of variability for various characters, which were studied in present investigation (Table 1). The range record for plant height (36.10-152.88), days to first flowering (31.57-43.21), days to 50% flowering (36.66-46.53), number of branches per plant (6.55-22.43), number of flowers per cluster (6.11-9.20), number of flower cluster per plant (11.05-40.67),No. to first fruits picking (90.33-110.78),number of fruits per plant (48.33-215.33), days to first fruit set (39.44-50.33), fruit yield per plant (2.74-7.41), fruit weight (34.55-89.00), fruit Thickness (3.43-
6.83), TSS (3.50-5.50), ascorbic acid (12.40-17.27), pericarp thickness (3.43-6.83), number of locules per fruit (3.00-5.78),acidity (0.40-1.69), Fruit shape index (3.43-6.83),Leaf

curl severity % (0.00-38.87), Leaf curl incidence (12.15-31.59), Self life in day (4.11-12.11).

Genotypic coefficient of variation (GCV) and phenotypic coefficients of variation (PCV) are categorized as low (<10%), moderate (10-20%) and high (>20%) as suggested by Sivasubramanian and Madhavamenon (1973) [8].

The highest value of genotypic coefficient of variation (GCV) was recorded for average fruit weight (23.19%) followed by fruit yield per plant (25.3%), moderate coefficients of variation was recorded for number of locules per fruit (18.96%), number of flower cluster per plant (17.39%), pericarp thickness (17.54%), plant height (28.41%), days to first flowering (7.38%),fruit yield per plot(25.36%), and genotypic coefficient of variation was recorded for TSS (13.75%), Days to 50% flowering (4.77%),No. of branches per plant (21.17%) ascorbic acid (8.52%) and days to first fruit set (5.04%).

The magnitude of phenotypic coefficient of variation was higher than the corresponding genotypic coefficient of variation for most of the characters. This might be due to the interaction of the hybrids with the environment to some degree or environmental factors influencing the expression of these characters. Similar result was also observed by Ahemed *et al.* (2006) [1] for plant height, Prema *et al.* (2011) for TSS 0Brix and Manna and Paul (2012) [4] for ascorbic acid who reported that relative magnitude of phenotypic coefficient of variation is greater than corresponding genotypic coefficient of variation which indicates the effect of environment.

In the present study it was observed that magnitude of phenotypic coefficient of variation (PCV) were higher than genotypic coefficient of variation (GCV) for all the characters under study which is an indicator of additive effect of the environment on the expression of the trait. Similar finding were also reported by Dar and Sharma (2011) [3] and Rani and Anitha (2011). The differences between GCV and PCV for most of the characters are narrow. Thus, indicating the lesser influence of environmental factors on the hybrids, thus reflecting that the existing variability can be utilized in tomato breeding programme. The high values of heritability estimates in broad sense indicated that sustainable improvement can be made using standard selection procedures. Similar results were noticed by Phookan *et al.* (1998) for number of fruits per plant, fruit set per cent and average fruit weight; Ahmed *et al.* (2006) [1] for all traits; Mahesha *et al.* (2006) for plant height, fruit weight and fruits per plant and Dar and Sharma (2011) [3] for ascorbic acid.

On the other hand the highest genetic advance as percent of mean observed for plant height (5.25) number of locules per fruit (0.89), pericarp thickness (4.89), days to 50% flowering (44.12), TSS (4.24), ascorbic acid (14.60), days to first fruit set (4.48).

Tasisa *et al.* (2011) [9] recorded high genetic advance as per cent of mean for fruits per plant, plant height, yield per plant and fruit diameter, which indicate that selection would be more useful to improve crops.

The high heritability was associated with high genetic advance as per cent of mean for all the characters. The parallelism between the magnitude of heritability and degree of genetic gain has been due to the additive gene playing a predominant role and therefore, these were more reliable for effective selection. Similar finding were also reported by Ahmed *et al.* (2006) [1] and Mahesh *et al.* (2006) for plant height, number of fruits per plant, fruit weight and fruit yield per plant and Pandit *et al.* (2010) for fruit weight. And In the experimental study,

the traits like plant height, leaf curl incidence per cent, TSS 0Brix and ascorbic acid showed

high genetic advance as per cent of mean along with high heritability, genotypic coefficients of variation and phenotypic coefficients of variation. Similar finding were also reported by Manna and Paul (2012) [4] for plant height.

Conclusion

The results from the present investigation concluded that tomato hybrids S-22 X Kashi Vishesh and Azad T-6 X Kashi Vishesh identified as desirable with fruit yield per plant. Analysis of variance was significant for all characters under study. PCV is higher than GCV for all characters. High heritability coupled with high genetic advance (as% of mean) were noted for fruit weight, number of fruits per plant, days to first flowering, days to 50% flowering, pericarp thickness fruit yield per plant, plant height, number of locules per fruit.

path coefficient analysis showed that the fruit yield maximum positive direct effect on fruit yield per plant followed by TTS, Acidity, Shelf life, Leaf curl incidence

References

1. Ahmed N, Khan MI, Gupta AJ. Variability and heritability in tomato (*Lycopersicon esculentum* Mill.). Environment Ecology 2006;2:386-388.
2. Basavaraj SN, Hosamani RM, Patil BC. Genetic variability and genetic divergence in tomato (*Solanum lycopersicon* [Mill] Wattsd.). Karnataka J Agric. Sci 2010;23(3):536-537.
3. Dar RA, Sharma JP.Genetic Variability Studies of Yield and Quality Traits in Tomato (*Solanum lycopersicum* L.). International Journal of Plant Breeding and Genetic 2011;5(2):168-174.
4. Manna M, Paul A. Studies on genetic variability and character association of fruit quality parameters in tomato. Horticulture Flora Research Specific 2012;1(2):110-116.
5. Premalakshmi V, Kumar SR, Arumugan T. Evaluation and genetic advance in tomato hybrids. Trends in Bioscience 2014;7:1407-1410.
6. Rani CI, Muthuvel I, Veeraragavathatham D. Correlation and path coefficient for yield components and quality traits in tomato (*Lycopersicon esculentum* Mill.). Agriculture Scence. Dig. 2010;30:11-14.
7. Singh AK. Genetic variability, correlation and path coefficient studies in tomato (*Lycopersicon esculentum* Mill.) under cold arid region. Progressive Horticulture 2005;37:(2):437-443.
8. Sivasubramanian J, Madhavamenon P. Genotypic and phenotypic variability in rice. Madras Agriculture Journal 1973;12:15-16.
9. Taisa J, Belew D, Bantle K, Gebreselassie W. Variability, heritability and genetic advance in tomato (*Lycopersicon esculentum* Mill.) hybrids in West Shoa Ethopia. American-Eurasian Journal Agriculture & Environmental Science 2011;11(1):87-94.