The Pharma Innovation Journal 2022; 11(12): 1981-1983

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(12): 1981-1983

www.thepharmajournal.com
Received: 09-10-2022
Accepted: 13-11-2022

Mayur Kumar Sonagara
Department of Genetics and Plant Breeding, B. A. College of Agriculture, Anand Agricultural University, Anand, Gujarat, India

Dr. BN Patel
Associate Research Scientist, Pulse Research Station, Anand Agricultural University, Model Farm, Vadodara, Gujarat, India

Dr. RR Acharya
Research Scientist & Head, Main Vegetable Research Station, Anand Agricultural University, Anand, Gujarat, India

Dr. Akarsh Parihar
I/c. Unit Officer & Associate Research Scientist Department of Genetics and Plant Breeding, Anand Agricultural University, Anand, Gujarat, India

Dr. Rumit Patel
Research Associate, Department of Plant Molecular Biology and Biotechnology, Anand Agricultural University, Anand, Gujarat, India

Unnati Vaghela
Department of Genetics and Plant Breeding, B. A. College of Agriculture, Anand Agricultural University, Anand, Gujarat, India

Corresponding Author:
Mayur Kumar Sonagara
Department of Genetics and Plant Breeding, B. A. College of Agriculture, Anand Agricultural University, Anand, Gujarat, India

Assessment of genetic variability, heritability and genetic advance in brinjal (*Solanum melongena* L.)

Mayur Kumar Sonagara, Dr. BN Patel, Dr. RR Acharya, Dr. Akarsh Parihar, Dr. Rumit Patel and Unnati Vaghela

Abstract
The genetic parameters like range, mean, phenotypic coefficient of variation (PCV), genotypic coefficient of variation (GCV), heritability and genetic advance as a percentage over mean were studied in 96 brinjal genotypes for eleven traits in four different environments. The study revealed highly significant differences for most of the traits. High heritability coupled with high genetic advance as per cent of mean was observed for all the characters in all four environments except fruit yield per plant in E1, E2 and E4 (moderate heritability with moderate genetic advance as per cent of mean) and moisture content in all environments (high heritability with low genetic advance as per cent of mean). Genotypic and phenotypic coefficients of variations were highest for all the characters except for total soluble solid and moisture content. The high heritability and high genetic advance have been observed for all characters except two *viz.*, fruit yield per plant and moisture content.

Keywords: Brinjal, PCV, GCV, heritability, genetic advance

Introduction
Brinjal (*Solanum melongena* L.) is one of the principal vegetable crops cultivated in almost all parts of the Indian plains for its tender fruits. It is grown year-round except at higher altitudes. Tender fruits of brinjal contain protein, minerals, vitamins and iron (Gurbuz *et al.*, 2018) [2]. One-hundred-gram edible portion of brinjal fruits possesses 5.9 g carbohydrates, 1.4 g protein, 0.3 g fats, 1.3 g fibre, 124 I.U Vitamin A, 11 mg Vitamin C. It also contains minerals like chlorine 52.0 mg, phosphorus 47.0 mg and 44.0 mg sulphur. Fruits are well utilized in Indian System of Medicine. Principal states producing this crop are West Bengal, Orissa, Gujarat, Bihar, Madhya Pradesh, Chhattisgarh, Karnataka, Maharashtra, Andhra Pradesh and Tamil Nadu. Brinjal being indigenous to India, variation in plant type, stem color, leaf size, leaf tip, midrib colour, fruit size, fruit shape, fruit colour, fruit yield, cooking quality and tolerance to pest and disease is apparent (Ullah *et al*., 2014) [7]. The main objective is to study the extent of genetic variability with respect to yield, yield components and quality of fruits. Knowledge on the structure of the genetic variability within ecotypes of a region is of great help to draft programs for character improvement (Rathi *et al*., 2011) [5].

Materials and Methods
The experiment was conducted during *Kharif-Rabi* 2020-21 and *Kharif-Rabi* 2021-22, at two different locations i.e., Anand and Vadodara of Gujarat, under the jurisdiction of Anand Agricultural University. In Anand Main Vegetable Research Station, AAU, Anand is located in Agro Climatic Zone-III (Middle Gujarat) of Gujarat state. Geographically, Anand is situated at 22° 35' N latitude and 72° 55' E longitude with an elevation of 45.1 meters above the mean sea level. Pulses Research Station, AAU, Vadodara is located in Middle Gujarat Agroclimatic Zone-III. Geographically, Vadodara is situated at 22° 19' N latitude and 73° 11' E longitude with an elevation of 37.5 meters above the mean sea level. The experimental material is comprised of 96 genotypes of brinjal which were obtained from the Main Vegetable Research Station, Anand Agricultural University, Anand (Table 1). All four experiments were laid out in a randomized block design with three replications. Six weeks old healthy seedlings were transplanted along the sides of ridges laid at 60 cm spacing. The plant-to-plant distance was maintained as 60 cm. All the recommended packages of practices for raising a healthy crop were followed. Observations were recorded on five randomly selected plants of each accession for thirteen various characters.

Thirteen characters viz., days to 50% flowering, branches per plant, plant height (cm), fruit length (cm), fruit girth (cm), average fruit weight (g), fruits per plant, fruit yield per plant (kg), total phenols (mg/100 g), total soluble solid (ºbrix), anthocyanin content (mg/100 g), moisture content (%), and test weight (g). Phenotypic and genotypic coefficient of variation (Burton, 1952) [1], heritability (Allard, 1960) [10], and genetic advance as per cent of mean (Johnson *et al.* 1955) [3] were calculated.

Results and Discussion

In the present study, the variation that existed among the accessions was estimated as the coefficient of variation. The data on PCV and GCV for different traits presented in Table 2, further confirm the existence of wide variation. A low difference between phenotypic and genotypic variance was observed in all characters, indicating less influence of environment on the expression of characters in all environments under study. It suggested that selection could be possible based on the phenotypic expression of characters. Estimates of GCV and PCV were high for all the characters except total soluble solid and moisture content offering better scope for selection due to less influence of environment and suggesting potential variability available in germplasm for these traits While GCV and PCV were low to moderate for Total soluble solid and low for moisture content in all environments which indicated low to moderate variability was available in studied genotypes for these traits. This result is in accordance with the reports of Vaishya *et al.* (2017) [8] and Sujin *et al*. (2017) [6].

High heritability coupled with high genetic advance as per cent mean were noticed for all the characters the characters except two *viz.*, fruit yield per plant and moisture content, which suggested additive gene action and hence, these traits may be improved through hybridization followed by selection.. Fruit yield per plant, on the other hand, exhibited moderate heritability and moderate genetic advance which suggest that character could be controlled by additive and non-additive gene action, whereas moisture content had high heritability coupled with low genetic advance, suggesting preponderance of non-additive gene action for this action. Above research is in accordance with the findings of Vaishya *et al*. (2017) [8] and Mangai *et al*. (2017) [4].

Table 1: List of brinjal genotypes and their source

Sr. No.	Genotype	Sr. No.	Genotype	Sr. No.	Genotype	Sr. No.	Genotype
1	GP-BRJ-1	25	GP-BRJ-79	49	GP-BRJ-173	73	GP-BRJ-242
2	GP-BRJ-2	26	GP-BRJ-86	50	GP-BRJ-177	74	GP-BRJ-244
3	GP-BRJ-7	27	GP-BRJ-88	51	GP-BRJ-179	75	GP-BRJ-247
4	GP-BRJ-8	28	GP-BRJ-89	52	GP-BRJ-183	76	GP-BRJ-249
5	GP-BRJ-12	29	GP-BRJ-95	53	GP-BRJ-185	77	GP-BRJ-253
6	GP-BRJ-13	30	GP-BRJ-98	54	GP-BRJ-189	78	GP-BRJ-254
7	GP-BRJ-17	31	GP-BRJ-99	55	GP-BRJ-191	79	GP-BRJ-255
8	GP-BRJ-21	32	GP-BRJ-103	56	GP-BRJ-192	80	GP-BRJ-260
9	GP-BRJ-25	33	GP- BRJ-115	57	GP-BRJ-194	81	GP-BRJ-264
10	GP-BRJ-27	34	GP-BRJ-120	58	GP-BRJ-195	82	GP-BRJ-265
11	GP-BRJ-29	35	GP-BRJ-122	59	GP-BRJ-199	83	GP-BRJ-269
12	GP-BRJ-30	36	GP-BRJ-126	60	GP-BRJ-202	84	GP-BRJ-274
13	GP-BRJ-32	37	GP-BRJ-127	61	GP-BRJ-206	85	GP-BRJ-275
14	GP-BRJ-39	38	GP-BRJ-129	62	GP-BRJ-208	86	GP-BRJ-278
15	GP-BRJ-40	39	GP-BRJ-132	63	GP-BRJ-213	87	GP-BRJ-279
16	GP-BRJ-43	40	GP-BRJ-134	64	GP-BRJ-221	88	GP-BRJ-282
17	GP-BRJ-45	41	GP-BRJ-139	65	GP-BRJ-224	89	GP-BRJ-286
18	GP-BRJ-52	42	GP-BRJ-141	66	GP-BRJ-225	90	GP-BRJ-288
19	GP-BRJ-55	43	GP-BRJ-144	67	GP-BRJ-229	91	GOB 1
20	GP-BRJ-62	44	GP-BRJ-148	68	GP-BRJ-230	92	GAOB 2
21	GP-BRJ-64	45	GP-BRJ-158	69	GP-BRJ-233	93	GRB 5
22	GP-BRJ-66	46	GP-BRJ-159	70	GP-BRJ-237	94	GAB 6
23	GP-BRJ-71	47	GP-BRJ-168	71	GP-BRJ-238	95	Punjab Sadabahar
24	GP-BRJ-72	48	GP-BRJ-169	72	GP-BRJ-240	96	Swarn Mani

Table 2: Genetic variance, Phenotypic variance, PCV, GCV, Heritability and Genetic Advance for various characters in Brinjal

Characters	Environment	σ^2_g	σ^2_p	GCV (%)	PCV (%)	H^2_b (%)	GA% Mean
Average fruit weight	E_1	649.50	800.62	30.75	34.14	81.12	57.05
	E_2	769.03	930.48	34.01	37.41	82.65	63.70
	E_3	701.49	794.32	31.48	33.50	88.31	60.95
	E_4	724.15	832.70	33.62	36.05	86.96	64.59
Fruits per plant	E_1	276.17	326.09	36.23	39.37	84.69	68.69
	E_2	278.49	321.41	39.43	42.37	86.65	75.62
	E_3	247.45	283.61	34.73	37.18	87.25	66.82
	E_4	238.65	273.45	37.06	39.67	87.27	71.31
Fruit yield per plant	E_1	0.13	0.35	11.15	18.14	37.76	14.11
	E_2	0.21	0.42	15.92	22.42	50.41	23.29
	E_3	0.39	0.60	18.20	22.63	64.66	30.14
	E_4	0.09	0.18	10.90	15.65	48.51	15.64

Total phenols	E_1	2241.72	2250.85	43.27	43.36	99.59	88.95
	E_2	2232.71	2257.49	43.33	43.57	98.90	88.76
	E_3	2250.67	2260.53	43.37	43.46	99.56	89.14
	E_4	2227.84	2240.32	43.27	43.39	99.44	88.89
Total soluble solid	E_1	0.36	0.43	9.79	10.75	83.06	18.39
	E_2	0.27	0.36	8.56	9.85	75.52	15.32
	E_3	0.51	0.60	11.47	12.51	84.11	21.68
	E_4	0.43	0.52	10.73	11.72	83.88	20.25
Average fruit weight	E_1	649.50	800.62	30.75	34.14	81.12	57.05
	E_2	769.03	930.48	34.01	37.41	82.65	63.70
	E_3	701.49	794.32	31.48	33.50	88.31	60.95
	E_4	724.15	832.70	33.62	36.05	86.96	64.59
Fruits per plant	E_1	276.17	326.09	36.23	39.37	84.69	68.69
	E_2	278.49	321.41	39.43	42.37	86.65	75.62
	E_3	247.45	283.61	34.73	37.18	87.25	66.82
	E_4	238.65	273.45	37.06	39.67	87.27	71.31
Fruit yield per plant	E_1	0.13	0.35	11.15	18.14	37.76	14.11
	E_2	0.21	0.42	15.92	22.42	50.41	23.29
	E_3	0.39	0.60	18.20	22.63	64.66	30.14
	E_4	0.09	0.18	10.90	15.65	48.51	15.64
Total phenols	E_1	2241.72	2250.85	43.27	43.36	99.59	88.95
	E_2	2232.71	2257.49	43.33	43.57	98.90	88.76
	E_3	2250.67	2260.53	43.37	43.46	99.56	89.14
	E_4	2227.84	2240.32	43.27	43.39	99.44	88.89
Total soluble solid	E_1	0.36	0.43	9.79	10.75	83.06	18.39
	E_2	0.27	0.36	8.56	9.85	75.52	15.32
	E_3	0.51	0.60	11.47	12.51	84.11	21.68
	E_4	0.43	0.52	10.73	11.72	83.88	20.25
Anthocyanin content	E_1	887.89	888.87	82.90	82.95	99.89	170.68
	E_2	883.49	884.83	82.75	82.82	99.85	170.34
	E_3	892.45	893.94	83.36	83.43	99.83	171.58
	E_4	889.69	890.53	82.52	82.56	99.90	169.92
Moisture content	E_1	2.18	3.28	1.83	2.25	66.24	3.07
	E_2	2.48	3.72	1.95	2.39	66.63	3.29
	E_3	2.48	3.36	1.95	2.27	73.91	3.46
	E_4	2.27	3.25	1.87	2.24	70.00	3.23
Test weight	E_1	1.16	1.20	23.85	24.26	96.59	48.28
	E_2	1.16	1.24	23.92	24.71	93.72	47.70
	E_3	1.14	1.22	23.69	24.51	93.42	47.17
	E_4	1.22	1.32	24.51	25.49	92.42	48.53

E_1: *Kharif - rabi* : Anand 2020-21, E_2: *Kharif - rabi* : Vadodara 2020-21, E_3: *Kharif - rabi*: Anand 2021-22, E_4: *Kharif - rabi* : Vadodara 2021-22

Conflict of Interest

Authors have declared that no competing interests exist.

References

1. Burton GW. Quantitative inheritance in grasses. Proc. Sixth. Int. Grassland. Congr. 1952;1:277-287.
2. Gurbuz NU, Frary SA, Doganlar S. Health benefits and bioactive compounds of eggplant. Food Chem. 2018;268:602-610.
3. Johnson HW, Robinson HF, Comstock RE. Estimates of genetic and environmental variability in soybean (Glycine max). Agronomy Journal. 1955;47:314-318.
4. Mangai V, Patil HB, Mallesh S, Satish D, Muthaiah K. Variability and Genetic Divergence studies in brinjal (*Solanum melongena* L.) genotypes. Environment & Ecology. 2017;35(2):1261-1265.
5. Rathi S, Kumar R, Munshi AD, Verma M. Breeding potential of brinjal genotypes using D2 analysis. Indian J Hort. 2011;68(3):328-331.
6. Sujin SG, Karuppaiah P, Saravanan K. Genetic variability and correlation studies in brinjal (*Solanum melongena* L.). Indian J Agri. Res. 2017;51(2):112-119.
7. Ullah S, Usman I, Shah TT, Najeebullah M, Niaz S. Association of genetic assessment in brinjal. European J Biotechnol. Biosci. 2014;2(5):41-45.
8. Vaishya DV, Yadav GC, Bhargav KK, Tripathi V, Pandey M, Singh D, *et al*. Genetic diversity assessment in brinjal (*Solanum melongena* L.) genotypes for yield and yield components. Bull. Environ. Pharmacol. Life Sci. 2017;6(11):108-111.
9. Verma P, Kushwaha ML, Panchhaiya A. Studies on Variability, Heritability and Genetic Advance for Yield Attributing Traits in Brinjal (*Solanum melongena* L.) for two different Seasons. Int. J. Curr. Microbiol. App. Sci. 2018;7(9):1543-1552.
10. Jain SK, Allard RW. Population studies in predominantly self-pollinated species, I. Evidence for heterozygote advantage in a closed population of barley. Proceedings of the National Academy of Sciences. 1960 Oct;46(10):1371-1377.