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Genetic variability studies for yield and quality parameters in Brinjal (*Solanum melongena* L.)

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Abstract
The estimates of variability *viz*. coefficients of variability (phenotypic and genotypic), heritability (in broad sense) and genetic advance as percent of mean (genetic gain) were worked out for selection of various characters. The phenotypic and genotypic coefficients of variability were high for incidence of fruit rot, incidence of fruit borer, number of marketable fruits per plant, fruit weight, yield per plant, yield per plot, yield per hectare, fruit length, number of branches per plant and fruit breadth. The high estimates of heritability (broad sense) were found for all the characters studied *viz*. incidence of fruit borer (99.39%), incidence of fruit rot (99.23%), ascorbic acid content (97.39%), plant height (96.83%), number of branches per plant (96.65%), number of marketable fruits per plant (96.44%), fruit breadth (94.80%), fruit length (94.42%), fruit weight (93.75%), total harvest duration (90.43%), total soluble solids (90.33%), days to 50 percent flowering (85.10%), days to first harvest (84.82%), yield per plant (83.87%), yield per plot (84.72%), yield per hectare (84.72%).

Keywords: Brinjal, variability, heritability, genetic advance, genetic gain

Introduction
Brinjal, eggplant or aubergine (*Solanum melongena* L.) is the most popular and widely cultivated warm season vegetable crop in the central, southern and south-east Asia and in some African countries. Based upon its highest production potential and availability of the produce to consumers, it is also termed as poor man's vegetable. The genetic coefficient of variation alone gives the real picture of variability. The extent of genetic variability existing in a crop is of great importance, since greater the genetic diversity, wider is the scope for selection. The phenotypic variability among a collection of germplasm gives an indication of potential genotypic variability; however, the quantitative characters are greatly influenced by the environment. Therefore, selection of the important traits for a sound breeding programme should be based on the extent of variability along with heritability and genetic advance.

Materials and Methods
Fifty diverse genotypes of brinjal were used for the investigations. The list of genotypes along with their sources is presented in Table 1. The investigation was carried out at the Experimental Farm of the Department of Vegetable Science, Dr YS Parmar University of Horticulture and Forestry, Nauni, Solan, (HP) during summer – rainy season of 2017. The Experimental Farm is situated at 30°51' N latitude and 77°11' E longitude at an elevation of 1270 m (amsl). Agro – climatically, the farm falls in the mid hill zone of Himachal Pradesh and is characterized by sub – temperate to sub – tropical climate with moderate rainfall (1000 – 1300 mm). Parameters of variability were estimated as per formula given by Burton and De vane (1953) [4]. Heritability in broad sense was calculated as per formula given by Burton and De vane (1953) [4] and Allard (1960) [2]. The expected genetic advance resulting from selection of five percent superior individuals was calculated as per Allard (1960) [2]. Genetic gain expressed as percent ratio of genetic advance and population mean was calculated by the method given by Johnson *et al*. (1955) [5].

Table 1: List of genotypes along with their sources

SN	Source	Genotype
1.	YSP UHF, Nauni, HP	UHF BRL – 1, UHF BRL – 2, UHF BRL – 3, UHF BRL – 4, UHF BRL – 5, UHF BRL – 6, UHF BRL – 7, UHF BRL – 8
2.	ASPEE College of Horticulture & Forestry, Navsari	IC-074224-1, H-295-3
3.	ICAR - IARI, New Delhi	DB-110, DBR-128, DB-144, DB-143, DBL-139, DB-109, DB-181, DBR-134, DB-30, Pusa Kranti
4.	ICAR - IARI, RRS, Katrain	PPC, PPL
5.	ICAR - IIHR, Bangluru	Arka Nidhi Arka Keshav, Arka Shirish, Arka Kusumkar, Arka Neelkanth
6.	GBPUA&T, Pantnagar	Pant Samrat, PB-4, PB-6, BARI, Swarn Anubhav
7.	PAU, Ludhiana	SR-301, SR-305, SR-312, PBH-3, SR-303, SR-333, BH-2, SR-321, BR 101, BR-322-2, BR-16, BR-123, PBHR-41, PBHR-42, Punjab Nagina, Punjab Sadabahar, Punjab Barsati

Results and discussion

Amongst the various parameters of variability, high phenotypic and genotypic coefficients of variability were found in incidence of fruit rot, incidence of fruit borer, number of marketable fruits per plant, yield per plant, yield per plot, yield per hectare, fruit weight, fruit length, number of branches per plant and fruit breadth indicating wide range of variations and offered better scope for improvement through selection. Moderate phenotypic as well as genotypic coefficients of variability were recorded in traits; ascorbic acid content, plant height, days to 50 percent flowering, total soluble solids and total harvest duration whereas, low phenotypic and genotypic coefficients of variability were found in days to first harvest. In the earlier studies also, the high estimates of phenotypic (PCV) and genotypic (GCV) coefficients of variation have been observed for fruit weight, number of fruits per plant, fruit length, fruit girth, yield per plant by Prasad and Singh (2003) [13], for number of fruits per plant and yield per plant by Negi *et al*. (2000) [10] and Ram *et al*. (2007) [14] and, for number of fruits per plant, fruit length and fruit yield per plant by Naik (2006) [9], while moderate PCV and GCV were observed for plant height by Patel *et al*. (2017) [11]; ascorbic acid content by Ravali *et al*. (2017) [15]; total soluble solids by Tirkey *et al*. (2018) [19]; plant height by Muniappan *et al*. (2010) [8], Ansari *et al*. (2011) [3], Lokesh *et al*. (2013) [7], Yadav *et al*. (2014) [21], Vidhya and Kumar (2015) [20] and Sujin *et al*. (2017) [18].

The estimates of heritability (broad sense) were found to be high for all the characters studied *viz*. incidence of fruit borer (99.39%), incidence of fruit rot (99.23%), ascorbic acid content (97.39%), plant height (96.83%), number of branches per plant (96.65%), number of marketable fruits per plant (96.44%), fruit breadth (94.80%), fruit length (94.42%), fruit weight (93.75%), total harvest duration (90.43%), total soluble solids (90.33%), days to 50 percent flowering (85.10%), days to first harvest (84.82%), yield per plant (83.87%), yield per plot (84.72%), yield per hectare (84.72%). High heritability for different traits indicated that large proportion of phenotypic variance was attributed to genotypic variance and therefore, reliable selection could be made for these traits on the basis of phenotypic expression. Similarly, Shekar *et al*. (2012) also reported high heritability in fruit length (99.00%), fruit diameter (97.00%), days to first flowering (97.00%), days to first picking (97.00%), number of fruits per plant (89.00%), fruit yield per plant (83.00%), fruit yield per plot (83.00%), fruit yield per hectare (83.00%) and number of branches per plant (81.00%). Akpan *et al*. (2016) [1] reported high broad sense heritability estimates for fruit circumference (98.37%), fruit diameter (97.44%), days to 50 percent flowering (96.69%), number of fruits per plant (83.27%) in brinjal grown in early season, while the late season planting experiment showed that fruit yield per hectare (98.08%), number of fruits per plant (99.48%), fruit circumference (99.16%) and fruit diameter (98.50%) were among traits with high broad sense heritability.

Table 2: Estimates of phenotypic and genotypic coefficients of variability, heritability, genetic advance and genetic gain of different characters in brinjal

Characters	Mean	Range	Coefficient of variation (%)		Heritability (%)	Genetic advance	Genetic gain
			PCV	GCV			
Plant height (cm)	91.11	52.13-130.47	21.15	20.81	96.83	38.43	42.18
Number of branches per plant	5.31	3.02-11.56	32.32	31.77	96.65	3.42	64.35
Days to 50 percent flowering	40.90	29.33 - 61.67	18.72	17.27	85.10	13.42	32.82
Days to first harvest	73.30	57.00-96.17	13.74	12.65	84.82	17.60	24.01
Total harvest duration	90.59	55.00-113.33	15.94	15.16	90.43	34.47	29.69
Fruit length (cm)	10.66	5.80-19.94	33.80	32.85	94.42	7.01	65.75
Fruit breadth (cm)	4.40	1.91-7.55	31.75	30.92	94.80	2.73	62.01
Fruit weight (g)	83.43	23.01-219.13	49.01	47.45	93.75	78.96	94.65
Number of marketable fruits per plant	12.60	1.39-29.86	62.46	61.34	96.44	15.64	159.03
Yield/plant (kg)	0.59	0.153-1.180	50.42	46.18	83.87	0.51	87.12
Yield /plot (kg)	9.12	2.39-18.25	50.61	46.59	84.72	8.06	88.33
Yield/hectare (q)	179.50	46.96-359.02	50.61	46.59	84.72	158.55	88.33
Total soluble solids (°Brix)	4.13	3.10-5.40	16.38	15.57	90.33	1.26	39.07
Ascorbic acid (mg/100 g)	12.35	5.29-18.89	27.51	27.14	97.39	6.82	70.72
Incidence of fruit rot (%)	4.26	1.17-19.81	85.69	85.36	99.23	7.47	224.48
Incidence of fruit borer (%)	9.02	1.14-23.22	64.19	63.99	99.39	11.85	168.42

An inquisition of data in Table 2 revealed that genetic gain (expressed as percent of population mean) was low to high in nature and ranged from 24.01 to 224.48 percent for different characters under study. It was found high for the traits *viz*. incidence of fruit rot (224.48%), incidence of fruit borer (168.42%), number of marketable fruit per plant (159.03%),

fruit weight (94.65%), yield per hectare (88.33%), yield per plot (88.33%), yield per plant (87.12%), ascorbic acid content (70.72%), fruit length (65.75%), number of branches per plant (64.35%) and fruit breadth (62.01%). Moderate genetic gain was observed for plant height (42.18%), total soluble solids (39.07%) and days to 50 percent flowering (32.82%) while, low genetic gain was observed for days to first harvest (24.01%) and total harvest duration (29.69%).

The expression of the traits with high heritability and genetic advance is predominantly governed by additive gene effects and therefore, selection based on phenotypic performance will be useful to improve these characters in future as suggested by Prasad *et al*. (2004) [12]. High heritability coupled with moderate genetic advance as percent of mean was observed for harvesting period, fruit circumference, fruit length indicated that these characters were also controlled by additive gene and selection would be effective for improvement as reported by Karak *et al*. (2012) [6] and Solaimana *et al*. (2015) [17]. In our investigations, high heritability with low genetic gain was reported for the traits; days to first harvest and total harvest duration which implied that there was high influence of genotype x environment interaction and these traits were regulated by non additive gene action as suggested by Vidhya and Kumar (2015) [20] and accordingly, the improvement in these traits would be effective through recombinant breeding.

References

1. Akpan NM, Ogbonna PE, Onyia VN, Okechukwu EC, Atugwu IA. Variability studies on ten genotypes of eggplant for growth and yield performance in south eastern Nigeria. The Journal of Animal and Plant Sciences. 2016; 26:1034-1041.
2. Allard RW. Principles of Plant Breeding. John Wiley and Sons, New York, 1960, 485p.
3. Ansari SF, Mehta N, Ansari S, Gavel JP. Variability studies in brinjal (*Solanum melongena* L.) in Chhattisgarh plain. Electronic Journal of Plant Breeding. 2011; 2:275-281.
4. Burton GW, De-Vane EW. Estimating heritability in tall fescue (*Festuca arundiancea*) from replicated clonal material. Proejtunniens 1953; 9:12-15.
5. Johnson HW, Robinson HF, Comstock RE. Estimates of genetic and environmental viability in soya bean. Agronomy Journal. 1955; 47:314-318.
6. Karak C. Genetic variation and character association in fruit yield components and quality characters in brinjal (*Solanum melongena* L.). Journal of Crop and Weed 2012; 8:86-89.
7. Lokesh B, Reddy PS, Reddy RVSK, Sivaraj N. Variability, heritability and genetic advance studies in brinjal (*Solanum melongena* L.). Electronic Journal of Plant Breeding 2013; 4:1097-1100.
8. Muniappan S, Saravanan K, Ramya B. Studies on genetic divergence and variability for certain economic characters in eggplant (*Solanum melongena* L.). Electronic Journal of Plant Breeding. 2010; 1:462-65.
9. Naik CKK. Genetic variability and divergence studies in brinjal (*Solanum melongena* L.). Karnataka Journal of Agricultural Science. 2006; 19:488.
10. Negi AC, Baswana KS, Singh A, Sanwal SK, Batra BR. Studies on genetic variability and heritability in brinjal (*Solanum melongena* L) under high temperature conditions. Haryana Journal of Horticultural Science. 2000; 29:205-206.
11. Patel VK, Singh U, Goswami A, Tiwari SK, Singh M. Genetic variability, interrelationship and path analysis for yield attributes in eggplant. Environment and Ecology. 2017; 35:877-880.
12. Prasad M, Mehta N, Dikshit SN, Nichal SS. Genetic variability, genetic advance and heritability in brinjal (*Solanum melongena* L.). Orissa Journal of Horticulture 2004; 32:26-29.
13. Prasad VSRK, Singh DP. Biometrical relationship between F_1 potential and genetic distance in full diallel population of eggplant (*Solanum melongena* L.). Indian Journal of Horticulture. 2003; 60:346-352.
14. Ram K, Singh P, Singh R. Studies on genetic variability and selection parameters for economic characters in eggplant. International Journal of Plant Sciences 2007; 2:90-102.
15. Ravali B, Reddy KR, Saidaiah P, Shivraj N. Variability, heritability and genetic advance in brinjal (*Solanum melongena* L.). International Journal of Current Microbiology and Applied Science 2017; 6:42-47.
16. Shekar K, Ashok P, Sasikala K. Studies on Heritability and Multivariate Analyses in Brinjal (*Solanum melongena* L.). Vegetable Crops Research Bulletin 2012; 76:79-88.
17. Solaimana AHM, Nishizawa T, Khatun, Ahmad S. Physio-morphological characterization, genetic variability and correlation studies in brinjal genotypes of Bangladesh. Concept Press Limited. 2015; 4:1-36.
18. Sujin GS, Karuppaiah P, Saravanan K. Genetic variability and correlation studies in brinjal (*Solanum melongena* L.). Indian Journal of Agricultural Research. 2017; 51:112-119.
19. Tirkey M, Saravana S, Pushpa L. Studies on variability, heritability and genetic advance for yield and its attributes in brinjal (*Solanum melongena* L.). Journal of Pharmacognosy and Phytochemistry. 2018; 1:1181-1183.
20. Vidhya C, Kumar N. Genetic variability studies in brinjal (*Solanum melongena* L.) for fruit yield and quality. Electronic Journal of Plant Breeding. 2015; 6:668-671.
21. Yadav V, Mehta N, Rangare SB, Sahu E. Variability and heritability estimates in the germplasm collection of egg plant (*Solanum melongena* L.). Trends in Biosciences 2014; 7:3482-3484.