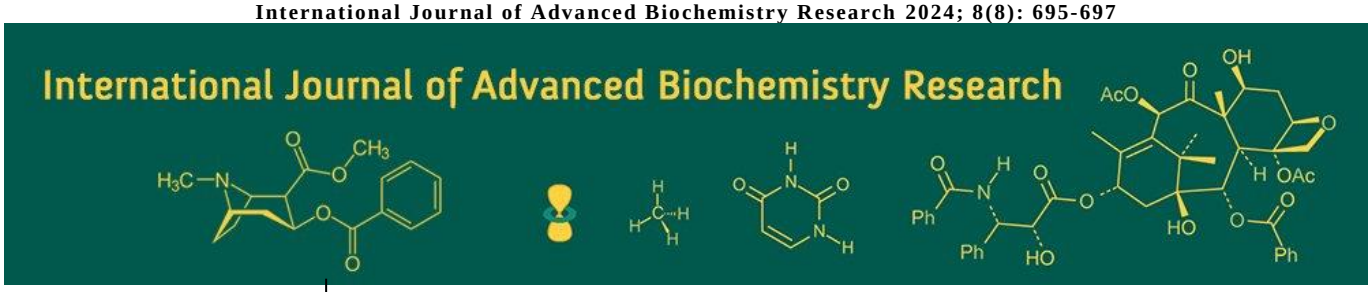

ISSN Print: 2617-4693
ISSN Online: 2617-4707
IJABR 2024; 8(8): 695-697
www.biochemjournal.com
Received: 06-06-2024
Accepted: 10-07-2024

Imamuddin Shah
Department of Vegetable Science, College of Agriculture, GBPUA&T, Pantnagar, Uttarakhand, India

Dhirendra Singh
Department of Vegetable Science, College of Agriculture, GBPUA&T, Pantnagar, Uttarakhand, India

SK Verma
Department of Genetics and Plant Breeding, College of Agriculture, GBPUA&T, Pantnagar, Uttarakhand, India

Alka Verma
Department of Vegetable Science, College of Agriculture, GBPUA&T, Pantnagar, Uttarakhand, India

Lalit Bhatt
Department of Vegetable Science, College of Agriculture, GBPUA&T, Pantnagar, Uttarakhand, India

Corresponding Author:
Dhirendra Singh
Department of Vegetable Science, College of Agriculture, GBPUA&T, Pantnagar, Uttarakhand, India

Assessment of variability, heritability and genetic advance in brinjal under Terai region of Uttarakhand

Imamuddin Shah, Dhirendra Singh, SK Verma, Alka Verma and Lalit Bhatt

DOI: https://doi.org/10.33545/26174693.2024.v8.i8i.1828

Abstract
An experiment was conducted at the Vegetable Research Centre, G. B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand during the *Kharif* season 2023 to determine the relationship between the characteristics affecting the plant growth and yield parameters in brinjal. The experiment was conducted in Randomize Block Design with twelve genotypes of brinjal. Highly significant differences were observed among forty-three diverse brinjal genotypes for various traits. Fruit yield per plant showed the highest phenotypic and genotypic coefficient variation. The lowest values were recorded for days to first fruit picking. Low differences were observed between GCV and PCV values across all traits. The heritability was estimates high (above 71.50%) for all traits. High genetic relatedness, indicating that they are controlled by additive genes and can be effectively improved through selection.

Keywords: Variability, heritability, genetic advance, brinjal

Introduction
Brinjal is an essential solanaceous crop mainly during summer and rainy season. It is widely grown in sub tropics, tropics and in temperate regions during warm seasons. Brinjal is well suited to high rainfall and warm temperature. It is one of the few vegetable capable of producing great yields in hot and humid conditions (Hanson *et al*., 2006) [5]. The name brinjal is also called as the Aubergine in the European countries which is taken from the French word (Reddy, M. 2021) [11]. The good amount of anthocyanins in brinjal acts as an antioxidant and prevents ageing, cancer, neurological disorders and inflammatory diseases. Brinjal extracts are used in reducing cholesterol of blood and liver. (Hanur, 2010) [6]. Lipid peroxidation is reduced by nasunin, a special type of anthocyanin pigment in eggplant. (Igarashi *et al*., 1993) [7]. Brinjal plant having the semi-spreading habit with erect in nature and grown as the herbaceous annual crop. The crop having the usually self-pollination but in case of hot and humid climate cross pollination occurs up to extent of the 20% *via.*, insect or wind. This crop is highly adaptable, growing throughout the year in various agro-climatic conditions. Although it grows perennially, it is cultivated for profit as an annual crop. Brinjal display a wide range of fruit shapes and colours, ranging from round or egg-shaped to long club-shaped; and from white, yellow, green through degrees of grandiloquent saturation to nearly black (Choudhary, 1976) [2].

Being the centre of origin, India has accrued many varieties of brinjal and has good variability in various traits. This has created a need for new varieties of brinjal that can meet the specific requirements of regional growers. Therefore, the coefficient of variation is useful in assessing the extent of genetic variability for particular traits. Selection in a population cannot be effective without variation. Heritability is a measure of the transmission of traits from parents to offspring (Falconer, 1981) [4]. Heritability represents the proportion of phenotypic variation that is repeatable due to genes and thus helps breeders select superior varieties for a trait (Koundinya *et al*., 2013) [8]. The main objective of this research is to identify better genotypes from 43 populations of brinjal.

Materials and Methods

The experiment was conducted during the *kharif* season 2023 at the Vegetable Research Centre, G. B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand. This site is located at 29.5°N latitude and 79.3°E longitude with an altitude of 243.84 meters above the mean sea level. The climate condition of this region is humid sub-tropical with hot dry summer and cool winter. The soil of the experimental farm is calcareous nature with shallow deep and pH range 6.5 to 7.6. The experiment was conducted in Randomize Block Design with forty-three genotypes of brinjal. The spacing between plant to plant and row to row was kept 75 × 75cm. The experimental material comprising of these brinjal genotypes were evaluated for twelve horticultural characteristics. We used farmyard manure (FYM) @ 1000-1500 kg per hectare and 120 kg nitrogen, 60 kg phosphorus and 50 kg potassium per hectare (NPK) fertilizers were applied in each germplasm. The biometric observations on growth and yield were recorded in each replication of five randomly selected plants at different stages. The observations *i.e*., plant height (cm), days to 50% flowering, days to first fruit picking, number of primary branches, leaf area (cm^2), number of flowers per cluster, number of fruits per cluster, length of calyx (cm), length of pedicel (cm), fruit length (cm), fruit diameter (cm) and fruit yield per plant (kg).

Statistical analysis

The variability in forty-three genotypes were analysed in thirteen traits for growth and yield characters suggested for a Randomized Block Design (RBD) was used to analysis for significant differences among the treatments using 'R' platform.

Results and discussion

The findings from the present research studies regarding various genetic variability parameters *viz*., phenotypic variance, genotypic variance, environmental variance, phenotypic coefficient of variation (PCV), genotypic coefficient of variation (GCV), heritability (h^2) and genetic advance as percentage of mean (genetic gain) for all the 12 traits under the present study for *Kharif* season 2023 has been presented in the Table and explained below in various subheads.

Genotypic and phenotypic coefficient of variation

The genotypic and phenotypic coefficient of variation (PCV and GCV) was found high for fruit yield per plant (37.79% and 36.63%), number of fruits per cluster (32.19% and 30.99%), fruit diameter (31.21% and 30.67%), leaf area (29.85% and 29.45%), fruit length (21.52% and 21.07%) and plant height (21.42% and 21.26%). Apart from this, high GCV and medium PCV was observed for number of flowers per cluster (22.66% and 19.44%). The moderate GCV and PCV was observed for the traits *viz*., number of primary branches (15.80% and 15.27%) and length of pedicel (14.79% and 12.92%). Here, moderate GCV and low PCV was found for length of calyx (11.51% and 9.73%). Low GCV and PCV was observed for days to first fruit picking (7.47% and 6.81%) and days to 50% flowering (6.78% and 6.52%). While studying brinjal, examined the genotypic and phenotypic variations in various traits. High variation provides opportunities to select desirable characteristics through selective breeding. Most qualitative and yield parameters displayed high GCV and PCV across different brinjal genotypes. The similar results were also given by Sujin *et al*. (2017) [14], Dutta *et al*, (2018) [3], Sreevandana and Jana (2024) [13] and Singh *et al*. (2024) [12].

Heritability (h^2)

The high heritability plant height (98.49%), leaf area (97.35%), fruit diameter (96.58%), fruit length (95.83%), fruit yield per plant (93.94 %). number of primary branches (93.34%), days to 50% flowering (92.68%), number of fruits per cluster (92.64%) and days to first fruit picking (83.15%). Whereas, moderate heritability was found for the traits *viz*., length of pedicel (76.29%), number of flowers per cluster (73.59%) and length of calyx (71.50%). While investigating heritability in eggplant, various traits were evaluated. High heritability estimates for traits such as plant height, leaf area, fruit diameter, fruit length, fruit yield per plant, number of primary branches, days to 50% flowering and number of fruits per bunch suggest that genetic factors significantly influence their expression. Understanding heritability helps in selecting better parent plants for breeding programs focused on enhancing desirable traits in future generations. The similar experiments were reported by Tirkey *et al*. (2018) [15], Kuswaha *et al*. (2023) [9] and Sreevandana and Jana (2024) [13] were reported in brinjal.

Table: Estimation of genetic parameters for growth and yield traits

Characters	PCV (%)	GCV (%)	Heritability (h^2)	Genetic Advance as % of mean
Plant Height (cm)	21.42	21.26	98.49	43.47
Days to 50% flowering	6.78	6.52	92.68	12.94
Days to first fruit picking	7.47	6.81	83.15	12.80
Number of primary branches	15.80	15.27	93.34	30.39
Leaf area (cm^2)	29.85	29.45	97.35	59.86
Number of flower per cluster	22.66	19.44	73.59	34.35
Number of fruit per cluster	32.19	30.99	92.64	61.44
Length of calyx (cm	11.51	9.73	71.50	16.94
Length of pedicel (cm)	14.79	12.92	76.29	23.25
Fruit length (cm)	21.52	21.07	95.83	42.50
Fruit diameter (cm)	31.21	30.67	96.58	62.11
Fruit yield per plant (kg)	37.79	36.63	93.94	73.14

Genetic advance as % of mean

The genetic advance as % of mean (genetic gain) was recorded high for fruit yield per plant (73.14%), fruit diameter (62.11%), number of fruits per cluster (61.44%), leaf area (59.86%), plant height (43.47%), fruit length (42.50%), number of flowers per cluster (34.35%), number of primary branches (30.39%) and length of pedicel (23.25%). Moderate genetic was found for the traits *viz*., length of calyx (16.94%) and days to 50% flowering (12.94%). Low genetic gain was observed for days to first

fruit picking (12.80%). While investigating genetic advances in brinjal, various traits such as fruit yield per plant, fruit diameter, leaf area are evaluated and found to be more than 50% throughout the research. The high genetic gain indicates substantial potential for improvement through selection. The findings of Arti and Sharma (2018) [1], Dutta *et al*, (2018) [3] and Kuswaha *et al*. (2023) [9] and Nagar *et al*. (2024) [10] were similar.

Conclusion

High estimates of PCV, GCV and heritability as well as high estimates of genetic progress for plant height (cm), days to 50% flowering, days to first fruit picking, number of primary branches, leaf area (cm^2), number of flowers per cluster, number of fruits per cluster, length of calyx (cm), length of pedicel (cm), fruit length (cm), fruit diameter (cm) and fruit yield per plant (kg) indicated that the available variability for these traits in the germplasm was high and selection for these traits could be effective. The promising genotypes were identified in this study could be used for pre-breeding programmes for given traits.

References

1. Arti D, AK Sharma. Genetic variability studies for yield and quality parameters in Brinjal (*Solanum melongena* L.). J Pharmacogn Phytochem. 2018;7:2494-2496.
2. Choudhary B. Evolution of Crop Plants, Ed. N.W. Simmonds, Longman Inc., London and New York; c1976. p. 278-279.
3. Dutta R, Mandal AK, Maity TK, Hazra P. Multivariate genetic divergence in brinjal (*Solanum melongena* L.). J Crop and Weed. 2009;5:67-70.
4. Falconer DS. Introduction to quantitative genetics. Longman group Ltd. Agron J. 1981;51: 515-518.
5. Hanson PM, Yang RY, Tsou SCS, Ledesma D, Engle L, Lee TC. Diversity in eggplant (*Solanum melongena*) for superoxide scavenging activity, total phenolics, and ascorbic acid. J Food Composi Analysis. 2006;19:594-600.
6. Hanur VS. Brinjal. Advances in Horticulture Biotechnology Regeneration systems volume II: Vegetables ornamentals and Tuber crops- Singh, H. P, Parthasarathy, V. A. and Babu, K. N. Westville Publishing House, New Delhi. c2010.
7. Igarashi K, Yoshida T, Suzuki E. Antioxidative activity of nasunin in choujanasu (little eggplant, *Solanum melongena* L. Chouja). J Jpn Soc Food Sci. 1993;40:138-143.
8. Koundinya AVV, D hankhar SK, Yadav AC. Genetic variability and divergence in okra (*Abelmoschus esculentus*). Indian J Agric Sci. 2013;83(6): 685–8.
9. Kuswaha C, Singh L, Vyas RP, Singh PK, Rathore T, Yadav A, Kumar S. Study about the Genetic Variability, Heritability and Genetic Advance for Yield and Yield Attributing Traits of Brinjal (*Solanum melongena* L.). Int J Environ Clim. 2023;13:4566-4574.
10. Nagar KL, Rana DK, Barela A, Rahangdale S. Study of Genetic Diversity and Genetic Advance in Brinjal for Morpho-Economic Traits (*Solanum melongena* L.). Int J Environ Clim. 2024;14(3):437-444.
11. Reddy M. Compiled vegetable science. Jain brothers publisher, New Delhi. c2021, p. 75-82.
12. Singh B, Chaubey T, Singh RK, Upadhyay DK, Jha A, Pandey S. Genetic variation in phenatic traits of extant varieties of brinjal (*Solanum melongena* L.). J Appl Hortic, 2024;26(1):107-111.
13. Sreevandana K, Jana JC. Studies on Genetic Variability, Heritability and Genetic Advance for Yield and Its Attributed Traits in Brinjal (*Solanum melongena* L.). Int J Environ Clim. 2024;14(4):275-282.
14. Sujin GS, Karuppaiah P, Saravanan K. Genetic variability and correlation studies in brinjal (*Solanum melongena* L.). Indian J Agric Res. 2017;51(2):112-119.
15. Tirkey M. Saravana S, Lata P. Studies on variability, heritability and genetic advance for yield and its attributes in brinjal (*Solanum melongena* L.). J Pharmacogn Phytochem. 2018;7:1181-1183.