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Genetic Variability Studies in Advanced Breeding Lines of Brinjal (*Solanum melongena* L.) for Fruit Yield and Quality Parameters

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ABSTRACT

An experiment was carried out to assess genetic variability in thirty advanced breeding lines of brinjal during *Rabi* season 2021-2022 at the College of Horticulture, Mudigere. The experiment was laid out in randomized complete block design with three replications. Analysis of variance indicated the presence of large variability for different characters under study. The genotypic coefficient of variation and phenotypic coefficient of variation was high (>20 %) for the number of primary branches at 30 DAT, average fruit weight, whereas, plant height at 30 and 90 DAT, number of primary branches at 90 DAT, stalk length, fruit yield per plot, estimated fruit yield per hectare, dry matter content and fruit phenol content showed moderate GCV and PCV. High heritability coupled with high genetic advance (>20 %) in per cent of mean were recorded for plant height at 30 DAT, number of primary branches at 30 and 90 DAT, days to first flowering, average fruit weight, stalk length, fruit yield per plot, estimated fruit yield, dry matter content and fruit phenol content indicating that these traits are controlled by additive gene action. Therefore, studied characters may be included in assortment criterion for improvement in fruit yield per plant and yield contributing traits.

Key words : *Brinjal, Variability, PCV, GCV, Heritability and genetic advance.*

Introduction

Brinjal or Aubergine or Eggplant [*Solanum melongena* L.] 2n=2x=24 belongs to the family Solanaceae which is one of the most important commercial vegetable crops in the world, especially in the tropics and subtropics. Brinjal is grown on commercial scale in India, China, Turkey, Japan, Egypt, Italy, Indonesia, Iraq, Syria, Spain, Philippines, Bulgaria and USA. In India, Brinjal is grown with an area of 7.27 million hectares with the production of 1.27 million MT Anon (2019). In Karnataka, brinjal covers an area of 9,596 hectares with the production of 2,44,154 metric tonnes and productivity is 25.44 met-

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ric tonnes per hectare Anon (2019).

Being the centre of origin, India has accumulated with wide range of variability in this crop, and exhibits a good amount of variability for various characters. However, regional preference differs greatly with size, shape, colour of fruits and prickles on the calyx. This has created the necessity to breed new brinjal varieties, which may fulfil the area specific needs of the growers. Planning and execution of a breeding programme for the improvement of the various quantitative attributes depend, to a great extent, upon the magnitude of genetic variability and divergence existing in the population. So, it is necessary to partition total variability to principal components (heritable and non-heritable) through estimation of some genetic parameters like phenotypic (PCV) and genotypic (GCV) coefficient of variability, heritability and genetic advance that gave complete indication of genetic variations of the studied traits.

The present studies were, therefore, initiated with an objective to determine genetic variability for fruit yield and related attributes along with quality components in a collection of 30 advanced breeding lines of brinjal.

Materials and Methods

The current research was done at the College of Horticulture, Mudigere, Karnataka during *Rabi* season 2021-22. Thirty advanced breeding lines of brinjal along with five checks (Arka Neelanchal Shyama, Mattigulla, Devanur Local, Arka Keshav, Arka Harshitha) were evaluated in randomized complete block design with three replications. Thirty days old seedlings from the nursery beds were transplanted in the main field adopting a spacing of 75 cm × 60 cm. All the recommended cultural practices and plant protection measures were followed. Observations were recorded from five randomly selected tagged plants of each line in each replication for various quantitative characters and mean data were subjected to statistical analyses. Analysis of variance of the data for the component traits was analysed as per the model given by Panse and Sukhatme (1967). The phenotypic, genotypic, environmental coefficients of variation, heritability in broad sense (h^2bs) and the expected genetic advance (GA) for different characters content were calculated as suggested by Burton and Devane (1953) and Johnson *et al.* (1955) respectively. Moisture content is determined by ohaus instant moisture analyzer (MB45, Parsippany, NJ, USA).Total phenolic contents were determined using folinciocalteu reagent and expressed as gallic acid equivalents (Singleton and Rossi, 1965).

Results and Discussion

Estimates of genetic parameters for yield and quality attributes in advanced breeding lines of brinjal is furnished in Table 1.

Estimates of phenotypic coefficient of variation (PCV) and genotypic coefficient of variation (GCV) for different quantitative traits in advanced breeding lines of brinjal

In the present study, the genotypic coefficient of variability was lower in magnitude than the phenotypic coefficient of variability for all the characters studied. High values of these characters indicate wider variability and vice versa. Accordingly, a narrow difference between the phenotypic coefficient of variation (PCV) and genotypic coefficient of variation (GCV) implies the lesser effect of the environment on the expression of these traits. High (> 20 %) values of PCV and GCV were observed for the characters like the number of primary branches at 30 DAT and average fruit weight. While, moderate (10 - 20 %) PCV and GCV were registered by the characters like plant height at 30 and 90 DAT, number of primary branches at 90 DAT, stalk length, fruit yield per plot, estimated fruit yield, dry matter content and fruit phenol content indicating the presence of a high level of variability and offer a better opportunity for improvement through selection. These results are in corroboration with Devaraju *et al.* (2020) and Sharma *et al*. (2022).

High PCV and moderate GCV were observed for the characters like days to first flowering indicating the role of the environment. This is in conformity with the findings of Magar *et al*. (2019).

Low PCV and GCV were observed for the characters like moisture content indicating that extent of genetic variation observed was low for these character among the genotypes studied. Low PCV and GCV showed the narrow genetic base consequently selection for such characters may not give pleasing results. These results are in agreement with the findings of Verma *et al*. (2021) and Kumar *et al*. (2022).

Estimates of broad sense heritability in advanced breeding lines of brinjal

Heritability is the heritable portion of the phenotypic variance. It is an efficient indicator of the transmission of characters from parents to offspring. For plant breeders, selection of elite genotypes from the diverse genetic population could be easily achieved through heritability. Heritability suggests plant breeders about the proportion of improvement of their populations through the genetic study of plants. In the selected plants, improvement in the mean genotypic value over the parental population is termed as genetic advance. It helps to measure the genetic gain under selection. Enhancement of yield and quality of brinjal is attributed by the simultaneous choice of desirable character combination of genotypes existing in nature.

In the present study, high (>60 %) heritability has been observed for all the characters is the indication of prevalence of additive genetic effects (fixable) involved in their expression and predicted to show good response to phenotypic selection in crop improvement programme. Hence, it is advisable for direct selection based on phenotype to improve these characters. These results are in agreement with the findings of Sajjan *et al*. (2021) and Verma *et al*. (2021).

Estimates of genetic advance along with heritability in a broad sense for all studied traits in advanced breeding lines of brinjal

A significant degree of genetic advance must be present in addition to high heritability in order to make effective selection in segregating generations. Genetic advance is an improvement over the base population that can be potentially achieved through selection and a function of heritability of the trait the breeder uses. High heritability accompanied by high genetic advance indicates the predominance of additive gene effects and selection may be effective.

In the present experiment, estimates of high heritability in broad sense coupled with high genetic advance as per cent of mean was recorded for plant height at 30 DAT,number of primary branches at 30 and 90 DAT, days to first flowering, average fruit weight, stalk length, fruit yield per plot, estimated fruit yield, dry matter content and fruit phenol content.The results indicate the presence of additive genes in these attributes and less influence of environmental variation which further suggest reliable crop improvement through selection based on phenotypic performance for these attributes would be effective. These results are in accordance with Kumar *et al*.(2022).

Moderate heritability in broad sense and low genetic advance as per cent over mean was observed for the character moisture content indicating that this character was influenced by environment and selection for improvement of this character would be ineffective. Similar reports were illustrated by Verma *et al*. (2021).

The study revealed moderate to high genetic variability exists in the population for plant height at 30 and 90 DAT, number of primary branches at 30 and 90 DAT, days to first flowering, average fruit weight, stalk length, fruit yield per plot, estimated

Table 1. Estimates of genetic parameters for yield and quality attributes in advanced breeding lines of brinjal

Sl. No.	Characters	GV	PV	GCV (%)	PCV (%)	h^2 (%)	GA	GAM (%)
1	Plant height at 30 DAT (cm)	12.84	14.79	16.17	17.36	86.78	6.88	31.04
2	Plant height at 90 DAT (cm)	35.28	40.61	10.19	10.93	86.87	11.40	19.56
3	Number of primary branches (30 DAT)	0.97	1.13	21.64	23.43	85.30	1.87	41.17
4	Number of primary branches (90 DAT)	4.94	5.25	18.10	18.67	93.93	4.44	36.13
5	Days to first flowering	72.06	84.49	19.05	20.62	85.29	16.15	36.23
6	Average fruit weight (g)	140.06	149.13	20.55	21.21	93.92	23.63	41.03
7	Stalk length (cm)	0.38	0.42	16.03	16.99	89.00	1.19	31.14
8	Fruit yield per plot (kg)	3.90	4.28	15.29	16.00	91.29	3.89	30.09
9	Estimated fruit yield (t/ha)	21.80	23.03	16.32	16.78	94.65	9.36	32.72
10	Dry matter content (g/100g)	1.87	1.93	14.59	14.84	96.70	2.77	29.56
11	Moisture content	1.70	3.55	1.44	2.08	48.02	1.86	2.06
12	Fruit phenol content (mg/100g)	64.42	67.76	16.72	17.15	95.08	16.12	33.59

GV = Genotypic variance GCV = Genotypic coefficient of variation h^2 =Heritability GA= Genetic Advance
PV = Phenotypic variance PCV =Phenotypic coefficient of variation AM =Genetic Advance as per cent over mean

fruit yield, dry matter content and fruit phenol content along with high heritability coupled with high genetic advance as per cent over mean. Therefore, direct selection can made for these characters and could be utilized for development of high yielding genotypes in brinjal.

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Conflict of interest

The authors have declared that no conflict of interest exists.

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