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Variability, heritability and genetic advance for qualitative and quantitative characters in brinjal (*Solanum melongena* L.)

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Abstract
A study was carried out using 30 local genotypes of brinjal to estimate the variability, heritability and genetic advance in the Department of Vegetable Crops, Horticultural College and Research Institute, Coimbatore. Relatively high estimates of genotypic and phenotypic coefficient of variation were observed for number of branches per plant, days to first flowering, fruit girth, fruit length and fruit borer infestation. Low level of genotypic coefficient of variation for plant height, protein, total phenols, ascorbic acid and solasodine and low to moderate levels of genotypic coefficient of variation and phenotypic coefficient of variation for branches per plant, days to first harvest and fruit yield per plant were recorded. High heritability coupled with high expected genetic advance was observed for days to first flowering, days to 50 per cent flowering, days to first harvest, fruit length, fruit girth, fruit weight, fruit yield per plant and fruit borer infestation, which indicates that the selection among the local type can bring about significant improvement in the fruit yield and its component characters.

Keywords: Brinjal, heritability, genetic advance, fruit yield

Introduction
Brinjal (*Solanum melongena* Linn.) is commonly known as egg plant / aubergine is an important vegetable which is believed to be originated in India, belongs to the family *Solanaceae.* As a native crop of the country, it has been cultivated since time immemorial. This is a most common, popular vegetable crop, highly cosmopolitan and considered as poor man's crop grown in almost all parts of India except higher altitudes, all the year round. It contributes nine per cent of the total vegetable production in our country.

The area under brinjal cultivation in as 16.2 million ha, production as 145.4 million metric tonnes (Statistical Year Book, India, 2016).

The brinjal fruit at vegetable maturity has quite high nutritive value and can be well compared with tomato. It contains high amount of carbohydrates (6.4%), protein (1.3%), fat (0.3%), calcium (0.02%), phosphorus (0.02%), iron (0.0013%) and other mineral matters.

Brinjal provides an excellent example of crop grown in different macro environments and it is particularly appropriate to embark upon a variation study as a primary step in formulating a rational improvement programme. For any breeding programme, information on the nature and magnitude of variability and association of plant characters is useful as a basis for selection of desirable parents.

In the crop improvement programme, information in the range of variability present in respect of different quantitative characters is of great importance as the success of phenotypic selection depends upon the range of genetic variability present in the population as stated by Prakash *et al.* (1990) [8]. Evolving superior genotypes would be effective, only when the existing variability in the chosen material is wide.

The observed variability for any character is the result of interaction of hereditary effects of concerned genes and the influence of environment. Hence, it becomes necessary to partition the overall phenotypic variability into heritable and non-heritable components to have an effective selection for superior genotypes. A comprehensive knowledge on the above genetic parameters is indispensable to aim at rational improvement in crop plant.

In any selection programme, it may not be always possible to select based on yield alone, for evolving superior yielding genotypes, because yield is a complex character and is collectively influenced by many component characters

Hence selection pressure could be more easily exerted on any character which shows close association with yield.

Materials and methods

The present investigation on brinjal was carried out in the Department of Vegetable Crops, Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore. The experimental material consisted of 30 local types of brinjal, which were collected from several districts in Tamil Nadu. The main field was thoroughly ploughed for 4 times and FYM was incorporated in the soil @ 25 tonnes per hectare. Raised beds of 1.0 m breath, 0.15 m height with convenient length were prepared. Five weeks old healthy seedlings were transplanted in a crossing block with spacing of 60 x 60 cm. The plants were nourished with 125: 100: 50 kg of NPK per hectare. All other recommended cultivation practices were followed. Observations on various growth parameters, earliness for flowering and harvest, fruit characters were measured. The harvested fruits at vegetable maturity were used for quality analysis *viz.*, protein content, total phenols, ascorbic acid and solasodine content. The recorded observations were statistically analyzed and tabulated.

Results and discussion

The table value showed that relatively high estimates of genotypic and phenotypic coefficient of variation were observed for number of branches per plant, days to first flowering, fruit girth, fruit length and fruit borer infestation. This is in accordance with the findings of Omkar Singh and Kumar (2005) [7]. Mahaveer Prasad *et al.* (2006) [5] who observed similar trend for days to first flowering. Moderate phenotypic and genotypic coefficient of variation was observed for days to first harvest, fruit weight, number of fruits per plant, and fruit yield per plant. This is in corroboration with the findings of Islam and Uddin (2009) [3] and Sharmin *et al.* (2010) [12]. Low level of genotypic coefficient of variation for plant height, protein, total phenols, ascorbic acid and solasodine, and low to moderate levels of genotypic and phenotypic coefficient of variation for branches per plant, days to first harvest and fruit yield per plant were recorded. Similar results were reported by Sharmin *et al.* (2010) [12] and Roychowdhury *et al.* (2011) [9].

In general, the values of phenotypic coefficient of variation were higher than the values of genotypic coefficient of variation indicating that the apparent variation is not only due to genotypes but also due to the influence of environment. Hence selection for improvement of such characters will not be rewarding but the values of genotypic coefficient of variation and phenotypic coefficient of variation for plant height, plant spread, number of branches per plant, number of fruits per cluster, average fruit diameter, average fruit weight, shoot and fruit borer incidence on shoot and on fruit and fruit yield per plant were high indicating the presence of high variability in the germplasm for selection and even the differences between phenotypic coefficient of variation and genotypic coefficient of variation values were minimum, indicating that the traits under study were less influenced by the environment. Hence, these characters can be relied upon and simple selection practice for further improvement.

In this study, the coefficient of genotypic and phenotypic variation in respect of all the characters did not differ much in their magnitude suggesting that the characters are not much amenable to environmental factors, as such the selection may be based very well on the phenotypic values.

Genotypic coefficient of variation does not give an idea of total variation that is heritable. Further, it may not be feasible to determine the amount of heritable variation and the relative degree to which a character is transmitted from parent to offspring, by the estimate of heritability. But heritability estimate in broad sense alone, do not serve as the true indicator of genetic potentiality of the genotype, since the scope is restricted by their interaction with environment. Hence, it is advisable to consider the predicted genetic advance as percent of mean along with heritability estimate as a reliable tool in selection programme (Johnson *et al.*, 1955) [4]. Hence, both heritability and genetic advance as percent of mean were determined to get a clear picture of the scope of improvement in various characters through selection.

In the present investigation, high heritability coupled with high expected genetic advance was observed days to first flowering, days to 50 per cent flowering, days to first harvest, fruit length, fruit girth, fruit weight, fruit yield per plant and fruit borer infestation, which indicates that the selection among the local type can bring about significant improvement in the fruit yield and its component characters. This result is in conformity with the findings of Sao and Abhinav (2006) [11]. Further high heritability coupled with high expected genetic advance indicated the involvement of additive gene action, therefore selection may be effective. Similar findings were reported by Ambade (2008) [11], Mishra *et al.* (2008) [6], Sabeena *et al.* (2011) [10] and Balaji Lokesh *et al.* (2013) [2] in brinjal.

High heritability and moderate genetic advance as per cent of mean were recorded for number of branches per plant, number of fruits per plant and shoot borer infestation. High heritability and low level infestation of genetic advance as per cent of mean were recorded for plant height, protein content, Ascorbic acid content and Solasodine content. Similar results of high heritability and moderate genetic advance as per cent of mean was reported in brinjal by S. F. Ansari *et al.* (2011) [10] and high heritability with low genetic advance as per cent of mean for the above characters were noticed by Balaji Lokesh *et al.* (2013) [2].

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