

Research Article**Genetic Variability For Different Biometrical Traits In Pearl Millet Genotypes (*Pennisetum glaucum* L. R. BR.)**

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Abstract

Pearl millet (*Pennisetum glaucum* (L.) R. Br.) is an important crop of the semi-arid tropics in Africa and India. The present study was conducted to evaluate the pearl millet genotypes to assess the magnitude of variability and to understand the heritable component of variation present in the biometrical characters. A field trial was laid out with 47 pearl millet genotypes and the observations were recorded on days to 50% flowering, plant height, number of tillers per plant, ear head length, ear head breadth, root length, shoot length, root shoot ratio and seed yield per plant. The phenotypic co-efficient of variation (PCV) was greater than genotypic co-efficient of variation (GCV) for all the characters studied, this shows the influence of the environmental effect on the characters. The traits, number of tillers per plant, ear head length, root-shoot ratio and seed yield showed moderate PCV and GCV while the traits, days to 50% flowering, plant height, ear head breadth, root length and shoot length showed low PCV and GCV. High heritability was observed for all the traits under study. High heritability combined with high genetic advance (as per cent of mean) was observed for ear head length and seed yield and these characters were controlled by additive gene effects. Selection based on these characters would be effective for future pearl millet crop improvement programme.

Key words: Pearl millet, heritability, PCV, GCV, genetic advance

Introduction

Pearl millet is the fifth most important cereal crop, and the most important millet with more than 55 percent of global millet production, grown in 40 countries, predominantly in Africa and Asia, as a staple food grain and source of feed, fodder, fuel and construction material. In India pearl millet occupies fourth position among cereal crops next to rice, wheat and sorghum. Though it is a drought tolerant crop, it faces moisture stress very often. Hence breeding for drought tolerance forms an integral part of pearl millet breeding.

Genetic variability studies provide basic information regarding the genetic properties of the population based on which breeding methods are formulated for further improvement of the crop. These studies are also helpful to know about the nature and extent of variability that can

be attributed to different causes, sensitive nature of the crop to environmental influences, heritability of the characters and genetic advance that can be realized in practical breeding. Progress in any crop improvement venture depends mainly on the magnitude of genetic variability and heritability present in the source material. The extent of variability is measured by GCV and PCV which provides information about relative amount of variation in different characters. Hence, to have a thorough comprehensive idea, it is necessary to have an analytical assessment of yield components. Since heritability is also influenced by environment, the information on heritability alone may not help in pin pointing characters enforcing selection. Nevertheless, the heritability estimates in conjunction with the predicted genetic advance will be more reliable (Johnson *et al.*, 1955). Heritability gives the information on the magnitude of inheritance of quantitative traits, while genetic advance will be helpful in formulating suitable selection procedures.

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Materials and Methods

The experimental material for the present study consists of forty seven diverse genotypes of pearl millet, which are being maintained at Department of Millets, Centre for Plant Breeding and Genetics, Tamil Nadu Agricultural University, Coimbatore. The crop was raised during kharif 2008 at the Department of Millets, Centre for Plant Breeding and Genetics, Tamil Nadu Agricultural University, Coimbatore in a randomized block design with three replications. Each genotype was sown in two rows of 4m length plot and 45cm apart by adopting a spacing of 45 x 15cm. Normal recommended cultural practices and plant protection measures were followed. The observations were recorded for five randomly selected plants in each genotype for nine characters *viz.*, days to 50% flowering, plant height, number of tillers per plant, ear head length, ear head breadth, root length, shoot length, root-shoot ratio and seed yield per plant. The data were subjected to statistical analysis. Phenotypic and genotypic variances were estimated according to the formula given by Lush (1940), PCV and GCV were computed based on the methods given by Burton (1952). The heritability was computed based on the methods given by Falconer (1960) and genetic advance was estimated according to the formula given by Johnson *et al.*, (1955).

Results and discussion

Analysis of variance revealed high and significant variation for all the characters under study indicating considerable amount of genetic variation present in the materials. The estimates of genetic parameters like genotypic coefficient of variation, heritability and genetic advance are presented in table 1. Perusal of the data indicates that the traits, plant height and shoot length recorded higher genotypic and phenotypic variation than the other characters studied. The maximum range of variation was observed for plant height, ear head length and shoot length, indicating the scope for genetic improvement in these characters through selection and other breeding methods.

Coefficient of variation

Though the phenotypic coefficient of variation (PCV) was greater than genotypic coefficient of variation (GCV) for all the characters studied, the close resemblance between the corresponding estimates of PCV and GCV in almost all the characters except number of tillers per plant,

suggested that the environment had little role in the expression of these characters. None of the traits recorded high PCV and GCV. The traits *viz.*, number of tillers per plant, ear head length, root-shoot ratio and seed yield per plant showed moderate GCV and PCV values. Similar results were reported for ear head length by Galeta *et al.*, (2005) and for number of tillers per plant by Vetriventhan and Nirmalakumari (2007). Low PCV and GCV were observed for days to 50% flowering, plant height, ear head breadth, root length and shoot length. Similar results were reported for days to 50% flowering and ear head breadth by Vetriventhan and Nirmalakumari (2007).

Heritability

The heritability and genetic advance estimates were interpreted as low medium and high as per the classification of Johnson *et al.*, (1955). Broad sense heritability ranged from 56.11 (Number of tillers per plant) to 95.25 (Plant height) per cent. High heritability was recorded for all the characters under study except number of tillers per plant, which showed moderate heritability. High heritability combined with high genetic advance as per cent of mean was observed for ear head length and seed yield per plant. This indicates the lesser influence of environment in expression of these characters and prevalence of additive gene action in their inheritance, hence amenable for simple selection. Similar results were reported for ear head length by Galeta *et al.*, (2005) and for seed yield per plant by Bhoite *et al.*, (2008) and Meena Kumari and Nagarajan (2008).

High heritability with moderate genetic advance as per cent of mean was recorded for plant height and root-shoot ratio, indicating that these characters were governed by additive gene action. Besides, high heritability with moderate genetic advance as per cent of mean for root/shoot ratio indicates that selection based on this character will be more effective for screening drought tolerant pearl millet genotypes. High heritability coupled with low genetic advance as per cent of mean was recorded for days to 50% flowering, ear head breadth and shoot length indicating non-additive gene action for these traits. These results are in conformity with Vetriventhan and Nirmalakumari (2007), Ghorpade and Metta (1993), Saraswathi *et al.*, (1995) and Chen ling *et al.* (1996).



The knowledge on heritability of traits is helpful to decide the selection procedure to be followed to improve the trait in a situation. Higher estimates of heritability with genetic advance as per cent of mean was observed for ear head length and seed yield per plant indicating the presence of additive gene action and so selection can be easily done for these traits. The traits which expressed high heritability and low genetic advance showed non additive gene action, hence heterosis breeding would be recommended for these traits.

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**Table 1. Estimates of variability parameters for different biometrical characters in pearl millet**

Character	Mean	Range	Genotypic variance	Phenotypic variance	GCV (%)	PCV (%)	Heritability (%)	Genetic advance as percent of mean
Days to 50% flowering	48.46	44.50 - 52.50	2.76	3.16	3.43	3.67	87.41	6.61
Plant height (cm)	148.29	122.50 - 185.50	178.80	187.69	9.02	9.24	95.25	18.13
Number of Tillers	4.20	2.50 - 5.50	0.21	0.38	10.94	14.61	56.11	16.88
Ear head length (cm)	22.45	19.00 - 44.00	12.58	14.76	15.80	17.12	85.23	30.05
Ear head breadth (cm)	8.36	7.00 - 9.40	0.22	0.29	5.62	6.41	77.00	10.16
Root length (cm)	22.83	18.77 - 27.35	3.80	4.81	8.546	9.61	78.91	15.62
Shoot length (cm)	123.19	107.00 - 137.50	48.92	56.79	5.68	6.12	86.14	10.86
Root-shoot ratio	0.19	0.14 - 0.24	0.01	0.01	10.63	11.70	82.59	19.91
Grain yield per plant (g)	54.24	44.28 - 63.83	0.02	0.02	11.62	12.48	86.73	22.29