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# Genetic Variability, Heritability and Genetics Advance studies for yield and its Contributing traits in Pearl millet [*pennisetum glaucum* (L.) R.Br.] hybrids

**Manoj Kumar[1] P. C. Gupta[2] and Mukesh Kumar[3]**

[123]Department of Plant Breeding and Genetics College of Agriculture, SKRAU, Bikaner (Rajasthan), India

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**Abstract**

**A field investigation was carried out to estimate the genetic variability, heritability and genetic advance in the pearl millet hybrids. The phenotypic coefficient of variation (PCV) was higher than the genotypic coefficient of variation (GCV) in all the characters. The highest GCV associated with high heritability of with good genetic advance was observed for biological yield per plant followed by harvest index. The lowest variability associated with low heritability and low genetic advance as per cent of mean was observed for plant height. High heritability in association with high genetic advance observed for biological yield per plant and moderate heritability coupled with high genetic advance observed for harvest index. It indicates that most likely the heritable is due to the preponderance of additive gene effects and the potential of selection for these characters to improve yield.**

**Key words**: Genetic variability, heritability, genetic advance, pearl millet.

## Introduction

Pearl millet [ *Pennisetum glaucum* (L.) R.Br.] is a major warm season cereal crop in arid and semi-arid regions of Africa, India and other Asian countries. It is locally known as bajra, sajja, combo, bari, ganti and kambam. The crop is grown commonly under the most difficult farming conditions, including those in drought stricken areas where rainfall and soil fertility is low and food supplies are dependent on rainfall. It is the fourth most important staple food after rice, wheat, and maize in India. The potential of pearl millet as food, feed and fodder is well known. In India pearl millet occupied an area of 6.84 mha with production and productivity of 7.26 mt and 1061 kg/ ha. (Anonymous, 2012-13). Pearl millet is mainly grown in Rajasthan, Western part of Gujrat, Haryana and Western Utter Pradesh. Rajasthan occupies first position in area and production in India. In Rajasthan it is cultivated on 39.56 lac ha area with the production and productivity of 38.39 lac tonnes and 971 kg/ ha. (Anonymous, 2012-13). The grains of pearl millet are very nutritious and good source of carbohydrates, protein, fat and minerals, particularly phosphorus and iron. Evolution of genotypes to asses the existing variability is considered as preliminary steps in any crop improvement programme, further estimate of heritability and genetic advance would give the best picture of the extent of improvement expected from selection and reliability of selection based on phenotype therefore present investigation was made to estimate the genetic variability, heritability and genetic advance in the pearl millet genotypes.

## Materials and Methods

The present investigation comprised of 50 pearl millet genotypes including 3 checks. The genotypes were sown in randomized block design with two replication at Agriculture Research Station Beechwal, Bikaner during kharif season 2013. Each genotype was planted in a double rows plot of 4x1 $m^2$, maintaining row to row and plant to plant spacing 15 cm and 50 cm respectively. All the recommended package of practices was given to raise a good crop. Observations on ten randomly selected plants From each replication were recorded for 8 characters *viz*, plant height (cm), number of effective tillers per plant, ear head length (cm), ear head diameter (cm), 1000-seed weight (g), harvest index (%), biological yield per plant (g) and seed yield per plant (g). While two characters namely days to 50 per cent flowering and days to maturity were recorded on whole plant basis. Data recorded were subjected to statistical analysis. Genotypic coefficient of variation (GCV) and phenotypic coefficient of variation (PCV) were calculated by formula given by Burton (1952), heritability in broad sense by Burton and Vane (1953) and genetic advance given by Johnson *et al.* (1955).

***Corresponding authors- e-mail: manoj.vishnoi108@gmail.com***
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**Results and Discussion**

Genetic variability, heritability and genetic advance for ten characters in fifty genotypes were studied. Analysis of variance revealed significant differences among the genotypes for all the characters studied. Variability parameters for all the studied traits were given in Table 1. The magnitude of PCV as expected was greater than the corresponding GCV for all the characters indicating importance of environment in expression of characters. Among all the traits high GCV and PCV were observed for number of effective tillers per plant, harvest index, biological yield per plant and seed yield per plant in comparison to other characters indicating the presence of high amount of genetic variability for these characters therefore selection for these characters would be effective because the response to selection is directly proportional to the variability present in the experimental material. Low GCV and PCV were observed for days to 50 per cent flowering, days to maturity, plant height (cm) and ear head diameter (cm). Similarly high and significant variability for grain yield per plant was reported by Vidyadhar *et al*.(2007) and Sumathi *et al*.(2010). Genetic coefficient of variance does not provide the clear indication of proportion of heritable components of variation therefore estimation of heritability become necessary. In the present study the heritability in general was high (›90%) for a character i.e biological yield per plant (g), While moderate heritability was recorded for most of the characters i.e. days to 50 per cent flowering, days to maturity, number of effective tillers per plant, ear head length (cm), ear head diameter (cm), test weight (g), harvest index (%) and seed yield per plant (g). Low heritability was observed for plant height (cm). Similar estimation of heritability for various characters have been reported by Laxshmana *et al*. (2003) and Nagar *et al*. (2006). The heritability estimates alone do not provide reliable information about the gene governing the expression of a particular character and this do not provide the information of the amount of genetic progress that would result from the selection of best individuals. Johanson *et al*. (1995) had pointed about that the heritability estimates along with genetic advance were more useful than heritability estimates alone in predicting the response to selection. In the present investigation genetic advance was estimated for all the traits. Genetic advance was highest for biological yield per plant (g) and harvest index (%).whereas it was moderate for plant height (cm). Heritability and genetic advance are two complementary concepts. Thus, heritability values may be used to estimate the genetic advance through selection for predicting the utility and value of selection. In the present investigation, high heritability along with high genetic advance was observed for biological yield per plant (g). Moderate heritability with high genetic advance was observed for harvest index (%).None of the character showed low heritability and low genetic advance.

**Table 1: Estimates of range, genotypic and phenotypic coefficient of variation, heritability (broad sense %) and genetic advance of different characters of pearl millet hybrids**

| S. No. | Character | Mean | Range | G.C.V. % | P.C.V. % | Heritability $h^2$(b) (%) | Genetic Advance | GA % of Mean |
|---|---|---|---|---|---|---|---|---|
| **1.** | Days to 50% flowering | 51.96 | 44-63 | 8.58 | 9.12 | 88.52 | 8.6 | 16.55 |
| **2.** | Days to maturity | 81.92 | 74-93 | 5.46 | 5.76 | 89.75 | 8.7 | 10.62 |
| **3.** | Plant height (cm) | 127.52 | 108-152 | 5.82 | 8.61 | 45.72 | 10.33 | 8.1 |
| **4.** | No. of effective tillers/plant | 1.27 | 1-2 | 21.50 | 24.96 | 74.19 | 0.49 | 38.4 |
| **5.** | Ear head length (cm) | 21.66 | 17.3-28.9 | 10.48 | 13.03 | 64.66 | 3.76 | 17.35 |
| **6.** | Ear head diameter (cm) | 2.23 | 1.9-2.6 | 5.95 | 8.36 | 50.71 | 0.2 | 8.94 |
| **7.** | Test weight (g) | 8.19 | 5.3-11.6 | 15.01 | 17.40 | 74.38 | 2.19 | 26.73 |
| **8.** | Harvest index (%) | 39.39 | 12.1-63.8 | 33.29 | 35.73 | 86.78 | 25.17 | 63.9 |
| **9.** | Biological yield/plant (g) | 40.37 | 19.37-89.5 | 34.20 | 35.56 | 92.54 | 27.37 | 67.79 |
| **10.** | Seed yield/plant (g) | 14.75 | 5.91-26.47 | 30.95 | 34.32 | 81.33 | 8.49 | 57.52 |

**References**


1. **Anonymous,** 2012-13. Agricultural Statistics At A Glance, Directorate of Economics and Statistics, Deptt. of Agriculture and Cooperation, Ministry of Agriculture, Gov. of India.

2. **Anonymous,** 2012-13. Rajasthan Agricultural Statistics At A Glance, Commissionarate of Agriculture, Rajasthan, Jaipur.

3. **Burton, G.W.,** 1952. Quantitative inheritance in pearl millet (*Pennisetum glaucum*) *Proc. 6th Intl. Grassland Cong*., **1**:277-283.

4. **Burton, G.W. and Vane de, E.M.** 1953. Estimation of heritability in tall fescus (*Festuca arundinacea*) from replicated clonal material. *Agron. J.,* 45: 478-481.

5. **Johnson, H.W., H.F. Robinson, and R.E. Comstock,** 1955. Estimate of genetic and environmental variability in soyabean. *Agron. J*., **47**:314-318.

6. **Lakhasmana, D., Kumar, S and Gurbmrthu, R,** 2003. Genetic variability studies in pearl millet.*Crop Res*., **4**:363-365.

7. **Nagar, R.P., Singh, D. and Jain R.K.** 2006. Genetic variability in fodder pearl millet. *Range Mgnt. and Agroforestry*, **27**:55-57.

8. **Sumathi, P., Madinesi, S. and Veerabadhiran, P.** 2010. Genetic variability for different biometrical traits in pearl millet genotypes (*Pennisetum glaucum* (L.) R. BR.).*J. Plant Breeding*, **1**(4):437-440.

9. **Vidyadhar, B., Swanalatha, P.I., Sai, Reddy, V.M. and Ramachandraiah, D.** 2007. Genetic variability and character association in pearl millet. Indian *J. of Agric. Res.*, 41(2): 150-153. 6