



## Assessment of Genetic Variability Parameters in Pearl Millet [*Pennisetum glaucum* (L). R. Br.] Hybrids

Ravina Beniwal<sup>1,4\*</sup>, P.C. Gupta<sup>1</sup>, A.K. Sharma<sup>1</sup>, O.P. Parihar<sup>2</sup>, Bhagyashree Phogat<sup>3</sup>  
and Navreet Kaur Rai<sup>1</sup>

<sup>1</sup>Department of Genetics and Plant Breeding, SKRAU, Bikaner (Rajasthan), India.

<sup>2</sup>Department of Agronomy, COA, RVSKVV, Gwalior (Madhya Pradesh) India.

<sup>3</sup>Department of Agronomy, SKRAU, Bikaner (Rajasthan), India.

<sup>4</sup>Department of Genetics and Plant Breeding, ICAR-IARI (New Delhi), India.

(Corresponding author: Ravina Beniwal\*)

(Received: 03 January 2023; Revised: 13 February 2023; Accepted: 15 February 2023; Published: 18 February 2023)

(Published by Research Trend)

**ABSTRACT:** The 63 hybrids pearl millet (*Pennisetum glaucum* L.) were evaluated for ten quantitative characters for screening the genetic variability. These hybrids were evaluated in RBD during kharif 2019 conducted at Research Farm of SKRAU, Bikaner Rajasthan. Analysis of variance obtained prominent differences among the hybrid varieties for all that characters except days to maturity indicating presence of good variability amount in the hybrids of pearl millet used in the study. As usual the PCV values were found more than GCV values for all traits which indicated positive effect of environment on the characters expression. Biological produce per plant and seed produce per plant had improved estimate of GCV and PCV. Biological produce per plant and seed produce per plant had high estimate heritability along with genetic advance as per cent of mean.

**Keywords:** Hybrids, variability parameters, quantitative traits, Pearl millet.

### INTRODUCTION

Pearl millet is an important crop in millets which confer nutrition, meal and fodder for the growing population and animals. Compared to other millets, a fair amount of lipid around five per cent is obtained from pearl millet. Pearl millet is also used in many type of diseases as if abdominal, costiveness and many non-communicable diseases (Nambiar *et al.*, 2011). The highest production of pearl millet is in India. Annual production of pearl millet is around eight million tonnes which is produced in area of about seven million hectares. The productivity of pearl millet in one hectare is 1154 kilogram. (Anonymous, 2017-18).

In India, the state of Rajasthan comes first in pearl millet production and area. In Rajasthan among the crops of kharif season, pearl millet is grown in maximum area. In Rajasthan pearl millet is the second most consumed grain after wheat. In Rajasthan, it is cultivated in 4.15 million hectares area with the production of 4.01 million tonnes and productivity 1001 kg/ha. Major pearl millet producing districts of Rajasthan are Alwar, Sikar, Bharatpur, Jhunjhunu, Sikar Karauli, Jaipur, Dausa, Dholpur, Nagaur, Swai Madhopur, Barmer, Bikaner, Jaisalmer and Churu (Agricultural Statistics at a Glance 2017-18).

### MATERIALS AND METHODS

The experiment design RBD and Three replications during kharif season 2019 at Research Farm of Beniwal *et al.*,

SKRAU, Bikaner Rajasthan. In each plot, two rows of 4 meter long were kept. The row to row and plant to plant distance was taken 60 × 15 cm. Normal and uniform cultural operations carried out during the crop season. So that good production can be done. The experiment was sown on 26 July, 2019. During the experiment included of 60 hybrids, produced by crossing four male sterile lines which is female parents and the fifteen restorers which is male parents and three check hybrids of pearl millet. Ten quantitative traits were recorded for experiment *viz.*, data of days to 50 per cent flowering, data of days to maturity, plant height measurement (cm), data of number of effective tillers per plant, ear head length measurement (cm), ear head diameter measurement (cm), test weight (in gram), harvest index (per cent), biological yield per plant (in gram) and seed yield per plant (in gram). Statistical analysis of the genetic advance was analyzed by the formula suggested by Robinson *et al.* (1949) and genetic advances per cent mean was categorized according to Johnson *et al.* (1955). Genotypic and phenotypic coefficients of variation were analyzed from a method given by Burton and Devine (1953) and classified according to Sivasubramanian and Menon (1973).

### RESULTS AND DISCUSSION

It is shown from the given data table number one that significant difference to each of the hybrids for all the traits except days to maturity indicating presence of

good variability amount in the hybrids of pearl millet used in the study. However, replications were non-significant for all the Characters indicating good homogeneity among replications. An extensive category of variability for various characters has been found earlier by Shanmuganathan *et al.* (2006); Govindaraj *et al.* (2011).

Genetic variability parameters studied for different traits of pearl millet all these are given in table number two. Based on the analyzed data the PCV values were more than GCV values. all the given traits which indicated positive effect of environment on the characters expression. Among all the characters high GCV were observed for biological produce per plant (g) and seed produce per plant (g) as PCV were observed for no. of effective tillers per plant, harvest index (per cent), biological produce per plant (gram) and seed produce per plant (gram) compared to all other characters indicating the existence of high degree of genetic variability for all the given characters. Moderate GCV were observed for harvest index (%) and PCV were recorded for plant height (cm), ear head length measurement (cm), measurement of ear head diameter (cm) and test weight. Low GCV were recorded for days to 50 per cent flowering, days to maturity, plant height measurement (cm), measurement of ear head

length, measurement of ear head diameter (cm) and test weight and PCV were recorded for days to 50 percent flowering and days to maturity. The significant variability for most of the traits is commonly reported in natural population of pearl millet. High and significant variability for plant height was recorded by Sagar and Sagar (2002); Lakshmana *et al.* (2003), Sharma *et al.* (2003), for each plant grain production by Bhorkhataria *et al.* (2005); for dry fodder production on each plant by Vidyadhar *et al.* (2007).

According to current analysis, the heritability in general was high for a character i.e. ear head length (cm), measurement of ear head diameter (cm), harvest index of pearl millet (%), biological production per plant (gram) and seed produce per plant (gram). Similar estimation of heritability for various traits have been reported by Kulkarni *et al.* (2000); Sharma (2002). Genetic advance recorded highest for biological produce per plant (g). It was less for days to fifty percent flowering, days to maturity of plant, measurement of plant height (cm), count number of effective tillers per plant, measurement of ear head length (cm), ear head diameter (cm), test weight analysis (g), harvest index analysis (per cent) & seed produce per plant (gram).

**Table 1: Analysis of variance for different characters of pearl millet hybrids.**

Sr. No.	Characters	Replications (df= 2)	Genotypes (df=62)	Error (df=124)
1.	Days to 50 %	5.227	26.501**	15.598
2.	Days to maturity	38.100	53.529	39.401
3.	Plant height (cm)	198.554	403.234**	235.640
4.	No. of effective tillers/plant	0.575	0.802*	0.562
5.	Ear head length (cm)	3.806	14.705***	5.725
5.	Ear head diameter(cm)	0.087	0.197***	0.070
7.	Test weight (g)	2.363	2.398*	1.566
8.	Harvest index (%)	8.436	37.547***	15.883
9.	Biological yield/plant	836.682	7789.079***	2612.908
10.	Seed yield/ plant (g)	23.084	250.191***	107.530

\* Significant at 5% probability level; \*\* Significant at 1% probability level

**Table 2: Estimates of range, genotypic and phenotypic coefficient of variation, genetic advance and heritability (broad sense per cent) of different traits of pearl millet hybrids.**

Character	Mean	Range	GCV (%)	PCV (%)	Heritability (%) (bs)	GA	GA % of Mean
1. Days to 50% flowering	45.80	30.66-50.33	4.16	9.57	18.90	1.70	3.72
2. Days to maturity	82.61	55.33-88.33	2.62	8.03	10.78	1.46	1.76
3. Plant height (cm)	159.01	110.66-177	4.70	10.73	19.26	6.74	4.23
4. No. of effective tillers/plant	2.83	1.40-4.06	9.95	28.27	12.40	0.20	7.22
5. Ear head length (cm)	23.97	14.86-28.83	7.21	12.31	34.33	2.08	8.71
6. Ear head diameter (cm)	2.53	1.73-2.96	8.12	13.28	37.56	0.25	10.24
7. Test weight (g)	10.39	7-11.63	5.06	13.06	15.04	0.42	4.04
8. Harvest index (%)	16.51	11.15-30.67	16.27	29.10	31.35	3.09	18.73
9. Biological yield/plant (g)	196.01	102-306	21.19	33.60	39.88	53.96	27.53
10. Seed yield/plant (g)	31.89	16-58	21.62	39.04	30.77	7.86	24.66

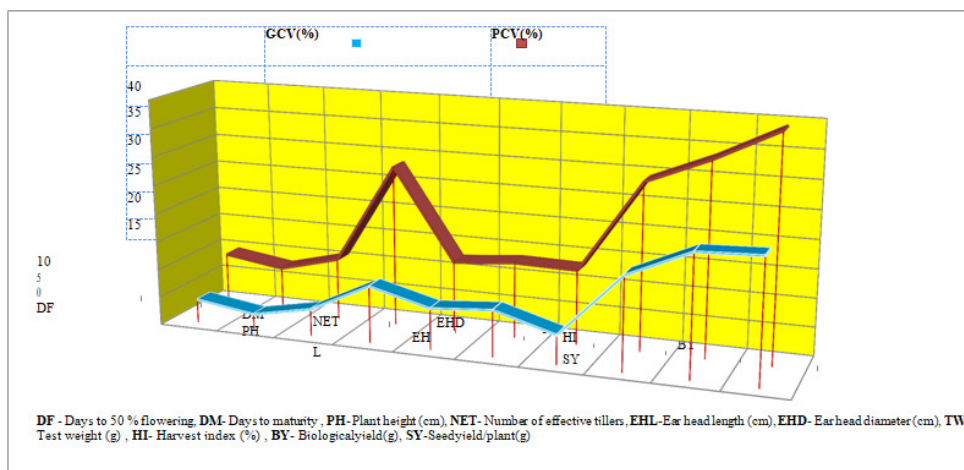


Fig. 1. Genotypic and phenotypic variability in Pearl Millet hybrids.

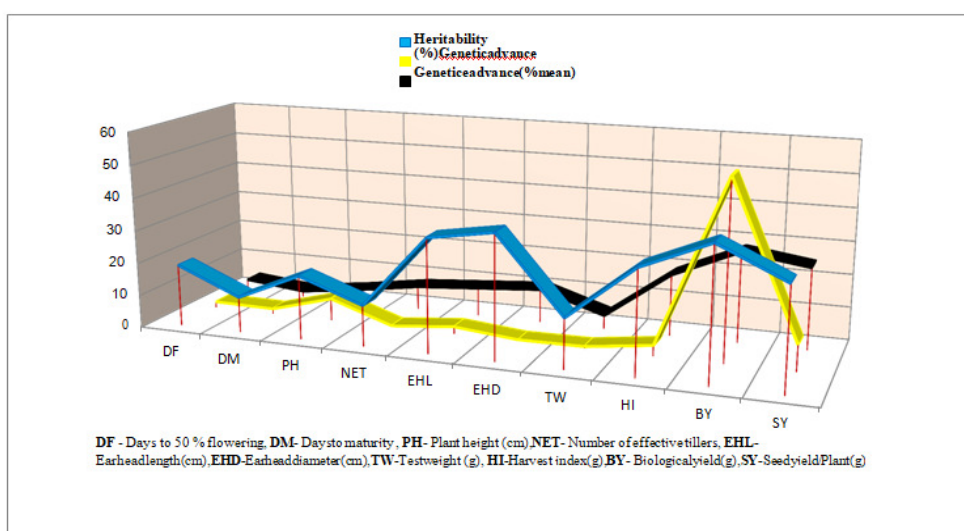


Fig. 2. Heritability, genetic advance and GA (% mean) in Pearl Millet.

## CONCLUSIONS

Based on the research findings, it can be concluded that the study shows significant variability among pearl millet hybrids for most traits, except for days to maturity. Replications were non-significant, indicating good homogeneity among replications. The PCV values were higher than the GCV values for all traits, indicating a positive effect of the environment on their expression. The highest GCV values were observed for biological and seed produce per plant, while the highest PCV values were recorded for no. of effective tillers, harvest index, biological produce per plant, and seed produce per plant. Heritability was generally high for ear head length, ear head diameter, harvest index, biological production per plant, and seed produce per plant. Genetic advance was highest for biological produce per plant and lowest for days to 50 percent flowering and days to maturity. The results suggest good variability in pearl millet traits, indicating the potential for selection and breeding programs to improve yield and quality.

**Acknowledgment.** This research work was completed with the guidance and help of the advisory committee and all co-authors, P.C. Gupta, A.K. Sharma, Omprakash Parihar, Bhagyashree Phogat Navreet Kaur Rai and my parents I am highly grateful of research facilities provided by college of agriculture, SKRAU- Bikaner, Rajasthan.

**Conflicts of Interest.** None.

## REFERENCES

- Agricultural Statistics at a Glance (2017-18). Area, production and productivity, Ministry of Agriculture Govt. of Rajasthan.
- Anonymous (2017-18). Agricultural Statistics at A Glance 2016, Directorate of Economics & Statistics, Department of Agriculture, Cooperation and Farmers Welfare, Ministry of Agriculture and Farmers Welfare, Govt. of India. [www.agricoop.nic.in](http://www.agricoop.nic.in).
- Burton, G. W. and Devane, E. M. (1953). Estimating heritability fall fescue (*Festuca arundanaceae*) from replicated coinal-material. *Agron. J.*, 45, 478-481.
- Govindaraj, M., Selvi, B., Rajarathinam, S. and Sumathi, P. (2011). Genetic variability and heritability of grain yield components and grain concentration in pearl millet accessions. *African J. Food, Agric. Nutrition and Development*, 11(3).

- Johnson, H. W., Robinson, H. F. and Comstock, R. E. (1955). Estimates of genetic and environmental variability in soybeans. *Agron. J.*, 47, 314-308.
- Kulkarni, V. M., Navale, P. A. and Harinarayana, G. (2000). Variability and path analysis in white grain pearl millet. *Trop. Agric.*, 77, 130-132.
- Lakhasmana, D., Kumar, S. and Gurbmrthu, R. (2003). Genetic variability studies in pearl millet. *Crop Res.*, 4, 363-365.
- Nambiar, V. S., Dhaduk, J. J., Sareen, N., Shahu, T. and Desai, R. (2011). Potential functional implications of pearl millet (*Pennisetum glaucum*) in health and disease. *J. Applied Pharmaceutical Sci.*, 1(10), 62-67.
- Robinson, H. F., Comstock, R. E. and Harvey, P. H. (1949). Estimates of heritability and degree of dominance in corn. *Agron. J.*, 41, 353-359.
- Sagar, P. and Sagar, P. (2002). Analysis of genetic variation in some pearl millet inbreds. *National J. Plant Improve.*, 4, 43-45.
- Shanmuganathan, M., Gopalan, A. and Mohanraj, K. (2006). Genetic variability and multivariate analysis in pearl millet [*Pennisetum glaucum* (L.) R. Br.] germplasm for dual purpose. *J. Agric. Sci.*, 2(1), 73-80.
- Sharma, K. C., Sharma, R. K., Singhania, D. L. and Singh, D. (2003). Variation and character association in fodder yield and related traits in pearl millet (*Pennisetum glaucum* (L.) R. Br.). *Indian J. Genet.*, 63, 115-118.
- Sharma, L. D. (2002). Heterosis, combining ability and phenotypic stability in pearl millet (*Pennisetum glaucum* (L.) R. Br.). Ph.D. Thesis (unpubl.) *Rajasthan Agric. Univ., Bikaner*.
- Sivasubramanian, S. and Menon, M. (1973). Heterosis and inbreeding depression in rice. *Madras Agric. J.*, 60, 1139-1140.
- Vidyadhar, B., Pooranchand, Devi, I. S., Vijayasai M., Reddy, and Ramachandraiah, D. (2007). Genetic variability and character association in pearl millet [*Pennisetum glaucum* (L.) R. Br.] and their implications in selection. *Indian J. Agric. Res.*, 41(2), 150-153.

**How to cite this article:** Ravina Beniwal, P.C. Gupta, A.K. Sharma, O.P. Parihar, Bhagyashree Phogat and Navreet Kaur Rai (2023). Assessment of Genetic Variability Parameters in Pearl Millet [*Pennisetum glaucum* (L.) R. Br.] Hybrids. *Biological Forum – An International Journal*, 15(2): 639-642.