The Andhra Agric. J 64 (4): 783-786, 2017

Genetic Variability, Heritability and Genetic Advance for Yield and Yield Component Characters among Maintainer Lines of Pearl millet [*Pennisetumglaucum* (L.) R. Br.]

A Radhika Ramya, Lal Ahamed M, D RatnaBabu, Y Ashoka Rani, V Srinivasa Rao and R K Srivastava

Department of Genetic & Pland Breeding, Agricultural College, Bapatla 522 101, Andhra Pradesh

ABSTRACT

An investigation was carried out to study genetic variability, heritability and genetic advance among 161 maintainer (B-)lines of pearl millet for twelve characters *viz*., days to 50% flowering, plant height, ear length, ear diameter, productive tillers per plant, head yield per plant, grain yield per plant, panicle harvest index, fresh stover yield per plant, dry matter yield per plant, 1000 grain weight and grain harvest index.The results revealed that the characters ear length, productive tillers per plant, head yield per plant, grain yield per plant, fresh stover yield per plant and dry matter yield per plant showed high PCV and GCV. High estimates of heritability along with genetic advance (% mean) were observed for plant height, ear length, ear diameter, productive tillers per plant, 1000 grain weight and dry matter yield per plant indicating that the selection for these traits would be more effective.

Key words*: Genetic Advance, Heritability, Maintainer (B-) lines, Pearl millet, Variability.*

The genetic variability present in the population is the prerequisite for the success of any crop improvement program. An insight into the magnitude of variability along with heritability and genetic advance helps to measure the amount of progress that could be expected with selection for a particular character. Hence, an attempt was made to study genetic variability, heritability and genetic advance present in the material used in the experiment.

MATERIAL AND METHODS

The material used in the experiment comprised of 161 maintainer (B-) lines of Pearl millet and evaluated during *kharif*, 2014 at RP 9A field, ICRISAT, Patancheru, Hyderabad in a Randomized block design with two replications. Observations were recorded on five randomly selected plantsfor twelve characters *viz*., days to 50% flowering, plant height, ear length, ear diameter, productive tillers per plant, head yield per plant, grain yield per plant, panicle harvest index, fresh stover yield per plant, dry matter yield per plant, 1000 grain weight and grain harvest index. The planting was done on ridges which were 75 cm apart. Each entry was planted in single row of 2 m length with a spacing 15 cm between plant to plant, at a uniform depth. Standard agronomic management practices were followedthroughout the entire growing period as required. The data were subjected to statistical analysis using GenStat Version 14.0 software and genetic parameters such as Phenotypic coefficient of variation (PCV) and Genotypic coefficient of variation (GCV) as per Burton (1952), heritability in broad sense (h^2_b)and expected genetic advance as percent of mean (GAM) worked out as per Johnson *et al*. (1955) and Hanson (1963).

RESULTS AND DISCUSSION

The analysis of variance for 161 inbred lines of pearl millet for twelve quantitative traits are presented in Table 1 and revealed significant differences among the genotypes for all the characters studied, indicating the presence of variability in the material. The estimates of PCV, GCV, heritability and genetic advance as percent of mean are presented in Table 2. All the characters under study showed wide range of values, revealing ample scope for exploitation of the traits through the process of selection. The phenotypic coefficient of variation (PCV) was higher than genotypic

Table 1. Analysis of variance for yield and yield component characters in Pearl millet [*Pennisetumglaucum* (L.) R. Br.].

Source of variation	d.f.	TB	PH	EL	ED	Till	HYP	GYP	PHI	FSYP	DMYP	TGWT	GHI
Replications	1	64.45	8.11	57.22	11.84	2.08	2689.2	1536.4	9.8	637	407.8	7.2	20.58
Treatments	160	33.85**	607.57**	54.57**	39.07**	4.74**	1615.40**	681.80**	89.17**	8821.00**	2141.30***	6.49**	69.47**
Error	160	4.14	47.94	3.82	3.63	0.81	871.6	334.1	54.65	2836	465.6	0.68	33.69

d.f. – degrees of freedom; ** Significant at 1% level

Table 2. Estimates ofvariability, heritability and genetic advance as percent of mean for yield and yield component characters in Pearl millet [*Pennisetumglaucum* (L.) R. Br.].

S. No.	Character	Mean	Range		Coefficient of variation		Heritability in broad sense [$h^2_{(b)}$]	Genetic Advance (GA)	Genetic Advance as percent of mean (GAM)
			Minimum	Maximum	GCV (%)	PCV (%)			
1	TB	47.18	37.00	61.00	8.17	9.24	78.21	7.02	14.88
2	PH	103.57	64.17	155.83	16.15	17.48	85.37	31.84	30.74
3	EL	18.83	10.17	35.83	26.75	28.70	86.90	9.67	51.37
4	ED	28.50	15.20	38.56	14.77	16.21	83.01	7.90	27.72
5	Till	3.51	0.71	10.00	39.94	47.45	70.84	2.43	69.25
6	HYP	60.35	5.21	192.00	31.95	58.43	29.91	21.73	36.00
7	GYP	38.82	2.90	107.48	33.97	58.06	34.23	15.89	40.93
8	PHI	64.46	42.68	77.57	6.45	13.16	24.00	4.19	6.50
10	FSYP	114.68	25.17	775.00	47.70	66.57	51.34	80.75	70.41
11	DMYP	49.83	4.09	390.15	58.09	72.45	64.28	47.81	95.94
9	TGWT	9.83	3.58	15.45	17.34	19.26	81.05	3.16	32.15
12	GHI	35.74	2.87	50.15	11.83	20.09	34.68	5.13	14.36

TB – Days to 50% flowering; PH- Plant height (cm); EL- Ear length (cm); ED- Ear diameter (cm); Till- Productive tillers per plant; HYP- Head yield per plant (g/plant); GYP- Grain yield per plant (g/plant); PHI- Panicle harvest index; FSYP- Fresh stover yield per plant (g/plant); DMYP- Dry matter yield per plant (g/plant); TGWT- 1000 grain weight (g) and GHI- Grain harvest index.

coefficient of variation (GCV) for all the characters indicating the influence of environment on expression of these traits. Highest magnitude of PCV and GCV (72.45 and 58.09) was observed for dry matter yield per plant, while lowest PCV and GCV (9.24 and 8.27) was recorded by days to 50% flowering. This is in agreement with the findings of Kant *et al*. (2012) and Singh *et al*. (2014a).The characters *viz*., ear length, productive tillers per plant, head yield per plant, grain yield per plant and fresh stover yield per plant recorded high PCV and GCV. These results are in correspondence with the findings of Bika and Shekhawat (2015) for ear length and freshstover yield per plant,Kumar *et al*. (2015) for productive number of tillers, Chaudhary *et al*. (2012) and Vagadiya *et al*. (2013) for head yield per plant and grain yield per plant. Moderate PCV and GCV were observed for plant height, ear diameter and 1000 grain weight. High PCV and moderate GCV was observed for grain harvest index and moderate PCV and low GCV was recorded by panicle harvest index. This indicates that there is considerable amount of variability for majority of the characters studied.

Broad sense heritability estimates ranged from 24.0% (panicle harvest index) to 86.9% (ear length). High estimates of heritability were observed for days to 50% flowering, plant height, ear length, ear diameter, productive tillers per plant, dry matter yield per plant and 1000 grain weight. These results are in consonance with the findings of Kant *et al*. (2012) and Singh *et al*. (2014a) for days to 50% flowering, plant height, ear length, ear diameter, dry matter yield per plant and 1000 grain weight. Moderate estimates of heritability were recorded by head yield per plant, grain yield per plant, fresh stover yield per plant and grain harvest index while, low heritability was recorded by panicle harvest index. Similar results were given by Lakshmana *et al*. (2003) and Yahava (2015) for grain yield per plant. Heritability values coupled with genetic advance would be more reliable than heritability estimates alone for selection of characters. The genetic advance expressed as percent of mean values ranged from 14.36 (grain harvest index) to dry matter yield per plant (95.94). Except days to 50% flowering, panicle harvest index and grain harvest index, remaining characters showed high estimates of genetic advance. The estimates of heritability and genetic advance as percent of mean were high for plant height, ear length, ear diameter, productive tillers per plant, dry matter yield per plantand 1000 grain weight suggesting that these traits were amenable for further improvement by following simple selection methods.These findings were in agreement withVinodhana *et al*. (2013), Singh *et al*. (2014a) and Bika and Shekhawat (2015) for plant height, ear length and ear diameter, Singh *et al*. (2014b) and Kumar *et al*.(2015) for productive tillers per plant and 1000 grain weight, Singh *et al*. (2014a) and Bika and Shekhawat (2015) for dry matter yield per plant.

The trait days to 50% flowering recorded high heritability with moderate genetic advance, whereas moderate heritability coupled with high genetic advance was noticed for traits, grain yield per plant and fresh stover yield per plant indicating the role of both additive and non-additive gene actions in the inheritance of these characters and improvement can be brought about using breeding methods like diallel selective mating or biparental mating followed by selection in advanced generation. These findings were in accordance with that of Vagadiya *et al*. (2013) Vinodhana *et al*. (2013), Singh *et al*. (2014a) and Kumar *et al*. (2015) for days to 50% flowering and Yahaya *et al*. (2015) for grain yield per plant.The character head yield per plant recorded low heritability combined with high genetic advance, while grain harvest index recorded moderate heritability accompanied with moderate genetic advance. Low heritability coupled with low genetic advance were observed for panicle harvest index revealing that these traits are governed by non-additive gene action and can be improved by selection and intermating among selected ones in early generation followed by selection. In contrast to these findings, Singh *et al*. (2014a) and Kumar *et al*. (2015) reported high heritability coupled with high genetic advance for harvest index.

LITERATURE CITED

Bika N K and Shekhawat S S 2015 Genetic variability study in pearl millet (*Pennisetumglaucum* (L.) R. Br.) for green fodder yield and related traits. *Electronic Journal of Plant Breeding*, 6(2): 600-602.

Burton G W 1952 Quantitative inheritance in grasses.*Proceedings of the 6th International Grassland Congress*. Pennsylvania State College, USA, 23 August 1952. 277-283.

Chaudhary V P, Dhedhi K K, Joshi H J and Sorathiya J S 2012 Genetic variability for quantitative traits in line x tester crosses of pearl millet. *International Journal of Agricultural Sciences*, 8(2): 479-482.

Hanson W O 1963 In: *Heritability in Statistical Genetics and Plant Breeding*, Hanson, W.O and Robinson, H.F. 9eds.), 1982. National Academy of Science and National Research Council, Washington D. C. Pp. 125-139.

Johnson H W, Robinson H F and Comstock R E 1955 Estimation of genetic and environmental variability in Soybean .*Agronomy Journal*, 47: 314-318.

Kant S, Yadav Y P, Kumar S and Singh M 2012 Variability, heritability and genetic advance in pearl millet (*Pennisetumglaucum*(L.) for implications of selection. *Environment and Ecology*, 30(4): 1378-1380.

Kumar M, Gupta P C and Kumar M 2015 Genetic variability, heritability and genetics advance studies for yield and its contributing traits in pearl millet [*Pennisetumglaucum* (L.) R.Br.]hybrids. *Indian Research Journal of Genetics and Biotechnology*, 7(2): 271 – 273.

Lakshmana D, Surendra P and Gurumurty R 2003 Genetic variability studies in pearl millet (*Pennisetumglaucum* L.) genotypes. *Research on Crops*, 4(3): 355-357.

Singh B, Upadhyay P K and Sharma K C 2014a Genetic variability, correlation and path analysis in pearl millet (*Pennisetumglaucum* (L.) R. Br.). *Indian Research Journal of Genetics & Biotechnology*, 6(3): 491-500.

Singh S, Yadav Y P, Yadav H P, Vart D and Yadav N 2014b Studies on genetic variability and trait association for grain yield and its components in pearl millet [*Pennisetum glaucum* (L.) R. Br.]. *Forage Research*, 40(2): 91-94.

Vagadiya K J, Dhedhi K K and Joshi H J 2013 Genetic variability, heritability and genetic advance of grain yield in pearl millet. *Agricultural Science Digest*, 33(3): 223 – 225.

Vinodhana N K, Sumathi P and Sathya M 2013 Genetic variability and inter-relationship among morpho-economic traits of pearl millet (*Pennisetumglaucum* (L.) R. Br.) andtheir implications in selection. *International Journal of Plant, Animal and Environmental Sciences*, 3(2): 145-149.

YahayaY 2015 Correlation and heritability in pearl millet [*Pennisetumglaucum* (L) R. Br.].*African Journal of Agronomy*, 3(3): 257-258.

(Received on 26.12.2016 and revised on 25.04.2017)