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Research Notes

Studies on variability parameters in pearl millet *(Pennisetum glaucum* (L.) R.Br.)

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Pearl millet (*Pennisetum glaucum* (L.) R.Br.) is the most widely grown millet. Grown in India and Africa since prehistoric times, it is generally accepted that pearl millet originated in Africa and was subsequently introduced into India. 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 variability existing in the metric traits of the base population. 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 (Johanson *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. In the early days of research, the crop breeders used morphological markers for the assessment of genetic diversity and for choosing parents for developing new varieties.

Five male sterile lines and thirty inbreds of pearl millet were chosen for the study. The materials were obtained from Department of Millets, Centre for Plant Breeding and Genetics, Tamil Nadu Agricultural University, Coimbatore. Among the five male sterile lines used as female parents, ICMA 94111A and 81A are having A_1 cytoplasm, ICMA 88004A and PT 5054A have A_4 cytoplasm and 732A belongs to Bellary cytoplasm, a different source which had been derived from PT 819, an inbred line originated from Andhra Pradesh, India. The thirty inbreds were used as testers. Resultant hybrids along with their parents, and standard check MBH 163 were raised in Randomized Block Design with three replications during *kharif,* 2006. Each hybrid was accommodated in one row of 4m with a row spacing of 45 cm and plant to plant spacing of 15 cm. Uniform and recommended cultural practices were followed to raise agronomically good managed crop. The observations were recorded on five randomly selected competitive plants from each replication for 8 traits *viz.,* days to 50 per cent flowering, plant height, total number of tillers, total productive tillers, ear length, ear girth, 100 grain weight and grain yield per plant. 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), heritability computed based on the methods given by Falconer (1967) and genetic advance estimated according to the formula given by Johnson *et al.* (1955).

Table 1. Variability parameters for grain yield and its components in pearl millet

Character	Mean	Range		PV	GV	PCV %	GCV %	h^2% (broad sense)	GA	GA as % of mean
		Maxi-mum	Mini-mum							
Days to 50% flowering	46.95	51.67	43.33	2.50	1.99	3.37	3.012	79.80	2.60	5.54
Plant height	197.12	250.22	98.67	1078.77	1068.9	16.66	16.58	99.05	67.04	34.01
Total number of tillers	6.25	7.78	4.20	0.81	0.71	14.35	13.45	87.00	1.62	25.96
Total productive tillers	5.54	7.25	3.78	0.64	0.54	14.43	13.33	85.00	1.41	25.36
Ear length	24.72	30.51	17.33	7.73	7.36	11.47	11.2	95.00	5.46	22.52
Ear girth	8.61	10.02	7.03	0.80	0.64	10.38	9.3	80.27	1.47	17.16
100 grain weight	1.29	1.81	0.83	0.07	0.06	20.66	20.44	97.00	0.53	41.68
Grain yield/ plant	61.68	96.21	37.59	204.44	200.63	23.18	22.96	98.00	28.9	46.86

In the present study, all the traits showed narrow difference between phenotypic coefficient of variance (PCV) and genotypic coefficient of variance (GCV) except days to 50 per cent flowering, indicating the low effect of environment and greater role of genetic factors on the expression of the traits (Table 1). High GCV estimates were recorded for two traits namely 100 grain weight and grain yield per plant. Similar findings had been reported in the past by Gynandra Singh and Major Singh (1995), for grain yield per plant and 100 grain weight. Kabdal *et al.* (2003) observed high GCV and PCV. The traits *viz.,* plant height, total number of tillers, total productive tillers, ear head length and 100 grain weight showed moderate values. Similar results were reported for earhead length by Galeta *et al.* (2005) and for 100 grain weight by Anatharaj (2001).

Days to 50 per cent flowering showed high heritability with low genetic advance as per cent mean indicating the non-additive type of gene action. High heritability might be based on favourable influence of environment. Hence selection for this may not be rewarding. Saraswathi *et al.* (1995) and Anantharaj (2001) reported high heritability for days to 50 per cent flowering. Ear head girth recorded high heritability coupled with low genetic advance as per cent of mean indicating the presence of both additive and non-additive type of gene actions. This finding was in conformity with Ghorpade and Metta (1993), Saraswathi *et al.* 1995 and Chen ling *et al.* 1996. The heritability values for different yield contributing characters ranged from 79.80 to 99.05 per cent. Highest heritability was observed for plant height (99.05 per cent) and grain yield per plant (98.08 per cent). The lowest heritability was recorded in days to 50 per cent flowering (79.80 per cent).

The present study indicated that based on high phenotypic and genotypic coefficient of variance, low difference between PCV and GCV indicating the vast influence of genetic components, very high heritability and estimated genetic advance as per cent of mean for the

yield contributing traits *viz.*, 100 grain weight, plant height, total productive tillers, ear length and ear girth could be utilised for selection of best male sterile lines and *per se* performing testers for crossing to exploit the genetic potential of the genotypes.

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Research Notes

Correlation and path analysis in sunflower *(Helianthus annuus* L.)

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Yield is a complex character and influenced by several other yield component characters. The knowledge on association of several characters with yield and among themselves will be very essential for planning a successful breeding programme. Path analysis splits the correlation coefficient into measures of direct and indirect effects and determines the direct and indirect contribution of various characters towards yield. The present study was undertaken to assess the association between yield and yield components and also path analysis of