https://doi.org/10.29321/MAJ.10.A01696

Madras Agric. J. 80 (10) : 556 - 561 October 1993

GENETIC VARIABILITY IN PEARL MILLET, NAPIER GRASS AND THEIR HYBRIDS

S. THIRUMENI and L.D. VIJENDRA DAS

ABSTRACT

Fifteen genotypes of pearl millet, five genotypes of napier grass and the resultant fifteen hybrids obtained from them were evaluated for genetic variability, heritability and genetic advance. The differences between the genotypes were highly significant for all the 13 traits. Among the traits, leaf: stem ratio, dry matter yield, leaf area per clump, green fodder yield, crude protein and calcium content in pearl millet; stem girth, green fodder yield, dry matter yield, leaf: stem ratio and calcium content in napier grass and dry matter yield, leaf area per clump, green fodder yield, stem girth, number of leaves per clump, leaf: stem ratio, number of tillers per clump and crude protein in pearl millet x napier hybrids recorded high heritability coupled with high genetic advance. These traints in pearl millet, napier grass and pearl millet x napier hybrids are the most suitable for improvement through selection.

Key words: *Pearl Millet, Napier Grass, Pearl Millet x Napier Hybrids, Variability, Heritability, Genetic Advance*

Among forage grasses, pearl millet x napier hybrid grass assume important position owing to its better quality and high fodder yield. This is an interspecific hybrid between pearl millet and napier grass with the objective to introgress high-yielding, perennial aggressive nature of napier grass with forage quality of pearl millet (Javhar, 1981). Magnitude of heritable variation within the breeding material becomes one of the essential components in the selection programmes for ideal plant types. It is thus needless to say that partitioning of total variability into heritable and non-heritable component have vital importance in any breeding programme. Though a few studies have been made on variability and heritability in forage pearl millet, napier grass and the pearl millet x napier hybrids no precise information is available yet. Keeping this in view, an attempt was made in the present investigation to assess the variability, heritability and genetic advance of 13 characters in pearl millet, napier grass and pearl millet x napier hybrids separately.

MATERIALS AND METHODS

The methods consisted of fifteen genotypes of forage pearl millet, five genotypes of napier grass and fifteen pearl millet x napier hybrids obtained by randomly crossing the pearl millet and napier grass genotypes. These twenty parents and their fifteen pearl millet x

Department of Agriculture Botany, Agricultural College & Research Institute, Killikulam.

napier hybrids were planted in a randomized block design with two replications. Each entry was grown in a single row of five metre length and spacing of 50 x 50 cm for pearl millet x napier hybrids and napier grass and 50 x 20 cm for pearl millet were adopted. Four cuttings in case of napier grass and pearl millet x napier hybrids and only one cutting in pearl millet were taken. Data were recorded on nin biometrical observations such as plant height, number of tillers per clump, number of leaves pe clump, leaf area per clump, internode length, stem girth, gree fodder yield, dry matter yield and leaf: stem ratio and four biochemical observations such as crude protein, calcium, phosphorus and oxalate. The phenotypic and genotypic variance and co-efficients of variability were worked out separately for peral millet, napier grass and pearl millet x napier hybrids. The method suggested by Lush (1940) was adopted to work out the estimates of broad sense heritability. The expected genetic advance was calculated as suggested by Johnson et.al. 1955.

RESULTS AND DISCUSSION

The analysis of variance indicated significant differences for all the 13 traits studied. Data on mean, variability, heritability and genetic advance are presented in Tables 1-3. In pearl millet high genotypic and phenotypic co-efficient of variability (GCV and PCV) were observed in leaf area per clump and dry matter yield. Similar results were reported by Sangha and Singh (1973) and Prakash (1983). High estimates of heritability (h^2) for plant height, leaf area per clump, green fodder yield, dry matter yield and leaf: stem ratio were observed. However, low estimate of heritability ws noticed for number of tillers per clump. This is in accordance with the results reported by Gupta **et. al.** (1975) and Mukherji **et. al.** (1982). High estimates of heritability for calcium and crude protein contents were observed which is similar to the results obtained by Gupta and Batra (1980). High heritability indicates that effectiveness of selection for phenotypic performance is high, but it does not necessarily mean a high genetic gain for a particular character. However, high heritability estimates along with high genetic gain render the selection effective (Johnson et.al. 1955). High heritability coupled with high genetic advance estimates were observed for leaf: stem ratio, dry fodder yield, leaf area per clump, green fodder yield, crude protein and calcium. Hence these traits may be given weightage while selecting superior genotypes.

In napier grass, high genotypic and phenotypic co-efficient of variability were observed for green fodder yield and dry matter yield. High heritability estimates were observed for all the quantitative traits studied. Calcium and crude protein also showed high estimates of heritability. Though heritability estimates were high for all the quantitative traits, high heritability coupled with high genetic advance were observed in stem girth, green fodder yield, dry matter yield and leaf: stem ratio. The positive trend of these parameters indicate the scope of selection for desirable genotypes. Regarding qualitative traits,

Table 2. Variability and heritability estimates in pearl millet

Sl. No.	Traits	Mean	Variance		Coefficient of variability		h2 (%)	G.A.	G.A. as % over $\bar{x}$
			Genotypic	Phenotypic	GCV (%)	PCV (%)			
1	Plant height (cm)	203.43	47.20	54.30	3.38	3.62	86.94	13.21	6.49
2	Number of tillers/clump	14.70	2.70	2.85	11.18	11.48	94.82	3.30	22.44
3	Number of leaves/clump	144.62	236.26	241.69	10.63	10.75	97.76	31.33	21.67
4	Leaf area/clump (m^2)	3.24	0.09	0.10	9.04	9.33	93.85	0.58	18.06
5	Internode length (cm)	11.38	0.22	0.23	4.09	4.18	95.51	0.93	8.24
6	Stem girth (cm)	5.20	0.75	0.76	16.72	16.75	99.68	1.79	34.42
7	Green fodder yield (g)	479.23	9572.94	9581.56	20.42	20.43	99.91	201.66	42.08
8	Dry fodder yield (g)	86.34	336.99	337.23	21.14	21.15	99.93	37.84	43.58
9	Leaf: Stem ratio	0.44	0.003	0.004	13.06	13.06	99.79	0.12	26.89
10	Crude protein (%)	8.59	0.25	0.26	5.83	5.83	95.19	1.01	11.72
11	Calcium (%)	0.38	0.006	0.007	20.42	20.42	94.73	0.16	40.98
12	Phosphorus (%)	0.17	0.002	0.003	8.72	8.72	78.57	0.03	15.95
13	Oxalate (%)	3.94	0.02	0.04	3.12	3.12	42.39	0.16	4.18

GCV - Genotypic coefficient of variation

PCV - Phenotypic coefficient of variation

h^2 - Heritability

G.A. - Genetic advance

Table 3. Variability and heritability estimates in pearl millet

Sl. No.	Traits	Mean	Variance		Coefficient of variability		h2 (%)	G.A.	G.A. as % over $\bar{x}$
			Genotypic	Phenotypic	GCV (%)	PCV (%)			
1	Plant height (cm)	283.03	770.02	790.61	11.55	11.70	97.40		
2	Number of tillers/clump	18.88	11.34	12.60	17.80	18.77	89.97		
3	Number of leaves/clump	176.86	1184.76	1223.30	19.47	19.79	96.85		
4	Leaf area/clump (m^2)	3.05	0.80	0.81	29.47	29.68	98.63		
5	Internode length (cm)	17.86	4.27	5.33	11.51	12.86	80.14		
6	Stem girth (cm)	2.87	0.36	0.36	21.34	21.38	99.63		
7	Green fodder yield (g)	560.30	29180.18	29241.32	28.79	28.82	99.79		
8	Dry fodder yield (g)	114.27	1371.36	1373.91	32.61	32.64	99.81		
9	Leaf: Stem ratio	0.80	0.02	0.02	17.89	17.89	99.92		
10	Crude protein (%)	8.40	0.97	1.00	11.81	11.99	97.03		
11	Calcium (%)	0.79	0.006	0.007	9.82	10.03	95.83		
12	Phosphorus (%)	0.20	0.0002	0.004	7.47	10.29	52.76		
13	Oxalate (%)	3.01	0.02	0.04	4.47	6.44	48.28		

GCV - Genotypic coefficient of variation
PCV - Phenotypic coefficient of variation
h^2 - Heritability
G.A. - Genetic advance

Table 2. Variability and heritability estimates in pearl millet

Sl. No.	Traits	Mean	Variance		Coefficient of variability		h2 (%)	G.A.	G.A. as % over $\bar{x}$
			Genotypic	Phenotypic	GCV (%)	PCV (%)			
1	Plant height (cm)	203.43	47.20	54.30	3.38	3.62	86.94	13.21	6.49
2	Number of tillers/clump	14.70	2.70	2.85	11.18	11.48	94.82	3.30	22.44
3	Number of leaves/clump	144.62	236.26	241.69	10.63	10.75	97.76	31.33	21.67
4	Leaf area/clump (m^2)	3.24	0.09	0.10	9.04	9.33	93.85	0.58	18.06
5	Internode length (cm)	11.38	0.22	0.23	4.09	4.18	95.51	0.93	8.24
6	Stem girth (cm)	5.20	0.75	0.76	16.72	16.75	99.68	1.79	34.42
7	Green fodder yield (g)	479.23	9572.94	9581.56	20.42	20.43	99.91	201.66	42.08
8	Dry fodder yield (g)	86.34	336.99	337.23	21.14	21.15	99.93	37.84	43.58
9	Leaf: Stem ratio	0.44	0.003	0.004	13.06	13.06	99.79	0.12	26.89
10	Crude protein (%)	8.59	0.25	0.26	5.83	5.83	95.19	1.01	11.72
11	Calcium (%)	0.38	0.006	0.007	20.42	20.42	94.73	0.16	40.98
12	Phosphorus (%)	0.17	0.002	0.003	8.72	8.72	78.57	0.03	15.95
13	Oxalate (%)	3.94	0.02	0.04	3.12	3.12	42.39	0.16	4.18

GCV - Genotypic coefficient of variation

PCV - Phenotypic coefficient of variation

h^2 - Heritability

G.A. - Genetic advance

high heritability values coupled with high genetic advance were noticed for calcium content. Hence this trait may be given emphasis while selecting a better genotype.

In pearl millet x napier hybrids, high genotypic and phenotypic coefficient of variability were observed for leaf area per clump, stem girth, green fodder yield and dry matter yield. Similar results were reported by Gupta and Bhardwaj (1975). High estimates of heritability were observed for all the quantitative traits studies. Regarding qualitative traits high heritability values were observed for crude protein and calcium content. Among the quantitative traits, dry matter yield, leaf area per clump, green fodder yield, stem girth, number of leaves per clump, leaf: stem ratio and number of tillers per clump showed high heritability with high genetic advance. Among qualitative traits, only crude protein recorded high heritability coupled with high genetic advance. The positive trend of these parameters showed preponderance of additive genetic action in their expression (Johnson **et. al.** 1955) and they may be given emphasis while selecting better genotypes.

REFERENCES

GUPTA, V.P. and BATRA, R. 1980. Path coefficient analysis of oxalic acid in relation to some minerals in green fodder of pearl millet **In: Trends in Genet. Res. Pennisetums** (V.P. Gupta and J.L. Minocha Eds.) **Punjab Agric. Univ.** 255-257.

GUPTA, V.P. and BHARDWAJ, B.L. 1975. Genetic variability and scope of selection in the clonal populations of napier bajra hybrids **(P. purpureum x P. typhoides). Punjab Agric. J. Res. 12** (4): 336-349.

GUPTA, V.P., SIDHU, P.S. and NANDA, G.S. 1975. Genotype environmental interactions for green fodder yield and its components in pearl millet, **Crop. Improv.,** 2: 52-54.

JAVHAR, P.P. 1981. Cytogenetics of pearl millet. **Adv. Agron. 34:** 407-479.

JOHNSON,H.W., ROBINSON, H.F. and COINSTOCK, R.E. 1955. Estimation of genetic variability and environmental variability in Soyabean. **Agron. J. 47:** 314-138.

LUSH, J.L. 1940. Intra-sire correlation and regression of offsoring on dames as a method of estimating heritability of characters. **Proc. Amer. Soc. Animal Prodn., 33:** 293-301.

MUKHERJI, P., AGRAWAL, R.K. and SINGH, R.M. 1982. Variability, correlation and path - coefficients in inbreds of pearl millet **(P. typhoides). Madras Agric. J.,69:** 45-50.

PRAKASH, O. 1983. Variability studies for forage traits in some of the strains of **Pennisetum typhoides** (Burm.) S&H. **Thesis Abstr., Haryana Agric. Univ.,** 9: 311.

SANGHA, A.S. and SINGH, B.V. 1973. Genetic variability and Correlation studies of morphological characters in **Pennisetum typhoides** (S & H). **Madras Agric. J. 60:** 1258-1265.