Forage Res., **40** (2) : pp. 106-108 (2014) **http://forageresearch.in**

GENETIC ANALYSIS OF FORAGE YIELD AND ITS COMPONENT TRAITS IN BAJRA X NAPIER HYBRIDS

SUNIL M. SATAPUTE, ANANT R. MALI* AND PANKAJ P. JIBHAKATE

Department of Agricultural Botany
M. P. K. V., Rahuri-413 722, (Maharashtra), India
**(e-mail : armali.333@gmail.com)*

(Received : 27 August; Accepted : 20 September)

ABSTRACT

Variability in 32 derivatives of Bajra x Napier grass hybrids was studied for forage yield and its component characters viz., plant height, number of tillers per plant, number of leaves per tiller, number of internodes per tiller, leaf length, leaf width, L/S ratio, crude protein, oxalic acid content, dry matter yield and green forage yield. The derivative lines were grouped based on vegetative plant vigour into good (9), medium (13) and poor (10), while growth habit into erect (10), semi-erect (10) and spreading (12). High genotypic coefficient of variation for dry matter per plant (33.50), moderate variability in plant height, number of tillers per plant and number of leaves per plant were observed among the germplasm studied. The estimates of heritability (b. s.) and GA as percentage of mean were high for characters viz., dry matter yield, green forage yield, number of tillers per plant, and L : S ratio, indicating influence of additive gene action on these characters, so that further selection should be followed for improvement of derivatives of grass hybrids.

Key words : Bajra x Napier grass hybrids, genetic advance, heritability, variability, forage yield

Bajra or pearl millet *(Pennisetum glaucum* L.) (2n=14), is a coarse annual bunch grass and is grown in Asia and Africa primarily for grain and in some regions of America for feed and forage for animals (Gupta and Mhere, 1997). This grass is resistant to drought and most of pests and diseases (Bogdan, 1977). Napier or Elephant grass, *P. purpureum* Schum. (2n=28), is a robust perennial grass grown for forage mainly in tropical areas of Africa, Asia, South and Central America. Napier grass is forming large broad clumps. Its stems are tall and up to 3 cm in diameter in the lower part. This grass is deep rooted and drought resistant and as a fodder it has a very long world history (Bogdan, 1977).

The hybridization between pearl millet and Napier is known to occur naturally since these are protogynous and cross pollinated. It shows that these two species readily cross and that the resultant interspecific hybrids are more vigorous than the parent species and are highly sterile (2n=21). Thus, it can be propagated as a forage plant without danger of becoming a weed, as is the case with Napiers (Gupta and Mhere, 1997). According to Gupta and Mhere (1997), several workers reported the potential for improvement in yield and quality of Bajra x Napier hybrids over Napier. They also observed that the dry matter yield of hybrids from the cross Bajra x Napier was comparable with common Napier and its selections. Therefore, the present study was carried out to assess the genetic variability of various morphological characters with forage yield in derivatives of Bajra x Napier grass hybrids.

MATERIALS AND METHODS

The material for the present study comprised 32 experimental hybrids of Bajra x Napier grass at Grass Breeding Scheme, MPKV, Rahuri, during **rabi** 2011-12. These hybrids were sown in randomized block design with two replications for evaluation, with 7.20 m long two-row plots with spacing of 90 x 60 cm. Recommended cultural practices were followed to raise a good crop. Under each treatment and each replication, five competitive plants were randomly selected for recording observations at the time of each cut and averages were worked out for nine metric characters viz., plant height, number of tillers per plant, number of leaves per tiller, number of internodes per tiller, leaf length, leaf width, L : S ratio, dry matter yield and green forage yield and two biochemical characters reflecting fodder quality viz. crude protein and oxalic acid content. Observations on green forage yield and dry matter yield were recorded from June 2011 to January 2012 (3 cuts in total) and expressed in kg/plant. First cut was taken 60 days after planting and subsequent cuts were taken at an interval of 50 days.

Analysis of variance and estimates of genotypic and phenotypic coefficients of variation, broad sense heritability and expected genetic advance were worked out following conventional methods (Falconer, 1968).

RESULTS AND DISCUSSION

The analysis of variance (Table 1) revealed significant differences for all the eight characters studied. The derivative lines were grouped (Table 2) based on vegetative plant vigour into good (9), medium (13) and poor (10), while growth habit into erect (10), semi-erect (10) and spreading (12). The range of variation (Table 3) was maximum for the characters viz., plant height (124.89-207.56 cm) followed by tillers per plant (13.76-29.40), leaves per tiller (7.32-12.13), internodes per tiller (2.80-8.40), leaf length (71.06-90.40), crude protein (6.79-10.97), dry matter yield (0.82-2.48 kg/plant) and green forage yield (3.91-10.05 kg/ plant), while it was lowest in case of L : S ratio (0.37-1.18) and oxalic acid content (1.97-2.72) followed by leaf width (2.40-3.57 cm). In general, PCV values were marginally higher than GCV values (Table 3). The characters studied in the present investigation showed moderate to low PCV and

TABLE 1

Analysis of variance for green forage yield and its components in Bajra x Napier hybrids

Character	Replication 1	Treatment 31	Error 31
Plant height	396.209	888.661**	71.586
Tillers/plant	7.095	25.322**	1.733
Leaves/tiller	15.840	2.357**	0.596
Internodes/tiller	7.728	3.275**	0.129
Leaf length	10.192	40.807**	5.840
Leaf width	0.001	0.120**	0.023
L : S ratio	0.020	0.090**	0.010
Crude protein	0.464	2.261**	0.221
Oxalic acid content	0.164	0.060**	0.010
Dry matter yield	0.088	0.450**	0.006
Green forage yield	1.071	5.863**	0.281

**Significant at P=0.01 level.

TABLE 2

Morphological characterization of 32 derivatives of Bajra x Napier grass hybrids

S.	Character	No. of lines	Derivatives of B x N grass hybrids
A. Vegetative plant vigour			
(a)	Good	9	RBN-2011-12, RBN-2011-18, RBN-2011-22, RBN-2011-23, RBN-2011-24, RBN-2011-26, NB-21 (NC), CO-3 (NC), P. Jaywant (Check)
(b)	Medium	13	RBN-2011-3, RBN-2011-7, RBN-2011- 8, RBN-2011-9, RBN-2011-10, RBN-2011-15, RBN-2011-16, RBN-2011-17, RBN-2011-19, RBN-2011-20, RBN-2011-21, RBN-2011-25, RBN-2011-28
(c)	Poor	10	RBN-2011-1, RBN-2011-2, RBN-2011-4, RBN-2011-5, RBN-2011-6, RBN-2011-11, RBN-2011-13, RBN-2011- 14, RBN-2011- 27, RBN-2011-29
B. Growth habit			
(a)	Erect	10	RBN-2011-3, RBN-2011-7, RBN-2011-8, RBN-2011-12, RBN-2011-14, RBN-2011-15, RBN-2011-17, NB-21(NC), CO-3(NC), P. Jaywant (Check)
(b)	Semi-erect	10	RBN-2011-1, RBN-2011-6, RBN-2011-9, RBN-2011-13, RBN-2011-19, RBN-2011-21, RBN-2011-23, RBN-2011-24, RBN-2011-25, RBN-2011-26
(c)	Spreading	12	RBN-2011-2, RBN-2011-4, RBN-2011-5, RBN-2011-10, RBN-2011-11, RBN-2011-16, RBN-2011-18, RBN-2011-20, RBN-2011-22, RBN-2011-27, RBN-2011-28, RBN-2011-29

GCV values except dry matter yield. The magnitude of variation was maximum for the character dry matter yield followed by green forage yield, L : S ratio and internodes per tiller, while it was lowest for leaf length, leaf width and oxalic acid content (Das, 1994; Suthamathi and Dorairaj, 1997; Khan and Sukumar, 2002).

In the present investigation, most of the characters expressed high heritability estimates (Table 3). The characters showing high values of heritability were dry matter yield (97.37), number of internodes per tiller (92.38), green forage yield (90.88), number of tillers per plant (87.21), plant height (85.09), crude protein (82.26), L : S ratio (80.00) and leaf length (74.96). The genetic advance was highest for plant height (38.41) followed by low values for leaf length (7.46) and number of tillers per plant (6.60). High heritability accompanied with high genetic advance as percentage of mean was observed for plant height (24.48), number of tillers per plant (29.80), number of internodes per tiller (50.00), L : S ratio (45.49), crude protein (20.53), dry matter yield (68.41) and green forage yield (50.94) indicating that these traits could be prominently governed by additive gene effects and selection of these traits would be more effective for desired genetic improvement (Suthamathi and Dorairaj, 1997; Khan and Sukumar, 2002; Mahawar *et al.,* 2003; Kamble, 2011). The remaining characters recorded high heritability with low genetic advance indicating that the characters were unstable and environment had major impact on the expression of those characters, since, breeder should not rely on the estimates of the heritability alone.

TABLE 3

Genetic parameters for green forage yield and its components in Bajra x Napier hybrids

Character	Range	(σ^2_g)	(σ^2_p)	(σ^2_e)	GCV (%)	PCV (%)	ECV (%)	h^2 (b. s.) (%)	GA	GAM
Plant height (cm)	124.89-207.56	408.54	480.11	71.58	12.88	13.97	5.39	85.09	38.41	24.48
Tillers/plant	13.76-29.40	11.79	13.52	1.73	15.49	16.59	5.93	87.21	6.60	29.80
Leaves/tiller	7.32-12.13	0.88	1.48	0.60	9.65	12.52	7.97	59.46	1.49	15.33
Internodes/tiller	2.80-8.40	1.57	1.70	0.13	25.16	26.18	7.25	92.38	2.48	50.00
Leaf length (cm)	71.06-90.40	17.48	23.32	5.84	5.14	5.94	2.97	74.96	7.46	9.17
Leaf width (cm)	2.40-3.57	0.05	0.07	0.02	7.81	9.25	4.94	67.83	0.37	13.11
L : S ratio	0.37-1.18	0.04	0.05	0.01	24.69	27.61	12.35	80.00	0.37	45.49
Crude protein (%)	6.79-10.97	1.02	1.24	0.22	10.99	12.12	5.10	82.26	1.89	20.53
Oxalic acid content (%)	1.97-2.72	0.02	0.03	0.01	5.89	7.22	4.17	71.43	0.27	11.47
Dry matter yield (kg/plant)	0.82-2.48	0.22	0.23	0.006	33.50	34.25	5.53	97.37	0.96	68.41
Green forage yield (kg/plant)	3.91-10.05	2.79	3.07	0.28	25.94	27.19	8.21	90.88	3.28	50.94

σ^2g : Genotypic variance, σ^2p : Phenotypic variance, σ^2e : Environmental variance, GCV : Genotypic coefficient of variation, PCV : Phenotypic coefficient of variation, ECV : Environmental coefficient of variation, h^2 : Heritability, GA : Genetic advance and GAM : Genetic advance as per cent of mean.

REFERENCES

Bogdan, A.V. 1977 : *Tropical Pasture and Fodder Plants.* Longman Group Limited, London. pp 233-244.

Das, L. D. 1994 : Genetic variability in pearl millet, napier grass and their hybrids for quality traits. *Ann. Agric. Res.,* **15** : 99-101.

Falconer, D. S. 1981 : *Introduction to Quantitative Genetics, 2nd edn.* ELBS, Longman. pp. 14-169.

Gupta, S. C. and O. Mhere, 1997 : Identification of superior pearl millet by Napier hybrids and napiers in Zimbabwe. *Afr. Crop Sci. J.* **5** : 229-237.

Kamble, S. Y. 2011 : Genetic diversity studies in napier grass. M. Sc. Thesis submitted to M. P. K. V., Rahuri.

Khan, A. K. F., and K. Sukumar, 2002 : Variability, heritability, genetic advance in napier grass. *Madras Agric. J.,* **88** : 461-464.

Mahawar, R. K., K. C. Sharma, and D. K. Jain, 2003 : Genetic variability in fodder bajra (*Pennisetum glaucum* L). *Res. on Crops,* **4** : 363-365.

Suthamathi, P., and M. S. Dorairaj, 1997 : Genetic variability in Napier grass. *Indian J. Genet.,* **57** : 319-321.