Annals of Arid Zone 32 (2) 107–108 1993

Stability of *Dichanthium annulatum* for Fodder Production in Semi- Arid Rajasthan

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Abstract Sixteen genotypes of *Dichanthium annulatum* were evaluated for fodder production over 4 years of growth in semi-arid Rajasthan. Stability analysis revealed significant differences between genotypes and environments (years) for green fodder and dry matter yields. Genotype x environment (linear) component and pooled deviations were also significant for both the attributes. CAZRI 487 was found to be the most stable genotype combining high fodder potential and low mortality rate. CAZRI 491 was suitable for favourable environment.

Key words Genotypes, *Dichanthium annulatum*, Fodder yield

Grass production in semi-arid grazing lands fluctuates widely due to variations in precipitation and the poor yield levels of native grass strains. The carrying capacity of the grasslands, therefore, remains low and this hinders planned grazing. Selected grass strains with greater stability and yield potential can help raise the average productivity of such grasslands and also enable better management of livestock grazing.

Marvel grass[*Dichanthium annulatum* (Forsk.) Stapf] is an important constituent grass of the grasslands of semi-arid Rajasthan. Thus, a study was conducted to assess the stability of different genotypes of the grass and to identify those with superior and stable fodder production potential for this region.

Materials and Methods

Sixteen genotypes (strains) of *Dichanthium annulatum* were planted (in 1989) in a RBD with 4 replications at Pali in semi-arid Rajasthan. Local strain of Pali was included as a check. Young seedlings (45–day old) of each strain were transplanted in 3.5x 4 m plots maintaining inter-row spacing of 70 cm and 50 cm between plants. Data on green fodder and dry matter yields were recorded at different harvests taken during 1984 to 1986 and 1988 and the mean values (yield plant^{-1}) were used for the stability analysis (Eberhart & Russell 1966). Mortality rate (%) was computed in the third year of growth in 1986.

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Results and Discussion

Pooled analysis of variance showed that the mean differences between the genotypes (strains) and genotype x environment (year) interaction components were significant for both green fodder and dry matter yield (Table 1). The environment (linear) variance components were highly significant indicating that the environment (years) tested were different and had predominant effect on these attributes. Pooled deviation (non-linear component) and genotype x environment (linear) were significant for both the attributes. The former reflects presence of genetic diversity in the material and the importance of deviations from linear regression (s^2 di) as a stability parameter. The latter indicates the value of regression coefficient (b_i) in interpreting stability for these traits.

Table 1 *Stability analysis of variance for green fodder and dry matter yield s.*

Source	d.f.	Green fodder	Dry matter
Genotypes (Strains)	15	193.65*	72.69*
Environment (years)	3	5639.47* +	793.04**
Genotype x environment	45	238.70*	68.20*
Environment (linear)	1	16918.42* +	2379.12* +
Genotype x environment (linear)	15	345.128*	78.18*
pooled deviations	32	173.896*	59.26*
Pooled error	192	74.46*	24.01

* Significant at P = 0.01 when tested against pooled error

\+ Significant at P = 0.01 when tested against pooled deviations

Table 2 *Estimated stability parameters and performance of Dichanthium annulatum genotypes*

Genotype (CAZRI No.)	Green fodder (g plant^{-1})			Dry matter (g plant^{-1})			Mortality (%)
	$\bar{X}$	b_i	S^2di	$\bar{X}$	b_i	s^2di	
483	70.83 (2.02)@	0.31±0.24	14.967	33.30 (0.95)	−0.12±0.65	38.315*	14.6
485	72.09 (2.06)	1.85±0.46	152.033*	35.24 (1.01)	2.20±0.70	49.258**	13.8
487	66.82 (1.91)	0.93±0.15	−48.760	36.45 (1.04)	1.34±0.37	−3.034	6.3
489	53.38 (1.53)	0.53±0.06	−70.744	25.66 (0.73)	0.78±0.17	−19.902	25.7
491	74.10 (2.12)	1.76±0.37	70.272	32.57 (0.93)	2.02±0.34	−6.316	8.7
492	58.86 (1.68)	1.49±0.50	193.385*	24.69 (0.71)	1.48±0.66	41.784**	23.9
493	64.70 (1.85)	1.11±0.39	83.212	30.78 (0.88)	1.05±0.34	−6.248	4.2
494	64.82 (1.85)	1.22±0.23	−16.421	32.95 (0.94)	1.51±0.33	−7.512	4.2
499	68.62 (1.96)	0.78±0.75	528.095*	34.76 (0.99)	1.07±1.19	188.252**	23.0
501	56.39 (1.61)	0.96±0.22	−24.557	25.99 (0.74)	0.77±0.55	20.427*	18.8
502	73.26 (2.09)	0.29±0.21	−29.247	33.79 (0.97)	0.43±0.44	4.936	12.0
588	63.09 (1.80)	0.01±0.34	46.653	31.61 (0.90)	−0.24±0.52	15.919	12.5
679	64.40 (1.84)	1.46±0.42	109.921	31.50 (0.90)	1.45±0.72	52.273**	10.5
680	74.69 (2.14)	1.70±0.77	547.470*	37.47 (1.07)	1.25±1.25	208.074**	4.2
681	74.77 (2.14)	1.18±0.37	75.001	38.28 (1.09)	1.13±0.45	6.152	8.8
Local (Pali)	57.58 (1.65)	0.40±0.25	10.367	26.76 (0.76)	−0.12±0.19	−18.401	27.1
G.M.	66.15			31.98			
SEm±	7.61			4.44			

*, ** Significant at P = 0.05 and P = 0.01, respectively.

Figures in parentheses indicate estimated mean yield (t ha^{-1})

Perusal of S^2 di values for individual genotypes (Table 2) revealed that genotypes showing non-significant S^2 di (= 0) and hence considered stable for green fodder may not always be stable for dry matter also. Nine out of 16 genotypes revealed non-significant S^2di for both green fodder and dry matter and were considered stable in overall production.

Since stability should be combined with high yield and reduced mortality rate (greater persistency) in a superior grass variety, these genotypes were compared for such attributes. Among these genotypes CAZRI 489 was the poorest in green fodder and dry matter yields and also showed higher mortality percentage (Table 2). Rest of the genotypes were statistically at par to local check for green fodder and dry matter. However, about 15 to 30 per cent higher green fodder and 20 to 40 per cent higher dry matter were recorded by CAZRI 681, 502, 491 and 487 compared to the in local. These genotypes had lower mortality rates than that local and *inter se* CAZRI 487 showing least per cent mortality was the most persistent followed by CAZRI 491, 681 and 502.

The regression coefficient (b_i) is a measure of responsiveness to environment. Significant regression was detected for green fodder in CAZRI 491 and 487 and for dry matter in CAZRI 491 (Table 2). CAZRI 491 showed b_i values greater than unity. It indicated that this genotype has above average response and is, therefore, well adapted to favourable years. In contrast, CAZRI 487 with b_i around unity showed average response for these attributes which indicates that it is more stable in production.

Thus, on the basis of mean fodder production, mortality rate, b_i and S^2d_i values, CAZRI 487 appeared to be the most stable and superior genotype. It combined stability with high fodder potential and persistency. CAZRI 491 is particularly suitable for high fodder yield in favourable years or environments.

References

Eberhart SA & Russell WA 1966 Stability parameters for comparing varieties. *Crop Science* **6** 36-40

(Received January 1992 Accepted March 1993)