Indian J. Genet., 51 (3): 345–348 (1991)

STABILITY ANALYSIS FOR GREEN AND DRY FODDER YIELD IN CLUSTERBEAN

J. V. SINGH, R. S. PARODA, R. N. ARORA AND M. L. SAINI*

Department of Plant Breeding, Haryana Agricultural University, Hisar 125004

(Received: May 29, 1989; accepted: October 9, 1990)

ABSTRACT

Genotype x environment interactions for green fodder and dry matter yield in clusterbean (*Cyamopsis tetragonoloba* (L.) Taub.) were studied by growing 14 genotypes over four years. The genotypes showed significant interactions with the environment for both the traits and a large portion of these interactions was accounted for by the linear regression on the environmental index for dry matter yield, whereas the reverse was the case for green fodder yield. The genotypes, HFG 156 and HFG 119 were most stable with high yield and unit regression coefficient for both the traits studied.

Key words: Stability analysis, G x E interactions, clusterbean.

A successful evaluation of stable genotypes, which could be used in future breeding programmes to develop stable and promising genotypes, can be done through the study of genotype x environment interaction. Clusterbean is a drought tolerant, summer annual legume grown primarily for seed, vegetable and fodder in arid zones. Earlier studies in clusterbean for green fodder yield [1, 2] and dry matter yield [3] indicated that different genotypes behave differently under varying environmental conditions. Thus, the present investigation has been undertaken with a view to study the phenotypic stability of different genotypes in clusterbean for green and dry fodder yield.

MATERIALS AND METHODS

Fourteen genotypes of clusterbean, including two checks, namely, HFG 119 and FS 277, were tested during kharif, 1981 to 1984. The experiment was laid out in a randomized block design with three replications in the last week of June every year. The plot size was 20 m^2 and row-to-row distance 30 cm. Harvesting was done at 50% flowering, data on green fodder yield recorded, and analysis done after converting the data in q/ha. Dry matter yield

*Present address: Professor of Plant Breeding, HAU Regional Research Station, Bawal, Distt. Rewari 123501.

was calculated from oven dried 1 kg green fodder sample per plot and expressed as q/ha. Since the error variances were homogeneous, the stability parameters of different genotypes were computed on the basis of mean performance over years, using the method as suggested by Eberhart and Russell [4].

RESULTS AND DISCUSSION

Pooled analysis of variance for both green fodder and dry matter yield (Table 1) indicated highly significant difference between the genotypes and between environments. This was indicative of the variability among the genotypes and among environments over the year. The mean sum of squares due to variety x environment (linear), tested against pooled deviation, were significant for dry matter yield only, indicating that genetic differences existed among the varieties for regression of lines on environmental index. On the contrary, the mean sum of square due to genotype x environment (linear) was not significant against pooled deviation for green fodder yield, which means that there are no genetic differences among the varieties for their regression on environmental index. Further, prediction of genotypes will be difficult for this trait. However, even for the unpredictable characters, prediction can still be made if one considers stability parameter of individual genotypes. Similar results were also reported by Singh and Yadava [5] in sunflower.

Table 1. Pooled analysis of variance for green fodder and dry matter yield in clusterbean

Source	d.f.	Green fodder yield	Dry fodder yield
Genotypes (G)	13	176381.2**++	189.9**++
Environments (E)	3	126759.2**++	9122.6**++
Environments + (G x E)	42	10453.4**++	770.3**++
Environment (linear)	1	380277.6**++	27368.0**++
G x E (linear)	13	823.1++	220.6**++
Pooled deviation	28	1716.6++	75.6++
Pooled error	104	64.1	7.1

**Against pooled deviation, P = 0.01.
++Against pooled error, P = 0.01.

Mean green fodder and dry matter yield and the two parameters of stability (b and $\bar{S}^2_d$) are given in Table 2. The overall mean performance of 14 genotypes for green fodder and dry matter yield varied from 266.1 to 328.1 and 63.0 to 87.3 q/ha, respectively. The highest overall yield was given by HFG 156, whereas the lowest yield was recorded in HFG 327 for both traits.

Considering the response of genotypes to environmental changes, the genotypes GG 2, GG 5, HFG 119, GG 4 and HFG 156 had unit regression coefficient for both the traits as indicated by nonsignificant b value from unity. Therefore, these genotypes could perform well under normal environmental conditions. The other genotypes, namely, FS 277,

Table 2. Mean green fodder and dry matter yield (q/ha) over four years and stability parameters of different genotypes of clusterbean

Variety	Green fodder yield (g/ha)			Dry matter yield (g/ha)		
	mean	b	$\bar{S}^2_d$	mean	b	$\bar{S}^2_d$
HFG 156	328.1	0.88	252.7	87.3	0.98	3.6
HFG 254	295.6	1.13	2991.2**	79.8	1.41*	0.04
HFG 297	301.8	0.98	921.4**	78.9	0.65*	10.8
HFG 314	288.8	1.24	4242.4**	69.1	0.56	240.1**
HFG 326	299.9	0.97	801.4**	76.8	1.20*	50.6**
HFG 327	266.1	0.99	3730.3**	63.0	0.50	204.8**
HFG 340	267.5	0.82	2455.8**	68.1	0.38	12.4
HGS 24	297.7	1.14	1382.4**	78.4	1.24*	36.4*
GG 1	301.9	0.82	854.2**	82.2	1.27*	48.9**
GG 2	316.2	1.19	387.6**	69.6	1.14	27.7*
GG 4	286.3	0.55	892.9**	80.7	0.84	55.7**
GG 5	311.4	1.09	337.7	81.9	1.15	76.0**
HFG 119	314.9	1.11	102.1	82.5	1.22	4.6
FS 277	278.0	1.09	3783.4**	71.6	1.38*	146.6**
Population mean	296.7			76.4		
SE (mean)	± 23.9			± 8.6		
SE (b)		± 0.25			± 0.33	

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

HFG 326, HGS 24, HFG 254 and GG 1, had b value greater than 1 for dry matter yield, therefore, these genotypes were good in response and could be expected to give better dry matter yield under better environmental conditions.

There were distinct difference among the genotypes for both green fodder and dry matter yield, as indicated by the estimated value of $\bar{S}^2_d$. Nonlinear trend was showed by the genotypes HFG 314, HFG 326, HFG 327, HGS 24, GG 1, GG2, GG4 and FS 277 and therefore, these genotypes were most unstable for both the traits studied. The genotypes HFG 254, HFG 297 and HFG 340 were unstable for green fodder only, and GG 5 was unstable for dry matter yield. The genotypes HFG 156 and HFG 119 were stable for both the traits. These genotypes also had better mean performance for both the traits compared to the population mean. However, genotype GG 5 was stable for green fodder and genotypes HFG 254, HFG 297 and HFG 340 were stable for dry matter yield. Their mean performance was at par with population mean for both the traits.

Considering all the three parameters of stability (mean, b and $\bar{S}^2d$), the genotype HFG 156 was highest yielder for both the characters, with unit regression coefficient and greater stability. The genotype HFG 119 showed the same trend, except that it had average mean performance for both the traits. Due to its excellent performance, this genotype was released for general cultivation all over India by the Central Variety Release Committee in 1981. The genotype HFG 156 was also released for general cultivation all over India by the Central Variety Release Committee in 1988. The genotype HFG 119 was also reported to be stable and promising by Saini et al. [2]. Therefore, both these genotypes should be utilized in future breeding programme to develop stable genotypes having better pe rformance.

REFERENCES

1. R. S. Paroda and N. Mehrotra. 1976. An investigation of genotype–environment interactions for green fodder yield in clusterbean (*Cyamopsis tetragonoloba* (L.) Taub.). Genet. Agrar., **30**: 191–200.

2. M. L. Saini, B. S. Jhorar and K. R. Solanki. 1979. Genotype x environment interactions for green fodder yield in clusterbean. Forage Res., **5**: 185–188.

3. B. S. Jhorar, M. L. Saini and K. R. Solanki. 1980. Phenotypic stability of dry matter yield in clusterbean. Haryana agric. Univ. J. Res., **10**: 1–4.

4. S. A. Eberhart and W. A. Russell. 1966. Stability parameters for comparing the varieties. Crop Sci., **6**: 36–40.

5. J. V. Singh and T. P. Yadava. 1983. Stability studies for yield and its components in sunflower (*Helianthus annuus* L.). Indian J. agric. Res., **17**: 213–218.