Legume Res., 29 (2) : 102 - 105, 2006

EVALUATION OF GROUNDNUT VARIETIES FOR YIELD AND QUALITY CHARACTERS

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ABSTRACT

Six groundnut varieties were evaluated under rainfed situations for yield and quality characters for stability analysis. Mean square due to G x E (linear) interaction was significant for pod yield and hundred pod weight only. Non-linear component was significant for all the traits indicating the presence of variability among the varieties regulated by various environmental conditions prevailing in different years. S-2d was significant for all the characters studied invalidating the linear prediction of performance of varieties. The variety B 95 registered highest pod yield, hundred-pod weight and hundred-kernel weight across the environments. Based on its non-responsiveness to the fluctuating environmental conditions this variety was adjudged to be more adaptive for these characters.

INTRODUCTION

Groundnut is an important oilseed crop of the world on account of its various uses. In India, fluctuations in its annual production have generally been observed due to sensitive behaviour of available varieties to the changing agro-climatic conditions. Groundnut is predominantly cultivated as rainfed crop and is thus exposed to the vagaries of monsoon. Inadequate and erratic rainfall results in low yield and in extreme cases complete failure of the crop. Besides yield maximization, stabilizing yield under rainfed conditions appears to be an important breeding objective. With a view to obtain information on the performance of six groundnut varieties for stability parameters with respect to yield and quality characters in groundnut the present study was carried out in rainfed situation of *kharif* season over six years.

MATERIAL AND METHODS

Six released varieties of groundnut used as national or zonal check varieties in the national groundnut improvement programmes were studied for productivity and stability during *kharif* 1996, 1997, 1998, 1999, 2000 and 2001 at Junagadh (20.21^0 N, 80.55^0 E, 178 m amsl), Gujarat. The trials were laid out in randomized block design with three replications. Each variety was grown in five rows each of 5m lengths. The row-to-row and plant-to-plant distance was 45 cm and 10 cm, respectively for Spanish type (GG 2 and JL 24) and 60 cm and 10 cm respectively for Virginia type (B 95, Somnath, ICGS 44 and Kadiri 3). Harvesting was done when the crop attained the maturity. After proper drying pod yield and kernel yield were recorded on plot basis. The quality characters, hundred-pod weight (g), hundred-kernel weight (g), sound mature kernels (%) and shelling (%). Pod yield and kernel yield were expressed in kg/ha. The method outlined by Eberhart and Russel (1966) was used to analyze the experimental data.

RESULTS AND DISCUSSION

The analysis of variance for phenotypic stability is presented in Table 1 for yield and quality characters. The mean sums of squares due to varieties were significant for hundred-pod weight, hundred-kernel weight and shelling per cent. The variance due to environment (linear) was significant for all the characters indicating real differences in varieties for regression over environmental means. It also elucidated that the varieties and the environments behave differently for different characters as also reported earlier by Vindhiya Varman *et al.*, 1989. Varieties x

Table 1. Pooled analysis of variance for phenotypic stability over six years for yield and its components

Source	d.f.	Mean Squares					
		Pod yield (kg/ha)	Kernel yield (kg/ha)	Hundred pod weight (g)	Hundred kernel weight (g)	Sound mature kernel (%)	Shelling per cent
Varieties	5	244157	57248	5265.50*	1142.81*	76.67	80.10*
Environments	5	6143382*	3405253*	1750.43*	109.06*	1005.02*	24.43*
Varieties x Environments	25	262592	130459	139.27	20.24	48.65	4.56
Environments (Linear)	1	30716886@	17026250@	8752.23@	545.28@	5025.07@	122.17@
Varieties x Environments (Linear)	5	183920@	67005	308.04@	19.95	77.38	5.33
Pooled deviation	24	235218$	121936$	80.90	16.92$	34.56$	3.64$
Pooled Error	72	49283	32366.	60.48	6.95	12.60	2.09

* Significant at 5% level when tested against G x E interaction
@ Significant at 5% level when tested against pooled deviation
$ Significant at 5% level when tested against pooled error.

environment (linear) was significant for pod yield and hundred pod weight only, suggesting that G x E interactions of varieties was predictable for these two characters. Significant Variety x environment (linear) interactions have also been reported by Vindhiya Varman *et al.* (1989); Chuni Lal *et al.* (1998); Sojitra and Pethani, (1994); Patil *et al.* (1984) and Senapati and Sarkar, (2002) for pod yield and by Sojitra and Pethani, (1998a) for hundred pod weight. Pooled deviation was highly significant for pod yield, kernel yield, hundred pod weight, hundred kernel weight, sound mature kernel and shelling per cent thus signify a considerable role of non-linear component of Variety x environment interactions in the expression of these characters. This also indicated that varieties varied considerably with respect to their stability and hence prediction of their performance across the environments would be difficult for all the traits. These results are in conformity with earlier reports (Joshi *et al.*, 2003, Senapati and Sarkar, 2002; Chuni Lal *et al.*, 1998; Sojitra and Pethani, 1998a; Sojitra and Pethani, 1998b; Kandaswami, 1989 and Vindhiya Varman, *et. al.*, 1989). Varying magnitudes of Variety x environment interactions appear to be common in groundnut resulting in poor stability across the varying environmental situations as reported earlier (Singh *et al.*, 1975; Yadav and Kumar, 1978 and Tai and Hammons, 1978).

The mean performance (X), the regression coefficient (b) and the mean square deviation ($S^{-2}d$) from linear regression for different characters studied are presented in Table 2. Among the varieties, B 95 recorded the highest pod yield (2318 kg/ha). Though mean square deviation ($S^{-2}d$) was significantly different from zero, but regression coefficient for this variety did not significantly deviate from unity. This variety may be adaptive for most environmental situations in terms of high yield performance and non-responsiveness to varying environmental situations. Like-wise, other varieties also showed significant mean square deviation ($S^{-2}d$). Thus these varieties were unstable across the environments.

For kernel yield the variety Somnath gave the highest mean value (1570 kg/ha) across the environments followed by JL 24. Regression coefficients (b) for both the varieties were statistically equal to unity, indicating non-responsiveness of these varieties to the environments. Hundred-kernel weight was found to be unstable as indicated by the significant mean square deviations for all the varieties. GG 2 was responsive to the favourable

Table 2. Estimates of stability parameters for yield and its components

Varieties	Pod yield (kg/ha)			Kernel yield (kg/ha)			Hundred pod weight (g)		
	$\bar{X}$	b	S^2d	$\bar{X}$	b	S^2d	$\bar{X}$	b	S^2d
B 95	2318	1.17	227638*	1546	1.09	78544*	154.98	1.46	70.62*
Somnath	2266	0.95	275944*	1570	0.91	149306*	145.01	1.62*	-9.88*
GG 2	1743	0.70	319975*	1317	0.76*	171558*	78.35	0.71	-3.42*
JL 24	2080	0.89	244573*	1569	0.95	123052*	117.01	1.04	7.75*
ICGS 44	2104	1.16	49234 *	1547	1.14	11010*	97.48	0.46*	-24.98*
Kadiri 3	2074	1.14	-761*	1537	1.15	3950*	99.64	0.71	82.44*
Mean	2097			1514			115.4		
S.Em.	217	0.214		156	0.20		4.02	0.23	
	Hundred kernel weight (g)			Sound mature kernel (%)			Shelling per cent		
	$\bar{X}$	b	S^2d	$\bar{X}$	b	S^2d	$\bar{X}$	b	S^2d
B 95	66.79	1.54	12.99*	73.00	1.14	8.94*	66.04	1.03	1.84*
Somnath	65.39	1.36	27.70*	75.17	0.35	-6.32*	68.54	1.16	1.62*
GG 2	33.29	0.28	-4.30*	77.50	0.68	37.85*	74.54	1.30	4.34*
JL 24	46.97	1.26	9.56*	83.00	0.59*	45.25*	74.59	1.69	0.77*
ICGS 44	40.94	0.78	2.97*	79.50	1.23	41.28*	73.66	0.49	1.40*
Kadiri 3	41.83	0.78	10.92*	79.83	1.01	4.78*	73.87	0.32	-0.67*
Mean	49.2			78.00			71.87		
S.Em.	1.83	0.43		23.63	0.20		0.85	0.42	

* Significant at P = 0.05.

environments as revealed by significant deviation of its regression coefficient from unity.

The variety B 95 registering the highest pod yield also gave highest hundred pod weight (155 g) and hundred kernel weight (67 g). S^2d of all the varieties differed significantly from zero for both hundred-pod weight and hundred-kernel weight. The variety Somnath was found to be more responsive to the favourable environment as compared to ICGS 44 as evident from the magnitude of significant values of regression coefficients for hundred-pod weight of these varieties.

Like other characters, sound mature kernels and shelling per cent also exhibited mean square deviations (S^2d) significantly different from zero for all the varieties, implying, thereby, lack of stability in the varieties for the expression of these characters. The variety JL 24 though unstable, but was found to respond to the favourable environment as its regression coefficient (b) was significantly deviating from unity. Highest sound mature kernels (83 %) were also obtained in this variety. Mean performance of varieties ranged from 73 to 83 percent and 66.04 to 74.59 per cent for sound mature kernels and shelling per cent, respectively. Regression coefficient in all the varieties was non-significant for shelling per cent indicating non-responsiveness of varieties to environmental fluctuation.

No variety was found to be stable for any of the characters studied. However, the variety B 95 which registered highest pod yield, hundred pod weight and hundred kernel weight across the environments and adjudged to be more adaptive for these characters as it was non-responsive to the changing environments, may be considered for general cultivation across the environments.

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