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Research Article

Stability analysis of foliar disease resistant groundnut genotypes (*Arachis hypogaea* L.)

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Abstract
Fifteen foliar disease resistant groundnut genotypes and one local variety (VRI 4) were evaluated over four seasons in a single location to identify the stable high yielding genotypes. Significant G X E interaction showed the differential performance of genotypes over different environments / seasons. Stability analysis revealed that only one genotype (ICGV 92093) had near unity regression coefficient coupled with non-significant deviation from regression and high mean kernel yield. Hence, the genotype may be recommended over wide range of environments / seasons.

Key words: Groundnut, foliar disease resistant, stability.

Introduction

Groundnut (*Arachis hypogaea* L.) is considered to be the most important and main oilseed crops of India. The major limiting factors associated with groundnut production are changing agro-climatic conditions, vagaries of monsoon and occurrence of foliar diseases. Identification of suitable genotypes having minimum G X E interaction with moderate level of resistance or less susceptible would be immense need to improve the production of groundnut. Hence, an attempt was made to evaluate the stability of 16 Spanish bunch groundnut genotypes having foliar disease resistance.

Materials and methods

Material for this study consists of 15 Spanish bunch groundnut genotypes (*Arachis hypogaea* L. subsp. *fastigiata* var *vulgaris*) obtained from ICRISAT, Patancheru along with one local variety (VRI 4) for the purpose of conducting International Foliar Disease Resistant Groundnut Varietal Trial at the New Farm of Regional Research Station, Vridhachalam. Sowing was done in 4 x 4 triple lattice design with three replications. The plot size was 5.0 x 1.2 m with a inter and intra row spacing of 30 cm x 10 cm. The genotypes were evaluated continuously in four seasons (Rabi/summer 1998-1999, Kharif 1999, Rabi/summer 1999-2000 and Kharif 2000). Recommended package of practices were followed to raise a healthy crop. Plot yield was recorded and kernel yield per hectare was calculated for the purpose of data analysis. The data were analysed as per the method proposed by Panse and Sukhatme (1978). The stability analysis was carried out according to the method suggested by Eberhart and Russel (1966).

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Results and Discussion

The analysis of variance for individual and pooled environment showed that the mean square due to genotypes were significant for kernel yield which indicated the presence of substantial variability in the mean performance of genotypes over four environments / seasons. The mean square due to environment was also significant indicating the variable environment. Significant G X E interaction showed the differential performance of genotypes under different environments / seasons. The existence of significant G X E interaction have already been reported by Chuni Lal *et al*. (1998), Patil *et al*. (1998), Bentur *et al*. (2004), Senapathi *et al*. (2004) and Hariprasanna *et al*. (2008). The linear component of G X E interaction was significant for kernel yield indicated the genotypes differed for their linear response to the fluctuating

environment. The magnitude of variation due to environment (linear) was higher than G X E (linear) for this trait which depicted that major part of the total variation was a linear function of environment only. Significant pooled deviation suggested that genotypic performance varied with their respective linear paths of response to environment. The predominance of linear component would help in predicting the performance of the genotypes across the environments.

The genotype ICGV 92093 had the higher mean kernel yield (2533 kg/ha), unit regression (b_i=1.447) and non-significant deviation from regression. Thus this genotype appears to have average stability over all the seasons / environments. Non-significant S^2d_i, above average response (bi >1) and relatively higher mean kernel yield observed in ICGV 92083 and ICGV 93187 indicated its adaptability for favourable environments. Though, three genotypes *viz*., ICGV 92080, ICGV 92097 and ICGV 93222 registered higher mean kernel yield and non-significant regression coefficient, its performance was unpredictable as it showed significant S^2d_i.

In summation, only one genotype (ICGV 92093) was found to be promising and stable for kernel yield. Hence, the genotype may be recommended for wide range of environments.

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Table 1. Pooled analysis of variance for kernel yield in groundnut

Source of variation	df	Mean sum of square	
Genotypes (G)	15	290411.718	**
Environment (E)	3	3260085.250	**
G X E	45	119113.953	**
E + (G X E)	48	315424.656	
Environment (linear)	1	9780256.000	**
G X E (linear)	15	92882.867	
Pooled deviation	32	123965.539	**
ICGV 92080	2	212879.406	**
ICGV 92083	2	5952.062	
ICGV 92086	2	139505.437	**
ICGV 92088	2	35925.531	**
ICGV 92093	2	6514.915	
ICGV 92097	2	171002.312	**
ICGV 92098	2	65102.371	**
ICGV 92102	2	219549.234	**
ICGV 92106	2	170570.640	**
ICGV 93187	2	1553.589	
ICGV 93197	2	64899.750	**
ICGV 93217	2	104532.250	**
ICGV 93222	2	62091.882	**
ICGV 93229	2	136595.625	**
ICGV 87160	2	494528.968	**
VRI 4	2	92244.570	**
Pooled error	120	12596.308	

*, ** significantly different at p=0.05 and p=0.01 levels respectively.

Table 2. Estimates of stability parameters for kernel yield in groundnut.

Genotype	Mean yield (kg/ha)	b_i		S^2d_i	
ICGV 92080	2403	1.040		0.608	**
ICGV 92083	1903	1.212		0.986	
ICGV 92086	1757	1.226		0.767	**
ICGV 92088	1767	1.173		0.921	**
ICGV 92093	2533	1.447		0.989	
ICGV 92097	2218	1.429		0.785	**
ICGV 92098	1754	0.827	*	0.762	**
ICGV 92102	1939	0.639		0.362	**
ICGV 92106	1776	0.751		0.502	**
ICGV 93187	1757	1.091		0.997	
ICGV 93197	1682	0.955		0.811	**
ICGV 93217	2208	0.881		0.694	**
ICGV 93222	2113	1.662		0.931	**
ICGV 93229	1837	0.977		0.681	**
ICGV 87160	1622	0.013		0.000	**
VRI 4	2038	0.671		0.598	**
Mean	1957				

*, ** significantly different at p=0.05 and p=0.01 levels respectively.