Indian J. Genet., **58**(2): 215-218 (1998)

STABILITY FOR SEED SIZE IN BUNCH GROUNDNUT (*ARACHIS HYPOGAEA* LINN.)

V. K. SOJITRA AND K. V. PETHANI*

Main Oilseeds Research Station, Gujarat Agricultural University, Junagadh 362 001

(Received: March 20, 1993; accepted: June 11, 1995)

ABSTRACT

Twenty nine bunch groundnut genotypes were evaluated under four environments to estimate the stability parameters for 100 seed weight. Both predictable and non predictable components of genotypes × environment (G × E) interaction were important for expression of this trait. However, linear portion was significantly higher than nonlinear portion. Seventeen genotypes showed linear and 11 genotypes nonlinear sensitivity. Both the components of G × E interaction were present in genotype JB-224. The bold seeded genotype EC-100827 and small seeded genotype JB-215 showed wider adaptation. The bold seeded genotype JB-210 and small seeded genotype J-18 were highly responsive and suitable for favourable environments. Bold seeded genotype J-17, GG-2, J(E)-1, JB-223 and CGC-3 as well as small seeded genotypes ICGS-11, J-11, NRGS-4, J(E)-1, JB-187, J(E)-336 and GAUG-1 were suitable for adverse environments.

Key words: Adaptation. bunch groundnut, controversy, stability, predictable

Large sized seeds of groundnut fetch better price due to its demand for confectioneries, but seed size is highly influenced by environments and very scanty information is available on the stability of seed size during summer season in groundnut [1-3]. An attempt has been made to know the influence of environment on seed size in the present study.

MATERIALS AND METHODS

The experimental material consisted of twenty-nine diverse genotypes of bunch groundnut (*Arachis hypogaea* L.) randomly selected from the gene pool, having seven germplasm accessions, sixteen advance breeding lines along with six released cultivars. They were grown in randomized block design in four replications under each environments during summer at two locations namely, Junagadh and Amreli sown

*Present address : Main Millet Research Station, Gujarat Agricultural University, Jamnagar 361 006 (Gujarat)

at two different sowing times viz., 25 January and 10 February. Each entry was sown in a single-row plot of 5 m length, with 60 cm interrow distance. The distance between the plants was 10 cm. Ten random plants were used to record data for 100-seed weight. Mean values were used to compute G × E interaction following Eberhart and Russell [4].

RESULTS AND DISCUSSION

Differences among the genotypes were significant under each environment. Genetic variability among genotypes and diversity of environments was confirmed by the pooled analysis (Table 1). Genotypes also interacted significantly with environments for 100-seed weight as evident from the joint regression analysis. Significant linear as well as remainder mean squares showed that G × E interaction was shared by both predictable and nonpredictable components. The importance of both linear and nonlinear sensitivity for the expression of this trait was thus evident. However, linear component was significantly higher than the nonlinear portion of the G × E interaction, supporting the earlier findings [1-3, 5].

Table 1. Pooled analysis of variance

Source	d.f.	Mean square
Genotypes (G)	28	60.72^{*}
Environments (E)	3	23.07^{*}
G × E	84	1.97^{+}
Environments (Linear)	1	69.20^{+}
G × E (Linear)	28	3.62^{+}
Pooled deviation	58	1.10^{+}
Pooled error	336	0.18

* Significant against G × E at P 0.05, + Significant against pooled error at P 0.05

Only the nonlinear portion of G × E interaction was found significant in eleven genotypes as displayed by the significant deviation from the regression slope with nonsignificant regression coefficient. Further, 17 genotypes did not interact with environments as shown by both bi and S_d^2, being nonsignificant (Table 2). Therefore, prediction of performance was perfect in the case of these 17 genotypes. Prediction of performance was not possible in the case of genotype JB-224, which showed significant b and S_d^2 values. None of the genotype showed regression coefficient significant only for this attribute.

Table 2. Estimates of stability parameters across the environment

Genotype	$\bar{X}$	b	S^2_d
Germplasm accessions:			
U/4/4/10	25.6	1.99	–0.02
26/5/1	22.2	0.39+	0.43*
VRR-308	28.4	1.36	0.91*
Starr	26.6	0.81	1.03*
U/2/4/5	26.7	1.27	1.02*
EC-100827	29.9	0.99	0.08
21/1/2	29.2	1.34	0.56*
Advance breeding lines:			
NRGS-4	25.1	–0.22+	0.32
CGC-3	29.0	0.49	–0.05
NRGS (E)-6	24.2	0.26+	0.53*
CS-9	27.4	2.12	1.09*
CS-11	26.9	1.56	1.40*
J(E)-2	26.7	1.21	0.88*
JB-215	27.7	1.08	–0.13
JB(E)-336	22.9	0.33	–0.11
JB-223	29.2	0.50	0.04
J-18	26.8	1.26	0.26
J(E)-1	31.2	–0.09+	0.10
J-17	40.1	0.42	0.06
JB-224	37.5	6.10•+	16.92*
JB-210	28.8	2.46	0.26
JB-187	24.2	–0.22+	–0.01
J(E)-3	26.4	0.74	–0.17
Released cultivars:			
ICGS-11	26.4	0.81	–0.15
ICGS-44	27.9	1.71	0.68*
Girnar-1	28.2	0.81	0.61*
GG-2	32.6	–0.44+	0.18
GAUG-1	22.9	0.37	–0.04
J-11	25.4	–0.32+	–0.12
Mean	27.8		
C.D.	1.96		

• bi Significant against 0, + bi Significant against 1, * Significant at $P \leq 0.05$

The results revealed that the bold seeded genotype EC-100827 had wider adaptation across the environments as manifested by higher seed weight (100-seed weight 29.93 g) unit b value coupled with nonsignificant S_d^2. Five bold seeded genotypes; viz., J-17 (40.1 g), GG-2 (32.6 g), J(E)-1 (31.2 g), JB-223 (29.2 g) and CGC-3 (29.0 g) were found suitable for adverse agroclimatic conditions as indicated by b < 1 and $S_d^2 \simeq 0$, while the genotype JB-210 (28.8 g) was suitable for favourable environments as displayed by b > 1 and $S_d^2 \simeq 0$.

On the other hand, small seeded genotype JB-215 (27.7 g) has unit b value coupled with nonsignificant S_d^2, indicating its wider adaptation across the environments. The small seeded genotype J-18 (26.8 g) also had low mean performance and is suitable for favourable agroclimatic condition as evident from the nonsignificant S_d^2 value coupled with high responsiveness (b > 1). While six small seeded genotypes namely, ICGS-11 (26.4 g), J-11 (25.4 g), NRGS-4 (25.1 g), JB-187 (24.8 g), J(E)-336 (22.9 g), and GAUG-1 (22.9 g) showed less fluctuation in seed size over the changing environment as exhibited by the nonsignificant deviation from regression slope and less responsiveness (b < 1).

The genotype which showed high mean performance and high response for 100-seed weight (JB-210) under changing environmental condition, had also exhibited higher *per se* performance and response for pod yield. On the other hand, the genotype which exhibited average adaptation across the environment for 100-seed weight (ICGS-11) also showed lower per se performance and response for pod yield. The bold seeded genotypes J(E)-1 and JB- 210 showed higher 100-seed weight; these genotypes were top ranking for pod yield [6]. It can be concluded that higher pod yield leads to the higher seed weight. The use of these genotypes as a parent in breeding programmes or for general cultivation after testing over a wide range of environments can be advocated. Genotype J(E)-1 which was released for commercial cultivation in Gujarat state is a desirable variety for summer season.

REFERENCES

1. T. P. Yadava and P. Kumar. 1978. Phenotypic stability of yield and its components in semi-spreading group of groundnut (*Arachis hypogaea* L.). Crop. Improv., **5**(1): 45-49.
2. T. P. Yadava and P. Kumar. 1979. Phenotypic stability for yield components and oil contents in bunch group of groundnut. Indian J. Agric. Sci., **49**(5): 318-321.
3. T. P. Yadava, P. Kumar and A. K. Yadav. 1980. Stability analysis for oil content and yield components in groundnut (*Arachis hypogaea* L.). HAU. J. Res., **10**(4): 560-563.
4. S. A. Eberhart and W. A. Russell. 1966. Stability parameters for comparing the varieties. Crop Sci., **6**: 36-40.
5. P. Kumar, T. P. Yadava and S. C. Gupta. 1984. Stability analysis in bunch group of groundnut. HAU. J. Res., **14**(2): 180-183.
6. V. K. Sojitra and K. V. Pethani. 1994. Phenotypic adaptability of bunch groundnut (*Arachis hypogaea* L.) for pod yield during summer. Indian J. Genet., **54**: 321-324.