Indian J. Genet., **59**(1): 95-98 (1999)

Short Communication

GENETICS AND ORDER EFFECTS OF SEED WEIGHT IN GROUNDNUT — A TRIALLEL ANALYSIS

P. VINDHIYA VARMAN AND S. THANGAVELU

Regional Research Station, Vridhachalam 606 001

(Received: August 5, 1996; accepted: October 24, 1998)

Seed size is an important yield and quality traits in groundnut. The genetic investigations of seed size in ground nut have given contradictory results with regards to the relative importance of additive [1, 2], non additive [3, 4] and epistatic [5] effects. The present attempt, therefore, was made to further analyse the gene action of seed size by triallel analysis [6-8] which provides information not only on additive, dominance and epistasis type of gene actions but also about the order effect of the parents in three way crosses.

Sixty three-way crosses involving six groundnut cultivars, *viz.*, ICGS 44, Girnar 1, ALR 2, JL 24, GG 2 and Co 2 were raised in RBD with three replications. Data on seed weight were recorded on fifteen randomly selected plants. As the data were recorded on single plant basis, twenty random seeds from each plant were picked and their total weight recorded (Table 1). The mean data were subjected to triallel analysis [7].

The estimates of two-line specific effect of the first kind (d_{ij}) were positive and significant for the crosses Girnar 1 × JL 24, ICGS 44 × Co 2, ICGS 44 × ALR 2 and ICGS 44 × GG 2 suggesting their superiority as good parents for three-way crosses. Similarly, two-line specific effect of the second kind (S_{ij}) was the highest in the cross ICGS 44 × ALR 2 followed by ICGS 44 × JL 24, JL 24 × Co 2 and Girnar 1 × Co2 respectively and the reciprocal effects (S_{ji}) were positive and significant for the crosses, GG 2 × ICGS 44, JL 24 × Girnar 1 and Co 2 × Girnar 1. These results indicate that all the crosses except Girnar 1 × Co 2 with high two line specific effects of second kind had invariably reciprocal differences also and were associated with order effects in the three-way hybrids.

The estimates of three-line specific effects (T_{ijk}) were found to be highly positive and significant in 13 combinations. In the best performing triplet (ICGS 44 × Co 2)

Table 1. Mean values of parents, single and three-way crosses for seed weight in groundnut

Parent/Crosses	20 seed weight (g)	Crosses	20 seed weight (g)
Parents		(ICGS 44 × Girnar 1) × Co 2	5.30
ICGS 44	7.23	(ICGS 44 × ALR 2) × Girnar 1	6.30
Girnar 1	4.47	(ICGS 44 × ALR 2) × JL 24	7.30
ALR 2	5.57	(ICGS 44 × ALR 2) × GG 2	6.76
JL 24	7.97	(ICGS 44 × ALR 2) × Co 2	7.34
GG 2	5.43	(ICGS 44 × JL 24) × Girnar 1	6.63
Co 2	6.70	(ICGS 44 × JL 24) × ALR 2	7.60
Single crosses			
ICGS 44 × Girnar 1	6.67	(ICGS 44 × JL 24) × GG 2	7.20
ICGS 44 × ALR 2	5.53	(ICGS 44 × JL 24) × Co 2	7.20
ICGS 44 × JL 24	8.53	(ICGS 44 × GG 2) × Girnar 1	5.80
ICGS 44 × GG 2	5.57	(ICGS 44 × GG 2) × ALR 2	6.96
ICGS 44 × Co 2	5.67	(ICGS 44 × GG 2) × JL 24	9.00
Girnar 1 × ALR 2	6.77	ICGS 44 × GG 2) × Co 2	7.00
Girnar 1 × JL 24	5.77	(ICGS 44 × Co 2) × Girnar 1	8.73
Girnar 1 × GG 2	6.53	(ICGS 44 × Co 2) × ALR 2	7.73
Girnar 1 × Co 2	5.23	(ICGS 44 × Co 2) × JL 24	8.00
ALR 2 × JL 24	7.60	(ICGS 44 × CO 2) × GG 2	7.50
ALR 2 × GG 2	5.33	(Girnar 1 × ALR 2) × ICGS 44	6.03
ALR 2 × Co 2	6.43	(Girnar 1 × ALR 2) × JL 24	6.26
JL 24 × GG 2	6.67	(Girnar 1 × ALR 2) × GG 2	6.06
JL 24 × Co 2	7.40	(Girnar 1 × ALR 2) × Co 2	7.30
GG 2 × Co 2	5.30	(Girnar 1 × JL 24) × ICGS 44	6.60
Three-way Crosses			
(ICGS 44 × Girnar 1) × ALR 2	7.06	(Girnar 1 × JL 24) × ALR 2	6.76
(ICGS 44 × Girnar 1) × JL 24	6.40	(Girnar 1 × JL 24) × GG 2	8.40
(ICGS 44 × Girnar 1) × GG 2	4.66	(Girnar 1 × JL 24) × Co 2	9.50

(Table 1 Contd.)

(Girnar 1 × Co 2) × ALR 2	5.86	(ALR 2 × Co 2) × ICGS 44	7.23
(Girnar 1 × Co 2) × JL 24	7.40	(ALR 2 × Co 2) × Girnar 1	6.43
(Girnar 1 × Co 2) × GG 2	7.40	(ALR 2 × Co 2) × JL 24	7.10
(Girnar 1 × GG 2) × ICGS 44	6.86	(ALR 2 × Co 2) × GG 2	7.76
(Girnar 1 × GG 2) × ALR 2	6.03	(JL 24 × GG 2) × ICGS 44	8.83
(Girnar 1 × GG 2) × JL 24	6.23	(JL 24 × GG 2) × Girnar 1	7.70
(Girnar 1 × GG 2) × Co 2	6.33	(JL 24 × GG 2) × ALR 2	6.26
(Girnar 1 × Co 2) × ICGS 44	5.86	(JL 24 × GG 2) × Co 2	8.50
(ALR 2 × JL 24) × ICGS 44	6.56	(JL 24 × Co 2) × ICGS 44	7.53
(ALR 2 × JL 24) × Girnar 1	8.90	(JL 24 × Co 2) × Girnar 1	8.80
(ALR 2 × JL 24) × GG2	6.93	(JL 24 × Co 2) × ALR 2	6.50
(ALR 2 × JL 24) × Co 2	7.56	(JL 24 × Co 2) × GG 2	7.00
(ALR 2 × GG 2) × ICGS 44	6.63	(GG 2 × Co 2) × ICGS 44	7.23
(ALR 2 × GG 2) × Girnar 1	6.86	(GG 2 × Co 2) × Girnar 1	7.33
(ALR 2 × GG2) × Co 2	6.86	(GG 2 × Co 2) × ALR 2	7.96
(ALR 2 × GG 2) × JL 24	6.23	(GG 2 × Co 2) × JL 24	7.66

× Girnar 1, only Co 2 was a good combiner, the other two being poor combiners. The two line specific effect of the first kind was high in ICGS 44 × Co 2. The triplet (ICGS 44 × Co 2) × Girnar 1 was the best because of Co 2 as the grand parent, the specific effect of cross ICGS 44 × Co 2 and the interaction of the parents in the particular order. The order effect in three way crosses was evident in the triplet (ICGS 44 × Co 2) × Girnar 1 which showed the highest positive three line specific effect, but the same parents in the cross (Girnar 1 × Co 2) × ICGS 44 showed negative estimates.

The magnitude of additive genetic variance was lower than epistatic variance. Thus predominance of epistatic components of genetic variance for seed weight has to be kept in mind while formulating breeding procedure for peanut improvement specially for seed weight.

REFERENCES

1. H. L. Nadaf., A. F. Habib, S. Suresh, Patel and Syed Sadaqat. 1988. Heterosis and combining ability in groundnut (*Arachis hypogaea* L.) J. Oilseeds Res., **5** : 7-15.
2. P. Vindhiya Varman and K. Paramasivam, 1992. Genetic architecture of yield and quality characters in groundnut. Madras Agric. J., **72**: 688-693.
3. M. S. Basu, N. P. Singh, M. A. Vaddoria and P. S. Reddy. 1986. Genetic prepotency of the sources of resistance of rust and late leafspot in groundnut. Indian J. Agric. Sci., **56**: 822-826.
4. P. Seshadri. 1990. Genetic analysis of yield and yield components in intra and inter subspecies crosses of *Arachis hypogaea* L. Unpubl. Ph.D. Thesis. Tamilnadu Agric. Univ., Coimbatore.
5. V. Manoharan. 1992. Genetic analysis of yield and its components in bunch groundnut (*Arachis hypogaea* L.). Unpubl. Ph.D. Thesis. Tamilnadu Agric. Univ. Coimbatore.
6. K. Hinkelmann. 1965. Partial triallel cross. Sankhya series A., **27**: 173-196.
7. K. N. Ponnuswamy, M. N. Das and M. T. Handoo. 1974. Combining ability type analysis for triallel crosses in maize. Theor. Appl. Genet., **15**: 170-175.
8. J. O. Rawling and C. C. Cockerham. 1962. Triallel analysis. Crop Sci., **2**: 228-231.