Meelu, O.P. Furoc, R.E., Rizon, R.X., Morris and Marquezes, E.P. (1986). Studies on organic manures in cropping sequences. *Philipp. J. Crop Sci.*, **11**: 20-24.

Rao, D.L.N. and Batra, L. (1983). Ammonia Volatalisation from applied nitrogen in alkali soil. *Pl. Soil.* **10**: 219-228.

Sarkar, M.C. and Azad, A.S. (1970). Effect of sources of fertiliser on loss of N as ammonium in a sierozem soil of Hissar. *J.Indian Soc. Soil Sci.*, **18**: 93-98.

Srinivasalu Reddy (1988). Integrated Nitrogen management in rice based cropping system, Ph.D. Thesis, Tamil Nadu Agril. Univ., Coimbatore.

Tomas, P., Khind, K.S. and Maskina, M.S. (1984). Effect of organic manures on P transformation and availability on rice crop. *Indian J. Agron.*, **6**: 162-167.

Ventura, W., Maskarina, G., Furoc, R.C. and Watanabe, I. (1987). Azolla and Sebania as bio fertiliser for low land rice. Paper presented in the third FCSSP Annual conference held at UPLB, Laguna, Philippines. April 28-30. 1987, P:46-54.

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Choice of parents for number of primary branches in bunch groundnut (*Arachis hypogaea L.* ssp. *fastigiata.* Waldron.)

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Abstract : The estimated variance due to GCA was higher than SCA indicating the predominance of additive gene action for number of primary branches. The general combining ability effects revealed that ICGS 44 and ALR 2 were the good general combiners for this trait. The specific combining ability effects revealed that none of the direct crosses were good specific combiners; whereas, five combinations of the reciprocal crosses were good specific combiners indicated the importance of maternal effects for this trait. The component analysis indicated that the dominance was in excess of additive component. Intermating of the segregants or multiple crossing are suggested for the improvement of this trait. (*Key Words : Groundnut, General combining ability, Specific combining ability, Additive gene action and Non-additive gene action).*

Groundnut (Arachis hypogaea L.) is an important oil seed crop of India. It lacks varietal breakthrough due to inherent biological limitations associated with this crop. The success of any crop improvement programme mostly depends on the knowledge of the genetic architecture of the population handled and the basic genetic mechanism involved in generating variability. Number of branches is an important component, in view of its positive correlation with the pod yield (Labana et al. 1980). Studies in this trait have been carried out only with inter-subspecific crosses. In India, where the majority of the area under this crop is covered with cultigens belonging to ssp. *fastigiata* var.*vulgaris*, such studies become very essential. The objective of the present study was set towards obtaining information on the gene action governing number of primary branches in bunch groundnut.

Materials and Methods

Six groundnut varieties, namely, ICGS 44, Girnar 1, ALR 2, JL 24, GG 2 and Co 2 were crossed in a diallel mating design that included reciprocals. The F_1 hybrids of 30 cross combinations and six parents were sown in a randomised block design with three replications in the rainy season (June - October) of 1994 at Regional Research Station, Vridhachalam. Each plot had 10 rows of 3 meter length with 30 x 15 cm spacing. Ten

Table 1. Analysis of variance for components of combining ability for number of primary branches.

Sources	df	Variances
GCA	5	1.90**
SCA	15	0.32*
REC	15	0.89**
Error	70	0.15
Var (GCA)		0.37
Var (SCA)		0.13
Var (REC)		0.10
GCA : SCA		1.31:1

** P<0.01; *P<0.05

Table 2. Per se performance of the parents and general combining ability effects for number of primary branches in groundnut.

S.No.	Parents	Per se performance	GCA effects
1.	ICGS 44	6.50	0.51**
2.	Girnar 1	4.97	-0.43**
3.	ALR 2	4.97	0.43**
4.	JL 24	5.23	-0.21*
5.	GG 2	5.57	0.40
6.	Co 2	5.03	-0.34**
	SE gi		0.10

** P<0.01; *P<0.05

Table 3. Specific combining ability effects for number of primary branches.

Direct crosses	Values	Reciprocal crosses	Values
ICGS 44 x Girnar 1	0.22	Girnar 1 x ICGS 44	0.67*
ICGS 44 x ALR 2	0.40	ALR 2 x ICGS 44	0.13
ICGS 44 x JL 24	-0.37	JL 24 x ICGS 44	0.40
ICGS 44 x GG 2	0.15	GG 2 x ICGS 44	0.53
ICGS 44 x Co 2	-0.27	Co 2 x ICGS 44	1.23**
Girnar 1 x ALR 2	0.02	ALR 2 x Girnar 1	0.42
Girnar 1 x JL 24	0.26	JL 24 x Girnar 1	-0.15
Girnar 1 x GG 2	-0.39	GG 2 x Girnar 1	-0.15
Girnar 1 x Co 2	-0.34	Co 2 x Girnar 1	-0.25
ALR 2 x JL 24	0.36	JL 24 x ALR 2	-0.82**
ALR 2 x GG 2	0.23	GG 2 x ALR 2	1.07**
ALR 2 x Co 2	0.47	Co 2 x ALR 2	0.85
JL 24 x GG 2	-0.09	GG 2 x JL 24	0.50
JL 24 x Co 2	-0.20	Co 2 x JL 24	0.25
GG 2 x Co 2	0.22	Co 2 x GG 2	1.08**
SE (ij)	0.24	R (ij)	0.28

** P<0.01; *P<0.05

Table 4. Components of genetic variance and their ratios for number of primary branches.

Components	Variances/ratios
D	0.20 ± 0.04**
F	-0.08 ± 0.11
H_1	0.63 ± 0.12**
H_2	0.33 ± 0.10**
h^2	0.10 ± 0.07
E	0.15 ± 0.01**
Ratios involving different Parameter	
$(H_1/D)^{0.5}$	1.78
$H_2/4H_1$	0.13
KD/KR	0.78
h^2/H_2	0.32
Heritability (narrow sense) (%)	20.01

** P<0.01; *P<0.05

competitive plants were randomly selected and used to record number of primary branches in each plant. The mean data were analysed following combining ability analysis method 1, model 1 (Griffing, 1956) and component analysis (Hayman, 1954).

Results and Discussion

Mean squares due to general combining ability (GCA), specific combining ability (SCA) and reciprocal effects (REC) were highly significant (Table 1). The estimated variance due to GCA was higher than SCA indicating the predominance of additive gene action. Similar reports were made by Basu et al. (1986) and Seshadri (1990).

The general combining ability effects (Table 2) revealed that ICGS 44 and ALR 2 were the good general combiners for this trait, whereas, Girnar 1, Co 2 and JL 24 were found to be poor combiners. Hence, for the improvement of this trait ICGS 44 may be considered as it had high mean performance for this trait.

The specific combining ability effects (Table 3) revealed that none of the direct crosses were significant indicating the lack of good specific combiners. However, the reciprocal crosses revealed five combinations namely, Co 2 x ICGS 44, Co 2 x ICGS 44, Co 2 x GG 2, GG 2 x ALR 2, Co 2 x ALR 2 and Girnar 1 x ICGS 44 were good specific combiners for this trait. It indicates the importance of maternal effect for this trait. This observation was also supported by Wynne and Halward (1989).

Component analysis revealed that the additive (D) and dominance components (H1 and H2) were highly significant (Table 4). The magnitudes of the dominance components were larger than that of D. This was also confirmed by the dominance ratio. This sort of contradiction between the combining ability analysis on the one hand and the genetic analysis on the other, is not uncommon in the diallel analysis in many crops. Arunachalam (1976) pointing out such discrepancies, reported that the combining ability analysis were more reliable.

This character recorded the lowest heritability estimate of 20.01 per cent, normally expected for a non-additive type of gene action. Epistatic gene action for this trait had also been reported by Sandhu and Khehra (1975), Vindhiya Varman et al. (1990) and Manoharan (1992). The non-additive gene action may retard the rapid improvement of this trait through selection from the segregating populations. Postponement of selection to later generations, intermating segregants of desirable phenotype or multiple crossing are likely to yield useful progenies possessing more number of branches and yield.

References

Arunchalam, V. (1976). Evaluation of diallel crosses of graphical and combining ability methods, *Indian J. Genet.*, **36:** 358-366.

Basu, M.S., Singh, N. P., Vaddoria, M.A. and Reddy, P.S., (1986). Genetic architecture of yield and its components in groundnut *(Arachis hypogaes L.) Ann. Agric. Res.* **7:** 144-148.

Griffing, B. (1956). Concept of general and specific combining ability in relation to diallel crossing systems. *Aust. J. Biol. Sci.*, **9:** 463-493.

Hayman, B.I. (1954). Theory and analysis of diallel crosses. *Genetics,* **39:** 789-809.

Labana, K.S., Singh, M., Sangha A.S. and Jaswal, S.V., (1980). Variability and inter-correlations among characters in F_2 progeny of groundnut. *J. Res. Punjab Agrl. Univ.*, **17:** 107-114.

Manoharan, V. (1992). Genetic analysis of yield and its components in bunch groundnut (Arachis hypogaea L.) Ph.D. Thesis, Tamil Nadu Agric. Univ. Coimbatore.

Sandhu, B.S. and Khehra, A.S. (1975). Genetic analysis of the number and length of the primary and secondary branches in groundnut. *Crop Improv.*, **2:** 90-95.

Seshadri, P. (1990). Genetic analysis of yield and yield components in inter and inter subspecies crosses of *Arachis hypogaea L.* Ph.D. Thesis, Tamil Nadu Agric. Univ., Coimbatore.

Vindhiya Varman, P., Manoharan, V. and Rathinasamy, R., (1990). Studies on gene action in groundnut. *Madras Agric. J.*, **77:** 571-573.

Wynne, J.C. and Halward, T., (1989). Cytogenetics and genetics of *Arachis. CRC critical Reviews in plant Sciences,* **8:** 189-220.

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