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# Combining ability for pod yield and its components in groundnut [*Arachis hypogaea* (L.)]

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## ABSTRACT

**Combining ability was studied in 8 x 8 diallel set (excluding reciprocals) in groundnut. Analysis of variance for gca and sca were highly significant for all the traits *viz*., 100-kernel weight, number of pods per plant, sound mature kernel, shelling outturn, kernel yield per plant, pod yield per plant higher magnitude of $ó^2$ gca and $ó^2$ sca indicating preponderance of non-additive gene action for all the traits studied. The parents GG 5 for number of pods per plant, sound mature kernel, shelling outturn, kernel yield and pod yield per plant, while GG 7 for 100-kernel weight, sound mature kernel, kernel and pod yield per plant were good general combiners. The best specific combiner for pod yield and its components was GG 5 x JL 24 followed by SB XI x JL 24.**

**Key words :** Combining ability, Gene action and groundnut

## INTRODUCTION

Groundnut is commercially cultivated crop and plays an important role in the economy of several countries. India is the chief producer of groundnut in the world and it accounts for about 40 per cent of the world area and 30 per cent of the world production. A choice of appropriate parents to be used in the hybridization programme is very essential to bring about the desired recombinants. The breeding strategy to be adopted for the improvement of a crop depends primarily on the nature of gene action involved in the expression of quantitative traits of economic importance. Diallel analysis helps in identification of parents with general combining ability (gca) effects and in locating cross combinations possessing high specific combining ability (sca) effects. Therefore, the present investigation has been undertaken to get information on combining ability of eight Spanish bunch genotypes of groundnut in respect of pod yield and its components.

## MATERIALS AND METHODS

A set of 8 x 8 diallel crosses ($F_1$) of groundnut excluding reciprocals was made during Summer-2002 and selfed $F_1$ generation during *kharif*- 2002 for advancing the generation. Only $F_2$ crosses were evaluated along with their parents (GG 2, GG 5, GG 7, TG 19A, SB XI, FeESG 10, JL 24 and Chico) in a Randomized Block Design with three replications at Main Oilseeds Research Station, Junagadh Agricultural University, Junagadh during summer-2003. Each entry was sown in a single row plot of 3.0 m. length with row-to-row and plant-to-plant spacing of 30 cm. and 10 cm., respectively. Observations were recorded on five randomly selected plants from each plot for pod yield and its components (Table 1). Combining ability analysis was made following method-2, model – I of Griffing (1956).

## RESULTS AND DISCUSSION

Analysis of variance for combining ability revealed the variance due to gca and sac were highly significant for all the six traits (Table 1). This indicated existence of genetic variability among parents included and role of both additive and non-additive gene effects in the inheritance of these traits. The components of variance revealed that $ó^2$gca was lower than $ó^2$ sca for all the characters indicating preponderance of non-additive gene action in the inheritance of all the characters. The results are in general accordance with findings of Basu *et al*.(1986), Upadhyaya *et al*.(1992) and Mathur *et al*.(2000).

The estimates of gca effects of parents for all the six characters are presented in Table1 2. An overall appraisal of gca effects of the parents used in the present study indicated that in general, none of the parents was a good general combiner for all the traits studied. However, parent GG 5 was a good general combiner along with high *per se* performance for number of pods per plant, sound mature kernel (%), shelling outturn (%), kernel yield per plant and pod yield per plant ranked first, which can be utilized in plant breeding programme as one of the parents to develop high yielding genotypes. GG 2 was also a good general combiner for number of pods per plant, sound mature kernel (%), shelling outturn (%) and kernel yield per plant. GG 7 was good general combiner for 100-kernel weight, sound mature kernel (%), kernel

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**Table 1 : Analysis of variance for combining ability in $F_2$ generation for different characters in groundnut**

| Source | d.f. | Mean squares | | | | | |
|---|---|---|---|---|---|---|---|
| | | 100-kernel weight (g) | Number of pods per plant | Sound mature kernel (%) | Shelling outturn (%) | Kernel yield per plant (g) | Pod yield per plant (g) |
| gca | 7 | 80.958** | 9.528** | 61.910** | 108.636** | 2.605** | 5.121** |
| sca | 28 | 16.735** | 4.771** | 24.296** | 22.248** | 1.701** | 3.575** |
| Error | 70 | 0.128 | 0.240 | 0.162 | 0.132 | 0.084 | 0.089 |
| $\sigma^2_g$ | | 6.422 | 0.476 | 3.761 | 8.639 | 0.090 | 0.155 |
| $\sigma^2_s$ | | 16.607 | 4.531 | 24.134 | 22.116 | 1.617 | 3.486 |
| $\sigma^2_g / \sigma^2_s$ | | 0.387 | 0.105 | 0.156 | 0.391 | 0.056 | 0.044 |

* and ** indicates significance of values at P=0.05 and 0.01, respectively.

**Table 2 : Estimation of general combining ability (GCA) effects of parents in $F_2$ generation of groundnut**

| Sr. No. | Parents | 100-kernel weight (g) | Number of pods per plant | Sound mature kernel (%) | Shelling outturn (%) | Kernel yield per plant (g) | Pod yield per plant (g) |
|---|---|---|---|---|---|---|---|
| 1. | GG 2 | -2.33** | 1.30** | 0.87** | 5.79** | 0.41** | -0.07 |
| 2. | GG 5 | -0.39** | 1.36** | 4.03** | 2.87** | 0.79** | 0.63** |
| 3. | GG 7 | 2.68** | -0.29* | 3.31** | -2.28** | 0.24** | 0.60** |
| 4. | TG 19A | 5.87** | -0.95** | -2.55** | -3.09** | -0.07 | 0.49** |
| 5. | SB XI | -0.85** | 0.15 | -0.84** | 2.55** | 0.10 | 0.04 |
| 6. | FeESG 10 | -2.28** | 0.23 | -1.47** | 2.02** | -0.13 | 0.07 |
| 7. | JL 24 | -1.35** | -1.36** | -2.11** | -2.83** | -0.80** | -1.02** |
| 8. | Chico | -1.33** | -0.46** | -1.25** | -1.00** | -0.55** | -0.73** |
| | S.E.($g_i$) ± | 0.106 | 0.145 | 0.119 | 0.108 | 0.086 | 0.088 |
| | S.E.($g_i - g_j$) ± | 0.160 | 0.219 | 0.180 | 0.163 | 0.129 | 0.133 |

* and ** indicates significance of values at P=0.05 and 0.01, respectively.

yield per plant and pod yield per plant; TG 19A for 100-kernel weight and pod yield per plant and SB XI for shelling outturn. The parents showing higher mean performance generally proved to be good general combiners. In such cases, additive effect is more important and the choice of parents should be dependent on their performance.

The sca effects (Table 3) suggested that the crosses GG 5 x JL 24 and SB XI x JL 24 were very good specific combiners for all the traits studied, while the cross TG 19A x Chico was very good specific combiner for 100-kernel weight, number of pods per plant, kernel yield per plant and pod yield per plant. All the nine crosses showed high sca values for pod yield per plant. Two crosses *viz*., FeESG 10 x JL 24 and FeESG 10 x Chico exhibited high sca effects for number of pods per plant, kernel yield

**Table 3 : Estimation of specific combining ability (SCA) effects of best nine crosses in $F_2$ generation of groundnut**

| Sr. No. | Crosses | 100-kernel weight (g) | Number of pods per plant | Sound mature kernel (%) | Shelling outturn (%) | Kernel yield per plant (g) | Pod yield per plant (g) |
|---|---|---|---|---|---|---|---|
| 1. | TG 19A x Chico | 6.82** | 1.63** | -1.90** | -2.77** | 1.81** | 3.46** |
| 2. | GG 5 x JL 24 | 4.41** | 2.75** | 1.10** | 5.75** | 2.73** | 3.23** |
| 3. | SB XI x JL 24 | 2.34** | 3.23** | 4.87** | 4.59** | 2.58** | 2.93** |
| 4. | FeESG 10 x JL 24 | -4.40** | 4.68** | -0.82* | -2.19** | 1.47** | 2.90** |
| 5. | FeESG 10 x Chico | -4.08** | 3.51** | 1.06** | -5.80** | 1.00** | 2.80** |
| 6. | GG 7 x Chico | 6.58** | 0.63 | 6.49** | 0.39 | 1.30** | 2.07** |
| 7. | TG 19A x SB XI | 4.94** | -0.18 | -7.17** | -1.88** | 0.42 | 1.94** |
| 8. | GG 7 x JL 24 | 0.59 | 0.60 | 4.86** | 3.83** | 0.04 | 0.84** |
| 9. | TG 19A x JL 24 | 3.07** | 0.67 | -1.55** | 0.18 | 0.22 | 0.57** |
| | S.E.($S_{ij}$) ± | 0.325 | 0.444 | 0.365 | 0.329 | 0.263 | 0.270 |
| | S.E.($S_{ij} - S_{ik}$) ± | 0.481 | 0.658 | 0.540 | 0.487 | 0.389 | 0.399 |
| | S.E.($S_{ij} - S_{lk}$) ± | 0.453 | 0.620 | 0.509 | 0.459 | 0.366 | 0.377 |

* and ** indicates significance of values at P=0.05 and 0.01, respectively.

per plant and pod yield per plant. Similarly, GG 7 x Chico for 100-kernel weight, sound mature kernel, kernel yield per plant, and pod yield per plant, TG 19A x SB XI for 100- kernel weight and pod yield per plant exhibited high sca effects. High sca effects was also recorded by the cross GG 7 x JL 24 for sound mature kernel, shelling outturn and pod yield per plant and TG 19A x JL 24 for 100-kernel weight and pod yield per plant. These findings are in agreement with the earlier findings of Basu *et al.* (1986), Rudraswamy *et al*. (2001) and Dobaria *et al*.(2004). This indicated that the crosses with high sca for pod yield per plant simultaneously showed high sca for 100-kernel weight, number of pods per plant, sound mature kernel, shelling outturn and kernel yield per plant.

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