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# COMBINING ABILITY FOR SOME ECONOMIC CHARACTERS IN PEANUT (*Arachis hypogaea*,L)

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**ABSTRACT: Six parental peanut genotypes (*Arachis hypogaea* L), i.e.; 1) NC 12, 2) Line 292, 3) Line 320, 4)Line 480, 5)Giza 6 and 6)Gregory vary in genetic make up were employed to obtain half diallel of 15 $F_1$ and $F_2$ crosses, excluding reciprocal . The parental peanut genotypes and their Fifteen $F_1$ and $F_2$ crosses were evaluated in a randomized complete block design in three replications under two sowing dates and two different locations, Ismailia and Sharkia governorates for no. of pods / plant, pods weight / plant , pod yield (ard / fad.), seed weight / plant, 100-pod weight, 100-seed weight, shelling percentage and oil percentage. Collected data were statistically and genetically analyzed according to Griffing (1956) Model-1, Method-2.**

**The results revealed that, both general combining ability (additive) and specific combining ability (non-additive) gene actions were important in controlling the expression of all the studied yield characters. The additive genetic variance was greater than dominance one for pods weight / plant (g), pod yield ard / fad, 100-pod weight (g) and 100-seed weight (g) under both sowing dates and locations.**

**Parental peanut genotypes NC 12, Line 480, Giza 6 and Line 623(Gregory) showed positive and significant GCA effects for pods weight / plant (g), pod yield ard / fad, 100-pod weight (g), 100-seed weight (g) and seed weight / plant (g) under the two sowing dates and locations. Moreover, Line 292 and Line 320 were good general combiner for no. of pods / plant, shelling percentage and oil percentage, therefore these genotypes can be used in breeding programs to improve these characters.**

**Peanut crosses (Line 480 x Giza 6, Line 480 x Gregory and Giza 6 x Gregory) and (NC 12 x Line 292, NC 12 x Line 320 and Line 480 x Giza 6) exhibited positive and significant SCA effects for most studied yield characters under both sowing dates and the two locations. These results are of great interest for peanut breeder when planning effective and correct breeding program for improving yield and its components.**

**Key words: Peanut, additive gene action, non-additive gene action, general combining ability, specific combining ability.**

## INTRODUCTION

Peanut (*Arachis hypogaea* L) is one of the most important oil seed crops not only in Egypt but also in other parts of the world. In Egypt, it is used mainly as a confectionary crop rather than an oil seed crop. Harvestable seed yield is usually the main target of peanut breeding programs.

Harvestable seed yield is usually the main target of peanut breeding programs. Breeders often wish to improve several traits simultaneously. This can be accomplished by various breeding methods, depending on the prevailed type of gene action.

The general and specific combining ability (GCA and SCA) effects are important indicators of the potential value in hybrid breeding programs. Differences in GCA effects have been attributed to additive, additive x additive and higher order interactions of additive gene effects in the base population. While, differences in SCA has been attributed to non-additive genetic variance (Falconer, 1960).

Griffing (1956) outlined procedures for calculating correlation among GCA and SCA components to estimate joint responses as they occur in the parent random-mating population. He stated that these correlations are genetics and associated with additive (for GCA correlations) and non-additive (for SCA correlations) effects.

Several investigators reported the predominance of additive gene action in the expression of economic characters, i.e. pods weight (Varman, 1998); no. of mature pods / plant (Vindhiyavarman, 2001); no. of pods / plant, pods weight /plant (g), 100-pod weight (g), 100-seed weight (g), shelling percentage and

oil percentage (El- Baz *et. al.*, 2006).

Meanwhile, non-additive gene action was governed the economic characters such as; no. of pods/plant and pod yield / plant (Rudraswamy *et. al.*, 2001) and Mathur *et. al.* (2000) who work on oil content and Ali *et. al.* (2001) for no. of pods/ plant, pods weight /plant, seed weight / plant, 100-pod weight, 100-seed weight, shelling percentage and oil percentage .Yadav *et. al.* (2006) and Abd El-Aal (2007) reported same conclusion. The main target of this work was to get additional information, about general and specific combining ability for some economic characters using diallelanalysis under two sowing dates and two locations i.e., Ismailia and Sharkia.

## MATERIALS AND METHODS

### Plant Materials and Experimental Design

Six genotypes of peanut were crossed in a diallel fashion, excluding reciprocal to obtain 15 $F_1$crosses at Ismailia Agriculture Research Station during summer season 2004.Pedigree and origin of the studied genotypes are given in Table 1.

**Table 1. Names, origin and characteristics of the six peanut genotypes used as parents in this study**

| No. | Parental genotype | Origin | Growth habit | Days to maturity |
|---|---|---|---|---|
| 1 | NC 12 | U.S.A | Erect | 120 |
| 2 | Line 292 | U.S.A | Erect | 85-90 |
| 3 | Line 320 | U.S.A | Erect | 85-90 |
| 4 | Line 480 | ICISAT | Semi erect | 120 |
| 5 | Giza 6 | Egypt | Erect | 120 |
| 6 | Line 623(Gregory) | U.S.A | Spreading | 150 |

During summer season of 2005, six parental genotypes and 15 $F_1$'s were sown in a randomized complete block design with three replications under two sowing dates, early (1st May) and late (1st June) and different locations i.e., Ismailia and Sharkia governorates. Each experimental plot consisted of two rows for each parent and one row for $F_1$ crosses. The row was 4 meters length with 20 cm

between hills. All normal recommended agriculture practices for peanut production were done at the suitable time in each location. Additional seeds were obtained for $F_1$'s to produce $F_2$ generation.

During summer season of 2006, parents, 15 $F_1$crosses and 15 $F_2$'s were sown in two sowing dates under both locations using complete randomized block design in three replications. Experimental plot consisted of 9 rows, i.e., 2 rows for each parent, 1 row for $F_1$ and 4 rows for $F_2$.

## Collected Data

Data were recorded on ten guarded and competitive plants from each parent and $F_1$ and 20 plant from $F_2$ to estimate the following traits, number of pods / plant, pods weight / plant (g), pod yield (ard / fad.), seed weight / plant (g), 100-pod weight (g), 100-seed weight (g), shelling percentage (%) and oil percentage (%)

## Biometrical Analysis

Before subjecting to biometrical analysis collected data were subjected to two – way analysis of variance according to Steel and Torrie (1980). General and specific combining ability were estimated according to Griffing (1956), method-2, model-1 for both of $F_1$ and $F_2$ generations in both sowing dates and locations.

# RESULTS AND DISCUSSION

## Analysis of Variance of Combining Ability

The mean square due to general and specific combining ability for $F_1$'s and $F_2$'s at two sowing dates and two locations are presented in Tables 2 and 3. The results indicated that both general and specific combining ability mean squares were highly significant for all the studied characters. These results revealing that both additive and non- additive gene action were important in the gene expression of these characters. The ratio of GCA/SCA were more than unity for pod weight /plant, pod yield

**Table 2. Mean squares of general combining ability (G.C.A) and specific combining ability (S.C.A) for no. of pods /plant, pods weight /plant, pods yield ard /fad and seed weight /plant in half diallel crosses 6x6 of F1 and F2 during summer season 2006 in two sowing date under Ismailia and Sharkia locations**

| S.O.V | 1st location | | | | 2nd location | | | |
|---|---|---|---|---|---|---|---|---|
| | 1st sowing date | | 2nd sowing date | | 1st sowing date | | 2nd sowing date | |
| | F1 | F2 | F1 | F2 | F1 | F2 | F1 | F2 |
| **No. of pods / plant** | | | | | | | | |
| GCA | 36** | 185** | 32** | 74** | 16** | 118** | 6** | 43** |
| SCA | 15** | 42** | 8.3** | 10.6** | 8.6** | 11.7** | 3.7** | 4.8* |
| GCA/SCA | 0.83 | 1.48 | 1.26 | 2.34 | 0.63 | 3.36 | 0.55 | 2.93 |
| **Pods weight / plant (g)** | | | | | | | | |
| GCA | 187.8** | 193.8** | 165.6** | 106.7** | 117.1** | 160.9** | 176.6** | 99.9** |
| SCA | 43.0** | 37.5** | 8.1 | 16.2** | 25.5** | 19.4** | 17.4** | 12.6** |
| GCA/SCA | 1.45 | 1.72 | 6.81 | 2.19 | 1.53 | 2.75 | 3.38 | 2.63 |
| **Pods yield ard / fad** | | | | | | | | |
| GCA | 22.0** | 29.3** | 22.1** | 14.9** | 18.1** | 19.2** | 20.7** | 13.3** |
| SCA | 5.01** | 5.9** | 1.5** | 2.2** | 3.9** | 1.9** | 1.4** | 1.7** |
| GCA/SCA | 1.46 | 1.67 | 4.77 | 2.19 | 1.56 | 3.31 | 4.82 | 2.68 |
| **Seed weight / plant (g)** | | | | | | | | |
| GCA | 32.6** | 54.4** | 54.2** | 21.8** | 32.2** | 25.9** | 22.6** | 27.9** |
| SCA | 31.2** | 26.2** | 31.5** | 19.7** | 25.1** | 13.2** | 13.9** | 14.9** |
| GCA/SCA | 0.35 | 0.69 | 0.57 | 0.37 | 0.43 | 0.66 | 0.54 | 0.62 |

**Table 3. Mean squares of general combining ability (G.C.A) and specific combining ability (S.C.A) for 100-pod weight/plant , 100-seed weight/plant , shelling percentage (%) and oil percentage (%) in half diallel crosses 6x6 of F1 and F2 during summer season 2006 in two sowing date under Ismailia and Sharkia locations**

| S.O.V | 100-pod weight (g) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1st location | | | | 2nd location | | | |
| | 1st sowing date | | 2nd sowing date | | 1st sowing date | | 2nd sowing date | |
| | F1 | F2 | F1 | F2 | F1 | F2 | F1 | F2 |
| GCA | 3088** | 1938** | 3401** | 1501** | 4054** | 1305** | 4606** | 1305** |
| SCA | 85.6** | 141** | 316 ** | 108** | 315** | 57** | 121 ** | 57** |
| GCA/SCA | 12.0 | 4.59 | 3.58 | 4.65 | 4.29 | 7.59 | 12.67 | 7.59 |
| | **100-seed weight (g)** | | | | | | | |
| GCA | 819** | 421** | 524** | 297** | 483** | 441** | 332** | 4670** |
| SCA | 63.1** | 54.8** | 45.8** | 22.7** | 36.6** | 19.6** | 49.4** | 35.2** |
| GCA/SCA | 4.32 | 2.56 | 3.81 | 4.37 | 4.41 | 7.48 | 2.24 | 4.45 |
| | **Shelling percentage (%)** | | | | | | | |
| GCA | 147** | 164** | 47** | 94** | 129** | 388** | 165** | 180** |
| SCA | 60** | 43** | 91** | 49** | 36** | 36** | 44** | 49** |
| GCA/SCA | 0.83 | 1.27 | 0.17 | 0.64 | 1.20 | 3.63 | 1.24 | 1.21 |
| | **Oil percentage (%)** | | | | | | | |
| GCA | 28.4** | 27.7** | 37.8** | 31.6** | 40.6** | 16.7** | 29.4** | 29.6** |
| SCA | 12.5** | 11.6** | 12.4** | 14.4** | 14.1** | 5.9 | 10.3** | 15.1** |
| GCA/SCA | 0.76 | 0.80 | 1.02 | 0.73 | 0.96 | 0.94 | 0.95 | 0.65 |

(ard/fad.), 100-pod weight and 100-seed weight over the two sowing dates and the two locations, indicating the major role of additive gene action in the inheritance of these characters. Therefore these characters could be improved through phenotypic selection. The ratio of GCA/SCA was less than unity for seed weight / plant and oil percentage through the two sowing dates and the two locations, revealing that non-additive gene action was the preponderance type in the gene expression of these characters. Thus, these characters may be improved through hybrid breeding method These results are confirmed with El- Sawy and Abd el-Hakim (1999), Rudraswamy *et al* (1999), Francies and Ramalingam (1999), Varman (2000a and b), Rudraswamy *et al* (2001), El-Sawy (2006), El-Baz *et al* (2006) and Abd El-Aal (2007).

## Combining Ability Effects

Data of general combining ability effects (GCA) for no. of pods / plant, pod weight / plant, pod yield (ard/fad.) and seed weight for $F_1$ and $F_2$ through the two sowing dates and both locations are given in Table 4.

It is interest to mention that, parental genotypes Giza 6 and Gregory having positive and significant GCA effects for pod weight / plant and pod yield (ard./ fad.) and genotypes No.2 (Line 292) and 3 (Line 320) showed positive and significant effects for no. of pods / plant in both sowing dates and locations, No.-2(Line 292) for Ismailia under 2nd sowing date for ($F_1$) and No.-3(Line 320) for Sharkia under 1st and 2nd sowing dates for (F2), while, genotype Giza 6 gave positive and significant GCA effects for seed weight / plant under both sowing dates and locations, indicating that these genotypes could be involved in breeding programs for improving these characters.

General combining ability effects (GCA) for 100-seed weight (g), 100-pod weight (g), shelling percentage and oil percentage (Table 5), indicated that genotypes No.-1( Nc12), No.-4(Line 4800, No.-5(Giza 6) and No.-6(Gregory) have positive and significant GCA effects for 100-seed weight and 100-pod weight in the two sowing dates and locations, so these genotypes could be employed in peanut breeding programs to improve such characters.

At the same time, genotypes No.-2(Line 292) and No.-3(Line 320) gave positive and significant GCA

**Table 4. General combining ability (G.C.A) effects for no. of pods /plant, pods weight /plant, pods yield ard /fad and seed weight /plant in half diallel crosses 6x6 of peanut during summer season 2006 in two sowing dates under Ismailia and Sharkia locations**

| Characters | No. of pods / plant | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Parents | 1st location | | | | 2nd location | | | |
| | 1st sowing date | | 2nd sowing date | | 1st sowing date | | 2nd sowing date | |
| | F1 | F2 | F1 | F2 | F1 | F2 | F1 | F2 |
| P1 | -1.9** | 5.0** | -3.6** | 0.06 | -1.1* | -0.7* | -0.6* | -1.1* |
| P2 | 1.0** | 4.9** | 0.21 | 1.7** | 2.7** | 4.1** | 1.6** | 3.4** |
| P3 | 0.96* | 3.1** | 1.6** | 4.6** | -0.5* | 4.9** | -0.13 | 2.2** |
| P4 | 3.3** | -3.5** | -0.71* | 0.14 | 0.23 | -0.8* | -0.16 | -0.5* |
| P5 | -1.2* | -5.2** | 0.87* | -3.1** | -0.9* | -2.7** | 0.09 | -2.0** |
| P6 | -2.1** | -4.2** | 1.6** | -3.5** | -0.6* | -4.9** | -0.9* | -2.0** |
| gii | 0.60 | 0.74 | 0.39 | 0.55 | 0.34 | 0.54 | 0.32 | 0.46 |
| | **Pods weight / plant (g)** | | | | | | | |
| P1 | 2.5** | 5.3** | -0.38 | 1.9** | -0.02 | 3.5** | 1.7** | 1.9** |
| P2 | -5.1** | -6.3** | -4.9** | -4.7** | -2.2** | -5.4** | -4.7** | -4.5** |
| P3 | -7.2** | -4.4** | -5.3** | -4.5** | -6.2** | -5.5** | -6.1** | -4.5** |
| P4 | 3.7** | -1.4* | 1.1* | 1.3* | 1.2* | 0.38 | 1.9** | 3.2** |
| P5 | 2.8** | 1.6** | 3.4** | 3.4** | 2.6** | 2.4** | 1.6* | 1.9** |
| P6 | 3.3** | 5.3** | 6.1** | 2.7** | 4.6** | 4.7** | 6.0** | 2.0** |
| gii | 0.76 | 0.65 | 0.66 | 0.48 | 0.50 | 053 | 0.82 | 0.47 |
| | **Pods yield ard / fad** | | | | | | | |
| P1 | 0.67* | 1.9** | -0.09 | 0.7* | 0.01 | 0.5* | 0.80** | 0.62* |
| P2 | -1.7** | -2.4** | -1.8** | -1.7** | -0.8* | -1.9** | -1.6** | -1.4** |
| P3 | -2.5** | -1.7** | -2.0** | -1.6** | -2.4** | -2.0** | -2.3** | -1.8** |
| P4 | 1.4** | -0.54* | 0.42* | 0.47* | 0.52* | 0.78* | 0.42* | 1.4** |
| P5 | 1.1** | 0.68* | 1.4** | 1.3** | 0.99** | 0.87* | 0.78** | 0.57* |
| P6 | 0.95* | 2.1** | 2.1** | 1.0** | 1.8** | 1.7** | 1.9** | 0.63* |
| gii | 0.29 | 0.24 | 0.21 | 0.18 | 0.19 | 0.22 | 0.14 | 0.27 |
| | **Seed weight / plant (g)** | | | | | | | |
| P1 | -1.1* | 3.3** | -1.5** | 0.26 | 0.25 | 3.1** | -0.96* | 0.18 |
| P2 | -1.2* | -1.9** | -3.4** | -1.6** | 0.54* | 0.13 | -0.42* | -0.07 |
| P3 | -2.7** | -2.8** | -1.8** | -2.1** | -3.9** | -0.25 | -2.6** | -2.4** |
| P4 | 2.3** | -1.3* | 1.2* | 1.6** | 2.0** | -1.7** | 1.1** | 2.6** |
| P5 | 2.2** | 3.1** | 2.6** | 1.9** | 1.0* | 0.50* | 0.83* | 1.3** |
| P6 | 0.54* | -0.38 | 2.8** | -0.28 | 0.17 | -1.8** | 2.0** | -1.6** |
| gii | 0.48 | 0.52 | 0.44 | 0.35 | 0.32 | 0.37 | 0.30 | 0.33 |

**Table 5. General combining ability (G.C.A) effects for 100-pod weight, 100-seed weight, shelling percentage (%) and oil percentage (%) in half diallel crosses 6x6 of peanut during summer season 2006 in two sowing dates under Ismailia and Sharkia locations.**

| Characters | 100-pod weight (g) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Parents | 1st location | | | | 2nd location | | | |
| | 1st sowing date | | 2nd sowing date | | 1st sowing date | | 2nd sowing date | |
| | F1 | F2 | F1 | F2 | F1 | F2 | F1 | F2 |
| P1 | 6.9** | 10.2** | 13.8** | 9.5** | 6.3** | 4.9** | 7.5** | 4.9** |
| P2 | -17** | -16** | -28** | -17** | -26** | -16** | -23** | -16** |
| P3 | -28** | -22** | -23** | 16** | -27** | -15** | -33** | -15** |
| P4 | 0.57 | 4.9** | 9.3** | 6.0** | 7.0** | 4.0** | 4.3** | 4.0** |
| P5 | 13.8** | 10.0** | 10.2** | 6.9** | 12.7** | 9.4** | 14.2** | 9.4** |
| P6 | 24.4** | 13.9** | 18.9** | 12.4** | 28.3** | 13.3** | 30.7** | 13.3** |
| gii | 0.83 | 0.58 | 0.94 | 0.76 | 0.97 | 0.65 | 0.84 | 0.65 |
| | 100-seed weight (g) | | | | | | | |
| P1 | 7.6** | 2.4** | 4.5** | 3.9** | 3.2** | 3.8** | 4.4** | 5.6** |
| P2 | -11** | -8.5** | -10** | -7.4** | -9.4** | -8.3** | -7.3** | -10** |
| P3 | -13** | -8.6** | -9.5** | -7.2** | -9.1** | -9.5** | -7.9** | -8.6** |
| P4 | 5.4** | 2.2** | 1.8** | 1.2* | 2.6** | 1.7** | 1.7** | 1.5** |
| P5 | 2.4** | 2.5** | 4.1** | 1.9** | 2.1** | 2.8** | 1.0* | 3.7** |
| P6 | 9.7** | 9.9** | 9.4** | 7.6** | 10.4** | 9.5** | 8.1** | 8.0** |
| gii | 0.56 | 0.83 | 0.51 | 0.49 | 0.55 | 0.37 | 0.54 | 0.42 |
| | Shelling percentage (%) | | | | | | | |
| P1 | -5.3** | -0.57 | -2.5** | -2.2** | 0.16 | 1.5** | -5.5** | -2.0** |
| P2 | 4.8** | 5.1** | 0.27 | 4.0** | 4.9** | 7.5** | 6.2** | 7.3** |
| P3 | 5.1** | 1.2* | 3.9** | 2.6** | 1.8** | 7.3** | 4.2** | 1.1* |
| P4 | -1.2* | -1.2* | 0.73 | 1.8** | 2.1** | -4.1** | 0.53 | 0.91* |
| P5 | 0.05 | 3.3** | 0.14 | -1.0* | -2.7** | -1.7** | -1.9** | -0.25 |
| P6 | -3.8** | -7.9** | -2.6** | -5.1** | -6.4** | -10** | -3.5** | -7.2** |
| gii | 1.06 | 0.67 | 0.87 | 0.53 | 0.56 | 0.50 | 0.59 | 0.57 |
| | Oil percentage (%) | | | | | | | |
| P1 | -1.1* | -0.6* | 0.40 | 0.95* | -1.5** | -0.02 | -0.47* | 0.25 |
| P2 | 3.1** | 2.4** | 3.5** | 1.0* | 2.8** | 1.3* | 2.2** | 2.0** |
| P3 | 1.1* | 2.0** | 0.13 | 2.1** | -0.38 | 2.0** | 2.3** | 1.9** |
| P4 | -0.03 | -0.21 | 0.62* | -0.81* | 2.7** | -0.7* | -0.32 | -0.17 |
| P5 | -1.8** | -2.2** | -2.3** | 0.21 | -2.6** | -1.8** | -2.2** | -0.77* |
| P6 | -1.4** | -1.3** | -2.2** | -3.5** | -1.0* | -0.73* | -1.6** | -3.2** |
| gii | 0.40 | 0.37 | 0.53 | 0.49 | 0.51 | 0.55 | 0.46 | 0.45 |

effects for shelling and oil percentages in most cases for $F_1$ and $F_2$ generations during sowing dates and locations.

Specific combining ability effects, (SCA) effects for $F_1$'s and $F_2$'s during the two sowing dates under the two locations are presented in Table 6. Desirable SCA effects over sowing dates and locations were obtained for no. of pods/plant, pods weight/plant, pod yield (ard./fad.), seed weight/plant, 100-pod weight and 100-seed weight by the three crosses; (4x5), (4x6) and (5x6) These results are confirmed by GCA effects which were positive and significant for parental lines no. 4, 5, and 6.

Also, three crosses i.e., (1x2), (1x3) and (4x5) gave positive and significant SCA effects for seed weight /plant, 100-seed weight, shelling percentage and oil percentage.

Moreover the results of SCA effects showed that the cross combinations (1x2) and (1x4) gave positive and significant SCA effects in most cases under the two sowing dates and locations, indicating that these crosses could be further breed to improve no. of pods / plant. Peanut crosses i.e., (4x5) and (5x6) were the best for pod weight / plant over the two sowing dates and locations and generations except for $F_2$ under Ismailia at 1st and 2nd sowing dates and for $F_1$ under Sharkia at 2nd sowing date.

The results of SCA effects for pod yield (ard./fad.) and seed weight/plant. Table 6 showed that, crosses (4x5) and (5x6) possessed positive and significant SCA effects through both sowing dates and locations for $F_1$ and $F_2$ generations. These crosses could be fruitful in breeding program for improving those characters.

SCA effects for 100-pod weight and 100-seed weight (Table 6) showed that, five crosses i.e.; (1x4), (1x6), (4x5), (4x6) and (5x6) gave positive and significant SCA effects for $F_1$ and $F_2$ crosses over the two sowing dates and locations. Most of these cross combinations contain parental genotypes No.-4, No.-5 and No.-6 which were good general combiners for most of the studied characters.

As for shelling percentage (Table 6) the results of SCA effects showed that the two crosses (4x5) and (5x6) gave positive and significant SCA effects for both $F_1$ and $F_2$ generations through sowing dates and locations. Both crosses (1x2) and (3x4) were the promising

**Table 6. Specific combining ability (S.C.A) effects for some economic carachers in half diallel crosses 6x6 of peanut during summer season 2006 in two sowing dates under Ismailia and Sharkia locations .**

| Characters | No. of pods / plant | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Parents | 1st location | | | | 2nd location | | | |
| | 1st sowing date | | 2nd sowing date | | 1st sowing date | | 2nd sowing date | |
| | F1 | F2 | F1 | F2 | F1 | F2 | F1 | F2 |
| 1x2 | 3.7** | 6.5** | 0.69 | 0.72 | 2.5** | 0.92 | 4.0** | 0.68 |
| 1x3 | -3.5** | 0.34 | -1.7* | 4.2** | 1.8* | 2.1* | 2.4** | 4.5** |
| 1x4 | 5.2** | 5.6** | -1.2* | 2.3* | 1.8* | 5.1** | 1.9** | 0.64 |
| 1x5 | -3.0** | 7.3** | -0.44 | 1.5* | 1.6* | -1.6* | -2.4** | -1.8* |
| 1x6 | 3.3** | 1.9 | 1.1* | -3.0** | -3.8** | -0.04 | -2.4** | 0.14 |
| 2x3 | -3.7** | 6.4** | -6.1** | 5.1** | 6.6** | 2.3* | -1.5* | 0.30 |
| 2x4 | -3.0** | -5.2** | -1.9* | 0.64 | 0.96* | 4.6** | 1.5* | 2.7** |
| 2x5 | 3.2** | -11** | 2.9** | -1.2 | -1.9* | -0.04 | 0.51 | 3.2** |
| 2x6 | -1.8* | -3.9** | 5.0** | -0.03 | -0.28 | -0.83 | -0.65 | -0.45 |
| 3x4 | 4.2** | -3.4** | 3.2** | -1.9* | -2.2** | 1.5* | -0.75 | -2.4** |
| 3x5 | -2.0** | 1.2 | 0.18 | -1.7* | 0.50 | -0.49 | 0.06 | -1.9* |
| 3x6 | -1.1 | 3.5** | 0.50 | -2.2* | -1.4* | -1.3 | 0.15 | -0.24 |
| 4x5 | 0.77 | 3.8** | 3.5** | 2.4** | 2.1** | 1.8* | -0.39 | -1.5* |
| 4x6 | -4.8** | 2.2* | -0.87 | 1.2 | 0.32 | 3.0** | 0.32 | 0.51 |
| 5x6 | 5.8** | 5.8** | -1.3* | 6.1** | 1.6* | -1.3 | 1.3* | -0.66 |
| sii | 1.65 | 2.03 | 1.08 | 1.50 | 0.92 | 1.48 | 0.89 | 1.27 |
| | Pods weight / plant (g) | | | | | | | |
| 1x2 | 1.11 | 3.1** | -0.04 | 2.7** | 5.9** | 0.13 | 3.1** | 0.52 |
| 1x3 | -7.1** | 0.74 | -2.7** | -0.64 | 3.1** | -2.1* | 2.57* | -1.15 |
| 1x4 | 12.5** | -6.9** | -1.5 | -5.7** | 2.5** | -2.6** | 5.0** | 1.79* |
| 1x5 | -7.7** | -4.8** | -0.59 | 0.17 | 1.57* | -1.09 | -2.15 | 2.6** |
| 1x6 | 4.1** | 3.5** | 5.4** | 0.22 | -8.6** | 2.02* | -1.38 | 4.0** |
| 2x3 | 1.40 | 1.59 | 2.09* | 0.03 | -0.82 | 0.58 | -2.6* | -0.03 |
| 2x4 | -0.14 | -4.4** | 0.59 | -4.9** | -2.07* | -4.6** | -1.07 | -4.4** |
| 2x5 | 2.08* | -5.7** | -5.2** | -2.9** | -3.6** | -3.7** | 1.38 | 0.46 |
| 2x6 | -7.5** | -3.2** | -0.73 | -5.4** | 3.6** | -3.9** | -0.41 | 0.33 |
| 3x4 | 3.2** | -3.6** | -0.19 | 0.68 | -0.76 | -2.3* | 0.26 | -1.5* |
| 3x5 | -3.7** | -4.6** | 3.4** | -3.1** | 2.24* | -4.5** | 1.94 | -1.8* |
| 3x6 | -4.0** | -5.4** | -3.7** | 0.002 | -1.39* | -2.9** | -1.97 | 2.0* |
| 4x5 | 3.3** | 2.7** | 3.4** | 0.44 | 6.3** | 2.13* | 1.36 | 2.3** |
| 4x6 | -1.64 | 7.5** | 0.63 | 3.5** | 6.2** | 3.3** | 9.2** | 0.36 |
| 5x6 | 11.1** | 12.6** | 1.56 | 8.0** | 6.3** | 9.1** | 3.5** | 6.2** |
| sii | 2.07 | 1.79 | 1.81 | 1.33 | 1.36 | 1.44 | 2.25 | 1.30 |

**Table 6. Cont.**

| Characters | Pods yield ard / fad | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1st location | | | | 2nd location | | | |
| Parents | 1st sowing date | | 2nd sowing date | | 1st sowing date | | 2nd sowing date | |
| | F1 | F2 | F1 | F2 | F1 | F2 | F1 | F2 |
| 1x2 | 0.77 | 1.4* | -0.06 | 0.99* | 2.3** | -0.64* | 1.01* | 0.25 |
| 1x3 | -2.4** | 0.47 | -1.1* | -0.24 | 1.2* | -1.3* | 0.83* | -2.0** |
| 1x4 | 3.9** | -2.6** | -0.50 | -2.1** | 0.99* | -0.44 | 2.2** | 0.78* |
| 1x5 | -2.3** | -1.7** | -0.19 | 0.06 | 0.66* | -0.54* | -0.95* | 1.25* |
| 1x6 | -1.0* | 1.3* | 2.6** | 0.08 | -3.4** | 0.95* | -0.18 | 1.91* |
| 2x3 | 0.24 | 0.60 | 0.72* | 0.01 | -0.35 | -0.68* | -1.1* | -0.27 |
| 2x4 | 0.07 | -1.8** | 0.29 | -1.8* | -0.85* | -1.9** | -0.06 | -1.8** |
| 2x5 | 0.89* | -2.3** | -2.1** | -1.1* | -1.39* | 1.14* | 0.34 | 0.29 |
| 2x6 | -2.6** | -1.3* | 0.11 | -2.0** | 1.5** | 0.42 | 0.18 | 0.22 |
| 3x4 | 1.42* | -1.4* | -0.10 | 0.25 | -0.33 | 0.46 | 0.43* | -0.43 |
| 3x5 | -1.45* | -1.8** | 1.3* | -1.1* | 0.96* | -0.39 | 0.58* | -0.22 |
| 3x6 | -1.2* | -2.2** | -1.0* | -0.001 | -0.52 | 0.57* | -0.41* | 1.19* |
| 4x5 | 1.14* | 1.0* | 0.50 | 0.16 | 2.6** | 0.80* | 0.83* | 1.06* |
| 4x6 | -0.79 | 3.0** | 0.49 | 1.3* | 2.5** | 1.30* | 0.50* | 0.28 |
| 5x6 | 4.2** | 5.0** | 1.4* | 3.0** | 2.0** | 2.2** | 1.6** | 0.33 |
| sii | 0.79 | 0.67 | 0.58 | 0.49 | 0.53 | 0.57 | 0.39 | 0.73 |
| | Seed weight / plant (g) | | | | | | | |
| 1x2 | 6.2** | 5.5** | -2.1** | 4.1** | 4.1** | 1.80* | 5.2** | 5.0** |
| 1x3 | 0.61 | -0.54 | 3.6** | 1.3** | 0.91* | -2.4** | 3.2** | 2.0** |
| 1x4 | 9.6** | -1.33 | 3.9** | -3.1** | 1.1* | 3.6** | 1.07* | 0.006 |
| 1x5 | -6.2** | -1.08 | -1.19 | 1.6** | 3.7** | -1.24* | -6.3** | -0.37 |
| 1x6 | 3.1** | -3.9** | 7.9** | 5.5** | -2.1** | 2.8** | -6.2** | -4.3** |
| 2x3 | -0.19 | 1.71* | 2.6** | 2.1** | 0.62 | 0.17 | -5.0** | 1.3* |
| 2x4 | -7.8** | -4.7** | -7.8** | -3.6** | -1.21* | -3.4** | 0.53 | -3.4** |
| 2x5 | 1.32 | -8.8** | -3.9** | -4.9** | -3.8** | -2.9** | 1.16* | -3.8** |
| 2x6 | -4.3** | 1.29 | -0.81 | -5.6** | 2.6** | -3.2** | 0.61 | -1.08* |
| 3x4 | 1.19 | -3.2** | 1.23* | 1.9* | -1.80* | -1.4* | 0.07 | -3.7** |
| 3x5 | -3.3** | -2.6** | 4.9** | -4.7** | -1.80* | -0.87 | -1.30* | -2.8** |
| 3x6 | -6.7** | 3.5** | -5.7** | -4.4** | 0.66 | -3.9** | 1.49* | -0.08 |
| 4x5 | 4.4** | 2.2** | 2.4** | 2.5** | 7.4** | 3.5** | -0.39 | 3.1** |
| 4x6 | -1.7* | 4.4** | 5.5** | 2.8** | 4.4** | 4.8** | 4.1** | 3.5** |
| 5x6 | 6.8** | 10.6** | 6.4** | 7.1** | 9.1** | 4.7** | 5.0** | 8.8** |
| sii | 1.32 | 1.42 | 1.20 | 0.96 | 0.88 | 1.03 | 0.83 | 0.92 |

**Table 6. Cont.**

| Characters | 100-pod weight (g) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Parents | 1st location | | | | 2nd location | | | |
| | 1st sowing date | | 2nd sowing date | | 1st sowing date | | 2nd sowing date | |
| | F1 | F2 | F1 | F2 | F1 | F2 | F1 | F2 |
| 1x2 | -7.5** | -16** | -11** | 2.5* | -13** | 0.07 | 6.9** | 0.07 |
| 1x3 | -17** | -15** | -9.4** | -1.16 | -24** | -3.1** | -18** | -3.1** |
| 1x4 | 16.7** | 4.1** | 4.6** | -0.77 | 8.7** | 2.21* | 5.1** | 2.21* |
| 1x5 | 6.8** | 9.0** | 3.3** | 6.9** | -8.7** | 1.47 | -5.9** | 1.47 |
| 1x6 | 4.9** | 8.7** | 7.4** | 7.1** | 6.5** | 6.2** | 10.2** | 6.3** |
| 2x3 | 9.9** | 19.2** | -0.67 | 5.6** | 2.26 | -0.53 | -12** | -0.53 |
| 2x4 | -10** | -1.58 | -15** | -14** | -45** | -8.9** | -0.31 | -8.9** |
| 2x5 | -6.6** | -6.6** | -22** | -7.6** | 18** | -8.3** | 9.4** | -8.3** |
| 2x6 | 7.2** | -14** | -19** | -11** | 8.9** | -5.6** | -2.38* | -5.6** |
| 3x4 | 3.6** | -3.8** | -17** | -4.1** | 11** | -2.6** | -5.3** | -2.6** |
| 3x5 | 1.50 | -11** | -13** | 0.70 | 15** | -5.7** | 16.7** | -5.7** |
| 3x6 | -2.4* | -13** | -18** | -11** | 2.87* | -7.7** | 17.7** | -7.7** |
| 4x5 | 5.4** | 1.65 | 7.7** | 10.1** | 7.4** | 9.8** | 4.2** | 9.8** |
| 4x6 | 1.82 | 8.0** | 8.3** | 12.2** | -3.4** | 5.8** | 0.58 | 5.8** |
| 5x6 | 4.2** | 9.9** | 15** | 15.6** | -2.73* | 10.1** | 0.99 | 10.1** |
| sii | 2.28 | 1.59 | 2.59 | 2.10 | 2.67 | 1.79 | 2.30 | 1.79 |
| | 100-seed weight (g) | | | | | | | |
| 1x2 | -1.74* | 4.0** | 3.8** | 2.6** | 0.21 | 2.7** | 0.27 | 4.7** |
| 1x3 | -1.83* | 0.08 | 2.6** | 3.5** | -4.7** | 0.09 | -0.43 | 0.71 |
| 1x4 | 5.4** | 7.6** | 3.0** | 5.7** | 4.7** | -0.27 | 7.2** | 2.1** |
| 1x5 | 8.6** | -1.68 | -1.30 | 0.14 | 0.28 | 1.11* | 4.5** | -0.34 |
| 1x6 | 4.5** | 11.2** | 4.2** | 4.6** | 5.3** | 2.1** | 6.8** | 5.9** |
| 2x3 | 6.9** | 3.7** | 6.4** | 2.6** | 2.27* | 2.0** | 2.7** | 3.6** |
| 2x4 | -8.9** | -7.0** | -7.6** | -0.29 | -5.2** | -4.1** | -5.4** | -5.9** |
| 2x5 | -7.1** | -0.37 | -5.2** | -0.90 | -3.3** | -2.7** | -2.6** | -6.1** |
| 2x6 | -7.9** | -6.4** | -9.3** | -6.2** | -2.6** | -0.05 | -1.68* | -7.7** |
| 3x4 | -7.3** | -4.6** | -5.7** | -5.1** | -0.18 | -4.5** | -4.5** | -4.6** |
| 3x5 | -5.3** | -3.9** | -5.6** | -0.98 | -2.6** | -3.2** | -7.3** | -0.01 |
| 3x6 | -6.8** | -7.4** | -6.3** | -4.1** | -3.3** | -3.2** | -4.3** | -2.8** |
| 4x5 | 8.1** | 4.3** | 7.8** | 1.85* | 5.6** | 6.2** | 1.92* | 9.5** |
| 4x6 | 7.1** | 1.43 | 6.0** | 2.3** | 8.2** | 4.0** | 7.8** | 5.6** |
| 5x6 | 8.7** | 13.1** | 10.4** | 8.1** | 10.5** | 8.4** | 11.8** | 6.3** |
| sii | 1.55 | 2.28 | 1.41 | 1.35 | 1.51 | 1.03 | 1.44 | 1.16 |

Table 6. Cont.

| Characters | Shelling percentage (%) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Parents | 1st location | | | | 2nd location | | | |
| | 1st sowing date | | 2nd sowing date | | 1st sowing date | | 2nd sowing date | |
| | F1 | F2 | F1 | F2 | F1 | F2 | F1 | F2 |
| 1x2 | 9.9** | 5.8** | -5.4** | 4.7** | -0.78 | 3.9** | 6.7** | 10.0** |
| 1x3 | 12.4** | -3.8** | 13.3** | 3.4** | -3.3** | -2.9** | 2.42* | 5.9** |
| 1x4 | 2.57 | 7.3** | 10.2** | 1.29 | -1.25 | 10.5** | -5.4** | -2.5** |
| 1x5 | -2.78 | 4.1** | -1.02 | 3.2** | 6.3** | -2.10* | -10** | -4.2** |
| 1x6 | 0.81 | -9.6** | 7.8** | 11.7** | 8.6** | 3.9** | -11** | -12** |
| 2x3 | -1.77 | 1.43 | 2.79* | 6.8** | 3.7** | 2.5** | -6.9** | 4.4** |
| 2x4 | -16** | -3.5** | -18** | -0.09 | 0.64 | -1.20 | 1.43 | -1.15 |
| 2x5 | -0.59 | -9.9** | -0.45 | -7.5** | -2.9** | -1.83* | 0.80 | -10** |
| 2x6 | 1.25 | 6.2** | -1.14 | -6.1** | -1.01 | -7.0** | -0.46 | -4.3** |
| 3x4 | -3.1* | -2.9** | 3.3** | 3.0** | -3.4** | -0.67 | -2.5** | -6.9** |
| 3x5 | -1.58 | 1.57 | 5.3** | -6.9** | -8.1** | 4.2** | -6.5** | -4.2** |
| 3x6 | -10** | 13.7** | -7.3** | -11** | 2.04* | -6.4** | 4.0** | -3.5** |
| 4x5 | 3.7** | 1.04 | 0.79 | 4.6** | 5.6** | 6.2** | -3.8** | 3.6** |
| 4x6 | -0.43 | -0.69 | 9.3** | 1.29 | 0.40 | 6.6** | 6.1** | 7.8** |
| 5x6 | -0.48 | 3.5** | 5.2** | 4.9** | 9.8** | 0.74 | 4.5** | 10.6** |
| sii | 2.90 | 1.84 | 2.39 | 1.47 | 1.54 | 1.37 | 1.62 | 1.56 |
| | Oil percent age (%) | | | | | | | |
| 1x2 | 2.6** | 4.4** | 1.37 | 5.3** | 3.4** | 2.18* | 5.3** | 3.7** |
| 1x3 | -4.0** | 3.7** | 1.73* | 1.21 | -4.2** | 3.8** | 0.84 | 3.1** |
| 1x4 | 5.4** | -1.6* | 3.0** | 2.6** | 4.3** | 0.13 | -0.66 | 4.5** |
| 1x5 | -1.26* | -2.7** | 0.09 | 1.67* | -0.89 | -1.20 | 0.98 | -5.1** |
| 1x6 | -1.54* | -0.80 | 1.53* | -1.80* | -3.6** | 0.29 | -3.9** | 0.16 |
| 2x3 | 0.39 | 3.5** | 0.18 | 3.4** | 2.12* | 2.5** | -0.55 | 2.8** |
| 2x4 | 2.8** | -3.5** | 1.80* | -5.1** | 0.48 | -1.15 | -1.59* | -1.09 |
| 2x5 | -3.2** | -0.032 | -2.5** | -3.1** | -1.51* | -2.06* | -4.5** | -1.90* |
| 2x6 | 3.7** | -0.96 | 5.9** | -4.4** | 3.3** | 0.46 | 4.2** | -0.64 |
| 3x4 | 4.8** | 2.5** | 4.9** | 0.84 | 3.8** | -0.48 | 3.6** | 0.85 |
| 3x5 | 2.7** | -0.89 | -2.7** | 3.0** | -3.0** | 1.19 | 2.02* | 3.8** |
| 3x6 | -2.8** | -4.2** | -2.3* | 0.52 | -2.2* | -0.51 | 2.2** | -3.3** |
| 4x5 | -3.3** | 1.3* | 2.3* | 3.6** | 4.2** | 2.9** | 2.13* | 4.8** |
| 4x6 | -2.9** | 7.4** | 0.89 | 4.4** | 1.43* | -0.72 | 2.2** | -2.0* |
| 5x6 | 4.2** | -0.39 | -0.75 | 0.73 | 3.2** | 4.1** | 0.62 | 6.1** |
| sii | 1.10 | 1.01 | 1.46 | 1.34 | 1.40 | 1.51 | 1.26 | 1.25 |

for oil percentage under both sowing dates and locations. SCA effects for shelling percentage and oil percentage revealed that SCA effects of various peanut crosses varied from sowing date to sowing date and location to another as well as from generation to generation showing that environmental variance played a great role in the gene expression of these characters, reinforcing the importance of testing these genotypes under various locations and years.

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# القدرة علي الأئتلاف لبعض الصفات الاقتصادية في الفول السوداني

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٢- معهد بحوث المحاصيل الحقلية – قسم بحوث المحاصيل الزيتية – مركز البحوث الزراعية.

أجريت هذه الدراسة خلال الموسم الصيفي لأعوام ٢٠٠٤، ٢٠٠٥، ٢٠٠٦ واستخدم فيها ستة تراكيب وراثية كأباء وهي NC12، سلالة٢٩٢، سلالة٣٢٠، سلالة٤٨٠، جيزة٦، سلالة٦٢٣ (جريجوري) للحصول علي هجن الجيل الأول والثاني. تم تقييم المواد الوراثية في تصميم قطاعات كاملة العشوائية في ثلاث مكررات تحت ميعادي زراعة مبكر (أول مايو) ومتأخر (أول يوليه) في بيئتين الأولي محطة البحوث الزراعيه بالأسماعيليه والثانية في قرية وادى الملاك محافظة الشرقية لصفات عدد القرون / النبات ، وزن القرون / النبات (جم) ، وزن القرون (أردب / الفدان) ، وزن البذور / النبات (جم) ، وزن ال١٠٠ بذرة (جم) ، وزن ال١٠٠ قرن (جم) ، التصافي (%) ونسبة الزيت (%) . وقد تم تحليل البيانات طبقا لجرفينج (١٩٥٦) الطريقة الثانية – الموديل الأول.

أظهرت النتائج أن كلا من الفعل الجيني المضيف وغيرالمضيف لعب دورا هاما في وراثة جميع الصفات تحت الدراسة. كما أظهرت النتائج أن القدرة العامة علي الأئتلاف كان لها الدورالأكبر مقارنة بالقدرة الخاصة علي الأئتلاف لصفات محصول القرون / النبات ، محصول القرون (أردب / الفدان) ، وزن ال ١٠٠ قرن ووزن ال١٠٠ بذرة تحت ظروف المنطقتين وميعادي الزراعة .

أظهرت نتائج تأثيرات القدرة العامة علي التألف أن السلالات NC 12 ، سلالة ٤٨٠ ، جيزة ٦ و سلالة ٦٢٣ ذات قدرة أئتلافية موجبة ومعنوية لصفات وزن القرون / النبات ، وزن القرون أردب / الفدان ، وزن البذور ، وزن ال١٠٠ بذرة ووزن ال١٠٠ قرن. أشارت النتائج أن السلالتين ٢٩٢ ، ٣٢٠ ذات تأثير موجب ومعنوي بالنسبة لعدد القرون ، التصافي ونسبة الزيت تحت ظروف كلا المنطقتين وميعادي الزراعة و بذلك يمكن استخدام هذه السلالات في تحسين تلك الصفات .

أوضحت النتائج أن تأثيرات القدرة الخاصة علي الأئتلاف كانت موجبة ومعنوية للهجن التالية سلالة ٤٨٠×جيزة ٦ ، سلالة ٤٨٠× جريجورى ، جيزة ٦ × جريجورى و NC 12 ×سلالة ٢٩٢ ، NC 12 ×سلالة ٣٢٠ و سلالة ٤٨٠×جيزة ٦ لمعظم الصفات تحت الدراسة. وتعتبرهذه النتائج هامه لمربي النبات عند التخطيط لبرنامج تربية فعال لتحسين المحصول ومكوناته .