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# EVALUATION OF NINE PARENTS USING TOP CROSS MATING DESIGN IN COTTON (*Gossypium barbadense* L.)

**M.M. El-Lawendey and A.A. El-Akhedar**

Cotton Research Institute, Agricultural Research Center, Giza, Egypt

## ABSTRACT

*The female lines (Giza 45, Giza 70, Giza 85, Giza 86 and Giza 89) and testers (Giza 75, Giza 88, Pima $S_6$ and Suvin were crossed). The 5 lines (females), 4 testers (males) and their 20 $F_1$'s crosses were evaluated. Significant general combining ability variance, which may approximate additive genetic effects, was detected for only yellowness degree (+b). Also, additive gene effects were found for lint percentage and 2.5% span length. Non-additive gene effect was more predominant than additive gene effect for lint yield/plant, bolls/plant, seeds/boll, and fiber properties except 2.5% span length. Giza 86, Giza 75 and Suvin proved to be excellent combiners toward improving yield and colour traits. The correlation coefficients (r) between the performance of the parents per se and their corresponding GCA effects were non-significant for bolls/plant, seed index, seeds/boll, uniformity ratio, Pressley index and reflectance percentage. Some crosses involved Giza 45 and/or Pima $S_6$ (G. 45 x G. 75, G. 45 x G. 88, G. 45 x Suvin, G. 45 x Pima $S_6$, G. 86 x Pima $S_6$ and G. 89 x Pima $S_6$) exhibited significant favorable SCA effects and useful heterosis for fiber properties.*

Key words: ***Top cross, Cotton, Gossypium barbadense, Heterosis, gene action, GCA, SCA, Correlation coefficients.***

## INTRODUCTION

The choice of parents seems to be one of the most crucial points in a hybridization programme. General combining ability of parents, specific combining ability of crosses, degree of dominance and useful heterosis are necessary to chose the genetic recombination's and desirable gene frequencies. Khan *et al* (1990) reported that the nature of the gene action for cotton yield and its components appeared to be over-dominant, whereas genes for lint percentage were cumulative in their effects showing non allelic interaction. Mane and Bhatade (1992) found that variances due to GCA and SCA were significant for yield and ginning outturn. El-Dahan *et al* (2004) reported that GCA variance was significant for halo length, uniformity ratio, halo strength and micronaire reading, while SCA variance was insignificant. Regarding heterosis, Tang *et al* (1993a, b) found that the parents *vs*. hybrids comparison as a test for average heterosis was significant for elongation, micronaire reading, 50 and 2.5% span length, and uniformity of length, but non-significant for strength. Mid parent heterosis of 8 to 24% has been reported in cotton for yield and components of yield in selected intraspecific crosses. The purpose of this study was to obtain information regarding, 1- general combining ability of parents (GCA) and specific combining ability of crosses (SCA), 2- correlation coefficients (r) between the performance of the parents per se and their corresponding GCA effects and 3-correlation between useful heterosis and SCA effect in choice crosses.

## MATERIALS AND METHODS

The mating design used for this experiment was line x tester analysis. In 2004 season, twenty crosses were made using nine *G. barbadense* L. parents. The five female parents (lines) were G. 45, G. 70, G. 85, G. 86 and G. 89. The four male parents (testers) were G. 75, G. 88, Pima $S_6$ and Suvin. Variety name, original source and pedigree of the parental genotypes are shown in Table (1).

**Table 1. The name, original source and pedigree of the parental genotypes used.**

| Name | Original source | Pedigree |
|---|---|---|
| Giza 45 | Egypt | Giza 28 x Giza 7 |
| Giza 70 | Egypt | Giza 59 A x Giza 51 B |
| Giza 85 | Egypt | Giza 67 x C.B. 58 |
| Giza 86 | Egypt | Giza 75 x Giza 81 |
| Giza 89 | Egypt | Giza 75 x 6022 |
| Giza 75 | Egypt | Giza 67 x Giza 69 |
| Giza 88 | Egypt | Giza 77 x Giza 45B |
| Pima $S_6$ | USA | - |
| Suvin | India | Sujata x Vincent |

The nine parents and their 20 $F_1$'s crosses were evaluated at Sakha Agricultural Research Station in randomized complete blocks design with three replicates in 2005 season. Plots consisted of one ridge, 4.5 meter in length and 65 cm in width. Seeds were sown in hills spaced 30 cm apart, and two plants were left per hill at thinning time. Data were recorded from 10 guarded hills (20 guarded plants). Agricultural practices used were as recommended by Cotton Research Institute for this region. The studied characters were: (1) Lint yield (g)/plant (Ly/P), (2) Lint percentage (L%), (3) Bolls/plant (B/P), (4) Seed index (g) (SI), (5) Lint (g)/boll (L/B), (6) Seeds/boll (S/B), (7) 2.5% Span length mm (2.5% SL), (8) Uniformity ratio (UR%), (9) Micronaire reading (MR), (10) Pressley index (PI), (11) Reflectance percentage (Rd%), (12) Yellowness degree (+b). The fiber properties were measured by HVI system at Cotton Research Institute in Giza.

Analysis of variance, partitioning of genotypes, line x tester analysis, estimation of general and specific combining ability, additive and dominance components were computed according to Singh and Chaudhary (1977).

Correlation coefficients were calculated as outlined by Steel and Torrie (1960).Useful heterosis ($F_1$-BP) was determined as the deviation of hybrid mean from its better parent (Steel and Torrie 1960).

## RESULTS AND DISCUSSION

The analysis of variance (Table 2) showed significant differences among genotypes, parents, crosses and lines x testers for all the studied characters. These results indicated, the presence of genetic variability among the studied material, which considered adequate for further biometrical assessment. Mean squares of parents *vs.* crosses as indication to average heterosis over all crosses were significant for all studied characters, except lint percentage, lint/boll and Pressley index. This result was relatively associated with SCA (Table 3) and useful heterosis (Table 6). Partitioning parents to lines and testers indicates that, the mean squares of lines were significant for lint percentage, 2.5% span length, micronaire reading and yellowness degree. Mean squares of testers were significant for lint percentage, lint/boll, 2.5% span length and yellowness degree, indicating the line and tester parents had different effects on the top crosses. Similar results were obtained by May *et al* (1995), El-Feki *et al* (1996), Van Esbroeck *et al* (1997) and El-Lawendey (1999).

**Table 2. Mean squares for yield, yield components and fiber properties resulting from parents and crosses.**

| S.O.V. | d.F | Ly/P | L% | B/P | SI | L/B | S/B |
|---|---|---|---|---|---|---|---|
| Replications | 2 | 2.89 | 0.64 | 3.71 | 0.21 | 0.005 | 0.90 |
| Genotypes | 28 | 32.13** | 7.40** | 17.56** | 1.94** | 0.040** | 8.11** |
| Parents (P) | 8 | 24.23** | 10.39** | 6.65** | 4.44** | 0.063** | 6.62** |
| Crosses (C) | 19 | 36.33** | 6.44** | 22.43** | 0.72** | 0.031** | 8.59** |
| P.*Vs*.C | 1 | 15.65** | 1.67 | 12.32** | 5.26** | 0.022 | 11.01* |
| Lines (L) | 4 | 27.36 | 11.51** | 11.39 | 0.27 | 0.029 | 3.49 |
| Testers (T) | 3 | 74.50 | 21.68** | 41.88 | 1.80 | 0.089* | 15.95 |
| L x T | 12 | 29.77** | 0.94* | 21.24** | 0.60* | 0.017* | 8.45** |
| Error | 56 | 1.68 | 0.46 | 1.30 | 0.31 | 0.007 | 1.72 |
| | | 2.5% SL | UR% | MR | PI | Rd% | + b |
| Replications | 2 | 0.25 | 2.26 | 0.007 | 0.010 | 0.34 | 0.01 |
| Genotypes | 28 | 7.42** | 10.17** | 0.600** | 1.137** | 8.78** | 2.07** |
| Parents (P) | 8 | 10.45** | 9.81** | 0.671** | 1.241** | 7.64** | 1.68** |
| Crosses (C) | 19 | 6.33** | 10.16** | 0.491** | 1.153** | 9.41** | 2.22** |
| P.*Vs*.C | 1 | 3.89** | 13.35** | 2.113** | 0.003 | 5.81** | 2.27** |
| Lines (L) | 4 | 13.98** | 1.53 | 1.515** | 0.930 | 10.91 | 2.85** |
| Testers (T) | 3 | 16.64** | 17.23 | 0.326 | 2.793 | 17.49 | 8.61** |
| L x T | 12 | 1.21** | 11.27** | 0.190** | 0.818** | 6.90** | 0.42** |
| Error | 56 | 0.44 | 1.27 | 0.023 | 0.215 | 0.52 | 0.05 |

*,** Significant at the 0.05 and 0.01 levels of probability, respectively.

Note: M.S. due to lines and testers are to be tested against the M.S. due to lines x testers. The latter is, in turn, tested against M.S. due to error.

Table 3. Combining ability variances and partitioning of the genetic variance into additive (A) and dominance (D).

| S.O.V. | Ly/P | L% | B/P | SI | L/B | S/B |
|---|---|---|---|---|---|---|
| GCA | 0.191 | 0.161 | 0.035 | 0.004 | 0.0001 | 0.004 |
| SCA | 9.366** | 0.159 | 6.647** | 0.096 | 0.003 | 2.243** |
| Additive | 0.382 | 0.322 | 0.070 | 0.008 | 0.0002 | 0.008 |
| Dominance | 9.366 | 0.159 | 6.647 | 0.096 | 0.003 | 2.243 |
| Error | 0.56 | 0.15 | 0.43 | 0.10 | 0.002 | 0.57 |
| $(D/A)^{1/2}$ | 4.95 | 0.70 | 9.74 | 3.46 | 3.87 | 16.74 |
| | 2.5% SL | UR% | MR | PI | Rd% | + b |
| GCA | 0.150 | -0.032 | 0.009 | 0.010 | 0.073 | 0.053* |
| SCA | 0.257 | 3.333** | 0.056** | 0.201** | 2.126** | 0.123** |
| Additive | 0.300 | -0.064 | 0.018 | 0.020 | 0.146 | 0.106 |
| Dominance | 0.257 | 3.333 | 0.056 | 0.201 | 2.126 | 0.123 |
| Error | 0.15 | 0.42 | 0.008 | 0.07 | 0.17 | 0.02 |
| $(D/A)^{1/2}$ | 0.93 | -7.22 | 1.76 | 3.17 | 3.82 | 1.08 |

*,** Significant at the 0.05 and 0.01 levels of probability, respectively.

Additive gene action was detected for yellowness, lint percentage, 2.5% span length (Table 3). On the other hand, non-additive gene action was more predominant than additive gene action for lint yield/plant, bolls/plant, seeds/boll, and fiber properties except 2.5% span length, indicating the importance of non-additive gene action, in the inheritance of these traits. Potence ratio values in (Table 3) indicated existence of over-dominance for all studied traits except lint percentage and 2.5% span length. These findings are in conformity with those obtained by El-Okkia *et al* (1989) and Awad (2001)

The *per-se* performance of the parents in their crosses showed relationship with their respective GCA effects in a majority of the cases (Tables 4 and 5).

GCA effects (Table 5) showed that, the best general combiners were G. 86, G. 75 and Suvin for lint yield/plant, G. 85, G. 86, G. 75 and G. 88 for lint percentage, G. 86 and Suvin for bolls/plant, Suvin for seed index, G. 75 for lint/boll, G. 45, G. 70, G. 88 and Pima $S_6$ for 2.5% SL, G. 88 for uniformity ratio, G. 45, G. 85 and Pima $S_6$ for micronaire reading, G. 86, G. 75 and G. 88 for Pressley index, G. 86 and G. 75 for reflectance percentage, G. 86, G. 89, G. 75 and Suvin for yellowness degree. These results indicated that, G. 86, G. 75 and Suvin proved to be excellent combiners in a breeding programme toward improving yield and colour traits.

**Table 4. Averages of parents in their crosses for the studied characters.**

| Characters / Estimate | Ly/P | L% | B/P | SI | L/B | S/B |
|---|---|---|---|---|---|---|
| 4-Crosses for G. 45 | 11.06 | 34.50 | 11.02 | 9.93 | 1.00 | 18.79 |
| 4-Crosses for G. 70 | 13.67 | 36.19 | 12.06 | 10.06 | 1.10 | 19.23 |
| 4-Crosses for G. 85 | 12.56 | 36.46 | 12.04 | 10.13 | 1.12 | 18.98 |
| 4-Crosses for G. 86 | 15.14** | 37.17 | 13.65* | 10.32 | 1.10 | 18.16 |
| 4-Crosses for G. 89 | 13.57 | 36.15 | 11.63 | 10.23 | 1.13 | 19.61 |
| 5-Crosses for G. 75 | 13.95 | 37.55* | 12.49 | 9.82 | 1.15 | 19.51 |
| 5-Crosses for G. 88 | 12.22 | 36.61 | 10.88 | 9.98 | 1.12 | 19.56 |
| 5-Crossesfor Pima $S_6$ | 10.73 | 35.17 | 10.68 | 10.11 | 0.98 | 17.41 |
| 5-Crosses for Suvin | 15.89** | 35.05 | 14.3** | 10.6* | 1.11 | 19.33 |
| 9- parents | 12.28 | 36.39 | 11.27 | 9.60 | 1.06 | 19.72 |
| L.S.D. (0.05) | 2.12 | 1.11 | 1.86 | 0.91 | 0.14 | 2.14 |
| L.S.D. (0.01) | 2.82 | 1.47 | 2.48 | 1.21 | 0.18 | 2.85 |
| | 2.5% SL | UR% | MR# | PI | Rd% | + b |
| 4-Crosses for G. 45 | 34.43** | 84.73 | 3.35 | 9.48 | 70.99 | 10.33 |
| 4-Crosses for G. 70 | 33.55* | 84.56 | 3.86 | 9.58 | 71.26 | 10.39 |
| 4-Crosses for G. 85 | 32.38 | 85.37 | 3.60 | 9.83 | 71.77 | 9.97 |
| 4-Crosses for G. 86 | 31.66 | 85.07 | 4.26 | 10.20 | 73.16** | 9.64** |
| 4-Crosses for G. 89 | 32.59 | 84.54 | 4.03 | 9.78 | 70.77 | 9.23** |
| 5-Crosses for G. 75 | 31.76 | 84.78 | 4.02 | 10.09 | 72.94** | 9.64** |
| 5-Crosses for G. 88 | 33.58* | 85.99 | 3.81 | 10.03 | 70.38 | 10.98 |
| 5-Crossesfor Pima $S_6$ | 34.01** | 85.21 | 3.67 | 9.83 | 71.20 | 9.81* |
| 5-Crosses for Suvin | 32.33 | 83.43 | 3.78 | 9.15 | 71.83 | 9.21** |
| 9- parents | 32.46 | 85.70 | 3.48 | 9.79 | 71.03 | 10.26 |
| L.S.D. (0.05) | 1.08 | 1.84 | 0.25 | 0.76 | 1.18 | 0.37 |
| L.S.D. (0.01) | 1.44 | 2.45 | 0.33 | 1.01 | 1.57 | 0.49 |

**# Low values are desirable**

***, ** Significant at the 0.05 and 0.01 levels of probability were of the desirable difference among the crosses mean and parents mean**

**Table 5. Estimates of general combining ability effects for nine cotton parents.**

| Parents | Ly/P | L% | B/P | SI | L/B | S/B |
|---|---|---|---|---|---|---|
| Giza 45 | -2.14** | -1.6** | -1.06** | -0.2 | -0.09** | -0.2 |
| Giza 70 | 0.47 | 0.1 | -0.02 | -0.1 | 0.01 | 0.3 |
| Giza 85 | -0.64 | 0.4* | -0.04 | 0.0 | 0.03 | 0.0 |
| Giza 86 | 1.94** | 1.1** | 1.57** | 0.2 | 0.01 | -0.8* |
| Giza 89 | 0.37 | 0.1 | -0.45 | 0.1 | 0.04 | 0.7 |
| Giza 75 | 0.76* | 1.5** | 0..41 | -0.3* | 0.06** | 0.6 |
| Giza 88 | -0.98** | 0.5** | -1.20** | -0.2 | 0.03 | 0.6 |
| Pima $S_6$ | -2.47** | -0.9** | -1.40** | 0.0 | -0.11** | -1.5** |
| Suvin | 2.70** | -1.0** | 2.19** | 0.5** | 0.02 | 0.4 |
| SE (lines) | 0.37 | 0.20 | 0.33 | 0.16 | 0.024 | 0.38 |
| SE (testers) | 0.33 | 0.18 | 0.29 | 0.14 | 0.022 | 0.34 |
| (r) | 0.71* | 0.78* | 0.47 | -0.16 | 0.68* | 0.07 |
| | 2.5% SL | UR% | MR | PI | Rd% | + b |
| Giza 45 | 1.51** | -0.12 | -0.47** | -0.30* | -0.60** | 0.42** |
| Giza 70 | 0.63** | -0.30 | 0.04 | -0.19 | -0.33 | 0.48** |
| Giza 85 | -0.55** | 0.51 | -0.22** | 0.05 | 0.18 | 0.06 |
| Giza 86 | -1.26** | 0.21 | 0.44** | 0.43** | 1.57** | -0.27** |
| Giza 89 | -0.33 | -0.31 | 0.21** | 0.01 | -0.82** | -0.69** |
| Giza 75 | -1.16** | -0.07 | 0.20** | 0.31* | 1.35** | -0.27** |
| Giza 88 | 0.66** | 1.14** | -0.01 | 0.25* | -1.21** | 1.07** |
| Pima $S_6$ | 1.09** | 0.35 | -0.15** | 0.06 | -0.39* | -0.10 |
| Suvin | -0.59** | -1.42** | -0.04 | -0.63** | 0.25 | -0..70** |
| SE (lines) | 0.19 | 0.33 | 0.044 | 0.13 | 0.21 | 0.065 |
| SE (testers) | 0.17 | 0.29 | 0.039 | 0.12 | 0.19 | 0.058 |
| (r) | 0.72* | -0.36 | 0.77* | 0.29 | 0.52 | 0.80* |

*** and ** $P < 0.05$ and 0.01, respectively.**

**(r) = The correlation coefficients of GCA effects with their corresponding parental mean performance.**

The correlation coefficients (r) between the performance of the parents per se and their corresponding GCA effects for bolls/plant, seed index, seeds/boll, uniformity ratio, Pressley index and reflectance percentage were insignificant (Table 5). This indicates that the breeder can not depend on parents performance as an indication of their GCA effects and can not depend on this performance in the direction of his crosses in a breeding program, these were due to the importance of non-additive gene action, in the inheritance of these traits. Similar conclusion was found by Sorour *et al* (2006)

Concerning useful heterosis and specific combining ability effects (favorable) (Tables 6 and 7), three crosses (G. 45 x Pima $S_6$, G. 70 x G. 75 and G. 89 x Suvin) exhibited significant positive SCA effects and useful heterosis when compared with the better parent for lint yield/plant and bolls/plant, while G. 86 x Suvin showed significant positive SCA effect and useful heterosis for bolls/plant only. G. 85 x G. 75 manifested positive SCA effect and useful heterotic (22.0%) effect over the better parent for seeds/boll. The improvement in fiber properties may be achieved by crosses G. 45 x G. 88, G. 89 x Pima $S_6$ and G. 89 x Suvin for 2.5% SL, G. 45 x Pima $S_6$ for uniformity ratio, G. 89 x Pima $S_6$ for Pressley index, G. 45 x Suvin, G. 85 x G. 75 and G. 86 x Pima $S_6$ for reflectance percentage, G. 45 x G. 75, G. 70 x Suvin and G. 86 x Pima $S_6$ for yellowness degree. These crosses exhibited significant favorable SCA effects and useful heterosis over the better parent. These results indicated that, recurrent selection could be successful in improving these traits

The correlation coefficient (r) between the performance of the crosses per se and their corresponding SCA effects were significant for all studied traits, except lint percentage, 2.5% span length and yellowness degree (Table 7).This indicates that the breeder can depend on crosses performance as an indication of SCA effects and useful heterosis, these were due to the importance of non-additive gene action, in the inheritance of these traits.

Finally it may be recommended that parental genotypes: G. 86, G. 75 and Suvin may be excellent combiners in a breeding programme toward improving yield and colour traits. The crosses involved G. 45 and/or Pima $S_6$ may improve fiber properties. The best crosses which exhibited high useful heterosis and SCA effects were G. 89 x Suvin for lint yield/plant, bolls/plant and 2.5% span length, G. 45 x Suvin and G. 86 x Pima $S_6$ for colour traits.

**Table 6. Useful heterosis for the twelve studied characters.**

| Crosses | Ly/P | L% | B/P | SI | L/B | S/B | 2.5% SL | UR% | MR# | PI | Rd% | + b# |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| G. 45 x G. 75 | -47.9** | -1.7 | -33.6** | -21.8** | -19.7** | -17.0** | -3.5* | 0.4 | 10.3* | -1.0 | -1.5 | -5.8** |
| G. 45 x G. 88 | -14.2 | -8.2** | 5.6 | 5.2 | -13.0* | -4.2 | 3.7* | -1.4 | 31.0** | -1.9 | 1.0 | 10.5** |
| G. 45 x Pima $S_6$ | 28.0* | -1.2 | 25.3** | 25.3** | 3.3 | -21.2** | 1.2 | 2.8* | 13.8** | -9.8* | -2.8** | 2.9 |
| G. 45 x Suvin | -5.4 | -8.5** | -4.2 | -4.1 | -3.7 | -2.8 | -4.3** | -9.8** | 10.3* | -17.6** | 4.4** | -6.9** |
| G. 70 x G. 75 | 26.4** | 0.4 | 27.6** | -21.0** | 0.0 | 0.5 | -4.9** | -2.3* | 13.9** | -3.8 | 0.0 | -1.9 |
| G. 70 x G. 88 | -28.4** | -0.6 | -12.7 | 0.0 | -14.6** | -12.3* | -3.8* | -1.1 | [illegible] | -14.2** | -1.7* | 8.6** |
| G. 70 x Pima $S_6$ | -19.3* | -5.9** | -11.8 | 6.5 | -11.9 | -13.9** | -0.6 | 1.1 | 27.6** | -8.5* | -0.1 | 6.9** |
| G. 70 x Suvin | 10.0 | -5.0** | -0.8 | 12.2* | 7.3 | -4.8 | -2.9 | -8.2** | 11.1** | -11.3** | -1.7* | -10.8** |
| G. 85 x G. 75 | -11.7 | 3.7* | -3.0 | -25.0** | 3.3 | 22.0** | -4.9** | -2.3* | 12.1** | 5.0 | 2.6** | -1.0 |
| G. 85 x G. 88 | -12.8 | -1.6 | 10.3 | 3.1 | -5.7 | -4.7 | -2.0 | 0.5 | 6.3 | -2.9 | 0.0 | 10.2** |
| G. 85 x Pima $S_6$ | -20.4 | -4.0** | -10.4 | 8.4 | -6.4 | -29.3** | 1.2 | -3.3** | 20.7** | 0.0 | -4.7** | 1.0 |
| G. 85 x Suvin | 17.7* | -4.1** | 15.8* | 12.2* | 9.3 | -1.5 | 1.0 | -4.8** | [illegible] | 0.0 | -1.9* | -3.1 |
| G. 86 x G. 75 | 0.6 | -2.1 | 13.4 | -17.7** | -12.3* | -13.5* | -6.2** | 0.4 | 32.1** | 0.0 | 2.2** | -6.9** |
| G. 86 x G. 88 | -23.0** | -5.0** | -11.3 | -2.0 | -7.3 | -9.0 | -6.7** | -3.9** | 31.3** | 1.0 | -1.7* | 4.9** |
| G. 86 x Pima $S_6$ | -13.2 | -8.2** | -4.3 | 1.0 | -11.6* | -12.0* | -0.6 | 0.1 | 34.5** | 2.0 | 3.2** | -11.8** |
| G. 86 x Suvin | 27.0** | -10.2** | 50.8** | 8.9 | -6.6 | -6.1 | -1.9 | -3.4** | 13.9** | -4.9 | 3.6** | -7.8** |
| G. 89 x G. 75 | -39.3** | -1.4 | -38.8** | -19.4** | -0.8 | 4.0 | -4.3* | 1.5 | 4.9 | -5.9 | 0.4 | 2.2 |
| G. 89 x G. 88 | 5.7 | 0.0 | -14.2* | 5.2 | -4.1 | -6.6 | -5.2** | -1.5 | 25.0** | -3.8 | -4.3** | 18.0** |
| G. 89 x Pima $S_6$ | -13.1 | -0.3 | -19.4** | 8.8 | 6.1 | -6.7 | 3.3* | -2.7* | 37.9** | 12.8** | -1.0 | -1.1 |
| G. 89 x Suvin | 40.0** | -2.6 | 19.4** | 9.2 | 0.0 | -8.5 | 6.9** | -7.2** | [illegible] | -4.3 | -2.9** | -3.4 |
| L.S.D. (0.05) | 2.12 | 1.11 | 1.86 | 0.91 | 0.14 | 2.14 | 1.08 | 1.84 | 0.25 | 0.76 | 1.18 | 0.37 |
| L.S.D. (0.01) | 2.82 | 1.47 | 2.48 | 1.21 | 0.18 | 2.85 | 1.44 | 2.45 | 0.33 | 1.01 | 1.57 | 0.49 |

*, ** Significant at the 0.05 and 0.01 levels of probability, respectively.

# Low value desirable and therefore low parent value used.

Table 7. Specific combining ability effects for twenty cross combinations.

| Crosses | Ly/P | L% | B/P | SI | L/B | S/B | 2.5% SL | UR% | MR | PI | Rd% | +b |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| G. 45 x G. 75 | -3.31** | 0.51 | -2.49** | 0.12 | -0.08 | -1.75* | 0.20 | 0.01 | -0.35** | 0.28 | -1.08* | -0.29* |
| G. 45 x G. 88 | 1.99* | -0.79* | 1.45* | 0.39 | 0.04 | 0.87 | 0.88* | 0.19 | 0.43** | 0.54* | -0.22 | 0.17 |
| G. 45 x Pima $S_6$ | 2.75** | 0.33 | 2.75** | 0.47 | 0.04 | -0.55 | -0.42 | 2.51** | 0.07 | -0.34 | -0.84* | 0.24 |
| G. 45 x Suvin | -1.42 | -0.05 | -1.71* | -0.98** | 0.001 | 1.43 | -0.67 | -2.71** | -0.15 | -0.48 | 2.13** | -0.12 |
| G. 70 x G. 75 | 6.21** | -0.28 | 4.64** | 0.09 | 0.06 | 1.06 | 0.48 | -1.02 | 0.01 | 0.27 | -0.24 | 0.05 |
| G. 70 x G. 88 | -2.59** | 0.35 | -1.26 | -0.24 | -0.08 | -1.37 | -0.91* | 0.60 | -0.15 | -0.77** | 0.42 | -0.06 |
| G. 70 x Pima $S_6$ | -1.60* | -0.27 | -0.99 | -0.27 | -0.03 | 0.22 | -0.21 | 1.46* | -0.04 | 0.06 | 0.83 | 0.61** |
| G. 70 x Suvin | -2.03** | 0.19 | -2.39** | 0.42 | 0.05 | 0.09 | 0.64 | -1.04 | 0.18* | 0.44 | -1.00* | -0.59** |
| G. 85 x G. 75 | 1.09 | 0.56 | 0.52 | -0.52 | 0.08 | 2.10** | -0.32 | -0.53 | -0.10 | 0.43 | 1.25** | 0.00 |
| G. 85 x G. 88 | 0.75 | -0.25 | 0.96 | -0.01 | 0.01 | 0.54 | 0.77* | 1.19 | -0.19* | 0.09 | 1.94** | -0.24 |
| G. 85 x Pima $S_6$ | -1.85* | -0.20 | -1.14 | 0.16 | -0.12* | -2.71** | 0.03 | -1.82** | 0.05 | -0.59* | -2.31** | 0.03 |
| G. 85 x Suvin | 0.01 | -0.11 | -0.34 | 0.38 | 0.03 | 0.07 | -0.48 | 1.15 | 0.24** | 0.07 | -0.88* | 0.20 |
| G. 86 x G. 75 | 0.47 | 0.25 | 1.18 | 0.19 | -0.09 | -2.11** | 0.00 | -0.29 | 0.41** | -0.35 | -0.51 | 0.13 |
| G. 86 x G. 88 | -2.43** | 0.05 | -2.22** | -0.30 | 0.01 | 0.43 | -0.15 | -2.31** | -0.05 | 0.11 | -1.58** | -0.05 |
| G. 86 x Pima $S_6$ | 0.50 | 0.19 | -1.22 | -0.09 | 0.08 | 1.68* | 0.12 | -0.12 | -0.21* | 0.11 | 1.33** | -0.55** |
| G. 86 x Suvin | 1.46 | -0.49 | 2.26** | 0.19 | 0.001 | 0.00 | 0.04 | 2.72** | -0.15 | 0.13 | 0.76 | 0.46** |
| G. 89 x G. 75 | -4.46** | -1.04** | -3.84** | 0.12 | 0.02 | 0.70 | -0.37 | 1.83** | 0.04 | -0.63* | 0.58 | 0.11 |
| G. 89 x G. 88 | 2.28** | 0.63 | 1.07 | 0.16 | 0.03 | -0.48 | -0.59 | 0.32 | -0.05 | 0.03 | -0.56 | 0.17 |
| G. 89 x Pima $S_6$ | 0.21 | -0.06 | 0.60 | -0.27 | 0.03 | 1.37 | 0.48 | -2.03** | 0.13 | 0.76** | 0.99* | -0.33* |
| G. 89 x Suvin | 1.97* | 0.46 | 2.17** | -0.01 | -0.08 | -1.59* | 0.47 | -0.12 | -0.12 | -0.16 | -1.01* | 0.95 |
| SE | 0.75 | 0.39 | 0.66 | 0.32 | 0.05 | 0.76 | 0.38 | 0.65 | 0.09 | 0.27 | 0.42 | 0.13 |
| (r) | 0.72** | 0.31 | 0.77** | 0.73** | 0.59** | 0.79** | 0.35 | 0.84** | 0.50* | 0.66** | 0.68** | 0.35 |

*, ** significant at the 0.05 and 0.01 levels of probability, respectively.

(r) = The correlation coefficient of SCA effects with their corresponding crosses mean performance.

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# تقييم تسعة آباء باستخدام التهجين القمى فى القطن الباربادنس

**محمد محمد احمد اللاوندى ــ عادل عبدالعظيم ابواليزيد الأخضر**

معهد بحوث القطن ــ مركز البحوث الزراعية

*يهدف هذا البحث إلى دراسة:*

*١- تباينات القدرة على الإئتلاف ، أفضل الأباء ذات التأثيرات المرغوبة لقدرة العامة على الإئتلاف وأفضل الهجن ذات التأثيرات المرغوبة للقدرة الخاصة على الإئتلاف وقوة الهجين مقارنة بالأب الأفضل.*

*٢- معاملات الارتباط ، بين كل من تأثيرات القدرة العامة على الإئتلاف مع متوسطات الأباء وبين كل من تأثيرات القدرة الخاصة على الإئتلاف مع متوسطات الهجن.*

*ولتحقيق هذه الأهداف تم تهجين خمسة أصناف (كأمهات) وهى جيزه ٤٥ ، جيزه ٧٠ ، جيزه ٨٥ ، جيزه ٨٦ ، جيزه ٨٩ مع أربع كشافات (كأباء) وهى جيزه ٧٥ ، جيزه ٨٨ ، بيماس، وسوفين وذلك فى موسم ٢٠٠٤م. وتم تقييم التسعة اباء والعشرون هجين فى موسم ٢٠٠٥م فى محطة البحوث الزراعية بسخا فى تصميم قطاعات كاملة العشوائية ذات ثلاث مكررات. وكانت الصفات المدروسة هى محصول القطن الشعر/نبات (جم) ، معدل الحليج (%) ، عدد اللوز/نبات ، معامل البذرة (جم) ، وزن الشعر/لوزة (جم) ، عدد البذور/لوزة ، الطول عند ٢,٥ %(مم) ، الانتظام (%) ، قراءة الميكرونير ، معامل البريسلى ، نسبة الإنعكاس (Rd%) ودرجة الإصفرار (+b).*

*ويمكن تلخيص أهم النتائج المتحصل عليها كما يلى:*

*١- كانت التباينات الوراثية الراجعة للقدرة العامة على الإئتلاف معنوية فقط لدرجة الإصفرار (+b) ولكن التأثيرات الإضافية كانت أيضا ذات أهمية كبيرة لصفتى معدل الحليج والطول عند ٢,٥ %.*

*٢- كانت التأثيرات الراجعة للفعل الجينى غير المضيف (Non-additive) ذات أهمية أكبر من الفعل الجينى المضيف (Additive) فى وراثة صفات محصول القطن الشعر/نبات ، عدد اللوز/نبات ، عدد البذور/لوزة ، وصفات التيلة ماعدا صفة الطول عند ٢,٥ %.*

*٣- كانت معاملات الارتباط بين كل من تأثيرات القدرة العامة على الإئتلاف ومتوسطات الأباء غير معنوية لعدد اللوز/نبات ، معامل البذرة ، عدد البذور/لوزة ، الانتظام (%) ، معامل البريسلى و نسبة الإنعكاس (%) مما يدل على أن الفعل الجينى غير المضيف هو المتحكم فى وراثة هذه الصفات.*

٤-كانت الأصناف جيزه ٨٦ ، جيزه ٧٥ والسوفين ذات تأثيرات مرغوبة للقدرة العامة على الإئتلاف، ويمكن استخدامها فى برامج التربية لتحسين المحصول وصفات اللون (Rd%, +b).

٥-كانت الهجن المتضمنة جيزه ٤٥ و/أو بيماس، (جيزه ٤٥ × جيزه ٧٥ ، جيزه ٤٥ × جيزه ٨٨ ، جيزه ٤٥ × سوفين ، جيزه ٤٥ × بيماس، ، جيزه ٨٦ × بيماس، ، وجيزه ٨٩ × بيماس،) ذات أفضل تاثير مرغوب للقدرة الخاصة على الإئتلاف وأفضل قوة هجين مقارنة بالأب الأفضل. ويمكن استخدامها لتحسين صفات التيلة.