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SUMMARY

The stated objectives of this study was to evaluate stability of GCA and SCA under three different environments for several agronomic and fiber properties for five cotton varieties.

A half-diallel genetic design of five parents, their 10 F_1 hybrids and 10 F_2 populations were used. Parents are the five commercial varieties of Dandara (P_1), Giza 85(P_2), Giza 90 (P_3), Giza 83 (P_4) and Giza 91 (P_5). Chosen parents, the range of variability exiting in Egyptian cottons for most studied traits. Crossing parental materials inters by the diallel system was initiated at Sids Agricultural Experimental station ,ARC to generate F_1's and their corresponding F_2's in 2004 and 2005 seasons. In 2006, the five varieties and their derived crosses were evaluated under the three different locations of Sids (Beni-suef governorate), Tella (Minia governorate) and Dar El-salaam (Sohag governorate). The experimental layout was a Randomized Complete Blocks Design with three replications. Characters evaluated for GCA and SCA were:

1- Seed cotton yield/plant (g)

2- Lint yield /plant (g)

3- Number of bolls/plant.

4- Boll weight (g)

5- Lint percentage %

6- Seed index (g)

7- Lint index (g)

8- Fiber fineness in micronaire reading.

9- Fiber strength in Pressely index.

10- Fiber length "2.5% span length".

11- Uniformity ratio.

12- Mean length "50% span length".

Data obtained was statistically analyzed on plot mean basis. The ordinary analysis of variance was firstly performed on each experiment. Combined analysis was carried out afterwards. Separate and combined by locations genetic analysis to obtain GCA and SCA were conducted by using (**Griffing 1956** and **Singh 1973 a** and **b**) in diallel cross analysis designated a model I method II. Mid- and better- parent heterosis were computed. Also, values of inbreeding depression and phenotypic correlation were given.

The interaction between parents and locations (P x L) were highly significant for all agronomic traits in both generations except for seed cotton yield/plant and seed index only in F_2 generation, while insignificant for all fiber properties in both generations.

General combining ability mean squares were highly significant for all studied traits at the three locations in F_1 and F_2 generations except for boll weight and pressley index in both generations mean squares of specific combining ability were highly significant for all studied characters in both generations except for seed index in F_2 generation only.

The variances due to interaction GCA x locations were highly significant for all agronomic traits in both generations except for seed index in F_2 generation only, while GCA x locations interaction mean squares were insignificant for all fiber attributes under study except for uniformity ratio in F_2 generation.

Mean squares of SCA x locations interaction were significant or highly significant for all studied traits in both generations except for 50% span length and except for Micronaire reading, pressley index and 2.5% SL in only F_2 generation.

GCA/SCA ratio of variance components indicated that the additive genetic variance was greater importance for SL, LI, MIC and UR % in both generations and for B/P, SCY/P, L%, 2.5% SL and 50% SL in only F_2 generation. While, GCA/SCA ratios for the remaining trait in both generations were less than unity, indicating that non-additive genetic variance was more important than additive one in the inheritance of these traits.

With respect to GCA effects, it could be conclude that the parental genotype Giza 83 (P_4) was considered as the best general combiner for boll weight, (P_4) and Giza91 (P_5) for B/P, SCY/P and LCY/P, Dandara (P_1), (P_4) and (P_5) for L %, (P_1) for SI, (P_1) and (P_5) for LI, (P_1), Giza85 (P_2) and Giza90 (P_3) for fiber fineness (finer) and fiber strength, (P_5) for fiber length parameters.

The promising F_1's combinations showed the best favorable SCA effects at the three locations were (P_1xP_4), (P_2xP_3) and (P_3xP_5) for boll weight, (P_1xP_2), (P_1xP_3), (P_2xP_4), (P_2xP_5) and (P_3xP_4) for bolls/plant, (P_1xP_2), (P_1xP_3), (P_1xP_4), (P_2xP_4), (P_2xP_5), (P_3xP_4), (P_3xP_5) and (P_4xP_5), for seed cotton and lint yields/plant, therefore, it could be used these crosses in breeding programs to improve yielding ability for Egyptian cotton. Also, best favorable SCA effects were found by the crosses (P_1xP_2) , (P_1xP_5), (P_2xP_4), (P_2xP_5), (P_3xP_4), (P_3xP_5) and (P_4xP_5) for lint percentage, (P_2xP_3) for seed index, (P_2xP_4), (P_2xP_5) and (P_3xP_5) for lint index, (P_2xP_5) and (P_3xP_4) for fiber strength, (P_1xP_2), (P_2xP_4) and (P_3xP_5) for 2.5 %SL, (P_1xP_2), (P_1xP_4) and (P_3xP_4) for uniformity ratio and (P_1xP_2), (P_3xP_4) and (P_3xP_5) for 50% SL.

Heterosis over mid-parents (MP) and better parent were significant with a pronounced magnitude at different locations and their combined analysis for most of studied characters in this study. However, the promising crosses showed the highest values of Heterosis relative to MP over the three location were (P_3xP_5) for boll weight (16.53), (P_2xP_4) for bolls/plant (24.14), (P_1xP_2) for seed cotton yield/plant (30.16), (P_2xP_4) for lint yield/plant (37.26), (P_2xP_3) for lint % (3.09), (P_2xP_4) for seed index (11.29), (P_2xP_4) for lint index (22.29), (P_2xP_5) for fiber maturity, (6.75), (P_3xP_4) for fiber strength (5.03), (P_2xP_4) for 2.5 % SL (6.94), (P_1xP_2) for uniformity ratio and (P_2xP_4) for 50 % SL (8.17). On the other hand, the promising crosses which exhibited the highest values of Heterosis relative to their B.P at the three locations were (P_3xP_5) for boll weight (13.31), (P_2xP_4) for bolls/plant (14.61), (P_1xP_2) for both seed cotton (28.77) and lint (32.26) yields/plant, (P_2xP_4) also for both seed (8.90) and lint (17.97) indices, (P_2xP_5) for fiber maturity (16.39), (P_3xP_4) for fiber strength (3.91), (P_2xP_4) for 2.5% SL (6.13), (P_1xP_2)for uniformity ratio (1.92) and (P_2xP_4) for 50% SL (6.82), indicating that hybridization would improve cotton production and fiber quality.

Inbreeding depression values from combined data over the three locations were significant positive for bolls/plant, seed cotton yield/plant, lint yield/plant and seed index in most crosses under study and for lint index, pressley index, and fiber length parameters in some crosses, while it was negative and significant for fiber fineness in one cross (P_1xP_5). However, inbreeding depression values were insignificant for boll weight and lint percentage.