Enviromental effects on general and specific combining ability in egyptian cotton

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SUMMARY AND CONCLUSIONThe stated objectives of this study was to evaluate stability of gca andsea under three different environments for several agronomic and fiberproperties for six cotton varieties.A half-diallel genetic design of six parents, their 15 F1 hybrids and 15F2 populations were used. Parents are the commercial varieties of Giza 77(PI), Giza 81 (P4) and Dendera (P6), and the other, are the three promisingvarieties; Giza 84 (P2), Giza 85 (P3) and Giza 83 x (Giza 72 x Delcero)(Pe). Chosen parents, represent the range of variability existing inEgyptian cottons for most studied traits. Crossing parental materials intersby the diallel system was initiated at EI-Giza Agricultural Researchcenter, to generate Fl' S and their corresponding F2' S in 1992 and 1993seasons. In 1994, the six varieties and their derived crosses were grown inthe three different locations of Sacolta (Sohag governorate), Kenayate(Sharkiea governorate) and Sakha (kafr El-Shiekh governorate). Theexperimental layout was a randomized complete blocks design with threereplications. Characters evaluated for gca and sea were :-1- Seed cotton yield / plant. (g)2- Lint yield / plant (g)3- Number of bolls / plant.4- Boll weight. (g)5- Lint percentage. 0/06- Seed index (g)7- Lint index (g)8- Fiber fmeness in micronaire reading.9- Fiber strength in Pressely index.10- Fiber length "2.5 % span length". (mm)11- Mean length "50 % span length" (mm)12- Uniformity ratio.Data obtained was statistically analyzed on plot mean basis. Theordinary analysis of variance was firstly performed on leachexperiment.Combined analyses were carried out afterwards. Separate and combinedby locations genetic analyses to obtain gca and sea were conducted byusing (Griffing 1956, Singh 1973 a and b) in diallel cross analysesdesignated as model I method II. Mid- and better-parent heterosis werecomputed. Also, values of inbreeding depression and phenotypiccorrelation were given.Combined three locations analysis of parents, their FI' S and F2' srevealed highly significant differences among genotypes for all traitsexcept for uniformity ratio.Seed cotton yield / plant, lint yield / plant, number of bolls / plant andboll weight are the most affected characters by the genotype x locationinteraction than the other characters.Parent showed substantial differential response to the environmentalchanges for seed cotton yield / plant, number of bolls / plant, lintpercentage and Pressley index.F1' s and F2' S combinations showed substantial differential response forseed cotton yield, lint yield, number of bolls / plant, boll weight and lintindex.The level of heterosis was quite different from location to location. Themost drastic differences were those pertaining to seed cotton yield / plant,lint yield / plant, number of bolls / plant and lint percentage.Estimates of mid-parent heterosis over locations were observed forseed cotton yield / plant, lint yield / plant, number of bolls / plant, bollweight, lint percentage, lint index and 2.5 % span length. However, highlysignificant estimates of better-parent heterosis over locations were evidentfor seed cotton yield / plant (18.0 0/0), lint yield / plant (17.8 0/0) andnumber of bolls / plant (13.0 0/0).A considerable number of hybrids manifested significant positiveheterosis for seed cotton yield, lint yield, number of bolls / plant, bollweight and 2.5 % span length. Hybrids showing heterosis for the othertraits were less frequent.Mean inbreeding depression effects was small and insignificant for alltraits. Also, mean F2 deviations was small and non-significant for allcharacters which suggested that epistatic effects were not operative.Highly significant estimates of gca mean squares were calculated forall traits. Sea mean squares were detected only, for agronomic characters.Significant differences in gca and sea effects between locations formost traits suggested

that a range of environments (multi-locationexperiments) is needed to better evaluate hybrid combinations.Gca / Sea ratio of variance components indicated that additive geneticvariance was less in importance for seed cotton yield / plant, lint yield /plant, number of bolls / plant, weight per boll and seed index and ofgreater importance for lint percentage, lint index and fiber properties.Nevertheless, non-additive vanance was more important for yield andmost of the associated characters.The size of gca effects corresponded closely with the rank of parentalmeans for all traits except boll weight (P4) is the best combiner for seedcotton yield, lint yield, number of bolls / plant, lint percentage and lintindex. (P5) is good to improve number of bolls per plant and lintpercentage. (Pi) had high estimates of gca effects for Pressley index,2.5 % and 50 % span length, while (P2) is valuable parent for micronairereading (fmer).Moderate levels of heterosis and sea effects were observed in certaincrosses, for high cotton yield (P4 x P5) and (P3 x P6) had the best scaeffects and highly significant positive heterosis for seed cotton yield /plant, lint yield / plant and number of bolls / plant. (P3 x P5) gave highlysignificant and positive sea effects as well as heterosis for number of bolls/ plant. (P, x P2) could be used in breeding programs to improve fiberlength characters.