Kafrelsheikh University
Faculty of Agriculture
Agronomy Department

USING BIPARENTAL MATING SYSTEM FOR ENCOURAGING DESIRABLE RECOMBINATION IN COTTON

By

YASER MOHAMED ATYAFARAG

B. Sc. Agric .Cooperation. Sciences,1999

THESIS

Submitted in Partial Fulfillment of the Requirements for the Degree of MASTER

In

AGRICULTURAL SCIENCE
(AGRONOMY)

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Cotton Research Institute, Shakha, Agriculture Research Center

Date:26/7/2017(Committee in Charge)

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5. SUMMERY

The present study was done in the Agronomy Department, Faculty of Agriculture, Kafrelsheikh University investigation was carried out at Sakha Agric. Res. Stat. Kafrelsheikh, Agric. Res. Center, Egypt, during during 2013 to 2016 growing seasons. Parents were crossed to produce the followings two crosses:-

1- (Giza 94 ×Giza 45).

2- (Giza 70 × TNB1).

Biparental populations BIP derived from inter population mating in F_2 generation which evaluated with the F_3families selfed families. Two individual field trials were conducted to evaluate the biparental progenies and F_3 families with their original parents for the two crosses, in a randomized complete block design experiment with three replications.

The studied traits were:-

1. Growth habits and earliness characters:-

1.1. Days to first flower. (DFF, days)

1.2. Boll maturation period. (BMP, days)

1.3. Earline index. (EI, %)

2. Yield and yield component characters:-

2.1. Boll weight (BW, g).

2.2. Seed cotton yield / plant (SCY/P)

2.3. Lint yield / plant (LY/ P)

2.4. Lint percentage (LP %)

2.5 Seed index (SI)

2.6. Lint index (LI)

3. Fiber quality characters:-

3.1. Fiber Length (FL, mm)

3.2. Uniformity Ratio (UR %)

3.3. Fiber Strength as perisly index (FS)

3.4. Fiber fineness as Micronaire reading (MIC)

The important results could be summarized follows:

1. The results for cotton cross I (Giza 94 x Giza 45) exhibited a number of superior BIP genotypes compared with better parents (Giza 94) were 2, 10, 8, 3, 24, 1, and 2 for boll maturation period (BMP), seed cotton yield (SCY / P), lint yield (LY/ P), Fiber Length (FL), Uniformity Ratio (UR%), Fiber Strength (FS), and Micronaire reading values, respectively. On the other hand families the superior in F3 families were 2, 13, 24 and 5 for boll weight (BW), Fiber Length (FL), Uniformity Ratio (UR) and Micronaire Reading (Mic.), respectively.

2. The results for cotton cross II (Giza 70 x TNB1) exhibited that a number of BIP genotypes were superior compared with better parents (Giza 70) in mean performance. The biparental progenies 25, 12, 6, 12, 22, 11, 19, 14, 14 and 20, were superior for boll maturation period (BMP), earliness indexes (EI), seed cotton yield (SCY / P), lint yield (LY/ P), lint

percentage (LP), lint index (LI), fiber length (FL), uniformity (UN%), fiber strength (FS), and micronaire reading values respectively. While, among their correspondent F_3 families the number of superior families were 30, 10, 12, 28, 8, 25, 18, 12, 14 and 18 for boll maturation period (BMP), seed cotton yield (SCY/ P), lint yield (LY/ P/ P), lint percentage (LP), seed index (SI), lint index (LI), fiber length (FL), uniformity ratio (UR%), fiber strength (FS), and micron ire, respectively. The Results exhibited that number of superior biparental progenies were higher than F_3 families in cotton cross I for most studied traits. Therefore, the intermating among F_2 progenies was more efficient to improve cotton through selection compared with F_3 selfed. thus efficiency of biparental to breakage of undesirable linkage by forced recombination induced by biparental mating, thereby offers a great scope of selecting new recombinants for both yield and fiber properties in intermated progenies and could be used in cotton breeding program. For intermating BIP in cotton cross I (Giza 94 x Giza 45) families ranged from 43,17 to 47, 50 and 48.6 to 51.6 for boll maturation period, while in F_3 families ranged from 44.50 to 46.43 and 50.10 to 52.4 in cotton cross II(Giza 70 x TNB1). While for earliness index it ranged from 47.43 to 66.10 for BIP and 33.20 to 62.40 F_3 families in cotton cross I and 63.03 to 72.01 in BIP and 38.70 to 57.40 for F_3 families in cotton cross II,

3- The mean squares of two cotton crosses, male and female were highly significant for (DFF) and (BMP) in cotton cross I while, male mean squares were highly significant for (FFN) and (DFF) in cotton cross II. As regard to yield and yield components. mean squares for two cotton crosses, male and female were highly significant or significant as well as for all traits. In both cotton crosses except for all studied traits in both crosses. except for female mean squares for boll weight in cotton cross II same trend found in fiber properties which gave highly significant for all fiber properties in both

cotton crosses. Significant male and female indicated that important additive and non-additive of in heritance for these traits.

4- Genotypic and phenotypic variation coefficient

The genotypic coefficient variance (GCV) of all traits in BIP population was greater than that in F_3 families except for lint index, Lint percentage, seed index, and fiber strength in cross I; and for earliness index and lint yield in cross II. Phenotypic coefficient of variation (PCV) in BIP population was higher than F_3 families except for Lint percentage, seed index, strength, and micronaire reading in cotton cross I (Giza 94 x Giza 45) while, earliness index in cotton cross II. This could be attributed to the fact that intermating between F_2 caused forced recombination.

5- Comparison of heritability in broad sense (h^2_b %)

Comparison of heritability in brand sense (h^2b%) estimates between biparental progenies and selfed population for cross I and cross II revealed that, heritability estimates in broad sense (h^2_b%) improved considerably for most characters in F_3, except for days to first flowering. The change of heritability estimates towards higher side in F_3 progenies over selfing series occurred probably due to increased portion of genetic variance to total phenotypic variance due to cryptic genetic change that have been brought about one cycle of intermating.

6 - Genotypic correlation for among different traits for cross I

It is very important for plant breeders when the negative correlation between the two economic characters (seed cotton yield and fiber properties is overcome), thus selection of some genotypes have high yield and high fiber length is very difficult. Some relationships between traits, in cotton cross I changed by using intermating for example, correlation between seed cotton yield

/ P and earliness index changed from -0.20 to 1.08**, seed cotton yield and lint index in 0.42 to 1.09** and seed cotton yield / P with seed index from -0.35* to 0.72**, Seed cotton yield / P with micronaire changed from -0.57 to 0.184. Also, a comparison of correlation among different traits for BIP and F3 families for cotton cross II exhibited that, correlations between seed cotton yield / P and both, BP and micronaire reading were insignificant in F_3 families but these relations changed to significant for these traits in BIP. The differences in direction for correlation between seed cotton yield / P and both earliness index and lint index (in cotton cross I) help the breeder to selection some genotypes which have high yield and more earliness. Also, correlation between earliness index and each (lint percentage, seed index, lint index and fiber strength where the relation changed from negative to positive values.

7-Phenotypic correlation between seed cotton yield and different characters for cotton cross I

It is very important for plant breeder when the negative correlation between the two economic characters (seed cotton yield, and fiber length) is overcome thus isolation of some genotypes have high yield and high fiber length were difficult. Some relations between traits changed by random intermating for example correlation between seed cotton yield / P and earliness index changed from -0.124 to 0.669**, seed cotton yield / P and Lint index from -0.097 to 0.373, Seed cotton yield with micromere changed from - 0.168 to 0.136).

8 - Assessment observed direct and correlated response for seed cotton yield / P measured in percentage. Seed cotton yield consider very important as well as fiber properties and earliness traits, therefore, choose the best elite genotypes in (BIP and F_3 compared with the better original parent to selection some elite genotypes to use them in breeding programs. Results exhibited that the five families out yield over better parent of BIP and F_3 generation. The observed gain in seed cotton yield of the best five families for seed cotton yield / P ranged

from -21.35 % to 41.52 %, for lint yield / P, ranged from 15.09 % to 34.63% . Ranged from - 20.73% to -15.68 % and from -2.36% to, 2.89 %, seed index and boll weight, respectively (in cross). while, some crosses showed decrease in fiber length compared with Giza-94 (better original parent). However, F_3 selfed observed was non-significant for seed cotton yield / P. Observed direct and correlated response for seed cotton yield / P in cotton cross II (Giza 70 x TNB1) cleared that the crosses ranged from 35.81 % to 66.74 %, and 22.58% to 48.84%, for seed cotton yield / P while ranged from 5.06% to 14.89% and -15.56% to -11.32% for earliness index in BIP and F_3 families, respectively.

Conclusions

The pervious results exhibited that the mean performance was higher in biparental progenies than F_3 families. Increasing of mean performance in biparental for most traits in both crosses is due to the possible accumulation favorable genes as a result of breakdown of undesirable linkages by intermating.

The coefficient of both the variation genotypic and phenotypic for most traits revealed that high differences were observed for biparental compared with F_3 families except for lint index, lint percentage, seed index and fiber strength in cross I as well as, earliness index and lint yield in cross II

In general, high heritability was observed in biparental of cross I and cross II except for earliness index, seed cotton yield, lint yield and fiber properties compared to F_3 selfed. On the other hand, high heritability coupled with low and moderate GCV and PCV for some traits indicated the presence of both additive and non-additive gene action .Genotypic correlation between different traits changed especially between seed cotton yield and both earliness index and fiber properties in cross I by using intermating.

In this study, superior hybrids yield and more earliness and characteristics by high fiber quality compared with the F_3 families. Therefore, continue of evaluation and selection for those hybrids help to increase efficiency in cotton breeding programs where It depend on performance of families and individual plants within their hybrids which may bring better prospects of deriving superior genotypes with desired traits from intermated. Thus, these genotypes could be used in cotton breeding programs.

6. REFERENCES