

CONTENTS

<i>Title</i>	<i>Page</i>
1-INTRODUCTION	1
2- REVIEW OF LITERATURE	4
2.1- Biparental mating studies for creating variability in populations.....	4
2.2- Genetic behaviour and gene action of quantitative characters in cotton.....	9
2.3- Genetic association among traits.....	25
2.4- prediction of superior recombinations.....	31
3-MATERIAL AND METHODS	34
3.1 Genetic materials.....	34
3.2. Experimental design and laboratory procedures.....	35
3.3 Collection of data and recording of observations.....	36
3.4 Statistical and genetical analysis	39
4-RESULTS AND DISCUSSION	46
4.1 Comparison of variability among BIPs and F ₃ populations.....	47
4.2 Estimation of variance components and heritability.....	62
4.3 Prediction of superior recombinations in F ₃ generation.....	78
4.4 Genotypic and phenotypic associations.....	86
4.5 Assesement of superior segregants in biparental progenies.....	97
5- SUMMARY AND CONCLUSION	104
6- LITERATURE CITED	112
ARABIC SUMMARY	

5. SUMMARY AND CONCLUSION

The present investigation was conducted in the Department of Agronomy, Faculty of Agriculture, Mansoura university. The field experiments were carried out at Sakha Agriculture Research Station. A. R. C, Egypt over two cotton growing seasons, 2010 and 2011.

The purpose of this investigation was to study the nature and magnitude of variability generated for different quantitative characters each of the biparental progenies (obtained by attempting intermating of F_2 generations) and F_3 selfed populations. The study was also aimed to estimate the variance components and narrow sense heritability. And also was made to compare the variability of quantitative characters in BIP and F_3 selfed. The study was extended to predict and isolate the superior segregants or combinations through different selection approaches in cotton populations. In addition to, under standing the shift in association pattern of component characters.

In view of the previous objective, five cotton parents were crossed to produce three crosses as follows:-

- 1- (Giza 89 \times pima) \times 6022. (early \times early)
- 2- (Giza 92 \times pima). (high quality \times early + yield)
- 3- (Giza 86 \times pima). (high yield \times high yield + early)

Biparental populations BIPs derived from inter population matings in F_2 generation were evaluated with the F_3 families selfed. Two individual field trials were conducted to evaluate the biparental progenies and F_3 selfs with their original parents for the three crosses, at randomized

SUMMARY AND CONCLUSION

complete block with three replications. The following observations were recorded on six individual guarded plants in all the BIPs and F₃ selfed families for each cross.

A- Growth habits and earliness characters :

- 1- Position of first fruiting node.
- 2- Days to first flower.
- 3- Growth period duration.
- 4- Boll maturation period.
- 5- Relative growth rate of boll at three development stages i-e 10-20 , 20-30 and 30-40 days after anthesis.

B-Yield and yield components characters :

- 1- Boll weight (g).
- 2- Seed cotton yield / plant (g).
- 3- Lint yield / plant (g).
- 4- Lint percentage %.
- 5- Seed index (g).
- 6- Lint index (g).

C- Fiber quality characters :

- 1- Fiber fineness as micronaire reading.
- 2- Fiber strength as prissily index.
- 3- Fiber length.
- 4- Uniformity ratio.

SUMMARY AND CONCLUSION

Different parameters such as analysis of variance , means , range , genotypic and phenotypic coefficients of variability , components of genetic variance , phenotypic variance , heritability in broad and narrow senses , degree of association between different characters and prediction of superior recombination's were worked out for all the progenies seperately by using Minitap and Spss computer programmes.

The salient feature of the present invistigation are summerized as follows:

- 1- Analysis of variance revealed highly significant mean squares among biparental progenies in the three crosses which may be reflected that the parental involved in these crosses were diverse and this diversity could be transmitted to their progenies.
- 2- Mean squares due to male were highly significant and large in magnitude than mean squares due to female / males which, revealed over all differences between F₂ male parents.
- 3- High intra class variability values were recorded in both F₃ selfed families and biparental progenies and were observed for earliness and yield characters, indicating high variability between plants within families.
- 4- The variation between plants in biparental progenies were relatively high as compared with F₃ selfed families.
- 5- The comparison of mean for different characters among segregating populations indicated that mean values in general were relatively higher in case of biparental populations compared to F₃ populations for most characters.

SUMMARY AND CONCLUSION

- 6- The comparison of range values among different populations indicated wider range in biparental compared to F₃ selfed for most studied characters. It is noteworthy that upper limit of range was higher for most characters. At the same time lower limit was smaller compared to F₃ populations suggesting role of inter-mating in releasing more variability than selfed populations.
- 7- In general the magnitude of genotypic and phenotypic coefficients of variability were high for most studied characters over both BIP and F₃ selfed. Also, slight discrepancy between PCV and GCV for most characters indicated less effect by environmental factors.
- 8- The comparison of GCV and PCV among biparental progenies and F₃ selfed revealed that PCV were generally higher than GCV for all studied characters. This may due to involvement of high genotypic × environment interaction. BIP showed high mean GCV and PCV values for most studied characters compared to F₃ selfed. This may due to breakage of undesirable linkages and appearance of superior gene combinations. Some characters showed high GCV and PCV such as seed cotton and lint yield and relative growth rate of boll indicating the presence of repulsion phase linkage. However, other characters showed lower GCV and PCV values such as most fiber characters and lint percentage, this may be due to the presence of genes in coupling phase.
- 9- All the populations exhibited higher between family variance than within family variance for all studied characters. Higher magnitude of between

SUMMARY AND CONCLUSION

and within families was observed for yield characters followed by earliness and fiber characters.

- 10- Higher non-additive genetic variances were noticed for most characters in BIPs populations compared with F_3 selfed populations, which conformed by high degree of dominance than unity. This may be due breakage of repulsion phase linkage and that may lead to some cryptic genetic chances.
- 11- The reverse trends were obtained with F_3 selfed generations, most earliness characters and fiber quality characters were mainly controlled by additive genetic components, but most yield characters were under control non-additive genetic components except for lint percentage and lint index, which affected largely by additive ones.
- 12- Heritability estimates in broad sense improved considerably for most studied characters in biparental. Most characters showed high $H^2_b\%$ values over 50% in both BIP and F_3 selfed populations. Environmental variation played relatively limited role for most studied characters except for relative growth rate of boll at third interval which affected by great role of environmental conditions.
- 13- High narrow sense heritability was noticed in F_3 selfed generation compared with biparental progenies, for most characters. This was due to a great role of additive portion of genetic variance in selfed series. Among biparental populations, the crosses varied in narrow sense heritability with different characters. The characters like, days to first flower, growth period duration, boll maturation period, lint percentage, lint index and most fiber characters

SUMMARY AND CONCLUSION

showed high narrow sense heritability in both PIB and F₃ selfed populations. Therefore, selection will be effective for such characters based on phenotypic observation.

- 14- High proportion of recombinants likely to fall outside parental range were obtained for , first fruiting node, days to first flower and growth period duration, in the first cross. The second cross gave the highest proportion for RGR. While, the third cross showed high proportion for most yield contributed characters, and for seed cotton and lint yield/plant and seed index in the second cross. The third cross showed the highest proportion for most fiber characters. Thus the breeder should pay great emphasis for considering these crosses in cotton breeding programmes.
- 15- Analysis of correlation coefficients revealed that, in general genotypic correlation in both populations indicated that genetic causes were greater than environmental causes in the expression of these characters.
- 16- Generally, the results from correlation between yield and fiber quality indicated that selection for increased seed cotton and lint yield might result in a simultaneous reduction in fiber length and strength with late in maturity due to negative association. But lead to increase in micronaire reading (fineness) for inferior value. These association have been attributed to linkage or pleiotropy.
- 17- A comparison of direction and magnitude of association among characters between biparental and F₃ selfed populations indicated that several new associations in terms of direction and magnitude were observed. Many

SUMMARY AND CONCLUSION

additional correlations becomes established in PIBs compared with F_3 selfed populations. This may occur due to gene reshuffling and breakage of linkage.

18- The reduction or complete disappearance of the negative association in inter-mated progenies compared to F_3 selfed families may be due to the breakage of linkages upon inter-mating , thereby more number of plants having favorable combinations of genes were produced in BIP progenies.

19- In general, inter population mating has been very success full in increasing the mean of the population in the desired direction without losing variability. Thus , there is a lot of chance for recombination's to occur and chance of getting number of superior segregants is also high , the study clearly highlighted the distinct advantage of inter population mating over F_3 selfed as well as biparental mating in releasing variability in cotton crop.

CONCLUSIONS

The comparison of biparental mating and F_3 selfed generations shows that the additional variability generated through the inter-mating in early segregating generations has been consequence of release of concealed variability, in the segregating generations, which is probably brought about by rare combinations between the tightly linked genes. And it was also found to be effective in changing not only the magnitude but also direction of correlation coefficients between characters to desired direction.

This approach will help in creating new populations with high frequencies of rare recombinants which can not otherwise be realized in small segregants populations normally being raised through conventional breeding methods especially when desired genes are unfavorably linked. In addition to those, it will also help in maintaining a greater variability for selection to be effective for longer period, and will thus avoid the early fixation of genes in homozygous state. In the same time, estimation of additive and non-additive genetic components were more reliable, thus superior recombinants should be expected in the progenies of biparental matings compared with F_3 progenies, this due to breaking the repulsion and coupling phase linkages.

Finally, estimates of variance components and nature of gene action can be used for deciding future breeding procedure for improvement populations studied.