Pedigree selection and evaluation for yield and yield components in two segregating Populations of Egyptian cotton *(Gossypium barbadense* L.*)*

By

Abd El-Samea Abd El-Baky Abd El-Samea

B. Sc. Agric.,(Agron.), Al-Azhar University, 2010

M.Sc. Agric. Sci. (Agron.), Al-Azhar University, Assiut branch (2015)

THESIS

Submitted in Partial Fulfillment of the Requirements for the Degree of

DOCTOR OF PHILOSOPHY

In

AGRICULTURAL SCIENCES (AGRONOMY)

Department of Agronomy

Faculty of Agriculture

Al-Azhar University

(Assiut branch)

1442 AH

2020 AD

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5. Summary and conclusions

This experiment was conducted in Sohag Governorate (Dar El Salam Center) for three summer seasons from 2016 to 2018. The genetic material used was two clans of Egyptian cotton (*Gossypium barbadense* L.).. The first clan consists of crossbreeding (Giza 80 × C.B58), and the second clan of crossbreeding (Giza 85 × C.B58). The selection process was initiated in the second generation in order to select the best strains in the electoral traits. These four traits were used for the selection of cotton hair, selection for ginning, selection of almond weight and selection for hair rate.

The most important results can be summarized as follows:

1 - Description of the base Populations in the F_2 - generation., season 2016

2 - pedigree selection for lint yield/plant.

3 - pedigree selection for lint percentage.

4 - pedigree selection for lint index.

5 - pedigree selection for boll weight.

1 - Description of the base Populations, season 2016 1.1-means and variances

Summary of the characteristics of individual plants in the F_2 - generation of the two Populations

1.1.1-seed cotton yield/plant (g.)

Mean seed cotton yield/plant., ranged from 50.00 to 58.60 with an average of 54.75 g ./plant for the parent C.B 58, compared to arrange from 41.00 to 50.10 with an average of 45.99 /plant for Giza 80. mean seed cotton yield/plant of the F2 –Population 1 ranged from 13.30to 132.00 with an average of the 46.50 g/plant. seed cotton yield showed nearly complete

dominance or overdominance towards the low yielding parent (45.99) g/plant.

Giza 80 Hence the parent C.B 58 used as a common parent in two Populations in this study.

The phenotypic variance of Population 1 (553.76) was very high compared to the two parents, C.B 58 (7.36) and Giza 80 (8.43). consequently, the coefficient variability (CV%) was very high in the F_2 - generation compared to the two parents. The narrow range of variability of the two parents, which are the measure of environmental variance, inflated the genetic variance in the F_2 – Population, furthermore, the dominance effect was obvious, hence, estimate of heritability in broad sense (0.99) and (0.99) was very high for Pop. I and Pop. II., respectively.

1.1.2- lint yield/plant (g.)

Mean lint yield/plant ranged from 18.50 to 23.00 with an average of 21.II for the parent C.B 58, compared to arrange from 14.00 to 20.00 with an average 17.76 for another parent Giza 80. Mean lint yield of Pop. I ranged from 3.00 to 46.00 with an average of the 17.21 lint yield/plant showed complete over- dominance toward the low yielding parent, Giza 80 (17.76) Table 3. Narrow variability in the parents (2.37 and 2.24 for C.B.58 and Giza 80.which resulted in very small environmental variance and inflation of the genetic variance, respectively compared the F_2 - Population (86.95), gives, high estimate of broad sense heritability (0.970). in Pop. I, Pop. II lint yield /plant ranged from 3.40 to 45.00 /plant with an average 16.94 /plant, This results indicating that also complete – dominance towards the low yielding parent Giza 80 (19.32) the narrow range of variability of the two parents, which are a measure of the environmental variance effect was obvious. Hence estimate of heritability in broad sense (0.97) was very high in Pop. II

1.1.3. lint percentage

lint percentage of C.B 58 ranged from 32.88 to 37.35 with an average of 36.57% and from 34.33 to 37.30 with an average of 36.36 for Giza 80. The Population 1 ranged from 28.49 to 43.67 with an average of 35-56% which showed complete or over dominance toward the higher yielding parent C.B 58 (36.35) the low phenotypic variation (σ2ph) and coefficient of variability (c v%) of the two parents compared to high variability in Pop. I resulted in high broad sense heritability 0.90 % (Table3).

The expected genetic advance from selecting the superior 10% plants in lint percentage account to 10.04 and 26.72% from F_2 –mean, could be considered high.

the lint percentage of Pop. II (37.58%) showed over dominance towards the higher parent Giza 85 (36.36) the range 0f Pop II in lint percentage cover the range of the parents; C.B 58 and Giza 85. Furthermore, σ^2ph (56.68) and CV% (21.17) 0f Pop II were high compared to their parents. Consequently, broad sense heritability (0.95) and the expected genetic advance (41.22%) as percentage from the F_2 -meen was high.

1-1-5- Boll weight (g.)

Mean boll weight of Pop. I (2.32) was less than the low parent Giza 80. However, opposite results were found in Pop. II in which mean boll weight 2.14 showed over dominance toward the low parent Giza 80 (2.43) the two Populations showed high estimates of the coefficient of variation compared to their respective parents (Table 3 and 4). these results led to high estimates of broad sense heritability 0.80 and 0.92, and large expected gains in percentage of the mean of 36.51 and 46.87% for Pop. I and Pop. II; respectively

1-1-6- seed index (g.)

Mean seed index in Pop. I (7.60) showed nearly dominance towards the lower parent C.B 58 (8.05)

However, mean seed index of Pop. II (8.28) was lower than the lower parent C.B.58 (8.05). In the two Populations (Tables 3 and 4) the coefficient of variation was larger than their respective parents. in Pop. I, the coefficient of variation of seed index was 0.55 compared to 0.09 and 0.04 for its respective parents also, the CV% in Pop. II was 17.17 compared to 3.78 and 3.73% for its respective parents. These findings resulted in high estimates of broad sense heritability 0.88 and 0.94, and high expected genetic gain in percentage of the mean of 16.32and 33.30% for Pop. I and Pop. II; respectively.

1-1-4- Number of bolls/plant:

Mean number of bolls/plant of Pop. I (20.54) was nearly less than from high parent; C.B 58(22.14), indicating partial dominance towards the high parent, furthermore, the range of number of bolls/plant was of Pop. I very wide (from 3.54 to 76.29) compared to the two parents. In consequence, high σ2ph (141.16) and CV% (54.91) were obtained for Pop .I compared to low CV% (6.57%) for C.B 58 and (6.71%) for Giza 80. These results led to high estimate of broad sense heritability (0.99) and very large expected advance (24.14) bolls /plant in Pop .I.

Mean number of bolls/plant of Pop. II was (21.64) compared to 22.14 for C.B.58 and 20.35 for Giza.85. The phenotypic variation in number of bolls /plant in terms of σ^2ph and CV% was very low for two parents compared to high σ^2ph (101.29) and CV% (49.00) for Pop. II. Hence very high of broad sense heritability (0.98) and expected genetic advance (20.24) bolls /plant were obtained.

1-1-7. lint index

Concerning mean lint index ., Pop. I showed nearly partial or complete dominance (4.34) towards the higher parent Giza 80 (4.41)

However, Pop. II showed over dominance (5.09) towards the higher parent Giza 85 (4.55). In both of Pop. I and Pop. II, the coefficient of variation was higher than respective parent, which resulted in 0.94 and 0.95 broad sense heritability and expected genetic advance relative to the mean of 55.68 and 71.45% for Pop. I and Pop. II, respectively.

1.1- lint yield/plant (g.)

1.2 - After two rounds of two selections, the analysis of variance showed the existence of high significant differences between families of the fourth generation F_4 for lint yield and all the studied traits in the two Population. The genetic and phenotypic difference coefficient was sufficient for other electoral rounds and reached 34.15, 34.00% for Pop.I and for Pop.II it was 14.41,13.75 respectively, The estimates of the broad-sense heritability for lint yield were very high, reaching 0.99, 0.99% for Pop.I and for Pop.II, respectively. On the contrary, from the calculation of the realized heritability, which was low for the second selection cycle, it was 33.98 and 45% for Pop.I and for Pop.II respectively.

2.2- After two cycles of selection for lint yield in the Pop.I, 9 families from the Populations showed high significant values of direct genetic improvement of the cotton yield of hair from both the bulk and the top parent sample, and the percentage of improvement achieved from the bulk sample ranges from 18.99 to 100.02% and from the supreme father 12.11 In the Pop.II, showed 8 families from the Population showed high significant values of direct genetic improvement for lint yield from both the

bulk sample and the upper parent, and the percentage of improvement achieved from the bulk sample ranged from 6.64 to 31.78%, and from the better parent, 7.51 to 44.09%.

3.2- The top 4 superior families in the Pop.I are Family No. 14, No. 22, No. 49, and No. 102 The family No. 14 showed a clear genetic improvement for for seed cotton yield, and it was 40.70, 35.80%, 8.57 and 5.96% for lint percentag, 32.66 and 29.26% for No. of bolls / plant, 5.90 and 6.38% for boll weight, -1.83 and -8.08% for seed index, 12.59 and 1.37% for lint index from the bulk sample and better parent, respectively.

4.2- In Pop.II,, two families, No. 351 and No. 353, showed a genetic improvement in the quality for seed cotton yield, for No. of bolls / plant, as well as the rest of the traits.

3- lint percentage

1.3 - After two rounds of two selections, the analysis of variance showed the existence of high significant differences between families of the fourth generation F_4 for lint percentage , and all the studied traits in the two Populations. The genetic and phenotypic difference coefficient was sufficient for other electoral rounds and reached 8.38, 9.07% for Pop.I and for Pop. II. it was 3.06, 3.34% respectively, The estimates of the heritability coefficient in the broad sense of the clearing of the ginning plant were very high, reaching 0.81,0.85% for Pop.I and for Pop. II, respectively. On the contrary, from the calculation realized heritability, which was low for the second selection cycle, it was 33.63 and 65.03% for Pop.I and for Pop. II respectively.

2.3- After two cycles of selection for lint percentag, for Pop.I, 9 families from the clan showed high significant values of direct genetic improvement from both the bulk sample and the better parent, and the percentage of improvement achieved from the bulck sample ranged from 2.54 to 12.16%

and from the better parent From 2.42 to 12.25%, in Pop. II, 9 families from Population showed high significant values of direct genetic improvement of lint percentage from both the bulk sample and the better parent, and the percentage of improvement achieved from the bulk sample ranged from 1.71 to 9.37%, and from the better parent 1.11 to 8.73%.

3.3- The top 3 super families in Pop.I are Family No. 185, No. 269, and No. 369, Family No. 185 showed clear genetic improvement to the trait of seed cotton yield, and it was 5.12, 5.12%, 15.35 and 12.90% for lint yield -6.55 and 3.56% for the No. of bolls / plant, 11.11 and -6.25% for boll weight, -13.25 and -14.10% for seed index, -7.57 and -9.52% for lint index from the bulk sample and better parent, respectively.

4.3- In Pop. II, the two best families, No. 184 and No. 239, showed genetic improvement in seed cotton yield, lint yield, as well as the rest of the traits.

4-Boll weight (g.).

1.4 - Analysis of variance for families The analysis of variance showed the existence of high significant differences between families of the fourth generation of the weight of tonsil and all the studied traits in the two clans. The genetic and phenotypic difference coefficient was sufficient for other electoral rounds and it reached 6.46, 7.23% for the first clan and for the second clan it was 8.16, 8.69% respectively. The estimates of the heritability coefficient in the broad sense of the ginning class of plants were very high, reaching 0.88.0.80% for the first and second clans, respectively. On the contrary, from the calculation of the verified heritability coefficient, which was low for the second election cycle, it was 36.44, 38.12% for the first and second clans, respectively.

2.4- After two cycles of selection for the almond weight class in the first clan, 8 families from the clan showed high significant values of direct genetic improvement of the ginning trait of the plant from both the bulk

sample and the superior parent, and the percentage of improvement achieved from the balck sample ranged from 4.82 to 24.94% and from the top father 1.56 In the second clan, the ten families of the clan showed high significant values of direct genetic improvement of the clearness of the ginning characteristic of the plant from both the bulk and the higher parent sample, and the percentage of improvement achieved from the plank sample ranged from 2.44 to 34.15%, and from the top father 10.53 to 44.74%.

3.4- The top 3 superior families in the first clan are Family No. 10, No. 15, and No. 20 Family No. 10 showed a clear genetic improvement to the trait of being squeezed cotton blossom, and it was 16.58 and 12.53%, 22.20 and 15.15% for the trait of the hair cotton crop, 5.71 and 5.01% As for the ginning recipe, as well as the rest of the traits, which are the number of almonds on the plant, the seed factor, and the hair factor from the black sample and the top of the two, respectively.

4.4- In the second clan, the best three families are No. 89 and No. 132

5-lint index

1.5 - Analysis of variance for families The analysis of variance showed the existence of high significant differences between families of the fourth generation for the rate of hair rate and all the studied traits in the two clans. The genetic and phenotypic difference coefficient was sufficient for other electoral rounds and reached 5.81, 7.00% for the first clan and for the second clan it was 6.25 and 7.24% respectively. The estimates of the inheritance factor in the broad sense of the hair rate class were very high, reaching 0.75.0.69% for the first and second clans, respectively. On the contrary, from the calculation of the verified heritability factor, which was low for the second election cycle, it was 40.63, 43.2% for the first and second clans, respectively.

2.5- After two cycles of selection for the hair rate characteristic of the plant in the first clan, 9 families from the clan showed high significant values of direct genetic improvement of the hair rate trait from both the bulk and the top parent. The percentage of improvement achieved from the bulk sample ranges from 1.76 to 11.46% and from the top parent 4.54 In the second clan, the ten families of the clan showed high significant values of direct genetic improvement, the rate of plant hairs from both the bulk sample and the upper parent, and the percentage of improvement achieved from the bulk sample ranges from 9.98 to 34.61%, and from the top father 1.25 to 23.93%.

3.5- The top 3 superior families in the first clan are the family No. 121, No. 238, and No. 352. Family No. 121 showed a clear genetic improvement to the trait of being squeezed cotton blossom, and it was 9.27, 12.06%, 11.58 and 11.14% for the trait of the hair cotton crop 4.19 and 1.78% for For the quality of ginning as well as the rest of the characteristics, which are the number of almonds on the plant, the weight of the almonds, and the seed factor of the plank sample and the top of the two, respectively.

4.5- In Pop. II, the best three families are No. 68, No. 235 and No. 239 showed genetic improvement in seed cotton yield, lint yield, and the other characteristics.

Depending on the method of pedigree selection in the four characteristics lint yield, lint percentage, boll weight, and lint index for the plant combined, a number of families showed a significance for genetic improvement and families were numbers (No. 14, No. 22, No. 49, No. 102), (No. 351 and No. 353) For lint yield in the two populations and (No. 185, No. 269, No. 369), (No. 184 and No. 239) as for lint percentage in the Pop. II and Pop. I, respectively and (No. 10, No. 15, No. 20) and (No. 89, No. 132 and No. 296) for boll weight of first population and second

population respectively and (No. 121, No. 238, No. 352), (No. 68, No. 235 and No. 239) for lint yield in first population and second population, respectively, and these are Families who were selected by means of the pedegree selection method.