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SUMMARY

The present study was carried out at Assiut Univ. Exper. Farm during the three summer seasons of 2004 - 2006. The basic materials consisted of two F_6- populations stemmed from crosses between three Egyptian cotton varieties (*Gossypium barbadense L.*), i.e., population I (Giza-83 x Dandara), and population II (Giza-83 x Giza-45). Two cycles of selection to improve earliness index and lint yield/plant were completed at early and late planting dates using two methods of pedigree selection i.e., single trait selection and multiple traits selection (selection index).

The results could be summarized as the following:

A- Description of the base populations for earliness index (season 2004).

1- Mean squares of the families of the base population I and II were highly significant for earliness index and most of the other traits at early and late plantings conditions.

2- At early planting seven families from population I surpassed the earlier parent (Dandara) in earliness index, four of them were significantly earlier than the earlier parent Dandara (No. 1, 10, 16, and 18), and out-yielded the two parents.

3- In the late planting six families from population I were significantly earlier than the earlier parent. Five of them (No. 7, 8, 17, 19 and 20) significantly out-yielded the two parents.

4- At early planting 10 families from population II significantly surpassed the better parent Giza-83 in earliness index, six of them (No. 8, 11 13, 15, 17 and 19) were significantly out-yielded the high yielding parent.

5- At late planting six families from population II, (No. 2, 5, 8, 10, 15 and 16) were significantly earlier than the earlier parent (Giza-83) and significantly exceeded it in seed cotton and lint yield/plant.

6- In population I the gcv values for the criterion of selection (earliness index) were 20.27 and 19.14% at early and late plantings, respectively. Also they were 20.41 and 17.15 for population II.

7- High gcv was observed in the correlated traits; seed cotton yield/plant, lint yield/plant and number of bolls/plant in populations I and II under early and late planting dates.

B- Description of the base populations for lint yield/plant (season 2004).

1- Highly significant differences among families were found for lint yield/plant and most of the other traits in populations I and II under the two planting dates.

2- Six families from population I at early planting (No. 10, 13, 14, 15, 16 and 17) were significantly out-yielded the high yielding parent (Giza-83) in lint yield/plant, three of them (No. 13, 16 and 17) surpassed the earlier parent in earliness index by 13.78%.

3- At late planting seven families from population I (No.2, 7, 11, 12, 15, 17 and 19) significantly out-yielded the two parents in seed cotton yield/plant. Moreover, families No.7, 14 and 15 exceeded the earlier parent (Dandara) in earliness index.

4- 10 families from population II at early planting surpassed significantly the better parent (Giza-83 in lint yield/plant. But, all of them except family No.1 were late in maturity.

5- At late planting eight families from population II surpassed the better parent (Giza-83) in seed cotton and lint yield/plant. Two families (No. 4 and 16) surpassed the earlier parent in earliness index by 5.63%.

6- In the two populations sufficient genetic of variability measured as (gcv) was observed for the criterion of selection; lint yield/plant under the two planting dates.

C. Evaluation of the second cycle of single trait selection (earliness index) in season 2006.

1- Families mean squares were highly significant in earliness index and most of the other traits of populations I and II at early and late plantings.

2-Means of the selected families for earliness index after two cycles of pedigree selection in population I at early date of planting resulted in three families (No. 1, 15 and 17) which were significantly earlier than the earlier parent Dandara.

3-The promising families No. 1 and 15 showed significant observed responses from Dandara in earliness index of 15.58% for each of them, while family No. 17 showed insignificant direct response from Dandara of 14.29%.

4- At late planting three families from population I (No. 7, 19 and 20) were significantly earlier than the earlier parent Dandara.

5- The direct observed response as calculated from the earlier parent was significant for the best family No. 20 and reached 24.00% in earliness index, accompanied with significant correlated response in seed cotton yield/plant (10.10%).

6- Selection for earliness index in population II at early planting gave three families (No. 11, 15 and 17) significantly earlier than the earlier parent Giza-83 and also they were significantly out yielded Giza-83 in seed cotton and lint yield/plant and number of bolls/plant.

7- Families No. 15 and 17 showed significant observed response in earliness index from the earlier parent of 18.42 and 14.47%. And highly significant correlated response in seed cotton and lint yield/plant and number of bolls/plant.

8- Respect to the late planting, three families from population II (No. 2, 5 and 16) were significantly earlier than the earlier parent in earliness index and also surpassed it in seed cotton yield/plant.

9- Two promising families from population II at late planting (No. 5 and 16) showed direct response in earliness index from the earlier parent of 11.84 and 18.42%, and correlated response in seed cotton and lint yield/plant and in number of bolls/plant.

10- Genotypic coefficients of variability (gcv) were 23.17 and 18.73% for earliness index in population I and 22.12 and 17.02% in population II at early and late planting, respectively.

11- Realized heritability for earliness index was medium and accounted for 50 and 43.75% in population I at early and late plantings, respectively. In population II, realized heritability was 46.15 and 50% at early and late plantings, respectively.

D- Evaluation of the second cycle of single trait selection (lint yield/plant) in season 2006.

1- Mean squares of the selected families from the two populations at early and late plantings are highly significant for lint yield/plant, and most of the other traits.

2- After two cycles of pedigree selection for lint yield/plant there were three families from population I at early planting exceeded the high yielding parent Giza-83 in seed cotton yield/plant (No. 10, 14 and 17) two of them (No. 10 and 17) significantly out-yielded Giza-83 in seed cotton yield/plant, lint yield/plant and number of bolls/plant, but both of them were less than the better parent in earliness index.

3- The direct observed response in lint yield/plant was positive and highly significant for families No. 10 and 17 and accounted for 32.22 and 18.93% from the high yielding parent Giza-83, respectively.

4- Under late planting family means of population I showed that three families surpassed the high yielding parent Dandara (No. 11, 14, and 19) in seed cotton yield/plant by 8.91% in lint yield/plant by 7.8% and in number of bolls/plant by 16.12%. Two of them (No. 11 and 14) were earlier than the earlier parent Dandara by 7.93%.

5- The direct response in lint yield/plant was not significant and accounted for 11.18, 6.41 and 6.10 of the better parent for families (No. 11, 14 and 19), respectively. The best family No. 11 showed highly significant correlated responses in number of bolls/plant and insignificant correlated response in seed cotton yield/plant, lint percentage, seed index and earliness index.

6- At early planting, three families from population II (No. 4 ,6 and 11) significantly out yielded the better parent in lint yield/plant, seed cotton yield/plant, number of bolls/plant and boll weight. And were comparable to Giza-45 in 2.5% span length. Moreover, family No. 11 also significantly earlier than the earlier parent by 19.74%.

7- Two families No. 4 and 6 showed highly significant observed response in lint yield/plant of 38.62 and 55.68%, respectively, accompanied with significant or highly significant correlated response in seed cotton yield/plant of 41.36 and 55.59%, in number of bolls/plant of 18.39 and 21.48% and in boll weight of 19.23 and 28.08%, respectively.

8- At late planting three families from population II (No. 1, 5 and 6) surpasses Giza-83 in seed cotton yield/plant by 10.35%, in lint yield/plant by 1.90% and in number of bolls/plant by 6.86%. Moreover, they were earlier than the earlier parent by 5.20%.

9- Families (No. 1 and 5) showed direct responses in lint yield/plant of 5.60 and 3.57%, respectively, from the better parent, and showed correlated response in seed cotton yield/plant of 12.63 and 13.45%, in number of bolls/plant of 6.84 and 15.17%. However, family No. 5 showed significant correlated response in earliness index (19.48%), and family No. 1 showed (7.79%) correlated response in earliness index.

10- Sufficient genetic variability in populations I and II for further cycles of selection was obtained and accounted for 23.39 and 8.16% and 28.21 and 10.47%, for lint yield/plant, at early and late plantings, respectively.

11- Average and low realized heritability was estimated for all the studied traits, which was 49.75 and 33.10% for lint yield/plant in population I at early and late plantings, respectively. In population II realized

heritability do not differ from early to late planting in criterion selection (lint yield/plant) which was 48.84% in early and 48.88% in late planting.

E. Evaluation of the second cycle of selection indices. (Earliness groups).

Population I (Giza-83 x Dandara)

1- Two cycles of index 1 and 2 in population I at early planting resulted in the same promising families (No.17 and 20) which showed highly significant direct response from the better parent in seed cotton yield/plant of 19.65 and 25.21%, significant or highly significant response in lint yield/plant of 12.11 and 15.60% and highly significant response in number of bolls/plant of 53.29 and 66.58% respectively. And significantly earlier than the earlier parent by 14.28 and 16.88% respectively.

2- Two cycles of index 3 resulted in four families (No. 7, 10, 12 and 17) which showed significant or highly significant increases in lint yield/plant ranged from 12.11 to 29.01% and in number of bolls/plant which ranged from 47.01 to 76.80% from the better parent. The best family was family No.7.

3- Under late planting selection indices 1 and 3 resulted in the same two superior families. Family No.12 showed significant or highly significant responses of 25.58, 15.63, 29.15 and 14.67% from the better parent for seed cotton yield/plant, lint yield/plant, number of bolls/plant and earliness index, respectively and flowered earlier than the earlier parent by -2.19%. Furthermore, family No. 14 achieved responses from the better parent which accounted for 34.23, 22.40, 27.26 and 17.33% for

seed cotton yield/plant, lint yield/plant, number of bolls/plant and earliness index, respectively.

4- Selection index 2 in late planting resulted in one superior family No.18, which showed significant or highly significant observed responses from the better parent of 25.77, 21.35, 11.11 and 14.67% for seed cotton yield/plant, lint yield/plant, number of bolls/plant and earliness index, respectively.

Population II (Giza-83 x Giza-45)

1- Two cycles of selection indices 1, 2 and 3 at early planting resulted in five superior promising high yielding and early families. These families were No. 2 and 17 (index 1), No. 2 and 15 (index 2) and No. 2, 3, 15 and 16 (index 3). The best family was No. 2 which showed observed responses from the better parent of 35.09, 30.22, 43.08 and 14.29% for seed cotton yield/plant, lint yield/plant, number of bolls/plant and earliness index, respectively.

2- Under late planting two superior families; No. 15 and 19 were obtained from selection index 1. Family No. 15 showed significant or highly significant observed responses from the high parent of 66.22, 21.69, 20.79 and 11.84% for seed cotton yield/plant, lint yield/plant, number of bolls/plant and earliness index, respectively. The respective observed responses for the same traits in family No. 19 were 28.23, 24.34, 9.90 and 18.42%, in addition to 17.19% for boll weight.

3- Two cycles of selection index 2 at late planting resulted in two promising families (No. 6 and 19) which family No.6 showed significant or highly significant observed responses from the higher parent of 33.05, 32.28, 17.87 and 15.79% for seed cotton yield/plant,

lint yield/plant, number of bolls/plant and earliness index, respectively, without adverse effects on the other agronomic and fiber traits.

4- Selection index 3 at late planting resulted in two promising families (No. 11 and 14) which showed significant or highly significant observed responses from the higher parent of 16.85, 16.93, 15.84 and 11.84% for family No. 11 and 28.42, 17.46, 22.13 and 14.74% for family No. 14 for seed cotton yield/plant, lint yield/plant, number of bolls/plant and earliness index, respectively.

F. Evaluation of the second cycle of selection indices. (Yield groups).

Population I (Giza-83 x Dandara).

1- Two cycles of selection indices 1 and 2 in population I at early planting resulted in the same five selected families. The best three families were No. 2, 8 and 16 which showed significant observed responses from the better parent accounted for 22.52, 13.69 and 33.30% for family No. 2, 41.62, 32.22 and 72.34% for family No. 8 and 29.06, 24.85 and 37.46% for family No. 16 for seed cotton yield/plant, lint yield/plant and number of bolls/plant, respectively, furthermore, family No. 8 was significantly earlier than the earlier parent by 15.28%.

2- Two cycles of selection index 3 isolated two promising families; No. 9 and 10. The highly significant observed responses from the better parent accounted for 19.93, 16.27 and 23.75% for family No. 9, and 41.62, 32.10 and 72.34% for family No. 10 for seed cotton yield/plant, lint yield/plant and number of bolls/plant, respectively. Family No. 9 was also significantly earlier than the earlier parent by 16.67%.

3- Under late planting, the three selection indices 1, 2 and 3 succeeded to isolate three early high yielding families; family No. 9 (index 1), No. 2 and 11 (index 2) and No.9 (index 3). The observed responses as measured from better parent accounted for 21.68, 22.57, 15.07 and 12.20% for family No. 9, 22.93, 21.50, 20.80 and 4.88% for family No. 2 and 8.09, 11.18, 27.16 and 10.98% for family No. 11 for seed cotton yield/plant, lint yield/plant, number of bolls/plant and earliness index, respectively.

Population II (Giza-83 x Giza-45).

1- The three selection indices 1, 2 and 3 isolated four promising high yielding families (No. 7, 8, 14 and 16). Family No. 7 was the only one which showed highly significant observed response from the better parent in earliness index.

2- At late planting, index 1 resulted in two superior families No. 2 and 8 which showed significant or highly significant observed responses from the better parent for seed cotton yield/plant of 22.73 and 35.89%, lint yield/plant of 11.56 and 25.32% and earliness index of 16.88 and 7.79%, respectively. Family No. 8 showed highly significant increase than the better parent in number of bolls/plant of 14.83%.

3- Two cycles of selection indices 2 and 3 isolate the same five families, two superior families of them (No. 13 and 16) showed highly significant responses from the better parent in seed cotton and lint yield/plant.

G- Comparison between single and multiple trait selection .

G- 1. Earliness groups.

1- At early planting from population I, the four selection methods resulted in four promising families No. 1 and17 (selection for earliness index), No. 17 and 20 (index 1 and 2) and No 7 and 17 (index 3). Index 3 was the better methods of selection than the other three methods, which resulted in the highest improvement in seed cotton yield/plant, lint yield/plant and number of bolls/plant. Index 1 and 2 were the better in earliness index which gave the highest significant responses from the earlier parent in family No. 20 (16.88%).

2- Under late planting in the same population, selection indices still showed their superiority than single trait selection. Selection indices 1 and 3 resulted in the best two superior families (No. 12 and 14) in both yield and earliness index.

3- At early planting in population II, the three selection indices did not differ significantly than single trait selection in their family's responses in yield and earliness, which every method showed two superior early and high yielding families.

4-Under late planting in population II, the best method of selection was index 2 which resulted in family No. 6 showed significant or highly significant observed responses from the higher parent in seed cotton yield/plant, lint yield/plant, number of bolls/plant and earliness index.

G- 2. Yield groups.

1- Under early planting in yield groups from population I, index 1 and 2 resulted in the same two superior early and high yielding families (No. 8 and 16). However, single trait selection resulted in high yielding families No. 10 and 17 but they were late in mature.

2- At late planting in the same population, index 2 was the better methods of selection which resulted in two early high yielding families (No. 2 and 11). However, selection for lint yield/plant only failed to isolate significant early and high yielding families.

3- At early planting, single trait selection was more effective than selection indices in population II which resulted in the highest significant responses in families No. 4 and 6. But these two families were late in maturity. However, selection index 2 was the only method which gave significant responses in both earliness and yield for family No. 7.

4- Under late planting, selection indices method was more effective and better than selection for lint yield only in population II, selection index 1 succeeded to isolate two superior families No. 2 and 8 which showed significant or highly significant observed responses from the better parent in yield and earliness But, single trait selection failed in isolate promising families.