V. SUMMARY

The present study was carried out during the period of 2008, 2009 and 2010 growing seasons at Sids Agricultural Research Station, Beni-sueif Governorate, Egypt.

The objective of this study was to estimate the response to different methods of plant breeding *i.e*., pedigree, bulk and single seed descent (SSD). Also, direct and indirect selection for increased grain yield were carried out. The selection intensity of 5% approximately was used with direct selection (selection for grain yield itself) and with indirect selection using yield component in wheat, *i.e.*, number of spikes/plant, no of kernels/spike and 1000-kernel weight. The genetic parameters were estimated in F_3 and F_4 generations.

Two F_2 populations derived from the two crosses

1- FLORKA-2 / Kauz "s" // Sakha93

2- KAUZ//ALTAR84/AOS/3/KAUZ /4/ Sids6

The obtained results could be summarized as follow:

A- First cross:

A-1- F_3 and F_4 generations:

1- The mean squares associated with F_3 families were found to be significant for all studied traits**.** High estimates of heritability in broad-sense in the F_3 families were detected for all studied traits.

2- In the F_3, genetic gain was rather higher for no. of spikes/plant, no., of kernels/spike, 1000-kernel weight and grain yield/plant. Also, high G.C.V%. was detected for number of kernels/spike, 1000-kernel weight and grain yield/plant. However, low to moderate G.C.V%. was obtained for number of spikes/plant.

4- From the previous mentioned data, it is observed that the pedigree method was more effective for selected superior families or lines.

5- In the F_3 high heritability values were detected for number of spikes/plant and number of kernels/spike,1000-kernel weight and grain yield/plant indicating the effectiveness of selection in this material for these traits.. The values of expected gain (ΔG) and ΔG % reported the possible gain from selection as percent increase in the F_5 over the F_4 are selected. Also, genetic gain was rather higher for number of spikes/plant, number of kernels/spike,1000-kernel weight and grain yield/plant.

A-2- F_5 generation:

A-2-a- Breeding methods:

1- The mean squares due to breeding methods were significant for yield and its components.

2- The pedigree method was considered the best breeding method for grain yield/plant, 1000-kernel weight, number of kernels/spike and number of spikes/plant than those bulk and SSD in this cross.

3- The best lines of seed yield/plant were number 16 (45.80g) and no. 14 (43.22 g) in pedigree method and no. 6 (39.52g) in bulk method.

A-2-b- Selection criteria:

1- Mean squares for selection criteria *i.e*. number of spikes/plant, 1000-kernel weight, number of kernels/spike (indirect selection), and high grain yield/plant (direct selection) were significant.

2- The present investigation expressed the selection for high 1000-kernel weight was more efficient as indirect selection for grain yield/plant and ranked the second for number of spikes/plant, grain yield/plant and number of kernels/spike.

With respect to the effect of selection criteria on 1000-kernel weight, the results revealed that selection for 1000-kernel weight gave significant heavier grain index followed by selection high number of spikes/plant. However, selection of high grain yield /plant gave the lowest one

3- The comparison of selection criteria revealed the efficiency of the selection of high 1000-kernel weight, gave the highest grain yield/plant, but without superiority of grain yield per plant. The second number of spike/plant followed by direct selection for grain yield/plant

B- Second cross:

B-1- F_3 and F_4 generation:

1-Significant F_3 mean squares were detected for all the four studied traits indicating wide differences between the F_3 families'

2- for number of spikes/plant, the families' number 38, 6, and 69 gave the highest values than the better cheeks (Sids1), but not significantly. While, the families number 38, 6, 69, 13, 14, 15, 16, 7, 54, 60, 61, 18, 37, 5, 51, 56, 19, 68, 3 and 49 significantly surpassed the over mean and Parent1.

3- The lien number 69 gave the highest values for number of kernels per spike than the better cheek sids12. while, the families' number 69, 7, 1, 16, 22 and 50 had significantly higher number of kernels per spike than the parent1.

4- For 1000-kernel weight, families no. 59, 45, 44, 40, 41, 42, 52, 54, 60 and 58 surpassed significantly the heavier parent (parent1). With respect to grain yield/plant the families no. 69, 38, 61, 19, 15, 16, 54, 6, 4, 20, 18, 37, 63, 3, 7, 60, 39, 13, 58, 49, 9, 56 and 59 significantly outyielded the better cheek Sids1.

5- High estimates of heritability in broad-sense in the F_3 families were detected for all studied traits which ranged from 63.32 to 95.51.

6- Significant mean squares for F_4 selected families were detected for all studied traits except 1000-kernel weight.

7- As for number of spikes/plant, the range of selected families varied from 5 to 19 spikes. While, line number 13 gave the highest values (19 spikes) for number of spikes/plant

8- With regard to grain yield/plant seven selected families surpassed significantly than the best parent (parent1). The range of selected families varied from 15.8 (family no. 38) to 51.63 (family no. 13). The best families were number 13, 29, 9, 31, 21, 12 and 17.

9- In the F_4 families' high heritability values were detected for number of spikes/plant, for 1000-kernel weight and grain yield /plant indicating the effectiveness of selection in this material for these traits. However, moderate values were obtained for number of kernels/spike.

B-2- F_5 generation:

B-2-a- Breeding methods:

1- Mean squares due to breeding methods were significant for yield and its components.

2- The pedigree method was considered the best breeding method for high grain yield/plant, number of spikes/plant and number of kernels/spike, than those bulk and SPD methods. While the bulk method was the best breeding method for 1000-kernel weight in this cross.

3- The efficiency of breeding methods revealed that pedigree method produced consistently more superior lines compared to the best parent and two cheeks or the average population.

4-The best lines were number 7 (38.30g) ,no. 8 (48.23g) ,no. 12(40.50g),no.13(37.48g) and number 16 (40.71g) in pedigree method

6- For number of Spikes/plant the results indicated that the pedigree method produced more superior lines followed by bulk and then by SSD compared to the best parent and cheek (Sids12) or average over lines with 2, 3,11,13 and 16; 1,7,15 and 16; 9 lines, respectively..

7- Regarding 1000-kernel/weight, 2,13,14 and 16; zero; and zero lines showed, significant higher values than the best

parent and two cheek (Sids1 & Sids12) and average over lines for bulk, pedigree and SSD methods, respectively. The heaviest line was number 13 (62.88) followed by line number 1(62.76) and then by line number 14 (60.55) and line number 16(59.73) in pedigree method

8- For number of kernels/spike, four lines showed significant higher kernels number than the average of all lines or best parent and two cheek (Sids1 & Sids12) pedigree breeding method and SSD breeding method. The line number 2 and 12 in pedigree breeding method and the line number 2 and 4 in SSD method gave the highest number of kernels/spike.

B-2-b- selection criteria:

1- Mean squares for selection criteria *i.e*. number of spikes/plant, 1000-kernel weight, number of kernels/spike (indirect selection), and high grain yield/plant (direct selection) were significant.

2- Generally, the indirect selection of grain yield/plant gave the highest grain yield/plant, but without superiority of grain yield per plant. The second number of spikes/plant followed by for 1000-kernel weight

3- Concerning number of spikes/plant, the selection method of high number of spikes/plant exhibited significantly higher value of this trait followed by high grain yield/plant. While, selection of high number of kernels/spike gave the lowest one

4- The best lines were number 4 when selecting plants with high grain yield per plant, number 15 and 19 when selected for number of spikes/plant.

5- Regarding grain yield/plant the range of selected lines ranged from 17.89g to 41.16g; 21.68g to 40.56g; 15.97g to 36.99g and 18.22g to 33.84g when selection plants with heavier grain yield per plant, number of spike per plant, number of kernels per spike, 1000- kernel weight, respectively. Also, one, two, zero and zero lines significantly surpassed higher grain yield per plant about the best cultivar Sids1, respectively, in the same order.

6- The comparison between selection criteria indicated that selection for grain yield/plant, number of spikes/plant and1000-grain weight, were more efficient in breeding for word superior yielding F_5 lines.It could be concluded that selection for grain yield/plant (direct selection) three successive generations was successful in improving the mean grain yield in the F_5 lines.