Direct and indirect selection for grain yield on durum wheat in the lower egypt

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The present investigation was carried out at Esmalia Agric. Res. Station. Agric. Res. Center, Egypt, during the four winter seasons of 1999/2000, 2000/2001, 2001/2002 and 2002/2003.The objective of the present investigation was to study the response to selection in four durum wheat populations under new lands, East of Delta using the pedigree selection method with 10% selection intensity and direct and indirect selection for grain yield, also to study genetic components of variability via F2, F3, F4 and F5 generations.The materials used in this study were four wheat populations as follows:1.Bani Sweif 1 x Sohag 12.Bani Sweif 3 x Sohag 23.Bani Sweif 3 x Sohag 34.Bani Sweif 2 x Sohag 3The F2 plants were used as a base population for selection to derive F3, F4 and F5 generations.The studied traits were as follows;1.Number of spikes / plant2.Number of kernels / spike3.100- kernel weight (g)4.Grain yield / plant (g)The results obtained from the present study are summarized in the following : A- Genetic attributes and effect of selection in early generation: Grain yields and its components : A.1- Number of spikes / plant :The actual response to selection were 121, 49, 20 and 104 in the F3 generations compared with 11, 6, 32, and 39% in the F4 generation in the four populations, respectively .The Genetic analysis revealed that dominance and non- additive genetic variance condition the inheritance of number of spikes/plant in all four populations and in full agreement with combining ability, which showed very low GCA/SCA (0.542). A.2- Number of kernels / spike :Results show increase in number of kernels/spike in response to selection of 74, 61, 67 and 59%, in F3, compared with 58, 40, 65 and 72 for F4 of the four populations, respectively . Genetic analysis revealed the prevalence of additive genetic variance except the third one, which showed both types with prevalence of non-additive gene action. In support of these results, GCA/SCA ratio of this trait was 3.128, i.e. more than unity. Populations 2 and 4 showed positively highSo values.A.3-1000- kernel weight (g):The 1000-kernels weight showed 50, 109, 26 and 36% excess in kernel weight in F3, compared with 15, 68, 14, 20% for F4 of the four populations, respectively. The results of genetic analysis revealed non-additive genetic variance in populations 1,2 and 4. Additive gene effects were detected in population 3. In this respect, GCA/SCA was not far below unity (0.682) and all of the recommended populations accounted for positive S1 values. A.4-Grain yield / plant (g):The results showed that the actual responses to selection for grain yield were 18, 99, 171 and 133. In F3, compared with 91, 25, 139, 180 for F4 generation in the four populations, respectively. The results revealed the prevalence that additive genetic variance in population 2 and 4. While the dominance effects were in populations 1 and 3 as resulted from their respective S1 values. B- Direct and indirect selection : B.1- The first population (Bani Sweif 1 x Sohag 1):Mean squares pertaining to the four selection criteria; no. of spikes/ plant, no. of kernels/spike, 1000-kernel weight and grain yield / plant were significant.Selection for high no. of spikes / plant gave the highest no. of spikes / plant and grain yield / plant followed by high grain yield / plant.Regarding grain yield / plant, the range of selected lines ranged from 6.49 to 11.23; 5.79 to 10.71; 6.44 to 10.09 and 6.26 to 10.09 when plants with selecting high no. of spikes / plant, no.of kernels / spike, 1000-kernel weight and grain yield / plant, respectively.Therefore that selection for high no. of spikes / plant inthe three successive generations was successful for improving grain yield / plant. B.2- The second population (Banff Sweif 3 x Sohag 2):Mean squares pertaining selection criteria i.e., number of spikes/plant, no. of kernels/ spike, 1000-kernel weight (indirectselection) and

grain yield / plant (direct selection) were significant.Selection of high number of kernels / spike gave the highest no. of kernels / spike, number of spikes and grain yield/ plant. In addition, selection of spikes/plant exhibiting the highestno. of spikes/plant gave the highest no. of spikes and grain yield/plant.Concerning the effect of selection based on grain yield / plant, the selection of heavier grain index gave significant highest grain yield / plants followed by selection of high no. of kernels / spike, then by selection of high no. of spikes / plant.Regarding grain yield / plant, selected lines ranged from 5.68 to 10.54; 5.70 to 10.29; 6.41 to 12.36 and 5.46 to 10.24 when selection was practiced for plants with high no. of spikes /plant, no. of kernels / spike, 1000-grain weight and grain yield / plant, respectively.Results suggest, in total that indirect selection for yield via high no. of kernels/spike and heavy seed index were more efficient than direct selection for yield per se. B.3- The third population (Bani Sweif 3 x Sohag 3):Mean squares accounted with the four selection criteria i.e., number of spikes/plant, no. of kernels/ spike, 1000-kernel weight (indirect selection) and grain yield / plant (direct selection) were significant.With respect to the effect of selection based on 1000-kernel weight, the results revealed that selection for 1000-kernel weight gave significantly heavier seed index followed by selection for high no. of spikes / plant. However, selection of high no. of kernels / spike gave the lowest one.For grain yield / plant, the selection for heavier seed index and high number of spikes / plant resulted in significantly higher values of this trait. However, selection for high no. of kernels and high grain yield / plant gave the lowest one.Regarding grain yield / plant, the range of selected lines was from 4.23 to 7.81; 4.26 to 6.95; 5.32 to 6.97 and 3.87 to 6.80 when selection was practiced for plant with high no. of spikes / plant, no. kernels / spike, heavy seed index and high grain yield, plant, respectively.It could be concluded that selection of high no. of spikes / plant and heavier seed index gave the highest mean values of grain yield/ plant.B.4- Fourth population(Banff Sweif 2 x Soha 2•Mean squares relesant to the four selection criteria i.e., number of spikes/plant, no. of kernels/ spike, 1000-kernel weight(indirect selection) and grain yield / plant (direct selection) were significant.The highest no. of spikes / plant was recorded fromselection for high no. of spikes / plant followed by selection to high grain yield / plant.Selection for no., of kernels/spike, the selection of high no. of kernels/ spike gave significantly higher value followed by selection based on pertaining heavier seed index. However, the selection of high no. of spikes / plant gave the lowest one.For grain yield/ plant, the selection for heavier seed index resulted in significantly higher value of this trait, followed by either selecting plants with high no. of kernels or grain yield /plant. However, selection of high no. of spikes / plant gave the lowest one.Regarding grain yield / plant, the range of selected lines was from 4.35 to 6.48; 3.38 to 7.48; 4.71 to 7.38 and 4.07 to 6.92 when selecting plants with high no. of spikes / plant, no. ofkernel / spike, 1000-kernel weight and grain yield / plant, respectively.