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SUMMARY

The present investigation was carried out at Kom-Ombo Agric. Res. Stat., Agric. Res. Center during the three growing seasons of 1999/2000, 2000/2001 and 2001/2002. The objectives of this work were to: 1) study the response to direct selection for early heading and grain yield under early and late planting. 2) estimate the correlated response of the other studied traits. 3) study the relative merits of pedigree selection in changing the mean of selection criterion in a high and low environment (early and late plantings) and their effects on the sensitivity of the selected families.

The basic materials used in this study consisted of 120 F3 families stemmed from cross between two lines (C. 271 x INIA SIB/PAK) and (KI34(60)/4/TOB/BMAN//BB/3/CAL) of bread wheat.

In 1999/2000 season, the 120 F3 families as well as the F3 bulk, parents and local check (Giza 164) were grown at the two sowing dates (20th, of November and 20th of December). The earliest 24 families and the highest 24 families in grain yield were selected under the two sowing dates.

In 2000/2001 season, the earliest 24 families and highest 24 families in yield which were originally selected under early planting were grown under early planting (18th of November). While, the earliest 24 families and the highest 24 families in yield which were selected under late planting were grown under late planting (16th of December). The earliest 6 families and the highest 6 families in grain yield were selected under the two sowing dates.

In 2001/2002 season, the F3 bulk, F5 unselected, parents, the check cultivar; Giza 164 and 12 selected families for earliness (6 families from early and 6 families from late planting) as well as 12 selected families in grain yield (6 families from early and 6 families from late planting) were grown under early planting (19th of November) and late planting (19th of December).

The results could be summarized as follows:

I. Evaluation of base population:

I.1. The analysis of variance revealed that significant differences among F3 families for heading date, plant height, yield and its components under early and late sowing dates.

I.2. The average of characters was 86.32 and 77.69 days for heading date, 100.31 and 95.93 cm for plant height, 7.46 and 5.97 spikes/plant for no. of spikes/plant, 50.69 and 43.94 for no. of kernels/spike, 52.77 and 49.56 gm for 1000 kernel weight, 18.04 and 16.74 for no. of spikelets/spike, 43.0 and 36.24 g/plant for biological yield/plant and 14.61 and 11.58 g/plant for grain yield/plant under early and late planting, respectively.

I.3. The results indicate that the phenotypic and genotypic coefficients of variability were 5.84 and 5.75% for heading date, 10.40 and 10.35% for plant height, 18.53 and 17.32% for no. of spikes/plant, 12.90 and 12.47% for no. of kernels/spike, 9.38 and 9.20% for 1000-kernel weight, 7.64 and 6.74% for no. of spikelets/spike, 10.97 and 10.54% for biological yield/plant and 14.32 and 13.22% for grain yield/plant under early planting, while they were 6.29 and 6.14% for heading date, 10.85 and 10.78% for plant height, 19.89 and 18.53% for no. of spikes/plant, 13.20 and 12.73% for no. of kernels/spike, 9.49 and 9.18% for 1000 kernel weight, 7.32 and 6.41% for no. of spikelets/spike, 12.46 and 11.94% for biological yield/plant and 17.80 and 15.13% for grain yield/plant under late planting. The foregoing results for estimates of the phenotypic and genotypic coefficients of variation indicate the presence of sufficient variability for days to heading and grain yield, indicating that selection among the F3 families could be effective for this characters.

I.4. Heritability estimates in broad sense were 96.90 and 95.10% for heading date, 99.10 and 98.70% for plant height, 87.40 and 86.50% for no. of spikes/plant, 93.50 and 93.00% for no. of kernels/spike, 96.0 and 93.50% for 1000 kernel weight, 77.90 and 76.70% for no. of spikelets/ spike, 92.20 and 91.70% for biological yield/plant and 85.20 and 72.20% for grain yield/plant under early and late sowing dates, respectively.

I.5. The results of phenotypic and genotypic correlation between heading date and other traits under early planting indicate negative phenotypic and genetic correlations with all studied traits under early and late planting while, phenotypic and genotypic correlations between grain yield/plant and all studied traits were positive for all studied traits except heading date and plant height under early and late planting.

II. Direct and indirect response to selection for earliness under early and late planting:

II.1. The results indicate that phenotypic and genotypic coefficients of variability for days to heading under early planting were (5.84 and 5.75%), (3.83 and 3.59%) and (1.39 and 1.29%) for F3 families, first cycle and second cycle of selection, respectively. While, they were (6.29 and 6.14%), (3.99 and 3.63%) and (1.67 and 1.47%) under late planting for F3 families (C0), first cycle (C1) and second cycle (C2), respectively. These results appears that C0 and C1 possessed considerable amount of genetic variation more than that exist in the C2 cycle for heading date.

II.2. Heritability in broad sense under early and late planting was (96.9 and 95.1%), (88.0 and 82.8%) and (86.1 and 77.9%) for F3 families (C0), first cycle (C1) and second cycle (C2), respectively.

II.3. After two cycles of pedigree selection for earliness the observed response towards earliness was -14.03 and -17.49% under early and late planting, respectively measured as % deviation from the F3 bulk and -7.05 and -10.64% under early and late planting, respectively measured as % deviation from the earlier parent. Direct selection for early heading under early planting was accompanied with a decrease of (2.50, 6.19%) for plant height, (4.94, 24.30%) for no. of spikes/plant, (3.09, 14.86%), for no. of kernels/spike, (3.32, 19.04%) for 1000 kernel weight, (5.0, 9.08%) for no. of spikelets/spike, (4.96, 6.29%) for biological yield/plant and (12.93, 13.66%) for grain yield/plant after the first and second cycle, respectively compared with F3 bulk. The percentage of reduction ranged

from 7.34% for plant height to 27.07% for no. of spikes/plant compared to the earlier parent after two cycles of selection under early planting. While, direct selection for earliness under late planting was accompanied with a decrease of (3.23, 3.55%) for plant height, (16.52, 28.36%) for no. of spikes/plant, (12.92, 21.31%) for no. of kernels/spike, (0.95, 9.73%) for 1000 kernel weight (3.69, 4.38%) for no. of spikelets/spike, (1.73, 3.37%) for biological yield/plant and (17.0, 19.15%) for grain yield/plant after the first and second cycle of selection, respectively compared with F3 bulk. The percentage of reduction ranged from 4.32% for biological yield/plant to 27.25% for no. of kernels/spike compared to the earlier parent after two cycles of selection.

III. Direct and indirect response to selection for grain yield under early and late planting:

III.1. The results indicate that phenotypic and genotypic coefficients of variability for grain yield/plant under early planting were (14.32 and 13.22%), (6.85 and 5.28%) and (1.47 and 1.08%) for F3 families, first cycle and second cycle of selection, respectively. While, they were (17.80 and 15.13%), (5.71 and 4.10%) and (0.96 and 0.62%) under late planting for F3 families, first cycle and second cycle, respectively. These results indicate that C0 and C1 possessed considerable amount of genetic variation more than that exist in the C2 cycle for grain yield/plant.

III.2. Heritability in broad sense under early and late planting was (85.2 and 72.2%), (59.4 and 51.5%) and (54.5 and 41.2%) for F3 families (C0), first cycle (C1) and second cycle (C2), respectively.

III.3. After two cycles of pedigree selection for grain yield/plant the observed response was 20.21 and 18.47% under early and late planting, respectively, measured as deviation from the F3 bulk and 7.62 and 7.54% under early and late planting, respectively, measured as % deviation from the better parent. Direct selection for grain yield/plant under early planting was accompanied with an increase of (4.12, 6.91%) for heading date, (15.52, 19.79%) for no. of spikes/plant, (7.45, 16.35%) for no. of kernels/spike, (10.78, 12.04%) for 1000 kernel weight, (14.38, 17.25%)

for no. of spikelets/spike and (12.22, 12.62%) for biological yield/plant after the first and second cycle, respectively compared with F3 bulk. The percentage of increase ranged from 2.82% for no. of spikelets/spike to 16.44% for no. of spikes/plant compared to the better parent after two cycles of selection under early planting. While, direct selection for grain yield/plant under late planting was accompanied with an increase of (4.41, 4.97%) for heading date, (10.31, 13.63%) for no. of spikes/plant, (5.26, 9.56%) for no. of kernels/spike, (9.81, 13.17%) for 1000-kernel weight, (12.58, 14.0%) for no. of spikelets/spike and (12.05, 16.82%) for biological yield/plant after the first and second cycle, respectively compared with F3 bulk. The percentage of increase ranged from 2.0 for no. of spikelets/spike to 15.58% for biological yield/plant compared to the better parent after two cycle of selection.

IV. Environmental sensitivity:

1 - The results indicate that selection for early heading under early planing was superior when genotypes evaluated under early planting while selection under late planting was superior when genotypes evaluated under late planting. Also, pedigree selection was effective in breeding for earliness.

Selection for earliness under early planting (antagonistic selection) decreased sensitivity of the selected families while, selection under late planting (synergistic selection) increased the sensitivity.

2 - The results indicate that selection response for grain yield/plant under late planting was better than early planting when selection was made under late planting, also pedigree selection was effective in breeding for improving grain yield for population under studied.

Selection fog grain yield at early planting (synergistic selection) increased sensitivity of the selected families, while selection at late planting (antagonistic selection) decreased the sensitivity.