

Inheritance of yield and its components in long spike wheat

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V- SUMMARY This work was undertaken to study heterosis, combining ability as well as genetic components for some important traits in wheat. To achieve the target of this work six wheat genotypes namely Sids 4 (long spike, early) Sakha 69 (normal), Sakha 93 (normal, new), Gemmiza 7 (long spike), Gemmiza 9 (normal, late), and Giza 168 (new) were crossed in diallel system in 2001/2002 season. The resultant F1 were evaluated in 2002/2003 season under two nitrogen levels (40 and 70 kg N/fed). The experiment design was Randomized Complete blocks with four replications. Two adjacent experiments were conducted fertilized by two nitrogen levels respectively. Combining ability analysis was done according to Griffing (1956) and genetic components were estimated according to Hayman (1954-b). The following traits studied were days to heading, days to maturity, flag leaf area, plant height, no. of spikes/plant, spike length, no. of spikelets/spike, no. of grains/spike, grain weight/spike, 100-kernel weight, grain weight/plant and total yield/plant. Results indicated significant differences among genotypes for all studied traits under the two nitrogen levels and their combined analysis. However, no significant genotypes X nitrogen interaction was detected. A significant mean squares due to parents and hybrids were detected for most traits in each nitrogen levels and the combined data. The best performing parents were P1 (Sids 4) for heading date, maturity date, plant height, spike length, no. of grains/spike, grain weight /spike, and 100-grain weight, P2 (Sakha 69) for number of spikes/plant, P4 (Gemmiza 7) for flag leaf area, total yield /plant, P5 (Gemmiza 9) for number of spikelets/spike and grain weight/plant. The fifteen hybrids showed significant differences in all traits, under both nitrogen levels, and the combined data, except for grain yield /plant. Regarding mean performance the best crosses were:-- P1 X P3 (Sids 4 X Sakha 93) for early heading and maturity dates.- P1 X P4 (Sids 4 X Gemmiza 7) for spike length, grain weight/spike and 100- grain weight.-P4 X P5 (Gemmiza 7 X Gemmiza 9) for plant height and no. of spikelets /spike.-P2 X P6 (Sakha 69 X Giza 168) for no. of spikes /plant and total yield.-P4 X P6 (Gemmiza 7 X Giza 168) for flag leaf area, number of grains/spike, and grain weight /plant. Significant heterotic effects could be detected through significant parents vs. crosses mean squares for most traits which significant interaction between parents vs. crosses and nitrogen applications for two traits only, i. e., flag leaf area and grain weight /spike. No cross did show negative heterosis for days to heading or days to maturity, neither over mid- parent nor over better parent. Flag leaf area showed mid- parent heterosis for 5, 8, 6 crosses at first and second nitrogen levels and the combined data, respectively, compared to 4, 4 and 4 for better parent heterosis. The best performing one was P3 X P5 (Sakha 93 X Gemmiza 9) with 22.04% heterosis. Grain weight /plant exhibited mid- parental heterosis in 7, 10 and 8 crosses for the two nitrogen levels and in the combined data, respectively, as compared with 1, 2 and 1 cross for better parent heterosis. The best performing cross was P1 X P3 (Sids 4 X Sakha 93) with 23.73% heterosis over better parent. Plant height showed in 4 crosses mid- parental heterosis in the combined analysis of both nitrogen levels as compared with only one cross i. e., P1 X P6 (Sids 4 X Giza 168) showing 3.31% better parental heterosis at second nitrogen level. For no. of spikes /plant, mid- parental heterosis was detected in 5 crosses. No heterosis was detected over better parent. Mid- parental heterosis for spike length was detected in 6 crosses as compared to one cross only, i. e., P5 X P6 (Gemmiza 9 X Giza 168) which showed 3.00% heterosis over the better

parent .For no. of spikelets /spike, 4 crosses showed mid-parental heterosis, as compared with only two crosses showing heterosis over the better parents. The best cross was P IX P3 (Sids 4X Sakha 93) which gave 2.28% extra spikelets /spike. Most crosses showed mid- parental heterosis for 100 —grain weight. The highest performing one was P2 X P3(Sakha 69XSakha 93)which recorded 19.65% extra weight over the better parent .For grains weight /spike nine crosses showed mid —parental heterosis as compared with 4 crosses for better parental one . The highest value was recorded for P2 X P3 (Sakha 69 X Sakha 93) with 15.93% more than the better parent, in full agreement with its performance in 100 — grain weight .Summary94Eight crosses showed mid — parental heterosis for grain weight/plant, as compared with three crosses, i. e., P1 X P3 (Sids 4 X Sakha 93) recording 23.73% extra yield over the better parent .No type of valuable heterotic effect could be detected for total yield/plant, number of spikes/plant and number of grains /spike for better parent.Both general and specific combining ability were detected in most cases, where G.C.A/S.C.A ratios were largely exceeding the unity indicating the important roles of additive and additive X additive types of gene action, than non- additive type.Regarding general effects of combining ability, the P1(Sids 4) was the best general combiner for earliness (heading and maturity) and the yield components, i.e. number of grains /spike, grain weight /spike and 100 — grain weight , in addition to long spike. The other parents showed lower effects, e. g. parent P2 (Sakha 69) for number of spikes /plant, P3 (Sakha 93) for short stems, P4 (Gemmiza 7) for flag leaf area and plant height, P5 (Gemmiza 9) for no. of spikelets/ spike and total yield/plant, and P6 (Giza 168) for grain weight /plant.Valuable specific effects were detected for large flag leaf area, grain weight/spike, 100- grain weight and short stems in P3 X P5 (Sakha 93 X Gemmiza 9), for tallness in P1X P3 (Sids 4 X Sakha 93), for longer spikes in P5 X P6 (Gemmiza 9 X Giza 168), for more grains /spike in P2XP3 (Sakha 69 X Sakha 93), for higher grain weight /plant in P1XP2 (Sids 4 X Sakha 69).Thus, the best performing crosses may be P3 X P5 (Sakha 93 X Gemmiza 9) for large flag leaf area, short stems, spike yield and heavy kernels, being followed byP1X P2 (Sids 4 X Sakha 69)Summary95for grains weight /plant and P1X P3 (Sids 4 X Sakha 93) for tallness.Genetic analysis, based on Haymans principles indicated prevalence of additive gene action (D) for all studied traits except total yield/plant. This result was supported by high to moderate heritability estimates for most traits under both nitrogen levels and the ratio $(D/HI)Y'$ was greater than unity for most cases. H1 suggested significantly existence of dominance component for all traits, except days to heading, no. of spikelets /spike and total yield/plant at both nitrogen levels, and no. of spikes /plant and grain weight /plant under the second nitrogen level.The ratio $(HUD) 14$, as a measure of average degree of dominance over all loci, indicated:- Partial dominance for all traits except grain weight /spike at the first nitrogen level and grain weight /plant and total yield/plant at both levels.- Absent dominance for grain weight /plant at the second nitrogen level.- Complete dominance for grain weight /spike at the first nitrogen level and no. of grains /spike at the second nitrogen level.- Over dominance for no. of grains /spike and grain weight /plantat first nitrogen level and total yield /plant at both nitrogen levels .- $(H2)$ values, being less than H1, indicated unequal frequencies of both positive and negative alleles for all traits.- The two ratios $H2 / 4H1$ and $[(4DHI)'' + F] / [(4DH1)^{1/2} - F]$ indicated unequal distribution of both positive and negative alleles among parents for all traits, except days to heading.- The positive values of (F) showed the excess of dominance alleles in the parental populations for all traits.Summary96- $(h2)$ estimates indicated dominance due to heterozygosis, and that dominance was unidirectional in all traitsSummary97