# Improving production under saliine and drought conditions by using diallel crossing system

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The first stucjyAwation The main objective of this investigation was to determine the extent of heterosis and combining ability estimates and their interactions with two environments (non-stress and stress irrigation treatments) for some growth and yield characters, i.e. plant height, flag leaf area, number of spikes/plant, number of kernels/spike, 1000-kernel weight, straw yield/plant, grain yield/plant, biological yield and harvest index. The five drought measurements, i.e. stomatal resistance (SR), transpiration rate (TR), leaf temperature (LT), relative water content (RWC) and Potassium content (K+) were estimated.Also, the susceptibility index (SI) was calculated for the two experiments (non-stress and stress irrigation) from origin data for yield and yield components before, using a generalized formula (Saulescu et al. 1995).Seven parental varieties and/or lines namely Yacora Rojo (P 1), Sham-6 (P2), ICARDA-3 (P3), Giza-168 (P4), Sakha-93 (P5), Gemmiza-7 (P6) and line-606 (P7) representing wide rang of variability in most of the studied traits were utilized.Crossing among the parental materials by half diallel system was initiated at 2002/03 season. In 2003/04 growing season, two experiments were conducted in the headquarters of Desert Research Center (DRC), each experiment include the seven parents and their 21 F1 hybrids, which were sown on 20th November, 2003 in a randomized complete block design (RCBD) with three replications. Each plot consisted of one row; three meters long with 10 cm. between rows and plants within row were 10 cm. apart allowing a total of 30 plants per plot. The dry method of planting was used in this concern. The two experiments were planted in two adjacent fields to avoid the differences in soil productivity. The first experiment was irrigated when the field capacity was 60% depletion of the available soil moisture and the second experiment was irrigated when the field capacity was 40% depletion of the available soil moisture. The other agricultural practices were carried out as usual in the conventional wheat fields. Data were recorded on ten plants chosen at random fromeach plot An ordinary analysis of variance was firstly performed for each experiment, and then a combined analysis was carried out whenever homogeneity of error variances was realized. Bartlett’s test of homogeneity of variance was used, Heterosis was computed mean squares and as the percentage deviation of F1 mean performance from either the mid-parent or the better parent mean (BP) average values for each individual cross. General and specific combining ability estimates were obtained by employing Griffin’s (1956) diallel cross analysis designated as a model-1 method-2.The results obtained can be summarized as follows: A- The First studyIL’i generationi:.A.1. Growth, yield and its components:A.1.1. Analysis of variances, means and heterosis:-1-Irrigation treatments mean squares were significant for all studied traits. The mean values of all studied traits increased significantly with non-stress compared with stress condition.2-Highly significant genotypes mean squares were obtained for all studied traits in separate irrigation treatments as well as the combined analysis. Significant genotypes X environment interaction mean squares were detected for all studied traits.3-Mean squares due to parents were significant for all studied traits. Significant mean squares due to interaction between parental varieties and irrigation treatments were detected for all the studied traits except plant height and no. of spikes/plant.4-The parental variety Gemmiza-7 (P6) exhibited the highest values for plant height and 1000-kernel weight. While, it gave the lowest values for no. of spikes/plant, and harvest index. Meanwhile, it almost expressed moderate values for the most of other traits.5-The parental

line-606 (P7) expressed the highest values for flag leaf area, no. of spikes/plant, straw, grain and biological yield/plant. However, it gave moderate values for the most of other traits, 6-Crosses mean squares were significant for all studied traits under both environments as well as the combined analysis, revealing an over all differences between these hybrids. Significant mean squares due to interaction between crosses and environments were detected for all the studied traits, 7-The two crosses Sham-6 (P2) x Sakha-93 (P5) and Sham-6 (P2) x Gemmiza-7 (P6) in the combined analysis had the highest grain yield/plant. The high grain yield/plant of the both crosses could be attributed to the high no. of spikes/plant, no. of kernels/spike and 1000-kernel weight.8-Mean squares for parents vs. crosses as an indication to average heterosis overall crosses was significant for all traits in both treatments as well as the combined analysis, except flag leaf area and harvest index in the combined analysis and the non stress experiment, respectively. Significant mean squares due to interaction between parents vs. crosses and environments were detected for all traits except plant height, no. of kernels/spike, 1000-kernel weight and straw yield/plant, 9-Regarding grain yield/plant, the highest desirable heterotic effects relative to better-parent were detected for the crosses Yacora Rojo (P1) x Gemmiza-7 (P6), Sham-6 (P,) x Sakha-93 (P5), Sham-6 (P2) x Gemmiza- 7 (P6) and ICARDA-3 (P3) x Gemmiza-7 (P6) in the combined data, A.1.2. Combining ability : 1-The mean squares associated with general combining ability (GCA) and specific combining ability (SCA) were highly significant for all the studied traits, 2-The mean squares of interaction between irrigation treatments and general combining ability were significant for all traits except plant height and no. of spikes/plant. Significant mean squares of interaction between specific combining ability and irrigation treatments were obtained for all the studied traits, 3-Low GCA/SCA ratio of less than unity were obtained for number of spikes/plant, in both irrigation treatments as well as the combined analysis, no. of kernels/spike and grain yield/plant in normal irrigation as well as the combined analysis and straw and biological yields/plant and harvest index in stress irrigation treatment as well as the combined analysis. On the other hand, high GCA/SCA ratio which exceeded the unity was detected for other cases.4-The ratio of SCA x irrigation treatment/SCA was much higher than ratio of GCA x irrigation treatment/GCA for all traits except straw and biological yields/plant and harvest5-The parental line Line-606 (P7) could be considered the best combiner for grain, straw and biological yields, 1000-kernel weight, no. of spikes/plant, flag leaf area and higher plant in stress irrigation treatment.6- The combination Sham-6 (P2) x Sakha-93 (P5) expressed significant positive So effects for yield and some of its components. Therefore, this cross seemed to be the best combinations for breeding towards high potentiality under drought conditions. A.2. Drought measurements : A.2.1. Analysis of variance, means and heterosis : 1-Irrigation mean squares were highly significant for all the studied traits. Except for TR and RWC, mean values of stress condition for all drought measurements were higher than those of normal irrigation, 2-Means squares for genotypes, parents, crosses and parent vs. crosses were significant for all traits in both environments as well as the combined analysis, except parents' mean square for LTDF in stress condition, parent vs. crosses for SRDF in the combined analysis and TRDF, LTDF and RWC in stress condition, 3-Genotypes x irrigation, parent x irrigation, Flx irrigation and parent vs. crossesx irrigation were significant for all traits except parent x irrigation for LTDF, crosses x irrigation for SRDF and parent vs. crossesx irrigation for LTDF and Icf content. 4-Mean squares for parent vs. crosses as an indication to average heterosis overall crosses were significant for all drought measurements in both irrigation treatments as well as the combined analysis, except SR in the combined analysis, TR, LT and RWC in stress condition., A.2.2. Combining ability:1-The mean squares associated with (GCA) were significant for all drought measurements in both irrigation treatments as well as the combined analysis except stomatal resistance (SR), leaf temperature (LT) and Potassium content (K) in stress irrigation. While, mean squares due to (SCA) were significant for all drought measurements under study. 2-Low GCA/SCA ratios of less than unity were obtained stomatal resistance (SR) in stress irrigation as well as the combined analysis, transpiration rate (TR) in both irrigation treatments as well as the combined analysis, (RWC) in normal irrigation and potassium content (K+) in the stress conditions. On the other hand, high GCA/SCA ratio, which exceeded than the unity were obtained for other cases. 3-With the exception of (SR) and (TR), it is fairly evident that ratios for SCA xE/SCA was much higher than ratios of GCA x E/GCA for other

drought measurements, 4-The variety ICARDA-3 (P3) expressed significant positive gi effects for stomatal resistance (SR), relative water content (RWC), and potassium content (K+) in the normal irrigation as well as the combined analysis. Also, it seemed to be the best combiner for leaf temperature well as the combined analysis, except SR in the combined analysis, TR, LT and RWC in stress condition. A.2.2. Combining ability: 4- The cross Giza-168 (P4) x Sakha-93 (P5) exhibited the best desirable susceptibility index to drought resistance for most yield and its components.A.3.2. Combining ability : 1-The variance associated with general and specific combining ability were highly significant for SI in all traits except GCA for number of spikes/plant.2-With the exception of Si for 1000-kernel weight low GCA/SCA ratios of less than unity were detected for all .