

**GENETIC STUDIES ON MALTING PRODUCTIVITY AND  
YIELD COMPONENTS OF SOME BARLEY GENOTYPES**

**By**

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#### ABSTRACT

This study was carried out in 2011/2012, 2012/2013 and 2013/2014 seasons at the Agricultural Research center, Giza Governorate, Egypt. The aims were to identify superior parents and cross combinations from 5x5 half diallel cross system of barley parental genotypes and estimates of combining ability effects, heterosis and to determine the mode of inheritance for some agronomic and yield traits. In addition Inter Retrotransposon Amplified Polymorphism (IRAP) was adopted in this study to identify the studied genotypes which were originally selected from the malting barley collection. Results of analysis of variance for the studied traits of 15 genotypes (5 parents + 10 F<sub>1</sub> crosses) indicated that mean squares due to genotypes (G) was highly significant for all studied traits, except spike length, No. of grains/plant and grain yield/plant. Mean squares of genotypes were partitioned into parents (P), F<sub>1</sub> crosses (C) and P vs. C. Mean squares due to (P) and (C) were significant ( $P \leq 0.05$  or  $P \leq 0.01$ ) for all studied traits, except spike length, No of grains/plant and grain yield/plant. However, P vs. C was highly significant for days to heading, plant height, No. of spikes/plant and 1000 kernel weight, indicating significant heterosis for these traits. The ratio of GCA/SCA exceeded the unity, suggesting that additive was much larger and more important than non-additive gene effects for days to heading, No. of tillers/plant, spike length, No. of spikes/plant, No. of grains/plant, grain yield/plant, and biological yield/plant. Some crosses showed significant desirable heterosis for all studied traits. It is interesting to mention that two crosses showed a positive heterosis (Al-Ahram x Grace and Al-Ahram x Shakirs) for grain yield/plant and biological yield/plant. It is interesting to mention that the high positive heterosis in grain yield/plant was associated with high positive heterosis in days to heading, days to maturity, No. of tillers/plant, No. of spikes/plant and No. of grains/spike. The crosses showing the best heterosis could be recommended to improve the respective traits. For yield attributes the largest positive (favorable) GCA effects were exhibited by Marny for spike length, No. of grains/spike and 1000-kernel weight, Shakira for No. of spikes/plant and Sckarlet for 1000 kernel weight. It is interesting to note that the cross Al-Ahram X Shakira and Sckarlet x Marny showed superiority in SCA effects for most of yield attributes. Twenty four IRAP primers were tested for multi-locus fingerprints using retro-elements based markers. Fifteen out of them were informative and revealed the genetic polymorphism among the 5 barley parental genotypes. IRAP primers produced 109 bands; 83 of these were polymorphic and 26 monomorphic. Primer IRAP-695 gave the highest number of bands (19) while primer IRAP-1372 gave the lowest number (2). Percentage of polymorphic bands ranged 0 and 100 %. The number of polymorphic amplicons per primer ranged from zero and 16 bands. The average number of amplicons per primer across the five genotypes was 7.26 and for polymorphic amplicons were 5.53. IRAP analysis succeeded to produce positive and negative unique markers that helped in genotype discrimination. The cluster analysis resolved the 5 barley genotypes into two main clusters, which is subsequently divided to other groups. The range of pair similarity coefficient among the five barley genotypes ranged from 27.9 to 77.5%. Shakira and Sckarlet were the most divergent genotypes. This could be attributed to fact that the two genotypes possess different ancestors. Genotypes Means of malting traits of 5 barley parental genotypes and their 21 diallel F<sub>1</sub> crosses, differed significantly in all malting traits. The low means for total protein, and the high means for  $\alpha$ -amylase,  $\beta$  amylase starch% and hot water extract% were considered favorable. Only one cross Shakira x Marny showed positive heterosis (favorable) for three malting traits ( $\alpha$ -amylase, starch% and hot water extract %).

**Key words:** Barley, Combining ability, Heterosis, Malting quality and Retrotransposons