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# Heritability and inheritance of grain protein content and other characters in crosses of winter and spring common wheats (*Triticum aestivum* L.)

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Abstract

Two high protein winter wheat lines (F310-C3-4 and F21-76) were crossed direct and reciprocal with two semi-dwarf spring wheat varieties (Pak-70 and Tandojam-75). The parents $F^1$ and $F^2$ generations were studied. The experiment was sown in an irrigated experimental field of Research Institute for Cereals and Industrial Crops, Fundulea, Romania. The experiment was conducted by the two planting dates (Autumn and Spring), in order to study the biological material in two contrasting environments.

The protein content in percentage and absolute protein content per grain are the two characters of complex and polygenic nature of control. The two winter wheat lines are much superior to the spring varieties. The genotype x environment interactions played major role in the expression of grain protein content. In $F^1$ generation the protein percentage showed a partial dominance of the low protein content, whereas, the protein content per grain showed both intermediate and heterosis, depending on environment and genotype.

Seed index (expressed by the weight of 1000 grains) was partially dominant when the experiment was sown in autumn, but showed an apparent heterosis when the experiment was sown in spring. This heterosis was explained by the fact that the spring sown winter parents headed late and did not express their potential to grain size due to poor development of seeds.

Plant height showed partial dominance in the autumn sowing and heterosis in the spring sowing. The earliness (expressed as number of days from planting to heading) and high spike length were about completely dominant in spring sown material, whereas, in the autumn sowing

the degree of dominance proved to be dependent on the specific genotypes. The number of spikelets per spike showed heterosis in all the combination of spring sown and particularly the crosses of a winter line F21-76 with the spring varieties in autumn sowing.

The differences between reciprocal hybrids were small and non-significant in most of the cases. It is concluded that the large genetical and physiological differences, between the winter and spring wheats used in the crosses, did not express at a cytoplasmic level.

Genotype × environment interaction played a major role in expression of most of the characters in winter and spring wheats crosses. This suggests that, while using such crosses, wheat breeders should pay more attention in choosing the appropriate environment for selection.

The heritability values ($h^2$) were quite high for most of the characters. This proves that the $F_2$ generations, of crosses between winter and spring wheats, contain a large genetical variability, which offers great possibilities for selection.