

RELATIONSHIPS BETWEEN GRAIN PROTEIN CONTENT AND YIELD-RELATED TRAITS IN DURUM WHEAT BY QTL MAPPING

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Grain protein content (GPC) is a major trait of the nutritional value and the baking properties of common wheat as well as of the pasta-making technology characteristics of durum wheat. In the last decades obtaining wheat cultivars with higher protein content has been one of breeders' greatest concerns. GPC is a typical quantitative trait controlled by a complex genetic system and influenced by environmental factors and management practices. Nevertheless, the genetic improvement has been restricted by the negative correlation between productivity and GPC found in segregating populations and germplasm collections in all cereals.

To evaluate the genetic interrelationships between GPC and grain yield per spike, thousand-kernel weight, plant height and heading time, quantitative trait loci (QTL) for GPC were mapped using GPC adjusted data in a covariance analysis on yield components. Phenotypic data were evaluated in a segregating population of 144 recombinant inbred lines derived from crossing two different durum wheat lines and evaluated at four environments in southern Italy. QTL were determined by composite interval mapping based on a linkage map obtained with 5,942 SNP markers. The close relationship between GPC and yield components was reflected in the negative correlation between the traits and in the reduction of variance when GPC values were adjusted to yield components. Five independent genomic regions involved in

the expression of GPC were detected, three of which were associated with QTL for one or more grain yield related traits. QTL alleles with increased GPC effects were associated with QTL alleles with decreased effects on one or more yield component traits. Two QTL for GPC showed significant effects independently from variation in the yield-related trait. A better understanding of the genetic relationships between grain storage proteins and yield-related traits is of special interest for marker-assisted selection programs aimed at improving wheat quality.