

## GENOME-WIDE ASSOCIATION STUDIES TO IDENTIFY LOCI ASSOCIATED WITH IMMUNOGENIC GLUTEN PROTEINS/EPITOPES

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Gluten matrix is a bio-molecular network of gliadins and glutenins encoded by multiple genes at complex *loci* on durum wheat chromosomes 1 and 6. Gluten is responsible for the rheological properties of the wheat flour dough and therefore contributes to the texture of end-products. Unfortunately, toxic epitopes of gluten proteins are the cause of several digestive disorders, of which the most relevant are Coeliac disease (CD) and Non-Coeliac wheat sensitivity (NCWS). One of the objectives of durum wheat breeding programs is to identify varieties with a lower content of immunogenic gluten, thus reducing toxic epitopes.

Within this motivating context, 79 Italian durum wheat cultivars released from 1915 to 2010 were first phenotyped for two consecutive growing seasons in relation to gluten protein composition and to the presence of immunogenic epitopes, (i.e. peptides generated by simulated gastrointestinal digested) and then genotyped by using the wheat 15K SNP Illumina Infinium assay. Genome-wide association studies were performed using 4 different approaches in order to make robust and reliable SNP-trait associations. Association tests identified SNPs on chromosomes 1A, 2A, 2B, 3A and 6B significantly associated with immunogenic toxic epitopes of gluten, while SNPs associated with gliadins and glutenins composition were detected on chromosomes 1A, 1B, 2B, 5A, 5B, 6A and 6B. Finally, the identified SNPs were mapped on Svevo and Zavitan genomes in order to identify candidate genes.

The insights and resources generated here provide useful information to detect low toxic durum wheat cultivars identify candidate genes related to immunologic mechanisms of digestive disorders and, develop useful molecular markers to select new durum wheat varieties with reduced toxic epitopes.