PHYTOENE SYNTHASE 2 LOCI (PSY2) IN DURUM WHEAT - MOLECULAR CHARACTERIZATION AND DEVELOPMENT OF FUNCTIONAL MARKERS FOR SEMOLINA COLOUR

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phytoene synthase 2, durum wheat, yellow pigment

Yellow pigment content in durum wheat (Triticum turgidum L. ssp. durum) is an essential feature for both pasta yellow color and human health because of antioxidant properties of carotenoids involved in the yellow pigmentation.

Carotenoids are the most important components of semolina yellow pigments and are synthesized through a complex pathway, involving more than 10 enzymatic steps. Phytoene synthase (Psy), catalizing the condensation of two geranylgeranyl pyrophosphate molecules into phytoene, is generally considered the rate-limiting enzyme in carotenoids biosynthesis. In the grass family, triplicated genes were identified and designated as Psy1, Psy2, and Psy3 respectively. Phytoene synthase 1 showed effective association with the yellow pigment (YP) content in wheat grain. Characterization of Psy genes and development of functional markers are important for marker-assisted selection in wheat breeding.

One of the goals of this study is to develop functional markers based on the sequence of Psy2 gene sand to map them in different segregant populations and a set of Chinese Spring nulli-tetrasomic, ditelosomic and deletion lines. To date no full-length DNA sequence of Psy2 has been cloned in either common or durum wheat. With the aim of clarifying the structure of Psy2 gene in the coding sequence region and identifying allelic variants at this locus, the CDS region was sequenced by cloning cDNA and reconstructing the 5’-UTR and 3’-UTR through 5’ and 3’RACE-PCR. The A and B genome loci were easily discriminated by differences in the nucleotide sequence.

Using the reconstructed sequences it will be possible to design primers able to amplify the whole gene sequence, identify different alleles, and determine the association of allelic variants with phenotypic variation for endosperm colour, in segregant populations and collections of wheat cultivars.