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Poster Abstract - F.04

GENETIC MANIPULATION OF STARCH COMPOSITION IN DURUM AND BREAD WHEAT

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Starch, which account for 65-75% of wheat grain dry weight, is the major constituent of flour and semolina. Starch is composed of two different glucan chains, amylose and amylopectin. These polymers have the same basic structure, but they differ in their length and degree of branching. Amylose is an essentially linear polymer of glucosyl residues linked via α-1,4 glucosidic linkages and it is about 20-30% of total starch, whereas amylopectin exists as a branched α-1,4:α-1,6 D-glucan polymer and constitutes the remaining 70-80% of starch. The relative amounts of amylose and amylopectin are responsible for the unique physical and chemical properties of starches. Altering the levels of key enzymes that are directly involved in starch synthesis can influence flour properties. In this work, key enzymes involved in starch synthesis were identified; particularly, the role of five isoforms of starch synthases (SS) was elucidated. Four of these are involved in amylopectin synthesis, along with branching and debranching enzymes; whereas the granule bound starch synthases (GBSSI or waxy proteins) are the sole starch synthase responsible for amylose synthesis in storage tissues. The starch granule proteins (SGP-1) are SS isoforms involved in amylopectin synthesis.

In this work, the molecular characterization of mutated *waxy* loci in bread and durum wheat cultivars was conducted. Primer pairs have been developed that identified the above-mentioned mutations and allowed their molecular description, providing a useful tool for further germplasm screening or marker assisted progeny selection in breeding programs involving the newly identified material. We have found that a complete gene deletion is responsible for a null allele at the *Wx-B1* locus in one bread wheat line, whereas sequencing of the corresponding fragments showed a 724 bp deletion in the *Wx-D1* locus in one line of bread wheat and an insertion of 89 bp in the *Wx-A1* locus in one line of durum wheat, respectively. In addition, nucleotide substitutions and various insertions/deletions ranging from 3 to 30 bp were detected in the PCR fragments of one durum wheat line with a Wx-B1 protein with a different electrophoretic mobility.

In order to investigate the influence of the single alleles and their different combination on the starch properties, a complete set of Near Isogenic Lines (NILs) null for the SGP-1 and waxy proteins, both in bread (N11) and durum (Svevo) wheat, was produced. The pasting properties of these materials have been assessed by RVA (Rapid Visco Analyzer) analysis.