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Characterization of alpha gliadin genes from polyploidy wheat

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Wheat flour is unique because it alone has the ability to form dough that exhibits the rheological properties required for the production of leavened bread. The quality of the flour are determined by the seed storage protein gluten. Gluten consists of two groups of proteins; gliadin and glutenins. Gliadins are a heterogeneous mixture of a monomeric protein. Based on the electrophoretic mobility in acid –PAGE, it is divided into four groups α - , β -, γ - and ω -. The ω - gliadins differ in amino acid composition from other gliadins and are devoid of cysteine residues. The α -gliadin genes are highly variable in a single plant family due to the genetic variation in multigene families which have originated by successive duplication, subsequent divergence and recombinant of the ancestor genes within the families. The objective of the present study was to characterize α -gliadin genes of hexaploid wheat for cloning of a functional α - gliadin gene into a binary vector to develop genetically engineered “wheat like–rice”. PCR amplified gliadin gene was topo cloned in pCR 2.1 vector. Five of the gliadin containing recombinant clones were sequenced. Three clones were found to be pseudogenes. Pseudogenes result from one or more internal stop codons and/or frame shift mutations. All α - gliadins contained four celiac toxic peptide sequences (PSQQ, QQQP, QQPY, and QPYP).

The functional gliadin gene (AC: KC660356) contained six cysteine residues and the other functional gliadin gene (AC: KC660358) contained five cysteine residues. The sixth cysteine was substituted by arginine (TGT to CGT) and is identified as a novel functional α -gliadin gene. Gliadin molecules interact with each other and also with glutenin to form gluten. Thus, α -gliadin containing 5 cysteine residues will form intra-molecular disulfide bonds using 4 cysteine residues. The remaining cysteine residue can make an inter-molecular disulfide bond which may participate in the gluten polymer making.

Keywords: α -Gliadin, gluten, wheat