Comparative study of the α-gliadin genes in diploid and polyploid genomes of wheat

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Introduction

Hexaploid bread wheat originated from the spontaneous hybridization of tetraploid wheat (*Triticum turgidum*, AABB) with a diploid progenitor, *Aegilops tauschii* (DD). The tetraploid wheat was from the hybridization of two diploid progenitors, *Triticum urartu* (AA) and an unconfirmed specie, which donated the BB genome. [1]

Gliadins are gluten proteins associated with celiac disease (CD), a food-sensitive enteropathy caused by the ingestion of gluten from wheat, barley and rye. The most toxic peptide is on an α-gliadin, which contains six overlapping T-cell epitopes with high stimulatory properties [2]. The genes encoding α-gliadins are controlled by the *Gli-2* loci (*Gli-A2*, *Gli-B2*, and *Gli-D2*) present on the short arms of the group 6 chromosomes in bread wheat.

A collection of wheats encompassing the ancestor diploid genomes (AA, BB and DD) and the derived hexaploid (AABBDD) was studied to analyse the evolution of α-gliadin genes during the polyploidization phenomenon.

Methods

Genomic DNA was extracted from leaves, amplified by PCR and ligated into pGEM-T Easy Vector for sequencing. Seqman from DNAstar (Madison, WI, USA) was used to assemble the sequences.

Results and discussion

A total of 68 full α-gliadin genes were obtained from the diploids and 127 from the hexaploids. In addition to this, more than 50% of the sequences analysed were pseudogenes (with a premature stop codon) in the hexaploids. Therefore, it is suggested that in the process of polyploidization the number of genes was decreased while increasing the number of pseudogenes.

Table 1. Description of α-gliadin genes and pseudogenes.

					Gene length (bp)	
Genotipes		**Genome**	**Genes**	**Pseudogenes**	**max**	**min**
Triticum aestivum	*ssp. macha*	AABBDD	40	77	970	846
	ssp. spelta	AABBDD	45	67	957	657
	ssp. aestivum	AABBDD	42	58	924	837
Triticum urartu		AA	20	14	912	831
Aegilops searsii		BB	23	7	933	858
Aegilops tauschii		DD	25	7	906	840

References

1. Gu YQ, Coleman-Derr D, Kong X, Anderson OD (2004). *Plant physiology* 135:459-470.
2. Shan L, Molberg O, Parrot I, Hausch F, Filiz F, Gray GM, Sollid LM, Khosla C (2002). *Science* 297:2275-2279.

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