ABSENCE OF GLIADIN PEPTIDES TOXIC TO CELIAC PATIENTS IN SORGHUM PLANT SPECIES


*) IGB “ABT” – CNR, Via P. Castellino 111, 80131 Naples, Italy
**) ISA – CNR, 83100 Avellino, Italy
***) DiSteBa, University of Salento, Via Monteroni, 73100 Lecce, Italy

celiac disease, sorghum, prolamin (Kafirin), ELISA, comparative genomics

Celiac disease is a chronic inflammatory disease of the small intestine caused by the ingestion of proline- and glutamine-rich wheat gluten (consisting of the gliadin and glutenin subcomponents) (Sollid 2002). Several different celiac T cell epitopes derived from gliadin proteins have been identified during the last few years, and these epitopes cluster in the proline-rich regions of the proteins (Arentz-Hansen et al 2002).

The 33-mer LQLQPFPQPQPQPQPQPQPQPQPQPQPQPQPQPQPQPQPF epitope identified in α2-gliadin 56-88 (Shan et al 2002) was shown to be particularly important because it is recognized by intestinal T cells of the majority of adult celiac patients (Sollid 2002). The plants that have proteins that damage the small intestine of people with celiac disease are wheat, rye and barley. These three harmful species are members of the grass family and are quite closely related to each another, according to various plant taxonomists. However, not all members of the grass family contain proteins that are toxic to celiac patients. Since corn and rice are safe for celiacs, it is reasonable no expect that members of the grass family that are more closely related to these species (based on taxonomy) than to wheat are likely to be safe. Sorghum, among certain cereal grains, is close enough in his genetic relationship to corn to make it likely that it is safe for celiac patients to eat. There are both protein studies and in vitro and in vivo challenge of wheat-free sorghum food products that support this conclusion, although the studies are not sufficiently exhaustive to provide more than guidance (Ciacci et al 2007). In the present study we provide molecular evidence on the absence of toxic peptides to celiac patients in this grass species by both HPLC and SDS-PAGE analyses and enzyme-linked immunosorbent assay (ELISA) of aqueous/alcohol soluble prolamins (kafirns) from different sorghum varieties. The results of these experiments support the conclusion that sorghum-derived products do not contain proteins that are toxic for celiac patients. Analyses of genes in the recently published sorghum genome sequence provide further support for this assertion (Xu & Messing 2008). Therefore, sorghum can be definitively considered safe for people with celiac disease.


The research was supported by Istituto Banco di Napoli – Fondazione special grant “Sorghum chain in Campania Region Project” to L. Del Giudice. P. Pontieri was supported by a Postdoctoral Fellowship from the Istituto Banco di Napoli – Fondazione.