

**Celiac Disease: In Vitro and In Vivo Safety and Tolerability of Wheat-Free Sorghum Food Products.**

Celiac disease is a condition in which certain people have an autoimmune reaction to proteins found in wheat and related cereals. It is estimated that roughly 1% of the U.S. population has celiac disease, for which there is no cure. Sorghum has been considered as a safe cereal grain for people with celiac disease to eat due to its similarity to maize; however, direct testing on the toxicity of sorghum has not been conducted. By looking at tissue and blood samples from patients challenged with sorghum foods as well as immunological tests using sorghum peptides, we found no toxic responses for sufferers of celiac disease. Thus, wheat-free sorghum food products will provide a new source of food for people with celiac disease and new markets for sorghum producers. (Scott Bean, telephone: 785-776-2725; email: [scott.bean@gmprc.ksu.edu](mailto:scott.bean@gmprc.ksu.edu))

**Effects of Processing on Wheat Tortilla Quality: Benefits of Hard White Wheat.**

Tortillas have become the most prevalent ethnic bread in the U.S., often replacing white pan bread in many products. As a result, tortillas are the fastest growing segment of the U.S. baking industry with annual sales over \$6 billion and growth exceeding 10% per year. The majority of tortillas consumed in the U.S. are made from wheat flour, although traditional maize tortillas are also produced. Wheat flour tortillas are made from hard red winter wheat (HRW) that has been bred for optimal bread production. Hard white winter wheat (HWW) offers economic benefits - mainly higher milling extraction and color advantages over HRW.

HWW can be milled to greater extraction rate with a concomitant increase in protein content when milled to the same color. Additional advantages include color properties that are more desirable for products such as Asian noodles and tortillas. We examined the properties of HWW wheat milled at a high extraction rate for tortilla production by comparing HWW and HRW flour milled to 80% extraction HRW to 72% extraction commercial tortilla flour. All of the HWW wheat flours milled to 80% extraction produced tortillas which were equal to, or superior to, those made from 80% extraction HRW wheat flours and 72% extraction commercial tortilla flour. (Michael Tilley, telephone: 785-776-2759; email: [michael.tilley@gmprc.ksu.edu](mailto:michael.tilley@gmprc.ksu.edu))

**Pretreatment and Enzymatic Hydrolysis of Sorghum Fiber for Ethanol Production.**

Sorghum is a drought and heat tolerant grain with starch content similar to that of maize, and it is increasingly being used to produce fuel ethanol in the Great Plains. While the starch can easily be broken down into sugars to be fermented, parts of the grain such as the bran are not used in this type of fermentation process. This project investigated methods to treat sorghum bran so that sugars can be produced for fermentation. Using a combination of treatments, including starch degradation, hot water, and enzymatic hydrolysis, was found effective at producing sugars which could then be used to produce fuel ethanol. This research may lead to the utilization of new inputs, currently a byproduct of fuel ethanol production, as a new source for biofuel production. (Scott Bean, telephone: 785-776-2725; email: [scott.bean@gmprc.ksu.edu](mailto:scott.bean@gmprc.ksu.edu))

## **Hard Winter Wheat and Flour Properties in Relation to Breadmaking Quality of Straight-Dough Bread: Flour Particle Size and Bread Crumb Grain.**

Bread crumb grain is the cell structure of the bread as it is exposed when the loaf of bread is sliced. It is one of the critical quality parameters of bread, but relatively little research has been conducted on it. Crumb grain generally is evaluated visually based on cell size, cell shape, and cell wall thickness. Commonly, bread crumb containing uniformly small, elongated cells is considered superior in quality to one containing non-uniform, large, round cells. The flour properties of twelve hard winter wheat varieties were investigated to find quality parameters that correlate with crumb grain. We found two quality parameters correlated with crumb grain out of 38 quality parameters investigated. One was protein content (12.9-14.5%) which was inversely correlated to crumb grain score, and the other was flour particle size distribution. Crumb grain appears to improve as the proportion of smaller flour particles increases. (Seok Ho Park, telephone: 785-776-2708; email: [seokho.park@gmprc.ksu.edu](mailto:seokho.park@gmprc.ksu.edu))

## **Detection of Wheat Kernels with Hidden Insect Infestations Using an Electronically Conductive Roller Mill.**

Grain kernels infested by insects may show no indication of infestation on their exterior, even though they contain hidden larvae. Although grain is always inspected for insect infestations upon shipping and receiving, many infested samples go undetected. Many methods for detecting infested wheat have been developed, but none has seen widespread use due to expense or inadequate accuracy, or both. In this study, a laboratory roller mill system was modified to measure and analyze the electrical conductance of wheat as it was crushed. Accuracy of detection of wheat kernels with live insects hidden inside of them was 83% for those infested with large larvae or pupae and ~100% for undamaged kernels. The apparatus is low cost (~\$1,500 for parts) and can inspect a 1 kg sample in less than two minutes.

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## **Prospects for the Use of Entomopathogenic Fungi for Control of Stored-Product Pests.**

Only two fungus species, *Beauveria bassiana* and *Metarhizium anisopliae*, have been given serious attention as possible microbial controls for stored-product insect pests. Their host ranges are broad, but their potency for the various target insects varies greatly, and some of the most important pests such as the red flour beetle are very tolerant of fungi. Accordingly, strategies are needed to improve the fungal performance. One such strategy is combination with other environmentally benign treatments such as controlled desiccant dusts and controlled atmospheres. Ironically, the relative dryness of stored-product environments favors fungal efficacy. Desiccation stress renders some insects more vulnerable to fungi. The longevity of fungus spores is also best under dry conditions. The prospects of fungi for control of stored-product pests can be improved by taking advantage of these phenomena and judicious selection of use venues and application strategies. (Jeffrey Lord, telephone: 785-776-2705; email: [jeffrey.lord@gmprc.ksu.edu](mailto:jeffrey.lord@gmprc.ksu.edu))

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