

## Our Latest Research Results - November 2010

### **Detection of Contaminated Hazelnuts and Ground Red Chili Pepper Flakes by Multispectral Imaging**

**Authors:** H. Kalkan, P. Beriat, T.C. Pearson, Y. Yardimci

**Submitted to:** Applied Engineering in Agriculture  
A method was developed to detect aflatoxin contaminated hazelnuts and chili pepper flakes. Color images were used as well as images of non-visible light in the near infrared region. The method utilizes a new feature selection algorithm that minimizes the number of near infrared images that must be acquired; thus making a potential system affordable and able to inspect large quantities of foods very quickly. The method developed identifies over 90% of the contaminated hazelnuts and 80% of the contaminated chili pepper flakes. The method developed should also find uses with other foods such as corn, wheat and other tree nuts for food safety inspection and sorting.

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### **Protein and Quality Characterization of Triticale Translocation Lines in Bread Making**

**Authors:** R.S. Jonnala, F. MacRitchie, T.J. Herald, D. Lafiandra, B. Margiotta, M. Tilley

**Submitted to:** Cereal Chemistry  
Triticale is a man-made hybrid of rye and wheat developed mainly for forage/feed. Triticale combines the high yield potential and good grain quality of wheat with the disease resistance of rye. Because of the aforementioned traits, triticale may be suitable for food products in developing nations. Current lines do not perform well in milling and baking quality tests when compared to wheat. One strategy to improve the milling and end-product quality attributes of triticale involves the transfer of wheat genes that have been identified to confer bread quality. The milling and bread quality (loaf volume and crumb quality) attributes of four translocated triticale lines were compared to a control triticale line. The translocation specifically at the Glu-D1d allele with HMW 5+10 did provide a significantly improvement in milling yield, higher bread loaf volume and acceptable crumb grain compared to the control triticale lines. The translocated triticale lines may potentially be used in wheat flour blends for bread making without substantial loss of end product quality attributes.

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### **Separation of Kafirins on Surface Porous RP-HPLC Columns**

**Authors:** S. Bean, B.P. Ioerger, D.L. Blackwell  
**Submitted to:** Journal of Agricultural and Food Chemistry

Sorghum is known to have lower protein digestibility than other cereal grains. Sorghum proteins also cross-link extensively when heated, further reducing digestibility and functionality of sorghum. The exact reasons for these properties are not currently known. To be better able to study sorghum proteins and screen sample sets that vary widely in their genetic properties, we investigated the use of new HPLC columns to provide faster, higher resolution methods for analyzing sorghum proteins. Such improved methods will benefit scientists working to improve the quality of sorghum and as a tool to identify sorghum lines with improved end-use properties. This method also reduces the consumption of the solvents used during analysis of the proteins by 53% thereby producing less waste and lowering the cost of analysis.

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### **Evaluation of Egg Replacers in a Yellow Cake System**

**Authors:** D. Kohrs, T.J. Herald, F.M. Aramouni, M. Abu-Ghoush

**Submitted to:** Journal of Food and Agriculture Immunology  
Eggs are a major ingredient in the baking industry. The past scare of avian flu left some food processors concerned about another future outbreak. In the case of such an event, many food processors that use egg as a functional ingredient would be desperate to find a similar functional ingredient at short notice. Thus, processors that require eggs as a key ingredient in their products desire to have egg alternatives. The egg replacers studied were composed of either whey protein isolate, wheat starch, guar gum, xanthan gum or their blends. At 50% substitution, treatments performed closer to that of control compared to 100% substitution. The blends of guar/whey/starch (GPS) and xanthan/whey/starch (XPS) performed the best, having the closest volume and texture measurement compared to the egg control. A quantitative descriptive analysis was performed on blends of GPS and XPS at 100% replacement. Six attributes of cake-crust stickiness, crumb color, springiness, moistness, firmness, and egg flavor--were quantified by a panel. These treatments were competitive to the control across all attributes measured. In the consumer acceptability test, the XPS formulation

was significantly higher in acceptability for all attributes to that of the control.

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### **Comparative Evaluation of Phenoloxidase Activity in Different Developmental Stages of Lepidopteran Pests**

**Authors:** J.A. Valadez-Lira, J.Alcocer-Gonzalez, G. Damas, G. Nunez-Mejia, B.S. Oppert, C. Rodriguez-Padilla, P. Tamez-Guerra

**Submitted to:** Journal of Insect Science

Some insect pests can be controlled by microbial bioinsecticides, derived from fungi and bacteria, but insects may be able to resist by mounting an immune response. We evaluated the expression patterns of one enzyme involved in insect immune response, phenoloxidase, in four lepidopteran (moth) pests. We found that there were significant differences in the production of phenoloxidase in different larval stages and between male and female insects. These studies will be used to determine if application timing of a bioinsecticide may enhance its performance.

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### **Genetic Structure of *Tribolium castaneum* Populations in Mills**

**Authors:** A.A. Semeao, J.F. Campbell, R.W. Beeman, M.D. Lorenzen, R.J. Whitworth, P. Sloderbeck

**Submitted to:** Molecular Ecology

Food products made from processed grain can become infested by the red flour beetle, *Tribolium castaneum*, either at the mills where flour is produced or at subsequent points in the food distribution channel, so tools to identify source of infestation would be useful for the targeting of pest management. Variation in molecular markers – variable sections of DNA – was used to estimate how beetle populations from mills differ from each other, and how accurately beetles could be assigned to the mill from which they originated. Red flour beetles collected from nine wheat or rice mills ranging from 0.3 to 5,700 km (0.2 to 3,542 miles) apart were evaluated. Using molecular population genetic analyses it was shown that populations did differ from each other, but the majority of the variation occurred within a mill, rather than between mills which suggests limited isolation of the populations. It was also found that the difference in variation between two mills did not increase with how far apart the mills were from each other, which is what would be predicted if beetles were dispersing back and forth between the mills due to their own behavior. Only 56% of the collected beetles could be correctly assigned to their source population. Results of this research show that there is structure to the populations, but either there is significantly more movement of beetles among the mills than was

predicted or more suitable molecular markers are needed to accurately assign beetles to their source mill.

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### **Influence of Substrate and Relative Humidity on the Efficacy of Three Entomopathogenic Fungi for the Hide Beetle, *Dermestes maculatus***

**Author:** J.C. Lord

**Submitted to:** Biocontrol

Hide beetles are carrion feeders that are emerging as pests of a variety of stored commodities. While their control by chemical and physical means has been investigated, biological controls are untested. Three commercially available fungal pathogens were tested for efficacy and spore survival on various surfaces on which they might be used to treat hide beetles and at four humidities. *Beauveria bassiana* that was produced for use in control of field and greenhouse pests was the most efficacious of the fungi. Among the tested surfaces, only wood had a negative impact on the efficacy and spore persistence of any of the fungi. Insect mortality caused by *B. bassiana* was greater at 43% RH than at 56, 75, or 82% RH, suggesting that desiccation stress fosters fungal infection of hide beetles. This research indicates that fungi are another non-chemical method that can be used to control insect pests in stored commodities.

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