

Our Latest Research Results - May 2011

Effects of Integrating Cultivar Resistance and Fungicide Application on Fusarium Head Blight and Deoxynivalenol in Winter Wheat

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Submitted to: Plant Disease

Fusarium head blight, or scab, is a fungus that can cause significant economic losses in small grain production. There is a need to develop effective management strategies for scab. Field experiments were conducted to determine the effects of integrating winter wheat cultivar resistance and fungicide application on scab and the associated mycotoxin deoxynivalenol (DON). We showed that the effect of cultivar on the percentage of plant spikelets killed was highly significant. Fungicides were more effective in moderately resistant than in susceptible cultivars. Yield was negatively correlated to most scab and DON measurements, whereas scab and DON measurements were positively correlated. Correlations between scab and DON measurements were stronger in susceptible compared to moderately resistant cultivars, whereas negative correlations between yield and scab or DON were stronger in moderately resistant than in susceptible cultivars. The results from this study indicate that fungicide efficacy in reducing scab and DON was higher in moderately resistant cultivars compared with susceptible ones. This shows that integrating cultivar resistance with fungicide application can be an effective strategy for management of FHB and DON in winter wheat.

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Surface-Enhanced Raman Scattering Detection of DNA Derived from the West Nile Virus Genome using Magnetic Capture of Raman-Active Gold Nanoparticles

Authors: H. Zhang, M.H. Harpster, H.J. Park, P.A. Johnson, W.C. Wilson

Submitted to: Analytical Chemist

The global economy and warming has increased the need for rapid detection of introduced insect transmitted pathogens such as West Nile virus (WNV). A model rapid detection assay using nanotechnology was demonstrated for WNV genome that due to short reaction times can be conducted reproducibly. This system provides a novel diagnostic tool that is amenable to adaptation within a portable, user-friendly detection platform for nucleic acids.

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Characterization of the Sorghum Alpha-Kafirins

Authors: P.S. Pandit, H.K.C. Laidlaw, B.C. Campbell, S. Bean, M. Tilley

Submitted to: Journal of Cereal Science

Of the cereal grains, sorghum tends to have the lowest protein digestibility and sorghum proteins are unique in that after heating in the presence of water their digestibility decreases. Despite these unique properties, sorghum proteins have been poorly characterized relative to proteins from grains such as wheat and corn. To address this issue, the alpha kafirins, which are the major kafirin proteins in sorghum, were characterized at both the gene and protein level using novel genetic sources. Understanding the expression of the alpha kafirins may provide information for improving the protein quality of sorghum.

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Impact of Different Isolation Procedures on the Functionality of Zein and Kafirins

Authors: T. Schober, S. Bean, M. Tilley, B.M. Smith, B.P. Ioerger

Submitted to: Journal of Cereal Science

Producing high quality baked products such as bread from corn and sorghum is challenging due to the fact that the native proteins of these grains do not form dough when mixed with water. Previous research has shown that commercially isolated corn proteins will form dough however. Laboratory isolated corn and sorghum proteins however, did not have the same functionality as the commercial corn samples. Modifying extraction procedures to enrich isolated proteins with a specific component of corn proteins improved the functionality of the lab isolated proteins. Likewise, by modifying the extraction conditions, functionality of isolated sorghum proteins was improved. Understanding the factors necessary to make isolated corn and sorghum proteins function more like wheat will provide the necessary knowledge to produce fully functional sorghum flours for the wheat-free food market.

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Protein and Quality Characterization of Triticale Translocation Lines in Breadmaking

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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 significant 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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Fuzzy Clustering-Based Modeling of Surface Interactions and Emulsions of Selected Whey Protein Concentrate Combined to i-Carrageenan and Gum Arabic Solutions

Authors: M. Samhouri, M. Abu-Ghoush, E. Yaseen, T.J. Herald

Submitted to: Journal of Food Engineering

The food industry and academia have expressed an interest in gum-protein mixtures because of their contributions to stability and functionality. The prediction of surface properties of whey protein concentrate (WPC) in a combination with i-carrageenan or gum Arabic is considered as a complex system, so using the conventional technology to model these properties results in significant discrepancies between simulation results and experimental data. Fuzzy logic and fuzzy inference system (FIS) is an effective technique for the identification and modeling of complex nonlinear systems. Fuzzy logic is particularly attractive due to its ability to solve problems in the absence of accurate mathematical models. Thus, this complex nonlinear system fits within the realm of fuzzy logic technique. The application of fuzzy modeling achieved high accuracies and proved to be a reliable predictive model for this gum-protein system.

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Cracked Hulls Affect Population Development of *Rhizopertha dominica* in Rough Rice

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Submitted to: Insect Science

Lesser grain borers are serious pests of stored rice throughout the world. Varieties of rice vary in their resistance to insects, and resistance may be related to cracks in the hull of the rice kernel. Lesser grain borers lay their eggs loose in the mass of rice kernels, and young larvae search out and bore into a rice kernel, where they complete development. Thus, kernels with cracked hulls may be selected by females for egg laying or they may be selected by larvae because they may be easier to enter. We showed that more progeny emerged from kernels with cracked hulls when these kernels were mixed in with intact rice kernels, but some progeny did emerge from intact kernels. Thus, using grain handling methods that reduce cracked hulls in rice would be expected to reduce insect damage to rice in storage.

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