CGAHR
Center for Grain & Animal Health Research

Research Kernels

Our Latest Research Results - May 2012

Effect of HPMC on the Quality of Wheat-Free Bread Made From Carob Germ Flour-Starch Mixtures

Authors: B.M. Smith, S. Bean, T.J. Herald, F. Aramouni
Submitted to: Journal of Food Science
Gluten free breads typically suffer from poor quality and are usually produced from cake batter like systems rather from dough. This causes problems both in food quality and in food processing. Intense research has been focused on finding and developing non-wheat proteins that are capable of forming dough. This research optimized the use of a hydrocolloid in combination with carob germ flour to produce dough that handle similar to that of wheat dough. Breads made from this system had quality attributes similar to that of wheat bread. This research will benefit people with celiac disease and scientists working to improve the quality of celiac safe foods with other materials such as sorghum.
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Variability in Tannin Content, Chemistry and Activity in a Diverse Group of Tannin Containing Sorghum Cultivars

Authors: R.C. Kaufman, T.J. Herald, S. Bean, J.D. Wilson, M.R. Tuinstra
Submitted to: Journal of Agricultural and Food Chemistry
Tannins are large polyphenolic polymers and are known to bind proteins, limiting their digestibility. However, tannins are also known for having excellent antioxidant potential and therefore may provide important human health benefits. Some sorghum types contain tannins and interest has grown in the use of these sorghums for human health applications. Little is known how tannin content and chemistry varies from across tannin containing sorghum cultivars and from year to year. This research utilized a novel method to compare the variation in sorghum tannins from seven diverse sorghum cultivars grown over 2 years. Year to year and cultivar to cultivar variation was found in this sample set demonstrating that tannin content and composition plays a significant role on influencing tannin functionality. These differences will allow for selections of high tannin sorghums with consideration of the biological activities of the tannins.
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Alkaline Extraction of Phenolic Compounds from Intact Sorghum Kernels

Authors: D.L. Blackwell, T.J. Herald, S. Bean, P. Gadgil
Submitted to: International Journal of Food Science and Technology
Decortication is an abrasive method of bran removal and is not as effective for grains with softer pericarp such as sorghum. Thus, health promoting compounds that are found within the bran may be lost due to processing. Direct extraction of the health promoting compounds found in sorghum using an alkaline solvent was achieved without the need to decorticate or grind the grain. Furthermore, natural colorants within the bran may be isolated as a by-product of the waste stream to add further value. Alkaline extraction may hold advantages over the traditional decortications method with grains of soft endosperms. Direct isolation of the health promoting compounds using an alkaline extraction method eliminates the need to process sorghum into flour or meal.
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Gall Midges (Hessian Flies) as Plant Pathogens

Authors: J.J. Stuart, M.S. Chen, M.O. Harris, R.H. Shukle
Submitted to: Annual Review of Phytopathology
The Hessian fly is a major insect pest of wheat. Hessian fly is also a representative of a large group of pests, the gall midges. In many respects, Hessian fly and other gall midges are like biotrophic pathogens. Hessian fly interacts with wheat in a typical gene-for-gene manner, has a fixed feeding site, and manipulates host plants extensively. This review paper summarizes recent advances in research on the Hessian fly – wheat interaction.
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Regulation of Compound Leaf Development in *Medicago truncatula* by Fused Compound Leaf1, a Class M KNOX Gene

Authors: J. Peng, J. Yu, H. Wang, Y. Guo, G. Li, G. Bai, R. Chen
Submitted to: The Plant Cell
As the primary organ for photosynthetic carbon fixation, plant leaves play an important role in plant growth, biomass production and survival in environments. Plant leaves show a great difference in their morphology,

which contributes to the plant diversity in the natural environment. However, how leaf morphology is determined is not yet understood. *Medicago truncatula* is a legume plant species and its leaf consists of three blades (leaflets). We cloned a gene called Fused Compound Leaf 1 (FCL1) and demonstrated that FCL1 plays a positive role in boundary separation and proximal-distal axis development of compound leaves. SGL1, a gene regulating single/multiple leaflets development, and FCL1 act additively and both are required for petiole development. The identification of FCL1 may be useful for designing more efficient leaves.
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Consensus Mapping and Identification of Markers for Marker-Assisted Selection of Wsm2 in Wheat

Authors: H. Lu, R. Kottke, R. Devkota, P. St. Amand, A. Bernardo, G. Bai, P. Byrne, T.J. Martin, S.D. Haley, J. Rudd
Submitted to: Crop Science
Wheat streak mosaic virus (WSMV) is an important wheat pathogen that affects most wheat growing areas in the Great Plains of the USA. Wsm2 is a newly identified gene that confers a high level of resistance to WSMV. To facilitate deployment of this new gene in breeding programs, we identified DNA markers near Wsm2. The marker Xbarc102 was associated with Wsm2 in all 22 wheat lines derived from crosses with one parent carrying Wsm2. Therefore, this marker should be useful for marker-assisted selection of Wsm2 in breeding programs.
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A History of Wind Erosion Prediction Models in the United States Department of Agriculture, Part 1

Authors: J. Tatarko, M.A. Sporcic, E.L. Skidmore
Submitted to: Aeolian Research
The Great Plains experienced an influx of settlers in the late 1850s to 1900. Periodic drought was hard on both settlers and the soil and caused severe wind erosion. The period known as the Dirty Thirties, 1931 to 1939, produced many severe windstorms, and the resulting dusty sky over Washington, D.C. helped Hugh Hammond Bennett gain political support for the Soil Conservation Act of 1937 that start the USDA Soil Conservation Service (SCS). Austin W. Zingg and William S. Chepil began basic wind erosion studies at a USDA laboratory at Kansas State University in 1947. Neil P. Woodruff and Francis H. Siddoway published the first widely used model for wind erosion in 1965, called the Wind Erosion Equation (WEQ). The WEQ was solved using a series of charts and lookup tables. Subsequent improvements to WEQ included improvements to estimations of wind, vegetation, and wind erosion control practices. A computer version of WEQ was also developed, greatly simplifying its use. The SCS and the Natural Resources Conservation Service (NRCS) produced several computer versions of WEQ as well with the goal of standardizing and simplifying it for field personnel including a version of WEQ was developed in the late 1990s using Microsoft Excel. Although WEQ was a great advancement to the science of prediction and control of wind erosion on cropland, it had many limitations that prevented its use on many lands throughout the United States and the world. In response to these limitations, the USDA developed a state-of-the-art model know as the Wind Erosion Prediction System (WEPS). The USDA Agricultural Research Service has taken the lead in developing science and technology for wind erosion prediction.
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Surface-Enhanced Raman Scattering Detection of DNAs Derived from Virus Genomes Using Au-Coated Paramagnetic Nanoparticles

Authors: H. Zhang, M.H. Harpster, W.C. Wilson, P.A. Johnson
Submitted to: Langmuir
A model paramagnetic nanoparticle (MNP) duplex assay was demonstrated for West Nile virus (WNV) and Rift Valley fever virus genome that due to short reaction times can be conduced reproducibly and is amenable to adaptation within a portable, user-friendly detection platform for nucleic acids.
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