GMPRC
GRAIN MARKETING AND PRODUCTION RESEARCH CENTER

RESEARCH Kernels

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Efficient Ethanol Production From Grain Depends On The Types Of Starch Present. Starch as it exists in the seeds of plants is composed of two types of molecules. **Amylose** is made of glucose sugar units linked together in a straight chain while **amylopectin** contains glucose sugar units linked together in a branched (fan shaped) structure. The percentages of amylose molecules contained in any particular starch sample can vary from very near 0% (as in starches from waxy grains) all to way up to 100%. Typical corn starches contain approximately 50% amylose and 50% amylopectin. Our recent studies have shown that, when starches contain less than 35% amylose, the starch was more efficiently converted to ethanol. High-temperature cooking with agitation significantly increased the conversion efficiencies on starch samples containing from 35% to 70% amylose. A cooking temperature of 160^{o}C or higher was needed on high-amylose corn starches. These data clearly suggest that waxy grain containing low levels of amylose are much more desirable sources of starch for ethanol fuel production. (Scott Bean, telephone: 785-776-2725; email: scott.bean@gmprc.ksu.edu)

Sorghum Grain Hardness May Impact Digestibility. Grain hardness is an important quality trait in grain sorghum. It has been linked to milling and food quality as well as resistance to insects and mold. In sorghum, the grain is composed of areas of both hard and soft endosperm. Past research has demonstrated that the storage protein content of these endosperm types differs. Our current studies have shown that soft endosperm material contains higher relative amounts of a particular protein called gamma kafirin compared with hard endosperm. Furthermore, the cross linking of the kafirins also appears to be different in soft and hard endosperms. In a separate study, we have also shown that tannins, compounds that are thought to be responsible for insect, bird, and mold resistance, preferentially bind to these gamma kafirins. Proteins bound to tannins had a lower digestibility than unbound proteins and biodegradable films made from tannin-protein complexes had improved stability. Thus, sorghum containing large amounts of soft endosperm are harder to digest, but may be used to produce stable biodegradable films, while sorghum varieties with larger amounts of hard endosperm contain less gamma kafirin and may be more suitable as a food source. These results also indicate that, with proper testing and selection, it will be possible to develop new sorghum varieties with specific functional properties. (Scott Bean, telephone: 785-776-2725; email: scott.bean@gmprc.ksu.edu)

Dough Functionality Depends On Protein Structure. Proteins are compounds found in all living organisms that are made by linking amino acids together. However, as these molecules are made inside the cell, they are folded into specific three-dimensional shapes (called secondary and tertiary structures). These specific shapes along with the specific amino acid content determine how the protein functions. The amino acid content of a protein is under strict genetic control. However, the different folding formations of the proteins in secondary and tertiary structures can be altered by a number of things including mechanical mixing such as is done in dough preparation. In a previous study, we reported

that dough optimum mixing time was dependant upon gluten protein secondary structures that developed early in the mixing cycle. In subsequent studies, 55 Hard Red Winter wheat flours with proteins contents ranging from 8.7 to 14.2% were studied. A total of 34 end-use properties including mixograph mix time, and tolerance, baking mixing time, and loaf volume potential were evaluated. Over 70% of the total variance in these end-use properties could be explained by the development of specific protein secondary structures. (Bradford Seabourn, telephone: 785-776-2751; email: bradford.seabourn@gmprc.ksu.edu)

GMPRC Is Seeking Research Leader For The Grain Quality And Structure Research Unit (GQSRU). We are still seeking a replacement for Dr. Okky Chung who retired last September. This is a Supervisory Research Scientist position for an individual with training in Chemistry, Food Technology, Biology, or Genetics who has leadership skills and extensive research experience in cereal chemistry to assume the duties of Research Leader of the GQSRU. The announcement number is ARS-X6W-0292 and applications must be postmarked, e-mailed, or faxed by September 15, 2006. Applicants must be U.S. citizens. For copies of vacancy announcements and/or application materials, please call (310) 504-1482. For additional information regarding employment opportunities, please visit http://www.afm.ars.usda.gov/hrd/jobs/apply.htm.

Customer Interest Survey Still Available. It is again time to update our announcement concerning the GMPRC Customer Interest Survey. Any customer wishing to receive more timely information about our research results can sign up for this service by going to our GMPRC web page located at www.gmprc.ksu.edu and clicking on the CUSTOMER SURVEY item located in the bottom right-hand corner of this page. Simply indicate which of the various research topics are of interest, include your name, email address, etc. and submit the request. Each week, if we have significant results in any of the categories that are checked, we will send you an email message containing a brief description of these results along with the name of the individual to contact for more details.

Center Director To Retire In August After 20 Years Of Federal Service. August 31 will be the last official work day for Dr. Don Koeltzow who has been the Director of GMPRC since February 3, 1996. Dr. Koeltzow is a native of New Mexico where he earned a B.S. degree in chemistry from the New Mexico Institute of Mining and Technology in 1966. He attended graduate school at the University of Illinois in Urbana where he earned both M.S. (1968) and Ph.D. (1970) degrees in Biochemistry. After a Post Doctorate in Medical Microbiology at Stanford University, Dr. Koeltzow joined the faculty of Luther College in Decorah, Iowa, where he taught multiple courses in chemistry, biochemistry, and computer science for 15 years. He also served as Head of the Department of Chemistry for the last 10 years of his teaching career. In 1986, he accepted a position as Chief of the Research and Development Branch of the Federal Grain Inspection Service in Kansas City, Missouri, and in 1996, he accepted the position of Director at GMPRC. He often stated that his time at GMPRC was, “The best time of my scientific career because of the very significant research at the Center and because of the people it has been my pleasure to serve with.”

Dr. Koeltzow and his wife, Kathy, will move to their permanent home in the mountains of Colorado between Gunnison and Montrose just off Highway 50.

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