GMPRC
GRAIN MARKETING AND PRODUCTION RESEARCH CENTER

RESEARCH Kernels

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- **Wheat Germ Agglutinin May Be Potent Synergist for Biopesticides.** The protein called agglutinin that is found in low concentrations in wheat germ can bind to carbohydrate structures and is toxic when fed to insects. This protein apparently causes destabilization of the lining of the insect's midgut when it binds to the carbohydrate called chitin that is a vital component of the digestive membrane. We are investigating use of wheat germ agglutinin as a synergist that can be combined with other potential insecticides, such as compounds that inhibit the digestive enzymes in insects, to increase their overall potency. This work is in its very early stages and various combinations of proteins are being tested to identify the most effective cocktails for controlling stored-product insect pests in grains.
  (Karl Kramer, telephone: 785-776-2711, email: kramer@gmprc.ksu.edu)
- **Outside Populations May Be an Important Source of Infestation for Food Processing and Storage Facilities.** The distribution and movement patterns of warehouse beetle and Indianmeal moth outside of food processing and storage facilities were investigated. Both species were present in high numbers around food processing plants in Kansas. Monitoring pest populations inside and outside of facilities during a fumigation indicated that even if populations inside the facility were suppressed, the trap capture immediately outside the facility remained high. Mark-recapture studies outside showed that warehouse beetle flew up to 508 m and Indianmeal moth flew up to 276 m before capture. Mark-recapture studies were also performed to measure movement into and out of the facility. These findings indicate that insects marked outside the facility can be recaptured inside. These results suggest that insect movement from outside of food processing and storage facilities can have a significant impact on infestation and population resurgence after treatment. This research was done in collaboration with Mike Mullen (GMPRC) and Terry Arbogast (USDA, ARS, Gainesville, FL).
  (Jim Campbell, telephone: 785-776-2717, email: campbell@gmprc.ksu.edu)
- **New Insecticide to Control Stored-Grain Pests.** The insecticide, ethiprole, is part of a new class of insecticides with low mammalian toxicity that have very specific effects on insects. Tests were conducted in which ethiprole alone and in combination with other insecticides was evaluated as a residual protectant of stored corn and wheat. All treatments involving ethiprole successfully suppressed the development of insect progeny of the major internal and external feeders of both commodities for 6 months, regardless of the temperature at which the treated commodities were

stored. Data from this project will be useful for predicting the residual efficacy of ethiprole on stored grain and will provide support for registration.
(Frank Arthur, telephone: 785-776-2783, email: arthur@gmprc.ksu.edu)

- **Weed Sensor May Be Key to Decreased Herbicide Use.** Traditional approaches to herbicide applications are based on the assumption that weeds are distributed uniformly in fields. However, in most agricultural fields, weeds are generally localized in specific areas. The light absorption characteristics of weed stems and leaves were studied using a NIR spectrometer. Selected wavelengths of light were used to design an optical weed sensor. Laboratory tests showed that this sensor identified wheat, bare soil, and weeds with accuracies approaching 100%. These results will be used to develop a tractor-mounted sensor for field use. Farmers will benefit from this technology through reduced herbicide costs, and the impact of chemicals on our environment will be reduced because lower levels of herbicides will be applied.
(Floyd Dowell, telephone: 785-776-2753, email: fdowell@gmprc.ksu.edu)
- **Crumb Grain Scores and Softness May Depend on Starch Granule Size.** A commercial bread wheat flour (11.3% protein on a 14% moisture basis) was fractionated into starch, gluten, and water-soluble fractions. The starch fraction was further separated into large (10 - 40 micrometer diameter) and small (1 - 15 micrometer) fractions. Flour fractions were reconstituted to their original levels in the flour except the weight of the small starch granules added was varied from 0, 17, 30, 60, to 100% of the total starch. A modified pup straight-dough method was used in an experimental baking test. Loaf size and external appearance of breads were not affected by varying the levels of small starch granules. However, the crumb appearance and softness were affected. The bread made from flour containing 30% small granules had the best crumb grain score, fineness (CrumbScan, AIB), and the second highest elongation ratio (1.55 from CrumbScan, AIB). Inferior crumb grain scores, low fineness scores, and poor elongation ratios were obtained in breads made with starch fractions containing either 100 % small granules or 100% large granules. The higher the level of small granules, the softer the bread. (Okky Chung, telephone: 785-776-2703, email: okchung@gmprc.ksu.edu)
- **Grain Tagging May Assist With Identity Preservation.** One potential solution to the problems associated with keeping identity preserved grain samples separate as they move through marketing channels is the tagging of individual kernels within the sample. Procedures have been developed to safely coat wheat kernels with invisible Ultraviolet (UV)- fluorescent or near-infrared (NIR) absorbing dyes. Wheat coated with UV-fluorescent compounds can be identified using a black light and wheat with NIR-absorbing compounds can be identified from its NIR spectrum. Since the NIR absorbing compounds available strongly absorb NIR light, smaller amounts can be used. Current dyes being studied are not suitable for food use and are being explored as a means of developing calibrations for high-speed scanners and for determining the feasibility of such systems.
(M.S. Ram, telephone: 785-776-2728, email: ramms@gmprc.ksu.edu)
- **New Research Leader Takes Charge of the Plant Science and Entomology Research Unit.** Dr. Robert (Bob) Bowden was hired as the Research Leader for our Plant Science and Entomology Research Unit replacing Dr. Merle Eversmeyer who retired. Dr. Bowden received his B.S. degree from Michigan State University in Botany in Plant Pathology, his M.S. degree from the University of Minnesota, and his Ph.D. from the University of Wisconsin. Both his M.S.

and Ph.D. degrees were in plant pathology. His major research area deals with the genetics and diversity of Fusarium graminearum, the organism that causes head blight or scab in wheat and other small grains. Dr. Bowden comes to us from Kansas State University where he held a faculty appointment in the Department of Plant Pathology with additional duties in Agricultural Extension.
(Bob Bowden, telephone: 785-532-2368, email: rbowden@plantpath.ksu.edu)

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