



RESEARCH Kernels

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- **Number.** Our customers can use our new 800 number (**1-800-627-0388**) to contact us.
- **Heat Pump Grain Drying System.** Energy consumed in crop drying is equivalent to 757 million gallons of propane fuel each year in the U.S. A small, electric powered, heat pump based grain dryer was developed and tested at GMPRC. Drying tests were conducted in the fall of 1998 using three corn lots and one milo lot. The initial moisture contents were 25, 20 and 18% for the corn and 25% for the milo. All lots contained approximately 1000 bushels and were dried to average moisture contents below 13%. The average drying rate was approximately 10 bu per hour for this small system and the temperature of the heated air was controlled in the range from 110 to 120 ° F. The average energy used to remove water from the corn samples was 554 BTU (British Thermal Units) per pound of water. The amount of energy used for drying milo was 686 BTUs per pound of water removed. These results show that the energy consumption of the heat pump drying system can be much less than that of conventional, high temperature, gas fired systems which typically use 2800 BTUS to remove one pound of water. (James Steele, phone: 785-776-2727, email: jsteele@usgmrl.ksu.edu)
- **Grant for Mapping Tribolium Genome.** We have received funding from an international research organization, the Human Frontier Science Program, for a cooperative research project that involves an international collaboration between ARS, Kansas State University, and the University of Munich in Germany. The ARS portion (\$50,000 per year for three years) will involve creating high-resolution molecular maps of the Tribolium genome. Insects in this genus include the red and confused flour beetles. These maps will facilitate the discovery and exploitation of genes that can be used to control these pests. (Dick Beeman, phone: 785-776-2710, email: beeman@usgmrl.ksu.edu)
- **Second Year of Area-Wide Integrated Pest Management Study for Suppression of Insect Pests in Wheat was Completed.** The second year of a five-year area-wide integrated pest management research program was completed. The cost and effectiveness of currently used pest management methods were determined for 13 elevators in Kansas and 15 elevators in Oklahoma.

More than 6,000 one-gallon grain samples from the 30 million bushels of wheat stored at these elevators were examined for insects. Two thirds of these samples had no insects and most of the other samples had only a few insects. Fumigation is the primary method of insect control. However, aeration (blowing cold air through the grain in the fall) is also a commonly used method. Industry collaborators are using the information from the study to increase the effectiveness and reduce the cost of insect control. Subsequent studies will involve the implementation of additional integrated pest management tools and determination of their effectiveness at decreasing insect populations. This project is being conducted in cooperation with Kansas State University and Oklahoma State University. (Dave Hagstrum, phone: 785-776-2718, email:hagstrum@usgmrl.ksu.edu)

- **Efficacy of New Diatomaceous Earth Formulation.** Red flour beetles and confused flour beetles were exposed to a new formulation of diatomaceous earth, Protect-It™, for different time intervals at controlled temperatures and humidities. There was a slight increase in mortality of both species as the temperature increased. However, as the relative humidity increased, longer time intervals were required to kill both beetle species, indicating a decrease in effectiveness with increased humidity. In addition, the confused flour beetle was less susceptible to the product than the red flour beetle. Exposure intervals of 2-3 days killed all red flour beetles, whereas 3-4 days were required to kill all confused flour beetles. Seasonal variation within a storage facility, the target pest species, and the specific formulation of diatomaceous earth must be considered when using these materials to control insect pests in storage facilities. (Frank Arthur, phone: 785-776-2783, email:arthur@usgmrl.ksu.edu)
- **New Scientist Joins GMPRC Staff.** Dr. Jim Campbell joined the Biological Research Unit in March. He received his B.S. and M.S. degrees from Rutgers University and a Ph.D. in Entomology from the University of California at Davis. Previous research has involved host searching behavior of nematode parasites of insects and the development of nematodes as biological control agents. His research at GMPRC will focus on the behavior of stored product insects and their natural enemies. Understanding the behavioral characteristics of these pests and how they respond to control tactics and how natural enemies locate and attack these pests can lead to the development of more effective control strategies. (Jim Campbell, phone: 785-776-2717, email:campbell@usgmrl.ksu.edu)
- **Annual Progress Report for 1998 Is Now Available.** We have revived the tradition of publishing an annual progress report for GMPRC. This report describes each of the objectives and goals of major research projects at GMPRC and provides updates on the past year's results along with future plans. We also plan to make this information available on our web page as soon as possible. We invite your comments on these objectives, goals, and future plans. For more information and for additional printed copies, please contact Don Koeltzow, Center Director, at telephone (785) 776-2701, FAX (785) 776-2789, email:dek@usgmrl.ksu.edu.