GMPRC
GRAIN MARKETING AND PRODUCTION RESEARCH CENTER

RESEARCH Kernels

www.gmprc.ksu.edu **January 2003**

- **New Interest Inventory Categories Established.** We have updated our Customer Interest Inventory Profile topics on our web page. In an effort to provide results from our work that is of interest to each of our customers in a more timely fashion, we have established a Customer Survey form on our web page located at www.gmprc.ksu.edu. Customers can log onto this page and check the boxes listing areas of interest. Each week, we send short email summaries of our results that fall into the specific areas of interest to each customer who has subscribed along with the name of the individual to contact for further details. Our research emphasis has changed since we started this service and we have modified the old list to reflect these changes. If you are a user of this service, please feel free to check out the new items and submit a new interest profile. If you would like to sign up for this notification system, simply log onto our web page and select the GMPRC SURVEY. As always, we welcome your comments and suggestions concerning how we can improve our communications with you (D. Koeltzow, telephone: 785-776-2701, email: dek@gmprc.ksu.edu).

- **New Insect Pest Control Methods May "PiggyBack" on Molecular Genetics.** Genes control the normal development of all living organisms including insect pests that attack stored grain and cereal products. We have shown that a jumping gene called "piggyBac," isolated from a moth, can insert itself randomly into many different sites on the chromosomes of the red flour beetle. We also have shown that piggyBac can be loaded with other genes that are inserted along with the piggyBac segment. Furthermore, we can now mobilize the piggyBac so that it will move to a new location. This new tool will allow us to identify the functions of many of the genes in the red flour beetle chromosomes. As the piggyBac is inserted into a chromosome, it changes or destroys the functions of the normal gene at that location. Identifying the normal development processes in the pest insect that are affected tells us what the normal gene did. This tool also allows us to label or tag specific genes for further study. The end results will provide us with vital information about new vulnerable processes of normal insect development that can be attacked to control these important food pests (R. Beeman, telephone: 785-776-2716, email: beeman@gmprc.ksu.edu).

- **Are You Friend or Foe?** Parasitic wasps are small (approximately 1/8 inch long) insects that can

be found in locations where grain is stored. In nature, they attack insect pests that invade stored grain. We have studied the surface chemicals from the wasp that attacks the larva of an important pest moth and found two types of chemicals - hydrocarbons and waxes. We also found that these chemicals change with the age of the wasp, whether or not the wasp is a male or female, and the food source for the wasp. Evidence suggests that these chemicals play a key role in how these wasps identify each other and how they locate their prey. Information obtained from these studies will be used to further develop these insects into a more dependable tool for controlling insect pests that attack grain and cereal products (R. Howard, telephone: 785-776-2762, email: howard@gmprc.ksu.edu).

- **Plastics and Fuel from Grain Sorghum.** Most of the grain sorghum grown in the U.S. is currently used for animal feed. We conducted preliminary evaluations of sixteen sorghum varieties as a source of ethanol for fuel and for lactic acid, which is an important building block for the synthesis of biodegradable plastics and other important products. The amounts of ethanol and lactic acid that could be obtained from a particular sample varied with both the variety and the location where it was grown. Differences as high as 15% were recorded for ethanol or lactic acid yields. These studies will help plant breeders select new sorghum varieties with enhanced quality for bio-industrial uses and it will also help us develop more efficient techniques for harvesting needed fuels and chemicals from these renewable resources (S. Bean, telephone: 785-776-2779, email: scott@gmprc.ksu.edu).

- **Beetles Evaluate Food Quantity and Quality.** The red flour beetle has a long association with human stored food and can be a major pest in buildings used for storage and processing grain-based foods. In this environment, food can occur in small discrete patches and the size of these patches influences how many offspring of this pest survive. We have found that the number of eggs laid by female red flour beetles increased as the size of the food patch increased. We also learned that they had the ability to evaluate the quality of the food in a particular patch and again, adjust the number of eggs laid accordingly. These results further support the importance of sanitation programs in controlling insect pest populations (J. Campbell, telephone: 785-537-5506, email: campbell@gmprc.ksu.edu).

- **Insects Play Hide and Seek in Wheat.** Hidden insect infestations in wheat are very hard to detect and they can degrade the end-use quality and decrease the value of infested shipments. We have developed the software for the Perten SKCS 4100 that will allow it to detect wheat kernels that have hidden infestation. Live insect detection accuracy rates were 25% for kernels with small larvae, 62% for kernels with medium-sized larvae, 87% for kernels with large larvae, and 88% for kernels with pupae. The false positive error rate (selecting sound kernels as infected) was 0.5% or less depending on the wheat class (T. Pearson, telephone: 785-776-2745, email: tpearson@gmprc.ksu.edu).

- **Detection of Altered DNA.** Because of new developments in biotechnology, novel highly sensitive analytical tools are needed to detect or monitor DNA and proteins produced by genetically modified organisms in both the laboratory and as crops are grown in the field. In

collaboration with scientists at the Academy of Science of the Czech Republic and Prodigene, Inc., an agricultural biotechnology company, we have developed an electrochemical method based on avidin-biotin biotechnology that is very sensitive and specific for nucleic acids and proteins produced by transgenic crops. This method might be useful for monitoring fields surrounding transgenic crops for unintentional contamination of neighboring crops and weeds (K. Kramer, telephone: 785-776-2715, email: kramer@gmprc.ksu.edu).

- **New Plant Geneticist Joins GMPRC.** Dr. Guihua Bai joined the Plant Science and Entomology Research Unit in December 2002. He received his Ph.D. in Plant Genetics from Purdue University. Dr. Bai was an Assistant Professor of Wheat Molecular Genetics at Oklahoma State University where he investigated the interactions between fungal pathogens and wheat plants. His primary research focus at GMPRC will be the identification of molecular markers for resistance and quality traits in wheat with the development of genetic tools for using these markers. Dr. Bai also will be in charge of our newly established Molecular Plant Breeding Laboratory which will provide DNA mapping services to wheat, barley, and oat breeders (G. Bai, telephone: 785-532-7116, email:)

U.S. Department of Agriculture, Agriculture Research Service, Grain Marketing and Production Research Center, 1515 College Avenue, Manhattan, KS 66502. Phone: 800-627-0388.