



RESEARCH Kernels

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July 2000

- **Genetic Studies of Insect Development May Lead To Better Control Methods.** Increasing restrictions on pesticide use combined with the development of insect resistance to current control methods, make it necessary to produce alternative control techniques to protect our food supply in the future. One such technique may result from better knowledge of the basic genetic regulation of insect growth and development. We have shown that when a certain gene, called the “maxillopedia” gene, is eliminated in the red flour beetle, the mouth parts that are needed for feeding develop as legs. Therefore, larvae from these insects are unable to feed and they die of starvation shortly after hatching. In another instance, we have shown that when another gene is eliminated in the red flour beetle, the mouth parts develop as antennae. Again, these embryos die before they hatch because they are unable to chew their way out of the egg. Finding ways to disrupt important developmental genes such as these may lead to the development of potent new tools for controlling the red flour beetle and other insects. (Dick Beeman, telephone: 785-776-2710, email: beeman@usgmrl.ksu.edu)
- **NIR Analysis May Be Useful In Separating Single Kernels of Corn.** A diode-array Near-Infrared Spectrometer (NIR) was used to rapidly analyze single kernels of corn for the presence of attributes such as BGY fluorescence (an indicator of the presence of aflatoxin producing fungi), aflatoxin and fumonisin mycotoxins, fusarium (mycotoxin producing fungal species), and avidin (a protein from chicken eggs). NIR spectra could be highly correlated with BGY fluorescence. Transgenic corn kernels containing the gene from chicken eggs that produced high levels of avidin could be identified based on NIR absorption characteristics. Data from the correlation of NIR spectra to aflatoxin and fumonisin content and to the presence of fusarium fungi are being analyzed and will show the potential for NIR instruments to detect these important quality attributes in corn. (Floyd Dowell, telephone: 785-776-2753, email: fdowell@usgmrl.ksu.edu)
- **Insect Growth Regulator Effectiveness Tested on Concrete.** Insect growth regulators (IGRs) are chemicals that prevent larvae from reaching the adult stage or produce deformed adults that are unable to reproduce. These chemicals have potential for expanded use in modern pest control

programs. However, in most experimental studies, insects are exposed to various diets containing IGRs which does not mimic actual exposure conditions in the field. Mature larvae (last instar) of the red flour beetle and the confused flour beetle were exposed to the IGR hydroprene on concrete treated with the label rate for either 8 to 144 hours or they were continuously exposed on concrete treated with 25, 50, 75, or 100% of the label rate. Larvae were held at either 27 or 32 oC and 40%, 57%, or 75% relative humidity. Temperature effects were variable; however, the best control was obtained when larvae were continually exposed at 75% relative humidity. These results indicate that continual exposure of mature larvae to hydroprene can arrest the development of both the red and the confused flour beetles, but exposure intervals in excess of 6 days may be required for maximum effectiveness. (Frank Arthur, telephone: 785-776-2783, email:arthur@usgmrl.ksu.edu)

- Desiccant Dusts Increase the Effectiveness of Pathogenic Fungi in Controlling Insect Pests.** Diatomaceous earth (DE) is a desiccant insecticide that abrades and absorbs lipids from the exterior of insects. It is most effective for insect pest control at low humidity. *Beauveria bassiana* is a fungus that is pathogenic to insects which it infects by penetrating the outer layers of the insect pest. It is most effective at high humidity. Stored-grain beetles were exposed to several concentrations of this pathogenic fungus both in the presence and absence of DE or other abrasives such as silicon or diamond dusts. These experiments showed that a combination of the fungus and dust together was significantly more effective than either control method separately. (Jeff Lord, telephone: 785-776-2705, email:lord@usgmrl.ksu.edu)
- GMPRC Continues to Develop New Customer Alert System.** We are continuing our efforts to develop a specific customer notification system which will be used to alert customers when we have research results of particular interest to them. This is an electronic system that is based on electronic mail. If you are interested, please fill out a customer “interest profile” electronically through a special web page located at: <http://www.gmprc.ksu.edu/survey.html>. Once we have your interest profile and your email address, whenever we have results that fall into your particular area of interest, we will send you a brief electronic message alerting you to the results and identifying the contact person here at GMPRC who will be able to provide additional details. We currently are sending these message alerts on a weekly basis to provide more rapid access to research results from GMPRC. As always, we welcome your comments and suggestions concerning how we can improve our services. (Don Koeltzow, Center Director, telephone: 1-800-627-0388, email:dek@usgmrl.ksu.edu)
- U.S. Department of Agriculture, Agriculture Research Service, Grain Marketing and Production Research Center, 1515 College Avenue, Manhattan, KS 66502. Phone:800-627-0388.

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Grain