GMPRC
Grain Marketing and Production Research Center

Research Kernels

Our Latest Research Results • June 2009

Residual Efficacy of Aerosol Insecticides

Author: F.H. Arthur
Submitted to: International Association of Operative Millers-International Miller

The insect growth regulator pyriproxyfen (NyGuard®) can be used as an aerosol insecticide inside structural facilities, or as a surface treatment. However, there is little information regarding residual control offered by pyriproxyfen. In field trials inside a commercial facility, an aerosol combination of pyrethrin + pyriproxyfen gave effective residual control for about ten weeks by preventing normal growth and development of insect larvae. Laboratory studies also show residual control when pyriproxyfen is used as a surface treatment. Additional tests are being conducted to further evaluate the residual control from insect growth regulators, either used alone or in combination with other insecticides.

Contact Frank Arthur, telephone 785-776-2783, email frank.arthur@ars.usda.gov

Biorational Approaches to Managing Stored-Product Insects

Authors: T.W. Phillips and J.E. Throne
Submitted to: Annual Review of Entomology

Insects are estimated to cause up to 9% losses in stored products in developed countries and often more than 20% in developing countries. There is much interest in alternatives to conventional insecticides, reviewed herein, for controlling stored-product insects because of loss of insecticides due to regulatory action and insect resistance, and because of increasing consumer demand for product that is free of insects and insecticide residues. Sanitation is perhaps the first line of defense in grain stored at farms or elevators and for food processing and warehouse facilities. Some of the most promising biorational management tools for farm-stored stored grain are temperature management and use of natural enemies. New tools for insect sampling and computer-assisted decision-making appear most promising at grain elevators. Processing facilities and warehouses usually rely on trap captures for decision making, which needs further research to optimize this process.

Contact James Throne, telephone 785-776-2796, email james.throne@ars.usda.gov

Effects of Short Exposures to Spinosad-Treated Wheat or Maize on Four Stored-Grain Insects

Authors: C.G. Athanassiou, F.H. Arthur and J.E. Throne
Submitted to: Journal of Economic Entomology

Insecticides are one tool for controlling insect pests of stored grain, but we are losing many stored-grain insecticides because of insect resistance and registration issues. We evaluated control of four insect pests of stored wheat and maize after short exposures to a new insecticide, spinosad, which has low mammalian toxicity. Short exposures may occur because a grain bulk may not be completely treated with insecticide. The lesser grain borer was very susceptible to spinosad and no progeny were produced after eight hours exposure. There was moderate mortality of adult rice weevils, but progeny production was not impacted by spinosad. Spinosad had little effect on red flour beetles or the psocid *Lepinotus reticulatus*. This information will help grain storage managers select protectant insecticides for control of stored-grain insects.

Contact Frank Arthur, telephone 785-776-2783, email frank.arthur@ars.usda.gov

Efficacy of an Esfenvalerate plus Methoprene Aerosol for the Control of Eggs and Fifth Instars of the Indianmeal Moth

Authors: E.A. Jenson, F.H. Arthur and J.R. Nechols
Submitted to: Insect Science

Aerosol insecticides are used to control beetle pests inside flour mills and other facilities, but there is little published information regarding control of the Indianmeal moth, a primary pest of stored foods. We evaluated two registered insecticides for their ability to control eggs and late-stage larvae of the Indianmeal moth. Methoprene, an insect growth regulator, was effective on larvae but not as effective on eggs. Esfenvalerate, a pyrethroid, was not effective on larvae but gave some control on eggs. Using both insecticides in combination gave more complete control of eggs and larvae, and the combination treatment was also supported by an economic analysis.

Contact Frank Arthur, telephone 785-776-2783, email frank.arthur@ars.usda.gov

Methoprene and Synergized Pyrethrins as an Aerosol Treatment to Control *Plodia interpunctella*, the Indianmeal Moth

Authors: E.A. Jenson, F.H. Arthur and J.R. Nechols
Submitted to: Journal of Stored Products Research

Aerosol insecticides are used to control insects in food warehouses, but there is little data regarding susceptibility of eggs of the Indianmeal moth on different foods exposed to the aerosols. We conducted several field trials by exposing eggs of the Indianmeal moth in different foods and on different packaging materials treated with synergized pyrethrins applied alone and in combination with the insect growth regulator methoprene. Results of the field trials show the aerosols penetrated underneath pallets, and the combination of pyrethrin and methoprene was optimal for control of the eggs and for economic cost of treatment. There was some variation depending on the specific diet or package exposed, but overall results show that the aerosols could be used to control the eggs of the Indianmeal moth in a commercial facility.

Contact Frank Arthur, telephone 785-776-2783, email frank.arthur@ars.usda.gov

Measuring Grain and Insect Characteristics using NIR Laser Cluster Technology

Authors: F.E. Dowell, E. Maghirang and V. Jayaraman
Submitted to: Applied Engineering in Agriculture

A simple, low-cost, laser-based spectrometer was evaluated for measuring various grain and insect traits. This system is potentially much faster, cheaper, and more accurate than conventional near-infrared spectrometers. We evaluated the accuracy of this system for measuring wheat hardness, protein content, moisture content, and waxy character. We also used the system to determine the sex of tsetse fly pupae for potential sterile insect technique eradication programs. The laser cluster system predicted wheat hardness, moisture content, and fly sex with an accuracy similar to the near-infrared system, but predicted other traits with slightly less accuracy. The laser cluster system was limited to 8 wavelengths, and the accuracy of predicting other traits may be improved if different wavelengths were selected. This technology may provide a low-cost alternative for measuring some grain and insect traits.

Contact Floyd Dowell, telephone 785-776-2753, email floyd.dowell@ars.usda.gov

Predicting the Concentration and Specific Gravity of Biodiesel-diesel Blends using Near-infrared Spectroscopy

Authors: M. Coronado, W. Yuan, D. Wang and F.E. Dowell
Submitted to: Applied Engineering in Agriculture

Biodiesel made from different source materials can have different physical and chemical properties. Also, the concentration of biodiesel in biodiesel-diesel blends varies from pump to pump and from user to user. These factors can significantly affect the performance and efficiency of engines fueled with biodiesel. To address these challenges, models based on near-infrared spectroscopy were developed for relatively inexpensive and rapid on-line measurement of the concentration and specific gravity of biodiesel-diesel blends. Five different oils—soybean oil, canola oil, palm oil, waste cooking oil, and coconut oil—and two different brands of commercial-grade No. 2 on-highway diesel and one brand of off-road No. 2 diesel were used in the calibration and validation processes. The predicted concentration and specific gravity of the biodiesel-diesel blends were compared with the actual values. The average prediction error of biodiesel concentrations was about 3%. The specific gravity prediction model had an average error of 0.002. This information is necessary to develop engine electronic control units to adjust fuel injection timing for optimum engine performance.

Contact Floyd Dowell, telephone 785-776-2753, email floyd.dowell@ars.usda.gov

USDA-ARS Grain Marketing and Production Research Center

1515 College Avenue
Manhattan, KS 66502

800-627-0388
ars.usda.gov/npa/gmprc