CGAHR
Center for Grain & Animal Health Research

Research Kernels

Our Latest Research Results - June 2010

New Look

Research Kernels has a new logo and color scheme. What hasn't changed is providing the latest research results from the Center for Grain and Animal Health Research. Please recall that our name change was prompted by the relocation of the Arthropod-Borne Animal Disease Research Unit (ABADRU) from Laramie WY to Manhattan KS. ABADRU staff and programs have been transitioning to CGAHR and the move will be completed before September. Please send any comments or feedback to Tom Shanower at: tom.shanower@ars.usda.gov.

Efficacy of Spinosad and Methoprene, Applied Alone or in Combination, Against Six Stored-Product Insect Species

Authors: C. Athanassiou, F.H. Arthur, N. Kavallieratos, J.E. Throne

Submitted to: Journal of Pest Science

The lesser grain borer is the major pest of stored wheat in most of the world, and it has developed resistance to some of the insecticides used for its control. Thus, there is a need to develop alternative treatments for control of the lesser grain borer and other insect pests of stored wheat. We evaluated the bacterial insecticide spinosad and the insect growth regulator methoprene alone and in combination for control of six insect pests of stored wheat. Neither insecticide alone completely controls all insect pests of stored wheat. The specific combinations of spinosad and methoprene evaluated in our study would have no benefit over spinosad used alone for control of any of the six species tested.

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Susceptibility of Various Life Stages of Rhyzopertha dominica (F.) (*Coleoptera: Bostrichidae*) to Flameless Catalytic Infrared Radiation

Authors: M. Khamis, B. Subramanyam, P.W. Flinn, H. Dogan, A. Jager, J.A. Gwirtz

Submitted to: Journal of Economic Entomology

The lesser grain borer is one of the most damaging insect pests of stored wheat in the US, and there are few insecticides that are registered for control of this pest. In collaboration with scientists at Kansas State University, we conducted experiments to determine the effectiveness of infra-red radiation to kill different stages of lesser grain borers inside wheat kernels using a catalytic heater operating on propane gas. The grain temperatures attained were influenced by wheat quantity, distance from the emitter, and exposure time. In general, higher grain temperatures were attained in 113.5 g of wheat as opposed to 227.0 g, at 8.0 cm from the emitter surface rather than at 12.7 cm, and during a 60-second exposure compared to a 45-second exposure. Old larvae were less susceptible to infrared radiation than young larvae. Probability of death was 94-100% for all life stages when the wheat was exposed for 1 minute at a distance of 8.0 cm from the emitter. These results show that flameless catalytic infrared technology may be a viable option for disinfestation of stored wheat in the future.

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Evaluation of Reference Genes for Quantitative PCR across Life-Cycle Stages and Tissue Types of *Tribolium castaneum*

Authors: M.J. Toutges, K.L. Hartzer, J.C. Lord, B.S. Oppert

Submitted to: Journal of Agricultural and Food Chemistry

The ability to compare RNA levels among experimental treatments is employed in many areas of agricultural research including gene expression studies. We evaluated the appropriateness of specific genes for their use as controls (normalizers) in gene expression studies by evaluating nine potential normalizers across both developmental stages and tissue types of insects. We found several normalizer genes that are suitable for broad scale analysis of gene expression, and we also demonstrated that it is essential to validate normalizers for the experimental conditions tested and also for the specific instruments and/or methods employed in a study.

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Ecology and IPM of Insects at Grain Elevators

Authors: D.W. Hagstrum, P.W. Flinn, C.R. Reed, T.W. Phillips

Submitted to: Biopesticides International

It is estimated that economic losses caused by insects to stored wheat in the USA range from 5 to 10% per year, or about 1.25 to 2.5 billion dollars. Alternative, economically viable methods for controlling these insects and reducing losses to raw commodities are required because of loss of available insecticides due to insect resistance or regulatory changes. An insect ecology study was conducted in commercial grain elevators and flat storages in Kansas. The study showed that grain may become infested soon after it is stored. Residual insect infestations at the elevator appear to be the most common source of infestation. In stored wheat in commercial elevators, the rusty grain beetle was the most common insect species from June-September, but was often surpassed by the lesser grain borer after 3-4 months of storage. The red flour beetle was the third most common insect species. Insect populations in wheat increased from June to October, then leveled off and declined as fall and winter temperatures cooled the grain. The insect density decreased with increasing depth below the grain surface. In corn in flat grain storages, 90.9% of the insects were weevils, 7.3% were red flour beetles, 0.7% were lesser grain borers, and 1.1% were rusty grain beetles. In wheat, 74.7% of the insects were weevils, 17.0% were lesser grain borers, 6.1% were red flour beetles, and 2.2% were rusty grain beetles. Insect populations in wheat in flat storages generally peaked in March and then declined. Insect populations in corn in flat storages generally peaked in June and then decreased. The findings from this study will be used to improve insect pest management programs for stored grain.

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