GMPRC
GRAIN MARKETING AND PRODUCTION RESEARCH CENTER

RESEARCH Kernels

www.gmprc.ksu.edu October 2006

Distribution And Efficacy Of Pyrethrin Aerosol for Control of the Confused Flour Beetle In Food Storage Facilities. Aerosol fogging applications are often used to control insect pests in food storage facilities, including the confused flour beetle, but there is limited information regarding distribution and efficacy of aerosols for control of this insect in actual field sites. We exposed adult beetles either with or without flour inside an empty warehouse, and applied a commercial pyrethrin aerosol formulation according to label directions. Recovery from knockdown increased as the amount of flour in the test arenas increased, indicating that the flour compromised efficacy to an extent, but we also found that the aerosol was not equally distributed throughout the test warehouse. In addition, short-term application of aerosol (once a week for four weeks) did not seem to affect resident populations. Results indicate that long-term aerosol applications may be necessary in actual practice to decrease recovery from knockdown, account for unequal distribution of aerosol, and provide more opportunities for exposure of resident populations. (Frank Arthur, telephone: 785-776-2783; email: frank.arthur@gmprc.ksu.edu)

Efficacy Of Aerosols For Managing The Red Flour Beetle. Pest management professionals commonly utilize aerosolized liquid applications, also known as fogging, for management of stored-product insects, including the red flour beetle. These applications are part of a potential methyl bromide replacement technology because they could increase the time interval between structural fumigations or heat treatments. This study was conducted in pilot-scale warehouses to investigate the influence of spilled food accumulation, exposure under pallets vs. in the open, and different insect life stages on red flour beetle mortality using two common insecticides (esfenvalerate and synergized pyrethrins). Data show that aerosolized insecticide applications provided the greatest red flour beetle mortality in empty dishes placed in the open. Observed mortality decreased with increasing food accumulation in the dishes and exposure under pallets. (Frank Arthur, telephone: 785-776-2783; email: frank.arthur@gmprc.ksu.edu)

Evaluation Of Two Fumigants For Rapid Treatment Of Packaged Seeds. Commodity fumigation of packaged seed stocks prior to shipping is performed with the goals of both eliminating the risk of transporting live stored-product insect pests and other incidental species, and protecting these valuable commodities from insect feeding damage. To meet industry production goals, often the turnaround times on these pre-shipment treatments needs to be very short. The overall objective of this project was to evaluate the efficacy of Eco2Fume® and Profume® against stored-product insects in pallets of packaged seed with the goals of obtaining complete mortality of immature and adult stages of selected stored-product pest species and minimizing the exposure time. Although insect survival was generally zero or very low, one of the treatments tested at the target temperature of 27°C (Eco2Fume at 24 and 36 hr and Profume at 12 and 24 hr exposure times) resulted in 100% mortality across all the trials. Even using small fumigation chambers, it proved difficult to consistently obtain the same temperatures and gas concentrations, which may have

contributed to the variation in results we obtained. Our study illustrates the real-world challenges of fumigating storage structures or seed stocks because of the variety of conditions encountered during fumigant application. Of the treatments tested, Profume with 24 hr exposures provided the greatest and most consistent level of insect mortality. For both Eco2Fume and Profume, our results suggest that the recommendations for gas concentration were close to a threshold in terms of providing 100% mortality of the insects inside the envelopes. Of the species tested, red flour beetle eggs were the most difficult to kill for both fumigants. Therefore, the use of the red flour beetle egg card bioassay that we developed during this project represents an easier and faster method to test the effectiveness of the fumigant. (James Campbell, telephone: 785-776-2717; email: james.campbell@gmprc.ksu.edu)

Stick'em At The Point of Entry! Food processing facilities, retail stores, warehouses, and other storage structures each have unique construction features, but all have potential routes of entry for insects from the outside. Reducing the ability of insects to enter a facility is a critical component of a pest management program because it focuses on preventing pest infestation problems from occurring in the first place. It is widely known that immigration, and identification and sealing of potential routes of entry, are important, but determining the relative importance of different potential entry points and the impact of different methods of sealing on immigration rates are not as well understood. Sticky cards placed around potential routes of entry can be used to assess where and when insects are entering structures and evaluate the impact of different management tactics, such as installing gaskets have on reducing immigration. Prevention of pest problems requires a better understanding of pest populations and behavior. Fortunately, relatively simple tools such as glue traps can be used to help provide the necessary information with which to make these management decisions, but the key is to use them effectively. (James Campbell, telephone: 785-776-2717; email: james.campbell@gmprc.ksu.edu)

Integrating The Stored Grain Advisor Pro Expert System With An Automated Electronic Grain Probe Trapping System. Automation of grain sampling should help to increase the adoption of stored-grain integrated pest management. A new commercial electronic grain probe trap (OPI Insector™) has recently been marketed. To make accurate insect management decisions, managers need to know both the insect species and numbers found in their grain. To make good management decisions, trap catch needs to be interpreted for the user. Insect species and grain temperature are two important factors that influence trap catch. Thus, an electronic trap needs to be able to estimate the species caught and grain temperature. We field tested OPI Insector™ electronic grain probes in two bins, each containing 32.6 tonnes of wheat, for a 10-month period. We compared estimates of insect density (insects/kg wheat) to the Insector counts. A statistical model was used to convert Insector™ catch into insects per kg. The average Insector™ manual tip counts and electronic counts were similar for most trapping dates. Stored Grain Advisor Pro (SGA Pro) was modified to automatically read the Insector database and to use a statistical model to estimate rusty grain beetle density from trap catch counts and grain temperature. Management decisions using Insector™ trap-catch estimates for the rusty grain beetle density were similar to those made using actual insect density for 10 out of 12 sampling dates for the first grain bin, and 11 out of 12 sampling dates for the second grain bin. The statistical model used to predict insect density from Insector trap catch tended to underestimate rusty grain beetle density when the grain was warmer than 23°C. (Paul Flinn, telephone: 785-776-2707; email: paul.flinn@gmprc.ksu.edu)

Susceptibility Of Rhyzopertha Dominica (F.) (Coleoptera: Bostrichidae) Exposed On Rough Rice Treated With Methoprene. One of the insecticides used to control the lesser grain borer on stored rice is the insect growth regulator methoprene. While this insecticide limits development of immature insects, we have limited information regarding direct toxicity to eggs of the lesser grain borer. We exposed their eggs on filter paper and on rice treated with methoprene, and also exposed adults on treated rice. Mortality of eggs increased as the concentration of methoprene on filter paper increased, and eggs exposed directly on rice either failed to hatch or larvae died before they could penetrate the hull, or the immature insect died inside the kernel and did not reach the adult stage. When adult females were exposed on rice treated with methoprene, egg-laying was reduced. Results show that eggs of the lesser grain borer are extremely sensitive to methoprene, and it could be used effectively in management programs that are targeted toward this insect. (Frank Arthur, telephone: 785-776-2783; email: frank.arthur@gmprc.ksu.edu)

Detection of Corn Kernels Infected by Fungi. Near-infrared spectra, x-ray images, color images, near-infrared images, and physical properties of single corn kernels were studied to determine if combinations of these measurements could distinguish fungal-infected kernels from uninfected kernels. Kernels used in this study were inoculated in the field with eight different fungi: *Acremonium zeae*, *Aspergillus flavus, Aspergillus niger, Diplodia maydis, Fusarium graminearum, Fusarium verticillioides, Penicillium spp.*, and *Trichoderma viride*. Results indicate that kernels infected with *Acremonium zeae* and *Penicillium* were difficult to distinguish from uninfected kernels while all of the other severely infected kernels could be distinguished with greater than 91% accuracy. A neural network was also trained to identify infecting mold species with good accuracy, based on the near-infrared spectra. These results indicate that this technology can potentially be used to separate fungal-infected corn using a high speed sorter; and, automatically and rapidly identify the fungal species of infested corn kernels. This will be of assistance to breeders developing fungal-resistant hybrids as well as mycologists studying fungal-infected corn. (Thomas Pearson, telephone: 785-776-2729; email: thomas.pearson@gmprc.ksu.edu)

Detection Of Underdeveloped Hazelnuts From Fully Developed Nuts By Impact Acoustics. The acoustic emissions from inshell hazelnuts as they impact with a steel plate were analyzed for their ability to distinguish nuts with fully developed kernels from those with underdeveloped kernels. The analysis included examination of the acoustic signals in the time domain as well as the frequency domain. Classification accuracies as high as 97% were achieved by this simple and low cost method. The system has a potential to sort nuts at rates up to 40 per second. Nuts with underdeveloped kernels are of lower value and can be more likely to contain aflatoxin. Thus, this method should give hazelnut producers and exporters a means to produce a higher quality and safer product. (Thomas Pearson, telephone: 785-776-2729; email: thomas.pearson@gmprc.ksu.edu)

Separation Of Pearl Millet Proteins By HPCE. Pearl millet is widely grown around the world for a diverse number of uses. Millets are common in developing countries and often grown in areas with poor soil and low moisture levels. The characterization of pearl millet proteins is far behind that of cereals such as wheat. The purpose of this project was to investigate the use of high performance capillary electrophoresis for characterizing pearl millet proteins and for use in varietal identification and potential for analysis of protein expression during kernel development. HPCE was found to successfully separate millet proteins and was a rapid technique for differentiating pearl millet hybrids and lines, and provides a new tool for studying pearl millet proteins. (Scott Bean, telephone: 785-776-2725; email: scott.bean@gmprc.ksu.edu)

Factors Impacting Ethanol Production From Grain Sorghum In The Dry-Grind Process. Sorghum is a drought- and heat-tolerant grain with starch content similar to that of maize. Currently about 5 to 15% of the U.S. sorghum crop goes towards the production of fuel ethanol. In order to improve the production of fuel ethanol from sorghum, the goal of this research was to understand the key factors impacting ethanol production from grain sorghum. Major factors related to higher ethanol production from sorghum included high starch content, rapid liquefaction, and low viscosity during liquefaction. Understanding the factors that can lead to improved ethanol production from sorghum may lead to ways the ethanol process can be altered to improve ethanol yields from sorghum and help sorghum breeders identify sorghum germplasm specifically for ethanol production. (Scott Bean, telephone: 785-776-2725; email: scott.bean@gmprc.ksu.edu)

Durability And Breakage Of Feed Pellets During Repeated Elevator Handling. Pelleting of animal feed improves the efficiency of feeding and the convenience of feed handling. An estimated 80% of non-ruminant feed in the U.S. is pelleted. These feed pellets need to be durable and of high quality to withstand the handling and transportation process from feed mill to feed trough. To determine breakage and durability of corn-meal-type feed pellets, the pellets were repeatedly transferred between two storage bins in the USDA-ARS Grain Marketing and Production Research Center research elevator at Manhattan, Kansas. The feed pellets withstood eight repeated elevator handlings without a significant change in durability as measured by the standard tumbling box test. In general, the handing characteristics were similar to shelled corn, but these feed pellets generated less dust emissions compared with shelled corn. These results will help feed handlers evaluate and improve their handling and transportation procedures. (Mark Casada, telephone: 785-776-2758; email: mark.casada@gmprc.ksu.edu)

Registration Of 'OK Bullet' Wheat. 'OK Bullet' is a hard red winter wheat cultivar recommended for grain-only and dual-purpose production systems throughout Oklahoma and the southern Great Plains, and dryland and irrigated systems in the southern High Plains. Its name was chosen to acknowledge its exceptional ability to satisfy several targets for end-use quality attributes. OK Bullet is a semi-dwarf wheat with a moderately early heading date, and its plant height exceeds most currently grown hard winter wheat cultivars. OK Bullet shows rapid stand establishment with low sensitivity to high temperature during germination. Its erect to semi-erect vegetative growth habit may not be conducive to intensive fall grazing in a dual-purpose (graze-plus-grain) management system. OK Bullet is moderately resistant to wheat soilborne mosaic and wheat spindle streak mosaic viruses, but moderately susceptible to barley yellow dwarf virus. Based on greenhouse observations, OK Bullet is moderately resistant to tan spot and to septoria leaf blotch, but susceptible to powdery mildew. It is susceptible to some strains of greenbug and to Hessian fly. Milling and baking quality represent exceptional features of OK Bullet. It has large kernel size and weight, as well as high test weight. From multi-location composite grain samples evaluated in two crop seasons (2003 and 2004), OK Bullet had desirably high flour yields and low flour ash content values. Wheat and flour protein contents were both very good. Values for farinograph peak time and stability were 11.2 and 17.2 minutes. Straight-dough baking quality of OK Bullet is considered above-average, with very good bake absorption, intermediate bake mixing time, acceptable loaf volume, and very good crumb-grain scores. (Bradford Seabourn, telephone: 785-776-2751; email: bradford.seabourn@gmprc.ksu.edu)

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