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Research Kernels

Our Latest Research Results - June 2012

Sampling Stored Product Insect Pests: A Comparison of Statistical Sampling Models to Maximise Pest Detection

Authors: D. Elmouttie, A. Keirmeier, P.W. Flinn, B. Subramanyam, D. Hagstrum, G. Hamilton
Submitted to: Pest Management Science
Sampling stored grain for insect pests is critical for maintaining grain quality and to determine if insect control is necessary. To develop the best sampling protocol for stored grain it is important to select a statistical model that explains how the insects are distributed in the grain, because the model can be used to predict the number of samples necessary to detect insects in the grain. In collaboration with scientists from Queensland University of Technology and Kansas State University, we compared the accuracy of four different statistical models to detect insects in grain. Of the four models, the compound model performed the best under both high and low insect densities. The findings from this study will be used to improve insect pest management programs for stored grain.
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Measurement of Internal *Beauveria bassiana* to Ascertain Non-Target Impacts on Arthropods in Field Environments

Authors: M.S. Goettel, G.D. Inglis, G.M. Duke, J.C. Lord, S. Jaronski
Submitted to: Biocontrol
There is a need for viable alternatives to chemical insecticides to control insect pests of pasture and field crops. Fungi that infect insects have many advantages but also infect many non-target species. The methods that have been used to assess fungal non-target effects have been inconsistent and inadequate. We tested a variety of methods to assess non-target effects in field trials of the fungus *Beauveria bassiana* in alfalfa and rangeland. Incubation of insects in a saturated atmosphere led to lower estimates of fungal prevalence than crushing and spreading of culture medium. Fungal prevalence in spider's and non-target beetles was low and decreased with time. The fungus did not affect immature leaf-cutting bees but was present in a small number of foraging bees after application. This research will help researchers to better assess pathogen non-target effects and help growers to make sound pest management decisions.
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Effect of Canopy Leaf Distribution on Sand Transport and Abrasion Energy

Authors: L.J. Hagen, M. Casada
Submitted to: Aeolian Research
When crop canopies are short or sparse, wind erosion can uncover plant roots, deplete the soil resource, and damage plants by abrasion and desiccation. This study determined the effects of number and distribution of leaves on threshold velocities, sand transport rates, and relative abrasion energy among simulated soybean seedling plant canopies. Six canopies were tested in a wind tunnel with the floor covered with sieved sand using maximum freestream wind speeds from 30 to 38 mph. The height above the surface of maximum abrasion energy also increased with wind speed in the plant canopy, but remained nearly constant over a bare sand surface. When leaves were located nearest the surface, they modified the vertical abrasion profiles by deflecting a portion of the sand impact energy upward in the wind stream. The modified abrasion profiles differed from that for isolated plants subject to profiles that develop over a bare surface upwind of the plants. Hence, it may be important to place test plants within a canopy of similar plants when conducting plant abrasion tests using sand. In contrast, abrasion on inter-row flat soil containers was independent of wind speeds, but was slightly higher without a canopy compared to measurements in the canopy with a similar sand discharge.
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Discrimination of Conventional and Roundup Ready Soybean Seeds; Transmittance versus Reflectance Measurements and Moisture Effect

Authors: L.E. Agelet, G.R. Rippke, P.R. Armstrong, J.G. Tallada, C.R. Hurburgh
Submitted to: Journal of Near Infrared Spectroscopy
Roundup Ready® soybeans which are resistant to Roundup® herbicide were one of the first genetically modified commercial crops recognized as safe. However, most current worldwide regulations for importing and exporting food demand the control, identification, and proper labeling of all genetically modified agriculture products. Previous studies have shown that Near Infrared Spectroscopy (NIRS) could distinguish between Roundup Ready® (RR) and conventional soybeans at the bulk and single-seed sample level. This recent study found that NIRS was able to discriminate between five conventional varieties

and their respective Roundup Ready® version. Correct classifications ranged from 82% to 98%. Moisture content of the seeds was found to affect classification accuracy and may limit the use of the NIRS instrumentation tested as a screening tool where moisture can be controlled.
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Infrared Spectral Properties of Germ, Pericarp, and Endosperm Sections of Sound Wheat Kernels and Those Damaged by Fusarium graminearum

Authors: K.H.S. Peiris, W.W. Bockus, F.E. Dowell
Submitted to: Journal of Applied Spectroscopy
Fusarium head blight (FHB) is a fungal disease of wheat and other small-grain cereals that can reduce grain yield and quality when warm, humid weather conditions are experienced at the time of flowering. The food and feed prepared from Fusarium-damaged grains pose a health risk to humans and animals due to the presence of mycotoxins. We studied the pericarp, germ, and endosperm of individual kernels to determine the mycotoxins and fungi in each component using infrared spectroscopy. We found large differences in the pericarp and germ of infected and uninfected kernels, but little difference in the endosperm. These results show that infrared spectroscopy can be used to study where fungi and mycotoxins are concentrated in individual kernels. This will help wheat breeders study resistance mechanisms, and processors determine ways to reduce fungi and toxins in flour.
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Spatial Application of WEPS for Estimating Wind Erosion in the Pacific Northwest

Authors: J. Gao, L.E. Wagner, F.A. Fox, S. Chung, J. Vaughn, B.K. Lamb
Submitted to: Transactions of the ASABE
The Wind Erosion Prediction System (WEPS) was designed by the USDA-ARS to simulate soil erosion on cropland with uniform soil and a single crop. We modified the WEPS source code to allow it not only to run on multiple grids, but also to "save the state" of the model so it can be re-initiated from that state in future runs to allow the model to be started and "stepped through time" incrementally under various future climate or forecast weather scenarios. This modified version of WEPS was applied to estimate particulate emissions for Washington State as the basis for input of wind erosion emissions into the AIRPACT regional air quality forecast system for the Northwest. For a specific dust storm, the results from WEPS showed reasonable agreement with satellite images of the dust storm. The study shows that WEPS can be successfully extended to run from one field grid to multiple grids and the model can identify the regions with high potential for soil erosion. WEPS can be used for real-time monitoring of soil erosion and air quality in a large region if actual and forecast weather inputs are available.
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A Network-Based Meta-Population Approach to Model Rift Valley Fever Epidemics

Authors: L. Xue, M.H. Scott, L.W. Cohnstaedt, C. Scoglio
Submitted to: Journal of Theoretical Biology
Rift Valley Fever virus is an insect transmitted zoonotic disease, meaning it infects animals and humans alike. Like West Nile virus before it, Rift Valley Fever has the capability to rapidly spread throughout the North American continent. But in the absence of an outbreak, there is no way to determine the extent of an epidemic. Predicting the outcome of insect transmitted diseases is difficult because models must account for the cattle, humans and mosquitoes and how they are influenced by the weather which this Rift Valley Fever model does. The model was tested with data from an actual outbreak of South Africa where the disease is endemic. The model successfully predicted the spread and impact of the disease. The model can now be used to test spread in the United States and possible mitigation strategies.
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