USDA Research Kernels

Our Latest Research Results – March/April 2015

Orbiviruses – A North American Research Gap Analysis Summary

Authors: D. Scott McVey, B.S. Drolet, M.G. Ruder, W.W. Wilson, D. Nayduch, R. Pfannenstiel, L. W. Cohnstaedt, N.J. MacLachlan, C.G. Gay
Submitted to: Veterinaria Italiana

Orbiviruses are members of the Reoviridae family and include bluetongue virus (BTV) and epizootic hemorrhagic disease virus (EHDV). These viruses are the cause of significant regional disease outbreaks among livestock and wildlife in the United States. Some of these outbreaks have been characterized by significant morbidity and mortality. Competent vectors are clearly present in most regions of the globe; therefore, all segments of production livestock are at risk for serious disease outbreaks. The USDA, in collaboration with DOI, organized a gap analysis workshop composed of international experts on *Orbiviruses*. The workshop participants met at the Arthropod-Borne Animal Diseases Research Unit in Manhattan, Kansas, May 14–16, 2013, to assess the available scientific information and status of currently available countermeasures to effectively control and mitigate the impact of an outbreak of an emerging *Orbivirus* with epizootic potential, with special emphasis given to BTV and EHDV. The workshop participants determined that available countermeasures are somewhat effective, but several weaknesses were identified that affect their ability to effectively prevent and control disease outbreaks.
Contact: Scott McVey, telephone: 785-537-5561
email: Scott.McVey@ars.usda.gov

Determination of total phenolic content, antioxidant capacity, and tannin content, within a diverse sorghum population

Authors: T.J. Herald, P. Gadgil, R. Perumal, T. Tesso
Submitted to: Journal of Food Composition

Phytonutrients such as phenolic compounds are found in plants and may offer human health benefits. Such health benefits reported include antioxidant properties that help fight against cancer, cardiovascular, and other chronic diseases. A genetically diverse set of 265 sorghum lines were grown in two different locations and evaluated for total phenolic content and tannin content. These compounds were further evaluated for their antioxidant capacity. Approximately 50% of the sorghum grain analyzed possessed antioxidant properties greater than blueberries, a recognized source rich in antioxidants. Knowledge of the genetic basis underlying the phytonutrient properties of sorghum is essential to direct breeding programs in identifying accessions containing health promoting compounds.

Contact: Tom Herald, telephone: 785-776-2703
email: Tom.Herald@ars.usda.gov

Detecting black tip-damaged wheat kernels using visible and near infrared spectroscopy

Authors: P.R. Armstrong, E.B. Maghirang, T.C. Pearson
Submitted to: Cereal Chemistry

Black tip wheat damage is a distinct discoloration of the wheat germ end and surrounding area caused by fungi and bacteria. Black tip infections occur in the field under conditions of high relative humidity or rainfall. There are ongoing breeding efforts to develop black tip resistance but considering that it is highly weather-dependent, it has been difficult to prevent this problem. Black tip poses no toxicological danger, but can cause flour discoloration and is thus considered a serious quality factor. Measuring black tip damage is done by human inspection and an instrumented approach is highly desirable. Two instruments developed by USDA-ARS were evaluated for black tip measurement on single wheat kernels. Both take spectral measurements with one using near-infrared light and the other, visible light. The near-infrared instrument can process about three kernels per second while the visible instrument processes about 30 kernels per second. Near-infrared measurements could distinguish good and lightly damaged kernels from more heavily damaged kernels with good accuracy, greater than 80%. Visible measurements were less accurate but still could provide useful measurements for some applications using multiple passes of a sample through the instrument. These instruments can serve as important tools for plant breeders and grading facilities of the wheat industry that require timely and objective measurements to quantify this defect.
Contact: Paul Armstrong,telephone: 785-776-2728
email: Paul.Armstrong@ars.usda.gov

Registration of nine sorghum seed parent (A/B) lines

Authors: R. Perumal, T. Tesso, K. D. Kofoid, R. M. Aiken, P.V. Vara Prasad, S. R. Bean, J. D. Wilson, T. J. Herald and C. R. Little
Submitted to: Journal of Plant Registrations

Nine sorghum [*Sorghum bicolor* (L.) Moench] A1 cyto plasmic-genic male sterile seed parent (A) and their maintainer (B) lines were released by the Kansas State University, Agricultural Research Center, Hays, Kansas in August 2014. These nine lines were developed from random mating between the selected germplasm (PI550610B, IS2692R, IS9454R, IS9335R) and different genetic male-sterile (GMS) ms3 populations like KP8B, B51-B (plant, purple; seed white; glume, black), ms3 tan, and white tan B06-41701-313 with different combinations using a recurrent selection followed by pedigree and back cross breeding methods. The lines KS133A/B to KS137A/B are early in maturity and come to flowering in 60 to 65 days, whereas the lines KS138A/B to KS141A/B are medium in maturity and come to flowering in 65 to 70 days. In general, these A/B lines are three-dwarf (dw1, Dw2, dw3, dw4) in height, photoperiod-insensitive, and possess unique combinations of plant and seed color. All nine seed parent lines are tannin free, short in peduncle length, panicles with good panicle exsertion and combining ability for yield and standability.
Contact: Scott Bean, telephone: 785-537-5534
email: Scott.Bean@ars.usda.gov

A high-density SNP and SSR consensus map reveals segregation distortion regions in wheat

Authors: C. Li, G. Bai, S. Chao, Z. Wang
Submitted to: BioMed Research International

Most chromosome regions segregate following Mendelian inheritance in biparental mapping populations. However, distorted segregation from Mendelian inheritance is also very common in some chromosome regions. This skewing of genetic ratios can affect the accuracy of genetic mapping studies. To study segregation distortion in wheat, we constructed a high-density consensus map using single nucleotide polymorphism (SNP) and simple sequence repeat (SSR) markers. The map was developed by merging two linkage maps developed from two recombinant-inbred line populations resulting from crossing the wheat cultivars, 'Ning7840' x 'Clark' and 'Heyne' x 'Lakin'. The number of markers that showed distorted segregation was 490 (18.5%) in the Ning7840 x Clark population and 225 (10.4%) in the Heyne x Lakin population. Identification of distorted regions can help to understand the underlying causes of segregation distortion and the map developed in this study can be used to map genes for important agronomic traits.
Contact: Guihua Bai, telephone: 785-532-1124
email: Guihua.Bai@ars.usda.gov

Efficacy of Methyl Bromide for Control of Different Life Stages of Stored-Product Psocids

Authors: C.G. Athanassious, M.M. Hasan, T.W. Phillips, J. Aikins, J.E. Throne
Submitted to: Journal of Economic Entomology

Despite the phase-out of many uses of the fumigant methyl bromide, it is still used for quarantine and preshipment treatments where psocids (insects which are also called booklice) may be an issue. Methyl bromide has been evaluated for control of many insect species, but there are few data available on its efficacy for control of stored-product psocids. Psocids are pests of stored grains and grain products in most of the world, and they have natural tolerance to some of the insecticides used for control of stored-product insects. We evaluated methyl bromide for control of different life stages of the psocids *Liposcelis bostrychophila*, *L. decolor*, *L. entomophila*, *L. paeta*, and *Lepinotus reticulatus* (psocids generally are known only by their scientific names). Adults and nymphs were very susceptible to methyl bromide, and complete mortality was recorded at concentrations between 0.027 and 0.280 g/m^3 in 48-hour fumigations. In contrast, eggs were by far more tolerant than adults and nymphs for all species tested. At 0.027 g/m^3, egg mortality did not exceed 53%, while survival was high even at 0.113 g/m^3. Complete egg mortality was recorded at 0.393 g/m^3 for *L. decolor* and at 0.452 g/m^3 for *L. entomophila* and *L. bostrychophila*. These results show that stored-product psocids are susceptible to methyl bromide, but concentrations of 0.452 g/m^3 or higher for 48 hours should be used to control all life stages.
Contact: Frank Arthur, telephone: 785-776-2783
email: Frank.Arthur@ars.usda.gov

USDA-ARS Center for Grain and Animal Health Research

1515 College Avenue
Manhattan, KS 66502

800-627-0388
www.ars.usda.gov/npa/cgahr