Sustainable Plant Protection Systems

Agroecology and Biotechnology of Stalk Rot Pathogens of Sorghum and Millet

Project KSU 210
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The analysis of Fusarium toxins as a complement to aflatoxin analyses in maize and sorghum is critical to the production of food quality grains and thus the fight against poverty and hunger. Problems associated with toxins in contaminated maize may make maize produced in marginal areas unsafe for human consumption with levels of toxins expected to be higher than those allowed even in animal feed in developed countries. The results of this work on analysis of Fusarium Toxins in sorghum and confirmation that sorghum has less mycotoxins than maize could significantly boost sorghum production in areas where Fusarium in maize is a problem. The extension will also provide for the completion of the “Fusarium Laboratory Workshop” and “Scientific Writing” training workshops as scheduled. Both are critical activities.

Low Input Ecologically Defined Management Strategies for Insect Pests on Sorghum

Project MSU 205
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MSU-205 is working on the completion of two INTSORMIL Ph.D. programs at Mississippi State University and the completion of other sorghum research activities expected to have an immediate benefit to farmers in Central America and the United States. Timely Dipel and calcium sulfate sprays were more effective than chemical sprays for management of insect pests and diseases, respectively, on sorghum in Nicaragua. Grain feeding insect pests were identified in commercial seed storage facilities and were associated with levels of aflatoxin and related fungi, mostly Fusarium spp, but also four other fungi. In El Salvador, 16 lines of sorghum were identified with some resistance to a complex of diseases and insect pests. Timely application of selected insecticides at sorghum bloom proved to be relatively effective against the sorghum midge at moderate infestation levels. Whitefly population levels on sorghum and rice were documented at lowest levels during the past three years. Insect pests and diseases were quantified for the second year of a three year sorghum-soybean crop rotation study in Mississippi to determine the influence of this planting practice on these pests and yield. Pest insect and disease levels were about the same in 2005 as in 2004 in the various treatments. Stinkbug identification and population levels on crop and non-crop hosts in a sorghum date-of-planting study were documented, economic threshold studies were conducted, and crop host plant preferences were determined. Ecological and biological investigations of insect pests and diseases of sorghum, sorghum cropping systems investigations, and identification of economic threshold levels for specific pests will provide information for development of improved pest management tactics and strategies for sorghum crops in Central America and the United States. Student training and crop production technology transfer assists in institution building activities and in improving crop production in host countries.

Publications

Presentations

10 presentations at scientific meetings (with proceedings).

Publications and Presentations

Proceedings

Gutierrez, Yanet, Martha Zamora, Roger Vilchez, Oliver Rugama and Henry Pitre. 2006. Calidad Fitosanitaria y Presencia de Aflatoxinas en Granos de Sorgo (Sorghum bicolor (L.) Moench). 52nd Cooperative Meeting to Improve Crop and Animal Production in Central America. (PCCMCA Meeting) April 24-28, 2006. Montelimar, Nicaragua.

Zamora, Martha, Yanet Gutierrez, Carmen Gutierrez, Sergio Soza, Guillermo Taleno and Henry Pitre. 2006. Evaluacion de Productos Quimicos y no Quimicos para el Manejo de Plagas sel Sorgo (Sorghum bicolor (L.) Moench) en Masaya y Managua. PCCMCA Meeting. April 24-28, 2006. Montelimar, Nicargaua.

Obando, Rafael, Carmen Gutierrez, Martha Zamora, Gary Peterson and Henry Pitre. 2006. Evaluation of Sorghum Lines for Resistance to Sorghum Midge, Stenodiplosis sorghicola (Coq.), on Sorghum in Nicaragua. PCCMCA Meeting April 24-28, 2006. Montelimar, Nicaragua.

Serrano, Reina, Carlos Borja, Andreae Moran and Henry Pitre. 2006. Evaluacion de la Tolerancia y/o Resistencia a Enfermedades e Insectos en Viveros ADIN de Sorgo, en El Salvador, 2005. PCCMCA Meeting, April 24-28, 2006.

Cervantes, Leopoldo, Reina Serrano, Carlos Borja, A. Moran Rivera, A. Lemus Menjivar and Henry Pitre. 2006. Plaga de Musca Blanca (Aleurocybotus occiduus) para Maicillo (Sorghum bicolor) y Arrozo (Oriza sativa) en El Salvador, Central America: 2003-2005. PCCMCA Meeting. April 24-28, 2006. Montelimar, Nicaragua.

Parada, Mario and Henry Pitre. 2006. Southern Green Stinkbug (Nezara viridula) Development and Behavior With Relationships to Crop Plants. PCCMCA Meeting. April 24-28, 2006. Montelimar, Nicaragua.

Parada, Mario and Henry Pitre. 2006. Feeding Damage by Nymphs and Adults of Southern Green Stinkbugs (Nezara viridula) on Sorghum Panicles. PCCMCA Meeting. April 24-28, 2006. Montelimar, Nicaragua.

Pichardo, Sergio, Rich Baird and Henry Pitre. 2006. Occurrence of Disease and Insect Pests in Select Sorghum and Soybean Rotations in Mississippi. PCCMCA Meeting. April 24-28, 2006. Montelimar, Nicaragua.

Pichardo, Sergio, Rich Baird and Henry Pitre. 2006. Occurrence of Insect and Disease Pests in Select Sorghum and Soybean Rotations in Mississippi. Proc. Southern Soybean Disease Workers. March 8-9, 2006. Jackson, Tennessee.

Pichardo, Sergio, Rich Baird and Henry Pitre. 2006. Occurrence of Insect and Disease Pests in Select Sorghum (Sorghum bicolor (Linn.) Moench) and soybean (Glycine max (L.) Merr.) Rotations in Mississippi. Mississippi State Agric. Pest Mgt. Assoc. Joint Conf. Feb. 28 - March 2, 2006. Stoneville, Mississippi.

Striga Biotechnology Development and Technology Transfer

Project PRF 213
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Dr. Issoufou Kapran, Sorghum Breeder, INRAN, Niger
Dr. Aboubacar Touré, Sorghum Breeder, IER, Mali
Dr. N'Diaga Cisse, Sorghum Breeder, INERA, Senegal
Dr. Asmelash Abraha, Plant Protection Officer, DARE, Eritrea
Mr. Christopher Umburu, Weed Scientist, KARI, Kenya
Mr. Elias Latayo, Agronomist, Tanzania
Dr. Mbwanga, Striga Specialist, Tanzania

A major effort of this project this past year hs been graduate student expense support for Mr. Zenbaba Wordoffa, Ethiopia, and for operational expenses to complete his graduate degree research which is currently underway. This includes funds for specialty quarantine supplies, *Striga* seed, chemicals and materials which have been required for him to complete his research work. *Striga* is the major parasitic weed pest throughout Africa and its control is very critical for food deficit areas such as Ethiopia. The functioning of this lab is critical as it is the only approved lab in the U.S. to work with *Striga* seed.

Sustainable Management of Insect Pests

Project WTU 200
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Project WTU-200 currently supports three graduate students from Mali, India, and Ethiopia. The project is supporting graduate student research on determining causes of stored sorghum grain to maize weevils, relating amount and time of phytochrome to daily times of sorghum flowering and resistance to sorghum midge, and evaluating effect of temperature on corn leaf aphids on sorghum to be completed and reports and publications written. In addition to this work, the project is completing research and will publish the results on evaluation of alternative management practices (plant resistance and biological control) compared to the use of organophosphate and carbamate insecticides for controlling greenbugs in a sorghum-wheat cropping system in Texas and Kansas. Collaborative research with HC scientists will be completed on evaluation of pearl millet for resistance to millet head miner in Niger, sorghum lines for resistance to sorghum midge in Mali and Niger, and sorghum genotypes for resistance to sugarcane aphid, stalk borers and termites in Botswana, Mozambique and South Africa.

Publications

Journal Articles

Pendleton, Michael W., E. Ann Ellis, Fernando M. Chitio, and Bonnie B. Pendleton. 2005. Morphological differences in sorghum grains resistant to maize weevil, Sitophilus zeamais. Texas Journal of Microscopy 36: 47.

Sambaraju, Kishan R., and Bonnie B. Pendleton. 2005. Fitness of greenbug (Homoptera: Aphididae) on wild and cultivated grasses. Southwestern Entomologist 30: 155-160.

Books, Book Chapters and Proceedings

2005. Mosca Midge Deteccion Y Control. Brochure in Spanish. Midstates Ag Services, Inc.

Damte Belete, Tebkew, Bonnie B. Pendleton, and Lal K. Almas. 2006. Economic benefit of using a resistant sorghum hybrid to manage sorghum midge (Diptera: Cecidomyiidae). Pp. 7-8. In Proceedings of the 54th Annual Meeting of the Southwestern Branch of the Entomological Society of America and the Annual Meeting of the Society of Southwestern Entomologists, 27 February – 2 March 2006, Austin, Texas, U.S.

Dissertations and Theses

Traore, T. 2006. Distribution of greenbug (Hemiptera: Aphididae) biotypes and effect of photoperiod on fitness of greenbug biotypes on sorghum. M.S. thesis. West Texas A&M University, TX.

Abstracts

Abdou Kadi Kadi, H., and B. B. Pendleton. 2005. Evaluation of pearl millet for resistance to millet head miner in Niger. International Sorghum and Millets Newsletter 46: 115-116.

Abdou Kadi Kadi, H., I. Kapran, and B. B. Pendleton. 2005. Identification of sorghum genotypes resistant to sorghum midge in Niger. International Sorghum and Millets Newsletter 46: 57-59.

Pendleton, M. W., S. Vitha, E. A. Ellis, F. M. Chitio, and B. B. Pendleton. 2005. Morphology of sorghum grain in relation to

resistance to maize weevil. International Sorghum and Millets Newsletter 46: 55-57.

Yaro Diarisso, N., and B. B. Pendleton. 2005. Effectiveness of plant powder in controlling lesser grain borer in stored sorghum grain. International Sorghum and Millets Newsletter 46: 62-63.

Yaro Diarisso, N., M. Diourté, and B. B. Pendleton. 2005. Use of local plants to control sorghum insect pests in the field. International Sorghum and Millets Newsletter 46: 60-62.

Damte, T., B. B. Pendleton, L. K. Almas, and G. C. Peterson. 2006. Farm-level return on use of a sorghum midge (Diptera: Cecidomyiidae)-resistant sorghum hybrid. International Sorghum and Millets Newsletter 47.

Presentations

Lal K. Almas, W. Arden Colette, and Bonnie B. Pendleton. Grain sorghum production and profitability in the Texas Panhandle. West Texas A&M University Cornette Library Faculty Research Poster Presentation, 6 April 2006, Canyon, Texas.

Roxanne Bowling, Bonnie B. Pendleton, Robert Bowling, and Gerald J. Michels. Alternatives to organophosphates and carbamates for managing aphids in wheat and sorghum. Fifty-third Annual Meeting of the Entomological Society of America, 15-18 December 2005, Fort Lauderdale, Florida.

Roxanne Bowling, Bonnie B. Pendleton, and Gerald Michels. Does aphid-resistant wheat affect the ability of convergent lady beetle larvae to control aphids? Fifty-fourth Annual Meeting of the Southwestern Branch of the Entomological Society of America and the Annual Meeting of the Society of Southwestern Entomologists, 27 February – 2 March 2006, Austin, Texas.

Tebkew Damte Belete, Bonnie B. Pendleton, and Lal K. Almas. Economic benefit of using a resistant sorghum hybrid to manage sorghum midge (Diptera: Cecidomyiidae). Fifty-fourth Annual Meeting of the Southwestern Branch of the Entomological Society of America and the Annual Meeting of the Society of Southwestern Entomologists, 27 February – 2 March 2006, Austin, Texas.

Bonnie Pendleton. Pest management, entomology, and arachnology education and research partners at West Texas. Invited Symposium presentation. Fifty-fourth Annual Meeting of the Southwestern Branch of the Entomological Society of America and the Annual Meeting of the Society of Southwestern Entomologists, 27 February – 2 March 2006, Austin, Texas.

Bonnie Pendleton et al. Sustainable management of insect pests in Africa and the U.S. INTSORMIL West Africa Regional Meeting, 7-9 March 2006, Ouagadougou, Burkina Faso.

Bonnie Pendleton, Fernando Chitio, Michael Pendleton, Ann Ellis, and Stan Vitha. Relationship between sorghum morphology and resistance to maize weevil. Entomology Science Conference, 26-28 October 2005, College Station, Texas.

Bonnie B. Pendleton, Roy D. Parker, et al. Sorghum entomology research in Texas. Great Plains/Drought Symposium, 6-7 October 2005, Lubbock, Texas.

Bonnie Pendleton and Tiecoura Traore. Effect of photoperiod on greenbug fecundity and longevity on sorghum. Entomology Science Conference, 26-28 October 2005, College Station, Texas.

Michael W. Pendleton, E. Ann Ellis, Fernando M. Chitio, and Bonnie B. Pendleton. Comparison of morphology of sorghum grain to resistance to maize weevil (Coleoptera: Curculionidae). Microscopy and Microanalysis Conference, 31 July – 4 August 2005, Honolulu, Hawaii.

Michael W. Pendleton, E. Ann Ellis, Fernando M. Chitio, and Bonnie B. Pendleton. Comparison of morphology of sorghum grain to resistance to maize weevil (Coleoptera: Curculionidae). Texas Society of Microscopy, 13-15 October 2005, San Antonio, Texas.

Michael W. Pendleton, E. Ann Ellis, Fernando M. Chitio, and Bonnie B. Pendleton. Comparisons of morphology of sorghum grain to resistance to maize weevil (Coleoptera: Curculionidae). Fifty-third Annual Meeting of the Entomological Society of America, 15-18 December 2005, Fort Lauderdale, Florida.

Tiecoura Traore, Bonnie B. Pendleton, and G. J. Michels, Jr. Effect of photoperiod on fitness of greenbug (Hemiptera: Aphididae) biotypes E and I on sorghum. Ag Program Conference, The Texas A&M University System, 9-11 January 2006, College Station, Texas.