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7. Title

Enhancing Management Programs for Major Insect Pests of Corn, Grain Sorghum, and Wheat in Louisiana

12. Investigator Name(s) (Last Name and Initials)

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20. Termination Date 09/30/2014	40. Period Covered (mo/da/year): 01/01/2011 TO 12/31/2011

Outputs:

One book chapter was published. Six referred scientific papers were published including two in high- impact, international journals. Three article-technical reports were published in Louisiana Agriculture, Arthropod Management Tests, and the Louisiana Crops Newsletter. Four conference proceedings were published. Six invited oral and poster presentations have been delivered at professorial meetings. Several potential Bt resistant strains of fall armyworm (FAW) were identified. Once the resistance is confirmed, these insect strains will be screened against novel research materials.

Outcomes/Impacts:

Susceptibility of the six YieldGard-resistant strains of sugarcane borer (SCB) was evaluated to three Bt proteins, Cry1Ab, Cry1Aa, and Cry1Ac. Laboratory bioassays showed that all six strains established during 2009-2010 were highly resistant to Cry1Ab and Cry1Ac. These strains also demonstrated a relatively low level of resistance to Cry1Aa. Survival of the six SCB strains on YieldGard Bt corn plants was due to the resistance to the Cry1Ab protein in the plant. During 2011, larval movement and occurrence of SCB and corn earworm (CEW) was evaluated in four seed mixture patterns of non-Bt plants and Bt plants containing SmartStax traits. The four patterns of seed mixtures were: T1) pure Bt corn, T2) a non-Bt corn plant surrounded by Bt corn plants, T3) pure non-Bt corn, and T4) a Bt corn plant surrounded by non-Bt corn plants. Non-Bt plants in the mixed plantings of non-Bt and Bt plants provided an equivalent refuge population as structured refuge plantings for SCB, but not for CEW. Larval survival and plant injury of YieldGard-susceptible, -resistant, and -heterozygous genotypes of SCB on five corn hybrids were evaluated during 2011. These corn hybrids were two non-Bt and three Bt corn representing three Bt technologies, YieldGard, Genuity VT Triple Pro and SmartStax. Results of the studies showed that pyramided Bt corn was superior to the single-gene Bt corn in SCB control. The pyramided Bt corn also can completely overcome YieldGard-resistance and offers a means for resistance management in SCB. During 2011, an F2 screen was conducted to detect major resistance alleles to Cry1F corn in field populations of FAW sampled from U.S. southern region. High resistance to Cry1F Bt corn in FAW populations might already be present in the United States. Bt resistance surveys will continue to monitor this situation and ensure the continued success of Bt corn technology in the southern region.

Publications:

Huang, F., B.R. Leonard, X. Wu, and M.N. Ghimire. 2011. Risk assessment of sugarcane borer resistance to transgenic maize expressing Bacillus thuringiensis proteins. pp. 89-103. In Genetically Engineered Crops: Biotechnology, Biosafety and Benefits, ed by L. M. Grover Nova Science Publishers, Hauppauge, NY.

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Huang, F., D.A. Andow, and L.L. Buschman. 2011. Success of the high dose-refuge resistance management strategy after 15 years of Bt crop use in North America. Entom. Exp. App. 140: 1-16.

Huang, F., M.N. Ghimire, B.R. Leonard, J. Wang, C. Daves, R. Levy, D. Cook, G.P. Head, Y. Yang, J. Temple, and Rob

Ferguson. 2011, F2 screening for resistance to pyramided Bacillus thuringiensis maize in Louisiana and Mississippi populations of Diatraea saccharalis (Lepidoptera: Crambidae). Pest Manag. Sci. 67:1269-1276.

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Temple, J.H, F. Huang, J.T. Kardke, P.P. Price, K. Emfinger, and B.R. Leonard. 2011. Evalution of insecticides against sorghum webworm in grain sorghum, 2010. Arth. Manage. Tests F72.

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Wangila, S.D., B.R. Leonard, M.N. Ghimire, Y. Yang, J.T. Hardke, J.T. Temple, G. P. Head, and F. Huang. 2011. Occurrence and larval movement of sugarcane borer in mixed plantings of non-Bt and Bt corn expressing pyramided Cry proteins. USDA NC-205 Annual Reports (in CD).

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Yang, Y., J.T. Copes, B.R. Leonard, J. T. Hardke, J.W. Sharp, J.H. Temple, S. Martin, and F. Huang. 2011. Evaluation of Voliam Xpress for controlling corn earworm on sweet corn. USDA NC-205 Annual Reports (in CD).

Hardke, J.T., B.R.Leonard, F. Huang, and R.E. Jackson. 2011. Damage and survivorship of fall armyworm (Lepidoptera: Noctuidae) on transgenic field corn expressing Bacillus thuringiensis Cry proteins. USDA NC-205 Annual Reports. (in CD).

Participants:

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Target Audiences:

Crop growers, agricultural consultants, seed company representatives, Extension specialists, research scientists and regulators

Project Modifications:

Nothing significant to report during this reporting period.

Approved (Signature)	Title	Date