NCERA-125 Biological Control of Arthropods and Weeds
Kentucky - project reports

1) Project title: Movement of Bt toxins through food webs

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Project Description

With increasing acreages being planted to transgenic insecticidal crops, evaluating the non-target effects is an essential component of risk assessment in non-target food webs. Through a series of experiments, the following hypotheses were examined: (1) Bt-endotoxins would be detectable, using a quantitative ELISA, in non-target slugs following the consumption of transgenic material and (2) Bt-endotoxins would be present in non-target herbivores and higher-order arthropod predators collected from transgenic corn fields. The results would indicate if significant movement of endotoxins through the food chain, (3) Bt-endotoxins would flow through a plant-slug-carabid food chain, but quantities transferred would be sufficiently low to result in limited fitness consequences.

In addition to developing an accurate and quantitative assay for the detection of small quantities of Cry1Ab Bt-endotoxins in non-target arthropods, laboratory experiments indicated that although the uptake of endotoxins by mollusks was sufficiently high to allow detection, these toxins did not flow through the food chain to carabid predators and therefore resulted in no reduction in predator fecundity. However, these field experiments reported the first quantitative evidence for the uptake of endotoxins by non-target herbivores and higher-order arthropod predators in the field. Significant quantities of toxin were present in the Corn Flea Beetle, Japanese Beetle and Southern Corn Rootworm, as well as detectable quantities in a number of predators (nabids, spiders and coccinellids). This uptake could have occurred by direct consumption of plant material or feeding on Bt-containing herbivorous prey. This research provided the first conclusive evidence for the flow of transgenic endotoxins into predator communities and therefore forms the basis for future risk assessments of transgenic crops in the field.

2)) Project title: Interactions among native and introduced species of Coccinellidae

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Project Description

Through a series of laboratory and field studies, the interactions of *Harmonia axyridis* and *Coccinella septempunctata* with *Coleomegilla maculata* and *Cycloneda munda* are being examined. The focus of these studies is on larval interactions and methods to quantify interactions in the field.

Kentucky -- Publications (2005-06)

Harwood, J.D. & J.J. Obrycki. 2006. Web-site selection strategies of linyphiid spiders in alfalfa: implications for biological control. BioControl (in press)

Harwood, J.D., C. Ricci, R. Romani, K.M. Pitz, A. Weir & J.J. Obrycki. 2006. Prevalence and association of the laboulbenialean fungus *Hesperomyces virescens* (Laboulbeniales: Laboulbeniaceae) on coccinellid hosts (Coleoptera: Coccinellidae) in Kentucky, USA. European Journal of Entomology 103: 799-804.

Harwood, J.D., C. Ricci, R. Romani & J. J. Obrycki. 2006. Historic prevalence of a laboulbenialean fungus infecting introduced coccinellids in the United States. Antenna, Bulletin of the Royal Entomological Society 30: 74-79.

Harwood, J.D., A. Samson & J.J. Obrycki. 2006. No evidence for the uptake of Cry1AB Bt-endotoxins by the general predator *Sciaites subterraneus* (Coleoptera: Carabidae) in laboratory and field experiments. Biocontrol Sci. & Tech. 16: 377-388.

Harwood, J.D. & J.J. Obrycki. 2006. The detection and decay of Cry1Ab Bt-endotoxins within non-target slugs, *Deroceras reticulatum* (Muller) (Mollusca: Pulmonata), following consumption of transgenic corn. Biocontrol Sci. & Tech. 16:77-88

Harwood, J.D. & J.J. Obrycki. 2005. Quantifying aphid predation rates of generalist predators in the field. European Journal of Entomology, 102: 335-350.

Harwood, J.D. & J.J. Obrycki. 2005. The role of alternative prey in sustaining predator populations. pp. 453-462, In Proc. 2nd Inter. Symp. Biological Control of Arthropods Vol II. M.S. Hoddle (compiler). Sept 12-16, 2005, Davos, Switzerland.

Obrycki, J.J. & J.D. Harwood. 2005. Alfalfa Insects: Ecology and Management. In Encyclopedia of Pest Management. D. Pimentel (ed.) 3 pp; DOI: 10.1081/E-EPM-120041108; Published on: 28/Nov/2005

Krafsur, E.S., J.J. Obrycki, & J.D. Harwood. 2005. Comparative genetic studies of endemic and exotic Coccinellidae in North America. European Journal of Entomology 102: 469-474.

Harwood, J.D. , W. Wallin, & J.J. Obrycki. 2005. Uptake of Bt-endotoxins by non-target herbivores and higher order arthropod predators: molecular evidence from a transgenic corn agroecosystem. Molec. Ecology 14: 2815-2823.

Harwood, J.D. & J.J. Obrycki. 2005. Web-construction behavior of linyphiid spiders (Araneae, Linyphiidae): competition and co-existence within a generalist predator guild. J. Insect Behavior 18: 593-607.