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Increasing Concerns about Corn Earworm Susceptibility to Pyrethroids in the Midwestern USA

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The corn earworm (CEW), *Helicoverpa zea* (Boddie), is one of the most damaging insect pests of vegetable and field crops grown throughout much of the United States as well as southern Canada. Capinera (1) recently collated host records for the US and found that at least 24 vegetable crops, 15 field crops, 14 fruit and ornamental species, and 22 weeds and wild hosts serve as larval hosts, depending on the season and location. In the southern US, CEW has been a significant pest of corn, cotton, soybean, sorghum, and tomato. In the midwestern and northeastern US, sweet corn, tomato, snap bean, and corn grown for seed are most often damaged. Crop risk at any given location is the product of relative attractiveness of the crop to CEW adults seeking preferred oviposition sites, such as fresh silking corn or plants with fruiting growth stages. The propensity of larvae to feed on high value fruiting structures results in significant economic losses at relatively low pest infestation levels. Although CEW is not known to overwinter at latitudes higher than 40 to 45° (1), adults are quite mobile and able to migrate from the southern US to northern crops each year.

During the 1980s to late 1990s, a variety of pyrethroid insecticides provided cost-effective control of CEW for most crops affected. However, beginning in 2000, researchers in Minnesota and Wisconsin began to notice significant reductions in pyrethroid efficacy for larval control (only 35 to 45% control) as measured by small-plot studies in sweet corn. Although there have been only limited reports of CEW control problems in commercial sweet corn (southern Minnesota and Ontario, Canada), pyrethroid efficacy in small-plot trials has remained low. In most trials, the possibility of poor timing or other application problems was not viewed as the cause for low efficacy.

Because of growing concern about inconsistent CEW control, particularly in Midwest sweet corn, and the documented migratory behavior of CEW adults, a symposium was organized for the Annual Meeting of the North Central Branch of the Entomological Society of America, held 26-29 March 2006, in Bloomington, Illinois. The purpose of the symposium was to provide a comprehensive overview of the status and impact of *H. zea* resistance to synthetic pyrethroids, with a focus on the midwestern, northeastern, and southern US. A variety of speakers with expertise in all aspects of *H. zea* biology, ecology, migration, and resistance management were invited to contribute to this discussion. The scope of the resistance problem was reviewed by Bill Hutchison (University of Minnesota) for the Midwest, Shelby Fleischer (Pennsylvania State University) for the Northeast, and Patricia Pietrantonio (Texas A&M University) for Texas. Brian Flood (Del Monte Corp.) and Tom Rabaey (General Mills) provided a vegetable processing industry view for sweet corn and snap beans, including the need to quickly adapt and adjust integrated pest management (IPM) recommendations. Caydee Savinelli (Syngenta) provided an overview from the crop protection industry, as summarized by the Insecticide Resistance Action Committee (IRAC-US), and resistance

management recommendations used for other pest systems. Rick Weinzierl (University of Illinois) reported that, for most of the affected horticultural crops in the northern US, there are very few alternatives to the pyrethroids for cost-effective control. The symposium concluded with new ideas and suggestions for collaborative mapping of CEW flights and resistance management results by Shelby Fleischer, and current migration forecast systems by Mike Sandstrom and Dave Changnon (Northern Illinois University).

In summary, continued effective management of CEW will depend upon a reliable network of extension, industry, and research personnel to facilitate multi-state resistance monitoring, multi-state research, and the development of new alternatives for CEW management. Beginning in 2006, a renewed effort was made to expand the regional monitoring of CEW flights, resistance monitoring, and to facilitate discussion among entomologists to address resistance concerns. We have also initiated a new collaboration for the geographic expansion of the "PestWatch" web-based monitoring system at Pennsylvania State University for rapid documentation and delivery of moth flight data (2), and plan to couple this tool with resistance management updates via the Midwest "VegEdge" web site (3). We anticipate that the expanded utility of this online system will improve communication among researchers and provide timely IPM recommendations by extension educators in the regions most affected by continued pyrethroid resistance in CEW. Moreover, alternative IPM and Insecticide Resistance Management (IRM) recommendations can also be communicated via this effort as well as future educational conferences for growers and the vegetable processing industry.

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