EFFECT OF NEW CHEMISTRY INSECTICIDES TOWARDS BENEFICIAL INSECTS OF COTTON

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Abstract

Mortality of beneficial insects by insecticides is a limitation in the successful implementation of IPM programs. The objective of this research was to evaluate three new insecticides recommended for cotton, Confirm™, Tracer™ and Pirate™, for their effect on two key beneficial insects, the predator "insidious flower bug" (*Orius insidiosus*; Antochoridae) and the parasitic wasp of lepidopteran larvae, C*otesia marginiventris* (Hymenoptera, Braconidae). The closely related species *Cotesia plutella* was also evaluated. Percent mortalities of insects exposed to foliar dried residues were determined.

Introduction

Natural enemies are a key component for the management of cotton pests such as the beet armyworm and fall armyworm in cotton, and outbreaks of these pests are thought to be in part due to the use of non-selective insecticides. The relative abundance of *C. marginiventris* among all parasites which parasitize bollworm and budworm larvae is of 10% in South TX (Benedict et al., 1996). Further, a closely related species, *Cotesia plutella*, is an important parasitic wasp for the control of lepidopterans (loopers) in Cruciferae. Cocoons and adults are commercially available to be used in IPM programs (Hunter, 1994). In addition to feeding on aphids and mites, the predator *Orius insidiosus* is also a factor in the mortality of lepidopteran eggs in the field (Sansone, 1997). This predator is also commercially available for use in IPM.

The long term goal is to rank insecticides registered for use in cotton for their selectivity towards several beneficial insects in order to provide information and recommendations for IPM programs.

Methods

Adults of *O. insidiosus* were purchased from IPM Laboratories, Locke, NY, and cocoons of *C. plutella* were purchased from Biofac Crop Care, Mathis, TX. *C. marginiventris* was reared in the laboratory using second instar budworms *(Heliothis virescens)* as a host. Adults of *Orius* were fed with cotton aphids, and wasps with diluted honey. Insects were exposed to residues of the following insecticide formulations: Tracer™ [spinosyn A and B; Dow Elanco, Hesperia, CA]; Pirate™ [AC303,630;4-bromo- 2- (4- chlorophenyl) - 1 - etoxymethyl- 5-trifluoromethylpyrrole-3-carbonitrile; Cyanamid, Wayne, NJ], Confirm ™ [tebufenozide; RH 5992; Rohm & Haas, Philadelphia, PA] and Karate™ (lambda cyhalothrin; Zeneca Ag Products, Wilmington, DE). Insecticides were applied at the following recommended rates for cotton: Confirm 0.125 lb. a. i./acre; Tracer 0.073 lb. a. i./acre; Pirate 0.2 lb. a. i./acre and Karate 0.025 lb. a. i./acre. Cotton plants were treated in a simulation-aircraft chamber calibrated to deliver 5 gallons/acre. Pots were individually sprayed. Water sensitive cards were used during the experiments to control for the homogeneity of the applications. Two hours post treatment, when completely dried, plant tissue was placed on filter paper inside ventilated Petri dishes. Five insects per Petri dish were utilized. A total of 135 insects were tested per treatment, corresponding to 3 replications (conducted on three different days) of 45 insects each. Insects were exposed to these residues or 24 h-old foliar residues of the commercial formulations, for 24 or 48 h. Insects were kept at 24¡C until the end of the testing period. Mortality was recorded as the end point. Mortality was analyzed by analysis of variance. The SAS computer program was used for the statistical analysis for *C. plutella* and *O. insidiosus*. Insecticides are ranked as harmless (1= <25% mortality), slightly harmful (2= 25-50% mortality), moderately harmful (3= 51-75% mortality) and harmful (4= >75% mortality).

Results

Results of the foliar residues bioassays provide a measure of gross efficacy and information on the selectivity of the commercial formulations assayed on two different orders of insects. According to the percent mortality observed the insecticides were ranked utilizing the system explained above. For *Orius insidiousus* ranks were: Confirm (1); Tracer (1); Pirate (2) and Karate (4). For *Cotesia plutella*: Confirm (1); Karate (1); Tracer (2) and Pirate (4). Interestingly, under these conditions, insects avoided the Karate treated leaves resulting in low mortality. The compound was highly toxic when dip assays were performed. Preliminary results of *C. marginiventris* on similar spray assays with Pirate and Tracer indicate that these two insecticides are more toxic to this species than to *C. plutella.*

Conclusions

These results reflect the effects of dried insecticide residues, and not those of direct spray applications, therefore, they should be interpreted with caution. Different species of natural enemies respond differently to the same compound, even closely related species such as *C. plutella* and *C. marginiventris.* Results on *C. marginiventris* are considered preliminary since only 85 insects were used for Tracer and 91 for Pirate. Mortality

Reprinted from the *Proceedings of the Beltwide Cotton Conference*
Volume 2:1339-1340 (1997)
National Cotton Council, Memphis TN

is not always the best end-point to measure the effect of insecticides on beneficials: rate of parasitism and predation in the field should be also measured. Behavioral responses such as the avoidance observed with Karate should be considered when interpreting the results. Ranking systems must reflect the average of negative effects of pesticides among all the key beneficial insect species in cotton.

References

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Acknowledgments

Dr. Kirk (USDA, College Station); Dr. K. El-Zik (TAMU) and S. House (USDA, College Station). S. Deike for technical assistance. Dr. B. Vinson, TAMU. Dow Elanco, American Cyanamid, Rohm & Haas, and Zeneca Ag. products generously provided insecticides. This research was supported in part by the Extension Service IPM mini-grants program.