EFFECTS OF NEW INSECTICIDES ON INSIDIOUS FLOWER BUG

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Abstract

There was no significant mortality in nymphs, males or females caused by spinosad, indoxacarb, methoxyfenozide or tebufenozide after 24-hour exposure to treated cotton leaves. Imidacloprid, cyhalothrin, fipronil, abamectin and emamectin benzoate caused significant mortality. Spinosad, methoxyfenozide, tebufenozide and cyhalothrin caused no significant reduction in longevity of surviving individuals. Indoxacarb, fipronil and imidacloprid significantly reduced longevity and oviposition. Spinosad, methoxyfenozide and tebufenozide had no significant negative effects on insidious flower bug.

Introduction

The current trend in insecticide development has been towards those that are more specific to certain pests. A positive indirect result of this specificity is that many are also less toxic to certain predatory and parasitic arthropods. However, a simple lack of mortality may not translate into a lack of any negative effect on beneficial arthropods. Sub-lethal effects such as reduced oviposition, longevity, feeding and other behavior changes may also occur. Some pesticides have been known to cause natural enemies to stop feeding or reduce their reproductive capacity (Hamilton and Lashomb 1997, Studebaker and Kring 1999). Few studies have looked at these sub-lethal effects. These factors must be taken into account when evaluating the effects of pesticides on beneficial arthropod species.

The insidious flower bug, *Orius insidiosus*, is an important predator of thrips, mites and bollworm/budworm in cotton (Nuessly and Sterling 1994). Researchers have made observations of reduced numbers of this insect in plots treated with insecticides (Greene et al. 1995, Young et al. 1997). However, imidacloprid has been reported to have little or no effect on minute pirate bugs, a close relative of *O. insidiosus*, up to 14 days after exposure (McNally and Mullins 1996), but has been shown to have negative effects on *O. insidiosus* (Studebaker and Kring, 1999). Still, data is lacking on sub-lethal effects of many of the newer insecticides on this insect.

The objective of this study was to measure the lethal as well as the sub-lethal effects of spinosad, imidacloprid, indoxacarb, fipronil, abamectin, emamectin benzoate, methoxyfenozide, tebufenozide and cyhalothrin on *O. insidiosus* under field conditions.

Materials and Methods

O. insidiosus adults were collected from crimson clover, corn and grain sorghum early in the season. These individuals were maintained in the lab on green beans and *Helicoverpa zea* eggs. Plots of SureGrow 125 cotton were planted at the University of Arkansas Northeast Research and Extension Center located in Keiser, AR on May 10, 2000. Plots were sprayed with a hand-held CO2 powered boom equipped with two TX-6, hollowcone nozzles per row. Insecticides were applied at 10 gallons per acre volume. Test insects were caged on upper leaves of cotton plants as soon as sprays dried (usually within an hour of application). Third instar nymphs and adults that had eclosed 7 days before were caged with one bug per cage. Insects were left on treated plants for 24 hours and then removed. Mortality was recorded and surviving individuals were brought back to the lab to evaluate effects on longevity, oviposition and feeding. To measure these effects, survivors were placed individually in 30cc plastic cups with a small piece of green bean and 10 *H. zea* eggs. Used green beans and eggs were removed and replaced daily with a fresh batch. The number of eggs deposited by *O. insidiosus* females was counted and feeding was determined by counting the number of remaining *H. zea* eggs each day. Nymphs were kept up through development into adults.

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Results and Discussion

Spinosad, tebufenozide, methoxyfenozide and indoxacarb did not have significantly higher mortality than that of the untreated check, while the imidacloprid, abamectin, emamectin benzoate, fipronil and cyhalothrin treatments resulted in significantly higher mortality (Figure 1). Because there were no surviving individuals in the emamectin benzoate and the high rate of cyhalothrin treatments, no data is available on sub-lethal effects of these treatments.

There were no significant differences in longevity between males and females across treatments (Figure 2). Longevity ranged from 8.2 days (untreated) to 2 days (abamectin) after exposure to treatments. Imidacloprid, indoxacarb, fipronil and abamectin significantly reduced longevity in males, females and nymphs with the exception of the high rate of fipronil on nymphs. All other treatments had no significant reduction in longevity.

Oviposition was significantly reduced in the abamectin, indoxacarb, imidacloprid and fipronil treatments (Figure 3). Oviposition was not negatively affected by the other treatments.

The majority of individuals in all treatments resumed feeding after exposure with the exception of males in the imidacloprid at the high rate. No males in this treatment resumed feeding. It is also noted that very few of the males in the high rate of indoxacarb treatment resumed feeding.

Summary

From a mortality standpoint, cyhalothrin, emamectin benzoate, abamectin and fipronil are highly toxic to insidious flower bug causing greater than 80% mortality. Looking simply at mortality, the remaining treatments appear to be much less toxic. However, when one looks at the sub-lethal effects of these compounds, a different picture emerges. Indoxacarb, while causing low mortality at 24 hours after exposure, significantly reduced longevity to 3 to 4 days, reduced feeding in males and reduced oviposition in females after exposure. Similar results were found with imidacloprid with the exception that this compound did have a significant effect on mortality (approximately 50%). Obviously more than just simple mortality must be looked at when evaluating the effects of insecticides on beneficial arthropods. Effects on the feeding and ovipositional activities of these arthropods, as well as effects on longevity can significantly cancel out any positive effect of having the predator present.

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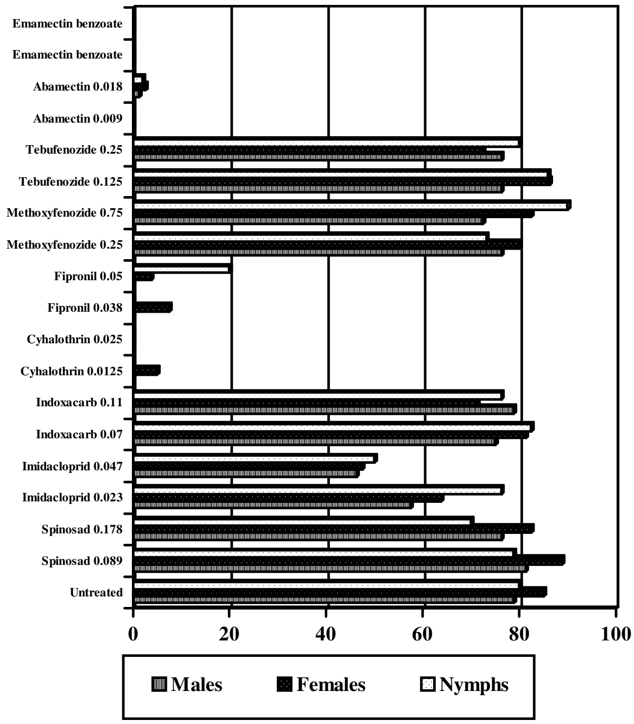

Figure 1. Percent survival in Orius insidiosus after exposure to insecticides.

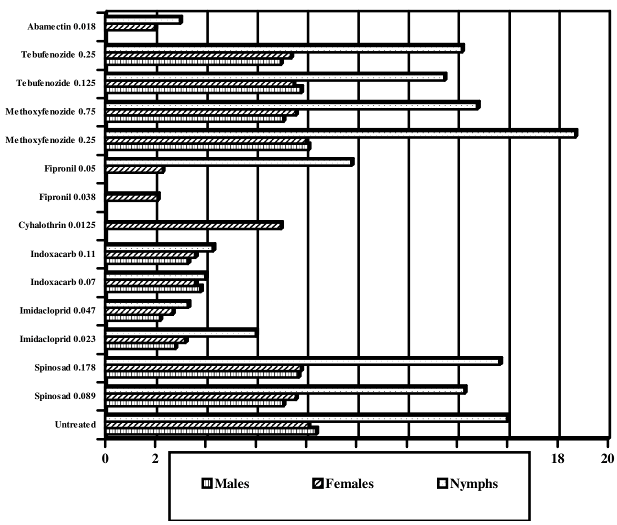

Figure 2. Longevity in days in Orius insidiosus after exposure.

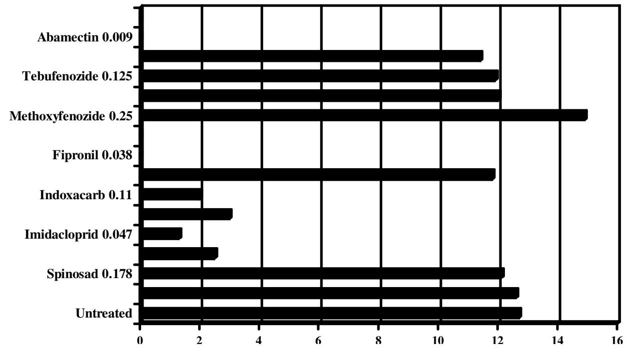

Figure 3. Average number of eggs per female after exposure.