INSECTICIDE TOXICITY TO SOUTHERN GREEN, *NEZARA VIRIDULA* (I.), AND BROWN, *EUSCHISTUS SERVUS* (SAY), STINKBUGS

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Abstract

Stink bugs, *Nezara viridula* (L.) and *Euschistus servus* (Say), are becoming more common pests in Louisiana cotton fields. Field and laboratory studies in 2000 compared the susceptibility of these species to selected pyrethroids. The results of the laboratory tests show all pyrethroids (cypermethrin, L-cyhalothrin, and cyfluthrin) except bifenthrin to be significantly more toxic to *N. viridula* compared to *E. servus*. In a field study, bifenthrin, at all rates treated, was more toxic to *E. servus* compared to *N. viridula.*

Introduction

Stink bugs are considered occasional or secondary insect pests in Louisiana cotton fields. Boll weevil, *Anthonomous grandis grandis* Boheman, eradication and the adoption of Bollgard® cotton has reduced insecticide applications in many regions of the Southeast. This decline in insecticide use has allowed other insects such as stink bugs to become economic pests. Numerous stink bug species are found on cotton throughout the United States (Table 1.) However, the most important members of the stink bug complex infesting cotton include the green stink bug, *Acrosternum hilare* (Say); the southern green stink bug, *Nezara viridula* (L.); and the brown stink bug, *Euschistus servus* (Say) (Turnipseed 1973).

Considerable information is available on stink bug pest status in soybean. No significant differences in soybean damage were detected among *N. viridula, A. hilare,* and *E. servus* (Jones 1979). Few studies are available concerning the impact of stink bugs on cotton. Limited data in cotton show that significant damage can occur in the presence of high stink bug populations in Georgia (Greene et al. 1992).

Injury to cotton generally occurs from adults migrating into cotton fields during the flowering and boll maturation stages. Stink bugs penetrate the boll wall and feed on developing seeds causing small bolls to be abort. This feeding often results in abscission of small bolls less than 10 days old. In older bolls, the lint becomes stained and individual locks may become hardened and un-harvestable. In reduced spray environments (post boll weevil eradication and Bollgard cotton), stink bug control with insecticides has become an important issue for producers.

Variation in sensitivity to methyl parathion has been reported among stink bug species and life stages (McPherson et al.1979). Baythroid, Bidrin, Capture, Decis, Fury, Karate-Z, Methyl Parathion, and Scout X-tra are currently recommended for Southern green stinkbug control in Louisiana (Bagwell et al. 2000). However, many of these products (including pyrethroids) did not provide effective brown stink bug control in Louisiana cotton fields during 2000.

The objectives of these tests were to evaluate *N. viridula* and *E. servus* adult susceptibility to selected pyrethroids in laboratory and field trials.

Materials and Methods

Tests were conducted at the Macon Ridge Location of the Northeast Research Station (Louisiana State University Agricultural Center, Louisiana Agricultural Experiment Station) near Winnsboro, Louisiana during 2000. Adult and late instars of *N. viridula* and *E. servus* were collected from soybeans during August and placed into rearing containers in the laboratory. Stink bugs were fed green beans, *Phaseolus vulgaris* (L.), and shelled peanuts, *Arachis hypogaea* L.

Laboratory Tests

Adult *N. viridula* and *E. servus* were exposed to cypermethrin, L-cyhalothrin, cyfluthrin, and bifenthrin residues using procedures modified from the adult vial bioassay (AVT) (Plapp 1987). Technical-grade samples of cypermethrin, L-cyhalothrin, cyfluthrin, and bifenthrin were obtained from the manufacturers. Serial dilutions were prepared in acetone. Vials were treated with each insecticide as described by Plapp et al. (1987) for *Heliothis virescens* (F.) and Snodgrass and Elzen (1995) for *Lygus lineolaris* (Palisot de Beauvois) and stored in the freezer until needed. Bioassays (1 stinkbug adult/vial) were conducted at room temperature (75° F). Stink bug mortality was determined 4 hours (h) after infestation in the treated vial. The criterion for mortality was the inability of the insect to assume an upright posture after being dislodged from the vial. Data were subjected to probit analysis and LC_{50} values with 95% confidence intervals were estimated. LC_{50} values were considered significantly different if 95% confidence limits did not overlap.

Field Tests

The efficacies of bifenthrin (Capture 2EC) and L-cyhalothrin (Karate-Z 2.08SC) were evaluated against *N. viridula* and *E. servus* using insecticide-treated bolls. Plots (4 rows X 50 ft.) of cotton (NAWF 5-7) were treated on 7 Jul with 5 rates of L-cyhalothrin (Karate-Z 2.08SC [0.005, 0.01, 0.015, 0.02, and 0.025 lb AI/acre]) or 5 rates of bifenthrin (Capture 2EC [0.0075, 0.0125, 0.025, 0.05, and 0.075 lb AI/acre]). Insecticide treatments were applied with a high-clearance sprayer calibrated to deliver 6.0 gpa through Teejet TX-8 hollow cone nozzles (2/row) at 52 psi. First position bolls (<1.5 inches diameter) were collected from row 2 within 2 hours after treatment (HAT). Bolls were placed into 3 oz. specimen cups and transported to the laboratory. Each cup was infested with 1 stink bug adult. *N. viridula* adults were exposed to both bifenthrin and L-cyhalothrin, while *E. servus* adults were exposed only to L-cyhalothrin. Specimen cups were sealed with corresponding lids and bioassays were conducted under constant light at 22±1° C and 40±5% RH. Mortality was assessed at 48 h after infestation (HAI). Data were analyzed with ANOVA, and treatment means were compared with DMRT.

Results and Discussion

Laboratory Tests

In the AVT with cypermethrin, L-cyhalothrin and cyfluthrin, dosage mortality values (LC_{50}'s) were higher for *E. servus* compared to those for *N. viridula*. However, for the vials treated with bifenthrin, there were no significant differences in LC_{50}'s between *N. viridula* and *E. servus* (Fig. 1).

Field Tests

Adult mortality in the experiment with bifenthrin ranged from 36 to 80% and 78 to 95% for *N. viridula* and *E. servus*, respectively, at 48 HAI (Fig. 2). The highest mortality was recorded with the highest rate of bifenthrin (0.075 lb AI/acre) for both species. Adult mortality was consistently higher for *E. servus* than for *N. viridula*.

In the L-cyhalothrin experiment, *N. viridula* mortality ranged from 40 to 100%. The highest mortality was observed at the 0.02 and 0.025 lb AI/acre rates (Fig. 3). No significant increase in control was observed at rates > 0.015 lb AI/acre.

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Summary

Based on data for these insecticides, *E. servus* appear to be more difficult to control compared to *N. viridula*. Recommended rates of pyrethroids should provide satisfactory control of *N. viridula* in cotton. Further studies will be conducted next year to support the data in these tests.

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Table 1. An abbreviated list of U.S. phytophagous stink bug (Pentatomidae) species.

Common Name	Scientific Name
Southern Green Stink Bug	*Nezara viridula* (L.)
Green Stink Bug	*Acrosternum hilare* (Say)
Brown Stink Bug	*Euschistus servus* (Say)
One-spotted Stink Bug	*E. variolarius* (Palisot de Beauvois)
Dusky Stink Bug	*E. tristigmus (Say)*
	E. impitiventris Stäl
Consperse Stink Bug	*E. conspersus* (Uhler)
Say Stink Bug	*Chlorochroa sayl* Stäl
Conchuela Stink Bug	*C. ligata* Say
Red Shouldered Stink Bug	*Thyanta accerra* McAtee
Spined Soldier Bug	*Podisus maculiventris* (Say)
	Podisus spp.
"Morning Glory" Stink Bug	*Edessa bifida* (Say)

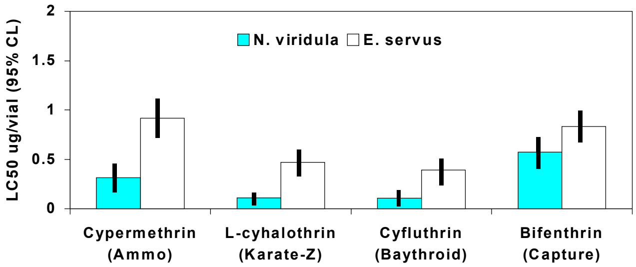

Figure 1. Efficacy of selected pyrethroids against adult stink bugs (adult vial test - AVT).

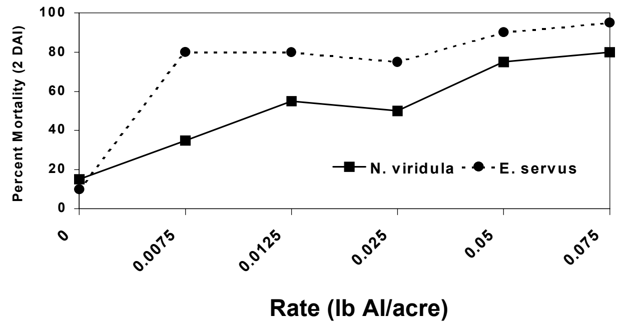

Figure 2. Efficacy of bifenthrin (Capture 2EC) against adult stink bugs (treated bolls).

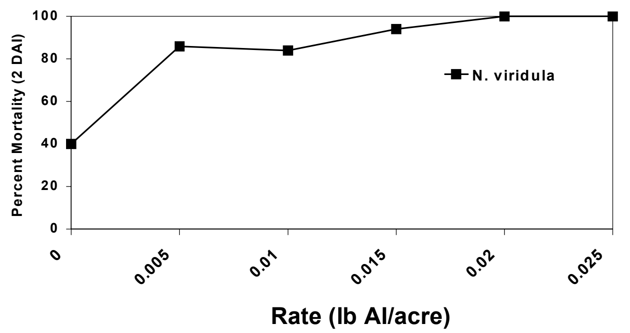

Figure 3. Efficacy of L-cyhalothrin (Karate-Z 2.08sc) against *N. viridula* (treated bolls).