SPRAY TABLE EVALUATION OF INSECTICIDAL MORTALITY FOR SOUTHERN GREEN STINK BUG ON GREENHOUSE-GROWN COTTON

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Abstract

Insecticidal mortality of Southern green stink bug, Nezara viridula on greenhouse-grown cotton was investigated on a spray table. Treatments comprising of synthetic pyrethroids and neoniconitoids were compared with dicrotophos at 8 oz formulated product per acre as the producer's standard, and an untreated check. At spray rates of 2 and 5 gallons per acre, dicrotophos at 8 oz formulated per acre consistently produced significantly greater mortality of N. viridula, when compared with either synthetic pyrethroids or neonicotinoids. Acetamiprid and imidacloprid caused significantly lower mortality of stink bugs compared with thiamethoxam. However, thiamethoxam produced mortality of Southern green stink bug adults comparabale to that of dicrotophos at 5 and 7 days after treatment, indicating slow activity of thiamethoxam.

Introduction

Southern green stink bug, Nezara viridula (L.) is one of the most important pests of several crops including cotton (Toscano and Stern 1976, soybean (Dougherty et al. 1964), and many variety of fruit trees (Madsen 1950). With continuing efforts to eradicate boll weevil and the introduction of Bt cotton in the United States, stink bugs have assumed greater importance as pests of cotton. Early season planting of soybean has also contributed to increased prevalence of stink bugs on cotton. Stink bugs transmit cotton seed and boll-rotting bacteria (Medrano and Bell 2007; Medrano et al. 2007), and cause abscission of bolls, decrease in lint quality and seed cotton yield (Greene et al. 1999; Barbour et al. 1990).

The objective of this study was to evaluate toxicity of selected insecticides comprising of synthetic pyrethroids, organophosphates and neonicotinoids against stink bugs on a spray table. The intent was to determine whether or not any particular insecticide has an advantage over another in inflicting significant mortality of adult N. viridula.

Materials and Methods

Cotton plants (Deltapine 436 RR), were grown in a greenhouse in 45.7 cm-long window boxes in a greenhouse and thinned to three plants per box. Adult southern green stink bugs used in this study were collected from 40-watt blacklight (BL) traps operated in an intensely cropped area in Burleson County in the Brazos River Valley, southwest of College Station, TX. The BL traps were operated and serviced daily except on weekends. The trap canisters containing the stink bugs were held in a walk-in cold room maintained at 50 ± 5° F, and were separated by species and fed on green beans, Phaseolus spp. for at least one day before they were used in the study.

Spray Table Tests. Two tests were conducted to evaluate insecticidal efficacy against stink bugs. In test 1, synthetic pyrethroid insecticides: bifenthrin, cyfluthrin, zeta-cypermethrin, lambda-cyhalothrin were compared with dicrotophos at 2 and 5 gallons per acre. In Test 2, acetamiprid, thiamethoxam and imidacloprid were compared with dicrotophos at 2 and 5 gallons per acre. The nozzles used were 650033 and 8002E nozzles, which delivered 2 and 5 gallons per acre, respectively.

Data Analyses

Data were analyzed using PROC GLM procedure (SAS 2003). Formulated insecticides were the main unit, active ingredient rates were the sub-unit, and days after treatment (DAT) were the sub-sub-units. Means with significant F values at the 5% level were separated using the least significant difference test (LSD).

Results and Discussion

At a spray rate of 5 gallon per acre, thiamethoxam caused significantly less mortality of N. viridula at 1 and 2 oz per acre compared with dicrotophos at 8 oz per acre one day after treatment (DAT). However, residual mortality caused by thiamethoxam at 2 oz per acre was comparable to that caused by dicrotophos at 5 and 7 DAT. Both acetamiprid and imidacloprid caused significantly less mortality of stink bugs compared with thiamethoxam. At a spray rate of 2 gallon per acre, thiamethoxam at 2 oz per acre was comparable to dicrotophos at 3, 5 and 7 DAT; but significantly less mortality of stink bugs occurred at 1 oz per acre compared with dicrotophos at 8 oz per acre.

At a spray rate of 5 gallon per acre, dicrotophos applied at 8 oz per acre caused comparable mortality to that of cyfluthrin 2E applied at 1.6 oz per acre up to 7 DAT. Bifenthrin was not as effective as dicrotophos or cyfluthrin in controlling green stink bugs on cotton. At a spray rate of 2 gallon per acre, bifenthrin at 2.6 oz per acre and cyfluthrin at 0.8 and 1.6 oz per acre and zeta-cypermethrin at 1.3 and 2.6 oz per acre produced mortality comparable to that of dicrotophos at 5 and 7 DAT. Data suggest that although dicrotophos caused consistently higher mortality of N. viridula adults, the neonicotinoid, thiamethoxam produced mortality of Southern green stink bug adults comparable to that of dicrotophos at 8 oz per acre, indicating slow activity of thiamethoxam.

Table 1. Percentage mortality of Southern green stink bug adults on cotton treated with synthetic pyrethroid insecticides or dicrotophos at 8 oz/acre compared with an untreated check.

		5 gallon/acre			
	Rate	Days After Treatment			
Insecticides	oz/acre	1	3	5	7
Dicrotophos 8 E	8	94.6	100	100	100
Cyfluthrin 2E	0.8	59.3	77.6	86.2	89.4
Cyfluthrin 2E	1.6	85.1	95.7	97.1	98.5
Bifenthrin 2 E	1.3	59.5	64.6	76.6	90.2
Bifenthrin 2 E	2.6	63.9	82.7	95.2	96.7
Cyhalothrin 2.08 CS	0.8	85	90	91.7	98.3
Cyhalothrin 2.08 CS	1.6	90.9	92.6	95.8	98.6
zeta-cypermethrin 1.5 E	1.3	83.9	85.6	88.9	96.7
zeta-cypermethrin 1.5 E	2.6	87.5	94.2	95.8	98.6
Untreated check		1.5	4.5	12.6	14.2

Means were separated using PROC GLM (SAS 2003). Means followed by the same lower-case letter are not significantly different if the difference between any two means do not exceed the least significant difference (LSD) value (P = 5%). LSD = 13.8

Table 2. Percentage mortality of Southern green stink bug adults on cotton treated with neonicotinoid insecticides or dicrotophos at 8 oz/acre compared with an untreated check.

		2 gallon/acre			
	Rate	Days After Treatment			
Insecticides	oz/acre	1	3	5	7
Dicrotophos 8 E	8	100	100	91.7	100
Cyfluthrin 2E	0.8	60.6	76.9	76.9	82.8
Cyfluthrin 2E	1.6	76.7	84.9	88.3	96.7
Bifenthrin 2 E	1.3	46.2	59.3	73.9	86.8
Bifenthrin 2 E	2.6	55.4	65.6	77.4	93.1
Cyhalothrin 2.08 CS	0.8	60	71.7	83.6	91.6
Cyhalothrin 2.08 CS	1.6	81.3	89.6	91.3	94.6
zeta-cypermethrin 1.5 E	1.3	61.7	77.4	84.5	93.1
zeta-cypermethrin 1.5 E	2.6	78	86.5	86.7	95.0
Untreated Check		6.7	13.1	21.3	24.5

Means were separated using PROC GLM (SAS 2003). Means followed by the same lower-case letter are not significantly different if the difference between any two means do not exceed the least significant difference (LSD) value (P = 5%). LSD = 14.7.

Table 3. Percentage mortality of Southern green stink bug adults on cotton treated with neonicotinoid insecticides compared with dicrotophos at 8 oz/acre

		5 gallon/acre			
Chemical	Rate	Days after treatment			
	oz/acre	1	3	5	7
Dicrotophos 8 E	8	96.9	100	100	100
Thiamethoxam 40 WG	1	60.4	79.6	86.4	90.9
Thiamethoxam 40 WG	2	67.8	90.2	93.7	95.5
Acetamiprid 70 WP	1	33.9	65.1	75.4	78.9
Acetamiprid 70 WP	2	35.6	51.1	61.7	64.7
Imidacloprid 4 F	0.75	39.3	50	59.1	65.4
Imidacloprid 4 F	1.25	27.7	40.9	49.6	53.8
Untreated Check		12.4	22.1	34.2	34.2

Means were separated using PROC GLM (SAS 2003). Means followed by the same lower-case letter are not significantly different if the difference between any two means do not exceed the least significant difference (LSD) value (P = 5%). LSD = 14.5.
LSD

Table 4. Percentage mortality of Southern green stink bug adults on cotton treated with neonicotinoid insecticides compared with dicrotophos at 8 oz/acre

		2 gallon/acre			
	Rate	Days after treatment			
Insecticides	oz/acre	1	3	5	7
Dicrotophos 8 E	8	77.2	82.4	82.4	84.2
Thiamethoxam 40 WG	1	37.7	55.6	70.3	71.4
Thiamethoxam 40 WG	2	50	83.6	88.7	92.9
Acetamiprid 70 WP	1	1.3	7.8	17.5	17.5
Acetamiprid 70 WP	2	17.5	39.8	53	59.3
Imidacloprid 4 F	0.75	24.3	30.5	38.5	44.3
Imidacloprid 4 F	1.25	24.3	30.5	38.5	44.3
Untreated Check		3.7	9	12.2	14

Means were separated using PROC GLM (SAS 2003). Means followed by the same lower-case letter are not significantly different if the difference between any two means do not exceed the least significant difference (LSD) value (P = 5%). LSD = 14.7.
LSD

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Disclaimer

Mention of a trade name does not imply endorsement by the US Department of Agriculture.

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