

**EFFECT OF SELECTED INSECTICIDES ON *LYGUS* SPP.
AND BENEFICIAL ARTHROPODS IN COTTON**

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Abstract

Several new and existing pesticides were evaluated for management of *Lygus* spp. and for their impact on beneficial arthropods in cotton. Results of analysis indicate that all insecticides provided some level of *Lygus* spp. control and generally, adversely affected beneficial arthropod populations. The data presented herein should provide needed information for further large-scale field studies to determine how best to implement these insecticides into an integrated pest management program.

Introduction

Several species of insects occur across the cotton producing states that cause significant cotton lint quality and lint yield reduction. Plant bugs in the genus *Lygus* have consistently been some of the most destructive insect pests of cotton. Imperative to the reduction of cotton yield loss attributable to these insect pests is the judicious use and appropriate application timing of effective pesticides. Additionally, many currently available pesticides for *Lygus* spp. management adversely effect beneficial arthropod populations, which may result in secondary pest outbreaks. The purpose of this study was to evaluate new and existing insecticides for *Lygus* spp. management and determine their effect on beneficial arthropod populations within the cotton agroecosystem.

Materials and Methods

Several insecticides were evaluated for control of *Lygus* spp. in a commercial cotton field located in El Paso County, TX. Plots, 4 rows x 30ft, were arranged in a randomized block design with four blocks and seven treatments with sub-sample nesting within the block x treatment effect. The center rows of each experimental unit were treated, leaving the outside two rows as a buffer between experimental units. Pesticide applications were made using a CO₂ backpack sprayer calibrated to deliver 10 gpa using 110015VS flat-fan nozzles on a 4 nozzle 4ft boom. Five samples within a row per plot were taken at 0, 3, 7, and 14 days after treatment using a 5 gal white beat bucket sampler. Each beat bucket sample consisted of 2 adjacent cotton plants in a row. All *Lygus* spp. and several beneficial arthropod taxa were counted, recorded and discarded. All data were tested for normality then log transformed to improve normality before being subjected to analysis of variance. Experimental and sampling error terms for the data were tested for homogeneity of variances, and pooled error terms were used to test the treatment effect when appropriate. Treatment mean separation was performed using protected least significant difference (LSD). All analyses were conducted at the 0.1 probability level.

Results and Discussion

Significant differences among treated and untreated plots were not found for any of the variables measured prior to treatment application (Table 1-8). All insecticides tested significantly reduced *Lygus* spp. population densities relative to the untreated control plots at 3 and 7 days after treatment (DAT) (Table 1). Except for the Provado 1.6F and Steward SC treated plots all insecticides tested possessed significantly lower *Lygus* spp. population densities relative to the untreated check plots at 14DAT. Plots treated with Karate Z and the higher rate of Leverage 2.7SC possessed either significantly or numerically lower *Lygus* spp. population densities relative

to other treated plots at 7 and 14DAT, and were the only treatments to maintain *Lygus* spp. population densities at or below economic thresholds across all sample dates.

With the exception of Steward SC at 7DAT, beneficial arthropod population densities in all treated plots were significantly lower relative to the untreated plots at 3, 7, and 14DAT (Table 2). Relative to other treated plots, the higher rate of Leverage 2.7SC possessed either significantly or numerically lower beneficial population densities at 3 and 14DAT. Steward SC treated plots possessed either significantly or numerically higher beneficial population densities relative to all other treated plots regardless of post treatment sample date.

Generally, all tested insecticides had a negative impact on beneficial arthropod population densities regardless of beneficial taxa (Tables 3-8). This observation appeared to be especially true for minute pirate bugs (Table 3). Minute pirate bug population densities were significantly lower in all treated plots regardless of post treatment sample date. The only exception to this trend was with the Steward SC treated plots, which did not show a significant population reduction relative to the untreated plots. Steward SC treated plots generally showed the least while Karate Z, Address 75S, and the higher rate of Leverage 2.7SC showed the greatest impact on beneficial taxa in this study (Tables 3-8). Lacewing larvae were the exception to this observation, which actually showed significant and or numerical population increases in the treated plots at 7 and 14DAT relative to the untreated control plots (Table 7). These observations may have occurred, at least in part, because of low population densities of several of the beneficial taxa (sampling error) and the small plot size used in this study. An alternative hypothesis could be that lacewing populations were responding to increases in prey populations that were flared by the insecticide treatments. Cotton aphid populations have been shown to increase under some pyrethroid insecticide pressure and are one prey source for lacewing larvae. Thus, cotton aphid populations were monitored during the course of this study. However, few cotton aphids were found regardless of sample date or treatment during the course of this study.

Summary

All insecticides under evaluation in this study significantly impacted *Lygus* spp. and beneficial arthropod population densities. Generally, Steward SC treated plots produced the least while Karate Z, and Leverage 2.7SC treated plots produced the greatest impact on *Lygus* spp. and beneficial arthropod population densities.

Table 1. Effect of selected insecticides on *Lygus* spp. population densities in cotton.

Treatment	Rate (lbs AI/acre)	Mean <i>Lygus</i> spp./Sample			
		0DAT*	3DAT	7DAT	14DAT
Untreated Check	-	0.90a	0.70a	1.00a	0.85a
Steward SC	1.25	0.45a	0.10b	0.60bc	0.85a
Karate Z	0.02	0.95a	0.15b	0.20d	0.20b
Provado 1.6F	0.04	0.50a	0.10b	0.30cd	0.50ab
+Kenetic	0.25%				
Address 75S	0.75	0.55a	0.10b	0.40bcd	0.45b
Leverage 2.7SC	0.063	0.80a	0.05b	0.05d	0.30b
+Kenetic	0.25%				
Leverage 2.7SC	0.04	0.55a	0.15b	0.70ab	0.35b
+Kenetic	0.25%				
LSD (P=0.05)		NS**	0.22	0.37	0.40
P>F		0.2205	0.0001	0.0007	0.0355

Means within a column followed by the same letter are not significantly different (P=0.1: LSD).

*DAT=Days after treatment.

**NS=Not significant.

Table 2. Effect of selected insecticides on beneficial arthropod population densities in cotton.

Treatment	Rate (lbs AI/acre)	Mean Beneficial Arthropods/Sample			
		0DAT*	3DAT	7DAT	14DAT
Untreated Check	-	3.00a	3.15a	3.80a	4.00a
Steward SC	1.25	2.35a	2.40b	3.05a	3.15b
Karate Z	0.02	2.65a	1.55c	1.55bc	1.75de
Provado 1.6F	0.04	3.10a	2.15bc	1.90b	2.6 bc
+Kenetic	0.25%				
Address 75S	0.75	2.30a	1.75bc	0.95c	2.15cd
Leverage 2.7SC	0.063	2.80a	0.75d	1.25bc	1.10e
+Kenetic	0.25%				
Leverage 2.7SC	0.04	2.70a	1.80bc	1.50bc	2.45bcd
+Kenetic	0.25%				
LSD (P=0.1)		NS**	0.687	0.851	0.765
P>F		0.4915	0.0001	0.0001	0.0001

Means within a column followed by the same letter are not significantly different (P=0.1: LSD).

*DAT=Days after treatment.

**NS=Not significant.

Table 3. Effect of selected insecticides on minute pirate bug population densities in cotton.

Treatment	Rate (lbs AI/acre)	Mean Minute Pirate Bugs/Sample			
		0DAT*	3DAT	7DAT	14DAT
Untreated Check	-	1.45a	2.05a	2.15a	2.00a
Steward SC	1.25	1.15a	1.15b	1.60ab	1.50ab
Karate Z	0.02	1.30a	0.80bc	0.35c	0.90c
Provado 1.6F	0.04	1.65a	0.50cd	0.35c	0.95bc
+Kenetic	0.25%				
Address 75S	0.75	0.95a	0.40cd	0.25c	1.00bc
Leverage 2.7SC	0.063	1.45a	0.15d	0.20c	0.30d
+Kenetic	0.25%				
Leverage 2.7SC	0.04	1.10a	0.80bc	1.15b	1.20bc
+Kenetic	0.25%				
LSD (P=0.1)		NS**	0.466	0.618	0.569
P>F		0.4929	0.0001	0.0001	0.0002

Means within a column followed by the same letter are not significantly different (P=0.1: LSD).

*DAT=Days after treatment.

**NS=Not significant.

Table 4. Effect of selected insecticides on spider population densities in cotton.

Treatment	Rate (lbs AI/acre)	Mean Spiders/Sample			
		0DAT*	3DAT	7DAT	14DAT
Untreated Check	-	0.60a	0.45bc	0.55a	0.65a
Steward SC	1.25	0.70a	0.65ab	0.35a	0.70a
Karate Z	0.02	0.55a	0.20cd	0.25a	0.30a
Provado 1.6F	0.04	0.70a	0.45bc	0.55a	0.65a
+Kenetic	0.25%				
Address 75S	0.75	0.45a	0.85a	0.20a	0.35a
Leverage 2.7SC	0.063	0.80a	0.10d	0.15a	0.30a
+Kenetic	0.25%				
Leverage 2.7SC	0.04	0.90a	0.15d	0.25a	0.40a
+Kenetic	0.25%				
LSD (P=0.1)		NS**	0.287	NS	NS
P>F		0.5201	0.0001	0.1963	0.0355

Means within a column followed by the same letter are not significantly different (P=0.1: LSD).

*DAT=Days after treatment.

**NS=Not significant.

Table 5. Effect of selected insecticides on big-eyed bug population densities in cotton.

Treatment	Rate (lbs AI/acre)	Mean Big Eyed Bugs/Sample			
		0DAT*	3DAT	7DAT	14DAT
Untreated Check	-	0.20a	0.20a	0.45ab	0.95a
Steward SC	1.25	0.20a	0.15a	0.65a	0.55b
Karate Z	0.02	0.40a	0.25a	0.40ab	0.25b
Provado 1.6F	0.04	0.25a	0.55a	0.55ab	0.30b
+Kenetic	0.25%				
Address 75S	0.75	0.25a	0.25a	0.05c	0.30b
Leverage 2.7SC	0.063	0.15a	0.15a	0.30bc	0.20b
+Kenetic	0.25%				
Leverage 2.7SC	0.04	0.30a	0.30a	0.05c	0.50b
+Kenetic	0.25%				
LSD (P=0.1)		NS**	NS	0.307	0.375
P>F		0.6813	0.4465	0.0064	0.0183

Means within a column followed by the same letter are not significantly different (P=0.1: LSD).

*DAT=Days after treatment.

**NS=Not significant.

Table 6. Effect of selected insecticides on damsel bug population densities in cotton.

Treatment	Rate (lbs AI/acre)	Mean Damsel Bugs/Sample			
		0DAT*	3DAT	7DAT	14DAT
Untreated Check	-	0.20a	0.15a	0.45a	0.25a
Steward SC	1.25	0.15a	0.05a	0.05bc	0.25a
Karate Z	0.02	0.25a	0.00a	0.10bc	0.05a
Provado 1.6F	0.04	0.25a	0.25a	0.25ab	0.05a
+Kenetic	0.25%				
Address 75S	0.75	0.25a	0.00a	0.00c	0.10a
Leverage 2.7SC	0.063	0.15a	0.00a	0.30bc	0.05a
+Kenetic	0.25%				
Leverage 2.7SC	0.04	0.35a	0.10a	0.00c	0.25a
+Kenetic	0.25%				
LSD (P=0.1)		NS**	NS	0.217	NS
P>F		0.7572	0.1516	0.0071	0.2221

Means within a column followed by the same letter are not significantly different (P=0.1: LSD).

*DAT=Days after treatment.

**NS=Not significant.

Table 7. Effect of selected insecticides on lacewing larva population densities in cotton.

Treatment	Rate (lbs AI/acre)	Mean Lacewing larvae/Sample			
		0DAT*	3DAT	7DAT	14DAT
Untreated Check	-	0.30a	0.25a	0.05b	0.05b
Steward SC	1.25	0.05a	0.15a	0.35a	0.05b
Karate Z	0.02	0.10a	0.05a	0.35a	0.25ab
Provado 1.6F	0.04	0.05a	0.30a	0.15ab	0.40a
+Kenetic	0.25%				
Address 75S	0.75	0.25a	0.15a	0.35a	0.40a
Leverage 2.7SC	0.063	0.10a	0.15a	0.30a	0.10b
+Kenetic	0.25%				
Leverage 2.7SC	0.04	0.05a	0.10a	0.05b	0.15b
+Kenetic	0.25%				
LSD (P=0.1)		NS**	NS	0.243	0.220
P>F		0.1639	0.4637	0.0959	0.0184

Means within a column followed by the same letter are not significantly different (P=0.1: LSD).

*DAT=Days after treatment.

**NS=Not significant.

Table 8. Effect of selected insecticides on lady beetle adult population densities in cotton.

Treatment	Rate (lbs AI/acre)	Mean Lady Beetle Adults/Sample			
		0DAT*	3DAT	7DAT	14DAT
Untreated Check	-	0.10a	0.05a	0.15a	0.10a
Steward SC	1.25	0.10a	0.25a	0.05a	0.10a
Karate Z	0.02	0.05a	0.15a	0.10a	0.00a
Provado 1.6F	0.04	0.20a	0.15a	0.05a	0.25a
+Kenetic	0.25%				
Address 75S	0.75	0.15a	0.10a	0.10a	0.00a
Leverage 2.7SC	0.063	0.15a	0.05a	0.10a	0.05a
+Kenetic	0.25%				
Leverage 2.7SC	0.04	0.00a	0.25a	0.00a	0.05a
+Kenetic	0.25%				
LSD (P=0.1)		NS**	NS	NS	NS
P>F		0.5450	0.4789	0.7032	0.1177

Means within a column followed by the same letter are not significantly different (P=0.1: LSD).

*DAT=Days after treatment.

**NS=Not significant.