

PERFORMANCE OF INSECTICIDES WITH DIFFERENT PHYSIOLOGICAL TARGETING OF BOLLWORM IN NONBT COTTON

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Introduction

Insecticides remain important pest management tools for profitable production of both transgenic *Bt* (*Bacillus thuringiensis*) and non *Bt* cotton. Currently there are several insecticides that are available for cotton pest managers which have different physiological targeting mechanisms for insects. Interchanging insecticides with different modes of action in spray programs during the season could help prevent resistance. This research was done at the Southeastern Branch Research and Education Center near Midville where we have conducted insecticide screening trials for 30 years. The data with organophosphate (chlorpyrifos, LorsbanTM), carbamate (thiodicarb, LarvinTM) and the pyrethroid (lambda cyhalothrin, KarateTM) insecticides is additive to our comparative database of the performance of these chemical types during that period. These standards were compared to newer insecticides rynaxypur (Coragen, Altacer, (proposed trade names)), spinosad (TracerTM), indoxacarb (StewardTM), and novaluron (DiamondTM), all of which have different modes of toxicity. The primary target site of action of organophosphates and carbamates is inhibition of acetylcholine esterase in neural synapses and for pyrethroids it is modulation of sodium channels on neural membranes. Indoxacarb also disturbs sodium channels, but not like pyrethroids, and cross resistance between the two insecticide classes does not occur. Spinosad affects insect nerves by selective inhibition of nicotinic acetylcholine receptors at neural junctions. Novaluron (DiamondTM) is a chitin (an essential constituent of insect cuticle) biosynthesis inhibitor (All and Treacy 2006). The Heliothine population (bollworm and budworm) at Midville usually has more than 50% bollworm during the season and insecticide evaluations at this location are more reflective of cotton infestations in eastern Georgia and the Carolinas.

Methods

The cotton was DP494R and four row plots (with one buffer row separating each plot) were established that were 40 feet long with 38 inch row width, 15 foot alleys arranged in a randomized complete block design replicated four times. Plots were sprayed with a high cycle sprayer equipped with a four row boom using three TX 4 spray nozzles/row. The sprayer traveled at 3 mph and applied 10 gallons per acre finished spray volume. Sprays were initiated when 8% squares showed damage in the field on July 7 and work continued on July 11, 19, 25, August 1 and 9. Adult bollworm and budworm populations were monitored weekly using pheromone traps (Figure 1). Fruiting structures in plots were monitored for damage by selecting five plants in the two middle rows of each plot and examining all fruiting structures in the upper half of the plant for damage and larvae. The two middle rows of each plot were harvested with a cotton picker on November 20.

Results and Discussion

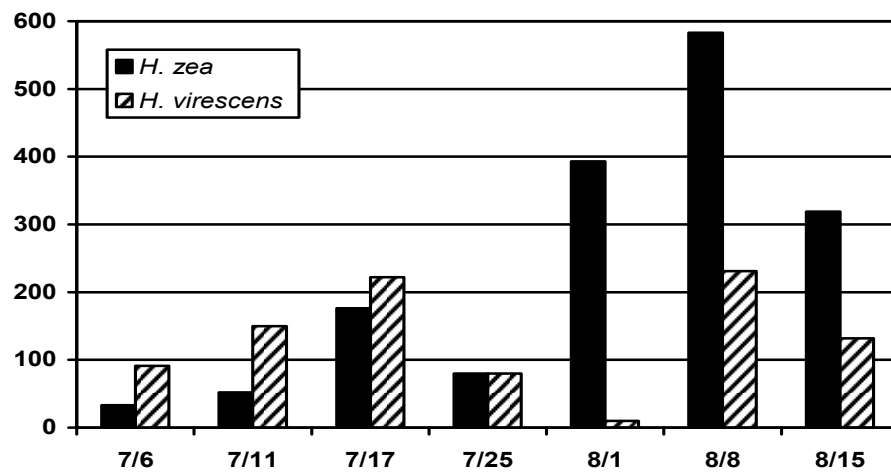
With the exception of Lorsban™ and the Diamond™ + Bidrin™ treatments all of the insecticides produced control of infestations during most of the season (Table 1). Only Tracer™ and rynaxypur kept infestations below 5% throughout the season. Larvin™ and Karate™ performed well during the season and efficacy was generally similar to performance over many years at the Midville Station. Diamond™, a slow acting chitin synthesis inhibitor, performed moderately well during the season especially when combined with Karate™. Highest yields in the test were associated with Karate™ (Karate™ alone and the combo treatments with Diamond™). Rynaxypur, Steward™, Tracer™ and Larvin™ treatments all had higher yield than the untreated check.

References

All, J. N. and M. F. Treacy, eds. 2006. Use and Management of Insecticides, Acaricides, and Transgenic Crops. APS Press. St. Paul, MN. 148 pp.

Table 1. Cotton insecticide screening trial, Midville, GA

Treatment	Rate (#a.i./A)	Percent Fruit Damage By Date					Yield Lbs/A
		7/11	7/17	7/25	8/1	8/8	10/20
Check		12.4 a	11.1 a	41.4 a	55.2 a	16.7 a	2557 c
Diamond™	0.058	0.8 b	4.7 abc	6.8 b	7.8 bc	3.2 b	3550 abc
Diamond™+Bidrin™	0.058 + 0.3	2.1 b	7.4 abc	12.2 b	16.0 bc	3.8 b	3722 ab
Diamond™+Karate™	0.039 + 0.025	2.7 b	2.0 bc	3.5 b	7.0 c	0.7 b	4044 a
Diamond™+Karate™	0.058 + 0.025	2.9 b	0.7 c	11.7 b	3.8 c	0.0 b	4340 a
Karate™	0.025	2.6 b	1.5 bc	8.8 b	4.7 c	3.6 b	4134 a
Larvin™	0.53	5.0 ab	4.4 abc	7.1 b	8.8 bc	4.9 ab	3868 ab
Lorsban™	1.0	2.0 b	8.1 ab	20.5 ab	25.2 b	11.6 ab	2892 bc
Rynaxypyr	0.088	4.4 ab	0.8 c	0.7 b	0.6 c	0.0 b	3859 ab
Steward™	0.088	2.8 b	0.6 c	10.5 b	6.9 c	0.8 b	3760 ab
Tracer™	0.062	2.1 b	0.6 c	1.4 b	2.0 c	1.5 b	3799 ab



2006 pheromone trap captures of male moths of *Helicoverpa zea* and *Heliothis virescens* at the Southeastern Branch research and Education Center near Midville GA.