

**PREDATOR MORTALITY IN COTTON
FROM DIFFERENT INSECTICIDE CLASSES**
W.D. Duffie, M.J. Sullivan and S.G. Turnipseed
Clemson University
Edisto Research and Education Center
Blackville, SC

Abstract

Survival of predaceous arthropods were observed after 1 and 2 applications of insecticides on cotton during 1996 and 1997 growing seasons in Blackville, SC. Insecticide classes included representatives from the following: biological, insect growth regulator (IGR), naturalyte, pyrrole, carbamate, pyrethroid, chloronictinyl, and organophosphate. The biological, IGR, and naturalyte classes had low toxicity to predators. Carbamate and pyrrole classes were moderately toxic to the predaceous arthropods. The pyrethroid, chloronictinyl, and organophosphate classes were the most toxic causing dramatic reductions in predator numbers.

Introduction

Predaceous arthropods that are commonly found in South Carolina cotton include the big-eyed bug, Geocoris spp. (Heteroptera: Lygaeidae); damsel bug, Nabis spp. (Heteroptera: Nabidae); green lacewing, Chrysopa spp. (Neuroptera: Chrysopidae); hooded beetle, Notoxus spp. (Coleoptera: Anthicidae); lady beetle, (Coleoptera: Coccinellidae); predaceous stink bug, Podisus spp. (Heteroptera: Pentatomidae); and spiders. Ants were not counted due to their sporadic field distribution. These predators play an important role in suppressing primary agricultural pests, including the tobacco budworm, Heliothis virescens, and the cotton bollworm, Helicoverpa zea in cotton. In studies conducted by Greene (1995), increased predaceous arthropods during June did not result in significant natural control of the cotton bollworm, which migrates into the cotton in high numbers in July. However, these predaceous arthropods helped reduce numbers of tobacco budworm, providing additional natural control in early season. Studies indicate that cotton in South Carolina compensates adequately for flower bud loss in June under most conditions and that insecticides for the tobacco budworm, are seldom needed in the early season (Mann 1995). The success of the Boll Weevil Eradication Program (BWEP) has allowed growers to concentrate on the budworm/bollworm complex without the early season pesticide applications for the boll weevil, which have proven to lower predator numbers. With the increase of resistance by the tobacco budworm to pyrethroid materials on cotton, and the release of new varieties of cotton with the Bacillus thuringiensis gene, predaceous arthropods become

even more important in suppressing budworm/bollworm pressures in cotton pest management (McCutchen and DuRant 1993). New classes of insecticides are being produced for use on pests of cotton. Knowing that the preservation of predators are very important, this study was designed to test the effects of new and old insecticides on predators in cotton.

Materials and Methods

Four tests were conducted in 1996 and five in 1997. The two that were chosen for discussion are representatives of all tests. Each test (or site) consisted of 10-12 treatments. Treatments, rates, and classes are listed below.

<u>Treatments</u>	<u>lbs AI/A</u>	<u>Class</u>
Gemstar	0.63	Biological
Match	2 qts	Biological
Confirm	0.125	IGR
Pirate	0.3	Pyrrole
Tracer	0.089	Naturalyte
Curacron	1.0	Organophosphate
methyl parathion	0.5	Organophosphate
Bidrin	0.25	Organophosphate
Orthene	0.75	Organophosphate
Karate	0.033	Pyrethroid
Larvin	0.8	Carbamate
Provado	0.047	Chloronictinyl
Karate +	0.033	Pyrethroid
Pirate	0.3	Pyrrole

* Rates used were standard recommended rates for insect control on cotton in South Carolina

Four replications per treatment were used. The tests were conducted using a randomized complete block design (RCBD). Plot size was 8 rows by 30 feet. Applications were made using a single boom CO₂ backpack sprayer with a 6X hollow cone tip, at 58 psi, which applied 13.00 gallons per acre. Sampling was conducted using a ground cloth ('beat cloth') which equaled 1 meter. Two samples were taken in 1996 and three samples in 1997.

Results and Discussion

The biological, IGR, and naturalyte classes had low toxicity to predators. Carbamate and pyrrole classes were moderately toxic to the predaceous arthropods. The pyrethroid, chloronictinyl, and organophosphates were the most toxic causing dramatic reductions in predator numbers. During the 1997 growing season, Orthene, Bidrin, Provado, methyl parathion, and Karate gave the most disruptions after two applications and Confirm and Tracer were the least toxic (Tables 1-2). Larvin and Pirate were intermediate in reduction for both 1996 and 1997. The combination of the pyrethroid Karate plus the pyrrole Pirate gave the most destruction to the predators after the first and second applications in 1996 (Tables 3-4). Gemstar, Match, Confirm, and Tracer were the least toxic causing little if no reduction of predators after both applications in 1996 (Tables 3-4). Results from both years studies were very similar.

References

Greene, J.K. 1995. Early season management of the tobacco budworm, *Heliothis virescens* (F), on South Carolina cotton, *Gossypium hirsutum* (L.): The impact of beneficial arthropods without early season chemical control. Thesis. Clemson University.

Mann, J.E. 1995. Effect of early season flower bud loss on maturity, yield, and quality of cotton, *Gossypium hirsutum* (L.), in South Carolina. Dissertation. Clemson University.

McCutcheon, G.S. and J.A. DuRant. 1993. Survival of predaceous arthropods in caged cotton with residues of insecticides. In Proceedings, Beltwide Cotton Production Conferences, National Cotton Council of America, Memphis, TN, pp. 1010-1012.

Table 1. Predators per 3 meters in cotton 3 days after the first application on August 1, 1997.

Treatment	TotalPreds	Geocorids	Spiders	Lady Beet
1) Larvin	12.00 bc	5.25 abc	2.25 cd	0.75 c
2) Provado	19.50 b	3.65 bc	8.00 a	3.00 bc
3) Confirm	36.75 a	10.00 a	6.00 ab	12.50 a
4) Tracer	28.50 a	5.75 abc	5.50 abcd	4.25 b
5) methyl p.	11.75 b	0.00 e	4.50 abcd	4.75 b
6) Karate	4.75 d	0.50 de	1.00 e	2.00 bc
7) Pirate	16.00 b	4.00 bc	5.75 abc	2.50 bc
8) Bidrin	14.75 bc	5.00 abc	3.25 bcde	0.75 c
9) Orthene	9.25 cd	2.25 cd	2.00 de	0.25 c
10) check	38.25 a	8.00 ab	6.00 ab	13.00 a

a Treatment means within a column followed by the same letter do not significantly differ ($\alpha = 0.05$), LSD.

b Sample proportions presented. Analysis performed on square root plus 0.05 transformed data.

Table 2. Predators per 3 meters in cotton 2 days after the second application on August 7, 1997

Treatment	TotalPreds	Geocorids	Spiders	Lady Beet
1) Larvin	15.25 bc	8.75 a	2.00 cd	0.25 d
2) Provado	19.75 b	4.25 b	8.50 a	3.75 cd
3) Confirm	51.25 a	10.00 a5	6.00 abc	24.00 a
4) Tracer	54.25 a	10.50 a	5.25 abc	27.50 a
5) methyl p.	23.25 b	1.50 cd	4.75 abc	8.00 bc
6) Karate	15.75 bc	0.00 d	1.00 d	11.25 b
7) Pirate	20.75 b	2.00 bc	3.50 bcd	7.75 bc
8) Bidrin	16.75 b	2.25 bc	2.25 cd	1.25 d
9) Orthene	8.50 c	0.75 cd	1.00 d	0.25 d
10) check	50.25 a	10.50 a	6.25 ab	26.00 a

a Treatment means within a column followed by the same letter do not significantly differ ($\alpha = 0.05$), LSD.

b Sample proportions presented. Analysis performed on square root plus 0.05 transformed data.

Table 3. Predators per 2 meters in cotton 3 days after the first application on August 2, 1996.

Treatment	TotalPreds	Geocorids	Spiders
1) Confirm	9.00 ab	6.00 a	1.25 abc
2) Tracer	10.75 ab	5.75 a	1.25 abc
3) Provado	8.75 ab	4.75 ab	2.25 ab
4) Curacron	3.00 cd	1.25 cd	1.00 abc
5) Larvin	6.50 abc	5.25 a	0.50 bc
6) Karate	1.50 d	0.40 d	0.50 bc
7) Match	9.25 ab	3.25 abc	2.00 abc
8) Gemstar	10.50 ab	4.50 ab	1.25 abc
9) Kar. + Pir.	0.25 d	0.00 d	0.00 c
10) Pirate	8.25 ab	4.00 abc	2.75 ab
11) methyl p.	5.50 bc	2.00 bcd	1.75 abc
12) check	12.00 a	5.00 a	2.75 a

a Treatment means within a column followed by the same letter do not significantly differ ($\alpha = 0.05$), LSD.

b Sample proportions presented. Analysis performed on square root plus 0.05 transformed data.

Table 4. Predators per 2 meters in cotton 3 days after the second application on August 8, 1996.

Treatment	TotalPreds	Geocorids	Spiders
1) Confirm	13.50 a	6.25 ab	3.75 a
2) Tracer	11.50 ab	5.25 ab	2.75 abc
3) Provado	5.75 c	2.50 bcd	2.25 abcd
4) Curacron	3.00 cd	0.25 d	2.25 abcd
5) Larvin	6.75 bc	3.75 abc	1.00 cde
6) Karate	2.75 c	0.00 d	0.75 de
7) Match	13.75 a	4.00 ab	3.50 ab
8) Gemstar	12.75 a	6.25 ab	2.25 abcd
9) Kar. + Pir.	3.25 c	0.25 d	0.25 e
10) Pirate	3.00 c	0.50 cd	1.50 bcde
11) methyl p.	3.75 c	0.25 d	1.25 cde
12) check	16.25 a	8.00 a	3.50 ab

a Treatment means within a column followed by the same letter do not significantly differ ($\alpha = 0.05$), LSD.

b Sample proportions presented. Analysis performed on square root plus 0.05 transformed data.