

**BENEFICIAL INSECTS
THEIR ROLE IN COTTON PEST
MANAGEMENT SYSTEMS FOUNDED ON
NATURALYTE INSECT CONTROL**

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Abstract

Tracer* naturalyte insect control, the first product from the naturalyte class being developed by DowElanco, is a major new tool for the implementation of IPM in cotton. Tracer is highly effective against lepidopterous pests of cotton at low application rates and is safe to many beneficial arthropods making it ideal for use as a foundation product in cotton IPM programs. Observations from 1995 research and EUP trials are presented to demonstrate that Tracer along with the conserved beneficial arthropods, controlled budworms and bollworms in cotton, reduced square damage, minimized flaring of secondary insect pests, increased spray intervals and provided yields equal to the current standard programs.

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Introduction

The introduction of Tracer, the first product of the naturalyte class of insect control, represents a major new tool for the implementation of functional IPM in cotton. Tracer, common name spinosad, has been reported previously (Anon. 1995, Sparks et al. 1995, Thompson et al. 1995) to be highly active against a variety of insect pests and to have a very favorable toxicology profile to mammals, birds and aquatic organisms. It also has a unique mode of action that makes it very useful in resistant management programs for existing chemistries (Sparks et al, 1995). This paper deals with combined effect of Tracer and beneficial arthropods against the key pests of cotton *Heliothis virescens* and *Helicoverpa zea*.

Materials and Methods

During the 1995 cotton season, over 100 trials were established across the cotton belt with Tracer. These were a mixture replicated research and development trials and commercial EUP trials. Applications were made by either air or ground equipment and the treatment rate varied from 0.045 to 0.09 lb ai/acre. Observations were made in 47 trials for the relationship between Tracer applications, beneficial arthropods and management of the pest population. In all cases, applications were made when the

pest population reached the economic threshold defined for that area of the cotton belt. The applications of Tracer and the corresponding standard chemical reference materials were not necessarily made at the same time, as the return of the pest to threshold level varied between treatments. Data were collected on compound efficacy via egg and larval counts, insect damage to squares, levels of beneficial arthropods present, secondary pest occurrence and yield estimates of seed cotton by making boll counts.

Results and Discussion

A Tracer based pest management program was highly effective against the tobacco budworm and cotton bollworm at rates from 0.045 to 0.09 lb ai/acre in all trials, keeping the larval population below the economic threshold level of 5%. Figure 1 demonstrates the larval pest control summarized from 7 Alabama and Georgia where the number of applications varied from 1 to 6 based on pest threshold levels for individual treatments.

The Tracer pest management program not only provided efficient control of target pests at low rates of product per acre, but it was also very effective in preventing damage to the cotton squares equal to or better than the grower's standard treatments. These summarized data in Figure 2, again from Alabama and Georgia, are representative of what was observed in all 47 trials across the cotton belt using an acceptable damage level of 5%.

Several years of testing Tracer against cotton insect pests, has confirmed the tolerance of a large number of beneficial arthropod species to proposed label rates of Tracer. The list of beneficial arthropods is presented in Table 1, and includes species whose tolerance to Tracer has been confirmed either in field or laboratory observations.

Figure 3 is a summary of the counts of beneficials found and identified in the 7 Alabama and Georgia Tracer trials during 1995. These data represent the picture observed across the entire cotton belt. Beneficial arthropods were consistently found in higher numbers in the Tracer plots than in the corresponding commercial standard program. There was considerable variability in the population numbers of beneficials between trials as well as differences in methods used to measure them. Data were collected by sweep nets, beat cloths or by visually counting numbers on whole plants. Some of the differences in the untreated and the Tracer plots could be attributed to the absence of food in the check plots that were decimated by pests earlier in the season.

Several trials experienced a flare-up of secondary pests in the grower's standard treatment but not in the Tracer or control plot. This corresponded to significantly lower numbers of beneficial arthropods in the standard than the Tracer or non-treated. Observations where the beneficial arthropods conserved by Tracer demonstrated their value

were made as follows: Beet armyworm flared in the grower standard treatment in 6 trials while larval numbers in the Tracer plots remained below threshold levels. The same occurred in 4 trials involving soybean looper. Even though there is ample evidence that Tracer will provide excellent control of both beet armyworm and soybean looper, in these 10 instances, there had been no Tracer treatment made for at least 12 days prior to the flare-up in the standard treatment plots.

Observations of 1 trial each where cotton mites, aphids and white flies flared in the grower standard treatment but not in the Tracer plots were also documented. From previous experience it is known that Tracer, at proposed rates for cotton, will not give demonstrable control of these three secondary pests, so any pest population control here appears to be due to the beneficials..

In 11 of 17 southeast Tracer cotton trials where we observed the conservation of beneficial arthropods, the number of budworm and/or bollworm larvae per 100 terminals was maintained below economic threshold levels for 2 to 7 days longer than in the grower's standard treatment. The standard treatments were typically hard on the beneficial arthropod numbers in these trials.

Yield estimates from all EUP trials were made by counting mature bolls in 5 feet of row. Recognizing that this may not be an accurate yield determination, it was felt that boll counts would give a consistent relative comparison of yield. In fact this was the case. In all trials the yield from the Tracer plots was equal to or greater than the corresponding grower program (Figure 4).

Tracer has demonstrated excellent efficacy against target lepidopterous pests of cotton, and beneficial arthropods commonly found in cotton fields are tolerant to proposed label rates of Tracer applications. Tracer will provide excellent and rapid control of the target pests present. Because beneficial arthropods are tolerant to Tracer, they will remain active and help to maintain the pest populations at low levels. It is safe to assume that the beneficial arthropods observed in the Tracer plots are actively parasitizing and feeding upon those pests that are present. In this way they are likely minimizing the flaring of secondary pests as well as maintaining low pest numbers already brought under threshold levels by Tracer, thus prolonging the length of effective control.

Tracer applications in conjunction with the naturally occurring beneficial arthropods combine to be an excellent example of a functional cotton IPM program.

Acknowledgments

We give special thanks to the many university research specialists and private consultants throughout the cotton

belt who have contributed to the ongoing development of this product as reported in this manuscript.

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Table 1. Active beneficial arthropods observed in Tracer treated cotton fields during 1995 research and EUP trials.

<i>Cotesia</i> sp.	<i>Microplitis</i> sp.
<i>Trichogramma</i> sp.	<i>Geocoris</i> spp.
<i>Orius</i> spp.	<i>Nabis</i> spp.
<i>Zelus</i> spp.	<i>Chrysopa</i> spp.
<i>Coccinella</i> spp.	<i>Hippodamia</i> sp.
Predator mites	Spiders
Fire ants	

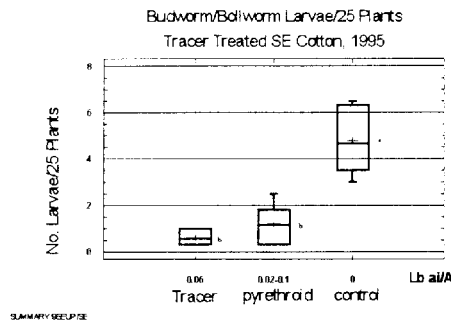
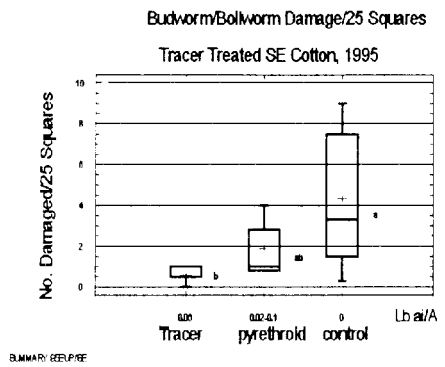


Figure 1. Summary of tobacco budworm and cotton bollworm larvae control from 7 Tracer trials in Alabama and Georgia during 1995.

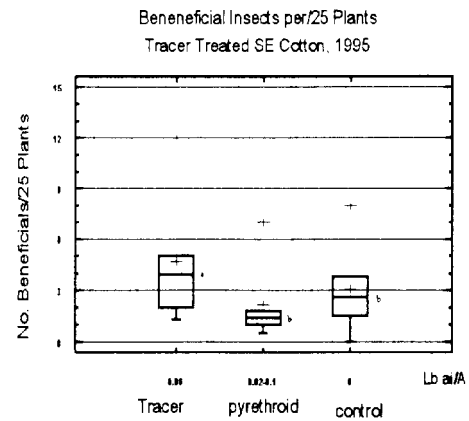




SUMMARY: GEL/P/FE



Figure 2. Summary of observations of insect damaged cotton squares from 7 Alabama and Georgia EUP trials during 1995.



SUMMARY: GEL/P/FE



Figure 3. Summary of total beneficial arthropod counts taken 3-5 days after application in 7 Tracer trials from Alabama and Georgia during 1995