EFFICACY OF AERIALLY APPLIED TRACER ON COTTON FOLIAGE

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Abstract

Field and laboratory studies were conducted to determine optimum aerial application parameters for Tracer™ to control cotton insect pests. Tracer™ and a Producer Standard (selections of Karate®, Pirate®, Larvin®, Condor®XL, and Matttch®) were applied at 2 and 5 gal per acre and 200 and 400 μm droplets. Detailed bioassays and sampling were conducted at open and closed canopy. Bioassays indicated that budworm mortality for Tracer™ was greater at 5 gal, 200 μm although reduced mortality was observed in the closed canopy application. Bollworm mortality was also highest for Tracer™ at 5 gal, 200 μm at open canopy but was highly reduced at closed canopy. Field evaluations revealed budworm larvae were numerically greater in Producer Standard treatments. Tracer™ treatments had significantly fewer third instar or larger larvae suggesting that Tracer™ controlled smaller larvae before they developed into more damaging instars. Tracer™ treatments also exhibited higher number of beneficial insects. Based on these data, Tracer™ appeared to control early budworm populations better when plant coverage was more uniform during open canopy applications, and it was less detrimental to the beneficial insect complex than were the Producer Standards.

Introduction

Tracer™ is a new product for control of lepidopterous cotton pests. The active ingredient is spinosad, a naturally derived fermentation product. A need was seen for determining optimal aerial application parameters focusing on application rates and droplet size. A study was undertaken to evaluate these parameters for Tracer™ versus a Producer Standard for control of the budworm/bollworm complex throughout the season. Laboratory bioassay and field evaluation results are presented herein.

Materials and Methods

Three replicates of Tracer™ (2.2 fl. oz./ac) and a producer-selected standard product were applied in a completely randomized block design at 2 and 5 gal/ac and 200 and 400 μm droplets (viz.8 treatments) at open (mid-season) and closed canopy (late-season) cotton. The Producer Standards at open and closed canopies were Pirate® (0.3 lb AI/ac) and a combination of Larvin® (0.222 gal/ac) and Mattch® (1¾ pt/ac), respectively. Four 63.3' airplane swaths were applied per treatment plot. In total, seven spray applications were made on the field plot throughout the season. Mean differences are noted at %=0.05 (LSD).

Laboratory Bioassays

Cotton leaves were collected on the day of treatment and 3 d post-treatment from five sampling locations per plot at open and closed canopy. Leaves were collected at mid-canopy and top canopy for both species and placed in petri dishes. Leaves were kept cool enroute to the laboratory. Five neonate laboratory-reared budworm and bollworm larvae were exposed per leaf. Mortality readings were recorded at 24 and 72 hrs.

Field Evaluation

Field observations for budworm/bollworm were initiated approximately three weeks before initial sprays by the producer. Treatment plots were checked on a 3-4 d schedule following treatments. Two 13 row ft (≈two 1/1000 ac) sections were evaluated per treatment plot per sampling date. Presence of budworm/bollworm eggs and larvae and beneficials were recorded.

Results and Discussion

Laboratory Bioassays

Budworm 24 h mortality was highest at 200 μm droplet treatments for Tracer™ and Producer Standard during open canopy treatments at both gallon rates. Further, mortality for Tracer™ treatments at 200 μm droplets was significantly higher than Producer Standard treatments at 400 μm. Similarly, budworm 24 h mortality in closed canopy was higher in Tracer™ treatments at 200 μm and significantly higher than Producer Standard treatment at 5 gal, 200 μm.

Bollworm 24 h mortality was significantly higher in all Tracer™ treatments than all Producer Standard treatments except 5 gal, 200 μm treatment during open canopy application. However, mortality for Tracer™ at 5 gal, 200 μm was significantly higher than all Producer Standard treatments. Conversely, bollworm 24 h mortality in closed canopy was numerically greater only in Tracer™ at 5 gal, 400 μm but not significantly higher than Producer Standard treatments. However, despite lower mortality, data suggest Tracer™ at 2 gal, 200 μm was as effective as Producer Standard treatments. Budworm 72 h mortality was numerically greater for Tracer™ treatments at both 2 and 5 gal, 200 μm. Tracer™ at 2 gal, 200 μm provided similar bollworm mortality (≈94%) as Producer Standard treatments.

Field Evaluation

Mean numbers of budworm/bollworm larvae in Producer Standard treatments were numerically higher than Tracer™ treatments but only statistically higher in the 2 gal, 400 μm Producer Standard treatment. This trend may be partially

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due to some resistant larvae surviving Producer Standard treatments and/or Tracer™ effectively controlling small larvae.

Identification of larvae collected randomly after open canopy treatments revealed more budworm larvae were observed in Producer Standard treatments. Presumably these were resistant larvae surviving these applications. Further, Producer Standard treatments had significantly more third instar or larger larvae than Tracer™ treatments. This suggests that Tracer™ indeed prevented small larvae from reaching larger and more damaging instars and that larvae in Producer Standard treatments may indeed be surviving these treatments.

A higher number of beneficial insects (i.e. *Chrysoperla*, *Geocoris*, *Orius*, *Nabis*, Coccinellidae) were observed for Tracer™ treatments. Mean number of beneficials for Tracer™ at 2 gal, 400 μm was significantly higher than virtually all Producer Standard treatments.

Summary

Bioassay data indicate 24 h mortality for budworm was highest with 200 μm droplets for Tracer™ and Producer Standard during open canopy treatments at both gallon rates. Mortality rates were slightly reduced at closed canopy although Tracer™ treatments at 200 μm continued to provide higher budworm mortality. Bollworm 24 h mortality in Tracer™ plots was significantly higher than virtually all Producer Standard plots during open canopy treatments. However, similar to budworm results, a decrease in bollworm mortality was observed in closed canopy treatments. These decreases may be attributed to increased foliage preventing uniform deposition of material. Field evaluations revealed budworm/bollworm larvae were numerically higher in Producer Standard treatments, suggesting larvae may be surviving Producer Standard treatments. Tracer™ treatments had significantly fewer third instar or larger larvae suggesting that Tracer™ controlled smaller larvae before they developed into larger and more damaging instars. Tracer™ treatments also exhibited higher number of beneficial insects. Based on these data, Tracer™ controlled early budworm populations when coverage was more uniform during open canopy applications. Further, Tracer™ was less detrimental to the beneficial insect complex.

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Mention of a trade name is for research purposes only. Use of trade names does not constitute endorsement by the United States Department of Agriculture.