FIELD EVALUATION OF AERIALLY APPLIED TRACER™ – SPRAY RATE AND DROPLET SIZE

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Abstract

Optimum aerial application parameters were determined for Tracer™, a "reduced risk" insect control material for lepidopterous cotton pests. A season-long lepidopterous insect control program was conducted with two spray rates, two droplet sizes, and two insecticides – Tracer™ and a producer standard composed of selections of Karate®, Larvin®, Mattch®, and Condor®XL. Detailed deposition sampling and laboratory bioassays were conducted on open and closed canopy cotton. Performance of Tracer™ was superior with the 5 gallon per acre spray rate and droplet sizes of 200- m volume median diameter.

Introduction

Tracer™ is a new cotton insect pest management material that reportedly is effective against selected lepidopterous pests. It is a 4 pound per gallon water-based suspension concentrate of the fermentation product – spinosad. Several questions arise relative to optimum aerial application parameters for this material with a somewhat unique chemistry. Most cotton insect management materials are emulsifiable concentrates (EC). Research has shown that different formulations and active ingredients in EC's give optimum performance with certain droplet sizes, droplet densities, and spray rates. The objective of this study was to determine favorable application parameters, including spray rate and droplet size, for Tracer™ as compared to more traditional materials used in cotton insect management.

Methods and Materials

An eight-treatment factorial arrangement of three replications of two spray rates, 2 and 5 gallons per acre (gpa); two spray droplet sizes, 200 and 400 m volume median diameter ($D_{V0.5}$); and two insecticides; Tracer™ and a producer-selected material for a standard treatment was used for the study. Season-long aerial applications were made on 8-acre plots in a 200-acre contiguous cotton field, based on scouting advice from the producer's crop advisor. Two application times were selected for detailed deposition sampling – the first bollworm/budworm spray at mid-season and one at late season with closed cotton canopy.

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Three sampling locations were staked in each 8-acre plot on a diagonal across the long dimension of the plots. These locations were used for water-sensitive-paper (WSP) card and leaf sampling during the study. Six WSP cards were folded and attached to leaves at both top and mid-canopy levels at each sampling location. Card surfaces attached to both the top and bottom sides of the leaves were analyzed in duplicate with computerized image analysis to determine spray deposit characteristics. Six top-canopy leaves and six mid-canopy leaves were harvested at each sample location for fluorometric analysis of dye contained in the spray mix to quantitate spray deposits. For the laboratory bioassay, five leaf sampling locations were selected in each plot, with two leaves harvested at each location. These leaves were placed in petri dishes and five first instar *Heliothis virescens* larvae were placed on each leaf. Leaves for the bioassay were collected on the day of treatment and 3 days post-treatment. Mortality readings were made at 24 and 72 hours after larvae placement. Plots were maintained until harvest and ¾-acre sub-plots were harvested for seed cotton yield.

Results

Droplet density and spray coverage data were measured on the WSP cards attached to the top and bottom surfaces of cotton leaves. The 5 gpa – 200 m treatment gave the highest droplet densities and the 2 gpa – 400 m treatment gave the lowest droplet densities. Droplet densities for Tracer™ averaged lower than for the producer standard. Top and mid-canopy droplet densities were highest with the 5 gpa – 200 m treatments. Mid-canopy droplet densities with the 5 gpa – 200 m treatments were almost as high as top-canopy droplet densities with 2 gpa – 200 m and 5 gpa – 400 m treatments. Average spray coverage on the WSP cards at 5 gpa was higher for the producer standard than for Tracer™. Average spray coverage at 2 gpa was not different for the two insecticides, and there was no difference in spray coverage between Tracer™ and the producer standard on the portion of the cards placed on the top of the leaves at the top-canopy locations with the 200 m treatments. The 5 gpa treatments gave the highest coverage at the top-canopy locations, with the 200 m treatments higher than the 400 m treatments. Mid-canopy spray coverage was not different for both 5 gpa treatments and the 2 gpa – 200 m treatments.

There was no difference in "active ingredient" (dye) deposits between Tracer™ and the producer standard insecticides as measured by fluorometric readings from leaf wash effluents. Average "active ingredient" (dye) deposits at mid-canopy were half of average deposits at top-canopy locations.

The laboratory bioassay showed that Tracer™ at 5 and 2 gpa with 200 m droplets provided greater mortality at 24 hours on *Heliothis virescens* larvae than the all other treatments. Larval mortality in the bioassays averaged near 80 percent with both insecticides.

There was no significant difference in seed cotton yields between the eight treatments in the study. However, there was a trend indicating lower yields for the 2 gpa Tracer™ treatments.

Summary

A season-long commercial-scale application and efficacy study was conducted to determine the most effective aerial application parameters for Tracer™, compared to EC producer-standard formulations. Spray coverage, canopy deposition at top and mid-canopy, droplet size, and laboratory bioassays on *Heliothis virescens* were assessment criteria. Spray rates of 2 and 5 gpa and droplet sizes of 200 and 400 m $D_{V0.5}$ were used for both Tracer™ and the producer standard formulations. The eight-treatment – three-replication study was conducted on 200 acres of cotton in Burleson County, Texas. Spray deposits were sampled with water-sensitive paper and with fluorometric tracer washed from cotton leaves. Laboratory bioassays of leaf samples were conducted on the day of treatment and 3 days post-treatment. Sub-plots of ¾-acre were harvested for seed cotton yield. The 5 gpa – 200 m treatment gave the highest top and mid-canopy droplet densities, the best efficacy, and trended to higher yields for Tracer™. Spray coverage was lower with Tracer™ than the producer standard formulations, but there was no difference in simulated active ingredient (fluorescent dye) deposits between Tracer™ and the producer standard formulations. The 5 gpa – 200 m Tracer™ treatment gave greater mortality on *H. virescens* larvae at 24 hours after application in the laboratory bioassay. Cotton yields were not different for the eight treatments but trended higher for the 2 gpa – 200 m treatment with the producer standard formulation applications.

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