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# REDUCING PLANTING TIME ALDICARB USE IN COTTON UTILIZING PRECISION PLACEMENT AND CONSERVATION TILLAGE

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## Abstract

Field studies were conducted to evaluate the effectiveness of varying rates of precision placed aldicarb treatments in combination with conservation tillage for the control of tobacco thrips, *Frankliniella fusca* (Hinds), in seedling cotton. Sampling showed that thrips counts were reduced in conservation tillage plots. Precision placed treatments significantly reduced thrips infestations in comparison with the untreated check and were as effective in reducing thrips populations as the standard in-furrow 3.92 kg product per ha rate. Precision placed aldicarb at rates of 1.44, 2.87, and 5.74 showed the most effective reduction in thrips populations. No interaction between tillage practices and insecticide treatments was observed. Plants from conservation tillage plots were significantly taller than plants from conventional tillage plots. Plants from precision placement treated plots were as tall as plants from plots treated with the standard in-furrow rate. No significant differences in yield were observed between conservation and conventional tillage plots. Yields from precision placement treated plots were as high as those from plots treated with the standard in-furrow rate. Results of this test indicate that precision placement of aldicarb at planting in combination with conservation tillage could result in substantially reduced amounts of insecticide needed for managing thrips infestations in seedling cotton. Application of a system of this type could result in substantial savings in grower costs as well as a reduction in environmental hazards.

## Introduction

Current management for thrips infestations in seedling cotton utilizes aldicarb (Temik®) applied in-furrow at-planting. In the United States in 1999, growers spent on average $10 per acre to control thrips, with approximately 75% of that being spent on aldicarb (Williams 2000). Aldicarb is an effective control measure, but it is considered to be one of the most acutely toxic systemic pesticides available for use and poses considerable environmental risks (EXTOXNET 1997).

Modern farming technology allows for the placement of seed in-furrow in exact, specific locations. This idea of precision placement can also be applied to insecticide use. Placing the insecticide along with the seed in a specific location would be a more efficient technique of applying planting time insecticides. This type of insecticide use could decrease the cost and amount of insecticide needed as well as decreasing human health and environmental risks. Field tests have shown that precision placement is an effective method for reducing aldicarb rates without affecting efficacy against thrips (Lohmeyer et al. 2001, All et al. 2000, Roberts et al. 1998). Precision placed rates of aldicarb have been shown to be as efficient at controlling thrips as the standard 3.92 kg product per ha in-furrow rate, but at rates that were reduced by up to 50%. Another aspect of thrips management in cotton is the possible utilization of certain cultural practices such as conservation tillage as a means of influencing pest populations. Previous research has shown that thrips populations are reduced in cotton that has been planted after a cover crop such as wheat, clover, or canola (All et al. 1992, All 1996, All et al. 1994).

Precision placement of aldicarb has shown promise as an improved method of thrips control at reduced rates. Cultural control practices such as conservation tillage may also decrease thrips numbers in early season cotton. This study was initiated to determine if the combination of precision placement of aldicarb and conservation tillage might be effective in further reducing thrips populations on seedling cotton.

## Materials and Methods

Experiments were conducted at the University of Georgia's Plant Sciences Farm, near Athens, GA. A split-block design with four replications and one untreated check per replication was used. Conventional tillage and strip-tillage blocks had been prepared prior to planting in a field that had been previously planted with wheat. Conventional tillage blocks were plowed and disked twice to prepare a smooth seedbed for planting. Bollgard™ NuCotn 33 seed was planted in a hill method with 3 seeds per hill on 18 May 2001. Hills were spaced 1 ft apart. Conventional tillage plots were planted using a two-row Monesem pneumatic planter. Strip-tillage plots were prepared with a KMC stripper/subsoiler implement followed by the same Monesem pneumatic planter utilized in the conventional tillage plots. All plots were planted with the furrow open. Varying rates of aldicarb were then applied to the two middle rows of each plot. Granular aldicarb was applied at planting using two methods: placement of the insecticide along the entire furrow with the seed, or precision placement of the insecticide directly on top of the seed in each hill with a "bazooka" type applicator that was constructed to direct calibrated quantities of insecticide granules onto the top of seed by a trap release system (Wiseman et al. 1980). All insecticide rates were specified as kg product per ha based on 38 inch wide rows. The open furrows were closed with a garden hoe.

### Thrips Sampling

Plots were sampled for thrips at 10, 20, 30 and 45 days after planting/treatment. Ten plants were randomly selected from the treated rows of each plot and immersed in a 120ml specimen cup containing 60ml of alcohol. Plants were large by the last sampling date, so only the upper portion of the plant was immersed in the containers. Samples were then taken to the laboratory where thrips were identified and counted using a dissecting scope.

### Plant Heights/Yield

At 50 days after planting/treatment, 10 plants were randomly selected from each plot and measured in centimeters. The terminal bud was used as the upper measurement point. To determine yield, plots were mechanically harvested on 1 November 2001. Seed cotton was weighed in kg in the field to determine yield.

### Statistical Analysis

Thrips counts were square root transformed before analysis. Means for thrips sampling, plant heights, and seed cotton yield were analyzed using GLM and Tukey's Studentized Range Test, with $P<0.05$ (SAS Institute 2000).

## Results

### Thrips Sampling

For all tests, over 95% of the adult thrips sampled and counted were tobacco thrips, *Frankliniella fusca* (Hinds). A few western flower thrips, *F. occidentalis* (Pergrande) were also present.

On 29 May, no differences in total thrips (adults + larvae) populations were observed between conventional and strip-tillage plots (Table1). All precision placed treatments significantly reduced thrips infestations when compared with the check and were as effective, if not more effective, in reducing thrips as compared to the standard in-furrow 3.92 kg product/ha rate. Precision placed aldicarb at 1.44, 2.87, and 5.74 kg product/ha showed the greatest reduction in thrips populations when compared to the check. No interaction between tillage and aldicarb treatments was observed.

On 6 Jun, significantly fewer thrips were observed in the strip-tillage plots when compared to conventional tillage plots. All treatments significantly reduced thrips populations when compared with the check except in-furrow aldicarb at a rate of 0.28 kg product/ha. All precision placed treatments were as effective in reducing thrips populations as the standard in-furrow 3.92 kg product/ha rate. Precision placed aldicarb at rates of 1.44, 2.87, and 5.74 kg product/ha showed the greatest reduction in thrips populations. No interaction was observed between tillage and aldicarb treatments.

On 18 Jun, significantly fewer thrips were observed in the strip-tillage plots when compared to conventional tillage plots. Prcision placed aldicarb at 1.44, 2.87, and 5.74 kg product/ha significantly reduced thrips populations when compared to the check. All precision placed treatments were as effective in reducing thrips populations as the standard in-furrow 3.92 kg product/ha rate. No interaction was observed between tillage and aldicarb treatments.
On 2 Jul, no differences in thrips populations were observed between conventional and strip-tillage plots. No significant differences in treatments were observed when compared to the check. No interaction was observed between tillage and aldicarb treatments.

### Plant Heights/Yield

Plants from conservation tillage plots were significantly taller than plants from conventional tillage plots. Plots treated with precision placement of aldicarb were significantly taller than plants from the untreated check and were as tall as plants treated

with the standard in-furrow rate of 3.92 kg product/ha rate. No significant differences in yield were observed between conventional and strip-tillage plots. Precision placed aldicarb at 1.44 and 2.87 kg product/ha had significantly higher yields when compared to the check. Yields from precision placement treated plots were as high as those from plots treated with the standard 3.92 kg product per ha rate. No interaction was observed between tillage and aldicarb treatments for yield.

## Conclusions

This study demonstrates that precision placement of aldicarb in combination with conservation tillage may be an effective system for thrips management in cotton at rates considerably lower than standard amounts used with in-furrow application. Precision placed aldicarb treatments effectively controlled thrips infestations at reduced rates in comparison to the standard in-furrow amount of insecticide. Strip-tillage effectively reduced thrips populations in comparison with conventional tillage on several sampling dates. Plants in strip-tillage plots were significantly taller than plants in the conventional tillage plots. Plants from all precision placement treated plots were significantly taller than plants from the untreated check and were as tall as plants from plots treated with the standard in-furrow 3.92 kg product per ha rate. Plots treated with precision placement showed no decrease in yield when compared to the standard in-furrow 3.92 kg product/ha rate.

Results indicate that an integrated system that combines precision placement of aldicarb with conservation tillage practices may be a potential new avenue for thrips control in cotton. Such a system could provide an environmentally safe and cost effective alternative to traditional aldicarb use in cotton by combining judicious use of insecticides with conservation tillage.

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Table 1. Efficacy of varying rates and application methods of aldicarb treatment in conventional and conservation tillage systems.

| Tillage Practice | 29 May | Mean # of total thrips[a] 6 Jun | 18 Jun | 2 Jul | Yield (kg/ha) | Plant Height (cm) |
|---|---|---|---|---|---|---|
| Conventional tillage | 22.98a | 131.45a | 35.45a | 6.03a | 2623.9a | 31.82b |
| Conservation tillage | 23.55a | 70.88b | 16.75b | 4.38a | 2768.9a | 37.53a |

| Rate/Application Method kg product/ha | 29 May | Mean # of total thrips[a] 6 Jun | 18 Jun | 2 Jul | Yield (kg/h) | Plant Height (cm) |
|---|---|---|---|---|---|---|
| 0.18 precision placed | 22.13cd | 107.50bc | 33.88ab | 6.13a | 2657.7ab | 32.99bcde |
| 0.71 precision placed | 23.75bcd | 110.13bc | 16.38bc | 3.00a | 2604.9ab | 36.32abcd |
| 1.44 precision placed | 4.75e | 15.00d | 7.75c | 3.50a | 2918.1a | 40.92ab |
| 2.87 precision placed | 6.13e | 9.00d | 10.38c | 3.63a | 2956.9a | 43.01a |
| 5.74 precision placed | 7.00e | 6.63d | 8.25c | 3.75a | 2699.9ab | 41.38a |
| 0.28 in-furrow | 50.50a | 208.00ab | 53.75a | 6.88a | 2376.0ab | 26.86ef |
| 0.56 in-furrow | 33.88abc | 137.38bc | 33.88ab | 7.88a | 2428.9ab | 29.99def |
| 1.12 in-furrow | 23.38bcd | 84.25bc | 35.25ab | 4.88a | 2103.3ab | 32.50cde |
| 3.92 in-furrow | 14.63de | 42.38cd | 23.50bc | 6.00a | 2200.0ab | 40.53abc |
| check | 46.50ab | 291.38a | 37.13ab | 6.38a | 1513.6b | 22.24f |

Means in a column followed by the same letter are not significantly different ($P$=0.05, Tukey HSD).
[a]Actual means; means were square root transformed before analysis.