EVALUATION OF ADAGE 5FS™
FOR EARLY-SEASON INSECT CONTROL

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Abstract

Widely used at-planting insecticides, Temik and Gaucho seed treatment, were evaluated along side a new insecticide seed treatment, Adage 5FS™, at two rates. More adult and larval thrips were observed in Gaucho and untreated plots, while Temik provided the greatest thrips control. Adage provided good thrips control but appeared to diminish in plants by 28 days after planting. All insecticide treatments resulted in more total lint than no treatment, and Gaucho seed treatment plots produced numerically more lint than Adage- and Temik-treated plots. Adage was competitive with the two standard at-planting treatments and will offer growers an alternative insecticide class for early season insect control.

Introduction

Thrips are among the first insects to attack cotton and cause significant damage (Burris et al. 1990). In 1997, approximately 77% of cotton acreage in the United States was infested by thrips. Nearly 7.5 of 13.8 million acres of cotton was planted with insecticide treatment to control early-season pests at a cost approaching $75,000,000 (Williams 1998). In addition to steadily increasing production costs, growers must also consider worker protection standards, environmental concerns, and efficacy of at-planting insecticide treatments.

In Tennessee, Temik 15G (aldicarb/carbamate) has been the product of choice for producers for several years. The introduction of Gaucho seed-treatment (imidacloprid/chloronicotinyl) offered growers another efficacious choice that was comparable in cost to Temik, but was safer and more convenient to use. The efficacy of Temik and Gaucho are somewhat dependent on growing conditions (Monke and Mayo 1990, Slosser 1993). In previous years, lack of soil moisture reduced plant uptake of aldicarb and imidacloprid, and if seed coats treated with imidacloprid did not remain in the soil when seedlings emerged, no insecticide was available to the plant for systemic protection (Mizell 1998). The search for a safe, efficacious, and economical at-planting insecticide treatment is ongoing (Parencia et al. 1957a). A new insecticide seed treatment, Adage 5FS (thiamethoxam/neonicotinoid), developed by Novartis Crop Protection, Inc. has entered the mix of options of at-planting insecticide treatments for cotton producers. Zang et al (1998) reported Adage had greater water solubility than Gaucho seed treatment and therefore exhibited more consistent efficacy, particularly in drier soils.

Insecticides that provide adequate thrips control may also affect plant growth and development (Mizell 1998). The objectives of this study were to evaluate Adage 5FS at 0.2 lb and 0.3 lb ai/cwt. as an early-season insect control method, and compare it to the commonly used at-planting treatments, Temik 15G at 0.7 lb ai/acre and and Gaucho 480F ST at 0.25 lb ai/cwt.

Materials and Methods

An early-season thrips control trial was conducted at West Tennessee Experiment Station in Jackson, TN in 1997. Plots were planted on May 15 with a 2-row IH800 planter in conventionally tilled soil according to University of Tennessee recommendations. Treatments were arranged in a randomized complete block design with five replications. Plots were four 38-inch rows X 30 ft. DPL 5415 seed treated with fungicide (Apron XL 10 g + Maxim 2.5 g + Nuflow M 28 g ai/100 kg seed) were supplied by Novartis. Treatments consisted of a no-treatment plot, Temik 15G 0.7 lb ai/A applied in-furrow, Gaucho 480F 0.25 lb ai/cwt seed treatment (ST), and Adage 5FS at two rates, 0.2 and 0.3 lb ai/cwt ST.

Efficacy of thrips control was measured by collecting 4 plants (2 plants selected randomly from each of the two center rows) per plot and placing them in appropriately labeled pint jars containing ~200 ml. of 70% ethyl alcohol. Lids were then placed on the jars, which were gently inverted to ensure all thrips were removed from the plants. Samples were taken to the laboratory and the plants were removed and placed in a standard US sieve No. 100 where they were rinsed with 70% ethyl alcohol. The alcohol remaining in the jar was poured through the sieve and the jar was rinsed to remove any remaining thrips. The sieve was back-rinsed with alcohol through a funnel into a glass vial. Samples were later counted using a stereo microscope and the number of thrips/4 plants was recorded. Thrips samples were collected 13, 18, 24, and 28 days after planting (DAP).

Plant stands were counted 16 DAP by randomly selecting a 10 ft section of each plot row and counting the healthy cotton plants in that section. The average of the number of plants in 10 row ft was used for analysis. Plants collected for thrips control (28 DAP) were used for measurement of leaf area (cm^2). The total leaf area (cm^2) per 4 plants was recorded and used for data analysis. Plant heights were measured 38 DAP. Five plants / plot were measured from the soil to the terminal. The average height (inches) of the five plants were used for analysis. Blooms were counted to determine if at-planting insecticides had an impact on fruit production. The number of blooms in 10 ft of row were

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counted 3 times within a 10-day period and the number/10 ft was recorded for data analysis. Blooms were counted 55, 59 and 62 DAP. Cotton was harvested with a two-row picker, and yields were measured. First harvest occurred 130 DAP, and second harvest 150 DAP. Data were analyzed using Analysis of Variance, and means were separated using Duncan's Multiple Range Test ($P < 0.05$).

Results

Adult thrips numbers were not different in Gaucho-treated plots compared to the untreated plots 13 DAP, while significantly lower numbers were observed in the Temik- and Adage-treated plots (Table 1). Only Temik provided control of adult thrips 18 DAP compared to untreated plots, and significantly fewer adult thrips were detected in Temik-treated plots compared to Gaucho-treated plots. Plots treated with Temik or Adage 0.2 lb had fewer adult thrips 24 DAP than Gaucho-treated and untreated plots. On the last sampling date, Temik provided better control of adult thrips than did any other treatment compared to untreated plots, but all insecticide treated plots for the only time during the sampling period, had fewer adults than did the untreated plots.

All insecticide treatments controlled larval thrips when compared to no treatment 13 DAP (Table 2). Temik and Adage provided greater larval thrips control than did Gaucho and no treatment, but all insecticide-treated plots had significantly fewer larval thrips than the untreated plots 18 and 24 DAP. Significantly fewer larval thrips were detected in Temik-treated plots compared to Gaucho-treated and untreated plots 28 DAP.

Plant stands were not affected by insecticide treatment 16 DAP, and while total leaf area (cm^2) was numerically greater in insecticide treated plots, leaf area was not statistically greater in treated plots compared to untreated plots (Table 3). Plant height was significantly affected by insecticide treatments compared to untreated plots. All insecticide-treated plots had taller plants than did untreated plots.

Gaucho- and Adage-treated plots produced plants with significantly more blooms than untreated plots, while only Adage at 0.3 lb ai/cwt had plants with more blooms than Temik- and untreated plots in the total of the first two early bloom counts (Table 4). Total bloom numbers were significantly greater in Gaucho- and Adage-treated plots than in untreated plots. Temik-treated plots did not differ in total early bloom numbers when compared to untreated plots.

All insecticide-treated plots produced more lint than untreated plots at 1st and total harvest (Table 5). Insecticide-treated plots did not differ from untreated plots in 2nd harvest yield. Higher percent 1st harvest yields were observed in insecticide-treated plots compared to untreated plots, and Adage 0.2 lb produced a greater percent 1st harvest than did Temik and untreated plots.

Discussion

Thrips pressure was moderate to high, with 6 to 23 adult and larval thrips per plant in untreated plots over the sampling period. Seedling protection from thrips by Temik and Adage was satisfactory. Temik provided the most efficacious and residual thrips control over the sampling period. Untreated and Gaucho-treated plots had adult thrips numbers above threshold levels (1/plant) on all sampling dates. Larval thrips numbers exceeded threshold levels in untreated plots on all sampling dates, and in Gaucho-treated plots on the last 3 dates. Gaucho-treated plots experienced greater thrips populations, but total lint yield was greater than in Temik or Adage-treated plots. Adage appeared to decline in plants, as exhibited by increasing adult and larval thrips numbers. Plant stands were not influenced by insecticide treatment. The total leaf area was twice as great in Temik-treated plots compared to untreated plots but no statistical difference was observed. Leaf area in plants collected from Temik-treated plots was nearly 24 – 33 % greater than those collected from Adage- and Gaucho-treated plots. Plant height is an indicator of vigor, and taller plants were observed in insecticide-treated plots. Numerically more blooms were seen in Adage- and Gaucho-treated plots compared to Temik-treated plots, but no statistical differences were observed among treatments. The greatest number of total early flowers was observed in Adage 0.3 lb plots and the least in untreated plots. First harvest and total yields were greater in insecticide-treated plots, with Gaucho-treated plots producing numerically more lint (26 lbs.) than the other insecticide-treated plots and 222 lb more than the untreated plots. All insecticide-treated plots produced more cotton at first harvest than untreated plots, as shown by percent first-harvest values, and Adage (0.2 lb) plots produced statistically more lint at first harvest than did Temik-treated plots. Differences in efficacy of treatments did not impact total yields.

Conclusions

At-planting insecticide treatments are important in the management of early-season thrips populations. Treatments included in this study provided adequate plant protection so that yields were increased compared to no treatment. Adage proved to be competitive with Temik and Gaucho in its ability to control adult and larval thrips. Even though its residual may be less than 28 days, its performance was comparable to the other treatments in most plant measurements.

As new chemistries are introduced and producer options are not limited to only a few insecticide classes, cotton production as a whole will benefit by reduction in the development of insecticide resistance and reduced pest exposure early in the growing season to commonly used mid- to late-season chemicals. In addition to problems with resistance, legislative action resulting from public concern about the negative effects of pesticides has increased insecticide cancellations and produced more restrictive worker protection standards. Adage is used as a seed-treatment at lower rates than the other insecticides tested. Ease of handling increases with seed treatments, and in the case of Adage, the rate of exposure by handlers decreases, making it a safer and easier product to use when compared to granular treatments such as Temik.

As production costs rise and market prices fall, growers need more economic alternatives for at-planting treatments. If Adage can be marketed at lower cost than other treatments, it will offer growers a more
affordable at-planting treatment option.

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Table 1. Effect of at-planting insecticide treatments on adult thrips numbers. 1998.

			Mean Number / 4 Plants			
Treatment	Rate	Appl	13 DAP	18 DAP	24 DAP	28 DAP
Untreated			11.8 a	5.2 ab	10.8 a	14.6 a
Temik 15G	0.7 lb ai/A	IFG	1.8 b	1.0 c	4.4 b	0.8 c
Gaucho 480F	0.25 lb ai/cwt	ST	10.6 a	6.6 a	10.4 a	6.8 b
Adage 5FS	0.2 lb ai/cwt	ST	2.6 b	2.4 bc	3.8 b	6.0 b
Adage 5FS	0.3 lb ai/cwt	ST	3.0 b	2.4 bc	6.6 ab	5.4 b
P > F			0.0001	0.0197	0.0240	0.0001

Table 2. Effect of at-planting insecticide treatments on larval thrips numbers. 1998.

			Mean Number / 4 Plants			
Treatment	Rate	Appl	13 DAP	18 DAP	24 DAP	28 DAP
Untreated			11.0 a	87.6 a	31.4 a	21.0 a
Temik 15G	0.7 lb ai/A	IFG	0.2 b	0.0 c	0.4 c	0.8 c
Gaucho 480F	0.25 lb ai/cwt	ST	0.8 b	47.4 b	21.2 b	15.8 ab
Adage 5FS	0.2 lb ai/cwt	ST	0.2 b	0.8 c	3.4 c	8.6 bc
Adage 5FS	0.3 lb ai/cwt	ST	0.2 b	1.4 c	3.6 c	6.8 bc
P > F			0.0001	0.0001	0.0001	0.0126

Table 3. Effect of at-planting insecticide treatments on stand, total leaf area, & plant height. 1998.

Treatment	Rate	Appl	Mean Stand # plants/10 ft 16 DAP	Total Leaf Area (cm^2) 28 DAP	Mean Plant Height (inches) 38 DAP
Untreated			40.7	103.8	10.4 b
Temik 15G	0.7 lb ai/A	IFG	40.2	226.0	12.2 a
Gaucho 480F	0.25 lb ai/cwt	ST	44.0	154.6	12.4 a
Adage 5FS	0.2 lb ai/cwt	ST	46.7	150.8	12.8 a
Adage 5FS	0.3 lb ai/cwt	ST	45.3	171.2	12.6 a
P > F			0.2229	0.0659	0.0024

Table 4. Effect of at-planting insecticide treatments on early bloom production. 1998.

Treatment	Rate	Appl	Mean Number of Blooms / 10 ft: Total of counts 1+ 2 (55 & 59 DAP)	Total of 3 counts (count 3 = 62 DAP)
Untreated			23.6 c	54.2 b
Temik 15G	0.7 lb ai/A	IFG	30.6 bc	61.4 ab
Gaucho 480F	0.25 lb ai/cwt	ST	42.0 ab	73.2 a
Adage 5FS	0.2 lb ai/cwt	ST	46.4 ab	74.8 a
Adage 5FS	0.3 lb ai/cwt	ST	50.8 a	79.6 a
P > F			0.0147	0.0482

Table 5. Effect of at-planting insecticide treatments on lint yield. 1998.

Treatment	Rate	Appl	Lint (lb / Acre) 1st Harv	2nd Harv	Total	Percent 1st Harvest
Untreated			693 b	195	888 b	77.9 c
Temik 15G	0.7 lb ai/A	IFG	854 a	188	1043 a	82.0 b
Gaucho 480F	0.25 lb ai/cwt	ST	922 a	188	1110 a	83.0 ab
Adage 5FS	0.2 lb ai/cwt	ST	924 a	156	1080 a	85.6 a
Adage 5FS	0.3 lb ai/cwt	ST	920 a	163	1084 a	84.9 ab
P > F			0.0002	0.0719	0.0007	0.0007