2003 BELTWIDE COTTON CONFERENCES, NASHVILLE, TN – JANUARY 6-10

PERFORMANCE OF EARLY-SEASON INSECTICIDES UNDER ADVERSE CONDITIONS IN WEST TENNESSEE

Gary L. Lentz, Nancy Van Tol, and Dana Pekarchick
Department of Entomology and Plant Pathology
The University of Tennessee
West Tennessee Experiment Station
Jackson, TN

Abstract

Five experiments were conducted in 2002 at the West Tennessee Experiment Station in Jackson, TN to evaluate the efficacy of early-season thrips control options on seedling cotton and their impact on yield. Seed treatments of imidacloprid (Gaucho) and thiamethoxam (Cruiser) were compared to selected rates of in-furrow applications of aldicarb (Temik) for residual efficacy and effect on yield. The two seed treatments often provided superior control of thrips and plots treated with them sometimes produced higher yields compared to the Temik treatment under the adverse conditions of this growing season.

Introduction

For many years, thrips control on seedling cotton has been accomplished by the application of in-furrow granules combined with seed treatments. In recent years, more effective seed treatments have become available (Hofer and Brandl 1999, Long et al. 2001, Minton et al. 2002) which provide excellent control and yield protection. Recent research suggested that Temik treatments outperformed the seed treatments with respect to thrips suppression, visual damage rating, and cotton yield and Temik increased yield, only in one of two years (Johnson et al. 2001). Further studies by these authors indicated that the seed treatments were competitive with Temik in performance and yield (Hopkins et al. 2002). In Tennessee, Lentz and Van Tol (2000) found that yields were comparable in Adage/Cruiser- and Temik-treated plots. A four-year summary of their work reported that performance and yield from the seed treatments were comparable to Temik treatments (Lentz and Van Tol, unpublished). The studies reported here were conducted to determine the performance of these treatments in different environments which included tillage, variety and fungicide seed treatment.

Materials and Methods

Five experiments were established at the West Tennessee Experiment Station in Jackson. Each experiment utilized different varieties and fungicide seed treatments, but all compared the efficacy and yield from treatments of aldicarb (Temik), imidacloprid (Gaucho), and thiamethoxam (Cruiser). Ridomil Gold was applied in-furrow at 8 lb/A in all five studies. The first experiment was planted no-till on May 6 using PM 1218 BG/RR and included the treatments listed in Table 1. Plots were eight 38-in rows by 60 ft. Treatments were replicated three times in a randomized complete block design (RCBD). Thrips densities were estimated up to 42 days after planting (DAP) every 6-7 days by pulling two four-plant samples from each plot. Each sample was placed in a pint jar containing 100 ml of 70% ethanol and taken to the laboratory where the samples were poured through a US No. 100 seive. Thrips were then backwashed into a 20-ml scintillation vial for later counting under a stereomicroscope. Plots were harvested Sept. 24 and Oct. 15.

The remaining experiments were planted in a conventional seedbed. The second experiment was planted on May 6 using DP 436 RR and included the treatments listed in Table 3. Plots were four 38-in rows by 30 ft. Treatments were replicated five times in a RCBD. Thrips were sampled as previously described except that only a single sample was taken from each plot. Plots were harvested Sept. 23 and Oct. 14. The last three experiments differed by variety and fungicide seed treatment. The third experiment was planted on May 7 using DP 458 BR. Plots were two 38-in rows by 30 ft. Treatments, listed in Table 5, were replicated five times in a RCBD. Thrips sampling was as previously described in experiment 2. Plots were harvested Sept. 23 and Oct. 14. The fourth study used the variety ST 4892 BR. FM 989 BGRR variety was planted in the fifth experiment.

Data were analyzed for ANOVA using ARM 6.1.12 software (P=0.05). Two analyses were performed on thrips count data, the first with the untreated check included and the second excluding the untreated check to reduce variance in the data and separate treatment means if they were different. For the purposes of this paper, tables of thrips count data are those where the untreated check was not included in the analysis. Yield data tables reveal analyses that include the untreated check. Where data failed Bartlett's Homogeneity of Variance test, data transformations were performed. All means reported are untransformed means, whereas statistics from transformed data are reported and denoted by lsd's that include a "t". Means were separated using Duncan's New Multiple Range test.

Results and Discussion

Thrips collections from the no-till large plot study revealed that at 16 DAP, thrips larval numbers were at zero in all treated plots and were significantly different from the control (Table 1). At the third and fourth sampling dates (22 and 28 DAP, respectively), numbers were still significantly lower in the treated plots compared to the control. An analysis of the 28 DAP data excluding the control revealed a significantly lower number of larval thrips in the Gaucho plot compared to the two low rates of Temik. The high rate of Temik, Cruiser and Gaucho treatments did not differ. At 35 DAP, thrips larval numbers were significantly lower in the seed treatment plots compared to the control and two low-rate Temik plots. At 42 DAP, there were no significant differences among treatments or the control. Yields were lowest in the control plots (912 lb/A), but these were not significantly different from yields in the treated plots (Table 2).

Experiments two through five were conducted on a conventional seedbed and experienced considerably different environmental conditions than the first experiment which was planted no-till. Although rainfall and temperature were similar for all experiments, water drained poorly from the conventional seedbed field, possibly causing increased seedling root disease and poor uptake of systemic insecticides. Soil temperatures were cooler than normal contributing to increased disease. Systemic insecticides may also have been leached away from the seed zone. In the second study, larval thrips numbers from treated plots differed from the control at 15, 22 and 28 DAP (Table 3). An analysis of transformed data excluding the control further separated the number of thrips in treated plots. Cruiser and Gaucho treatments had significantly fewer larval thrips than the two low Temik treatments at 22 DAP and all three rates at 28 DAP, but Cruiser and Gaucho treatments did not differ from each other. Lint yields at both first and total harvest from the control plots were significantly lower than from the treated plots which did not differ from each other (Table 4).

In the third experiment, larval thrips numbers 22 DAP did not differ among the treatments and all were different from the control. However, when the data were transformed and the control was excluded, the analysis showed that the number of larval thrips in the Gaucho plots was significantly lower than those in the Temik plot, but the Gaucho treatment did not differ from the Cruiser (Table 5). At 29 DAP, this analysis revealed that both Cruiser and Gaucho had significantly fewer thrips than Temik-treated plots. Differences among treatments and the control did not differ for the last two samples, 36 and 43 DAP. First harvest lint yields were higher from the Cruiser treatment than from the Temik and control plots (Table 6). Total lint yields did not differ among treatments and all were different from the control yield.

In the fourth study, thrips larval counts 22 and 29 DAP did not differ among the treatments and all were different from the control. In the analysis of transformed data excluding the control, Cruiser- and Gaucho-treated plots had significantly fewer thrips than Temik-treated plots at 29 DAP (Table 7). At 36 DAP, only Gaucho-treated plots had significantly lower larval thrips numbers. Lint yields at first harvest were significantly higher from Cruiser- and Gaucho-treated plots compared to the Temik-treated plot and all were different from the control (Table 8). Total yield from the untreated control was only 20.3% of the lowest yield from treated plots and was 17% of highest yield, indicating the severe damage caused by the thrips infestation.

In the fifth experiment, results were similar to the previous experiments with thrips larval counts 22 and 29 DAP not differing among treatments and all being different from the control. In the analysis which excluded the control, thrips larval numbers were significantly lower in the Cruiser- and Gaucho-treated plots compared to Temik-treated plots at 22 DAP. At 29 DAP, larval thrips numbers were significantly lower in the Cruiser-treated plots compared to the Gaucho- and Temik-treated plots (Table 9). First and total harvest yields were significantly higher in treated plots compared to the control and there were no differences among treatments (Table 10). Total yield from the control plots was less than 50% of that from treated plots.

Results from the 2002 studies indicate that under some conditions, the performance of early-season insecticide control options may fall short of expectations. Clearly, Temik-treated plants in these studies did not demonstrate the superior residual control seen in previous years. Further, yields from plots treated with insecticide seed treatments were equal to or superior to those treated with in-furrow granules.

Results from these experiments vividly demonstrate the need to control thrips, especially when growing conditions are not optimum. Although the varieties were not planted in the same plot, experiments 3-5 were planted side by side on the same date and the data would suggest that some varieties differ in their ability to sustain thrips damage or to recover from the damage inflicted. Further research is planned to investigate the susceptibility/tolerance of varieties to thrips feeding and damage and the impact of tillage on the performance of these control options.

Acknowledgements

We express our thanks to Aventis, Bayer CropSciences, Gustafson and Syngenta for their support of this work.

References

Hofer, D. and F. Brandl. 1999. Cruiser®/Adage™ performance features of thiamethoxam as a seed treatment in worldwide cotton, pp. 1101-1104. IN Proceedings Beltwide Cotton Conf., National Cotton Council, Memphis, TN.

Hopkins, J.D., J.D. Reaper,III, D.R. Johnson and G.M. Lorenz, III. 2002. Thrips management in Arkansas cotton. IN Proceedings Beltwide Cotton Conf., National Cotton Council, Memphis, TN.

Johnson, D.R., J.D. Hopkins, G. M. Lorenz, III and J.D. Reaper, III. 2001. Evaluation of thrips management options in cotton, pp. 1086-1087. IN Proceedings Beltwide Cotton Conf., National Cotton Council, Memphis, TN.

Lentz, G.L. and N.B. Van Tol. 2000. Early-season insect control: Adage™ vs recommended standards, pp. 1113-1115. IN Proceedings Beltwide Cotton Conf., National Cotton Council, Memphis, TN.

Long, D.H., N. Ngo, B. Minton and H.R. Smith. 2001. Adage®: an alternative to in-furrow insecticides for early season aphid and thrips control in cotton, p. 798. IN Proceedings Beltwide Cotton Conf., National Cotton Council, Memphis, TN.

Minton, B.W., B.D. Black, J.E. Driver, C.F. Grymes, J.C. Holloway, Jr., D. Long, S.H. Martin and N.D. Ngo. 2002. Cruiser® (Thiamethoxam) seed treatment for control of early season insects in cotton in the Mid-South and Texas. IN Proceedings Beltwide Cotton Conf., National Cotton Council, Memphis, TN.

Table 1. Efficacy of treatments for suppression of larval thrips on no-till seedling cotton, PM 1218 BG/RR. Jackson, TN 2002.

			Mean number larval thrips/4 plants				
Treatment		**Rate**	**May 22 16 DAP**	**May 28 22 DAP**	**June 3 28 DAP**	**June 10 35 DAP**	**June 17 42 DAP**
Untreated			1.0	51.0	112.5	84.2	62.3
Cruiser	5 FS	0.3 lb ai/cwt	0.0 a	1.3 a	4.7 ab	13.0 bc	27.3 a
Gaucho	480 F	0.25 lb ai/cwt	0.0 a	0.0 a	2.0 b	9.3 c	38.5 a
Temik	15 G	3.5 lb/A	0.0 a	2.7 a	13.5 a	42.7 ab	52.7 a
Temik	15 G	4.0 lb/A	0.0 a	2.2 a	13.3 a	64.2 a	65.5 a
Temik	15 G	5.0 lb/A	0.0 a	0.8 a	5.3 ab	20.2 bc	40.0 a
LSD (P=.05)			0.00	3.16	8.53	29.36	40.54
Treatment Prob(F)			1.0000	0.3830	0.0423	0.0119	0.3203

Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT). Untreated treatment excluded from analysis.

Table 2. Lint yield of PM 1218 BG/RR from no-till plots treated with selected insecticides. Jackson, TN 2002.

			Lint yield (lb/A)		
Treatment		**Rate**	**1st harvest**	**Total harvest**	**% 1st harvest**
Untreated			717 a	912 a	78.6 b
Cruiser	5 FS	0.3 lb ai/cwt	824 a	982 a	84.8 a
Gaucho	480 F	0.25 lb ai/cwt	873 a	1027 a	85.1 a
Temik	15 G	3.5 lb/A	856 a	1038 a	82.5 a
Temik	15 G	4.0 lb/A	880 a	1060 a	83.0 a
Temik	15 G	5.0 lb/A	841 a	990 a	85.0 a
LSD (P=.05)			148.97	194.52	3.71
Treatment Prob(F)			0.2462	0.6146	0.0208

Harvested September 24 and October 15. Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT).

Table 3. Efficacy of treatments for suppression of larval thrips on conventional planted seedling cotton, DP 436 RR. Jackson, TN 2002.

Treatment		Rate	Mean number larval thrips/4 plants May 21 15 DAP	May 28 22 DAP	June 3 28 DAP	June 10 35 DAP	June 17 42 DAP
Untreated			0.4	77.0	98.0	18.4	25.8
Cruiser	5 FS	0.30 lb ai/cwt	0.0 a	2.0 b	3.2 b	13.8 a	20.8 a
Gaucho	600 FS	0.25 lb ai/cwt	0.0 a	2.4 b	3.6 b	18.6 a	22.4 a
Temik	15 G	3.14 lb/A	0.0 a	6.4 a	18.0 a	24.0 a	24.0 a
Temik	15 G	3.69 lb/A	0.0 a	7.8 a	16.8 a	20.4 a	25.8 a
Temik	15 G	5.24 lb/A	0.0 a	2.8 b	15.8 a	14.8 a	23.6 a
LSD (P=.05)			0.00	3.52	1.015t	18.66	12.01
Treatment Prob(F)			1.0000	0.0081	0.0001	0.7720	0.9255

Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT). t=Mean descriptions are reported in transformed data units, and are not de-transformed. Untreated treatment excluded from analysis.

Table 4. Lint yield of DP 436 RR from conventional tilled plots treated with selected insecticides. Jackson, TN 2002.

Treatment		Rate	Lint yield (lb/A) 1st harvest	Total harvest	% 1st harvest
Untreated			331 b	475 b	67.5 b
Cruiser	5 FS	0.30 Lb ai/cwt	691 a	791 a	87.5 a
Gaucho	600 FS	0.25 Lb ai/cwt	635 a	733 a	86.5 a
Temik	15 G	3.14 Lb/A	642 a	754 a	85.2 a
Temik	15 G	3.69 Lb/A	631 a	739 a	85.4 a
Temik	15 G	5.24 Lb/A	657 a	784 a	83.8 a
LSD (P=.05)			110.27	118.92	6.90
Treatment Prob(F)			0.0001	0.0002	0.0001

Harvested September 23 and October 14. Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT).

Table 5. Efficacy of treatments for suppression of larval thrips on conventional planted seedling cotton, DP 458 BR. Jackson, TN 2002.

Treatment		Rate	Mean number larval thrips/4 plants May 22 15 DAP	May 29 22 DAP	June 5 29 DAP	June 12 36 DAP	June 19 43 DAP
Untreated			0.3	47.0	37.0	14.8	39.5
Cruiser	5 FS	0.30 lb ai/cwt	0.0 a	0.8 ab	2.8 b	7.1 a	59.7 a
Gaucho	600 FS	0.25 lb ai/cwt	0.0 a	0.2 b	7.4 b	12.0 a	39.0 a
Temik	15 G	3.50 lb/A	0.0 a	2.8 a	16.8 a	22.2 a	40.8 a
LSD (P=.05)			0.00	0.712t	9.14	19.40	0.450t
Treatment Prob(F)			1.0000	0.0443	0.0231	0.2397	0.9613

Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT). t=Mean descriptions are reported in transformed data units, and are not de-transformed. Untreated treatment excluded from analysis.

Table 6. Lint yield of DP 458 BR from conventional tilled plots treated with selected insecticides. Jackson, TN 2002.

Treatment			Rate	Lint yield (lb/A) 1st harvest	Total harvest	% 1st harvest
Untreated				186 c	353 b	53.1 b
Cruiser	5	FS	0.30 lb ai/cwt	811 a	957 a	84.7 a
Gaucho	600	FS	0.25 lb ai/cwt	756 ab	884 a	85.8 a
Temik	15	G	3.50 lb/A	675 b	808 a	83.6 a
LSD (P=.05)				117.03	155.34	2.47
Treatment Prob(F)				0.0001	0.0001	0.0001

Harvested September 23 and October 14. Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT).

Table 7. Efficacy of treatments for suppression of larval thrips on conventional planted seedling cotton, ST 4892 BR. Jackson, TN 2002.

				Mean number larval thrips/4 plants				
Treatment			Rate	May 22 15 DAP	May 29 22 DAP	June 5 29 DAP	June 12 36 DAP	June 19 43 DAP
Untreated				0.4	54.6	72.2	24.8	36.0
Cruiser	5	FS	0.30 lb ai/cwt	0.0 a	0.4 a	4.6 b	40.0 a	29.4 a
Gaucho	600	FS	0.25 lb ai/cwt	0.0 a	0.2 a	3.0 b	4.8 b	41.4 a
Temik	15	G	3.50 lb/A	0.0 a	1.2 a	18.0 a	34.4 a	48.2 a
LSD (P=.05)				0.00	1.01	1.562t	0.462t	24.52
Treatment Prob(F)				1.0000	0.1132	0.0201	0.0146	0.2599

Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT). t=Mean descriptions are reported in transformed data units, and are not de-transformed. Untreated treatment excluded from analysis.

Table 8. Lint yield of ST 4892 BR from conventional tilled plots treated with selected insecticides. Jackson, TN 2002.

Treatment			Rate	Lint yield (lb/A) 1st harvest	Total harvest	% 1st harvest
Untreated				71 c	169 c	33.9 b
Cruiser	5	FS	0.30 lb ai/cwt	772 a	945 ab	81.7 a
Gaucho	600	FS	0.25 lb ai/cwt	810 a	990 a	81.9 a
Temik	15	G	3.50 lb/A	642 b	832 b	76.7 a
LSD (P=.05)				123.67	138.95	15.00
Treatment Prob(F)				0.0001	0.0001	0.0001

Harvested September 23 and October 14. Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT).

Table 9. Efficacy of treatments for suppression of larval thrips on conventional planted seedling cotton, FM 989 BR.Jackson, TN 2002.

				Mean number larval thrips/4 plants				
Treatment			Rate	May 22 15 DAP	May 29 22 DAP	June 5 29 DAP	June 12 36 DAP	June 19 43 DAP
Untreated				0.2	85.6	114.8	19.0	20.4
Cruiser	5	FS	0.30 lb ai/cwt	0.0 a	0.0 b	0.8 b	14.8 a	23.8 a
Gaucho	600	FS	0.25 lb ai/cwt	0.0 a	0.0 b	10.0 a	25.8 a	41.0 a
Temik	15	G	3.50 lb/A	0.0 a	3.2 a	18.2 a	35.8 a	26.6 a
LSD (P=.05)				0.00	0.473t	1.339t	20.41	11.015t
Treatment Prob(F)				1.0000	0.0007	0.0018	0.1185	0.1022

Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT). t=Mean descriptions are reported in transformed data units, and are not de-transformed. Untreated treatment excluded from analysis.

Table 10. Lint yield of FM 989 BR from conventional tilled plots treated with selected insecticides. Jackson, TN 2002.

Treatment		Rate	Lint yield (lb/A)		
			1st harvest	Total harvest	% 1st harvest
Untreated			307 b	505 b	58.6 b
Cruiser	5 FS	0.30 lb ai/cwt	901 a	1084 a	83.1 a
Gaucho	600 FS	0.25 lb ai/cwt	886 a	1072 a	82.8 a
Temik	15 G	3.50 lb/A	881 a	1064 a	82.8 a
LSD (P=.05)			127.03	148.46	5.69
Treatment Prob(F)			0.0001	0.0001	0.0001

Harvested September 23 and October 14. Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT).