

THRIPS MANAGEMENT IN MID-SOUTH COTTON**D. R. Cook****Mississippi State University
Stoneville, MS****S. D. Stewart****The University of Tennessee
Jackson, TN****S. Brown****LSU AgCenter
Winnsboro, LA****J. Gore****Mississippi State University
Stoneville, MS****G. M. Lorenz****University of Arkansas
Lonoke, AR****A. L. Catchot****Mississippi State University
Starkville, MS****G. Stuebaker****University of Arkansas
Keiser, AR****N. Seiter****University of Arkansas
Monticello, AR****D. L. Kerns****Texas A&M University
College Station, TX****F. R. Musser****Mississippi State University
Starkville, MS****Abstract**

Studies were conducted to evaluate the performance of selected at-planting treatments against thrips infesting cotton seedlings. Thiamethoxam (Cruiser, Avicta Duo) and imidacloprid (Gaucho, Aeris) have been standards for thrips management for many years. In recent years resistance to thiamethoxam has been observed in tobacco thrips; which is the most common thrips species infesting cotton in the Mid-South. In studies conducted during 2017, thrips infestations were generally lower than those observed during previous years. All of the at-planting insecticides reduced thrips densities at the 1, 2, and 3-leaf growth stages. No differences were observed at the 4-leaf growth stage. All of the insecticide treatments reduced thrips injury. Also, acephate plus Gaucho, Gaucho, Aeris, Avicta Elite, imidacloprid plus abamectin, and AgLogic resulted in significantly less thrips damage compared to acephate (6.4 oz/cwt), with one exception. No significant differences in yield were observed between treatments.

Introduction

There are several species of thrips that infest cotton seedlings including tobacco thrips, *Frankliniella fusca* (Hinds); western flower thrips, *Frankliniella occidentalis* (Pergande); flower thrips, *Frankliniella tritici* (Fitch); onion thrips, *Thrips tabaci* (Lindeman), and soybean thrips, *Neohydatothrips variabilis* (Beach). Tobacco thrips is the predominate species that infests cotton seedlings across much of the Mid-South (Stewart et al. 2013). Aldicarb (Temik 15G) was the standard at-planting management strategy prior to the introduction of the neonicotinoid seed treatments. Many growers transitioned to the neonicotinoid seed treatments following their introduction, and following the removal of aldicarb from the market thrips have been managed almost exclusively with neonicotinoid seed treatments and supplemental foliar treatments. The two most widely used insecticide seed treatments for thrips management in cotton have been Gaucho (imidacloprid) and Cruiser (thiamethoxam), both are neonicotinoids. However, resistance to thiamethoxam has been observed in tobacco thrips populations from many areas of the Mid-South (Darnell et al. 2016,

Huseth et al. 2016). Also, performance of thiamethoxam has declined to the point that it is no longer recommended for thrips control in the Mid-South. An aldicarb product (AgLogic 15G) is currently available in some states, with plans for expanded availability in the future. During 2017 studies were conducted in Arkansas, Louisiana, Mississippi, Tennessee, and Texas to evaluate the performance of selected seed treatments alone and in combination with their respective companion nematicide products and AgLogic 15G against thrips infesting cotton seedlings in the Mid-South.

Materials and Methods

Studies were conducted during 2017 in Arkansas, Louisiana, Mississippi, Tennessee, and Texas to evaluate the performance of selected insecticide at-planting treatments against thrips in cotton. Treatments were arranged in a randomized complete block design with four replications. PhytoGen 333 WRF cotton seed was used in all trials. Cotton seed were treated by Dr. Gus Lorenz. Seed treated with Avicta Elite received Dynasty CST (3.95 oz/cwt) fungicide, while seed for all other treatments received Trilex Advanced 300FS (1.6 oz/cwt) fungicide. Planting dates ranged from 28 Apr to 18 May.

Thrips densities were determined by sampling 5 plants per plot at the 1, 2, 3, and 4 leaf stage using a modified whole plant washing procedure. Also, plant damage was also estimated at these timing using a 1 – 5 scale, with a rating of 1 = no damage and 5 = severe damage. Seed cotton yields were converted to lint yield based on 40% gin turnout. Data were subjected to ANOVA procedures, with means separated according to Fisher's Protected LSD.

Results

At the 1-Leaf growth stage all of the insecticide treatments, except Aeris, Avicta Elite, and imidacloprid plus abamectin, resulted significantly fewer thrips adults compared to the fungicide only control (Table 1). All of the insecticide treatments resulted in significantly lower densities of thrips immatures and total thrips, and a lower thrips damaged ratings compared to the fungicide only control. Acephate + Gaucho, Gaucho, Aeris, Avicta Elite, imidacloprid + abamectin, and AgLogic resulted in significantly lower thrips damage ratings compared to acephate alone (either rate).

At the 2-leaf growth stage only AgLogic resulted in significantly fewer thrips adults compared to the fungicide only control (Table 2). Only Avicta Elite, imidacloprid plus abamectin, and AgLogic resulted in significantly fewer thrips immatures compared to the fungicide only control. Imidacloprid plus abamectin and AgLogic were the only treatments that resulted in significantly fewer total thrips compared to the fungicide only control. All of the insecticide treatments resulted in significantly less thrips damage compared to the fungicide only control. Also, Aeris, Avicta Elite, imidacloprid plus abamectin, and AgLogic resulted in significantly lower damage ratings compared to either rate of acephate.

At the 3-leaf growth stage only AgLogic resulted in significantly fewer thrips adults compared to the fungicide only control (Table 3). All of the insecticide treatments resulted in significantly fewer thrips immatures and total thrips compared to the fungicide only control. Also, plots treated with imidacloprid plus abamectin or AgLogic had significantly fewer thrips immatures and total thrips compared to plots treated with acephate (6.4 oz/cwt). Additionally, plots treated with AgLogic had significantly fewer thrips immatures and total thrips compared to plots treated with Gaucho. All of the insecticide treatments resulted in significantly lower thrips damage ratings compared to the fungicide only control. Plots treated with acephate plus Gaucho, Aeris, Avicta Elite, imidacloprid plus abamectin, or AgLogic had significantly lower damage ratings compared to plots treated with acephate (6.4 oz/cwt). Also, plots treated with Aeris or Avicta Elite had lower damage ratings compared to plots treated with acephate (15 oz/cwt) or Gaucho.

At the 4-leaf growth stage there were no significant differences among treatments for thrips adults, thrips immatures, or total thrips (Table 4). All of the insecticide treatments resulted in significantly lower thrips damage ratings compared to the fungicide only control. Plots treated with acephate plus Gaucho, Gaucho, Aeris, Avicta Elite, imidacloprid plus abamectin, or AgLogic had significantly lower damage ratings compared to plots treated with acephate (either rate). Plots treated with AgLogic also had lower damage ratings compared to plots treated with acephate plus Gaucho or Gaucho.

Yields in these studies ranged from 1,165 to 1,237 lb lint per acre. There were no significant differences among treatments for yield (Table 5).

Table 1. Impact of selected at-planting treatments on densities of thrips adults, immatures, and total thrips and thrips damage at the 1 leaf growth stage.

Treatment	Rate	Thrips / 5 Plants			Damage Rating
		Adults	Immatures	Total	
Fungicide only	-	3.9a	22.6a	26.5a	2.6a
Acephate	6.4 ¹	2.1bc	6.9b	9.0b	2.2b
Acephate	15.0 ¹	2.3b	5.7b	8.1b	1.9c
Acephate + Gaucho	6.4 ¹ +0.375 ²	2.2b	5.0b	7.1b	1.6d
Gaucho	0.375 ²	2.3b	6.2b	8.5b	1.6d
Aeris	0.75 ⁴	2.8ab	2.9b	5.7b	1.6d
Avicta Elite ³	0.525 ³ +0.375 ²	3.2ab	3.0b	6.1b	1.5d
Imidacloprid + Abamectin	0.375 ² +0.15 ²	2.7ab	2.9b	5.6b	1.6d
AgLogic 15G	0.6 ⁵	0.9c	1.9b	2.8b	1.4d
<i>P>F</i>		<0.01	<0.01	<0.01	<0.01

Means within a column followed by a common letter are not significantly different (FPLSD 0.05).

¹oz product / cwt.

²mg AI / seed.

³mg AI / seed. Avicta Elite applied at the listed rate contains 0.375 mg AI thiamethoxam (Cruiser), 0.15 mg AI abamectin, and 0.375 mg AI imidacloprid.

⁴mg AI / seed. Aeris applied at the listed rate contains 0.375 mg AI imidacloprid (Gaucho) and 0.375 mg AI thiodicarb.

⁵lb AI / per acre, in-furrow granule.

Table 2. Impact of selected at-planting treatments on densities of thrips adults, immatures, and total thrips and thrips damage at the 2 leaf growth stage.

Treatment	Rate	Thrips / 5 Plants			Damage Rating
		Adults	Immatures	Total	
Fungicide only	-	3.1ab	12.7a	15.8a	3.1a
Acephate	6.4 ¹	2.3abc	10.6ab	12.9ab	2.6b
Acephate	15.0 ¹	2.1bc	9.6ab	11.6ab	2.2c
Acephate + Gaucho	6.4 ¹ +0.375 ²	2.9ab	10.0ab	12.9ab	2.0cd
Gaucho	0.375 ²	3.0ab	11.0ab	14.0ab	1.9cd
Aeris	0.75 ⁴	3.3a	9.1ab	12.4ab	1.6e
Avicta Elite ³	0.525 ³ +0.375 ²	3.4a	7.6b	10.9ab	1.9d
Imidacloprid + Abamectin	0.375 ² +0.15 ²	3.0ab	6.3bc	9.3b	1.8de
AgLogic 15G	0.6 ⁵	1.2c	1.8c	3.0c	1.7de
<i>P>F</i>		<0.01	<0.01	<0.01	<0.01

Means within a column followed by a common letter are not significantly different (FPLSD 0.05).

¹oz product / cwt.

²mg AI / seed.

³mg AI / seed. Avicta Elite applied at the listed rate contains 0.375 mg AI thiamethoxam (Cruiser), 0.15 mg AI abamectin, and 0.375 mg AI imidacloprid.

⁴mg AI / seed. Aeris applied at the listed rate contains 0.375 mg AI imidacloprid (Gaucho) and 0.375 mg AI thiodicarb.

⁵lb AI / per acre, in-furrow granule.

Table 3. Impact of selected at-planting treatments on densities of thrips adults, immatures, and total thrips and thrips damage at the 3 leaf growth stage.

Treatment	Rate	Thrips / 5 Plants			Damage Rating
		Adults	Immatures	Total	
Fungicide only	-	5.1ab	38.1a	43.2a	3.3a
Acephate	6.4 ¹	3.5abc	17.8b	21.2b	2.5b
Acephate	15.0 ¹	3.3bc	9.5bcd	12.8bcd	2.2bc
Acephate + Gaucho	6.4 ¹ +0.375 ²	4.8ab	9.2bcd	14.0bcd	2.0cd
Gaucho	0.375 ²	5.2ab	14.3bc	19.6bc	2.3bc
Aeris	0.75 ⁴	4.5ab	9.8bcd	14.3bcd	1.9d
Avicta Elite ³	0.525 ³ +0.375 ²	5.4a	12.2bcd	17.6bc	2.1cd
Imidacloprid + Abamectin	0.375 ² +0.15 ²	3.4bc	7.6cd	11.0cd	1.9d
AgLogic 15G	0.6 ⁵	2.4c	3.4d	5.6d	2.0cd
<i>P>F</i>		0.04	<0.01	<0.01	<0.01

Means within a column followed by a common letter are not significantly different (FPLSD 0.05).

¹oz product / cwt.

²mg AI / seed.

³mg AI / seed. Avicta Elite applied at the listed rate contains 0.375 mg AI thiamethoxam (Cruiser), 0.15 mg AI abamectin, and 0.375 mg AI imidacloprid.

⁴mg AI / seed. Aeris applied at the listed rate contains 0.375 mg AI imidacloprid (Gaucho) and 0.375 mg AI thiodicarb.

⁵lb AI / per acre, in-furrow granule.

Table 4. Impact of selected at-planting treatments on densities of thrips adults, immatures, and total thrips and thrips damage at the 4 leaf growth stage.

Treatment	Rate	Thrips / 5 Plants			Damage Rating
		Adults	Immatures	Total	
Fungicide only	-	6.4	37.4	43.8	3.6a
Acephate	6.4 ¹	5.4	22.6	28.0	3.0b
Acephate	15.0 ¹	4.0	17.6	21.6	2.8b
Acephate + Gaucho	6.4 ¹ +0.375 ²	4.9	30.4	35.4	2.1c
Gaucho	0.375 ²	5.1	26.1	31.2	2.1c
Aeris	0.75 ⁴	4.7	34.3	38.9	1.9cd
Avicta Elite ³	0.525 ³ +0.375 ²	4.8	26.8	31.6	1.9cd
Imidacloprid + Abamectin	0.375 ² +0.15 ²	4.0	29.8	33.8	2.0cd
AgLogic 15G	0.6 ⁵	3.0	17.4	20.4	1.6d
<i>P>F</i>		0.58	0.31	0.27	<0.01

Means within a column followed by a common letter are not significantly different (FPLSD 0.05).

¹oz product / cwt.

²mg AI / seed.

³mg AI / seed. Avicta Elite applied at the listed rate contains 0.375 mg AI thiamethoxam (Cruiser), 0.15 mg AI abamectin, and 0.375 mg AI imidacloprid.

⁴mg AI / seed. Aeris applied at the listed rate contains 0.375 mg AI imidacloprid (Gaucho) and 0.375 mg AI thiodicarb.

⁵lb AI / per acre, in-furrow granule.

Table 5. Impact of selected at-planting treatments on cotton yield.

Treatment	Rate	lb Lint / Acre
Fungicide only	-	1,180.2
Acephate	6.4 ¹	1,184.1
Acephate	15.0 ¹	1,175.1
Acephate + Gaucho	6.4 ¹ +0.375 ²	1,223.1
Gaucho	0.375 ²	1,210.0
Aeris	0.75 ⁴	1,237.6
Avicta Elite ³	0.525 ³ +0.375 ²	1,213.6
Imidacloprid + Abamectin	0.375 ² +0.15 ²	1,211.0
AgLogic 15G	0.6 ⁵	1,165.8
<i>P>F</i>		0.32

Means within a column followed by a common letter are not significantly different (FPLSD 0.05).

¹oz product / cwt.

²mg AI / seed.

³mg AI / seed. Avicta Elite applied at the listed rate contains 0.375 mg AI thiamethoxam (Cruiser), 0.15 mg AI abamectin, and 0.375 mg AI imidacloprid.

⁴mg AI / seed. Aeris applied at the listed rate contains 0.375 mg AI imidacloprid (Gaucho) and 0.375 mg AI thiodicarb.

⁵lb AI / per acre, in-furrow granule.

Acknowledgements

The authors wish to thank the technicians and summer employees at the participation institutions for their assistance with these studies; also Cotton Incorporated for financial support.

References

Darnell, C., A. Catchot, F. Musser, D. Cook, D. Dodds, J. Gore, and S. Morsello. 2016. Susceptibility of tobacco thrips, *Frankliniella fusca*, to the neonicotinoid class of insecticides in the Mid-South region, pp. 716-718. *In Proc. 2016 Beltwide Cotton Conf.*, National Cotton Council, Memphis, TN.

Huseth, A.S, T.M. Chappell, K. Langdon, S.C. Morsello, S. Martin, J.K. Greene, A. Herbert, A.L. Jacobson, F.P.F. Reay-Jones, T. Reed, D.D. Reisig, P.M. Roberts, R. Smith, and G.G. Kennedy. 2016. *Frankliniella fusca* resistance to neonicotinoid insecticides: an emerging challenge for cotton pest management in the eastern United States. *Pest Manag. Sci.* 72:1934-1945.

Stewart, S.D., D.S. Akin, J. Reed, J. Bacheler, A. Catchot, D. Cook, J. Gore, J. Greene, A. Herbert, R.E. Jackson, D.L. Kerns, B.R. Leonard, G.M. Lorenz, S. Micinski, D. Reisig, P. Roberts, G. Studebaker, K. Tindall, and M. Toews. 2013. Survey of thrips species infesting cotton across the Southern U.S. cotton belt. *J. Cotton Sci.* 17: 263-269.