# THRIPS WARS: CHALLENGES FROM THE NORTHEAST REGION D.A. Herbert, Jr.

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## <u>Abstract</u>

Thrips are consistently the number one insect pest of cotton in Virginia and North Carolina, both due to the higher levels compared with other cotton producing states, as indicted in published literature, and due to this area's often prolonged cool wet conditions which serve to lengthen the time of high seedling damage to thrips feeding. In a total of 25 replicated tests, the average yield loss due to thrips damage was 156 and 380 lb lint per acre in Virginia and North Carolina, respectively, when one compared the untreated checks with a seed treatment plus a foliar spray of acephate. In 30 tests conducted in Virginia from 2007 to 2010, the difference in yield varied between 364 lb lint per acre (2009) to a high of 720 lb lint per acre (2007), illustrating the extreme potential yield penalties that thrips can extract if not managed in the Upper Southeast region of the US cotton belt. In a series of replicated tests, all of the standard seed treatments (Gaucho Grande, Cruiser, Aeris, Avicta Complete and Acceleron) provided similar levels of thrips control and plant protection, although some differences were noted in individual tests. In-furrow sprays with both Verimark 20SC (cyazapyr) and Admire Pro 4.6SC (imidacloprid) looked promising with good yield protection, low thrips levels and low thrips damage. Likewise, foliar sprays with both Benevia 10OD (cyazapyr) and Radiant 1SC (spinetoram) held thrips levels to the statistically the same level as acephate - encouraging given the lower probability of beneficial arthropod disruption with these chemistries with new modes of action compared to organophosphates such as acephate and dimethoate. The candidate pyrethroid Karate 2.08SC (lambda-cyhalothrin) showed both thrips levels and damage ratings similar to the untreated check as foliar spray, supporting our recommendation to avoid this chemical class for thrips control.

## **Introduction**

Considering both damage and the cost of preventative and remedial control, thrips are consistently the number one insect pest complex of cotton in North Carolina and Virginia. This region of the US cotton belt is characterized by two phenomena that contribute to this problem: 1) lower early season temperatures, and 2) high thrips population levels caused at least in part by a relatively high alternate plant host vs. field size ratio. A 10-year tracking of cumulative DD60s (cotton development days based on a 60°F developmental threshold) shows that on average, Suffolk, VA lags behind Tifton, GA and Stoneville, MS by almost 200 DD60s by June 5, and 300-400 by July 10 (Figure 1). In a typical season, nighttime temperatures between planting time (late April to mid-May) and 4-leaf stage cotton can drop below 60°F and occasionally go below 40°F (Figures 2 and 3). These cooler temperatures result in slower seedling growth and a prolonged period of seedling vulnerability to thrips feeding.

Thrips populations in the upper Southeast are also relatively high compared with other cotton-growing states. Based on data taken from Arthropod Management Tests from 2000-2010, Virginia and North Carolina data shows an average of nearly 120 adult plus immature thrips per 5 plant sample compared with about 75 (GA) to as few as 10 (TX) (Figure 4). Of course these numbers vary greatly from year-to-year and from field-to-field. The combination of these pest exacerbating factors results in extreme lint yield reductions if thrips are not adequately controlled in Virginia and North Carolina. A 6-year summary from 2005-2010 showed that unprotected cotton suffered a loss of an average of 156 to 380 lb lint per acre in North Carolina and Virginia, respectively (Figure 5). Averaged over several field trials in Virginia, compared to all insecticide treatments, lint losses in non-treated plots ranged from 364 to 720 lb per acre (Table 1).

Although significant research in managing thrips has taken place throughout the cotton belt, including Beltwide collaborative studies (Akin et al, 2010 and 2011), the challenges of managing thrips and the associated high costs of

control in the Upper Southeast (Williams, 2011) dictate that studies into the effective management of this complex continue as a high research priority. Therefore, entomology programs at North Carolina State University (NCSU) and Virginia Tech (VT) have placed considerable emphasis on evaluating cotton thrips control options. These have included insecticides applied as seed treatments (Table 2), as in-furrow granular or liquid formulations, as foliar sprays, or in various combinations. This report summarizes highlights of the results of some of the newer treatment approaches and insecticide options.

## **Materials and Methods**

A series of approximately 80 replicated small plot tests was undertaken in Virginia and North Carolina between 2005 and 2010. However, some of our results presented below were taken from a few more recent evaluations as those tests reflected the more recent availability of newer seed, in-furrow and foliar products. Most tests were four to six rows wide and 30 to 50 feet in length and treatments were replicated four times in randomized complete block design. Damage to seedlings inflicted by thrips feeding was rated using a visual damage scale where 1 = no damage, and 5 = severely damaged to dead plant. All thrips counts refer to thrips that were field-collected from five randomly selected plants per plot, placed into glass jars with either soapy water or alcohol, brought into the lab, thrips extraction from plants and liquid, and counted under a dissecting microscope. Although not presented in this paper, adult thrips were often saved and subsequently identified to species. All foliar sprays were applied with a CO<sub>2</sub>-powered back pack type sprayer calibrated to deliver between 8-12 gpa at 50-60 psi. Yields were taken with a 2-row mechanical harvester. For clarification, in Figures 8 to 13 and 15, Benevia 100D (Dupont) cyazypyr is formulated as a foliar spray and in Figures 14 and 15, Verimark 20SC (Dupont) cyazypyr is formulated as an infurrow spray.

#### **Results and Discussion**

Combined results of two 2011 NCSU seed treatment field trials showed that Acceleron alone resulted in the fewest number of immature thrips compared with other seed or in-furrow treatments including Thimet, Poncho/VOTiVO, or Avicta, and all treatments were greatly improved with a foliar application of acephate (Figure 6). In a 2011 VT field trial, Avicta CP had higher numbers of immature thrips (Figure 7) and more feeding damage to seedlings (Figure 8) compared with Gaucho 600FS with and without Poncho/VOTiVO, and Aeris with and without Poncho/VOTiVO. In field trials at NCSU and VT evaluating foliar applied insecticides, numbers of immature thrips were not reduced by Karate but were reduced significantly by all other treatments with fewer after treatments with Dimethoate, Radiant, Orthene and Benevia compared with either Lannate or Vydate (Figures 9 and 11). Plant damage ratings showed a similar trend with the Orthene and Benevia treatments showing the least damage compared with all other treatments except Dimethoate (Figure 10 and 12). In the VT foliar trial, lint yields roughly followed the treatment trend although due to the extreme variability in the data, the trend was not significant at the P = 0.05level (Figure 13). In a 2011 VT field trial where Verimark, Orthene and Admire Pro were applied as in-furrow sprays, with and without follow-up postemergence foliar sprays with Orthene or Benevia, in general, Orthene applications resulted in less plant damage compared with Verimark, and Admire Pro treated plants had the least damage (Figure 14). Again, although not significant, lint yield roughly followed this trend with the Admire Pro treatment having the highest yield (Figure 15).





Figure 2. High and low temperature, April 15-June 15, 2009, Edgecomb Co., NC.



Figure 3. High and low temperature, April 20-June 15, 2008, Suffolk, VA.



Figure 4. Number of thrips per five plants in untreated controls (2000-2010 Arthropod Management Tests).



Figure 5. Yield loss to thrips damage (seed + Orthene vs. check) in North Carolina and Virginia, 2005-2011.

Table 1. Impact of thrips injury on cotton yield: yield increase (lint lb/A) over the untreated control-Suffolk, VA.

	Test									
Year	1	2	3	4	5	6	7	8	9	Mean
2007	718	724	856	941	665	867	616	536	560	720
2008	526	577	387	637	152	295	374	483		429
2009	234	474	361	329	546	242	391	336		364
2010	282	111	463	857	238					390

		Seed coat				
Product	Company	Insecticide	Nematicide			
Cruiser	Syngenta	thiamethoxam	-			
Gaucho Grande	Bayer	imidacloprid	-			
Avicta Duo	Syngenta	thiamethoxam	abamectin			
Aeris	Bayer	imidacloprid	thiodicarb			
Acceleron	Monsanto	imidacloprid	-			
Acceleron N	Monsanto	thiamethoxam	abemectin			
Poncho/VOTiVO	Bayer	clothianidin	B. fermis			

Table 2. Cotton seed treatments.

(28 Days after planting; 7 days after foliar spray)



Figure 6. Efficacy of selected at-planting strategies for thrips control, Rocky Mount & Plymouth, NC, 2011.







Figure 9. Effectiveness of selected foliar sprays for thrips control, Rocky Mount, NC & Suffolk, VA, 2011.



Figure 10. Cotton seeding damage rating for selected insecticides against thrips, Rocky Mount, NC, 2011.







Figure 13. Yield (lint lb/acre), Suffolk, VA, 2011.





Figure 15. Yield (lint lb/acre), Suffolk, VA, 2011.

## <u>Summary</u>

Results of these field trial efforts are encouraging and showed that with various application approaches (i.e., seed, in-furrow, or foliar applied treatments), one or more products were shown to be effective in reducing levels of thrips species commonly found on cotton in the upper Southeast, reduced thrips induced feeding damage to seedlings, and resulted in higher lint yields compared with untreated cotton. Adding formulations of cyazapyr as both a foliar spray and an in-furrow spray, a new mode of action for thrips control, to the thrips control arsenical as well as spinetoram as a foliar spray provides our growers the flexibility of selecting additional thrips management options for managing thrips on cotton in areas of high potential damage.

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