CURRENT OPTIONS FOR CONTROL OF THRIPS AND NEMATODES IN SOUTH CAROLINA

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Abstract

Thrips are one of the most predictable groups of pests of cotton in the southeastern US, and nematodes are a persistent threat in the sandy soils of the region. Because aldicarb (Temik 15G) is essentially no longer available for control of both groups of pests and continued manufacturing of the product is merely speculative at this point, it is worthwhile to examine available, labeled materials for potential synergy or additive effects that might benefit cotton producers. Two commercially available seed treatments provide some level of suppression of thrips and nematodes when experienced at low levels, and the insecticide/nematicide oxamyl (Vydate® 3.77 CLV) is available as a post-emergence, foliar spray. Combinations of seed treatment and foliar applications of Vydate provided variable results in controlling thrips and nematodes but remain available as an alternative in the absence of Temik. A commercially available cotton variety (Phytogen® 367) provided suppression of southern root-knot and Columbia lance nematodes, and supplemental applications of Vydate enhanced control of thrips and nematodes on the variety.

Introduction

In 2006, Syngenta Crop Protection introduced a cotton seed treatment, Avicta Complete Pak (ACP), that contains a nematicide (abamectin), a previously released insecticide (thiamethoxam – trade name Cruiser®), and a previously released fungicide package (Dynasty®). These three compounds were combined into one product (ACP) that could suppress nematodes, thrips, and seedling diseases. This was the first commercial release of a nematicide applied as a seed treatment. Bayer CropScience introduced a second combination nematicide/insecticide seed treatment during 2007 called Aeris® that is a combination of a nematicide/insecticide (thiodicarb – trade name Larvin®) and an insecticide (imidacloprid – trade name Gaucho Grande®). An additional fungicidal seed treatment (Trilex®) is offered in combination with Aeris. While fungicide treatments have been applied to cotton seed for some time, the addition of insecticides (Hofer and Brandl 1999, Carter 2003) and nematicides (Rideout 2005) to the seed coat is particularly new, especially in three-way combinations.

Oxamyl (Vydate® 3.77 CLV) has been labeled for use in cotton since 1991 and has various uses from contact and systemic activity on insects to nematode suppression. Broadcast application of Vydate at 8.5 and 17.0 oz/acre has demonstrated fair to good activity on adult and immature thrips in efficacy trials (Costello and Leonard 1999, Pankey et al. 1999). Additional research with Vydate as a nematicide has shown that applications at the 6-leaf growth stage reduced densities of reniform nematodes compared with aldicarb used alone (Lawrence and McLean 2000).

Because the availability of aldicarb remains uncertain and seed treatments offer suppression at best for thrips and nematodes, potential use of a foliar-applied, systemic insecticide/nematicide could prove very useful in controlling thrips and nematodes, particularly when combined with a seed treatment or resistant variety that also provides activity on the two pest groups. The major objective of this project was to investigate early use of Vydate for thrips control and impact on populations of nematodes in aid of a seed treatment or resistant variety for both pest groups.

Methods

Three trials were located at the Edisto Research and Education Center (EREC) near Blackville, SC, in an area infested with nematodes (primarily southern root-knot). Plots at EREC were 8 rows by 40 feet on a 38-inch row spacing with 4 replications of each treatment arranged in a RCBD. For Test 1 and Test 2, cotton (Deltapine® 1050 B2RF) was planted on 7 May (early in the "planting window") to encourage cool weather stunting, promote thrips injury potential, and support nematode population development in cotton. An insecticide/nematicide seed treatment (Aeris) was used as a base, at-plant preventative treatment. Applications of Vydate 3.77 CLV (E. I. du Pont de

Nemours and Company, Crop Protection, Wilmington, Delaware) were made at various growth stages or timings (Tables 1 and 2). In Test 3, the cotton variety Phytogen® (PHY) 367, purported to encompass resistance to nematodes, was also planted on 7 May and compared with a susceptible variety (PHY 375), both with and without Vydate (Table 3). Standard fertilization and herbicide practices were followed according to current Clemson University recommendations.

Table 1. Treatments for single 17-oz application of oxamyl (Vydate 3.77 CLV) at various cotton seedling growth stages to test for activity on thrips and nematodes (Test 1).

Treatment Number	**Treatment Description**	**Rate (oz)**	**Application Timing**
1	Untreated (no seed trt)	-	-
2	Aeris + Vydate	17.0	cotyledon stage
3	Aeris + Vydate	17.0	1-leaf stage
4	Aeris + Vydate	17.0	2-leaf stage
5	Aeris + Vydate	17.0	6-leaf stage
6	Aeris + Vydate	17.0	7-leaft stage

Table 2. Treatments for split applications of oxamyl (Vydate 3.77 CLV) at various cotton seedling growth stages to test for activity on thrips and nematodes (Test 2).

Treatment Number	**Treatment Description**	**Rate (oz)**	**Application Timing**
1	Untreated (no seed trt)	-	-
2	Aeris + Vydate	8.5 + 8.5	cotyledon + 12 d
3	Aeris + Vydate	8.5 + 8.5	1st leaf + 22 d
4	Aeris + Vydate	8.5 + 8.5	3rd leaf + 15 d
5	Aeris + Vydate	8.5 + 8.5	6th leaf + 14 d
6	Aeris + Vydate	8.5	7th leaf

Table 3. Treatments for comparison of variety and single 17-oz application of oxamyl (Vydate 3.77 CLV) at 2-leaf cotton seedling growth stage to test for activity on thrips and nematodes (Test 3).

Treatment Number	**Treatment Description**	**Rate (oz)**	**Application Timing**
1	PHY 367 untreated	-	-
2	PHY 375 untreated	-	-
3	PHY 367 + Vydate	17.0	2-leaf stage
4	PHY 375 + Vydate	17.0	2-leaf stage

Thrips were collected by randomly pulling 10 plants from rows 2 and 7 of each plot and dipping them in 48-oz jars of 50% isopropyl alcohol (Greene et al. 2007). After filtration procedures, nymphs and adults were counted from filter paper using dissecting microscopes. Insect counts began at the cotyledon stage before initial application of Vydate 3.77 CLV and continued until plant size limited sampling. Weekly ratings on insect injury to plants were conducted in all tests by observing the visible foliar damage caused by thrips and assigning a number to each plot with "0" equal to no damage and "5" equal to severe damage. Stand counts were taken in each test by counting the number of plants in 12 row feet per plot. Plant heights were taken weekly by measuring 5 plants per plot (cm from soil to terminal). Soil samples (six 1-inch diameter, 8-inch deep cores) for counting nematodes were taken in a random pattern from the center four rows of each plot on three dates (at planting, 6-7 weeks after planting, and at harvest) to determine nematode density and to estimate effects of nematodes on plant vigor and growth. Soil samples were sent to a laboratory where nematodes were extracted from soil using differential sieving and centrifugal flotation. Recovery was expressed as nematodes per 100 cm^3 of soil. Near the end of the growing season, plant roots from five plants per plot were excavated, rated for root galling using a 0 to 5 scale where 0 = no galling and 5 = 100% of the root system galled, and cut into pieces approximately 0.75 to 1 inch long before 15-gram samples were placed in a modified mist chamber for five days to collect migratory nematodes. After extraction, roots were dried in an oven for 72 hours. Recovery was expressed as nematodes per gram dry weight of root. At about 42 days after planting, five plants per plot from the center four rows were cut at the soil level, weighed for fresh weights, and dried in an oven for at least 48 hr before dry weights were determined. Yields were measured with a mechanical 2-row plot cotton picker. Data were processed using Agriculture Research Manager (Gylling Data Management, Inc., Brookings, SD), and means were separated using Least Significant Difference (LSD) procedures following significant F tests using Analysis of Variance.

Results and Discussion

Trials in 2012 were initiated because of results from our trials in 2011 that indicated that applications of oxamyl (Vydate 3.77 CLV) applied at the 3-4-leaf stage of cotton development did not significantly impact thrips populations but numerically reduced numbers of root-knot nematodes over Aeris and Avicta Complete seed treatments alone (unpublished data). Results from Test 1 demonstrated that earlier applications of Vydate at 17 oz/acre would aid in suppression of thrips populations when combined with the seed treatment Aeris and that control was best when applied early (Figure 1). Conversely, 17-oz applications of Vydate seemed to suppress root-knot nematodes better when applied later (Figure 2). However, yields were not significantly different ($P > 0.05$) among treatments. In a similar trial using split application timings for Vydate, numbers of thrips and nematodes were comparable, with early initial applications having more of an impact on numbers of thrips and later applications having greater negative effects on nematodes, as reflected numerically in root galling ratings (Figure 3).

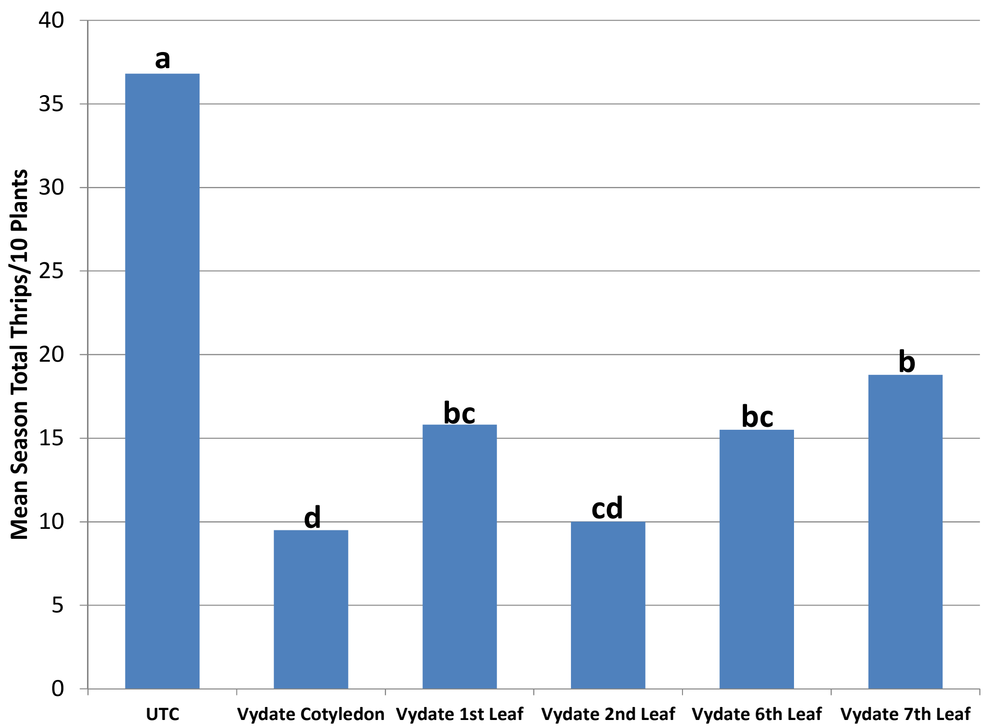

Figure 1. Effects of Aeris seed treatment and 17.0-oz foliar applications of oxamyl at different plant-growth stages on populations of thrips (Test 1).

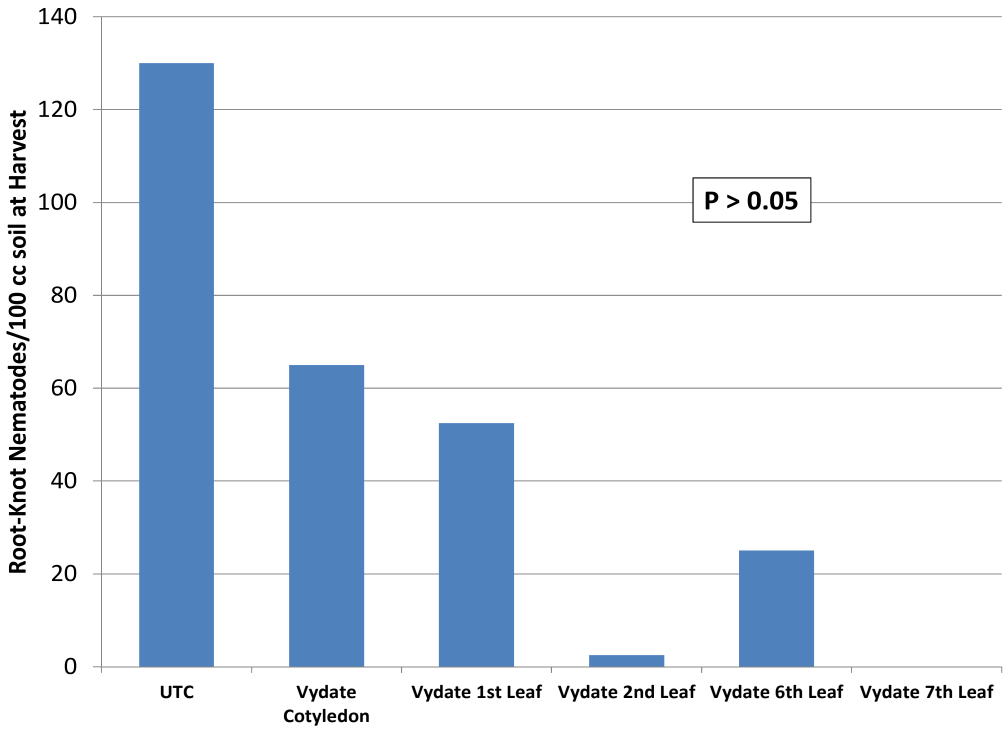

Figure 2. Effects of Aeris seed treatment and 17.0-oz foliar applications of oxamyl at different plant-growth stages on populations of root-knot nematodes (Test 1).

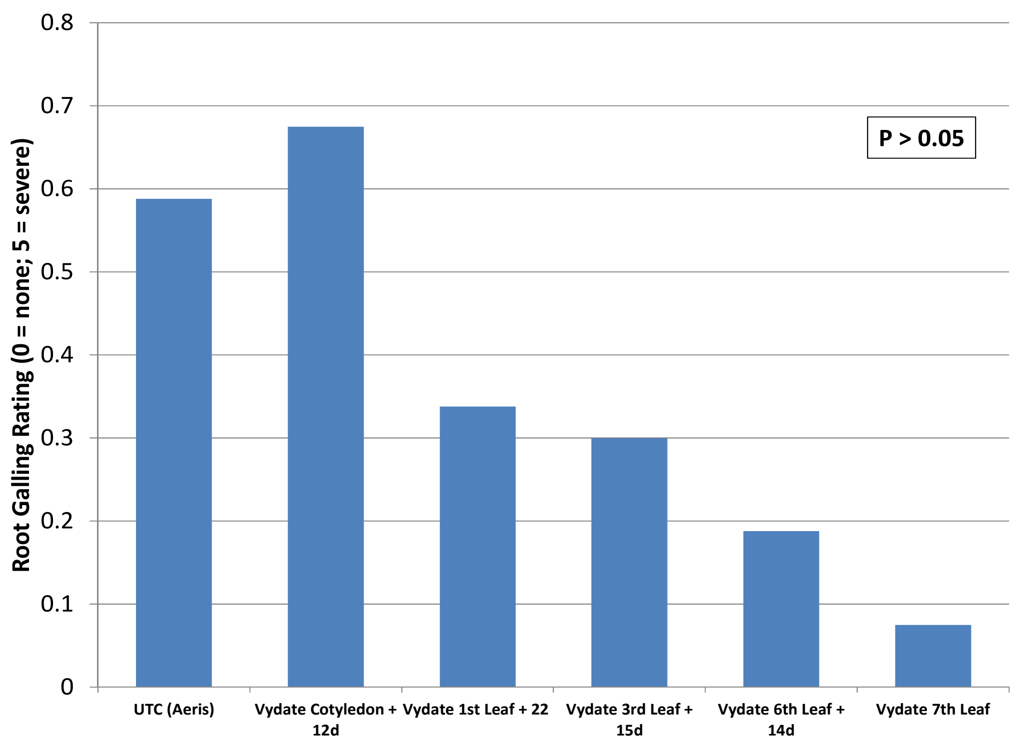

Figure 3. Effects of Aeris seed treatment and split applications of oxamyl (8.5 oz twice) at different plant-growth stages on root galling ratings (Test 2).

Although populations of thrips were generally low across trials, immature thrips were significantly reduced on PHY 367 and PHY 375 when treated with Vydate at 17 oz per acre at second true leaf in Test 3 (Figure 4). Additionally, untreated PHY 367 had significantly fewer thrips than untreated PHY 375. Populations of Columbia lance and root-knot nematodes (Figure 5) were numerically reduced by PHY 367 compared with PHY 375 and when Vydate was applied to PHY 375 at seven weeks after planting and at harvest. Patterns of root-knot and lesion nematodes recovered from mist-chamber procedures and root galling indices were very similar to root-knot numbers recovered from harvest soil samples. Although no statistical differences in yield were detected, a single foliar application of Vydate (17 oz) at the second true leaf improved yields of PHY 367 and PHY 375 by almost 50 and 100 lb of lint per acre, respectively (Figure 6).

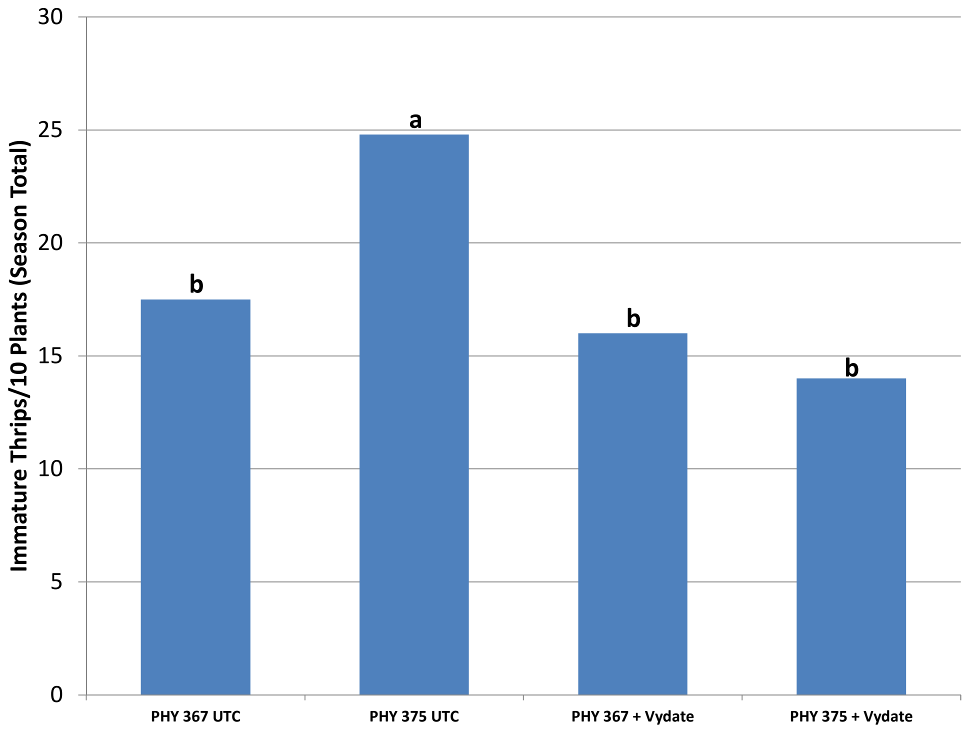

Figure 4. Effects of variety and 17-oz foliar applications of oxamyl at 2-leaf plant-growth stage on populations of immature thrips (Test 3).

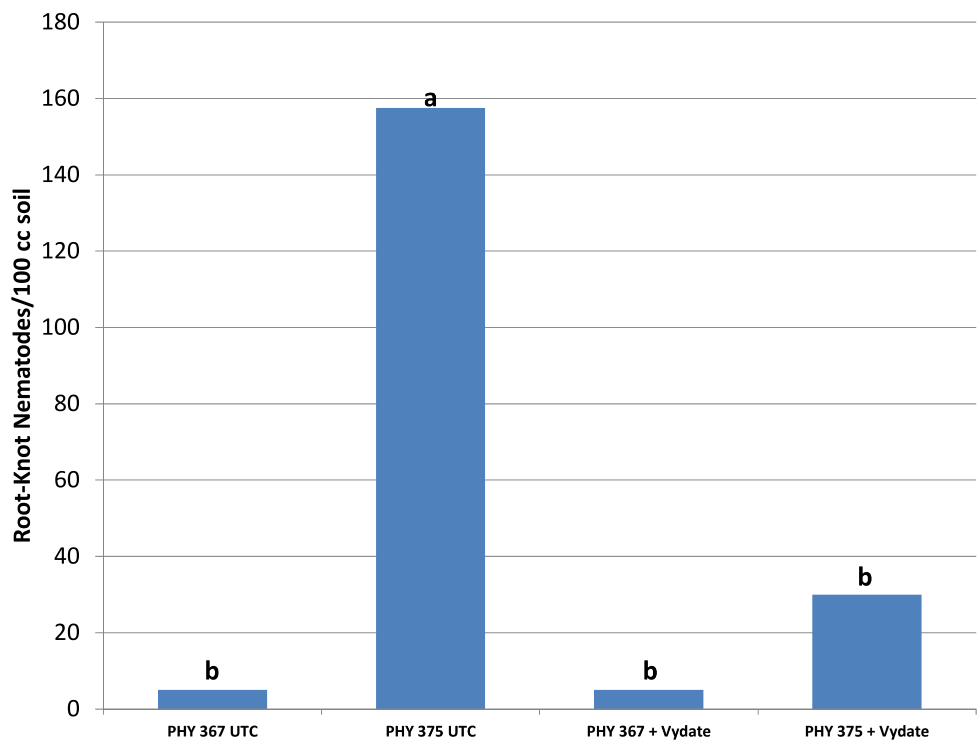

Figure 5. Effects of variety and 17-oz foliar applications of oxamyl at 2-leaf plant-growth stage on populations of root-knot nematodes at harvest (Test 3).

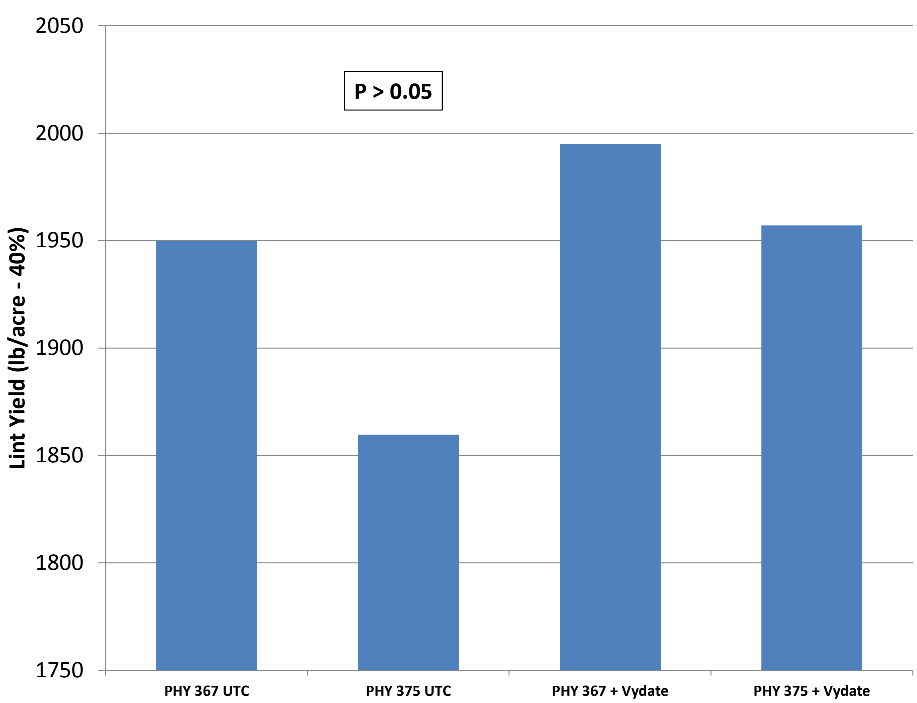

Figure 6. Effects of variety and 17-oz foliar applications of oxamyl at 2-leaf plant-growth stage on lint yield (Test 3).

Acknowledgments

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