# EVALUATION OF NEONICOTINOID INSECTICIDES AS AN ALTERNATIVE FOR ALDICARB FOR EARLY-SEASON COTTON INSECT PEST MANAGEMENT IN LOUISIANA

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## Abstract

During 2012-2013, four field trials were conducted in Louisiana evaluating the efficacy of the neonicotinoid insecticides thiamethoxam (Cruiser) and imidaclorpid (Gaucho) applied as seed treatments and in-furrow applied as Centric or Platinum and Admire Pro, respectively, relative to an in-furrow application of aldicarb (Temik) and non-treated seed. Thrips counts were collected by sampling 5 or 10 whole plants from each plot at the two and four true leaf growth stage in each test and count the number of thrips present. Damage ratings (1-5) were also conducted and yields taken. In 2012, the thrips populations were composed of approximately 50:50 western flower:tobacco thrips and all of the treatments provided thrips control relative to the non-treated but seed treatments appeared to provide shorter residual control. Both neonicotinoid in-furrow treatments appeared to provide activity similar to aldicarb. In 2013, the thrips population was predominantly tobacco thrips and treatments consisting of thiamethoxam performed poorly while the in-furrow applications of imidacloprid appeared as effective as aldicarb. There is evidence that some tobacco thrips in the Mid-south may be resistant to thiamethoxam.

## Introduction

Thrips have been recognized as cotton pests for many years and are usually the first insect to attack newly emerged cotton (Burris et al. 1990). Thrips control on seedling cotton is considered an essential crop production practice by most cotton producers to minimize early season stress on the cotton plant, thus enhancing earliness and yield. Several species of thrips infest cotton fields in Louisiana (Newsom et al. 1953) and have the potential to achieve population densities capable of causing economic injury. These include flower thrips, Frankliniella tritici (Fitch); tobacco thrips, Frankliniella fusca (Hinds); western flower thrips, Frankliniella occidentalis (Pergande); and soybean thrips, Neohydatothrips variabilis (Beach). Two most prevalent species in Northeast Louisiana are the tobacco thrips and western flower thrips (Williams et al. 2013).

Typical injury, due to thrips feeding, is characterized by whitish or silver areas on cotyledons. Excessive feeding by thrips adults and immatures can cause a reduction in leaf area and plant heights. Heavy infestations can cause plant death. Cotton is most susceptible to thrips from emergence to the 4 true leaf stage. Cotton seedlings that experience cool, wet soils develop very slowly and remain susceptible to thrips injury much longer than cotton planted in a warmer, more optimum, environment (Brown et al. 2012). Delays in crop maturity and in some instances, reductions in yield, can be a result when terminal bud abortion occurs and excessive branching is prevalent (Burris et al. 1989, Micinski et al. 1990).

The objective of this study was to evaluate neonicotinoid insecticides for early season insect control without the commercial availability of aldicarb.

## Materials & Methods

All studies were performed in Northeast Louisiana at the Macon Ridge Research Station (MRRS, LSU AgCenter) near Winnsboro, LA (Franklin Parish) or at the Northeast Research Station (NERS, LSU AgCenter) near St. Joseph, LA (Tensas Parish) during the period 2012-2013. In 2012, tests (DP 1133 B2RF) were planted on 27 Apr and 4 May at MRRS and NERS, respectively. In 2013, tests (PHY 499WRF) were planted on 6 and 7 May at MRRS and NERS, respectively. All plots consisted of four rows (centered on 40 inches) X 50 feet in length. Treatments were arranged in a RCB design with four replications. Seed treatments were treated by hand using a 2 gallon small plastic bag (2.5 lbs. seed/bag using a 50% insecticide slurry). Imidacloprid was applied as Gaucho 600FS at 0.375 mg-ai/seed, and thiamethoxam was applied as Cruiser 5FS at 0.375 mg-ai/seed. Liquid in-furrow spray treatments were applied with a CO2 charged spray system through 80015 even flat fan nozzles (1/row) mounted in front of the press wheels. The spray tips were turned at a 90° angle to spray entirely within the furrow. During both years, imidacloprid was applied as Admire Pro at 9.2 fl oz/acre. In 2012, thiamethoxam was applied as Centric 40WG at 7.5 oz/acre, while in 2013 it was applied as Platinum 75SG at 3.67 oz/acre. Each nozzle was calibrated to deliver 5 GPA finished spray. Aldicarb was applied as Temik 15G using standard planter mounted granule applicator boxes at 3.3-3.5 lbs/acre. Thrips counts were made by randomly selecting 5 or 10 plants per plot at 14, 21 and 28 days after planting (DAP). Plant samples were processed by using whole plant washing procedures to remove insects (Burris et al. 1990). Thrips were counted using a dissecting microscope, and adult thrips were identified to species. Plots were also visually rated for thrips damage using a 1 – 5 rating scale (where 1 = no injury and 5 = severe injury) at 28 DAP. Plots were harvested in 2012 on 28 Aug and 9 Oct, MRRS and NERS, respectively, and during 2013 on 19 Sep and 9 Oct, MRRS and NERS, respectively. All cultural practices and IPM strategies recommended by Louisiana Cooperative Extension Service were used to optimize plant development and manage non-target insects across the test sites. Yields were collected using a 2 row mechanical cotton picker with integrated scales. All data were analyzed with ANOVA and means were separated using an F protected LSD ($P < 0.05$).

## Results and Discussion

In 2012, the total thrips composition was approximately 50% western flower thrips and 50% tobacco thrips. However, during 2013, tobacco thrips accounted for 90% or more at both locations.

At the MRRS location during 2012, there were no significant differences in the number of total thrips at 28 DAP (Figure 1). However, at 14 DAP, plots treated with Centric, Cruiser ST and Temik had significantly fewer thrips compared to plots treated with Admire Pro, Gaucho ST and the non-treated. It is likely that we experienced an application error with Admire Pro in 2012 at the MRRS location.

During 2013, there were no significant differences at 14 and 28 DAP at the MRRS location (Figure 2). At 21 DAP, all the plots except Cruiser ST had fewer thrips than the non-treated. There have been unpublished reports of tobacco thrips resistant to thiamethoxam in the Mid-South. These data suggest that at the rates used here, the in-furrow spray of thiamethoxam is more efficacious than its seed treatment counterpart. At the MRRS location in 2012, at 28 DAP plots treated with Cruiser ST had suffered significantly less thrips injury compared to those treated with Admire Pro, Gaucho ST and the non-treated (Figure 5). In 2013, plots treated with Admire Pro, Gaucho ST and Temik had significantly fewer damaged plants compared to those treated with Cruiser ST and the non-treated (Figure 6).

At the NERS location during 2012, at 14 DAP all of the insecticide treated plots had significantly fewer thrips compared to the non-treated plots at 14 DAP (Figure 3). Additionally, Temik and Admire Pro both had fewer thrips than the other insecticide treatments. By 21 DAP, all of the insecticide treatments reduced the number of thrips compared to the non-treated with the exception of the two seed treatments, Gaucho ST and Cruiser ST. No differences were detected among treatments at 28 DAP. At this location in 2013, differences were detected among treatments only at the 21 DAP evaluation (Figure 4). At 21 DAP, plots treated with Admire Pro and Temik had significantly fewer thrips compared to the non-treated plots. In 2012 at NERS, the 28 DAP damage ratings suggest that all of the insecticide treatments help prevent thrips injury, but Temik offered the greatest protection followed by the in-furrow spray of thiamethoxam (Centric) (Figure 5). This is contradictory to 2013 observations where thiamethoxam as a seed treatment or in-furrow spray, failed to protect as well as either imidacloprid treatments (Gaucho and Admire Pro) or Temik (Figure 6). This is most likely due to a greater proportion of tobacco thrips present in 2013, possibly compounded by resistance to thiamethoxam.

The only differences detected in yields occurred at the NERS location in 2012 (Figures 7 – 10). In this test the Temik treated plots yielded the more cotton than the non-treated, but did not differ from Admire Pro (Figure 8).

Overall, in-furrow applications of the neonicotinoids, particularly Admire Pro, appear to be viable alternatives to Temik. They appear to offer longer residuals than their seed treatment counterparts, but product efficacy is dependent on thrips composition and may be influenced by tobacco thrips resistance to thiamethoxam.

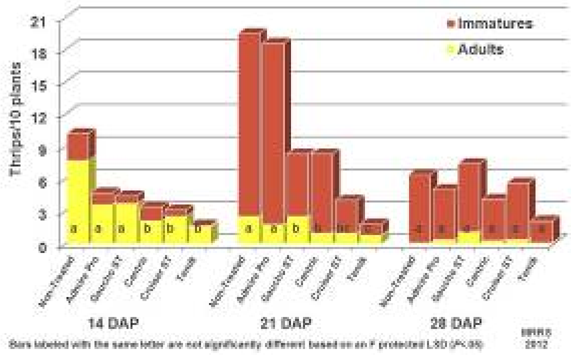


Figure 1. Efficacy of insecticides against thrips, MRRS 2012.

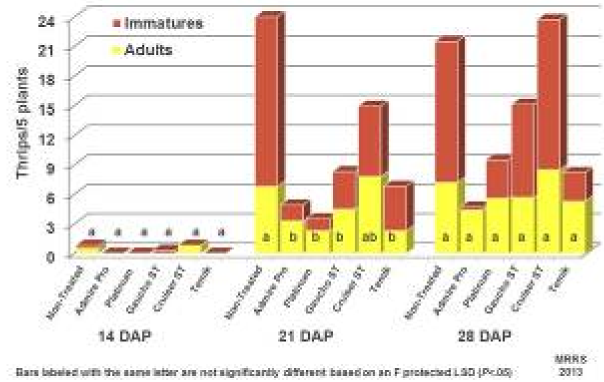


Figure 2. Efficacy of insecticides against thrips, MRRS 2013.

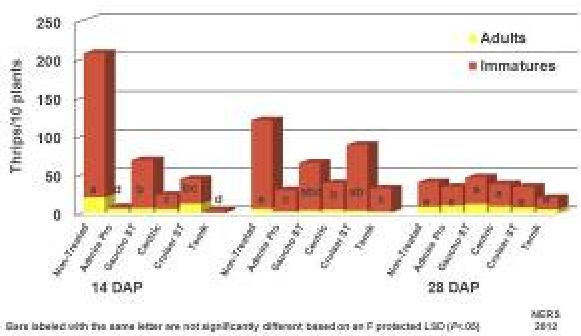


Figure 3. Efficacy of insecticides against thrips, NERS 2012.

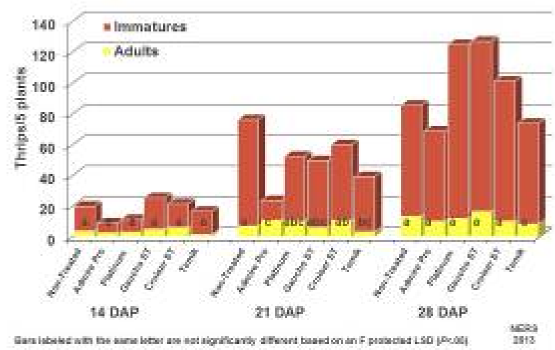


Figure 4. Efficacy of insecticides against thrips, NERS 2013.

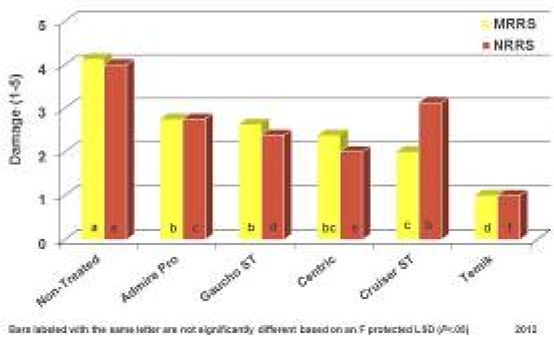


Figure 5. Insect damage ratings (28 DAP), MRRS and NERS – 2012.

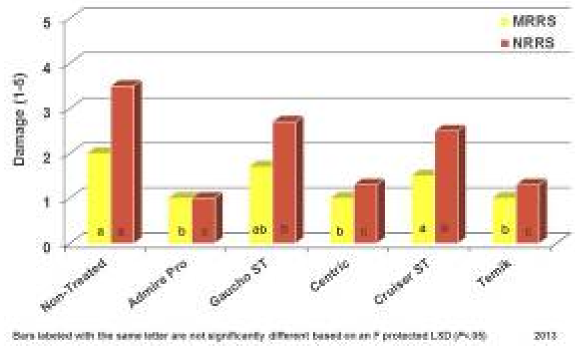


Figure 6. Insect damage ratings (28 DAP), MRRS and NERS – 2013.

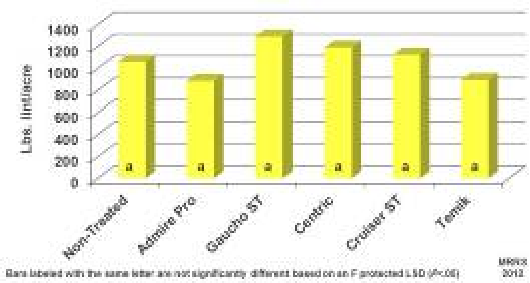


Figure 7. Effects of insecticides on cotton yield, MRRS 2012.

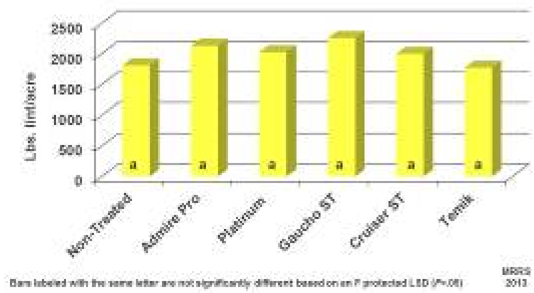


Figure 8. Effects of insecticides on cotton yield, NERS 2012.

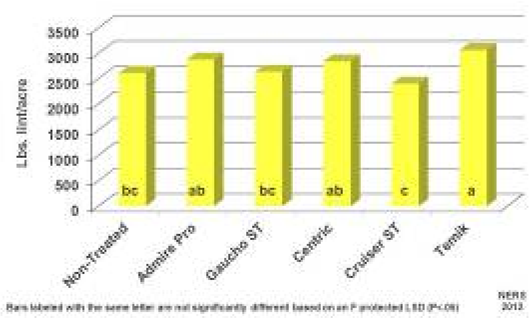


Figure 9. Effects of insecticides on cotton yield, MRRS 2013.

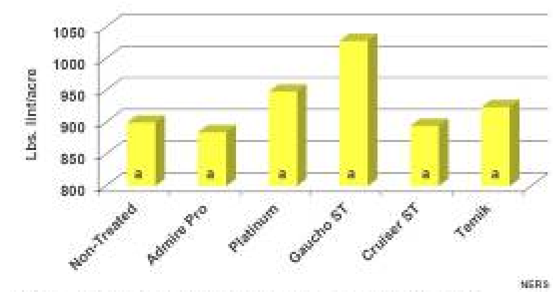


Figure 10. Effects of insecticides on cotton yield, NERS 2013.

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