COMPARING A COTTON IPM PROGRAM USING TRANSFORM AND RADIANT TO A COMMERCIAL PROGRAM

S. Brown
D. Kerns
LSU AgCenter
Winnsboro, LA
A.L. Catchot
Mississippi State University
Starkville, MS
J. Gore
Mississippi State University
Stoneville, MS
G.M. Lorenz
University of Arkansas
Lonoke, AR
M.M. Jones
University of Missouri
Portageville, MO
L.C. Walton
Dow Agrosciences
Tupelo, MS
R.P. Viator
Dow Agrosciences
Houma, LA
G.D. Thompson
Dow Agrosciences
Omaha, AR
B. Haygood,
Dow Agrosciences
Collierville, TN

Abstract

Cotton production in the Mid-South is affected by insect pests throughout the production season; with thrips *Frankliniella spp.* being one of the first insects to infest cotton after seedling emergence followed by tarnished plant bugs *Lygus lineolaris* (Palisot de Beauvois) after square initiation. Since the loss of Temik (aldicarb), thrips management has been accomplished by seed treatments and potentially disruptive foliar applications of broad spectrum insecticides including Orthene (acephate), Bidrin (dicrotophos) and dimethoate. However, the introduction of Radiant SC (spinetoram) offered a less disruptive foliar option that provided satisfactory control of thrips while reducing the likelihood of exacerbating secondary pest populations. Furthermore, the tarnished plant bug has become one of the most difficult insects in cotton to control. This issue is compounded by a limited number of available insecticides and this insect's propensity for developing insecticide resistance. Thus, Transform 50 WDG (sulfoxaflor) offers a unique mode of action that has demonstrated satisfactory performance equal to or greater than current insecticide options while offering a less disruptive option for growers. During 2014, studies were conducted in Louisiana, Mississippi, Arkansas and Missouri to evaluate the performance of a cotton IPM program using Transform and Radiant compared to a commercial program. The Transform/Radiant program provided similar levels of tarnished plant bug control to the commercial program. Yields between the two programs were not statistically different at all locations. No secondary pests (mites, aphids) were noted at any location.

Introduction

Thrips are typically the first insect pest that injures cotton following seedling emergence. Several species of thrips infest seedling cotton in the Mid-South including western flower thrips, *Frankliniella occidentalis* (Pergande), and tobacco thrips, *Frankliniella fusca* (Hinds) (Stewart et. al 2013). Thrips management, in the absence of Temik (aldicarb), primarily relies on the use of seed treatments and foliar insecticide applications. Presently, there are two commonly used seed treatment options: Cruiser (thiamethoxam) and Gaucho (imidacloprid). Seed treatments typically

provided satisfactory control; however, Syngenta recently confirmed resistance to Cruiser in tobacco thrips populations in the Mid-South. The inadequate control of tobacco thrips populations, with Cruiser, coupled with the environmental dependency of neonicotinoid seed treatments highlights the need for foliar control options. Many of the currently labelled insecticides for thrips control are highly toxic to beneficial insects and may lead to flaring of secondary pests. Therefore, growers are using less disruptive insecticidal control options including Radiant.

The tarnished plant bug (TPB) has become one of the most economically important insect pests affecting cotton in the Mid-South (Burris et. al 1997). Control options for TPB are becoming increasingly limited with few new insecticides registered and expanding instances of insecticide resistance occurring across the Mid-South. Many insecticides relied upon for TPB control may be adequate early season but gradually lose their effect as selection pressure increases and usage patterns change (Burris et. al 1997). Thus, the introduction of Transform offers a novel mode of action that fits into a cotton IPM program as a rotational partner. Transform is characterized as being a non-disruptive insecticide that may not flare secondary pests such as spider mites. Therefore, the objective of this study was to compare a non-disruptive cotton IPM program utilizing Radiant and Transform to a commercially utilized program composed of commonly applied insecticides for thrips and TPB in the Mid-South.

Materials and Methods

Studies were conducted during 2014 in Arkansas, Mississippi, Louisiana and Missouri. Missouri's data will not be included in this summary due to the lack of TPB pressure experienced at the test location. Treatments were arranged in a randomized complete block design with plot sizes ranging from 0.5 to 1.5 acres. Phytogen 495W3RF cotton seed, treated with Aeris seed treatment package, was used at all locations. Thrips densities were determined by sampling 5-10 cotton plants from each plot using a modified whole plant washing procedure or in-field sampling technique. Thrips applications were initiated upon detection of immatures. All applications were made by ground driven sprayers and included a crop oil concentrate. The Radiant/Transform program required the use of Radiant SC applied at 1.5 oz/acre while the commercial program was cooperators insecticide choice. Applications were repeated as needed.

Adult and immature tarnished plant bug densities were sampled using a black 5.0 ft^2 drop cloth. Tarnished plant bug applications were initiated upon participating states published economic threshold three weeks into square initiation. The Radiant/Transform program allowed the use of cooperators choice for the first TPB application followed by consecutive applications of Transform applied at 1.5 oz/acre. The commercial program allowed for cooperators choice throughout the duration of the study. Lint yield data was also collected from each location. Data were subjected to ANOVA procedures, with means separated according to Fisher's Protected LSD ($P < 0.05$).

Results

No significant differences were observed among treatments for total tarnished plant bugs detected across locations. Total program investment at each location, except Louisiana, resulted in the Radiant/Transform program costing less than the commercial program (Fig. 1). Average individual application costs across all locations were less for the Radiant/Transform program compared to the commercial (Fig. 2).

Aeris seed treatment package was effective at controlling thrips populations across all locations. Thrips densities were low across all locations tested resulting in only one foliar application at the Louisiana and Mississippi (A. Catchot) locations.

Tarnished plant bug numbers were significantly higher in the non-treated control plots at all locations tested. Seasonal averages across locations for tarnished plant bugs were 87.2 insects detected in the Transform/Radiant program, 81.0 insects detected in the commercial program and 284.9 insects detected in the non-treated check. Insecticide programs resulted in significantly higher yields than the non-treated check with the exception of the Louisiana location (Table 1). The addition of broad-spectrum insecticides such as acephate to commercial plots, may have contributed to increased yields by controlling insects such as stink bugs that Transform may have missed (Table 2).

Transform has the ability to be an effective rotational partner in Mid-South cotton IPM systems. Transform's less disruptive nature allows the use of this chemistry in fields where secondary pests including spider mites can become a problem. Transform has little to no efficacy on stink bug species that infest cotton fields facilitating the use of alternative chemistries for their control.

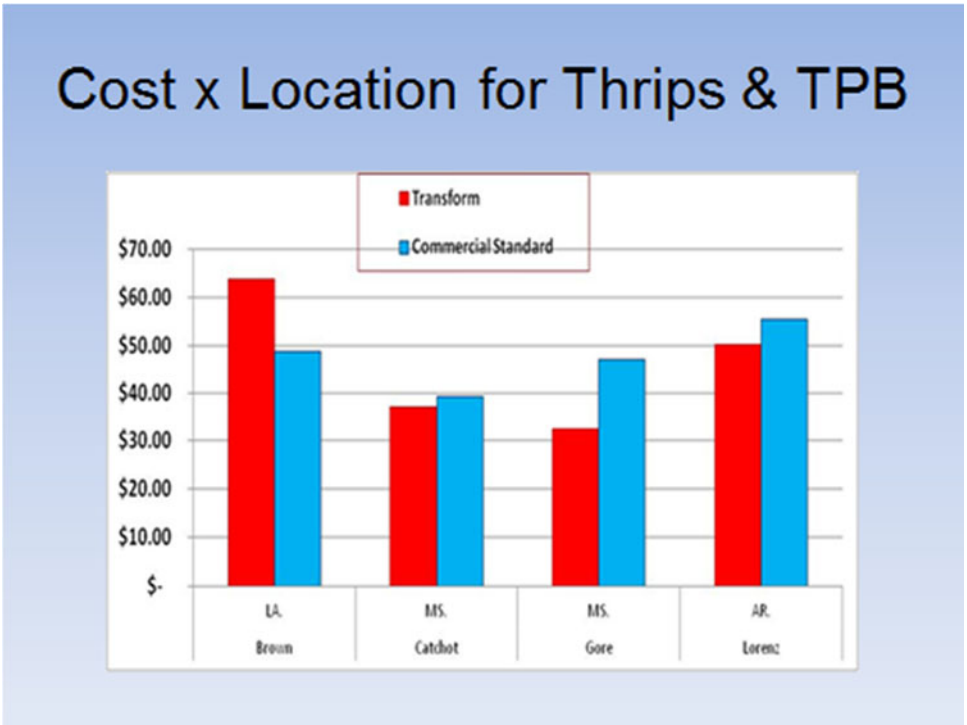

Figure 1. Seasonal cost by location for thrips and TPB.

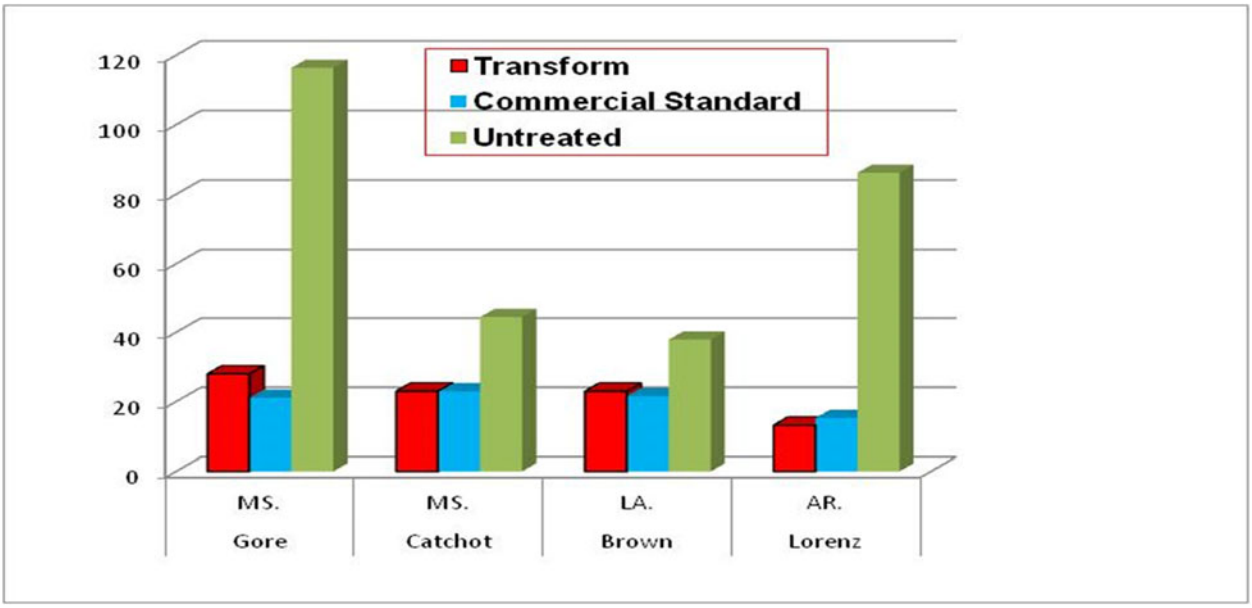

Figure 2. Seasonal total TPB counts for each location and treatment.

Table 1. Yield by treatment and location.

Location/Cooperator	Program	lb Lint / Acre
Mississippi (A. Catchot)	Radiant/Transform	1082.7a
Mississippi (A. Catchot)	Commercial	990.9a
Mississippi (A. Catchot)	Non-Treated	915.2a
Mississippi (J. Gore)	Radiant/Transform	1675.1a
Mississippi (J. Gore)	Commercial	1807.4a
Mississippi (J. Gore)	Non-Treated	1164.1b
Arkansas (G. Lorenz)	Radiant/Transform	1103.9a
Arkansas (G. Lorenz)	Commercial	1129.7a
Arkansas (G. Lorenz)	Non-Treated	591.5b
Louisiana (S. Brown)	Radiant/Transform	1127.8a
Louisiana (S. Brown)	Commercial	1165.5a
Louisiana (S. Brown)	Non-Treated	1076.3a
Average	Radiant/Transform	1247.4a
Average	Commercial	1273.4a
Average	Non-Treated	936.8b
P>F		<0.05

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

Table 2. Seasonal insecticide application number, product and rate used in Radiant/Transform and commercial programs.

Location/Cooperator/Program	Seasonal Insecticide Application Number and Products Used						
	Thrips App. and Rate	1st TPB App. and Rate	2nd TPB App. and Rate	3rd TPB App. and Rate	4th TPB App. and Rate	5th TPB App. and Rate	6th TPB App. and Rate
MS/A.Catchot/Dow	Radiant (1.5)[1] + COC 1% V/V	Transform (1.5)[1]	Transform (1.5)[1]	Transform* (1.5)[1]	---	---	---
MS/A.Catchot/Commercial	Bidrin (3.2)[2]	Centric (2.0)[1] + Diamond (6.0)[2]	Bidrin (8.0)[2] + Brigade (6.4)[2]	Orthene (0.75)[3] + Brigade (6.4)[2]	---	---‘	---
MS/J.Gore/Dow	---	Admire Pro (1.7)[2]	Transform (1.5)[1]	Transform (1.5)[1]	Orthene (0.75)[3] + Brigade (6.4)[2]	Transform (1.5)[1]	Transform (1.5)[1]
MS/J.Gore/Commercial	---	Admire Pro (1.7)[2]	Centric (2.0)[1] + Diamond (6.0)[2]	Orthene (0.75)[3] + Brigade (6.4)[2]	Endigo (5.0)[2] + Diamond (6.0)[2]	---	---
AR/G.Lorenz/Dow	---	Centric (2.0)[1]	Transform (1.5)[1]	Transform (1.5)[1]	Bidrin XP (12.0)[1]	---	---
AR/G.Lorenz/Commercial	---	Centric (2.0)[1]	Orthene (0.75)[3] +Diamond(6.0)[2]	Bidrin (8.0)[2] + Diamond(6.0)[2]	Bidrin XP (12.0)[1]	---	---
LA/S.Brown/Dow	Radiant (1.5)[1] + COC 1% V/V	Transform (1.5)[1]	Transform (1.5)[1]	Centric (2.0)[1] + Diamond (6.0)[2]	Transform (1.5)[1]	Transform (1.5)[1]	---
LA/S.Brown/Commercial	Bidrin (3.2)[2] + COC 1% V/V	Centric (2.0)[1] + Diamond (6.0)[2]	Bidrin (8.0)[2]	Orthene (0.75)[3] +Diamond(6.0)[2]	Orthene (0.75)[3] + Brigade (6.4)[2]	---	---

* Three consecutive applications of Transform is off label.
[1]dry ounces per acre of product.
[2]fluid ounces per acre of product.
[3]pounds per acre of product.

References

Burris, E., J. H. Pankey, B. R. Leonard, and J. B. Graves. 1997. Tarnished Plant Bugs *Lygus lineolaris* (Palisot de Beauvois), In Cotton. LSU AgCenter Research Information Sheet. 101: 1 – 6.

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 Science 17: 263-269.