SUCEPTIBILITY OF TOBACCO THRIPS, FRANKLINIELLA FUSCA, TO THE NEONICOTINOID CLASS OF INSECTICIDES IN MID-SOUTH REGION Chelsie Darnell Angus Catchot Fred Musser Don Cook Darrin Dodds Jeff Gore Mississippi State University Mississippi State, MS Shannon Morsello Syngenta Mississippi State, MS

<u>Abstract</u>

Reduced insecticidal efficacy of imidacloprid, thiamethoxam, and clothianidin against tobacco thrips, Frankliniella *fusca* (Hinds), in the Mid-Southern Region is a concern for cotton producers. Dose-response bioassays with the three commonly used neonicotinoid insecticides were performed on field-collected adult female tobacco thrips during May and June, 2014. Over the past several years farmers have seen reduced insecticidal efficacy in tobacco thrips to Thiamethoxam. It is critical to understand the level of resistance in the Mid-South.

Introduction

Reduced insecticidal efficacy of imidacloprid, thiamethoxam, and clothianidin against thrips in the Mid-Southern Region is a concern for cotton producers. Four commonly found thrips species in this region are tobacco thrips, *Frankliniella fusca* (Hinds); western flower thrips, *F. occidentalis* (Pergande); flower thrips, *F. tritici* (Fitch); and soybean thrips, *Sericothrips variabilis* (Beach). Over the past several years tobacco thrips have become an increasing problem throughout the cotton cropping systems in the South. The thrips lifecycle lasts approximately sixteen days, so resistance can develop quickly under the right environmental conditions.

Thrips can cause a delay in maturity and reduction in yield if not controlled. If infestations are severe, thrips can cause a loss of apical dominance or even kill plants. Currently, seed treatments are the primary means of controlling tobacco thrips in cotton. It is critical to understand the potential levels of resistance currently established in populations throughout the southern region of the U.S.

Materials and Methods

Populations were collected from agricultural regions in Mississippi from wild hosts as well as from insecticidetreated crops. Thrips-infested vegetation was gently beaten against a white tray to dislodge the thrips. The thrips were then aspirated off into a one milliliter micro-centrifuge tube which was then closed with a cap containing a sugar solution. After collection they were stored in a cool environment for transport. Once in the lab, thrips where reared in buckets with cabbage until assayed, usually within 3 days.

Dose-response bioassays with the three commonly used neonicotinoid insecticides, namely clothianidin, imidacloprid and thiamethoxam, were performed on field-collected adult female tobacco thrips during May and June, 2014. Five thrips were aspirated into each micro-centrifuge tube and closed with a cap containing a sugar solution with the appropriate concentration of one insecticide. Each concentration was made by serial dilutions from a stock solution on the day of the assay. The five replications of each dose were kept in a growth chamber at 26° C and mortality was recorded after forty-eight hours. Thrips were considered dead if they failed to walk when prodded by a paint brush.

Results and Discussion

In 2014, Mississippi State Extension Service saw a wholesale switch from thiamethoxam to imidacloprid due to reduced insecticidal efficacy (Figure 1). Results suggest that crop host was not an important factor in determining

survival to neonicotinoids, but agricultural region was (Table 1). Thrips collected from the Mississippi River Delta region were less susceptible to all three neonicotinoids than populations collected from the Northeastern part of Mississippi. When compared to a laboratory colony, field colonies were similarly susceptible to imidacloprid, but less susceptible to thiamethoxam (Table 2).



Figure 1. Recent trends in thrips foliar applications in Mississippi Cotton.

Region	Insecticide	# Pop. tested	Average LC ₅₀	Lowest LC	Highest LC
MS Hills	Gaucho	9	1.14	0.42	2.51
	Cruiser	10	9.49	5.05	15.6
	Poncho	6	22.66	11.18	44.67
MS Delta	Gaucho	12	2.52	0.34	6.99
	Cruiser	14	35.12	19.41	65.83
	Poncho	4	43.15	28.84	62.33
TN	Gaucho	1	4.26	2.51	6.00
	Cruiser	1	13.91	10.65	17.17
SC	Cruiser	1	26.72	26.72	26.72

Table 1. 2014 Thrips Assay Results.		
Thrips collected during May and June 2014.	LC	data expressed in PPM formulated

Colony	Cruiser		Gaucho		Poncho	
	LC ₅₀	RR	LC ₅₀	RR	LC ₅₀	RR
MS Delta	35.12	20.4	2.52	1.4	43.15	20.0
MS Hills	9.49	5.5	1.14	0.6	22.66	10.5
TN	13.91	8.1	4.26	2.3	-	-
SC	26.72	15.5	-	-	-	-
Lab	1.72	1	1.84*	1	2.16**	1

Table 2. Field Colony versus lab colony results.

* 3 assays with LC_{50} ranging from 0.1 to 4.5

** 3 assays and concentration not significant for any but all had similar LC_{50} estimate

Results suggest that crop host was not an important factor in determining survival to neonicotinoids, but agricultural region was. Thrips collected from the Mississippi River Delta region were less susceptible to all three neonicotinoids than populations collected from the Northeastern part of Mississippi. When compared to a laboratory colony, field colonies were similarly susceptible to imidacloprid, but less susceptible to thiamethoxam.

Summary

In conclusion, resistance ratios were significantly higher in the Mississippi Delta region compared to the Mississippi Hills region for thiamethoxam. To this date we have no evidence for resistance to imidacloprid, based on limited lab colony data, for tobacco thrips in any region. Collections from crops with seed treatments compared to weed collections did not significantly affect LC values. Overall there appears to be a shift in susceptibility with

thiamethoxam in Mississippi to tobacco thrips.

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