

EFFICACY OF SELECTED MITICIDES IN LOUISIANA COTTON, 2006-2009**J. H. Temple****J. Hardke****B. R. Leonard****LSU AgCenter Dept. of Entomology****P. Price****K. Emfinger****J. Sharp****LSU AgCenter Macon Ridge Research Station****E. Burris****LSU AgCenter Northeast Research Station****Baton Rouge, LA****Abstract**

Spider mites are an occasional pest of cotton in the United States, but have become more of a problem in recent years. In the Mid-South, only seven to nine percent of cotton acreage was treated for spider mite infestations from 2001-2003. From 2004-2008, percentage of acreage treated for spider mites increased to an average of 26% per year. With an increase in spider mite-infested cotton acres requiring miticide applications, it is important to screen products for efficacy against spider mites. Therefore, the objective of these experiments was to evaluate selected miticides for control of spider mites in Louisiana cotton. Several products provided acceptable levels of control (>75%) for spider mites including ABBA (6 oz/acre), Dicofol (12 and 32 oz/acre), Oberon (8 oz/acre), Portal (10 and 16 oz/acre), Zeal (1 oz/acre), Zephyr (6, 8, and 12 oz/acre), and Zoro (6, 12, and 20 oz/acre). Products that provided <75% control of spider mites in these trials included ABBA (4 oz/acre), Brigade, Denim, Oberon (4 and 6 oz/acre), and Zephyr (4 oz/acre). Brigade was the most inconsistent product with control ranging from 4-79%. Spider mites are one of the most expensive cotton arthropods to control with miticide costs ranging from 8-20 dollars/acre. Information on the efficacy and rate structure of these products is necessary to make the proper selection. Fortunately, these trials indicate that several miticides provide adequate control of spider mites in Louisiana.

Introduction

Cotton, *Gossypium hirsutum* (L.), is one of the major agronomic crops grown in the Mid-Southern United States. The states of Arkansas, Louisiana, Mississippi, and Tennessee produced 1.6 million acres of cotton that yielded >2.7 million bales during 2008 (Williams 2009). Producers spent >\$145 million for management of numerous arthropod pests in mid-south cotton fields. Some of the most important pests include tobacco budworm, *Heliothis virescens* (F.); bollworm, *Helicoverpa zea* Boddie; cotton aphid, *Aphis gossypii* Glover; tarnished plant bug (TPB), *Lygus lineolaris* (Palisot de Beauvois), and spider mites (*Tetranychus* spp.). Ten species of spider mites are reported to attack cotton in the United States (Leigh et al. 1996). The most important species in the Mid-South include the twospotted spider mite (*Tetranychus urticae* Koch), the strawberry spider mite (*Tetranychus turkestanii* Ugarov & Nikolski), the desert spider mite (*Tetranychus desertorum* Banks), and the carmine spider mite (*Tetranychus cinnabarinus* Boisduval) (Steinkraus et al. 2001).

Spider mites are most commonly found in colonies on the abaxial surfaces of cotton leaves (Jepson et al. 1975, Leigh and Burton 1976). Spider mites feed on epidermal cells and remove cell contents. This injury to cells results in chlorotic spots on leaves and may cover large areas of the leaf. Spider mite feeding affects water relation in leaf tissues, reduces photosynthesis, and causes necrosis and desiccation of leaves (Steinkraus et al.). Severe infestations can cause defoliation, fruiting form shed, and incomplete development of fiber and seed (Leigh et al. 1996). Spider mite infestations can often be observed as yellowish to reddish areas across the field (Steinkraus et al. 2001).

Spider mites are an occasional pest of cotton in the United States, but have become more of a problem in recent years (Table 1). In the Mid-South, only seven to nine percent of cotton acreage was treated for spider mite infestations from 2001-2003 (Table 2). From 2004-2008, percentage of acreage treated for spider mites increased to an average of 26% per year. In 2008, 20-30% of cotton acreage required miticide applications in Arkansas, Louisiana, Mississippi, and Tennessee (Williams 2009). In 2008, spider mites were considered the third most costly cotton pest, infesting ≈25% of the region's acreage and were determined to be responsible for a loss of ≈17,000

bales (Williams 2009). With an increase in spider mite- infested cotton acres requiring miticide applications, it is important to screen products for efficacy against spider mites. Therefore, the objective of these experiments was to evaluate selected miticides for control of spider mites in Louisiana cotton.

Materials and Methods

The performance of nine miticides in selected formulations and rates were evaluated for efficacy against spider mites during the previous four years (Table 3). A non-treated control was included in all trials to confirm spider mite infestation levels during the sample period. Studies were performed at the Macon Ridge Research Station near Winnsboro, LA (Franklin Parish) and Northeast Research Station near St. Joseph, LA (Tensas Parish) from 2006-2009. The general methods and experimental protocol for measuring miticide efficacy against spider mites in cotton was similar among all field trials. Cotton seed in each trial were planted during LSU AgCenter-recommended planting dates and managed according to best agronomic practices. Bollgard 2 varieties were planted in plots that consisted of four-eight rows (centered on 40 inches) and 45-50 ft in length. Treatments were placed in a RCB design with four-five replications. All cultural practices and IPM strategies recommended by the Louisiana Cooperative Extension Service were used to optimize plant development and manage non-target insects across the test sites. Miticides were applied when spider mite infestations reached a treatable level (30% of plants with discolored leaves). All treatments were applied with a high-clearance sprayer and CO₂-charged system calibrated to deliver 6.0-12.0 GPA. Miticides included in the trials (Table 3) included Oberon (4, 6, or 8 oz/acre; Bayer CropScience), Zephyr (4, 6, 8, or 12 oz/acre; Syngenta Crop Protection), ABBA (4 or 6 oz/acre; MANA Inc.), Brigade (6.4 oz/acre; FMC), Dicofol (12 or 32 oz/acre; MANA Inc.), Zoro (6, 12, or 20 oz/acre; Cheminova), Zeal (1 oz/acre; Valent), Portal (10 or 16 oz/acre; Nichino America), and Denim (12 oz/acre; Syngenta Crop Protection). Miticide efficacy was evaluated by recording the number of mites per 10 in² on the abaxial surface of randomly-selected leaves (one in²/leaf) within the upper mainstem nodes. Plots were sampled 2-3 DAT, 7-8 DAT, and 9-10 DAT depending on the trial. Data were analyzed with ANOVA and means separated according to DMRT. The results for each miticide in a specific trial were converted to percent control relative to the non-treated control. Means across all trials, as well as the lowest and highest relative control levels, are reported for each miticide treatment.

Results and Discussion

The efficacies of nine miticides at multiple rates against spider mites are reported in Table 4. Results for miticide treatments are not directly compared across all trials because of considerable variability in frequencies of tests for specific products. Sample sizes (trial numbers) for these products ranged from one to three. The efficacies of miticides ranged from <10% to >90% at three-seven DAT. Several products provided acceptable levels of control (>75%) for spider mites including ABBA (6 oz/acre), Dicofol (12 and 32 oz/acre), Oberon (8 oz/acre), Portal (10 and 16 oz/acre), Zeal (1 oz/acre), Zephyr (6, 8, and 12 oz/acre), and Zoro (6, 12, and 20 oz/acre). Products that provided <75% control of spider mites in these trials included ABBA (4 oz/acre), Brigade, Denim, Oberon (4 and 6 oz/acre), and Zephyr (4 oz/acre). Brigade was the most inconsistent product with control ranging from 4-79%.

Mid-South spider mite infestations have increased since 2004 and during 2008 become the third ranked pest following tarnished plant bugs and heliothines. Spider mites are one of the most expensive cotton arthropods to control with miticide costs ranging from 8-20 dollars/acre (Personal Communication, Raley Bros. Inc.). Information on the efficacy and rate structure of these products is necessary to make the proper selection. Fortunately, these trials indicate that several miticides provide adequate control of spider mites in Louisiana.

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Table 1. Total cotton bale loss and percentage of acreage treated for spider mites in the United States¹, 1999-2008.

Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Bales	30870	65000	8000	7256	34367	24768	121871	71488	60000	20000
% Treated Acreage	10	10	5	6	7	7	13	11	13	11

Table 2. Total bale loss, percentage of cotton acreage treated for spider mites, and total cotton acreage in Mid-South¹ (AR, LA, and MS), 1999-2008.

Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Bales	5823	6831	4105	3914	11608	5119	58859	40499	21252	8867
% Treated Acres	17	37	7	8	9	15	33	29	27	24
Acreage (x 1000)	1886	2930	3565	2572	2120	2527	2850	2926	1841	1316

¹Adapted from Williams (2008)

Table 3. Miticides evaluated in Louisiana field trials against spider mites during 2006-2009.

Trade Name	Common Name	Formulation	Manufacturer
ABBA	abamectin	0.15EC	MANA
Brigade	bifenthrin	2EC	FMC
Denim	emamectin benzoate	0.16EC	Syngenta
Dicofol	dicofol	4E	MANA
Oberon	spiromesifen	4SC	Bayer
Portal	fenpyroximate	5EC	Nichino America
Zeal	etoxazole	72WDG	Valent
Zephyr	abamectin	0.15EC	Syngenta
Zoro	abamectin	0.15EC	Cheminova

Table 4. Performance (percent control) of miticides against spider mites in Louisiana during 2006-2009.

Trade Name	Formulation	Rate (oz/acre)	Mean	High	Low
ABBA	0.15EC	4	60	66	52
		6	77	92	67
Brigade	2EC	6.4	46	79	4
Denim	0.16EC	12	58	72	44
Dicofol	4E	12	76	83	69
		32	76	79	73
Oberon	4SC	4	73	88	46
		6	68	91	44
		8	76	95	53
Portal	5EC	10	86	96	75
		16	79	91	71
Zeal	72WDG	1	81	97	65
Zephyr	0.15EC	4	65	88	25
		6	79	89	73
		8	76	89	58
		12	75	97	57
Zoro	0.15EC	6	77	86	68
		12	78	93	66
		20	83	94	71