

## **RESULTS FROM THE 2003 REGIONAL HARDLOCK PROJECT**

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### **Abstract**

Trials were conducted in 2003 at locations in AL, FL, GA, LA, and SC to evaluate thiophanate-methyl (Topsin M 70WP) for suppression of Fusarium hardlock of cotton. Topsin was applied at 0.5 or 1 lb/A on a 7- or 14-day schedule for a total of 2, 3, or 4 applications beginning at first bloom. No effect on hardlock was found for any of the Topsin treatments. Yields of seed cotton were increased by the application of Topsin, and the number of applications was found to be of more significance than the rate or time between applications. Further research will be required to elucidate the mechanism by which yield of cotton is increased by Topsin M.

### **Introduction**

Hardlock of cotton, which results from a failure of lint within individual locules to expand after boll opening, is thought to cause significant loss of yield in the humid southeastern United States. Hardlock can be caused by a number of physiological and environmental factors; however, researchers at the University of Florida have found an association between hardlock and a pathogen, *Fusarium verticillioides*. Results from trials conducted in 2001 and 2002 suggested that inoculation of blooms with *F. verticillioides* increased hardlock, and that applications of benzimidazole fungicides during the bloom period significantly reduced hardlock of cotton and increased yield. The current project was undertaken to identify the optimal rate, number, and timing of applications of Topsin M 70WP required during the bloom period for suppression of Fusarium hardlock and for maximization of yield.

### **Materials and Methods**

Experiments were conducted in 2003 at field sites in Alabama, Florida, Georgia, Louisiana, and South Carolina. Plot size, planting date, and cultivar varied by location. The experimental design was a randomized complete block arranged as a factorial with 4-5 replications, depending upon location. Factors included rate of Topsin (0.5 or 1 lb/A), application timing (7- or 14-day schedule), and number of applications (2, 3, or 4 sprays). Reference treatments included an untreated check and Topsin at 0.5 lb/A applied 6 times on a 7-day schedule. Total treatment number was 14 (Table 1). Fungicide applications were initiated when 25-50% of plants in the test area were at 1<sup>st</sup> bloom. Applications continued, depending upon the treatment, for up to 7 weeks after the first spray. Hardlock was evaluated as the number of symptomatic locules or bolls (depending upon location) immediately prior to harvest, and plots were harvested with a mechanical picker.

## Results

The severity of hardlock varied by location; the lowest levels of hardlock were observed in AL and LA, while the percentage of hardlocked bolls tended to be greater in FL, GA, and SC. Regardless of location, no effect of fungicide was observed on the percentage of hardlocked bolls (Table 1). In general, yields in plots treated with Topsin M were greater than for the untreated controls, particularly where the material had been applied 3 or 4 times (Table 2). Significant increases in yield were observed only where Topsin had been applied 3 or 4 times at the 0.5 lb/A rate (AL and GA) or at the 1 lb/A rate (GA). When data from each location were combined, significant effects on yield were recorded (Fig. 1). Topsin M applied 4 times at 1 lb/A on a 7-day schedule increased the yield of seed cotton by 500 pounds over the control, and by 250 pounds when applied on a 14-day schedule. Further analysis of the data revealed that yields for Topsin M at 0.5 lb/A did not differ from 1.0 lb/A, and no difference in yield was observed between spray schedules (7 or 14 days). A significant effect of application number was found. Yields for Topsin M (either rate or application schedule) applied 4 times were greater than for Topsin applied 2 or 3 times (Fig. 2). No differences were found between 2 or 3 applications of Topsin.

## Discussion

No definitive connection between fungicide application and severity of hardlock of cotton could be determined from testing at five locations across the southeastern U.S. in 2003. The increase in yield of seed cotton associated with Topsin M must therefore be attributed to something other than suppression of hardlock. It is possible that minor pathogens such as *Ascochyta* were suppressed, leading to higher yields. It is also possible that thiophanate-methyl, the active ingredient of Topsin M, affected the cotton plant directly, resulting in increased yield. Further testing will take place in 2004 to help elucidate the mechanism by which Topsin M affects yield of cotton.

Table 1. Effect of applications of Topsin M at two rates on 7- or 14-day spray schedules on hardlock of cotton at five locations in the southeastern United States, 2003.

Topsin rate / A	App. timing <sup>a</sup>	AL	FL	GA	LA	SC
		% Hardlock bolls/m <sup>b</sup>	Percent hardlock	Percent hardlock	Percent hardlock	Hardlocked bolls/m (#)
0.5 lb	ABCDEF	6.5 c	24.0 a	37.9 a	12.5 ab	7.2 a
0.5 lb	ABCD	13.3 abc	24.0 a	28.1 de	7.30 b	7.8 a
1.0 lb	ABCD	9.9 bc	28.0 a	31.1 b-e	12.8 a	7.3 a
0.5 lb	ACEG	19.2 a	29.0 a	32.0 a-e	11.8 ab	8.5 a
1.0 lb	ACEG	12.4 abc	29.0 a	28.4 de	9.80 ab	8.0 a
0.5 lb	ABC	5.8 c	27.0 a	35.3 abc	10.0 ab	9.2 a
1.0 lb	ABC	13.5 abc	28.0 a	28.9 b-e	11.0 ab	7.2 a
0.5 lb	ACE	5.9 c	27.0 a	32.4 a-e	13.5 a	10.8 a
1.0 lb	ACE	7.8 bc	27.0 a	34.5 a-d	9.80 ab	6.5 a
0.5 lb	AB	15.7 ab	29.0 a	27.1 e	10.3 ab	6.2 a
1.0 lb	AB	12.3 abc	32.0 a	28.8 cde	12.0 ab	6.2 a
0.5 lb	AC	7.8 bc	26.0 a	35.4 ab	13.8 a	7.2 a
1.0 lb	AC	13.3 abc	27.0 a	34.2 a-d	13.3 a	8.8 a
Untreated	--	12.8 abc	26.0 a	29.6 b-e	14.8 a	7.0 a
P-value		≤0.05	0.44	0.047	≤0.05	0.86

<sup>a</sup>Application timing: fungicides were applied beginning at first bloom (application A) and continued, depending upon the treatment, for 8 weeks (applications B-G).

<sup>b</sup>Hardlock evaluated as the percentage of hardlocked bolls per meter of row (AL), the percentage of hardlocked bolls per 10 plants (FL, GA, LA), or the number of hardlocked bolls per meter of row (SC).

Means followed by the same letter do not differ significantly according to Fisher's protected least significant difference test ( $P \leq 0.05$ ).

Table 2. Effect of applications of Topsin M at two rates on 7- or 14-day spray schedules on yield of seed cotton at five locations in the southeastern United States, 2003.

Topsin rate / A	App. timing <sup>a</sup>	Yield of seed cotton (lb/A)					
		AL	FL	GA	LA	SC (lint)	
0.5 lb	ABCDEF	3821 ab	5296 a	4832 a	2155 a	1259 ab	
0.5 lb	ABCD	4063 a	4507 a	4923 a	2173 a	1342 ab	
1.0 lb	ABCD	3799 ab	5600 a	4787 a	2237 a	1366 ab	
0.5 lb	ACEG	3721 abc	4673 a	4764 a	2408 b	1383 ab	
1.0 lb	ACEG	3920 ab	4729 a	4946 a	2194 a	1192 b	
0.5 lb	ABC	3821 ab	4729 a	4810 a	2531 bc	1255 ab	
1.0 lb	ABC	3543 bc	5061 a	4606 abc	2413 b	1389 ab	
0.5 lb	ACE	3578 bc	4646 a	4492 abc	2195 a	1275 ab	
1.0 lb	ACE	3699 abc	5420 a	4583 abc	2287 a	1326 ab	
0.5 lb	AB	3578 bc	4978 a	4492 abc	2145 a	1273 ab	
1.0 lb	AB	3479 bc	4342 a	4855 a	2122 a	1301 ab	
0.5 lb	AC	3622 abc	4729 a	4696 ab	2309 a	1431 a	
1.0 lb	AC	3303 c	4563 a	4637 abc	2057 a	1250 ab	
Untreated	--	3523 bc	4372 a	4140 bc	2114 a	1183 b	
P-value		≤0.05	0.44	0.09	≤0.05	0.24	

<sup>a</sup>Application timing: fungicides were applied beginning at first bloom (application A) and continued, depending upon the treatment, for 8 weeks (applications B-G).

Means followed by the same letter do not differ significantly according to Fisher's protected least significant difference test ( $P \leq 0.05$ ).

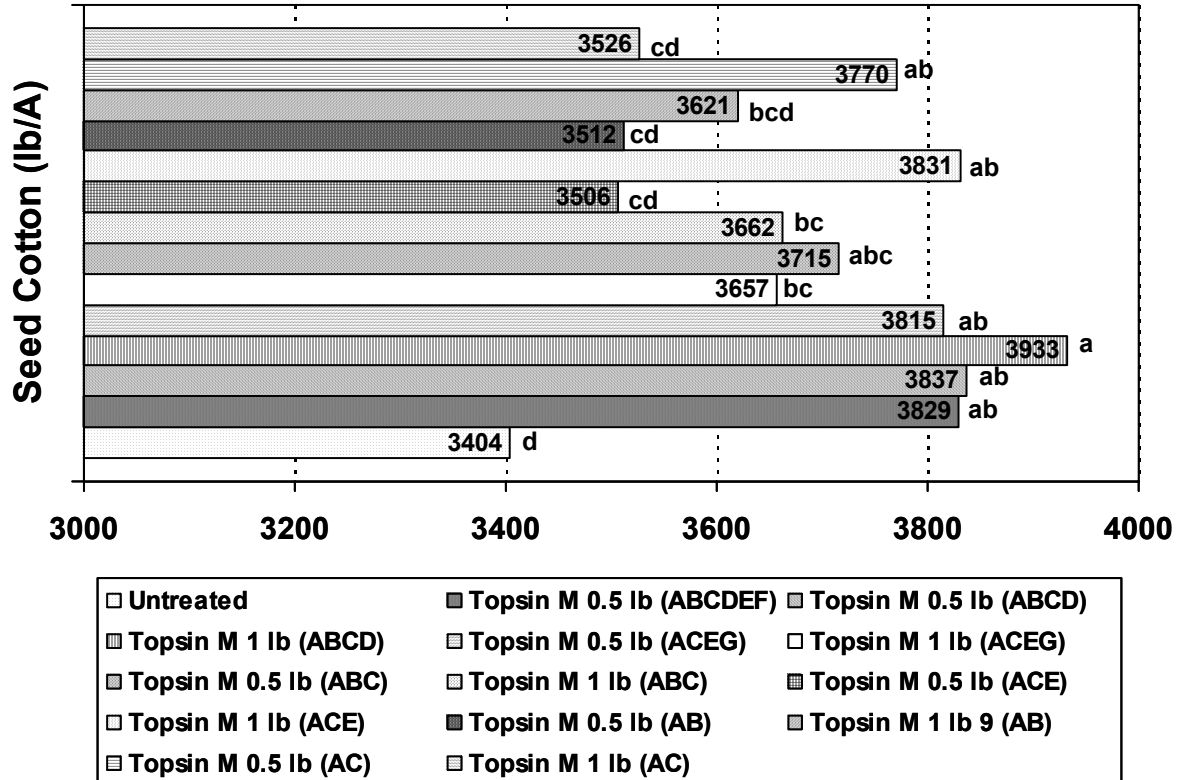


Figure 1. Effect of Topsin M applied at two rates (0.5 and 1 lb/A) and two application timings (7- and 14-day) on yield of seed cotton across five locations (AL, FL, GA, LA, and SC) in 2003.

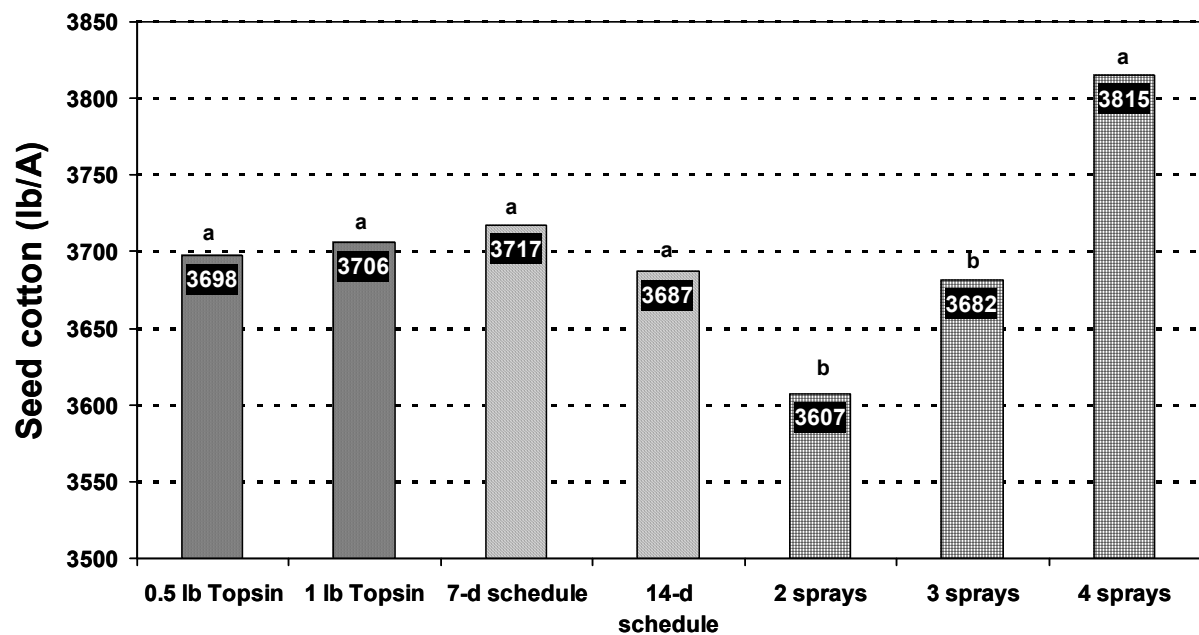


Figure 2. Effect of application timing, schedule, and number of sprays on yield of seed cotton averaged across five locations (AL, FL, GA, LA, and SC) in 2003.