USING COTMAN TO EVALUATE NITROGEN APPLICATION TO THRIPS DAMAGED COTTON

Ames Herbert
Tidewater AREC
Suffolk, VA
A. Ozzie Abaye and Jessica Bryant
Blacksburg, VA
James Maitland
SPAREC
Blackstone, VA
Virginia Polytechnic Institute and State University

Abstract

The experiment presented here was designed to document the impact of early season thrips injury on cotton growth and yield using COTMAN plant mapping techniques, and to evaluate the ability to improve performance of thrips-injured cotton by enhancing plant growth with N fertilization during the season. Thrips populations were manipulated with applications of Temik 15G, and N was applied either preplant incorporated (PPI), at PPI + at pinhead square (PHS), or at PPI + PHS + at first flower (FF). Temik 15G resulted in significantly less thrips injury compared with untreated plots. Temik 15G treated plots tracked the TDC more closely than non-Temik 15G treated plots, which had a lower apogee and a 14-day delay in nodal development. The highest lint yields occurred in plots where thrips injury was minimized with insecticide. In both the insecticide treated and untreated plots, N fertilization increased yields. N application at the middle (25 lb PPI + 45 lb PHS) and highest (25 lb PPI + 33 lb PHS + 32 lb FF) rates resulted in yields not significantly different from the Temik 15G plot treated with 25 lb N PPI, only. These results, albeit somewhat preliminary, indicate that although N application cannot substitute for thrips control, N supplements can aid cotton plants in recovery of some of the yield loss associated with severe early season injury caused by thrips feeding.

Objectives

1. To document the impact of early season thrips injury on cotton growth and yield using COTMAN plant mapping techniques.
2. To evaluate the ability to improve performance of thrips-injured cotton by enhancing plant growth with N fertilization during the season.

Introduction

Currently, 104,000 acres of cotton (*Gossypium hirsutum*) are being grown in Virginia, compared to 25,000 acres 3-4 years ago, and this acreage is expected to increase in the future. Although, cotton is not new to Virginia, because of its absence for a long period of time, most of the cotton producers are relatively new. Recent research has shown that severe lint losses can occur if early season thrips populations are not controlled and seedlings sustain injury. It is not clear how plants respond to this injury, what sources contribute most to lint loss, which plant parts suffer, or how plants respond. Also, it is felt that in situations where thrips are not controlled and injury occurs, there may be ways to enhance plant growth to overcome, or regain some of the loss. The experiment presented here was designed to evaluate COTMAN mapping techniques for documenting how early season thrips injury effects plant growth and maturity; and to evaluate the use of supplemental N applications during the season to enhance plant growth and yield potential of thrips injured plants. Specific objectives were to document the impact of early season thrips injury on cotton growth and yield using COTMAN plant mapping techniques, and to evaluate the ability to improve performance of thrips-injured cotton by enhancing plant growth with N fertilization during the season.

Reprinted from the *Proceedings of the Beltwide Cotton Conference*
Volume 2:1077-1079 (2001)
National Cotton Council, Memphis TN

Materials and Methods

The experiment was conducted at the Virginia Tech Tidewater Agricultural Research and Extension Center, Suffolk, VA in summer 2000. A 6-treatment, 4-replicate factorial experimental design was used. Factor 1 was thrips injury with 2 levels (level 1= an untreated control, and level 2 = a standard thrips control program using Temik 15G applied at 0.75 lb (AI)/acre into the seed furrow at planting). Factor 2 was N fertilization with 3 levels (level 1 = 25 lb (PPI) preplant incorporated, level 2 = 25 lb PPI + 45 lb at (PHS) pinhead square, and level 3 = 25 lb PPI + 33 lb at PHS + 32 lb at (FF) first flower). Plots were 4, 36-inch-center rows 40 feet long. Thrips injury was documented weekly beginning at plant emergence and ending when seedling growth reached the 6-leaf stage using a standard 0-5 visual injury rating scale where 0 = no injury and 5 = dead plants. Plant mapping using COTMAN techniques was initiated at PHS and continued through Node Above White Flower = 5 to document plant growth and maturity characteristics. Daily maximum and minimum temperatures were recorded throughout the growing season. Lint yields were determined using a commercial John Deere picker on the 2 center rows of each plot, and a sub-sample was ginned to determine lint:seed/trash ratio. Analysis of variance and means separation statistical procedures were applied.

Results and Discussion

Thrips populations were high in the experiment and injury reached severe levels (4.7 to 4.8) in all plots not receiving protection from insecticide (Table 1). Temik 15G resulted in significantly less thrips injury compared with untreated plots with injury never exceeding 2.6. Application of both Temik 15G and N had a profound effect on plant development. Generally, Temik 15G in combination with 25 lb N PPI, 25 lb PPI + 45 lb PHS, or 25 lb PPI + 33 lb PHS + 32 lb FF tracked the TDC more closely than treatments not receiving Temik 15G (Figures 1, 2 & 3). In treatments not receiving Temik 15G, regardless of N rate, the apogee was lower and nodal development was delayed by 14 days. In both Temik 15G treated and untreated plots, there appeared to be a growth advantage with application of additional N at PHS, but no additional advantage to later applications at FF. The extended flattened curve following apogee for the highest N application rate (without Temik 15G) indicated some level of compensation for the damage caused by thrips injury.

In general, lint yields paralleled these data with the highest yields occurring in plots where thrips injury was minimized with insecticide (Table 2). In both the insecticide treated and untreated plots, N fertilization increased yields. There was a significant yield increase in Temik 15G treated plots when an additional 45 lb was applied at PHS. No additional increase resulted when more N was applied at FF. In non-Temik 15G treated plots, although yields increased numerically as N rate increased, there were no significant differences among rates. N application at the middle (25 lb PPI + 45 lb PHS) and highest (25 lb PPI + 33 lb PHS + 32 lb FF) rates resulted in yields not significantly different from the Temik 15G plot treated with 25 lb N PPI, only. These results, albeit somewhat preliminary, indicate that although N application cannot substitute for thrips control, supplements can aid cotton plants in the recovery from severe early season thrips injury and offset some of the yield loss.

Table 1. Thrips injury ratings for Temik 15G and N treated cotton. Tidewater Agricultural Research and Extension Center, Suffolk, Virginia, 2000.

		Thrips injury rating[1]			
Temik 15G, lb	Nitrogen, lb	May 24	May 31	Jun 7	Jun 13
5 (IF)	25 (PPI)	0,5[2] b	1.8 b	1.6 b	1.6 b
	25 (PPI)				
5 (IF)	45 (PHS)	0.5 b	1.6 bc	1.7 b	2.3 b
	25 (PPI)				
	33 (PHS)				
5 (IF)	32 (FF)	0.5 b	1.4 c	1.6 b	2.6 b
None	25 (PPI)	3.0 a	3.9 a	4.5 a	4.8 a
	25 (PPI)				
None	45 (PHS)	3.0 a	3.9 a	4.5 a	4.8 a
	25 (PPI)				
	33 (PHS)				
None	32 (FF)	3.0a	4.0 a	4.5 a	4.7 a
LSD (P=0.05)		0.0	0.3	0.2	0.2

[1]Thrips injury rated on a 0-5 scale, 0=no thrips and 5=dead plants.
[2]Means within a column followed by the same letter(s) are not significantly different (LSD, P=0.05).

Table 2. Lint yields of Temik 15G and N treated cotton, Tidewater Agricultural Research and Extension Center, Suffolk, Virginia, 2000.

Material	Rate/A & application method/timing	Lint[1] lb/acre
Temik 15G	5 lb (IF)	
+ Nitrogen	25 lb (PPI)	903 b[2]
Temik 15G	5 lb (IF)	
+ Nitrogen	25 lb (PPI)	
+ Nitrogen	45 lb (@ PHS)	1363 a
Temik 15G (IF)	5 lb (IF)	
+ Nitrogen	25 lb (PPI)	
+ Nitrogen	33 lb (@ PHS)	
+ Nitrogen	32 lb (@ FF)	1404 a
N 25 lb (PPI)	25 lb (PPI)	604 c
Nitrogen	25 lb (PPI)	
+ Nitrogen	45 lb (@ PHS)	778 bc
Nitrogen	25 lb (PPI)	
+ Nitrogen	33 lb (@ PHS)	
+ Nitrogen	32 lb (@ FF)	848 bc
LSD (P=0.05)		246

[1]Cotton was harvested on Oct 18. Gross yields were reduced by 60% to account for seed and trash.
[2]Means within a column followed by the same letter(s) are not significantly different (LSD, P=0.05).

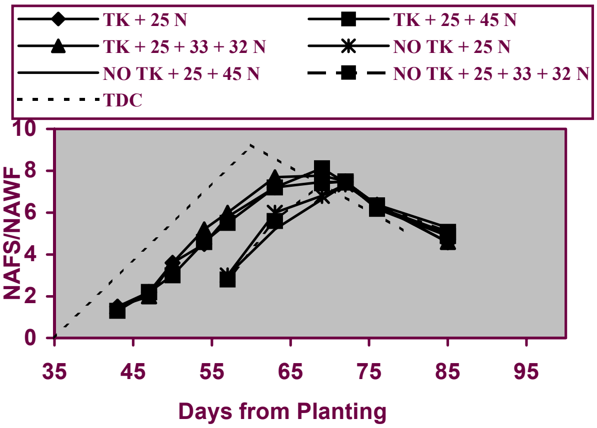

Figure 1. COTMAN generated growth curves for cotton treated with either Temik 15G at 5 lb product per acres in-furrow at planting time (TK) or no Temik (NO TK), and different rates of nitrogen fertilizer (N) at either PPI (preplant incorporated), PHS (pinhead square), or FF (first flower).

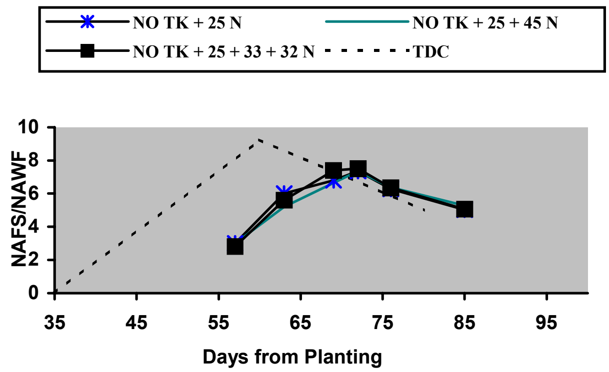

Figure 2. COTMAN generated growth curves not treated with Temik 15G (NO TK), but with different rates of nitrogen fertilizer (N) at either PPI (preplant incorporated), PHS (pinhead square), or FF (first flower).

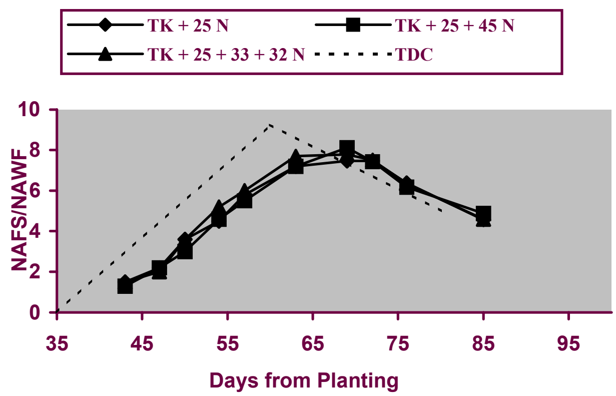

Figure 3. COTMAN generated growth curves for cotton treated with either Temik 15G at 5 lb product per acre in-furrow at planting time (TK), and different rates of nitrogen fertilizer (N) at either PPI (preplant incorporated), PHS (pinhead square), of FF (first flower).