# 2007 Cotton Research Report

Research Report No. 32
March 2008
Alabama Agricultural Experiment Station
Richard Guthrie, Director
Auburn University
Auburn, Alabama

Printed in cooperation with the Alabama Cooperative Extension System
(Alabama A&M University and Auburn University)

## Acknowledgments

This publication is a joint contribution of Auburn University, the Alabama Agricultural Experiment Station, and the USDA Agricultural Research Service. Research contained herein was partially funded through the Alabama Cotton Commission and private industry grants. All donations, including the Alabama Cotton Commission grants and private industry funding, are appreciated.



**This report can be found on the Web at**
**http://www.ag.auburn.edu/aaes/communications/researchreports/07cottonrr.pdf**

# CONTENTS

## Contents, Continued

### Nematicides



### Molecular

## Editors

K. S. Lawrence
Associate Professor
Entomology and Plant Pathology
Auburn University

C.D. Monks
Professor and Extension Specialist
Agronomy and Soils
Auburn University

D.P. Delaney
Extension Specialist IV
Agronomy and Soils
Auburn University

## Contributors

J. R. Akridge
Director
Brewton Agricultural Research Unit
Brewton, Alabama

F. J. Arriaga
Affiliate Assistant Professor
Agronomy and Soils, Auburn University
USDA-National Soil Dynamics Lab.

K. S. Balkcom
Affiliate Assistant Professor
Agronomy and Soils, Auburn University
USDA-National Soil Dynamics Lab.

J. Bergtold
Affiliate Assistant Professor
Agronomy and Soils, Auburn University
USDA-National Soil Dynamics Lab.

W. C. Birdsong
Regional Agronomist Southeast Alabama
Alabama Cooperative Extension System

C. Brodbeck
Engineer II
Biosystems Engineering, Auburn University

C. H. Burmester
Extension Agronomist
Tennessee Valley Research and Extension Center, Belle Mina, Alabama

J. Clary
Regional Extension Agent
Alabama Cooperative Extension System

L. M. Curtis
Professor and Extension Spec., Emeritus
Biosystems Engineering, Auburn University

D. P. Delaney
Extension Specialist IV
Agronomy and Soils, Auburn University

B. Dillard
Regional Extension Agent
Alabama Cooperative Extension System

C. Dillard
Agricultural Program Associate
Agronomy and Soils, Auburn University

M. P. Dougherty
Assistant Professor
Biosystems Engineering, Auburn University

F. Ducamp
Graduate Research Assistant
Agronomy and Soils, Auburn University

B. Durbin
Director, Field Crops Unit, E.V. Smith Research Center
Shorter, Alabama

B. Durham
Agricultural Program Associate
Tennessee Valley Research and Extension Center, Belle Mina, Alabama

J. P. Fulton
Assistant Professor
Biosystems Engineering, Auburn University

W. S. Gazaway
Professor and Extension Spec., Emeritus
Entomology and Plant Pathology
Auburn University

K. Glass
Agricultural Program Associate
Agronomy and Soils, Auburn University

R. W. Goodman
Associate Professor
Agricultural Economics and Rural Sociology
Auburn University

W. G. Griffith
Regional Extension Agent
Fayette County
Alabama Cooperative Extension System

M. H. Hall
Regional Extension Agent
Madison County
Alabama Cooperative Extension System

D. H. Harkins
Agricultural Program Assistant
Tennessee Valley Research and Extension Center, Belle Mina, Alabama

J. Holliman
Director, Black Belt Research and Extension Center, Marion Junction, Alabama

G. Huluka
Associate Professor
Agronomy and Soils, Auburn University

L. Kuykendall
Regional Extension Agent
Autauga County
Alabama Cooperative Extension System

G. W. Lawrence
Entomology and Plant Pathology
Mississippi State University

K. S. Lawrence
Associate Professor
Entomology and Plant Pathology
Auburn University

R. D. Locy
Professor
Biological Sciences, Auburn University

P. L. Mask
Assistant Director, Ag, For, Nat. Res.
Alabama Cooperative Extension System

C. C. Mitchell
Professor and Extension Agronomist
Agronomy and Soils, Auburn University

W. J. Moar
Professor
Entomology and Plant Pathology
Auburn University

C. D. Monks
Professor and Extension Specialist
Agronomy and Soils, Auburn University

S. R. Moore
Graduate Research Assistant
Entomology and Plant Pathology
Auburn University

S. Nightengale
Director, Plant Breeding Unit
E. V. Smith Research Center
Tallassee, Alabama

B. E. Norris
Director
Tennessee Valley Research and Extension Center, Belle Mina, Alabama

## Contributors, continued

S. H. Norwood
Regional Agent, Tennessee Valley REC
Alabama Cooperative Extension System

M. G. Patterson
Professor
Agronomy and Soils, Auburn University

H. Potter
former Regional Extension Agent
Alabama Cooperative Extension System

A. J. Price
Affiliate Assistant Professor
Agronomy and Soils, Auburn University
USDA-National Soil Dynamics Lab.

R. Raper
Affiliated Professor
Agronomy and Soils, Auburn University
USDA–National Soils Dynamic Lab

T. Reed
Extension Specialist
Tennessee Valley REC
Alabama Cooperative Extension System

N. S. Sekora
Graduate Research Assistant
Entomology and Plant Pathology
Auburn University

D. Schrimsher
Agriculture Technician I
Tennessee Valley Research and Extension Center, Belle Mina, Alabama

J. N. Shaw
Professor
Agronomy and Soils, Auburn University

N. K. Singh
Professor
Biological Sciences, Auburn University

R. H. Smith
Professor and Extension Spec., Emeritus
Entomology and Plant Pathology
Auburn University

D. Sullivan
Soil Scientist
USDA–ARS, Southeast Watershed Research Lab, Tifton, Georgia

D. B. Weaver
Professor
Agronomy and Soils, Auburn University

A. Winstead
Regional Agent, Tennessee Valley REC
Alabama Cooperative Extension System

R. P. Yates
Regional Extension Agent
Marengo County
Alabama Cooperative Extension System

# IRRIGATION

## Cotton Income Gains Due to Irrigation – 2007 Report

M. P. Dougherty, J. P. Fulton, C. H. Burmester, L. M. Curtis, D. H. Harkins, B. Durham, B. E. Norris, and C. D. Monks

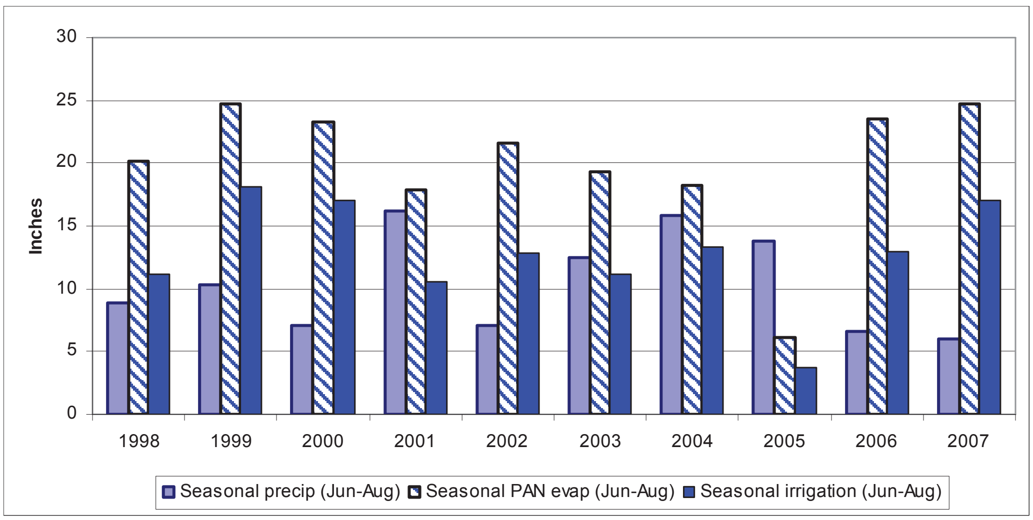
The 2006 and 2007 growing seasons were progressively dryer at the Tennessee Valley Research and Extension Center (TVREC), Belle Mina, Alabama, with decreasing precipitation and increasing evaporation during both years (see figure). The most recent 10-year average rainfall at Belle Mina for June through August is 10.5 inches; and the 78-year average is 11.5 inches. Comparable season rainfall in 2006 and 2007 was less than 7 inches.

Only four previous years on record had such low rainfall during these months; and only one year on record, 1954, had less rainfall than 2007. Not only was rainfall low, but evapotranspiration (approximated by pan evaporation in figure) was extremely high throughout the growing season of both years. As a result, cotton producers with adequate irrigation had the potential to realize significant yield gains in 2006 and 2007, similar to the excellent response to irrigation observed in 1999 and 2000.

This report evaluates irrigated cotton income gains over comparable dryland cotton using yield and irrigation data for overhead sprinkler plots at TVREC during two back-to-back drought years, 2006 and 2007. Total annual irrigation system ownership costs of $87.95 per acre and irrigation operating costs of $9.39 per acre-inch for a 140-acre pivot are taken from Timely Information Series publication BSEN-IRR-07-01 (May 2007) (http://www.aces.edu/dept/irrig/anIRR-01.php).

Table 1 shows increasing seasonal operating costs for irrigation as larger depths of water are applied. During the 2006 and 2007 drought, 100 percent of pan evaporation, adjusted for canopy cover, was required in sprinkler research plots to achieve maximum yields (Table 1). Total seasonal irrigation depths were extremely high during 2006 and 2007 (approximately 20 inches).

Table 2 shows that in 2006, if estimated irrigation ownership and operating costs are charged against 2006 gross receipts, overhead sprinkler irrigation results in a net income gain of $26 per acre over dryland (irrigation replaces 50 percent of pan evaporation, adjusted for crop canopy). A maximum net income gain of $144 per acre over




Ten-year seasonal water balance (June through August only), TVREC, Belle Mina, Alabama. Annual seasonal irrigation is calculated as 90 percent x seasonal pan evaporation x crop canopy factor.

**Table 1. Comparative Yields, Gross Receipts, and Estimated Operating Costs for Overhead Sprinkler Irrigation, 2006 and 2007, TVREC, Belle Mina, Alabama[1]**

| Source: TVREC record: 2006-2007 | | 2006 Lint yield *bales/A[2]* | 2007 Lint yield *bales/A[2]* | 2006 Gross receipts *$/A[3]* | 2007 Gross receipts *$/A[3]* | 2006 Operating costs *$/A[4]* | 2007 Operating costs *$/A[4]* |
|---|---|---|---|---|---|---|---|
| Sprinkler plots (actual 2006, 2007 irrigation depths): | | | | | | | |
| Dryland / winter cover | (0.0”, 0.0”) | 1.2 | 1.0 | $312 | $260 | $0 | $0 |
| 25% x PAN x canopy cover factor | (4.9”, 4.3”) | 1.7 | 2.2 | $438 | $589 | $46 | $40 |
| 50% x PAN x canopy cover factor | (10.1”, 9.6”) | 2.0 | 3.4 | $521 | $895 | $95 | $90 |
| 75% x PAN x canopy cover factor | (15.2”, 14.7”) | 2.2 | 3.8 | $574 | $1,000 | $143 | $138 |
| 100% x PAN x canopy cover factor | (20.4”, 19.3”) | 2.8 | 4.0 | $736 | $1,058 | $192 | $181 |
| 125% x PAN x canopy cover factor | (25.2”, 24.4”) | 2.9 | 3.9 | $774 | $1,040 | $236 | $229 |

[1] Operating costs do not include irrigation annual ownership costs.

[2] 2006: 38% turnout; 2007: 41 percent turnout.

[3] Gross receipts $0.55 / pound lint (includes resale of $200/ton seed).

[4] Operatiing cost for 101 horsepower diesel motor for irrigation pump; Estimated pumping costs for a 140-ac pivot-irrigated cotton field are $9.39/ac-in. Source: http://www.aces.edu/dept/irrig/anIRR-01.php.

dryland would be realized if irrigation replaced 100 percent of pan evaporation, adjusted for crop canopy. In 2007, a higher response to irrigation was observed in all sprinkler research plots. As a result, when estimated irrigation ownership and operating costs are charged against 2007 gross receipts, net income gain due to irrigation is $201 per acre over dryland even if irrigation replaces only 25 percent of pan evaporation, adjusted for crop canopy. Based on 2007 field trial data, a maximum net income gain of $529 per acre would be realized if irrigation replaced 100 percent of pan evaporation, adjusted for crop canopy. A separate report discusses reasons for the higher irrigation response in 2007 sprinkler trials at TVREC.

**TABLE 2. ESTIMATED NET INCOME GAIN OVER DRYLAND DUE TO OVERHEAD SPRINKLER IRRIGATION, 2006 AND 2007, TVREC, BELLE MINA, ALABAMA**

| Source: TVREC record: 2006-2007 | | 2006 Gross receipts *$/A*[1] | 2007 Gross receipts *bales/A*[1] | 2006 Total ownership + Operating costs *$/A*[2] | 2007 Total ownership + Operating costs *$/A*[2] | 2006 Net income gain over dryland *$/A* | 2007 Net income gain over dryland *$/A* |
|---|---|---|---|---|---|---|---|
| Sprinkler plots (actual 2006, 2007 irrigation depths): | | | | | | | |
| Dryland / winter cover | (0.0”, 0.0”) | $312 | $260 | $0 | $0 | --- | --- |
| 25% x PAN x canopy cover factor | (4.9”, 4.3”) | $438 | $589 | $134 | $128 | ($7) | $201 |
| 50% x PAN x canopy cover factor | (10.1”, 9.6”) | $521 | $895 | $183 | $178 | $26 | $457 |
| 75% x PAN x canopy cover factor | (15.2”, 14.7”) | $574 | $1,000 | $231 | $226 | $31 | $515 |
| 100% x PAN x canopy cover factor | (20.4”, 19.3”) | $736 | $1,058 | $280 | $269 | $144 | $529 |
| 125% x PAN x canopy cover factor | (25.2”, 24.4”) | $774 | $1,040 | $324 | $317 | $138 | $463 |

[1] Gross receipts $0.55 / pound lint (includes resale of $200/ton seed).
[2] Ownership costs = $87.95/ac; Operating costs = $9.39/ac-in (Table 1). Estimated costs include a 140-ac pivot system, with pump and motor. Source: http://www.aces.edu/dept/irrig/anIRR-01.php.

## SUBSURFACE DRIP IRRIGATION (SDI) FERTIGATION FOR SITE-SPECIFIC, PRECISION MANAGEMENT OF COTTON

M. P. Dougherty, J. P. Fulton, C. H. Burmester, B. E. Norris, D. H. Harkins, L. M. Curtis, and C. D. Monks

Since 2006, an SDI study at the Tennessee Valley Research and Extension Center (TVREC) has evaluated four precision fertigation management scenarios. Approximately 7,500 feet of SDI tape and four positive displacement liquid fertilizer injectors were used to evaluate four replications of five nutrient timing treatments. The twenty treatment plots were made up of eight, 345-foot rows of cotton on 40-inch row spacing, with drip tape between every other row of cotton. The four fertigation treatments and one non-fertigated control are described in Table 1.

Yield results for 2006 and 2007, two of the driest consecutive years on record at TVREC, are shown in the figure. Significant yield, quality, and nutrient differences are presented in Tables 2 and 3. Fertigated plot yields were comparable in 2007 and 2006 (2.9 bales and 3.0 bales, respectively). In 2007, the non-fertigated control (treatment 1) was the highest yielding treatment, but was not significantly different from the two highest fertigated treatments (treatments 2 and 5). The three highest yielding treatments in 2007 received at least 20 pounds of sur-

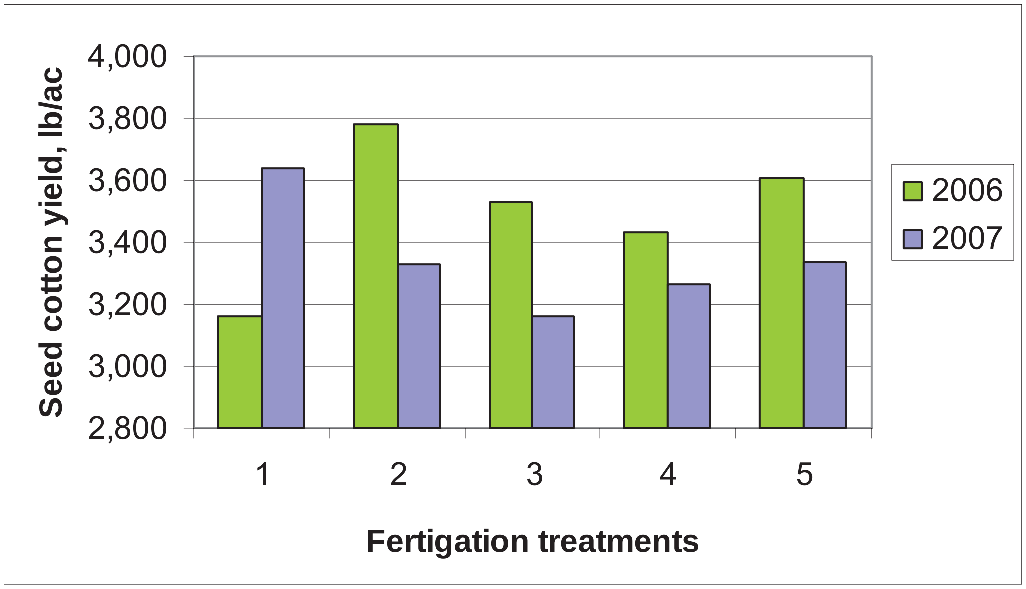
**TABLE 1. TREATMENT DESCRIPTION, FERTIGATION MANAGEMENT TRIALS, 2006-2007**

| Treatment[1] | Description |
|---|---|
| 1. Control – drip irrigated, but all fertilizers are surface applied. | Preplant 60 pounds N and K 60 (surface)<br>Post-Plant N (75 lb/A) sidedressed at early square. |
| 2. Timing 1 – with surface preplant | Preplant 20 pounds of N and K (surface).<br>Drip 40 pounds N,K – square to bloom (25 days)<br>Drip 75 pounds N,K – bloom to 25 days |
| 3. Drip timing 1 – no preplant | Planting Drip 20 pounds N,K<br>Drip 40 pounds N,K – square to bloom (25 days)<br>Drip 75 pounds N,K – bloom to 25 days |
| 4. Drip timing 2 – no preplant “spoon-fed” | Planting Drip 20 pounds N,K<br>Drip 40 pounds N,K – square to bloom (25 days)<br>Drip 75 pounds N,K – bloom to 40 days |
| 5. Timing 2 – with surface preplant | Preplant 40 pounds of N and K (surface).<br>Drip 95 pounds N,K – square through bloom (50 days) |

[1] All treatments received 135 pounds per acre of nitrogen and potassium ($K_2O$), 20 pounds per acre of sulfur, and l.0 pound per acre of boron. Phosphorus fertilizer was surface-applied to maintain P at high soil test levels. Drip fertilizer was 8-0-8-1.2S-0.06B made using 32 percent liquid N, potassium thiosulfate, fertilizer grade KCL, solubor, and water.

face-applied, preplant nitrogen and potassium ($K_2O$). In 2006, the non-fertigated control (treatment 1) was the lowest yielding treatment, with highest fertigated yields observed where fertigated nutrients were applied within 50 days of square (treatments 2 and 5).

The non-fertigated control treatment responded much better in 2007, possibly due to beneficial downward movement of surface-applied fertilizer early in the season as a result of 4.55 inches of rain from May through July. A comparable number of storm events in 2006 delivered only 2.87 inches of rain over the same May through July period. As a result, in spite of nearly equal total seasonal rainfall in the 2007 and 2006 growing seasons (6.1 inches and 6.6 inches, respectively), higher early season rainfall in 2007 may have assisted delivery of surface-applied nutrients. Several large convectional storms later in the 2007 season may have further moved surface-applied nutrients into the soil horizon, while leaching fertigated nutrients farther out of reach of roots. Increased soil moisture monitoring is being installed in 2008. In both 2007 and 2007, plant tissue nutrients were generally higher in the highest yielding treatments, with plant tissue boron, manganese, and sodium (results not shown) generally lower in the surface-applied control treatment (treatment 1).




Seed cotton yield, lb/A, drip tier fertigation management study, Belle Mina, AL, 2006-2007. N=4. Turnout = 41 percent.

**Table 2. Yield and Quality Analysis, Cotton Fertigation Management Trials, 2007**

| trt[1] | Lbs/A | Mic | Length | Strength | Uniformity | N% | Ca% | K% | Mg% | P% |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3636 a[2] | 4.40 a | 1.11 ab | 31.1 a | 84.0 a | 4.65 a | 3.30 a | 1.74 a | 0.57 a | 0.44 b |
| 2 | 3328 ab | 4.53 a | 1.11 ab | 30.7 ab | 84.2 a | 4.12 b | 3.09 ab | 1.58 ab | 0.42 bc | 0.54 a |
| 3 | 3164 b | 4.48 a | 1.10 b | 29.6 b | 83.9 a | 3.95 b | 2.83 b | 1.47 b | 0.38 c | 0.47 b |
| 4 | 3266 b | 4.45 a | 1.09 b | 30.8 ab | 83.9 a | 3.49 c | 2.99 b | 1.47 b | 0.41 bc | 0.49 ab |
| 5 | 3333 ab | 4.40 a | 1.13 a | 30.9 ab | 84.4 a | 4.14 b | 3.07 ab | 1.57 ab | 0.44 b | 0.47 b |

[1]1. Surface-applied N-P-K with drip irrigation (control). 2. Preplant 20 lb. N-K surface with 2 N-K drip timings. 3. 20 lb. N-K drip at planting with 2 N-K drip timings (to 25 days after bloom). 4. 20 lb. N-K at planting with 2 N-K drip timings (to 40 days after bloom). 5. Preplant 40 lb. N-K surface with 1 N-K drip timing (square through bloom).

[2] Different subscripts denote statistical difference (α=0.10). N=4. Turnout = 41percent.

**Table 3. Yield and Quality Analysis, Cotton Fertigation Management Trials, 2006**

| trt[1] | Lbs/A | Mic | Length | Strength | Uniformity | N% | Ca% | K% | Mg% | P% |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3160 c[2] | 4.83 a | 1.13 ab | 31.1 a | 84.3 a | 3.88 ab | 2.06 a | 1.48 a | 0.35 a | 0.28 a |
| 2 | 3780 a | 4.63 b | 1.15 a | 30.8 ab | 84.4 a | 3.92 a | 2.01 ab | 1.45 a | 0.32 b | 0.29 a |
| 3 | 3528 ab | 4.60 b | 1.12 b | 30.6 ab | 84.2 a | 3.62 bc | 1.86 c | 1.28 b | 0.32 b | 0.24 b |
| 4 | 3430 bc | 4.65 b | 1.13 b | 30.1 b | 83.8 a | 3.59 c | 2.07 a | 1.44 a | 0.31 b | 0.30 a |
| 5 | 3606 ab | 4.58 b | 1.13 b | 30.2 b | 83.9 a | 3.80 abc | 1.87 bc | 1.31 b | 0.32 b | 0.26 ab |

[1]1. Surface-applied N-P-K with drip irrigation (control). 2. Preplant 20 lb. N-K surface with 2 N-K drip timings. 3. 20 lb. N-K drip at planting with 2 N-K drip timings (to 25 days after bloom). 4. 20 lb. N-K at planting with 2 N-K drip timings (to 40 days after bloom). 5. Preplant 40 lb. N-K surface with 1 N-K drip timing (square through bloom).

[2] Different subscripts denote statistical difference (α=0.10). N=4. Turnout = 41percent.

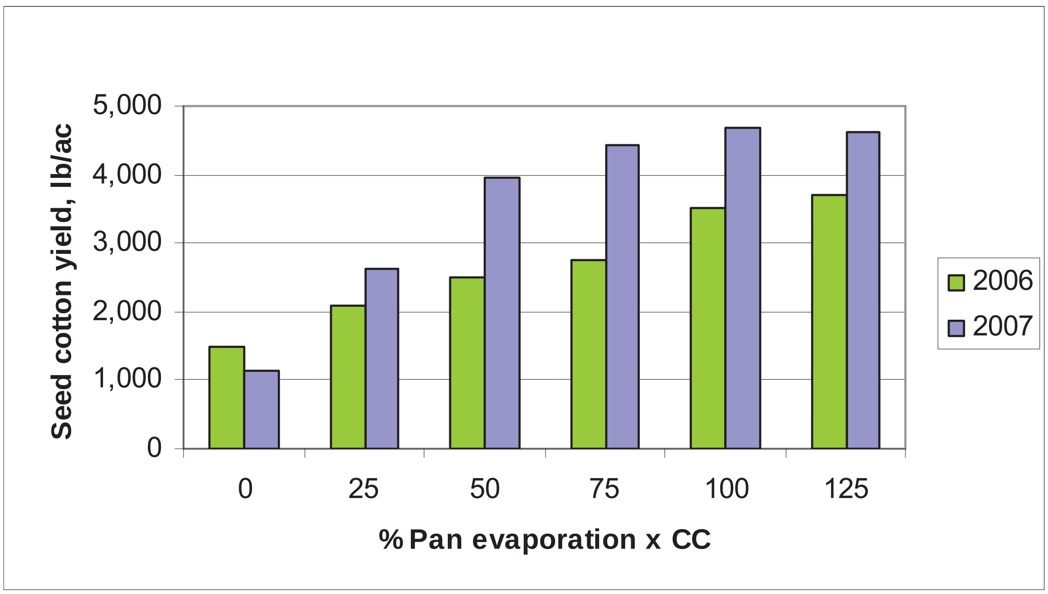
# Sprinkler Irrigation for Site-Specific, Precision Management of Cotton

M. P. Dougherty, J. P. Fulton, C. H. Burmester, B. E. Norris, D. H. Harkins, L. M. Curtis, and C. D. Monks

The sprinkler scheduling study initiated in 2006 at the Tennessee Valley Research and Extension Center (TVREC) was continued during 2007 on a randomized block design of 48 plots (39'x39') to test the soil and plant response of cotton grown using six irrigation treatments. Treatments ranged from 0 percent (dryland) to 125 percent of calculated pan evaporation adjusted for percent canopy cover. Of note, 2007 was the driest growing season on record at Belle Mina since 1954. June through August rainfall was less than 7 inches during both 2006 and 2007 growing seasons, with pan evaporation surpassing 23 inches each year.

Yield results from 2006 and 2007 (see figure) provided benchmarks indicating the response of various irrigation schedules on yield and operating cost. Sprinkler irrigated cotton yields averaged 2.3 bales in 2006 and 3.5 bales in 2007 (Table 1). From 2006 to 2007, dryland yield decreased while sprinkler-irrigated treatments increased. The highest yielding sprinkler treatment in 2007 (irrigation at 100 percent of calculated pan evaporation x canopy cover adjustment) yielded four bales per acre. Significantly increased 2007 sprinkler plot yields may have been due to a change in experimental method in 2007, which included deeper, less frequent irrigations, or due to a higher number of total heat-degree days in 2007, especially during the month of July. In 2008, a canola-soybean-cotton rotation will be incorporated into 24 of the 48 sprinkler test plots to assess the economic feasibility of adding two oil crops to a northern Alabama cotton rotation.

Table 2 provides estimated operating costs for pivot irrigation based on overhead sprinkler trials at TVREC during two back-to-back drought years, 2006 and 2007. Total irrigation operating costs of $9.39 per acre-inch are taken from Timely Information Series publication BSEN-IRR-07-01 (May 2007), assuming a 140-acre pivot. In a separate report, net income gain due to irrigation in 2006 and 2007 is estimated by deducting total estimated irrigation costs (ownership + operating) from estimated gross receipts and then comparing the results with estimated dryland receipts.




Seed cotton yield, precision sprinkler irrigation cotton trials, lb/A, for 2006 and 2007. Different subscripts denote statistical difference. In 2006, N=4, turnout = 38 percent. In 2007, N=8, turnout = 41 percent. In 2006, four out of eight replications were discarded due to irrigation malfunction. CC=canopy cover factor, where 100 percent equals closed canopy.

**Table 1. Yield Averages per Treatment for 2006 and 2007, Sprinkler Scheduling Trials**

| | 2006 | | 2007 | |
|---|---|---|---|---|
| Treatment | Seed cotton *lbs/A* | Bales *bales/A* | Seed cotton *lbs/A* | Bales *bales/A* |
| 125% pan evaporation x canopy cover factor | 3704 a[1] | 2.9 | 4612 a[1] | 3.9 |
| 100% pan evaporation x canopy cover factor | 3520 a | 2.8 | 4692 a | 4.0 |
| 75% pan evaporation x canopy cover factor | 2748 b | 2.2 | 4437 a | 3.8 |
| 50% pan evaporation x canopy cover factor | 2491 b | 2.0 | 3970 b | 3.4 |
| 25% pan evaporation x canopy cover factor | 2098 c | 1.7 | 2613 c | 2.2 |
| 0% pan evaporation (dryland) | 1492 d | 1.2 | 1151 d | 1.0 |

[1]Different subscripts denote statistical difference (α=0.10). In 2006, N=4, turnout 38 percent. In 2007, N=8, turnout 41 percent.

**Table 2. Irrigation Amounts and Estimated Center Pivot Operating Costs, Based on 2006 and 2007 TVREC Sprinkler Irrigation Trials**

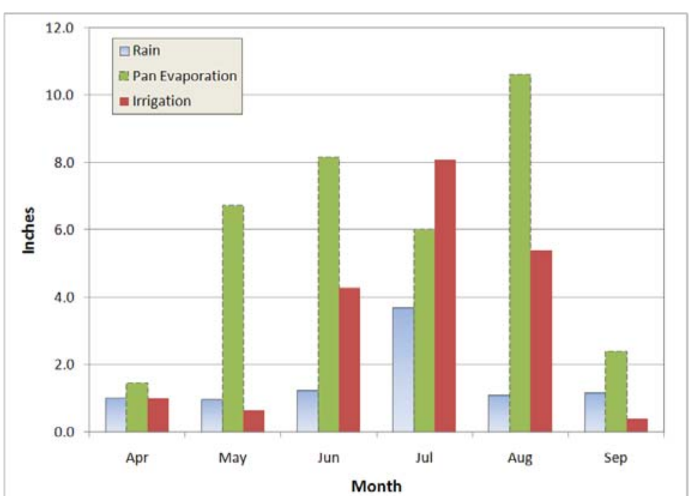
| Treatment | 2006 Irrigation depth *in* | 2006 Operating costs *$/A*[1] | 2007 Irrigation depth *in* | 2007 Operating costs *$/A*[1] |
|---|---|---|---|---|
| 125% pan evaporation x canopy cover factor | 25.17 | $236.35 | 24.42 | $229.30 |
| 100% pan evaporation x canopy cover factor | 20.44 | $191.93 | 19.31 | $181.32 |
| 75% pan evaporation x canopy cover factor | 15.24 | $143.10 | 14.71 | $138.13 |
| 50% pan evaporation x canopy cover factor | 10.07 | $94.56 | 9.63 | $90.43 |
| 25% pan evaporation x canopy cover factor | 4.87 | $45.73 | 4.29 | $40.28 |
| 0% pan evaporation (dryland) | 0.00 | $0.00 | 0.00 | $0.00 |

[1]Operating cost for 101 horsepower diesel motor for irrigation pump; Estimated operating costs based on a 140-ac pivot-irrigated cotton field are $9.39/ac-in. Source: http://www.aces.edu/dept/irrig/anIRR-01.php.

## Evaluating Pressure-Compensating Subsurface Drip Irrigation (SDI) for No-Till Row Crop Production on Rolling, Irregular Terrain

J. P. Fulton, M. P. Dougherty, J. N. Shaw, L. M. Curtis, C. H. Burmester, R. Raper, C.Brodbeck, B. Durham, D. H. Harkins, A. Winstead, and S. H. Norwood

The study was conducted on a 12-acre field located at the Tennessee Valley Research and Extension Center (TVREC), Belle Mina, Alabama. The two major objectives were to evaluate cotton production on rolling terrain irrigated with SDI in conjunction with cover crops and to evaluate spatial yield variability as related to water distribution and topography. The experimental design was a randomized block design with two irrigation treatments (Irr – irrigated; No Irr – non-irrigated) and two cover crop treatments (C – Cover; NC – No Cover) with four replications. Plots measured 27 feet by 1250 feet with SDI tape laid out in 1250-foot runs on 80-inch spacing (every other row of 40-inch cotton) and buried at an average depth of 13 inches. Plots receiving a cover crop treatment were planted with rye at a rate of 90 pounds per acre on October 23, 2006. Cotton, variety ST 4554 B2RF, was planted on April 23, 2007.




2007 accumulated monthly pan evaporation, rainfall, and irrigation during the growing season.

In 2007, irrigated treatments were to be scheduled based on daily application of 90 percent of daily pan evaporation, with the application amount adjusted for percent crop canopy cover. However, in mid-June, the water application amount was increased to more than two times the 90 percent level due to obvious plant development problems caused by extremely low soil moisture in the developing root zone. The figure presents the accumulated rainfall, pan evaporation, and irrigation over the growing season. During the 2007 growing season, a total of 19.8 inches of water was applied with only 8.1 inches of rain.

All plots were harvested on October 3 and 4, 2007. Mean yields per treatment and statistical significance for the 2007 growing season are provided in Table 1. Lint turnout data indicated that irrigated treatments averaged 44 percent while non-irrigated plot treatments averaged 40 percent. Significant yield differences were measured between the irrigated and non-irrigated treatments. As in 2006, irrigated yields were significantly higher than non-irrigated yields with 2007 treatment yields 66 percent higher than non-irrigated yields. Irrigated treatment yields averaged approximately three bales per acre in 2007. These yields were impressive considering the exceptional drought conditions experienced during the growing season and the questionable adequacy of irrigation early in the season.

No significant differences existed between cover and no-cover plots in 2007 although there was a numerical increase in yield for plots with cover crops compared to those without. It should be noted that the 16 percent difference between cover treatments in 2006 was partly caused by water application issues in the no-cover plots. For example, there was about a 3-week period in June where, due to a scheduling error, the irrigated/no-cover plots did not receive water probably causing a difference. Numerically higher yields in the 2007 cover crop treatment suggested that cover crops have potential yield benefits.

A quality analysis was conducted by harvesting 50 cotton bolls collected at six locations within each plot (96 total samples; six locations x 16 plots) in 2007. Quality factors considered were micronaire, strength, uniformity, and lint length (Table 2). There were significant differences between the irrigated and non-irrigated treatments for all quality factors which also existed in the 2006 quality data (Table 3). Micronaire values were below 3.5 for the non-irrigated plots, signifying a discount. Strength and uniformity were significantly higher on the irrigated plots with a high strength classification and an average to high uniformity, whereas the non-irrigated plots produced average strength and low to average uniformity. No significant differences existed between the irrigated/cover treatments compared to irrigated/no-cover. Micronaire, uniformity, and lint length were significantly different for the cover and no-cover, non-irrigated treatments. Uniformity and lint length had higher values (not always significant) in the no-cover treatments.

In summary, irrigated treatments in the 2007 growing season had significantly higher yields (66 percent greater) than non-irrigated treatments and compared to similar yield differences (60 percent) observed in 2006. While not significant, the winter cover crop did provide a 6 percent yield benefit in 2007. Results of the 2007 quality data indicated that repeatable differences existed, with micronaire, lint strength, lint uniformity, and lint length being significantly higher on irrigated than non-irrigated plots, a result also observed in 2006.

**Table 1. Yield Averages per Treatment for 2006 and 2007**

| Treatment | 2006 Seed cotton | 2006 Bales | 2007 Seed cotton | 2007 Bales |
|---|---|---|---|---|
| | *lbs/A* | *bales/A* | *lbs/A* | *bales/A* |
| Irrigated / Cover | 2853 a[1] | 2.6 | 3574.8 a | 3.1 |
| Irrigated / No-Cover | 2396 b | 2.1 | 3350.0 a | 2.9 |
| Non-Irrigated / Cover | 1098 c | 1.0 | 1187.9 b | 1.0 |
| Non-Irrigated / No-Cover | 941 c | 0.8 | 1119.3 b | 1.0 |

[1] Mean yields with similar letters indicate they are not statistically different at the 90 percent confidence level.

**Table 2. 2007 Quality Averages per Treatment**

| Treatment | Micronaire | Strength | Uniformity | Length |
|---|---|---|---|---|
| | *lbs/A* [1] | *g/Tex* | *%* | *in* |
| Irrigated / Cover | 4.7 a[2] | 30.0 a | 82.9 a | 1.10 a |
| Irrigated / No-Cover | 4.6 a | 29.4 a | 83.0 a | 1.11 a |
| Non-Irrigated / Cover | 3.3 b | 26.3 b | 79.6 b | 1.05 b |
| Non-Irrigated / No-Cover | 3.1 c | 26.1 b | 80.9 c | 1.08 c |

[1] Values between 3.5 and 4.9 are not discounted at the gin.

[2] Mean yields with similar letters indicate they are not statistically different at the 90 percent confidence level.

**Table 3. 2006 Quality Averages per Treatment**

| Treatment | Micronaire | Strength | Uniformity | Length |
|---|---|---|---|---|
| | *lbs/A* [1] | *g/Tex* | *%* | *in* |
| Irrigated / Cover | 4.4 a[2] | 28.5 a | 83.5 a | 1.1 a |
| Irrigated / No-Cover | 3.9 b | 28.0 a | 82.8 b | 1.1 a |
| Non-Irrigated / Cover | 4.1 b | 26.1 b | 81.8 c | 1.0 b |
| Non-Irrigated / No-Cover | 4.1 b | 25.2 c | 81.2 c | 1.0 b |

[1] Values between 3.5 and 4.9 are not discounted at the gin.

[2] Mean yields with similar letters indicate they are not statistically different at the 90 percent confidence level.

# WEED CONTROL

## Early Season Pigweed Control in Conservation Tillage Cotton

A. J. Price, C. D. Monks, and M. G. Patterson

Cotton acreage in conservation tillage systems is estimated to approach 60 percent in the southeastern United States. The use of cover crops in conservation tillage offers many advantages, one of which is weed suppression through physical as well as chemical allelopathic effects. Cereal rye (*Secale cereale* L.) is one of the most common winter cover crops recommended for cotton production in the United States. Recently, glyphosate-resistant Palmer amaranth *(Amaranthus palmerii)* has been discovered in Arkansas, Georgia, North Carolina, South Carolina, and Tennessee, and populations in Alabama may also be resistant. Current resistant Palmer amaranth control recommendations in Georgia rely on soil applied herbicides. However, conservation tillage systems are disadvantaged due to herbicide interception by winter cover residue. Banding herbicides over the drill may protecting cotton yield while reducing inputs. High amounts of residue can inhibit weed germination and emergence. Pigweed control may be higher in high-residue systems versus low-residue systems and at control levels equivalent to conventional tillage systems utilizing soil applied herbicides. Field studies were conducted to evaluate pigweed density, biomass, and cotton yield provided by two tillage systems containing four winter residue amounts in the conservation tillage system and four herbicide systems.

In the fall of 2006, field experiments were established at the E.V. Smith Research Center (EVSRC) located near Shorter, Alabama, and at the Tennessee Valley Research and Extension Center (TVREC) near Bella Mina, Alabama. The experimental design was a randomized complete block, having a split block restriction on randomization, with three replicates. Native populations of Palmer amaranth and redroot pigweed *(Amaranthus hybridus)* were present at EVSRC and TVREC locations, respectively. However, an additional 120,000 seed of each respective pigweed species was broadcast early spring over each plot.

Parallel strips consisted of four conservation-tillage treatments: high (PD1), medium (PD2), and low (PD3) amounts of cereal rye plus a winter fallow treatment, as well as a conventional tillage treatment that was left fallow. Three cereal rye residue amounts were generated by utilizing three fall planting dates: 2 and 4 weeks prior to and on the historical average first frost. The rye was established with a no-till drill at a seeding rate of 100 kg/ha; 56 kg of nitrogen (N) as ammonium nitrate was applied to rye in the fall. Additionally, perpendicular strips consisted of four herbicide regimes.

In the spring, the rye cover crop as well as weeds in the winter fallow treatment were terminated using glyphosate at 1.12 kg ae/ha and a mechanical roller-crimper. Cover biomass from each plot was measured immediately before termination; the aboveground rye cover was sampled, dried, and weighed.

The cotton variety DP 555 BG/RR was seeded at EVSRC following within-row subsoiling of all plots with a narrow-shanked parabolic subsoiler. The cotton variety DP 444 BG/RR was direct-seeded at TVREC. The conventional tillage treatment was prepared with multiple disk passes and cotton was seeded with a four-row planter equipped with row cleaners and double-disk openers at both locations. Both experimental areas were exposed to extreme drought, and the experimental area at EVSRC received minimal supplemental irrigation. At both locations, plots consisted of four 6-m rows spaced 102 cm apart.

Evaluations also included pigweed density, dry weight and fresh weight before and after postemergence and layby herbicide applications, cotton stand establishment, and height. Cotton seed lint yields were determined by machine-harvesting the middle two rows of each plot with a spindle picker. Due to space limitations, results from the herbicide regimes are not discussed here.

**Winter cover crop biomass and weed density.** At both locations, the highest rye biomass was attained following the earliest planting date and the lowest biomass was attained following the latest planting date (Figures 1 and 2). At TVREC, biomass yields of 8,680, 7,390, and 6,430 kg/ha were attained for planting dates one, two and three, respectively (Figure 1). At TVREC, the highest pigweed density (1,073,000 plants/ha) was observed following the winter fallow conservation-tillage (WF) treatment. The second highest densities were observed following the third planning date (493,000 plants/ha) and the conventional-tillage (CT) (560,000 plants/ha) treatments. The lowest densities followed the first (90,000 plants/ha) and second planting dates (123,000 plants/ha). At EVSRC, biomass yields of 8,430, 6,050, and 4,170 kg/ha were attained for planning dates one, two, and three, respectively (Figure 2). At EVSRC, the highest pigweed density again followed the winter fallow conservation-tillage treatment (797,000 plants/ha). The second highest density followed the conventional-tillage treatment (580,000). All three conservation-tillage systems provided lower densities ranging between 210,000 and 230,000 plants/ha compared to both the winter fallow conservation tillage and conventional tillage treatments.

**Winter cover crop biomass and pigweed biomass.** Differences between location and pigweed species biomass were significant. At TVREC, redroot pigweed biomass generally reflected pigweed density, with the highest pigweed biomass (270 kg/ha) attained in winter fallow conservation tillage and conventional tillage (200 kg/ha) treatments (Figure 3). Planting date three resulted in 20 kg biomass/ha while planting dates one and two resulted in less than 3 kg biomass/ha. At EVSRC, similar Palmer amaranth biomasses were observed in the winter fallow conservation tillage (85 kg/ha) and conventional tillage treatments (95 kg/ha) (Figure 4). Densities of 60 kg/ha and 55 kg/ha were observed in planting date treatments one and two, respectively. However, the third planting date, which provided similar pigweed density compared to planning dates one and two, provided the lowest pigweed biomass (25 kg/ha). Because the experimental area experienced severe drought stress throughout the season, the larger pigweed in the earlier planting dates may be due to increased moisture conservation provided by the higher mulch residue attained in these treatments, resulting in larger plants.

**Cotton yield.** At TVREC and EVSRC, cotton yield was not dependent on pigweed density (Figures 5 and 6) or pigweed biomass (data not shown). Additionally, all conservation-tillage treatments yielded more seed cotton than the conventional tillage treatment.

In conclusion, increasing amounts of winter cover biomass can decrease early season pigweed density in conservation-agriculture systems, thus allowing for a size differential between pigweed and crop for future herbicide applications.

Weed control provided by shallow tillage is similar to conservation-agriculture systems that have moderate amounts of residue.

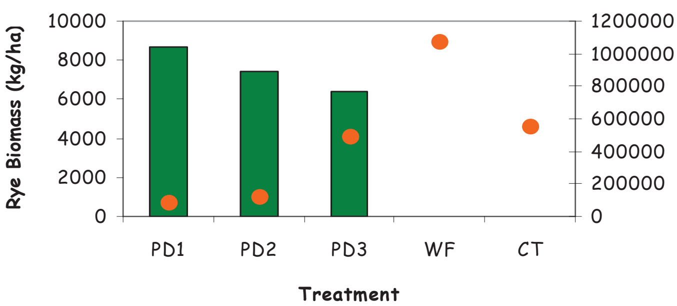



Figure 1. Cover biomass vs. early season pigweed density, TVREC, 2007. Bars represent rye biomass, dots represent pigweed density.

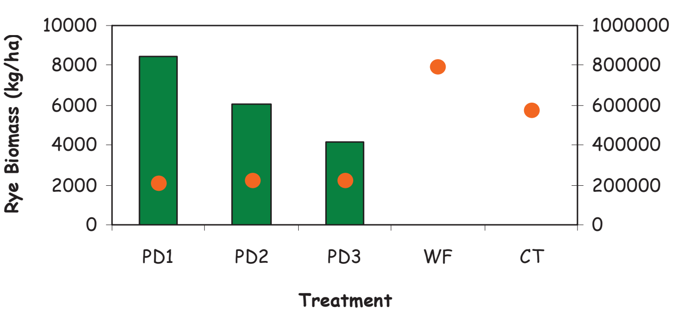



Figure 2. Cover biomass vs. early season pigweed density, EVSRC, 2007. Bars represent rye biomass, dots represent pigweed density.

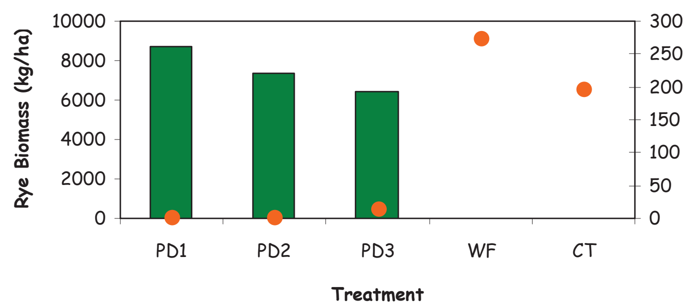



Figure 3. Cover biomass vs. early season pigweed biomass, TVREC, 2007. Bars represent rye biomass, dots represent pigweed density.

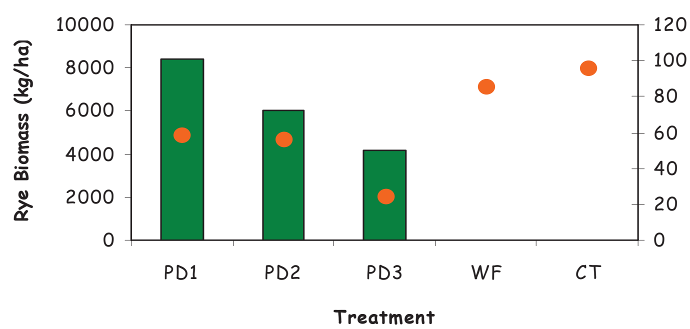



Figure 4. Cover biomass vs. early season pigweed biomass, EVSRC, 2007. Bars represent rye biomass, dots represent pigweed density.

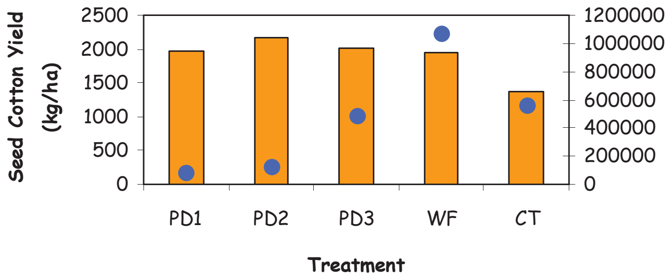



Figure 5. Cotton yield vs. early season pigweed density by cover crop treatment, TVREC, 2007. Bars represent rye biomass, dots represent pigweed density.

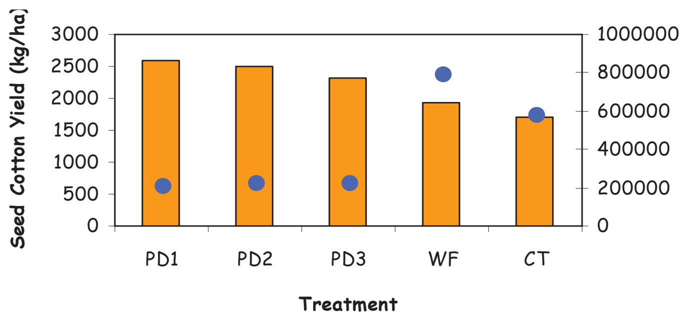



Figure 6. Cotton yield vs. early season pigweed density by cover crop treatment, EVSRC, 2007 Bars represent rye biomass, dots represent pigweed density.

## Influence of Tillage and Herbicides on Weed Control in Cotton

Mike Patterson and C. D. Monks

Tillage systems—including (1) moldboard plowing followed by disking with Prowl at 2 pints per acre followed by field cultivation, (2) disking twice with Prowl followed by field cultivation, (3) no-till with Prowl preemergence after planting, and (4) no-till without Prowl—were initiated in the spring of 2006 at the E.V. Smith Research Center. The trial was planted in Roundup Ready Flex cotton. Preemergence herbicides including Cotoran, Caparol, or none were applied after planting. Postemergence herbicides used following preemergence herbicides included either Roundup Weathermax at 22 fluid ounces per acre or none. The trial area was infested with annual grasses (goosegrass and crabgrass) and spiny pigweed. Visual weed control and seed cotton yields were obtained. The test area was replanted in 2007 using no-till planting across the entire test area to determine the residual effects of tillage conducted in 2006.

Weed control and seed cotton yields in 2006 were higher overall for the plots that received moldboard plowing, regardless of the preemergence or postemergence herbicides applied after tillage operations (Figures 1 and 2). No-till without Prowl resulted in lower overall weed control and cotton yield. This tillage influence carried over somewhat in 2007 with the same yield trend as 2006 (Figure 3). Continuing the trial in 2008 will provide more information on the potential residual benefits of primary tillage as an occasional break from reduced tillage.

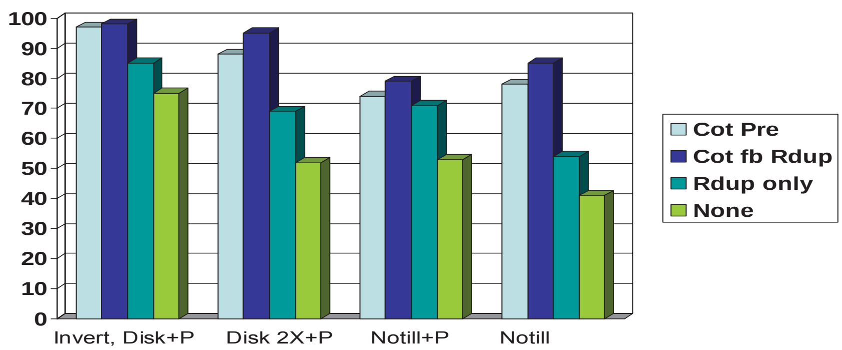



Figure 1. Effect of tillage and herbicides on weed control in cotton, 2006 (percent control). (P=Prowl, Cot=Cotoran, Rdup=Roundup)

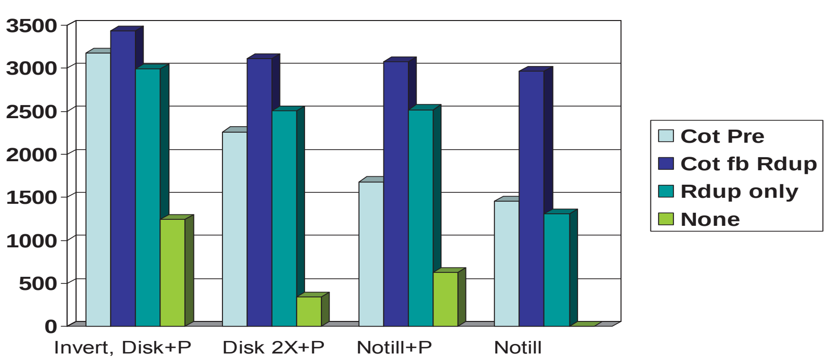



Figure 2. Effect of tillage and herbicides on seed cotton, 20086(seed cotton pounds per acre). (P=Prowl, Cot=Cotoran, Rdup=Roundup)

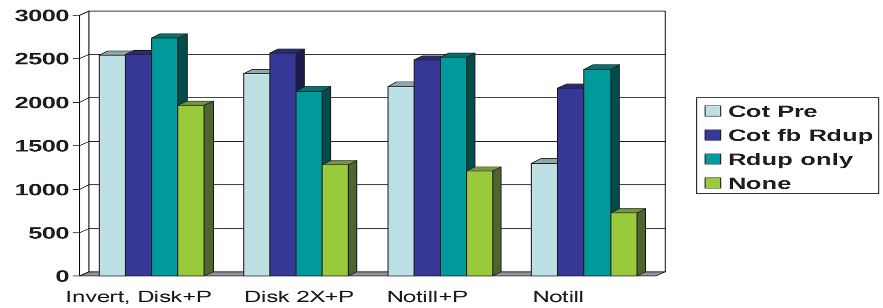



Figure 3. Effect of tillage and herbicides on seed cotton, 2007 (seed cotton pounds per acre). (P=Prowl, Cot=Cotoran, Rdup=Roundup)

# INSECTICIDES

## Identifying Different Chemicals or Combinations for Managing the Sucking–Bug Complex in Cotton Research in the Southeast Region

R. H. Smith

This test was conducted to validate sampling technique and treatment thresholds for stink bugs on cotton field borders adjacent to peanuts. Peanuts were chosen since they provide a good host for stink bugs and movement out of this crop occurs over a long period of the growing season. Many cotton fields in Alabama and the southeastern United States are planted adjacent to peanut fields and, therefore, incur this movement from peanuts to cotton throughout much of the fruiting season. This test was designed by planting eight rows of cotton through the middle of a peanut field.

Fifteen different chemicals or combinations were evaluated for residual control (Table 1). One application was made when the bug-damaged boll count reached 46 percent. Evaluations were then made at 7,14, and 21 days after application by selecting 25 quarter diameter bolls per treatment and examining them for internal injury.

**Table 1. Treatments for Stink Bug Trial, Wiregrass Research Center, Headland, AL, 2007**

| No. | Treatment | Formulation | Rate lbs ai/A (product/A) |
|---|---|---|---|
| 1 | NUP 05077 (lambda cyhalothrin) | 24.8% WDG | 0.03 |
| 2 | Karate (pyrethriod) | 2.08 CS | 0.03 (1.8 oz) |
| 3 | Trimax Pro (imidacloprid) | 4.4 SC | 0.06 (1.8 oz.) |
| 4 | Trimax Pro + Diamond (IGR) | 4.4 SC + 0.83 EC | 0.06 + 0.04 (1.8 + 6 oz.) |
| 5 | Trimax Pro + Bidrin (phosphate) | 4.4 SC + 8 EC | 0.06 + 0.33 (1.8 + 5.3 oz.) |
| 6 | Trimax Pro + Baythroid (pyrethroid) | 4.4 SC + 1 EC | 0.06 + 0.016 (1.8 + 2.1 oz.) |
| 7 | Endigo (Karate + Centric) | 2.06 SC (9.48% + 12.6 %) | 0.065 (4 oz.) |
| 8 | Diamond + Bidrin (threshold) | 0.83 EC + 8 EC | 0.04 + 0.33 (6+ 5.3 oz.) |
| 9 | Diamond + Bidrin (schedule) | 0.83 EC + 8 EC | 0.04 + 0.33 (6+ 5.3 oz.) |
| 10 | Bidrin | 8 EC | 0.33 (5.3 oz.) |
| 11 | Diamond | 0.83 EC | 0.06 (9.0 oz.) |
| 12 | Salt (Sodium Chloride) | — | 1.0 |
| 13 | Bidrin + Discipline | 8 EC + 2 E | 0.33 + .083 (5.3 + 5.3 oz.) |
| 14 | Discipline (pyrethroid) | 2 E | 0.1 (6.4 oz.) |
| 15 | Centric (Thiamethoxam) | 40 WG | 0.05 (2 oz.) |
| 16 | Untreated | — | — |

**Table 2. Evaluation of Select Insecticides for Residual Control of Stink Bugs, Wiregrass Research Center, 2007**

| | | | % internal boll injury | | |
|---|---|---|---|---|---|
| No. | Treatment | Rate lbs ai/A (product/A) | Aug. 22 (7 DAA) | Aug. 28 (14 DAA) | Sep. 4 (21 DAA) |
| 1 | NUP 05077 (lambda cyhalothrin) | 0.03 | 20 | 20 | 32 |
| 2 | Karate (pyrethriod) | 0.03 (1.8 oz) | 28 | 28 | 36 |
| 3 | Trimax Pro (imidacloprid) | 0.06 (1.8 oz.) | 48 | 20 | 32 |
| 4 | Trimax Pro + Diamond (IGR) | 0.06 + 0.04 (1.8 +6 oz.) | 32 | 20 | 52 |
| 5 | Trimax Pro +Bidrin (phosphate) | 0.06 + 0.33 (1.8 + 5.3 oz.) | 24 | 32 | 36 |
| 6 | Trimax Pro + Baythroid (pyrethroid) | 0.06 + 0.016 (1.8 + 2.1 oz.) | 20 | 24 | 20 |
| 7 | Endigo (Karate + Centric) | 0.065 (4 oz.) | 12 | 12 | 24 |
| 8 | Diamond + Bidrin (threshold) | 0.04 + 0.33 (6+ 5.3 oz.) | 12 | 20 | 28 |
| 9 | Diamond + Bidrin (schedule) | 0.04 + 0.33 (6+ 5.3 oz.) | 20 | 32 | 48 |
| 10 | Bidrin | 0.33 (5.3 oz.) | 28 | 20 | 44 |
| 11 | Diamond | 0.06 (9.0 oz.) | 16 | 24 | 36 |
| 12 | Salt (Sodium Chloride) | 1.0 | 76 | 44 | 48 |
| 13 | Bidrin+ Discipline | 0.33 +0 .083 (5.3 + 5.3 oz.) | 12 | 24 | 20 |
| 14 | Discipline (pyrethroid) | 0.1 (6.4 oz.) | 8 | 16 | 36 |
| 15 | Centric (Thiamethoxam) | 0.05 (2 oz.) | 12 | 20 | 48 |
| 16 | Untreated | — | 56 | 56 | 76 |

Adjacent strips (nonreplicated) of four rows by 250 feet were utilized for this test. One application was made on August 14 with evaluations made on August 22, 28, and September 8 (7, 14, and 21 days after application [DAA]) (Table 2). The stink bug population in this test was about 50:50 southern green and brown species.

About one half (46 percent) of the quarter diameter bolls had internal stink bug injury when this test was initiated on August 14. Most treatments had reduced injury on the first evaluation at 7 DAA. The weakest treatments at 7 DAA were Trimax Pro, Trimax Pro + Diamond and salt. Bug injury in the salt treatment was higher than the untreated, which would raise the question of an attractant property. The most effective treatments after 7 days posttreatment were Endigo (Centric + Karate), Diamond + Bidrin, Bidrin + Discipline, Discipline, and Centric.

Treatments that showed improved control at the 14 DAA evaluation were Trimax Pro, Trimax Pro + Diamond, Bidrin, and salt. At 14 DAA the salt treatment was more like the untreated, even though the damage was less than at 7 DAA. Treatments that showed similar control at 14 DAA as they did at 7 DAA were NUP 05077, Karate, Trimax Pro +

Baythroid and Endigo. The better treatments at 14 DAA were Endigo, Discipline, Centric, Bidrin, Diamond + Bidrin, Trimax Pro + Diamond, Trimax Pro, and NUP 05077.

Most treatments showed reduced effectiveness at the 21 DAA evaluation. The two exceptions were Trimax Pro + Baythroid and Bidrin + Discipline. The most residual treatments at 21 DAA were Trimax Pro + Baythroid, Endigo, and Bidrin +Discipline. Damage in the untreated area and several treatments increased approximately 50 to 100 percent between the 14- and 21-day evaluation. This might indicate the movement of additional stink bugs into the test area along with a loss in residual control of these treatments.

It is thought that most stink bugs in this test area were migrant adults. Therefore, the IGR products such as Diamond would have been at a disadvantage. Based on these results, it appears that pyrethroids, at moderate to high rates, alone or in combinations, offer the best residual control of stink bugs when migration from nearby crops or hosts is the situation. Cotton in this test area was bordered at one end by peanuts and the other end by corn. Both crops are known as good stink bug hosts.

Yields were collected from this test (Table 3). However, it is doubtful that the stink bug pressure present in this test had a significant or measurable impact on yields. This is based on the fact that the untreated and some of the less effective treatments, such as salt, yielded as much as some of the more effective treatments. If the natural stink bug population had continued to increase in late season, requiring more treatments, the likelihood of treatment impacts on yield would have been greater.

**TABLE 3. SEED COTTON YIELDS: STINK BUG TEST # 1, HEADLAND, AL 2007**

| Treatment | Actual lbs. seed cotton harvested[1] | Calculated lbs. seed cotton/A |
|---|---|---|
| NUP 05077 (lambda cyhalothrin) | 194 | 3162 |
| Karate (pyrethriod) | 213 | 3472 |
| Trimax Pro (imidacloprid) | 201 | 3276 |
| Trimax Pro + Diamond (IGR) | 210 | 3423 |
| Trimax Pro +Bidrin (phosphate) | 208 | 3390 |
| Trimax Pro + Baythroid (pyrethroid) | 206 | 3358 |
| Endigo (Karate + Centric) | 214 | 3488 |
| Diamond + Bidrin (threshold) | 179 | 2918 |
| Diamond + Bidrin (schedule) | 199 | 3244 |
| Bidrin | 210 | 3423 |
| Diamond | 204 | 3325 |
| Salt (Sodium Cloride) | 204 | 3325 |
| Bidrin+ Discipline | 180 | 2934 |
| Discipline (pyrethroid) | 210 | 3423 |
| Centric (Thiamethoxam) | 194 | 3162 |
| Untreated | 190 | 3097 |

[1] Harvested entire plot (4 rowsx220 ft.) by machine on 10/17/07. Weights taken by dumping into a boll buggy modified with scales.

## IDENTIFYING PRACTICAL KNOWLEDGE AND SOLUTIONS FOR MANAGING THE SUCKING–BUG COMPLEX IN COTTON RESEARCH IN THE SOUTHEAST REGION

Ron H. Smith

Peanuts serve as a host crop for stink bugs throughout the summer months. Many cotton fields in the southeastern United States are planted adjacent to these crops. In this situation, stink bugs appear to migrate weekly throughout the cotton fruiting season from corn/peanuts to cotton. Much knowledge has been gained in recent years about improved management and control of stink bugs in cotton. However, cotton field borders (approximately 50 to 60 feet) adjacent to other host crops face a unique situation with continuous reinfestation. More knowledge is needed as to how these borders can be protected from economic stink bug injury.

The study site consisted of an irrigated field 250 feet in length where the rows ran from corn on one end to a peanut field on the other. Four replicates consisting of eight rows by 80 feet planted to DP 555BG/RR were utilized.

For the threshold study, the test was initiated on week 7 of bloom when the damage level reached 20 percent. Two applications were made on an automatic schedule while three applications were made on a "sliding" threshold. Bidrin at a rate of 1 gallon to 24 acres was used as the insecticide. The ratio of southern green to brown stink bug species was about 80:20 in this test.

Treatment thresholds evaluated:

1. Untreated
2. Automatic (Week 3,5,7 of bloom)

Note: due to lack of stink bug pressure, first application was not made until week 6 of bloom (August 1). Second application was made 1 week later due to the rapid build up of stink bugs.

3. University sliding threshold as shown below:

| Week of bloom | % Boll damage threshold |
|---|---|
| 1 | 20 |
| 2 | 20 |
| 3 | 10 |
| 4 | 10 |
| 5 | 10 |
| 6 | 20 |
| 7 | 20 |
| 8 | 30 |
| 9 | 30 |

Treatments made:

| | | | | |
|---|---|---|---|---|
| #2 (Automatic) | 8/1/07 | Bidrin | 5.3oz | (Wk.6) |
| | 8/7/07 | Bidrin | 5.3oz | (Wk.7) |
| #3 (University) | 8/1/07 | Bidrin | 5.3oz | (Wk.6) |
| | 8/7/07 | Bidrin | 5.3oz | (Wk.7) |
| | 8/14/07 | Bidrin | 5.3oz | (Wk.8) |

The protocol for this trial was modified due to the late arrival of a natural infestation of stink bugs at treatable levels. Once the bug population was present, the cotton plants in this test fields had begun to abort squares and small bolls. As a result, bolls that were susceptible to stink bug injury were present for about 3 weeks.

Several points might be learned from the results of this trial. One, tremendous variability existed between replicates within the same treatment threshold based on our sample size of 25 bolls per plot (see table). Two, large sample sizes were prohibitive time wise, requiring four persons from 2 to 3 hours (8 to 12 man hours) to examine for internal injury. Three, based on the results of this test, it appears that a phosphate insecticide, such as Bidrin, does not offer growers the residual control needed for field borders with daily or continuous migration from other crops such as peanuts.

There was more variability between replicates than between treated and untreated plots in this trial. Some of this variability could have been due to sampling differences between those collecting the samples. Furthermore, there could easily be differences between samplers in the process of crushing and examining the bolls internally for bug injury. All of these possibilities define the complexities of sampling and making treatment decisions for stink bugs. When these points are added to the short residual control of some of our most common treatments, much work remains to be done in managing this insect.

When reviewing the damage level in this test by date it is difficult to see consistent trends (see table). On August 7 (7DAA), the difference between damage levels of the various treatments was erratic. After application #2 (August 14) the untreated began to separate from the treated. However, there was great variability between replicates receiving the same treatment. By week 3 (August 22) following the initial application, the treated plots had about one-half the damage as the untreated. However, the treated plots did not show acceptable levels of stink bug control. It was unfortunate that the test had to be terminated due to the lack of stink bug susceptible bolls.

In many ways, this test raised more questions than provided answers. It is difficult to determine exactly how much the heat, drought, lack of mid-season stink bug pressure, and the lack of late season bolls had on the results of this trial. Plans are to repeat this test again in 2008 and hopefully gain further insight into the management of stink bugs on the borders of cotton fields that interface with good alternate hosts for stink bugs, such as peanuts. Yields will be taken in this trial but they may or may not provide additional information for the 2007 season.

**STINK BUG THRESHOLD STUDY, HEADLAND, AL, 2007**

| | | % Quarter diameter bolls with internal injury[1] | | |
|---|---|---|---|---|
| Treatment threshold | Replicate | Aug 7 | Aug 14 | Aug 22 |
| Untreated | 1 | 48 | 56 | 52 |
| | 2 | 16 | 48 | 84 |
| | 3 | 20 | 20 | 76 |
| | 4 | 24 | 88 | 44 |
| | ***Ave.*** | ***27*** | ***53*** | ***64*** |
| Automatic | 1 | 24 | 12 | 20 |
| | 2 | 20 | 0 | 16 |
| | 3 | 32 | 16 | 8 |
| | 4 | 52 | 32 | 64 |
| | ***Ave.*** | ***32*** | ***15*** | ***27*** |
| University | 1 | 12 | 24 | 40 |
| | 2 | 16 | 36 | 16 |
| | 3 | 24 | 40 | 32 |
| | 4 | 32 | 20 | 36 |
| | ***Ave.*** | ***21*** | ***30*** | ***31*** |

| | | |
|---|---|---|
| Pretreatment Damage: | July 10- 0% | 3rd week of bloom |
| (% Quarter diameter bolls | July 17- 8% | 4th week of bloom |
| with internal damage) | July 24- 12% | 5th week of bloom |
| | July 31- 30% | 6th week of bloom |

[1]Sample size: 25 bolls per plot.

# FERTILITY

## Evaluation of Surface Application of Nitrogen Fertilizer Sources in a Conservation Tillage Cotton System

C. H. Burmester

Surface application of nitrogen (N) fertilizer sources was evaluated for two seasons on cotton grown in a conservation tillage system. The tests were conducted at the Tennessee Valley Research and Extension Center in Belle Mina, Alabama. Cotton was planted in late April each season into a heavy rye residue that was terminated approximately three weeks prior to cotton planting. The test area received 20 and 30 pounds per acre of preplant N fertilizer in 2006 and 2007, respectively.

At early squaring, all N fertilizer sources were surface applied. In 2006, 60 and 90 pounds per acre of N fertilizer were applied, while in 2007 N fertilizer rates were reduced to 50 and 80 pounds per acre because of an increase in preplant N fertilizer. In 2006 only granular fertilizer products were tested. Fertilizer products tested included (1) ammonium nitrate, (2) urea, (3) urea + Agrotain (1gallon per ton), (4) urea + 4.5 percent calcium thiosulfate (Cats), and (5) urea + 7.0 percent calcium thiosulfate. In 2007, the 7.0 percent calcium thiosulfate product was not tested, but four liquid fertilizer products were added. The four liquid fertilizer products included (1) 32 percent UAN, (2) 32 percent UAN + calcium chloride (50 percent), (3) 32 percent UAN +agrotain, (1 gallon per ton), and (4) Georgia Pacific 30-0-0 (GP).

All fertilizer products were applied at early squaring. The granular products were hand applied along each side of the cotton row. The liquid fertilizer products were applied with a $CO_2$ pressurized sprayer that dribble applied the fertilizer rate along one side of each cotton row. The residue from the rye cover crop provided thick residue each season. No rainfall occurred for 7 days following fertilizer application in 2006. In 2007, 0.11 inches of rain was recorded 3 days after fertilizer application, and irrigation (0.5 inches) was applied 7 days after application. Cotton leaf samples were collected after 3 weeks of blooming.

Very hot dry weather dominated both growing seasons in Alabama, but 2007 was especially severe. However, with 6.5 and 9.5 inches of irrigation applied to the test area in 2006 and 2007, respectively, cotton yields were excellent. Cotton yields averaged close to 2.5 bales in 2006 and close to three bales in 2007 (Tables 1 and 2). Responses to increasing N fertilizer rates were generally greater in 2006 than in 2007. In 2006 all granular fertilizers tested significantly increased cotton yields and leaf-N content as N rates were increased from 60 to 90 pounds per acre. In 2006 urea alone produce significantly lower yields than all other fertilizers tested at 90 pounds per acre and also significantly lower yields than ammonium nitrate when applied at 60 pounds per acre (Table 2). In 2006 the urea + Agrotain, and urea + calcium thiosulfate products produced yields similar to yields produced by ammonium nitrate at both N rates (Table 1). In 2007 all fertilizers products tested produced numerically higher yields when N rates were increased from 50 to 80 pounds per acre. However, these increases were only significantly different for ammonium nitrate, UAN + calcium chloride, and the 30-0-0 product from Georgia Pacific (Table 2). Leaf-N values were also numerically higher as N rates were increased from 60 to 90 pounds per acre for all fertilizers tested in 2007. The only significant increase in leaf N with increasing N rates, however, was found with the urea + calcium thiosulfate, and urea + agrotain fertilizers (Table 2).

Cotton quality samples were ginned and analyzed for lint percent, micronaire, staple length, and uniformity. In both seasons no significant differences could be found between these cotton quality measurements and the different N fertilizer sources or rates applied.

Apparently N fertilizer loss through volatilization was a greater problem in 2006 than 2007. Wetter soil conditions at application in 2006 may be the primary reason for this difference,

**Table 1. Seed Cotton Yields and Leaf-Nitrogen, 2006**

| Treatments Rate (lb/A) | Source | Seed cotton yield lb/A | Leaf-N % |
|---|---|---|---|
| 60 | Amm Nitrate | 3550 b | 3.67 cd |
| 60 | Urea | 3078 c | 3.41 e |
| 60 | Urea + Cats 4.5% | 3258 bc | 3.43 e |
| 60 | Urea + Cats 7.0% | 3183 bc | 3.41 e |
| 60 | Urea + Agrotain | 3308 bc | 3.48 de |
| 90 | Amm Nitrate | 3748 a | 3.98 ab |
| 90 | Urea | 3347 b | 3.85 abc |
| 90 | Urea Cats 4.5% | 3622 a | 3.93 ab |
| 90 | Urea Cats 7.0% | 3637 a | 3.81 bc |
| 90 | Urea + Agrotain | 3622 a | 4.04 a |
| ***LSD ($P \leq 0.05$)*** | | ***269*** | ***0.23*** |

**Table 2. Seed Cotton Yields and Leaf-Nitrogen, 2007**

| Treatments Rate (lb/A) | Source | Seed cotton yield lb/A | Leaf-N % |
|---|---|---|---|
| 50 | Amm Nitrate | 3528 c | 3.64 abc |
| 50 | Urea | 3479 c | 3.63 abc |
| 50 | Urea Cats 4.5% | 3520 c | 3.47 c |
| 50 | Urea + Agrotain | 3518 c | 3.53 bc |
| 50 | UAN 32% | 3625 bc | 3.65 abc |
| 50 | UAN + CaCl2 | 3540 c | 3.66 abc |
| 50 | UAN + Agrotain | 3730 bc | 3.69 abc |
| 50 | GP 30-0-0 | 3589 bc | 3.59 abc |
| 80 | Amm Nitrate | 3832 abc | 3.94 a |
| 80 | Urea | 3627 bc | 3.80 abc |
| 80 | Urea Cats 4.5% | 3659 bc | 3.90 ab |
| 80 | Urea + Agrotain | 3793 abc | 3.97 a |
| 80 | UAN 32% | 3717 bc | 3.79 abc |
| 80 | UAN + CaCl2 | 3942 ab | 3.83 abc |
| 80 | UAN + Agrotain | 3867 abc | 3.75 abc |
| 80 | GP-30-0-0 | 4079 a | 3.81 abc |
| ***LSD ($P \leq .0.05$)*** | | ***232*** | ***0.23*** |

combined with the extremely dry weather in 2007. These data support the possibility of N loss through volatilization. In both years granular urea alone produced the lowest numerical yield with both N fertilizer rates. These data also support previous research on the use of Agrotain to reduce N loss on surface-applied urea. Several of the other combination urea fertilizer products also showed promise when applied in a high-residue conservation-tillage system. Further research and product pricing will determine if they are viable fertilizers for the future. Total N fertilizer rates tested in this study (80 and 110 pounds ) support previous work indicating an N recommendation of 100 to 120 pounds per acre is sufficient on irrigated cotton on these soil types.

## Nitrogen and Plant Growth Regulator Rates on Cotton Yield and Fiber Quality

K. S. Balkcom and C. D. Monks

The project objective was to determine the effect of plant growth regulator (PGR) strategies, with and without a high application PGR rate prior to harvest, on cotton yield and fiber quality across two N rates for a cotton conservation-tillage system. Nitrogen rates and PGR strategies were implemented at the Wiregrass Research and Extension Center (WREC) in Headland, Alabama, and the Field Crops Unit of the E.V. Smith Research Center (EVSRC) near Shorter, Alabama. Treatments arranged in a split-plot design with four replications were as follows:

Nitrogen rates

1. 90 pounds per acre
2. 120 pounds per acre

Plant Growth Regulator Strategies

1. No PGR
2. Low rate, multiple PGR applications according to label directions
3. High rate, infrequent PGR applications according to label directions
4. No PGR plus a late season PGR application
5. Low rate, multiple PGR applications plus a late season PGR application
6. High rate, infrequent PGR applications plus a late season PGR application

A rye cover crop was drilled across both experimental areas in early November 2005 at the WREC and the EVSRC. Both were seeded at 90 pounds per acre. In early spring, 30 pound per acre, as $NH_4NO_3$, were applied to the cover crop at both locations to enhance biomass production. Biomass samples were collected at each location approximately 3 weeks before anticipated cotton planting dates. Biomass production averaged 3765 pounds per acre at WREC and 6400 pounds per acre at EVSRC. This difference in biomass production can be attributed to the different cover crop species and different termination dates. Immediately prior to cotton planting, all plots were in-row subsoiled with a KMC Ripper Stripper® equipped with rubber pneumatic tires to minimize surface disruption. The cotton variety DP 555® BG/RR was planted on May 21, 2007 at WREC and May 8, 2007 at EVSRC.

Rates of PGR application (Mepex Ginout®) were selected based on the label directions and the growing conditions. Table 1 summarizes the total amounts of PGR applied, which ranged from 0 to 22 ounces per acre across the six PGR strategies examined at the WREC. The initial low rate, frequent application consisted of 4 to 6 ounces per acre per application, while the high rate, infrequent application consisted of 12 ounces per acre per application. The late season application consisted of a single 8 ounces per acre application. Table 1 also summarizes the total amounts of PGR applied, which ranged from 0 to 32 ounces per acre across the six PGR strategies examined at EVSRC. The initial low rate, frequent application consisted of 4 to 8 ounces per acre per application, while the high rate, infrequent application consisted of 12 ounces per acre per application. The late season application consisted of a single application of 8 ounces per acre.

Immediately prior to defoliation, plant heights, whole plant biomass, and final node counts were collected from each plot. Plant heights were the average of 10 randomly selected plants within each plot. The nodes on each of the 10 randomly selected plants were counted at the time of plant height measurement collection to estimate final node production. Whole plant biomass consisted of clipping the aboveground portion of all the plants within a 3.28 feet section of a non-harvest row from each plot. The plant material collected was dried at 55 degrees Celsius for 72 hours and weighed to estimate the plant biomass of each plot. The experimental area at

**Table 1. Plant Growth Regulator (PGR) Amounts and Application Times Across Six PGR Strategies During the 2007 Growing Season**

| Application time | None | ——Low rate—— many applications | ——High rate—— few applications | —Late season application— None | Low rate | High rate |
|---|---|---|---|---|---|---|
| | ———— | ———— | oz/A | ———— | ———— | ———— |
| Wiregrass Research and Extension Center, Headland, Alabama | | | | | | |
| 52 DAP[1] | | 4 | | | 4 | |
| 64 DAP | | 4 | 12 | | 4 | 12 |
| 71 DAP | | 6 | | | 6 | |
| 85 DAP | | | | 8 | 8 | 8 |
| Total | 0 | 14 | 12 | 8 | 22 | 20 |
| E.V. Smith Research Center,Shorter, Alabama | | | | | | |
| 63 DAP† | | 4 | | | 4 | |
| 71 DAP | | 8 | 12 | | 8 | 12 |
| 78 DAP | | 8 | | | 8 | |
| 85 DAP | | 4 | | | 4 | |
| 92 DAP | | | | 8 | 8 | 8 |
| Total | 0 | 24 | 12 | 8 | 32 | 20 |

[1] Days after planting.

WREC was defoliated with 1.5 pints per acre Finish® and 5 ounces per acre Ginstar® on September 28, 2007 and harvested with a spindle picker equipped with a bagging attachment. The seed cotton was collected from the two center rows of each 40-foot plot and weighed on October 1, 2007 at EVSRC and Oct. 12, 2007 at WREC. A subsample of seed cotton from each plot was ginned in a 20-saw tabletop micro-gin to determine ginning percentage. Lint yields were determined by weighing lint and seed collected from each plot and multiplying corresponding seed cotton by the ginning percentage of each plot.

Nitrogen rates had no effect on the observed plant heights, whole plant biomass, or final node counts at defoliation for either location with the exception of whole plant biomass measured at EVSRC (Table 2). The additional N resulted in higher whole plant biomass for that location (Table 3). The PGR strategy did affect plant heights and final node counts for both locations (Table 2). At both locations, the tallest plants were observed where no PGR was applied or the late season application was applied alone (Table 3). The high PGR rate applied infrequently resulted in taller plants compared to the low rate applied more frequently, but the difference was only significant at EVS (Table 3). The late season application of PGR used in conjunction with the low- and high-application strategies produced no evidence to indicate that the late season application controlled plant heights better (Table 3). The final node count was analogous to plant height with more nodes present on the taller plants, which resulted when no PGR or the late season application was applied alone (Table 3).

Neither nitrogen nor PGR strategy had any effect on observed lint yields at either location (Table 4). However, there was a strong trend (P>F = 0.0597) that indicated PGR strategy influenced lint yields to some extent at EVSRC. At this location, PGR applied at low frequent rates tended to produce the highest lint yields (Table 4). In contrast, lint yields measured at WREC with no PGR applied were equivalent to lint yields observed following low- and high-application rates and with or without a late season application. The experiments at both locations were irrigated to maximize yield potential, but despite the irrigation, extremely dry conditions were experienced during the growing season. Although some differences were observed among selected plant measurements, the final yields indicate that PGRs were not beneficial, regardless of application strategy.

Extremely dry conditions made the evaluation of PGRs difficult. Although each location could be irrigated, the dry weather controlled excess growth much better than PGRs could. As a result, the benefit of PGR applications was minimally observed at only one location during the 2007 location. If costs of the product and the expense of application were factored into the analysis, the advantage of PGR applications would be certainly diminished.

**TABLE 2. LEAST SIGNIFICANT DIFFERENCE FOR PLANT HEIGHTS, BIOMASS AT DEFOLIATION, AND FINAL NODE COUNT ACROSS NITROGEN RATES AND PLANT GROWTH REGULATOR STRATEGIES AT THE E.V. SMITH RESEARCH CENTER NEAR SHORTER, AL, AND THE WIREGRASS RESEARCH AND EXTENSION CENTER IN HEADLAND, AL, DURING THE 2007 GROWING SEASON**

| | Plant height | Biomass | Final nodes |
|---|---|---|---|
| E.V. Smith Research Center | | | |
| Nitrogen | NS[1] | 136 | NS |
| Plant growth strategy | 1.6 | NS | 1.1 |
| Nitrogen*PGR | NS | NS | NS |
| Wiregrass Research and Extension Center | | | |
| Nitrogen | NS | NS | NS |
| Plant growth strategy | 4.5 | NS | 0.8 |
| Nitrogen*PGR | NS | NS | NS |

[1]Not significant at 0.05 level of probability.

**TABLE 3. PLANT HEIGHTS, BIOMASS AT DEFOLIATION, AND FINAL NODE COUNT ACROSS NITROGEN RATES AND PLANT GROWTH REGULATOR STRATEGIES AT THE E.V. SMITH RESEARCH CENTER NEAR SHORTER, AL, AND THE WIREGRASS RESEARCH AND EXTENSION CENTER IN HEADLAND, AL, DURING THE 2007 GROWING SEASON**

| | Nitrogen rate, lb/A | | ——Plant growth regulator strategies—— | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Late season application | | |
| | 90 | 120 | None | Low | High | None | Low | High |
| E.V. Smith Research Center | | | | | | | | |
| Plant height, inches | 42.6 | 44.0 | 47.0 | 40.7 | 43.3 | 45.6 | 40.3 | 43.0 |
| Biomass at defoliation, lb/A | 1002 | 1146 | 1017 | 1004 | 1067 | 1072 | 1249 | 1035 |
| Final nodes, no. | 19.6 | 20.1 | 20.5 | 19.4 | 20.0 | 20.2 | 19.3 | 19.5 |
| Wiregrass Research and Extension Center | | | | | | | | |
| Plant height, inches | 44.0 | 45.2 | 51.0 | 41.1 | 42.0 | 47.9 | 43.2 | 42.3 |
| Biomass at defoliation, lb/A | 1253 | 1376 | 1390 | 1231 | 1122 | 1403 | 1276 | 1467 |
| Final nodes, no. | 21.3 | 21.7 | 22.8 | 21.0 | 21.2 | 22.0 | 21.0 | 21.0 |

**TABLE 4. LINT YIELDS MEASURED ACROSS NITROGEN RATES AND PLANT GROWTH REGULATOR STRATEGIES AT THE E.V. SMITH RESEARCH CENTER NEAR SHORTER, AL, AND THE WIREGRASS RESEARCH AND EXTENSION CENTER IN HEADLAND, AL, DURING THE 2007 GROWING SEASON**

| | ———Lint yield——— | |
|---|---|---|
| Treatment | EVSRC | WREC |
| | ———lb/A——— | |
| Nitrogen | | |
| 90 lb/A | 1357 | 1501 |
| 120 lb/A | 1453 | 1581 |
| Plant growth regulator strategy | | |
| None | 1381 | 1504 |
| Low rate | 1479 | 1507 |
| High rate | 1370 | 1586 |
| Late application | 1332 | 1592 |
| Low rate + late application | 1431 | 1569 |
| High rate + late application | 1438 | 1488 |
| | ———P > F——— | |
| Nitrogen | 0.2717 | 0.3556 |
| Plant growth regulator strategy | 0.0597 | 0.7785 |
| Nitrogen x PGR strategy | 0.8285 | 0.3447 |

# Nitrogen Fertilizer Source, Rates, and Timing for a Cover Crop and Subsequent Cotton Crop

K. S. Balkcom, F. J. Arriaga, C. C. Mitchell, D. P. Delaney, and J. Bergtold

The project objective was to (1) compare N fertilizer sources, rates, and time of application for a rye winter cover crop to determine optimal biomass production for conservation tillage cotton production; (2) compare recommended and no additional N fertilizer rates across different biomass levels for cotton; and (3) determine the effect of residual N applied to the cover crop across two N fertilizer rates for cotton. Nitrogen sources, rates, and time of application were implemented at the Wiregrass Research and Extension Center (WREC) in Headland, Alabama. Biomass cover treatments were arranged in a split-split-plot design with four replications. At cotton planting, the eight row plots were split with one side receiving 90 pounds of N per acre at sidedress and the other side receiving no additional N.

Time of application
1. Fall
2. Spring

Nitrogen Source
1. Commercial fertilizer
2. Poultry litter

Nitrogen rates

| Commercial fertilizer | Poultry litter |
|---|---|
| 1. 0 lb/A | 1. 0 ton/A |
| 2. 30 lb/A | 2. 1 ton/A |
| 3. 60 lb/A | 3. 2 tons/A |
| 4. 90 lb/A | 4. 3 tons/A |

A rye cover crop was drilled across the experimental area on November 9, 2006 at the WREC. Rye was seeded at 90 pounds per acre. Plots consisted of eight 36-inch rows, 24 feet wide and 40 feet long. Fall poultry litter treatments were applied on the same day the cover crop was planted. Commercial fertilizer was applied on December 4, 2006 after stand establishment. The spring applications of commercial fertilizer and poultry litter were applied on February 7, 2007. Poultry litter application rates were designed to approximate commercial fertilizer rates based on total and estimated available N supplied in the litter (Table 1). Biomass samples were collected on April 16, 2007 by collecting all aboveground plant biomass from two 2.7 square foot areas within each plot. Immediately prior to cotton planting, all plots, were in-row subsoiled with a KMC Ripper Stripper® equipped with rubber pneumatic tires to minimize surface disruption. The cotton variety DP 555® BG/RR was planted on May 2, 2007. The eight row plots were split and corresponding cotton plots were sidedressed on June 20, 2007 with 90 pounds of N per acre, while other plots were not fertilized, in order to estimate any residual effects from the poultry litter.

**Table 1. Total and Available N Applied in the Fall and Spring from Poultry Litter on a Dry Weight Basis at the Wiregrass Research and Extension Center in Headland, AL, During the 2006-2007 Growing Season**

| Time of application | Total N, Rate (tons /A) 0 | 1 | 2 | 3 | Available N[1], Rate (tons /A) 0 | 1 | 2 | 3 |
|---|---|---|---|---|---|---|---|---|
| | lb /A | | | | | | | |
| Fall | 0 | 53 | 106 | 159 | 0 | 27 | 53 | 80 |
| Spring | 0 | 69 | 138 | 207 | 0 | 35 | 69 | 104 |

[1] Available N based on an estimate of 50 percent total N available during the first year of application.

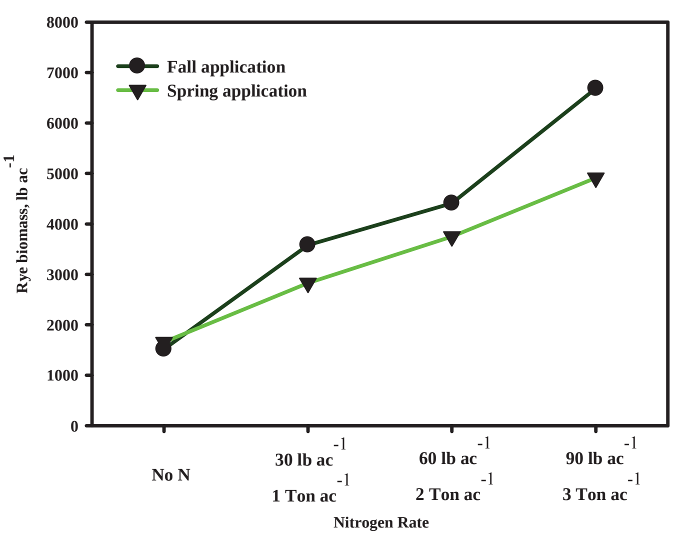



Figure 1. Rye biomass production measured between N rates, regardless of source and time of application during the 2006-2007 winter growing season at the Wiregrass Research and Extension Center in Headland, AL.

Nitrogen uptake at mid-bloom was determined by collecting whole plant biomass from the aboveground portion of all plants within a 3.28 foot section of a non-harvest row from each plot. The plant material collected was dried at 55 degrees Celsius for 72 hours and weighed to estimate plant biomass of each plot. A subsample from each plot was analyzed for total N by dry combustion on a LECO CHN-600 analyzer. Corresponding N contents and biomass were used to calculate N uptake at mid-bloom.

The plot area was defoliated with 1.5 pints per acre of Finish® and Ginstar® at 5 ounces per acre on September 26, 2007. All plots were harvested with a spindle picker equipped with a bagging attachment on October 3, 2007. A subsample of seed cotton from each plot was ginned in a 20-saw tabletop micro-gin to determine ginning percentage. Lint yields were determined by weighing lint and seed collected from each plot and multiplying corresponding seed cotton by the ginning percentage of each plot.

Biomass levels measured in 2007 produced a timing x rate interaction (Pr > F = 0.0440), which indicates that biomass levels increased with fall application of N (Figure 1). Timing of N fertilizer had no effect on measured biomass levels during the previous year of this study, but biomass levels following fall-applied N averaged over sources and rates for both crop years indicated 25 percent higher biomass levels compared to spring applied N. This would indicate that if growers choose to maximize biomass production by utilizing some form of N fertilizer, that fertilizer would be more beneficial to the cover crop if applied in the fall.

In 2007, time of application and cover crop N rate influenced cover crop biomass levels (Table 2). Significant interactions between time of application and sidedress N rates, as well as cover crop N rates and sidedress N rates were observed in 2007 and are illustrated in Figures 2 and 3. As expected, regardless of cover crop N timing, lint yields were increased with 90 pounds of N per acre compared to 0 pounds of N per acre; however, when N was applied to the cover crop in the spring, superior yields were produced compared to fall applied N at the 0 pounds per N per acre sidedress rate (Figure 2). Nitrogen applied in the spring to the cover crop would be less susceptible to loss, prior to cotton uptake, which could explain this difference. Depending on how quickly the poultry litter is mineralized, spring applications could also synchronize better with cotton uptake.

**TABLE 2. COTTON LINT YIELDS AND N UPTAKE MEASURED AT MID-BLOOM ACROSS COVER CROP FERTILIZER TIMING, COVER CROP N RATES AND SIDEDRESS COTTON N RATES DURING THE 2007 COTTON GROWING SEASONS AT THE WIREGRASS RESEARCH AND EXTENSION CENTER IN HEADLAND, AL**

| Treatment | | 2007 Lint yields (lb /A) | 2007 N uptake (lb /A) |
|---|---|---|---|
| Timing cover crop fertilizer | | | |
| Fall | | 1192 | 47.1 |
| Spring | | 1233 | 48.9 |
| Cover crop N rate | | | |
| Poultry litter (tons /A) | Commercial fertilizer (lb /A) | | |
| 0 | 0 | 1011 | 46.2 |
| 1 | 0 | 1267 | 48.7 |
| 2 | 0 | 1288 | 54.9 |
| 3 | 0 | 1393 | 57.4 |
| 0 | 30 | 1136 | 41.7 |
| 0 | 60 | 1182 | 45.7 |
| 0 | 90 | 1211 | 41.5 |
| Sidedress Cotton N rate (lb /A) | | | |
| 0 | | 912 | 36.0 |
| 90 | | 1513 | 60.0 |

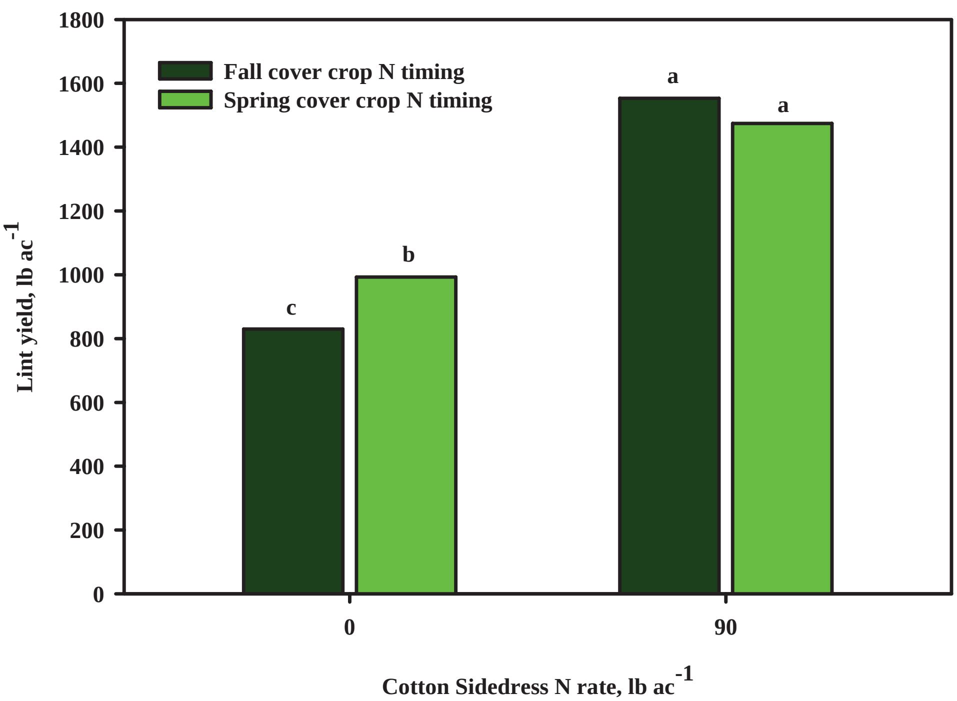



Figure 2. Cotton lint yields measured following fall and spring applied N to the cover crop and two cotton sidedress N rates (0 and 90 lb N /A) during the 2007 growing season at the Wiregrass Research and Extension Center in Headland, AL.

Figure 3 illustrates the interaction between cover crop N rate and sidedress N rate observed during the 2007 growing season. By examining only N applied to the cover crop (0 pounds of N per acre sidedress), the residual effects of the poultry litter are apparent. Regardless of N source, lint yields increased as cover crop N rate increased, but poultry litter improved lint yields compared to commercial fertilizer (Figure 3). At the recommended 90 pounds of N per acre sidedress rate, the difference between sources was not as great, but lint yields following poultry litter were higher (Figure 3). These data indicate there is no advantage to cover crop N rates greater than 30 pounds of N per acre as commercial fertilizer or 1 ton per acre as poultry litter when 90 pounds of N per acre is supplied at sidedress to the cotton. However, due to the organic fraction of poultry litter, utilizing higher poultry litter rates to the cover crop with lower sidedress N rates could provide some cost savings to growers without sacrificing yields.

In 2007, only cover crop N rate and sidedress cotton N rate influenced uptakes at mid-bloom (Table 3). Measured uptakes at mid-bloom were lowest from plots receiving 90 pounds of N per

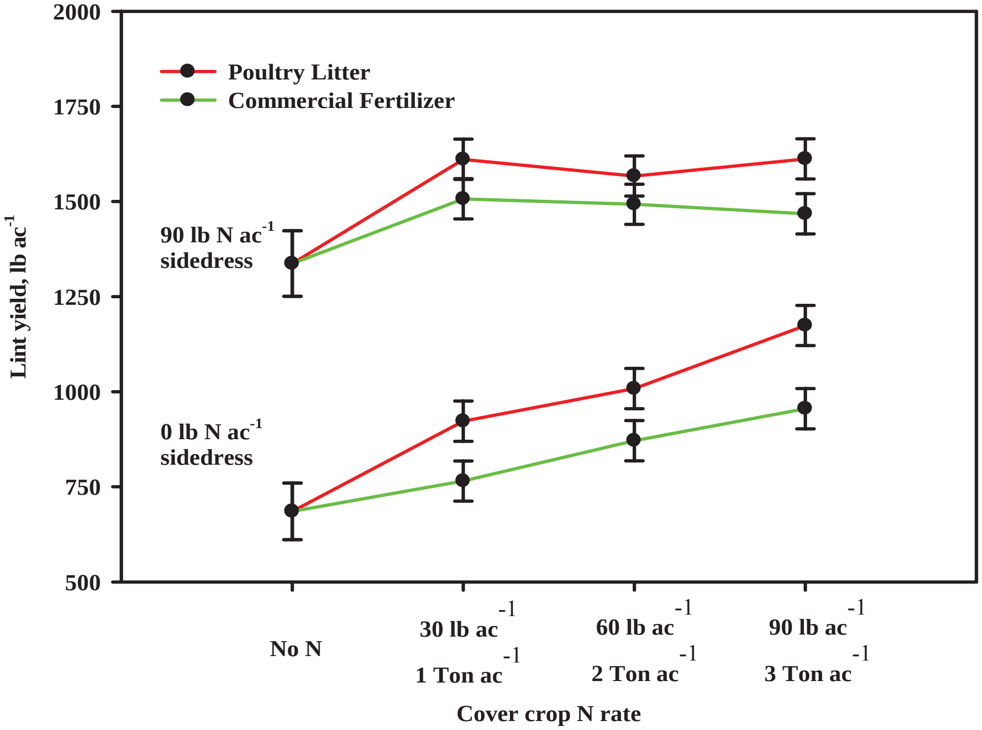



Figure 3. Cotton lint yields measured across two sources of N (commercial fertilizer and poultry litter) applied to the cover crop and two cotton sidedress N rates (0 and 90 lb N /A) during the 2007 growing season at the Wiregrass Research and Extension Center in Headland, AL.

acre to the cover crop, while the highest observed uptakes were measured from plots receiving 3 tons per acre of poultry litter (Table 2). Generally, higher measured uptakes were observed from plots receiving poultry litter compared to plots receiving commercial fertilizer (Table 2). As in 2006, measured uptakes at mid-bloom in 2007 were greater following plots that received the recommended 90 pounds of N per acre at sidedress compared to no additional N at sidedress (Table 2).

Poultry litter can be considered a slow release fertilizer and preliminary results indicate that when applied in the fall it benefits the cover crop and the cotton crop. Cover crop biomass is maximized and cotton N rates could be at least partially reduced by using poultry litter. Future work in this area should focus on comparing poultry litter supplied to the cover crop combined with lower cotton N side-dress rates to the current cotton conservation-tillage systems that utilize approximately 30 pounds of N per acre to the cover crop and maintain recommended side-dress N rates. These scenarios could maximize biomass, maintain yields, and decrease costly commercial N use.

## Use of Remote Sensed Thermal Imagery for In-Season Stress Detection and Site-Specific Management of Cotton

J. P. Fulton, J. N. Shaw, D. Sullivan, M. P. Dougherty, and C. Brodbeck

This project was conducted on a 12-acre field at the Tennessee Valley Research and Extension Center (TVREC), Belle Mina, Alabama. Treatments included two irrigations treatments (Irr – irrigated; No Irr – non-irrigated) and two cover crop treatments (C – Cover; NC – No-Cover). Subsurface drip irrigation (SDI) was buried on 80-inch spacing at a depth of 13 inches. Plots receiving a cover crop treatment were planted with winter wheat (*Triticum aestivum* L.) on October 28, 2006. Cotton was planted on April 18, 2007 using a 40-inch row spacing. Irrigation was initiated on May 26. Irrigation was scheduled based on pan evaporation and adjusted for canopy closure, triggering an irrigation event at 60 percent pan evaporation.

Airborne thermal infrared (TIR) imagery was acquired in-season using an unmanned aerial system equipped with a TIR sensor on July 18 at 10:13 AM central standard time, under clear conditions. Cotton was between first and peak flower with percent canopy ranging from 15 to 72 percent. TIR data were collected using an unmanned aerial vehicle equipped with a TIR sensor (Figure 1a). Ground truth data (soil water content, stomatal conductance, and digital photographs; Figure 1b) across the field were also collected. Comparisons were made to determine the relationship between TIR emittance, stomatal conductance, soil water content or plant available water, crop residue management, and canopy closure.

Since integrated effects of surface characteristics (canopy closure, percent actively transpiring vegetation, crop residue cover, and bare soil) impact observed emittance, variability in surface characteristics at the time of TIR acquisition were evaluated. Results indicated differences in soil water content between treatments. No significant interaction between treatments was observed. The impact of irrigation on canopy closure was most significant having 40 percent canopy closure on irrigated treatments and 26 percent canopy closure on non-irrigated treatments. Differences in canopy closure between covered and no-covered treatments were less significant; however, greater canopy closure was observed on cover crop treatments compared to no-cover treatments.

The relationships between observed TIR emittance and ground truth parameters were evaluated using Pearson linear correlation coefficients. Emittance spectra were negatively correlated with stomatal conductance ($r = -0.48$, $\alpha = 0.05$), providing evidence that observed emittance was related to variability in canopy response to irrigation and cover treatments. Additionally, a negative linear relationship was observed between TIR emittance and canopy closure ($r = -0.44$, $\alpha = 0.05$), indicating cooler surface conditions as canopy closure increased. As transpiration rates increased, TIR emittance decreased. Although soil water content was correlated with stomatal conductance ($r = 0.58$, $\alpha = 0.05$), no significant correlation was observed between TIR emittance and soil water content at the time of data acquisition.

SDI uniformity issues, including crimped distribution lines, were detected in some plots using TIR imagery (Figure 2). The crimped lines are quite evident, spanning the length of the image as a very bright feature within two irrigated treatments. At the time of data collection, these differences were not noticeable at ground level. Comparing the areas along either side of the crimped lines with adjacent rows of well-watered cotton, emittance was more than two times greater along the crimped lines, as would be expected. Water distribution problems are evident in Figure 2 as an area of very bright surface features (canopy stress), bounded on either side by dark surface features (actively transpiring canopy). Yield monitor data indicated yield losses up to 35 percent due to the crimped SDI tape. Based on observed results, SDI performance problems can be rapidly and easily identified using the UAV and TIR imagery, thereby allowing correction in a timely fashion during the growing season to minimize yield loss.

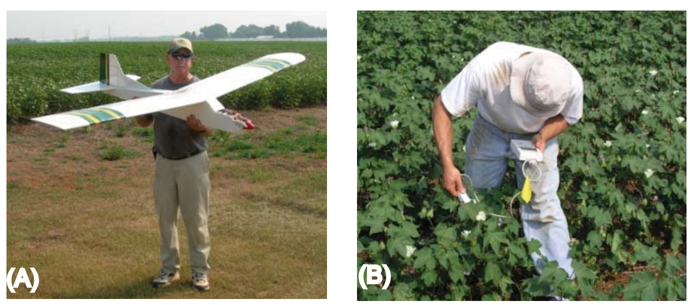



Figure 1. (A) UAV equipped with TIR sensor and (B) ground truth data collection on July 18 of leaf temperature and stomatal conductance.

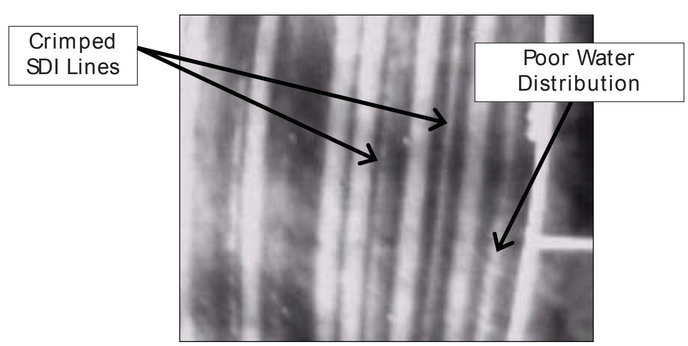



Figure 2. Thermal infrared image showing crimped SDI tape and an area of poor water distribution on July 18, 2007. Lighter or white rows heading N-S indicate stressed cotton plants (non-irrigated) while darker rows illustrate irrigated cotton which was less stressed during the time of data collection.

In conclusion, TIR shows promise for in-season evaluation of crop stress and SDI performance. Further, thermal imagery could be used for site-specific management of cotton and provide a management tool for SDI. This study is being continued at the same location in 2008 and 2009 to further evaluate the use of TIR imagery to monitor agronomic factors and real-time data collection methods for cotton production.

## Evaluation of Variable-Rate Seeding for Cotton

J. P. Fulton, S. H. Norwood, J. N. Shaw, C. H. Burmester, C. Brodbeck, R. W. Goodman, P. L. Mask, M. H. Hall, and C. Dillard

The objective of this project was to evaluate opportunities for increased yield or profits through variable-rate (VR) seeding for cotton production. The cooperative farmer identified in 2005 allowed the on-farm study in Northern Alabama to continue during the 2006 and 2007 growing seasons. This farmer utilizes a cotton and corn rotation while also managing center pivot irrigation on a select portion of farmland permitting the comparison of irrigated and dryland cotton production. Selected seeding rates, based on the farmer's traditional seeding rates and recommendations from consultants for both dryland and irrigated fields, included 35K, 50K, 65K, and 80K seeds/ac. A 24-row planter equipped with a VR drive system was used in this study. A study site within each field was blocked to provide four replications of the cotton treatments. Treatments were then randomly assigned within each block with a single pass of the planter representing a specific population treatment within the block.

After planting, stand counts were measured to determine the actual germinated population. Stand count measurements were gathered on each of the 12-row sections of the planter; counts were collected at three or more places along the 12 rows depending upon terrain variability. A cotton picker equipped with an AgLeader yield monitor was used to obtain spatial performance data for each plot. Analyses included summarizing stand counts along with spatially segregating yields based on the various seeding treatments to determine the effect of seeding rate on cotton yields. Yield and stand count data were statistically analyzed, using T-tests and Least Significant Difference ($\alpha = 0.1$) to determine if differences existed between seeding treatments.

Results showed that stand counts were all significantly lower, in both irrigated and non-irrigated fields, than the targeted seeding rate with the exception of one (35,000 seeds per acre treatment within the non-irrigated plot). The seed populations being consistently lower than the target application rate may be tied to calibration and planter setup along with poor emergence. However, the reason for the lower than expected actual populations is unknown. Statistically comparing the actual populations indicated significant differences between the four average populations for field 1 (non-irrigated); however, differences were reported in field 2 (irrigated) (see table). In field 2, the actual population of the 35K treatment was significantly different that the actual population of the 50K and 65K treatments. These results for each field were expected considering the differences between the seeding rate treatments.

In the non-irrigated field, there was not a significant difference in lint yield between the four seeding rates (see table). These results reflect the same outcomes as in 2005 and 2006 for the non-irrigated field. For the irrigated plots, a correlation existed between yield and actual population indicating the importance of seedling emergence on final yield (see table).

As expected, irrigated cotton yields were significantly higher than dryland cotton yields. They were around 49 percent higher for the various treatments. The value of the average yield response for irrigated cotton was slightly greater than the increased cost, returning on average $0.50 for every dollar spent on additional 1,000 seeds, while yield response on dryland cotton was poor, returning on average, a profit loss ($-1.25 per 1000 seeds). The change in seeding rate response from one year to the next has been statistically significant; however, extrapolation outside the range of the experiment is not recommended. Profit increase and decrease were determined using the following cost breakdown:

### Irrigated and Non-Irrigated Data for the 2006 and 2007 Growing Seasons

| | 2007 | | | | 2006 | | | |
|---|---|---|---|---|---|---|---|---|
| | Non-Irrigated | | Irrigated | | Non-Irrigated | | Irrigated | |
| Treatment *seeds/A* | Actual *plants/A*[1] | Yield *lbs lint/A*[3] | Actual *plants/A*[1] | Yield *lbs lint/A*[3] | Actual *plants/A*[2] | Yield *lbs lint/A*[3] | Actual *plants/A*[2] | Yield *lbs lint/A*[3] |
| 35,000 | 38,714 a | 662 a | 27,080 a | 984 a | 33,251 d | 660 c | 26,455 d | 1383 ab |
| 50,000 | 32,815 a | 657 a | 31,508 b | 1098 ab | 40,874 c | 621 c | 37,679 c | 1093 b |
| 65,000 | 39,986 a | 761 a | 42,979 b | 1145 b | 54,813 b | 624 c | 47,335 b | 1171 b |
| 80,000 | 56,701 b | 765 a | 52,490 b | 1140 b | 62,944 a | 645 c | 52,199 a | 1592 a |

[1] Means with similar letters in this column for 2007 indicates they are not statistically different at the 90 percent confidence level.
[2] Means with similar letters in this column for field 2 indicates they are not statistically different at the 90 percent confidence level.
[3] Mean lint yields with similar letters in each column for fields 1 and 2 indicates they are not statistically different at the 90 percent confidence level.

• Irrigated Cotton:
Cost of seed: $2 per 1000;
Yield response: 5 pounds of lint per 1000;
Profit increase ($.50 cotton): $2.50-$2 = $.50 per 1000
• Dryland Cotton:
Cost of seed: $2 per 1000;
Yield response: 1.5 pounds of lint per 1000;
Profit increase ($.50 cotton): $0.75-$2 = -$1.25 per 1000

In summary, similarities were reported for the 2005, 2006 and 2007 growing seasons. On the non-irrigated treatments the actual plant populations were all significantly less than the target population during the three growing seasons except for the lowest seeding rate (35K) in the 2006 and 2007 growing season. While some significant differences between actual populations did exist in the non-irrigated treatments (80K in 2006), no significant differences in lint yields were reported for the 2005, 2006, and 2007 growing seasons. For the irrigated treatments, a linear correlation existed between lint yields and actual populations and lint yields differing from the non-irrigated results. Finally, lint yields were at least 49 percent higher on irrigated treatments compared to non-irrigated treatments. Due to the atypical growing conditions in 2007, it has been decided to repeat this study in 2008 in an effort to draw more conclusive results, particularly within irrigated treatments.

# CROP ROTATION AND VARIETY SELECTION

## Crop Rotation for the Control of Reniform Nematodes

W. S. Gazaway, K. S. Lawrence, J. R. Akridge, and C. D. Monks

The reniform nematode *(Rotylenchulus reniformis)* replaced the root-knot nematode *(Meloidogyne incognita)* as the major nematode cotton pest in Alabama. Cotton farmers have been able to manage moderate to heavy reniform populations with nematicides, but have been unsuccessful managing extremely high reniform populations. Only rotation with non-susceptible summer crops has been successful in these extreme cases. To address the growing economic damage of the reniform nematode in fields with extremely high reniform nematode populations, a series of rotation studies were conducted. These included non-host crop rotations with and without nematicides applied to cotton following a non-host crop.

The test was designed to compare cotton yield and reniform nematode populations following 1 or 2-year rotations with non-host crops the same year beginning in 2007 and continuing indefinitely (Table 1). The soil was a Ruston Very Fine Sandy Loam (49 to 56 percent sand, 15 to 34 percent silt, 12 to 17 percent clay, 2.2 to 1.9 percent organic matter, and pH 6.0 to 6.2) that has been cropped continuously with cotton for several years. The field trial was a split-plot design with nematicides as the primary factor and summer non-host crops as the secondary factor with four replications. All non-host crop plots and continuous cotton plots were eight rows wide and 40 feet long. Cotton plots were split into two four-row subplots; one subplot was selected at random and treated with the fumigant Telone II. The entire field was planted in the winter with a rye cover which was cut in the spring, plowed and disked 6 weeks prior to planting the summer crops. Telone II was injected 18 inches deep, at a rate of 3 gallons per acre into raised seedbeds to designated nematicide plots three weeks before planting. Cotton seed (DP 449BG/RR) was treated with Cruiser® for early season insect control. Corn (Pioneer 33M53RR), peanut (AP3), and soybean (DP5634RR) were planted in the non-host plots on the same day as cotton. Nematode samples were collected at planting and at harvest. Twenty soil cores, 1 inch in diameter and 6 inches deep, were collected using a zig-zag sampling pattern. Nematodes were extracted from the soil by combined gravity screening and sucrose centrifugal flotation and enumerated with a stereo-microscope. Cotton yields were harvested with a mechanical plot cotton picker from the two center rows of each four-row cotton plot.

For statistical purposes, ANOVA was performed on all data on each trial and treatment effects considered significant where $P \leq 0.10$. Within each trial, treatment effects were examined utilizing LSD and data were combined where no interactions occurred. Where there was an absence of treatment interactions on nematode population or seed cotton yield, the main effects were compared.

In 2006, Telone, at a rate of 3 gallons per acre, improved cotton yields in all rotations except where cotton followed corn (Table 2). It increased yields the most (368 pounds per acre when applied to cotton following cotton (Table 2). When applied to cotton following soybean or peanut, Telone produced an increase in yield of 195 pounds per acre and 170 pounds per acre, respectively. Following a 1-year rotation with corn, Telone-treated cotton yielded only slightly greater numerically (64 pounds per acre) than the untreated cotton following corn. Cotton treated with Telone following peanut in 2005 produced the highest cotton yield in 2006 (Table 2). In 2007, Telone failed to improve cotton yields significantly (Table 3).

Looking at the impact of non-host crops alone, a 1-year peanut or corn rotation produced significantly larger cotton yields than a 1-year soybean rotation with cotton or continuous cotton in 2006 (Table 2). The first year that yields from the 1-year and 2-year rotation could be compared directly was 2007. Both the 1- and 2-year rotations improved cotton yields significantly over continuous cotton. The 2-year rotation was numerically but not significantly superior to the 1-year rotation (Table 3). The yield increase was reflected in smaller 2006

**Table 1. Rotation Scheme for Crop Rotation Study**

| Rotation | Telone[1] | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|
| Corn 1 year | +/- | cotton | corn | cotton | corn | cotton |
| Peanut 1 year | +/- | cotton | peanut | cotton | peanut | cotton |
| Soybean 1 year | +/- | cotton | soybean | cotton | soybean | cotton |
| Corn 2 year | +/- | corn | corn | cotton | corn | corn |
| Peanut 2 year | +/- | peanut | peanut | cotton | peanut | peanut |
| Soybean 2 year | +/- | soybean | soybean | cotton | soybean | soybean |
| Cont. cotton | +/- | cotton | cotton | cotton | cotton | cotton |
| Corn 1 year | +/- | corn | cotton | corn | cotton | corn |
| Peanut 1 year | +/- | peanut | cotton | peanut | cotton | peanut |
| Soybean 1 year | +/- | soybean | cotton | soybean | cotton | soybean |
| Corn 2 year | +/- | cotton | corn | corn | cotton | corn |
| Peanut 2 year | +/- | cotton | peanut | peanut | cotton | peanut |
| Soybean 2 year | +/- | cotton | soybean | soybean | cotton | soybean |
| Corn 2 year | +/- | cotton | cotton | corn | corn | cotton |
| Peanut 2 year | +/- | cotton | cotton | peanut | peanut | cotton |
| Soybean 2 year | +/- | cotton | cotton | soybean | soybean | cotton |

[1]Telone, a nematicide, was applied to designated cotton plots.

fall populations of reniform nematode following one season of peanut and corn (Table 2). It is also noteworthy that in the fall of 2006 the lowest reniform populations occurred in the plots following 2 years of peanut and corn, but there were no significant differences in reniform populations between the 1- and 2-year rotations in the fall of 2007 (Table 4).

This test has undergone severe drought conditions during both the 2006 and 2007 growing seasons. In 2007, the test received 16 inches of rain for the entire growing season. Consequently, both cotton yields and reniform nematode populations have been adversely impacted due to the lack of soil moisture. A real response to crop rotation and nematicide treatment has been undoubtedly compromised both years as a result of these unfavorable growing conditions. We will not have an accurate measure of the real affect of crop rotation and nematicide treatments until more normal growing conditions return.

**TABLE 2. EFFECT OF CROP ROTATION AND NEMATICIDE TREATMENT ON RENIFORM NEMATODES AND COTTON YIELD IN 2006**

| Rotation | | 2006 Spring nematode population | 2006 Fall nematode population | Seed cotton yield (lb/A) Nematicide | Seed cotton yield (lb/A) No nematicide |
|---|---|---|---|---|---|
| **2005** | **2006** | no./100 cc | no./100 cc | | |
| Cotton | Cotton | 1140 | 3450 | 1734 | 1366 |
| Cotton | Corn | 1087 | 367 | NA[2] | NA |
| Cotton | Peanut | 1081 | 383 | NA | NA |
| Soybean | Cotton | 856 | 3235 | 1619 | 1424 |
| Corn | Cotton | 753 | 2592 | 1767 | 1702 |
| Cotton | Soybean | 528 | 315 | NA | NA |
| Peanut | Cotton | 257 | 2321 | 1838 | 1668 |
| **Comparison only[1]** | | | | | |
| Corn | Corn | 219 | 61 | | |
| Peanut | Peanut | 335 | 106 | | |
| Soybean | Soybean | 798 | 256 | | |
| Pr>F | Rotation | 0.011 | 0.0001 | 0.0001 | |
| Pr>F | Nematicide | 0.4438 | 0.1072 | 0.0073 | |
| Pr>F | Rotation x Nematicide | | 0.5202 | 0.1809 | 0.0649 |
| ***LSD (P≤0.10)*** | | ***407*** | ***766*** | ***151*** | |
| ***C.V. (%)*** | | ***58*** | ***49*** | ***13*** | |

| | **Nematicide** | **Seed cotton yield (lb/A) 2006** | **Seed cotton yield (lb/A) 2007** |
|---|---|---|---|
| | Nematicide | 1739 | 1597 |
| | No nematicide | 1540 | 1541 |
| | Pr>F | 0.0579 | 0.5898 NA |
| | ***LSD (P≤0.10)*** | ***123*** | ***76*** |
| | ***C.V. (%)*** | ***13*** | |

[1]Not included in the statistical analysis. Comparisons included for information only. NA=not applicable.

**TABLE 3. EFFECT OF CROP ROTATION AND NEMATICIDE TREATMENT ON COTTON YIELD IN 2007**

| Crops 2005 | Crops 2006 | Crops 2007 | 2007 Seed cotton yield lbs/A |
|---|---|---|---|
| Cotton | Corn | Cotton | 1535 |
| Cotton | Peanut | Cotton | 1512 |
| Cotton | Soybean | Cotton | 1536 |
| Corn | Corn | Cotton | 1726 |
| Peanut | Peanut | Cotton | 1705 |
| Soybean | Soybean | Cotton | 1651 |
| Cotton | Cotton | Cotton | 1319 |
| ***LSD (P≤0.05)*** | | | ***257*** |
| Pr>F | Rotation | | 0.0001 |
| Pr>F | Nematicide | | 0.5898 |
| Pr>F | Rotation x Nematicide | | 0.9848 |

**TABLE 4. EFFECT OF CROP ROTATION AND NEMATICIDE TREATMENT ON RENIFORM NEMATODE POPULATIONS IN 2007**

| Crops 2005 | Crops 2006 | Crops 2007 | Reniform/100cc soil Telone | Reniform/100cc soil No Telone |
|---|---|---|---|---|
| Corn | Cotton | Corn | 322 de | 190 e |
| Peanut | Cotton | Peanut | 369 de | 242 e |
| Soybean | Cotton | Soybean | 199 e | 317 de |
| Cotton | Corn | Corn | 149 e | 175 e |
| Cotton | Peanut | Peanut | 225 e | 368 de |
| Cotton | Soybean | Soybean | 334 de | 297 de |
| Cotton | Corn | Cotton | 953 b-e | 1450 ab |
| Cotton | Peanut | Cotton | 836 b-e | 1293 abc |
| Cotton | Soybean | Cotton | 918 b-e | 1397 abc |
| Corn | Corn | Cotton | 802 b-e | 1197 a-d |
| Peanut | Peanut | Cotton | 667 b-e | 1371 abc |
| Soybean | Soybean | Cotton | 867 b-e | 1830 a |
| Cotton | Cotton | Cotton | 1382 abc | 1887 a |
| ***LSD (P≤0.05)*** | | | ***511*** | |

# Screening Commercial Cotton Varieties Against Fusarium Wilt

W. S. Gazaway and K. Glass

The purpose of this study was to identify commercial cotton varieties currently grown in Alabama that are susceptible or have tolerance to Fusarium wilt. Results are also published in a tabular form online and in the Alabama Cotton IPM guide each year.

Fifteen of the most commonly grown cotton varieties were planted late (June 14) due to lack of rain. The field was extremely dry and had to be irrigated to obtain a stand. Rowden, an extremely susceptible cotton variety, was planted as a control. Plots were 20 feet long and 16 rows wide. The test consisted of five replicates. Plants were evaluated for wilt soon after they reached the first true leaf stage. Plants showing Fusarium wilt symptoms were counted and removed. Plots were checked for wilt on a weekly basis and evaluated as symptoms appeared throughout the growing season.

Very little wilt occurred during the 2007 growing season due to the extreme drought and heat. Root-knot nematode damage, which is critical for Fusarium wilt to occur, was very light in 2007. Consequently, there was insufficient wilt in the plots during 2007 to separate cotton varieties' reaction to Fusarium wilt (see table).

**2007 Commercial Variety Fusarium Wilt, Plant Breeding Unit, Tallassee, AL**

| Variety | Rep 1 | Rep 2 | Rep 3 | Rep 4 | Av wilt % |
|---|---|---|---|---|---|
| **Rowden** | **8** | **6** | **5** | **3** | **6** |
| PhytoGen PHY 480WR | 6 | 5 | 0 | 0 | 3 |
| Fiber Max FM 9063B2F | 3 | 4 | 1 | 1 | 2 |
| Deltapine DP 454BG/RR | 5 | 0 | 1 | 3 | 2 |
| Fiber Max FM 1735LLB2 | 0 | 5 | 0 | 3 | 2 |
| Deltapine DP 445BG/RR | 3 | 2 | 0 | 0 | 1 |
| DynaGro DG 2520B2RF | 0 | 1 | 2 | 0 | 1 |
| Deltapine DP 555BG/RR | 0 | 1 | 2 | 0 | 1 |
| Fiber Max FM 960BR | 1 | 0 | 1 | 0 | 1 |
| Stoneville ST 4664RF | 0 | 2 | 0 | 0 | 0 |
| Deltapine DP 143B2RF | 0 | 1 | 0 | 0 | 0 |
| PhytoGen PHY 485WRF | 1 | 0 | 0 | 0 | 0 |
| Stoneville ST 6611B2RF | 0 | 0 | 0 | 0 | 0 |
| Crop. Gen. CG 3020B2RF | 0 | 0 | 0 | 0 | 0 |
| Deltapine DP 515BG/RR | 0 | 0 | 0 | 0 | 0 |
| Deltapine DP 444BG/RR | 0 | 0 | 0 | 0 | 0 |

# Cotton Cultivar Response to Temik 15G plus Avicta in Two Tillage Regimes in Alabama, 2007

K.S. Lawrence, K. S. Balkcom, and B. Durbin

Six cotton cultivars were evaluated for yield response to the root-knot nematode in a naturally infested field at E. V. Smith Research and Education Center, near Shorter, Alabama. The field had a long history of root-knot nematode infestation, and the soil type was classified as a sandy loam. Plots consisted of four rows, 50 feet long, with 3-foot row spacing and were planted in a factorial arrangement in a randomized complete block design with five replications. Blocks were separated by a 20-foot wide alley. Avicta was applied to the seed by the manufacturer. Temik 15G (5 pounds per acre) was applied at planting on May 16 in the seed furrow with chemical granular applicators attached to the planter. Orthene 90S (0.12 pound per acre) was applied to all plots as needed for thrips control. All plots were maintained throughout the season with standard herbicide, insecticide, and fertility production practices as recommended by the Alabama Cooperative Extension System. Population densities of the root-knot nematode were determined approximately 30 days after emergence. Ten soil cores, 1 inch in diameter and 6 inches deep, were collected from the center two rows of each plot in a systematic sampling pattern. Nematodes were extracted using the gravity sieving and sucrose centrifugation technique. Nematode eggs were extracted from the root systems of five plants collected at random across each plot using a 0.6 percent sodium hypochlorite separation. Plots were harvested on September 24. Data were statistically analyzed by GLM and means compared using Fisher's protected least significant difference test ($P \leq 0.10$).

Rainfall was the limiting factor in the 2007 season; thus, root-knot nematode pressure was moderate under these conditions. Only 17.7 in of rain were recorded for the entire growing season. At planting, root-knot nematode numbers averaged 107 J2s per 150 $cm^3$ of soil. Seed cotton stand was uniform for cultivars with or without nematicide. The ST5599BR cultivar produced a greater ($P \leq 0.10$) stand than DP 143B2RF or DP515BG/RR with the nematicide applications. Seedling vigor was also similar for each cultivar regardless of nematicide application. However, differences in vigor were observed between cultivars with ST5599BR and DP117B2RF being more vigorous in growth at 30 DAE than DP 555BG/RR when treated with a nematicide. Root-knot numbers of J2 from the soil and eggs from the roots varied between varieties and nematicide application. ST 5599BR root-knot numbers were numerically lower than all other cultivars, and all cultivars exhibited numerically greater numbers of root-knot nematodes in the control plots compared to the nematicide plots. ST 5599BR, DP 117B2RF, and DP 143B2RF did not produce a numerical yield increase with the nematicide combination of Temik 15G and Avicta; thus, tolerance is a possibility under the environmental conditions of this growing season. DP 555BG/RR and DP 515BG/RR did increase yields ($P \leq 0.10$) with the application of the nematicides.

**COTTON CULTIVAR RESPONSE TO TEMIK 15G PLUS AVICTA IN TWO TILLAGE REGIMES IN ALABAMA, 2007**

| | Stand/10 ft row[1] | | ——Vigor—— | | Plant height | | *Meloidogyne incognita* —J2 and eggs— | | —Lint lb/A— | |
|---|---|---|---|---|---|---|---|---|---|---|
| | N [2] | CK [3] | N | CK | N | CK | N | CK | N | CK |
| ST 5599BR | 41.6 | 41.5 | 4.4 | 4.0 | 8.1 | 7.5 | 10459 | 37809 | 433.7 | 473.8 |
| DP 117B2RF | 40.3 | 40.9 | 4.4 | 4.0 | 8.4 | 7.2 | 26631 | 150924 | 456.5 | 460.0 |
| STM | 38.0 | 38.4 | 3.9 | 3.6 | 7.1 | 6.6 | 34821 | 126303 | 496.2 | 486.1 |
| DP 555BG/RR | 36.8 | 40.4 | 3.7 | 3.6 | 7.7 | 7.6 | 45309 | 188556 | 549.1 | 480.1 |
| DP 143B2RF | 33.8 | 37.8 | 4.3 | 4.1 | 7.0 | 6.3 | 11447 | 65908 | 456.5 | 509.5 |
| DP 515BG/RR | 33.4 | 36.1 | 4.1 | 4.3 | 8.1 | 6.9 | 69194 | 164616 | 549.3 | 509.1 |
| ***LSD ($P \leq 0.10$)*** | ***6.8*** | | ***0.6*** | | ***1.1*** | | ***144221*** | | ***59*** | |

[1] Numbers in columns followed by the same letter are not significantly different by Fisher's LSD at $P \leq 0.05$.

[2] N is the application of the nematicides Avicta and Temik 15G.

[3] C stands for the non treated control plots.

# COTTON CULTIVAR RESPONSE TO TELONE II FOR RENIFORM NEMATODE MANAGEMENT IN COTTON IN SOUTH ALABAMA

K. S. Lawrence, S. R. Moore, G. W. Lawrence, and J. R. Akridge

Nine cotton cultivars were evaluated for yield response to reniform nematodes in a naturally infested producer's field near Huxford, Alabama. The field had a long history of reniform nematode infestation, and the soil type was classified as a loam. Plots consisted of four rows, 25 feet long, with a 3-foot row spacing and were planted in a factorial arrangement in a randomized complete block design with five replications. Blocks were separated by a 20-foot wide alley. Telone II was applied at 3.0 gallons per acre and compared with at-planting applications of Di-Syston 8EC at 5.0 pounds per acre. Telone II was applied with a modified ripper hipper. A $CO_2$ system was used to inject the fumigant through flow regulators mounted on stainless steel delivery tubes attached to the trailing edge of forward-swept chisels. The fumigant was placed 12 in. deep 21 days prior to planting. Rows were immediately hipped to seal and prevent rapid loss of the fumigant. All remaining rows were subsoiled 12 in. deep and hipped without applying the fumigant. All plots were maintained throughout the season with standard herbicide, insecticide, and fertility production practices as recommended by the Alabama Cooperative Extension System. Population densities of the reniform nematode were determined at monthly intervals. Orthene 90S at 0.12 pound per acre was applied to all plots as needed for thrips control. Ten soil cores, 1 inch in diameter and 6 inches deep, were collected from the two rows of each plot in a systematic sampling pattern. Nematodes were extracted using the gravity sieving and sucrose centrifugation technique. Plots were harvested on October 31. Data were statistically analyzed by GLM and means compared using Fisher's protected least significant difference test ($P \leq 0.10$).

Rainfall was the limiting factor in the 2007 season; thus, reniform nematode pressure was low to moderate under these conditions. Only 15.3 inches of rain was recorded for the entire growing season. At planting, reniform nematode numbers averaged 127 and 208 vermiform life stages per 150 $cm^3$ of soil in the Telone II and DiSyston plots, respectively. Seed cotton stand was uniform between treatments (data not shown). Reniform numbers increased by 170 and 110 percent in the Telone II and DiSyston plots at harvest (see table). The lowest reniform populations in the Telone II plots were observed in the DP 161B2RF, DP 174RF, and DP 121RF cultivars. DP 174RF, DP 121RF, DP 555BG/RR, and DP 515BG/RR supported the lowest populations in the DiSyston plots. Telone II numerically increased the yield of seven of the nine cultivars. DP 117B2RF was the highest yielding cultivar in both the Telone II and DiSyston plots, although yield was increased by 245 pounds per acre in the Telone II plots. DP 515BG/RR and DP 174RF did not produce a yield increase in response to Telone II and, thus, may possess some tolerance to the reniform nematode under drought conditions.

**EFFECT OF TELONE II AND DISYSTON ON CULTIVAR RESPONSE TO *ROTYLENCHULUS RENIFORMIS* AND SUBSEQUENT COTTON YIELD**

| | ——*Rotylenchulus reniformis*/150cc soil—— | | | | —Seed cotton lb/A— | |
|---|---|---|---|---|---|---|
| | Telone II | DiSyston | Telone II | DiSyston | Telone II | DiSyston |
| Cultivar | ——5/8/2007—— | | ——10/31/2007—— | | | |
| 1 DP 445BG/RR | 176 | 192 | 2689 a[1] | 3461 a | 1680 ab | 1475 b |
| 2 DP 555BG/RR | 109 | 207 | 3044 a | 1406 b | 1540 ab | 1199 bc |
| 3 DP 515BG/RR | 129 | 223 | 2750 a | 1437 b | 1517 ab | 1539 b |
| 4 DP 117B2RF | 125 | 218 | 2148 ab | 3152 a | 2102 a | 1856 a |
| 5 DP 141B2RF | 109 | 203 | 2055 ab | 3492 a | 1071 b | 982 c |
| 6 DP 161B2RF | 140 | 172 | 1638 b | 1947 ab | 1382 b | 1222 bc |
| 7 DP 174RF | 140 | 203 | 1144 b | 1762 b | 1104 b | 1136 bc |
| 8 DP 121RF | 94 | 223 | 1561 b | 1653 b | 1733 ab | 1505 b |
| 9 ST 5599BR | 124 | 239 | 3461 a | 2410 ab | 1724 ab | 1423 b |
| ***LSD ($P \leq 0.10$)*** | ***152*** | ***141*** | ***1537*** | ***1714*** | ***427*** | ***245*** |

[1] Numbers in columns followed by the same letter are not significantly different by Fisher's LSD at $P \leq 0.10$.

# Breeding Cotton for Yield and Quality in Alabama

David B. Weaver

There are three major aspects to this project: (1) development of cotton germplasm or cultivars with improved yield and fiber properties; (2) evaluation and development of cotton germplasm for resistance to reniform nematode; (3) and evaluation and development of cotton germplasm for resistance to abiotic stresses, particularly heat and drought.

For the first objective, experimental breeding lines from seven different cotton populations were developed using bulk and pedigree methods. In 2007, we evaluated 280 experimental lines (roughly 40 lines per population) for yield and fiber properties at two locations, Tallassee and Prattville. Plots were two rows, 20 feet in length, with a spacing of 36 inches between rows, replicated three times. Data were collected by sampling 50 bolls from each plot for determining lint percentage, boll size, lint weight per seed, and fiber quality. Fiber quality was analyzed by HVI at Cotton, Inc., Cary, NC. The entire plot was spindle-harvested to determine seed and lint yield. No data were collected at Prattville due to extreme drought. Supplemental irrigation, plus some very timely rainfall late in the season, resulted in good data from Tallassee; however, and fiber analysis is in progress. Five advanced lines were evaluated in the Regional Breeders Testing Network at 12 locations across the Cotton Belt. These are the first entries from the Auburn program since its inception. All locations have not reported, however, the top performing line at the Tallassee location (29 entries plus three checks) was an Auburn experimental line (Au04-6207, from the cross Miscot 8001 × Suregrow 747), with a lint yield of 1371 pounds per acre. Test average was 1123 pounds per acre. Fiber quality of this line was good, with 42.7 percent lint, micronaire of 4.4, 50 percent span length of 1.12 inches, and strength of 29.25 g/tex. Other Auburn lines are performing well at other locations, but all data have not been submitted. We have cooperated in this test for the past five growing seasons. Further work is being done to develop new populations for generating experimental cotton lines for future testing.

We have made significant progress developing advanced populations from crosses between four adapted lines (FM966, SG747, PM1218, and DeltaPearl) and two germplasm lines (TX245 and TX1419) identified as having a moderate level of resistance to reniform nematode. Three types of populations have been developed: Adapted × resistant accession (F2:3 lines); (adapted × resistant accession) × adapted (BC1:2 lines); and (adapted × resistant accession) × resistant accession (BC1:2 lines). We have a total of 1200 lines representing 25, 50, and 75 percent adapted germplasm, and these lines are ready for evaluation for nematode resistance in 2008. Evaluation and incorporation of genes for resistance into adapted types will be a long-term process.

We are continuing along the same path in development of similar type populations using genotypes identified as heat tolerant. We have identified seven accessions as having significantly greater vegetative heat tolerance than Deltapine 90. Development of these populations is progressing more slowly, due to the difficulty of crossing with these materials. These lines are photoperiodic, with long juvenile periods and can take over a year between planting and flowering. We were unable to make crosses in the winter nursery in 2007, and lines also failed to flower in the field during 2007. However, plants that were planted in the greenhouse in spring of 2007 are now flowering, and we are making crosses with the adapted Deltapine 90. We hope to have F2 populations developed by fall 2008; however, it is highly probable that the F1 hybrids will also have a long juvenile period, so it may take until 2009 before F2 populations are available for evaluation. During the upcoming year, we will continue to work with these lines to determine the level of expression of this trait and hope to identify genes that are responsible.

# Irrigation on The Old Rotation

C. C. Mitchell, K.S. Balkcom, and D.P. Delaney

The Old Rotation (circa 1896) is the oldest, continuous cotton experiment in the world. Its 13 plots on one acre of land on the campus of Auburn University continue to document the long-term effects of crop rotations with and without winter legumes (e.g., crimson clover) as a source of N for cotton, corn, soybean, and wheat. Irrigation was installed on half of each plot in 2003 and both irrigated and non-irrigated yields have been monitored since then (Figure 1). For more information on the history of the Old Rotation, visit the website at http://www.ag.auburn.edu/agrn/cotton.htm

The eastern half of each of the 13 plots on the Old Rotation can be irrigated separately using a system of eight 8-foot risers in each plot. Scheduling irrigation, on the other hand, is tricky. Ideally, irrigation should be based on soil moisture in the rooting depth plus the stage of growth of the crop. Because this system can be programmed to apply water on a regular schedule to each plot, we estimate evapotranspiration and preset the system to apply supplemental water. We adjust the timing and rate of irrigation based upon the weather, crop, and stage of growth. In general, during tasseling of corn and peak boll fill of cotton, we apply between 1 and 2 inches of irrigation per week if no rain occurs. In most years, the irrigation system is not turned on until June so cotton and corn crops are established without irrigation. Because of the extreme drought of 2007, irrigation was necessary to assure a uniform stand of cotton and soybeans. In 2007, irrigation began in mid-May and continued to early September. Most of the cotton plots received a total of 20 to 25 inches of irrigation. This was twice the total amount applied in previous years. Winter wheat and winter legumes are not irrigated.

From its inception in 1896 through 1996, all crops on the Old Rotation were produced with conventional tillage, e.g., moldboard plowing, disking, harrowing, and cultivation. Since 1997, all crops have been produced using conservation tillage which leaves a maximum of crop residue on the soil surface. Prior to planting, all crops receive in-row subsoiling or para-tilling, which is the only soil disturbance used. Since 1997 and the advent of genetically modified crops, the use of insecticides and herbicides have been dramatically reduced and overall crop yields have increased. Record yields of all crops grown on the Old Rotation have been produced since 1997.

**Cotton.** There were no differences due to irrigation during the first 4 years after irrigation was installed, 2003-2006. Most of Alabama suffered under a severe drought in both 2006 and 2007. However, the site of the Old Rotation received some timely rains during 2006 which it did not get in 2007 (Figure 2). In fact, 2007 was the worse drought in more than 50 years for the Auburn, Alabama, area. Cotton that was planted on May 17, 2007 did not emerge until late June except where the plots were irrigated. Cotton on plots low in soil organic matter due to a lack of long-term rotations (e.g. plots 1, 6, and 13) never emerged because of soil crusting. Previous research has shown that soil organic matter on these plots is less than 0.5 percent. Surface soil organic matter is as high as 2.5 percent on plots with rotations, winter cover crops, and high residue management. Irrigation in 2007 resulted in large yield differences and an all-time record cotton lint yield on plot 9 (2-year cotton–corn rotation with legume plus 120 pounds of N per acre) of 1940 pounds of lint per acre.

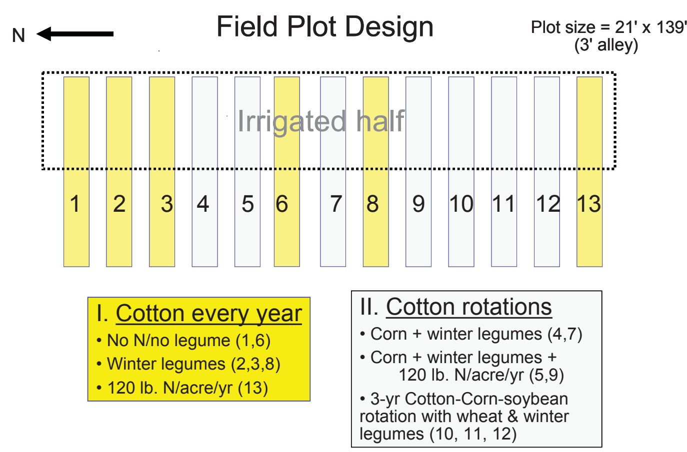



Figure 1. Field plot diagram of Old Rotation experiment showing irrigated half since 2003.

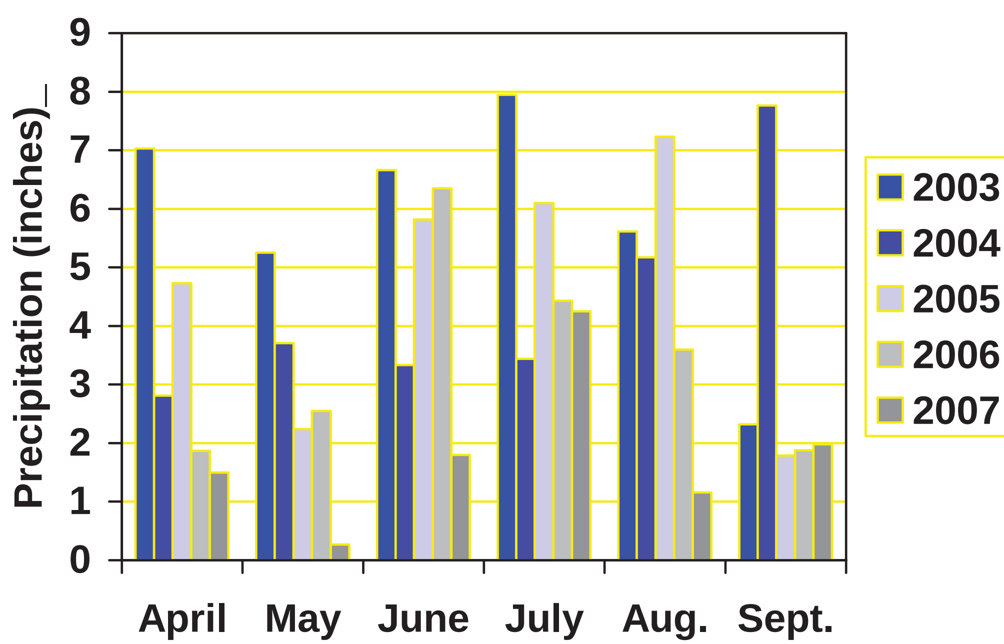



Figure 2. Monthly precipitation during the growing season for the Old Rotation site, 2003-2007.

Potassium deficiency, which has not been observed on the Old Rotation by any of the authors, was observed on plots 7, 8, and 9 in 2007. This was attributed to the very high irrigated cotton yields.

Because of the dramatic yield increase due to irrigation in 2007, the 5-year average yield increase due to irrigation was 22 percent (Figure 3).

In conclusion, irrigated cotton on the Old Rotation has resulted in a positive yield response in only one year out of five, and that was the severe drought year of 2007. Irrigated yields in 2007 were so dramatically higher than the non-irrigated cotton yields that over the 5-year period, irrigation resulted in a 22 percent average yield increase over all plots. Irrigation with corn and soybean resulted in higher grain yields each year with average increases of 47 and 44 percent, respectively, over all treatments.

## Effect of Irrigation on Old Rotation Mean Crop Yields, 2003-2007

| Treatment (plots) | Corn grain Irrigated | Corn grain Non-irrigated | Cotton lint Irrigated | Cotton lint Non-irrigated |
|---|---|---|---|---|
| | bu/A | | lbs/A | |
| Cotton every year | | | | |
| No N/no legume (plots 1 & 6) | -- | -- | 470 d[1] | 300 d |
| Legume N only (plots 2, 3 & 8) | -- | -- | 1020 c | 1000 b |
| 120 lb. N/acre (plot 13) | -- | -- | 1330 ab | 940 bc |
| Cotton Rotations | | | | |
| Cotton-Corn rotation, legume N only (plots 4&7) | 69 c | 54 c | 1190 bc | 1150 b |
| Cotton-Corn rotation, +legume, + 120 lb N/acre (plots 5&9) | 166 a | 116 a | 1530 a | 1380 a |
| 3-yr rotation, Cotton (winter legume)-Corn (wheat)-Soybean (plots 10, 11 , 12) | 119 b | 71 b | 1210 bc | 750 c |
| Soybean mean yield (irrigated) = 56 bu/acre | | | | |
| Soybean mean yield (non-irrigated) = 39 bu/acre | | | | |
| Wheat mean yield (non-irrigated) = 51 bu/acre | | | | |

[1] Values followed by the same letter within a column are not significantly different at $P \leq 0.05$.

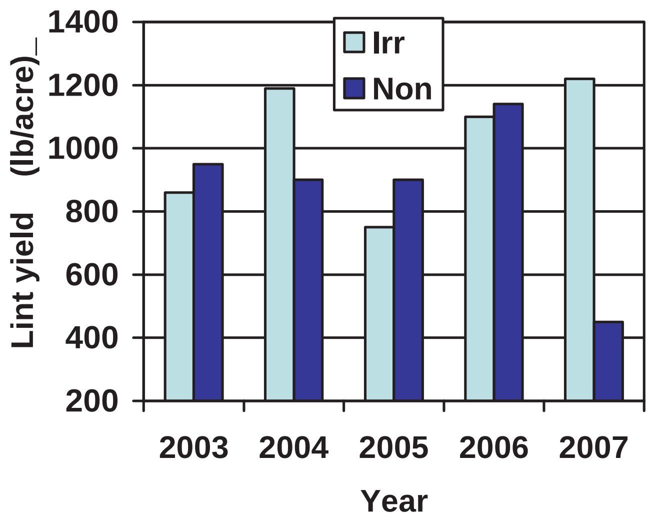



Figure 3. Mean cotton lint yields by year over all treatment/plots on the Old Rotation experiment as affected by irrigation (Irr) and non-irrigation (Non). LSD ($P \leq 0.05$) =400.

# Fertilization of Cotton on Black Belt Prairie Soils in Alabama

C.C. Mitchell, D.P. Delaney, R. P.Yates, G. Huluka, and J. Holliman

Soil fertility research with cotton has not been conducted on the fine-textured, often calcareous soils of the Alabama Black Belt Prairie region in several decades although as much as 30,000 acres are being planted on these soils. Most fine-textured, Black Belt soils test “low” in P and “high” or “very high” in K if recognized analytical techniques are used that are appropriate for these highly buffered, often calcareous soils. Nevertheless, cotton growers in this area sometime suspect K deficiency in spite of following the soil test recommendation. Very little research has been conducted to verify soil test calibration or recommendations for cotton on these soils. These soils have a much higher cation exchange capacity compared to adjacent soils of the Coastal Plain or Tennessee Valley region. They generally have poor internal drainage, low saturated hydraulic conductivity, poor infiltration and may be calcareous with a soil pH above 7.0.

Nitrogen management is also a concern for cotton on these slowly permeable soils where N denitrification may be more of a concern than nitrate leaching. On-farm research has suggested higher N rates are needed for corn on these soils Very little research has been conducted with cotton on these soils in Alabama. Standard N recommendations are based on research conducted on sandier, Coastal Plain soils or finer textured soils of the Tennessee Valley in northern Alabama.

The purpose of this experiment is to identify optimum rates of N, $P_2O_5$, and $K_2O$ for cotton on Black Belt soils on a permanent site for soil fertility research at the Black Belt Research and Extension Center in Marion Junction, Alabama.

Initial soil tests from the site indicated a very uniform site typical of unfertilized Black Belt area cropland (Table 1). Phosphorus was rated low using the Mississippi/Lancaster extract, which is the preferred method for these soils and is used by both the Auburn University and Mississippi State University soil testing laboratories. Potassium was rated “very high.” Soil samples have been taken from each plot every year of this experiment but are not included in this paper.

This experiment was laid out in 2004 and was designed to complement the “Rates of NPK Experiment” (circa 1929) on other outlying units of the Alabama Agricultural Experiment Station. The site is on an acid, Vaiden clay (very fine, smetitic,

**Table 1. Initial, Mean Plow-Layer Soil Yest Value (n=4) from Site Taken in 2004**

| Extract used | Soil pHw | P | K | Mg | Ca |
|---|---|---|---|---|---|
| | | mg/kg and rating[1] | | | |
| Mehlich-1 | 6.0 | 4 Very Low | 88 High | 35 High | 2330 (not rated) |
| Miss/Lancaster | 6.0 | 16 Low | 180 V. High | 60 High | 10,000+ |

[1]Adams et al., 1994.

**Table 2. Fertilizer Treatments and Cotton Lint Yields on a Vaiden clay in West Alabama, 2005-2007**

| Treatment no. | description | Rate of nutrients applied N | $P_2O_5$ | $K_2O$ | 2005 Lint yield | 2006 Lint yield | 2007 Lint yield |
|---|---|---|---|---|---|---|---|
| | | lb/A | | | | | |
| N rates | | | | | | | |
| 1 | No N | 0 | 100 | 100 | 177 | 311 | 870 |
| 2 | Low N | 30 | 100 | 100 | 214 | 380 | 1040 |
| 3 | Intermediate N | 60 | 100 | 100 | 265 | 403 | 990 |
| 5 | Control | 90 | 100 | 100 | 388 | 393 | 1076 |
| 4 | High N | 120 | 100 | 100 | 237 | 400 | 1037 |
| 6 | No S/VH N | 150 | 100 | 100 | 320 | 387 | 1040 |
| P rates | | | | | | | |
| 7 | No P | 90 | 0 | 100 | 280 | 378 | 910 |
| 8 | Very low P | 90 | 20 | 100 | 205 | 394 | 940 |
| 9 | Low soil P | 90 | 40 | 100 | 274 | 375 | 1091 |
| 10 | Intermediate P | 90 | 60 | 100 | 233 | 388 | 1027 |
| 5 | Control | 90 | 100 | 100 | 388 | 393 | 1076 |
| K rates | | | | | | | |
| 11 | No K | 90 | 100 | 0 | 157 | 353 | 585 |
| 12 | Very low K | 90 | 100 | 20 | 170 | 324 | 784 |
| 13 | Low K | 90 | 100 | 40 | 253 | 295 | 803 |
| 14 | Intermediate K | 90 | 100 | 60 | 341 | 335 | 922 |
| 15 | High K | 90 | 100 | 80 | 319 | 349 | 806 |
| 5 | Control | 90 | 100 | 100 | 388 | 393 | 1076 |
| Other treatments | | | | | | | |
| 16 | No lime | 90 | 100 | 100 | 196 | 413 | 1027 |
| 17 | Nothing | 0 | 0 | 0 | 160 | 300 | 649 |
| | ***L.S.D P<0.1*** | | | | ***135*** | ***ns*** | ***220*** |

thermic, Vertic Hapludalfs) and is the only soil fertility experiment in Alabama on Black Belt soils. The experiment consists of six N rates, four P rates, five K rates and a no-lime treatment and an unfertilized treatment replicated four times in a randomized block design (Table 2). Plot size was 15 x 25 feet laid out in five 36-inch wide rows. Because of disappointing yields in 2005 when cotton was planted no-till into a rye cover crop and excessive rainfall occurred, the decision was made to switch to a ridge tillage system with no cover crop for 2006 and 2007. All the P and K and half of the total N were applied within 1 week of planting in late April. The remainder of N was applied in mid-June. Lint yields were estimated by hand-picking 20 feet from the two middle rows in each plot. Relative yields are yields compared to the mean yield of treatment no. 5, the control treatment, which received 90-100-100 pounds N-$P_2O_5$-$K_2O$ per acre each year.

Excessive rainfall from several tropical storms and anaerobic soil conditions dramatically limited cotton lint yields in 2005. The following two years have been described as the worst summer droughts and highest temperatures in more than 50 years (Figure 1). The drought severely limited yields in 2006, but critical rainfall in July resulted in somewhat higher yields in 2007. Yields were from hand-picked plots. If the 2006 and 2007 crops had been machine harvested, very little of the lint would have been saved because of hard locks and weak bolls. Cotton lint quality was measured in 2006 and 2207 on four different treatments by USDA AMS Cotton Program Birmingham Classing Office, No N (treatment 1), No P (treatment 7), No K (treat ment 11) and the complete fertilized control (treatment 5). There were no differences in mean fiber quality due to soil fertility treatment.

| | **2006** | **2007** |
|---|---|---|
| Micronaire | 4.6 | 3.97 |
| Length | 97 | 1.02 |
| Strength | 26.9 | 26.4 |
| Uniformity | 81.9 | 81.9 |

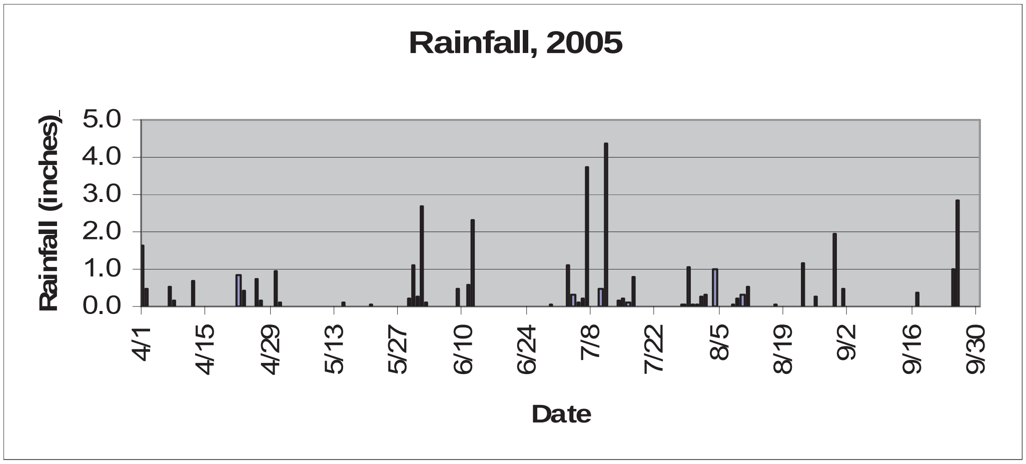
Because of the higher yields and significant differences in treatment on yield in 2007, 2007 data are probably more relevant to producers (Table 2).

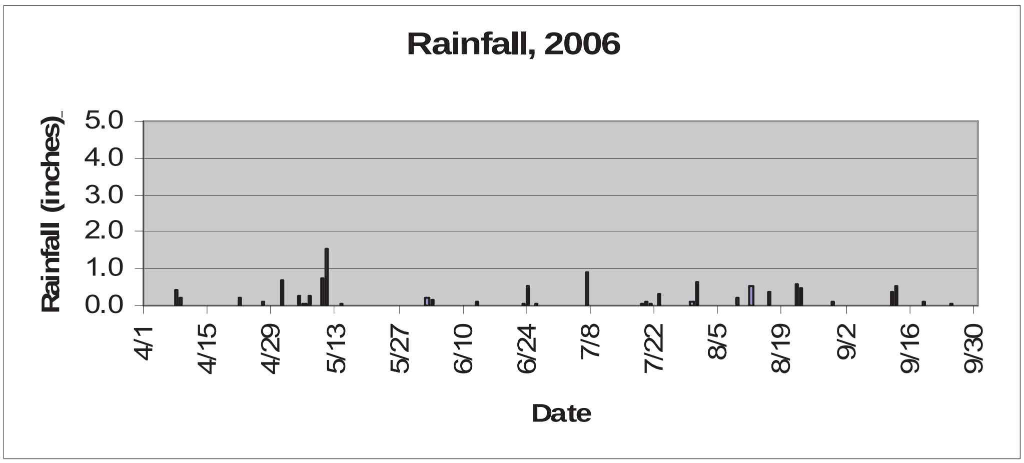
**N rates.** Optimum total N rates in the two dry years, 2006 and 2007, appeared to be around 60 pounds N per acre, although rates above 30 pounds N per acre produced relative yields above 95 percent of maximum. Although there was a more dramatic response to N rates in 2005, yields were low because excessive rainfall resulted in severe denitrification losses on these poorly drained soils. On-farm tests in 2003 when excessive rainfall also limited yields, showed that delaying N application until sidedressing could almost double the yield potential of cotton. In these tests, optimum N rate when denitrification was a problem was 120 pounds N per acre as a sidedress.

**$P_2O_5$ rates.** One would have anticipated more dramatic responses to rates of P than we found in these tests because of the low soil test P rating. Except for the low-yielding, wet year of 2005, there was very little yield response to added P. This calls into question the current “low” rating for this soil test value for cotton. The definition of a “low” soil test rating indicates that the soil will produce less than 75 percent of its potential without fertilization of that nutrient. Without P in 2006 and 2007, relative cotton lint yields were above 80 percent.

**$K_2O$ rates.** In spite of the fact that this soil initially tested “very high” in K, there were significant increases in yield with higher rates of $K_2O$ up to 100 pounds per acre in 2005 and 2007. These results provide credibility to grower’s claims that additional K seems to increase yields even though the soils are rated “very high” for K. There may be justification to change soil test K ratings for these soils and increase K recommendations for cotton. Additional studies are on-going related to this issue.

Three years of extreme weather conditions and very poor cotton yields at this site preclude any major conclusions regarding soil fertility. Significant differences in 2007 due to treatments suggest a need for modification of soil test ratings for both P and K on these soils. Phosphorus may be currently rated too low and potassium may be rated too high for cotton on these soils. Since these are the only established soil fertility variable plots on the Black Belt Research and Extension Center, we hope that they will be maintained indefinitely as is the “Rates of NPK” experiment at six other Alabama locations to provide more conclusive evidence for changes in soil test calibration for similar Alabama soils.



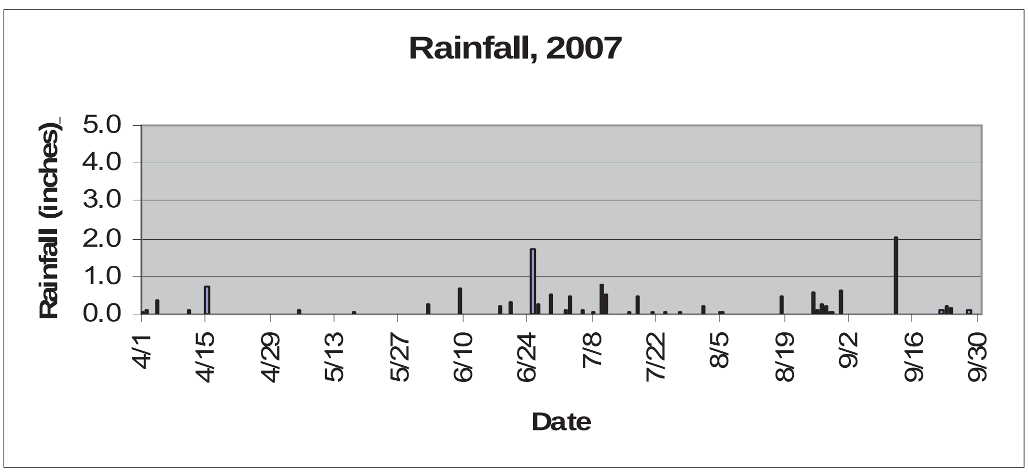




Figure 1. Precipitation at the Black Belt Research and Extension Center, 2005-2007.

# Ammonia Losses from Surface-Applied Urea-Based Nitrogen Fertilizers

F. Ducamp, C.C. Mitchell, F.J. Arriaga, K.S. Balkcom

Ammonia volatilization is the major process responsible for N losses from surface-applied urea-based fertilizers, with losses accounting up to 50 percent of the N applied The use of N stabilizers mixed with urea-based N fertilizers decreases the rate of urea hydrolysis and reduces ammonia volatilization losses, allowing the use of less expensive sources of N.

The objective of this study was to examine the effect of two N stabilizers on ammonia volatilization from surface-applied urea-based N fertilizers.

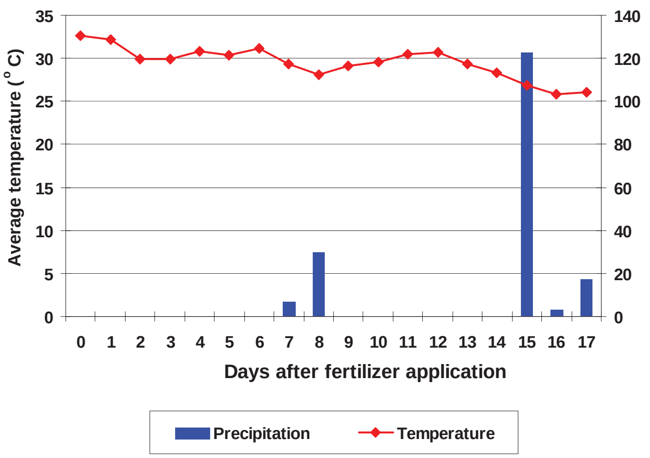



Figure 1. Average air temperature and precipitation for the experimental period.

The experiment was conducted at the E.V. Smith Research Center, in central Alabama, during August of 2007. Two N stabilizers (Agrotain® and calcium chloride) were evaluated on ammonia volatilization from urea and urea-applied nitrogen (UAN) fertilizers (applied at a rate of 134 kg N ha-1) under two field conditions (soil covered with rye residue and bare soil). Treatments for each situation were (1) Control (no N added), (2) urea, (3) urea+Agrotain®, (4) UAN, (5) UAN+Agrotain®, and (6) UAN+calcium chloride. Atmospheric ammonia was measured at 0, 1, 2, 3, 5, 8, and 17 days after the fertilizer application, following a methodology similar to the one proposed by the GRACEnet Protocol. Daily average temperature and precipitation data during the study period are shown in Figure 1. The statistical analysis was performed using the ANOVA procedure of SAS, considering effects as significant when P≤0.05.

Results are presented in Figures 2 through 5.

Agrotain significantly reduced the rate of ammonia volatilization from dry urea applied to either a bare soil or soil with a heavy rye residue, but Agrotain significantly decreased the accumulated ammonia loss only in the rye residue covered soil. There was not a consistent effect of Agrotain or $CaCl_2$ on the rate of ammonia volatilization from UAN. Neither Agrotain nor $CaCl_2$ significantly affected the accumulated ammonia loss from UAN when applied to a heavy residue or a bare soil. Accumulated ammonia losses from a bare soil were about half those with a heavy residue.

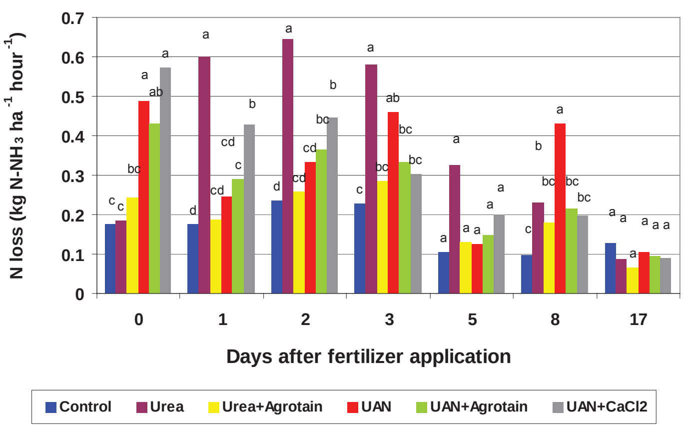



Figure 2. Ammonia volatilization rate as affected by treatments and time (rye residue covered soil). Urea+Agrotain had a lower ammonia volatilization rate than urea (days 1, 2, and 3), and Agrotain and $CaCl_2$ did not have a consistent effect on the ammonia volatilization rate of UAN.

Columns with different letters (for each day) are significantly different at P≤ 0.05.

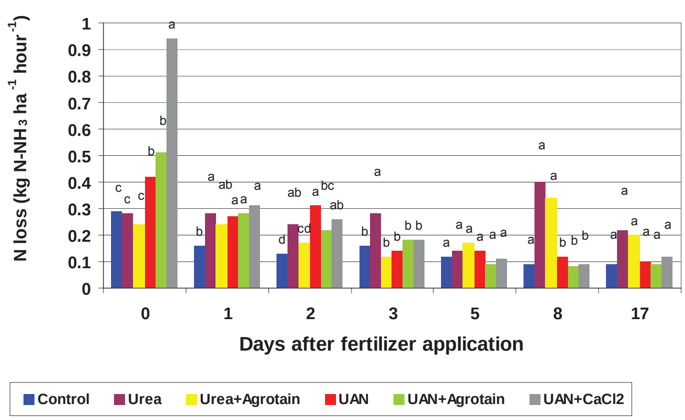



Figure 3. Ammonia volatilization rate as affected by treatments and time (bare soil). Urea+Agrotain had a lower ammonia volatilization rate than urea (days 2 and 3), and Agrotain and $CaCl_2$ did not have a consistent effect on the ammonia volatilization rate of UAN.

Columns with different letters (for each day) are significantly different at P≤ 0.05.

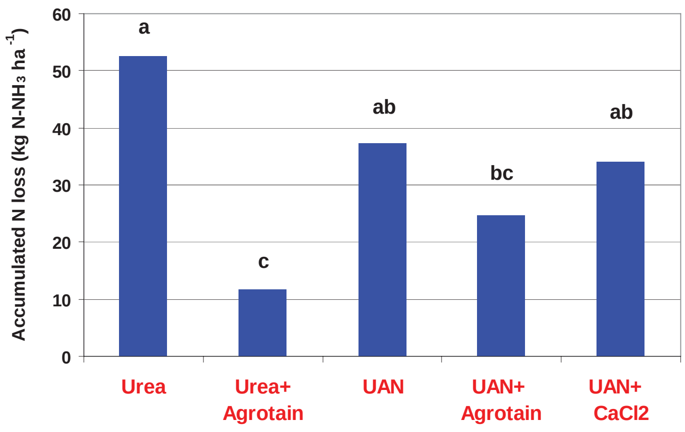



Figure 4. Accumulated net ammonia loss 8 days after applying the fertilizer (rye residue covered soil). Agrotain significantly reduced accumulated ammonia losses from urea but neither Agrotain nor $CaCl_2$ influenced accumulated ammonia losses from UAN.
Columns with different letters are significantly different at P≤ 0.05.

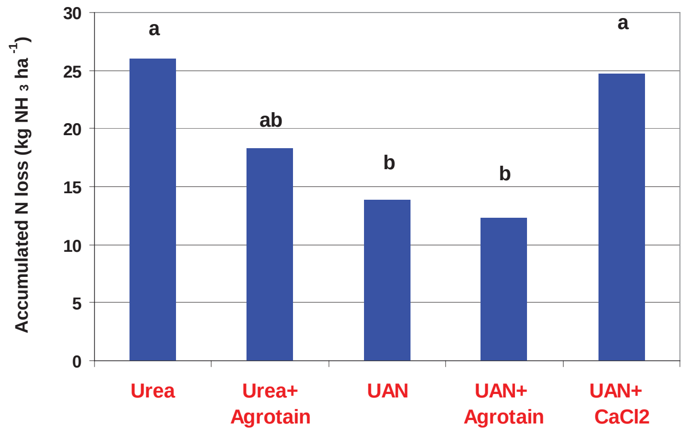



Figure 5. Accumulated net ammonia loss 8 days after applying the fertilizer (bare soil). Ammonia losses from bare soil were about half those with a heavy residue. Agrotain reduced the N volatilized from urea by 30 percent. Neither Agrotain nor $CaCl_2$ significantly reduced N volatilized from UAN.
Columns with different letters are significantly different at P≤ 0.05.

# FUNGICIDES

## Effect of Selected Fungicide Seed Treatment Combinations on Cotton Seedling Disease in North Alabama, 2007

K. S. Lawrence, D. Schrimsher, and B. Norris

A cotton seedling disease test was established at the Tennessee Valley Research and Education Center in Belle Mina, Alabama. The field selected had a history of seedling disease and the soil type was a Decator silt loam. On April 12, 2007 the soil was 60 degrees F at a 4-inch depth measured at 10 a.m. with adequate soil moisture. All fungicide seed treatments were applied by the manufacturers. High disease incidence plots were infested with autoclaved millet seed inoculated with *Pythium ultimum* and *Rhizoctonia solani*. Temik 15G (5 pounds per acre) was applied at planting in the seed furrow using chemical granular applicators attached to the planter. Orthene 90S (0.12 pound per acre) was applied to all plots as needed for thrips control. Plots consisted of four rows, each 25 feet long with a 40-inch row spacing, and were arranged in a randomized complete block design with five replications. Adjacent blocks were separated by 15-foot alleys. Standard herbicides, insecticides, and fertility production practices, as recommended by the Alabama Cooperative Extension System, were used throughout the season. Stand counts and skip index ratings were recorded 3 and 5 weeks after planting (WAP) to determine stand density and percent seedling loss resulting from cotton seedling disease. Plots were harvested on September 20, 2007. Data were statistically analyzed by GLM, and means compared using Fisher's protected least significant difference (LSD) test. The average monthly maximum temperatures for April through September were 69, 69, 91, 88, 98, and 87 degrees F, respectively, with average minimum temperatures of 46, 59, 66, 69, 72, and 72 degrees F. The total monthly rainfall from April through September was 4.27, 0.86, 0.49, 2.89, 0.93, and 0.23 inches for a total rainfall of 9.67 inches.

Seedling disease pressure was high for the early planted cotton in 2007. Less than 25 percent of the cotton seed planted in the high density seedling disease pressure plots emerged (see table). Fifty-four and 85 percent of the seeds produced seedlings in the low density plots at 3 and 5 WAP, respectively. Plant stand was increased ($P \leq 0.05$) in the high density plots at 5 WAP by the RTU Baytan Thiram + Trilex Advance + Vortex FL seed treatment as compared to the control. In the low disease density plots, plant stand was increased ($P \leq 0.05$) by all fungicide seed treatment combinations over the control. RTU Baytan Thiram alone or in combination with Trilex Advanced + Vortex FL or Dynasty CST produced similar stands which were greater than the control. Seed cotton yields varied by 2019 and 599 pounds per acre over all treatments in the high and low density plots, respectively. In the high disease pressure plots, RTU Baytan Thiram in combination with Trilex Advanced and Vortex FL or Dynasty CST produced an average of 1199 pounds per acre increase in yield over the RTU Baytan Thiram alone. Yields were not different between the fungicide seed treatments and the control in the low seedling disease plots.

### Seed Treatment Fungicide's Effects on Plant Stand and Cotton Yield

| | | Stand 10 ft row[1] | | | | Seed cotton lb/A | |
|---|---|---|---|---|---|---|---|
| Treatment | Rate/ oz cw | May 4 High | May 4 Low | May 18 High | May 18 Low | Sep 20 High | Sep 20 Low |
| 1 RTU Baytan Thiram | 3.0 + 0.75 | 4.6 a[2] | 34.2 a | 3.0 ab | 30.8 a | 822.6 b | 4.8 |
| 2 RTU Baytan Thiram | 3.0 + 0.75 | 4.2 a | 25.6 a | 2.0 ab | 21.6 bc | 995.8 b | 5477.5 a |
| Trilex Advanced | 1.64 | | | | | | |
| 3 RTU Baytan Thiram | 3.0 + 0.75 | 10.0 a | 31.8 a | 9.0 a | 26.6 ab | 2052.3 a | 5195.5 a |
| Trilex Advanced | 1.64 | | | | | | |
| Vortex FL | 0.34 | | | | | | |
| 4 RTU Baytan Thiram | 3.0 + 0.75 | 7.8 a | 29.6 a | 4.6 ab | 29.8 a | 2164.8 a | 5298.5 a |
| Dynasty CST | 3.95 | | | | | | |
| 5 Untreated | | 4.4 a | 17.8 b | 0.0 b | 17.6 c | 146.3 b | 5540.8 a |
| ***LSD ($P \leq 0.05$)*** | | ***7.45*** | ***6.94*** | ***5.42*** | ***6.62*** | ***860.6*** | ***585.5*** |

[1] Plant stand based on the number of seedlings/10 ft row.

[2] Numbers in columns followed by the same letter are not significantly different by Fisher's LSD at $P \leq 0.05$.

# EVALUATION OF AGRILIANCE COTTON SEED TREATMENTS IN NORTH ALABAMA, 2007

S. R. Moore and K. S. Lawrence

Selected seed treatments were evaluated to determine their efficacy against early season cotton disease in north Alabama. The soil was a Decatur silt loam that had a history of seedling disease. Soil temperature was 60 degrees F at a 4-inch depth on the day of planting, with adequate soil moisture. All fungicide treatments were applied to the seed by the manufacturer. High incidence disease plots were infested with millet seed inoculated with *Rhizoctonia solani* and *Pythium ultimum.* Temik 15G (5 pounds per acre) was applied at planting on April 12 in the seed furrow with chemical granular applicators attached to the planter. Orthene 90S at 0.12 pound per acre was applied to all plots as needed for thrips control. Plots consisted of four rows, each 25 feet long with 40 inch row spacing, and were arranged in a randomized complete block design with five replications. Adjacent blocks were separated by 15-foot wide alleys. Standard herbicides, insecticides, and fertility production practices, as recommended by the Alabama Cooperative Extension System, were used throughout the season. Stand counts were recorded 21 and 35 days after planting (DAP) to determine stand density and percent seedling loss resulting from cotton seedling disease. Plots were harvested on September 19. Data were statistically analyzed by GLM, and means compared using Fisher's protected least significant difference (LSD) test.

Seedling disease pressure was high for early planted cotton in 2007. At 21 DAP, 87 percent of the seeds planted in the high disease pressure plots did not emerge compared to 40 percent in the low disease pressure plots. Under low disease pressure, cotton seedling stand was increased by all treatments as compared to the untreated control ($P \leq 0.10$). All fungicides yielded as well as the untreated control ($P \leq 0.10$) with an average of 4906.8 pounds per acre seed cotton produced over all fungicide treatments. Under high disease pressure, all fungicides also increased cotton seedling stand as compared to the untreated control ($P \leq 0.10$). Catapult XL increased yield by an average of 776.1 pounds per acre over AGST06012 and Dynasty CST under high disease pressure. All treatments increased yield as compared to the untreated control ($P \leq 0.10$) by an average of 1879.7 pounds per acre seed cotton produced over all fungicide treatments.

## YIELD AND STAND COUNT OF COTTON IN NORTH ALABAMA TRIAL, 2007

| Treatment | Rate | Rate unit | Stand/10ft row[1] 21 DAP[2] | Stand/10ft row[1] 35DAP | Seed cotton yield lb/A |
|---|---|---|---|---|---|
| Low Disease Pressure | | | | | |
| 1 Untreated Control | | | 16.0 b | 16.0 b | 4919 a |
| 2 Catapult XL | 7.65 | ml/kg seed | 23.0 a | 21.0 a | 5750 a |
| 3 AGST06012 | 2.08 | ml/kg seed | 28.2 a | 24.2 a | 5566 a |
| 4 Dynasty CST | 0.03 | mg/seed | 29.0 a | 23.4 a | 5768 a |
| ***LSD ($P \leq 0.10$)*** | | | ***5.65*** | ***4.37*** | ***911.69*** |
| High Disease Pressure | | | | | |
| 1 Untreated Control | | | 0.2 c | 0.2 c | 206 c |
| 2 Catapult XL | 7.65 | ml/kg seed | 8.8 a | 8.0 a | 2894 a |
| 3 AGST06012 | 2.08 | ml/kg seed | 4.6 b | 5.4 b | 1889 b |
| 4 Dynasty CST | 0.03 | mg/seed | 7.4 a | 4.6 b | 2158 b |
| ***LSD ($P \leq 0.10$)*** | | | ***2.6*** | ***2.6*** | ***452.4*** |

[1] Plant stand was based on the number of plants per 10 feet of row. [2] Days after planting. Means within columns followed by different letters are significantly different according to Fisher's LSD ($P \leq 0.10$).

# Efficacy of Experimental Seed Treatments on Early Season Cotton Diseases in North Alabama, 2007

S. R. Moore and K. S. Lawrence

Selected experimental seed treatments were evaluated to determine their efficacy against early season cotton disease in north Alabama. The soil was a Decatur silt loam that had a history of seedling disease. Soil temperature was 60 degrees F at a 4-inch depth on the day of planting, with adequate soil moisture. All fungicide treatments were applied to the seed by the manufacturer. High incidence disease plots were infested with millet seed inoculated with *Rhizoctonia solani* and *Pythium ultimum*. Temik 15G (5 pounds per acre) was applied at planting on April 12 in the seed furrow with chemical granular applicators attached to the planter. Orthene 90S at 0.12 pound per acre was applied to all plots as needed for thrips control. Plots consisted of four rows, each 25 feet long with 40 inch row spacing, and were arranged in a randomized complete block design with five replications. Adjacent blocks were separated by 15-foot wide alleys. Standard herbicides, insecticides, and fertility production practices, as recommended by the Alabama Cooperative Extension System, were used throughout the season. Stand counts were recorded 21 and 35 days after planting (DAP) to determine stand density and percent seedling loss resulting from cotton seedling disease. Plots were harvested on September 19. Data were statistically analyzed by GLM, and means compared using Fisher's protected least significant difference (LSD) test.

Seedling disease pressure was high for early planted cotton in 2007. At 21 DAP, 74 percent of the seeds planted in the high disease pressure plots did not emerge as compared to 34 percent in the low disease pressure plots. Under low disease pressure, cotton seedling stand was increased by all treatments as compared to the Cruiser control (1) at 35 DAP. All treatments yielded as well as the Cruiser control (1) ($P \leq 0.10$) except for treatment 6 (Apron + Maxim + Systhane + A14911 + Cruiser). Under high disease pressure, cotton seedling stand was increased by all treatments as compared to the Cruiser control (1) at 35 DAP. All treatments produced higher yields ($P \leq 0.10$) than the Cruiser control (1) by an average of 1833.7 pounds per acre. Treatment two (Apron + Maxim + Systhane + Cruiser) had a lower yield ($P \leq 0.10$) than all other treatments, which did not differ ($P \leq 0.10$).

### Yield and Stand Count of Cotton in North Alabama Trial, 2007

| Treatment | Rate | Rate unit | Stand/10ft row[1] 21 DAP[2] | Stand/10ft row[1] 35DAP | Seed cotton yield lb/A |
|---|---|---|---|---|---|
| Low Disease Pressure | | | | | |
| 1. Cruiser 5 FS | 0.34 | mg/seed | 21.4 b[3] | 21.8 b | 4471 a |
| 2. Apron XL 3LS + Maxim 4FS + | 3.4 + 1.14 | g/lb seed | 31.4 a | 28.2 ab | 4309 ab |
| Systhane 40 WP + Cruiser 5 FS | 9.54 + 0.34 | mg/seed | | | |
| 3. Apron XL 3LS + Maxim 4FS + | 3.4 + 1.14 | g/lb seed | 25.2 ab | 29.8 a | 4232 ab |
| Systhane 40 WP + A15701 + | 9.54 + 15.67 | g/lb seed | | | |
| Cruiser 5 FS | 0.34 | mg/seed | | | |
| 4. Apron XL 3LS + Maxim 4FS + | 3.4 + 1.14 | g/lb seed | 25.2 ab | 26.0 ab | 3957 ab |
| Systhane 40 WP + A15423 + | 9.54 + 14.99 | g/lb seed | | | |
| Cruiser 5 FS | 0.34 | mg/seed | | | |
| 5. Apron XL 3LS + Maxim 4FS + | 3.4 + 1.14 | g/lb seed | 30.0 ab | 27.0 ab | 3964 ab |
| Systhane 40 WP + | 9.54 | g/lb seed | | | |
| A13012 + Cruiser 5 FS | 0.03 + 0.34 | mg/seed | | | |
| 6. Apron XL 3LS + Maxim 4FS + | 3.4 + 1.14 | g/lb seed | 25.8 ab | 29.8 a | 3603 b |
| Systhane 40 WP + A14911 + | 9.54 + 24.53 | g/lb seed | | | |
| Cruiser 5 FS | 0.34 | mg/seed | | | |
| 7. Apron XL 3LS + Maxim 4FS + | 3.4 + 1.14 | g/lb seed | 32.0 a | 29.6 a | 4427 a |
| Systhane 40 WP + Allegiance LS + | 9.54 + 6.81 | g/lb seed | | | |
| Baytan 150 SC + Trilex Flowable + | 2.27 + 4.54 | g/lb seed | | | |
| Cruiser 5 FS | 0.34 | mg/seed | | | |
| 8. Apron XL 3LS + Maxim 4FS + | 3.4 + 1.14 | g/lb seed | 24.0 ab | 26.2 ab | 4353 ab |
| Systhane 40 WP + STP27159 + | 9.54 + 61.78 | g/lb seed | | | |
| Cruiser 5 FS | 0.34 | mg/seed | | | |
| 9. Apron XL 3LS + Maxim 4FS + | 3.4 + 1.14 | g/lb seed | 24.0 ab | 29.0 a | 3876 ab |
| Systhane 40 WP + Allegiance LS + | 9.54 + 6.81 | g/lb seed | | | |
| Baytan 150 SC + Trilex Flowable + | 2.27 + 4.54 | g/lb seed | | | |
| Vortex 3.77 FS + | 0.91 | g/lb seed | | | |
| Cruiser 5 FS | 0.34 | mg/seed | | | |
| ***LSD (P≤0.10)*** | | | ***5.73*** | ***4.5*** | ***508.31*** |

**continued**

**Yield and Stand Count of Cotton in North Alabama Trial, 2007 (cont.)**

| Treatment | Rate | Rate unit | Stand/10ft row[1] 21 DAP[2] | Stand/10ft row[1] 35DAP | Seed cotton yield lb/A |
|---|---|---|---|---|---|
| High Disease Pressure | | | | | |
| 1. Cruiser 5 FS | 0.34 | mg/seed | 1.4 c | 0 d | 161 d |
| 2. Apron XL 3LS + Maxim 4FS + | 3.4 + 1.14 | g/lb seed | 6.0 b | 2.6 cd | 1261 c |
| Systhane 40 WP + Cruiser 5 FS | 9.54 + 0.34 | mg/seed | | | |
| 3. Apron XL 3LS + Maxim 4FS + | 3.4 + 1.14 | g/lb seed | 10.6 ab | 5.2 bc | 2006 ab |
| Systhane 40 WP + A15701 + | 9.54 + 15.67 | g/lb seed | | | |
| Cruiser 5 FS | 0.34 | mg/seed | | | |
| 4. Apron XL 3LS + Maxim 4FS + | 3.4 + 1.14 | g/lb seed | 11 ab | 8.2 ab | 2294 a |
| Systhane 40 WP + A15423 + | 9.54 + 14.99 | g/lb seed | | | |
| Cruiser 5 FS | 0.34 | mg/seed | | | |
| 5. Apron XL 3LS + Maxim 4FS + | 3.4 + 1.14 | g/lb seed | 13.8 a | 11.2 | 2221 a |
| Systhane 40 WP + | 9.54 | g/lb seed | | | |
| A13012 + Cruiser 5 FS | 0.03 + 0.34 | mg/seed | | | |
| 6. Apron XL 3LS + Maxim 4FS + | 3.4 + 1.14 | g/lb seed | 12.6 ab | 11.6 a | 2459 a |
| Systhane 40 WP + A14911 + | 9.54 + 24.53 | g/lb seed | | | |
| Cruiser 5 FS | 0.34 | mg/seed | | | |
| 7. Apron XL 3LS + Maxim 4FS + | 3.4 + 1.14 | g/lb seed | 12.6 ab | 5.2 bc | 1969 ab |
| Systhane 40 WP + Allegiance LS | 9.54 + 6.81 | g/lb seed | | | |
| Baytan 150 SC + Trilex Flowable | 2.27 + 4.54 | g/lb seed | | | |
| Cruiser 5 FS | 0.34 | mg/seed | | | |
| 8. Apron XL 3LS + Maxim 4FS + | 3.4 + 1.14 | g/lb seed | 8.4 ab | 4.6 bc | 1587 bc |
| Systhane 40 WP + STP27159 | 9.54 + 61.78 | g/lb seed | | | |
| Cruiser 5 FS | 0.34 | mg/seed | | | |
| 9. Apron XL 3LS + Maxim 4FS + | 3.4 + 1.14 | g/lb seed | 15.6 a | 8.6 ab | 2147 a |
| Systhane 40 WP + Allegiance LS | 9.54 + 6.81 | g/lb seed | | | |
| Baytan 150 SC + Trilex Flowable | 2.27 + 4.54 | g/lb seed | | | |
| Vortex 3.77 FS | 0.91 | g/lb seed | | | |
| Cruiser 5 FS | 0.34 | mg/seed | | | |
| ***LSD (P≤0.10)*** | | | ***4.42*** | ***3.4*** | ***420.08*** |

[1] Plant stand was based on the number of plants per 10 feet of row. [2] Days after planting. [3]Means within columns followed by different letters are significantly different according to Fisher's LSD (P ≤ 0.10).

## Evaluation of Cotton Seedling Disease Management in North Alabama, 2007

S. R. Moore and K. S. Lawrence

Selected fungicides were evaluated to determine their efficacy against early season cotton disease in north Alabama. The soil was a Decatur silt loam that had a history of seedling disease. Soil temperature was 60 degrees F at a 4-inch depth on the day of planting, with adequate soil moisture. All fungicide treatments were applied to the seed by the manufacturer. High incidence disease plots were infested with millet seed inoculated with *Rhizoctonia solani* and *Pythium ultimum.* Temik 15G (5 pounds per acre) was applied at planting on April 12 in the seed furrow with chemical granular applicators attached to the planter. Orthene 90S at 0.12 pound per acre was applied to all plots as needed for thrips control. Plots consisted of 4 rows, each 25 feet long with 40 inch row spacing, and were arranged in a randomized complete block design with five replications. Adjacent blocks were separated by 15-foot wide alleys. Standard herbicides, insecticides, and fertility production practices, as recommended by the Alabama Cooperative Extension System, were used throughout the season. Stand counts were recorded 21 and 35 days after planting (DAP) to determine stand density and percent seedling loss resulting from cotton seedling disease. Plots were harvested on September 19. Data were statistically analyzed by GLM, and means compared using Fisher's protected least significant difference (LSD) test.

Seedling disease pressure was high for early planted cotton in 2007. At 21 DAP, 82 percent of the seeds planted in the high disease pressure plots did not emerge as compared to 35 percent in the low disease pressure plots. Under low disease pressure, stands did not differ with the untreated control (P≤0.10) at 35 DAP. All treatments yielded as well as the untreated control (P≤ 0.10) with an average of 4763.8 pounds per acre seed cotton produced over all fungicide treatments. Under high disease pressure stands were increased (P≤0.10) by RTU Baytan Thiram + Allegiance + Trilex + Vortex + Allegiance + Gaucho and RTU Baytan Thiram + Allegiance + Dynasty + Gaucho as compared to the untreated control and the remaining fungicide combinations. All treatments increased yield as compared to the untreated control (P≤0.10) at an average of 1574.8 pounds per acre seed cotton produced over all fungicide treatments.

## YIELD AND STAND COUNT OF COTTON IN NORTH ALABAMA TRIAL, 2007

| Treatment | Rate | Rate unit | Stand/10ft row[1] 21 DAP[2] | Stand/10ft row[1] 35DAP | Seed cotton yield lb/A |
|---|---|---|---|---|---|
| Low Disease Pressure | | | | | |
| 1. Untreated + Gaucho | 2.08 | ml/kg | 19.8 b[3] | 19.4 a | 4674 a |
| 2. RTU Baytan Thiram + | 1.95 | ml/kg | 27 ab | 22.2 a | 4849 a |
| Allegiance + Gaucho | 0.49 + 2.08 | ml/kg | | | |
| 3. RTU Baytan Thiram + | 1.95 | ml/kg | 26.6 ab | 27.8 a | 4867 a |
| Allegiance + Trilex | 0.49 + 0.42 | ml/kg | | | |
| Allegiance + Baytan 30 | 0.49 + 0.16 | ml/kg | | | |
| Vortex FL + Gaucho | 0.06 + 2.08 | ml/kg | | | |
| 4. RTU Baytan Thiram + | 1.95 | ml/kg | 30.6 a | 28.8 a | 5055 a |
| Allegiance + Trilex | 0.49 + 0.42 | ml/kg | | | |
| Allegiance + Baytan 30 | 0.49 + 0.16 | ml/kg | | | |
| Gaucho | 2.08 | ml/kg | | | |
| 5. RTU Baytan Thiram + | 1.95 | ml/kg | 26.2 ab | 24.8 a | 4617 a |
| Allegiance + Trilex | 0.49 + 0.42 | ml/kg | | | |
| Vortex FL + Allegiance | 0.22 + 0.49 | ml/kg | | | |
| Gaucho | 2.08 | ml/kg | | | |
| 6. RTU Baytan Thiram + | 1.95 | ml/kg | 25.8 ab | 19.8 a | 4498 a |
| Allegiance + | 0.49 | ml/kg | | | |
| DynastyCST + Gaucho | 2.57 + 2.08 | ml/kg | | | |
| ***LSD (P≤0.10)*** | | | ***5.63*** | ***6.56*** | ***573.91*** |
| High Disease Pressure | | | | | |
| 1. Untreated + Gaucho | 2.08 | ml/kg | 0.2 c | 0 c | 128 c |
| 2. RTU Baytan Thiram + | 1.95 | ml/kg | 4.4 b | 2 bc | 1119 b |
| Allegiance + Gaucho | 0.49 + 2.08 | ml/kg | | | |
| 3. RTU Baytan Thiram + | 1.95 | ml/kg | 7.6 b | 2.4 bc | 1485 b |
| Allegiance + Trilex | 0.49 + 0.42 | ml/kg | | | |
| Allegiance + Baytan 30 | 0.49 + 0.16 | ml/kg | | | |
| Vortex FL + Gaucho | 0.06 + 2.08 | ml/kg | | | |
| 4. RTU Baytan Thiram + | 1.95 | ml/kg | 6.8 b | 3.2 bc | 1457 b |
| Allegiance + Trilex | 0.49 + 0.42 | ml/kg | | | |
| Allegiance + Baytan 30 | 0.49 + 0.16 | ml/kg | | | |
| Gaucho | 2.08 | ml/kg | | | |
| 5. RTU Baytan Thiram + | 1.95 | ml/kg | 13.6 a | 8.2 a | 2035 a |
| Allegiance + Trilex | 0.49 + 0.42 | ml/kg | | | |
| Vortex FL + Allegiance | 0.22 + 0.49 | ml/kg | | | |
| Gaucho | 2.08 | ml/kg | | | |
| 6. RTU Baytan Thiram + | 1.95 | ml/kg | 11.2 a | 6.6 ab | 2412 a |
| Allegiance + | 0.49 | ml/kg | | | |
| DynastyCST + Gaucho | 2.57 + 2.08 | ml/kg | | | |
| ***LSD (P≤0.10)*** | | | ***2.92*** | ***3.43*** | ***402.06*** |

[1] Plant stand was based on the number of plants per 10 feet of row. [2] Days after planting. [3]Means within columns followed by different letters are significantly different according to Fisher's LSD (P ≤ 0.10).

# Evaluation of Agriliance Cotton Seed Treatments in Central Alabama, 2007

S. R. Moore and K. S. Lawrence

Selected experimental seed treatments were evaluated to determine their efficacy against early season cotton disease in central Alabama. The soil was a Compass loamy sand that had a history of seedling disease. Soil temperature was 72 degrees F at a 4-inch depth on the day of planting, with adequate soil moisture. All fungicide treatments were applied to the seed by the manufacturer. Temik 15G (5 pounds per acre) was applied at planting on April 4 in the seed furrow with chemical granular applicators attached to the planter. Orthene 90S at 0.12 pound per acre was applied to all plots as needed for thrips control. Plots consisted of 4 rows, each 25 feet long with 40 inch row spacing, and were arranged in a randomized complete block design with five replications. Adjacent blocks were separated by 15-foot wide alleys. Standard herbicides, insecticides, and fertility production practices, as recommended by the Alabama Cooperative Extension System, were used throughout the season. Stand counts were recorded 21 and 35 days after planting (DAP) to determine stand density and percent seedling loss resulting from cotton seedling disease. Plots were harvested on September 6. Data were statistically analyzed by GLM, and means compared using Fisher's protected least significant difference (LSD) test.

Seedling disease pressure was moderate for early planted cotton in 2007. At 21 DAP, 37.7 percent of the seed planted did not emerge. No difference ($P \leq 0.10$) was observed in stand counts between the untreated control and the fungicide combinations at 35 DAP. Skip indexes taken at 35 DAP were also observed to be the same ($P \leq 0.10$) for all fungicide combinations and the untreated control. All fungicide treatments yielded as well as the untreated control ($P \leq 0.10$) with an average of 3193.4 pounds per acre of seed cotton produced over all fungicide treatments.

**Stand Count, Skip Index, and Yield in Central Alabama, 2007**

| Treatment | Rate | Rate unit | —Stand/10ft row[1]— 21 DAP[2] | 35 DAP | Skip Index[3] 35DAP | Seed cotton yield lb/A |
|---|---|---|---|---|---|---|
| 1. Untreated | | | 56.0 | 57.4 | 7.0 | 3039 |
| 2. Dynasty CST + | 0.03 | mg/seed | 69.8 | 69.2 | 2.8 | 3134 |
| Cruiser 5FS | 0.34 | mg/seed | | | | |
| 3. AGST06012 + | 2.28 | ml/kg seed | 68.2 | 61.8 | 6.4 | 3402 |
| Cruiser 5FS | 0.34 | mg/seed | | | | |
| 4. AGST06012 + | 0.03 | oz/lb seed | 63.0 | 66.4 | 4.6 | 3528 |
| AGI07004 | 0.13 | oz/lb seed | | | | |
| 5. AGST06012 + | 0.03 | oz/lb seed | 54.4 | 57.6 | 6.2 | 3144 |
| AGI07007 | 0.13 | oz/lb seed | | | | |
| ***LSD ($P \leq 0.10$)*** | | | ***14.9*** | ***12.4*** | ***4.4*** | ***301.6*** |

[1] Plant stand was based on the number of plants per 10 feet of row. [2] Days after planting. [3] Skip index rating is equal to the footage of row greater than 1 foot not occupied by seedling.

# Efficacy of Experimental Seed Treatments on Early Season Cotton Diseases in Central Alabama, 2007

S. R. Moore and K. S. Lawrence

Selected experimental seed treatments were evaluated to determine their efficacy against early season cotton disease in central Alabama. The soil was a Compass loamy sand that had a history of seedling disease. Soil temperature was 72 degrees F at a 4-inch depth on the day of planting, with adequate soil moisture. All fungicide treatments were applied to the seed by the manufacturer. High incidence disease plots were infested with millet seed inoculated with *Rhizoctonia solani* and *Pythium ultimum*. Temik 15G (5 pounds per acre) was applied at planting on April 4 in the seed furrow with chemical granular applicators attached to the planter. Orthene 90S at 0.12 pound per acre was applied to all plots as needed for thrips control. Plots consisted of 4 rows, each 25 feet long with 40 inch row spacing, and were arranged in a randomized complete block design with five replications. Adjacent blocks were separated by 15-foot wide alleys. Standard herbicides, insecticides, and fertility production practices, as recommended by the Alabama Cooperative Extension System, were used throughout the season. Stand counts were recorded 21 and 35 days after planting (DAP) to determine stand density and percent seedling loss resulting from cotton seedling disease. Plots were harvested on September 6. Data were statistically analyzed by GLM, and means compared using Fisher's protected least significant difference (LSD) test.

Seedling disease pressure was moderate for early planted cotton in 2007. At 21 DAP, 48.3 percent of the seeds planted in the high disease pressure plots did not emerge as compared to 20.5 percent in the low disease pressure plots. Under low disease pressure, all fungicide combinations increased seedling stand at 35 DAP as compared to the Cruiser control ($P \leq 0.10$). All fungicides also produced a lower skip index rating as compared to the Cruiser control ($P \leq 0.10$) at 35 DAP indicating more evenly spaced plants. All fungicides yielded as well as the

Cruiser control with an average of 3061.3 pounds per acre of seed cotton produced over all fungicide treatments. Under high disease pressure, all fungicide combinations increased seedling stand at 35 DAP as compared to the Cruiser control (P≤ 0.10) except for the Apron + Maxim + Systhane + Cruiser combination which did not differ. All fungicides produced a lower skip index compared to the Cruiser control (P≤ 0.10) at 35 DAP. All fungicides yielded as well as the Cruiser control with an average of 2146.6 pounds per acre of seed cotton produced over all fungicide treatments.

### Stand Count, Skip Index, and Yield in Central Alabama, 2007

| Treatment | Rate | Rate unit | —Stand/10ft row[1]— 21 DAP[2] | 35 DAP | Skip Index[3] 35DAP | Seed cotton yield lb/A |
|---|---|---|---|---|---|---|
| Low Disease Pressure | | | | | | |
| 1. Cruiser 5 FS | 0.34 | mg/seed | 47.2b | 43.6 b | 12.2 a | 3544 a |
| 2. Apron XL 3LS | 28.4 | l/kg seed | 68.8 a | 66.0 a | 9.0 b | 3434 a |
| Maxim 4FS + | 9.5 | l/kg seed | | | | |
| Systhane 40 WP + | 79.5 | l/kg seed | | | | |
| Cruiser 5 FS | 0.34 | mg/seed | | | | |
| 3. Apron XL 3LS | 28.4 | l/kg seed | 77.6 a | 65.0 a | 5.2 c | 3112 a |
| Maxim 4FS + | 9.5 | l/kg seed | | | | |
| Systhane 40 WP + | 79.5 | l/kg seed | | | | |
| A15701 + | 130.6 | l/kg seed | | | | |
| Cruiser 5 FS | 0.34 | mg/seed | | | | |
| 4. Apron XL 3LS | 28.4 | l/kg seed | 81.2 a | 72.0 a | 3.8 c | 2992 a |
| Maxim 4FS + | 9.5 | l/kg seed | | | | |
| Systhane 40 WP + | 79.5 | l/kg seed | | | | |
| A15423 + | 124.9 | l/kg seed | | | | |
| Cruiser 5 FS | 0.34 | mg/seed | | | | |
| 5. Apron XL 3LS | 28.4 | l/kg seed | 77.2 a | 69.0 a | 4.8 c | 3021 a |
| Maxim 4FS + | 9.5 | l/kg seed | | | | |
| Systhane 40 WP + | 79.5 | l/kg seed | | | | |
| A13012 + | 0.03 | mg/seed | | | | |
| Cruiser 5 FS | 0.34 | mg/seed | | | | |
| 6. Apron XL 3LS | 28.4 | l/kg seed | 69.2 a | 77.6 a | 5.6 c | 2869 a |
| Maxim 4FS + | 9.5 | l/kg seed | | | | |
| Systhane 40 WP + | 79.5 | l/kg seed | | | | |
| A14911 + | 204.4 | l/kg seed | | | | |
| Cruiser 5 FS | 0.34 | mg/seed | | | | |
| 7. Apron XL 3LS | 28.4 | l/kg seed | 74.8 a | 70.0 a | 4.6 c | 3155 a |
| Maxim 4FS + | 9.5 | l/kg seed | | | | |
| Systhane 40 WP + | 79.5 | l/kg seed | | | | |
| Allegiance LS + | 56.8 | l/kg seed | | | | |
| Baytan 150 SC + | 18.9 | l/kg seed | | | | |
| Trilex Flowable + | 37.9 | l/kg seed | | | | |
| Cruiser 5 FS | 0.34 | mg/seed | | | | |
| 8. Apron XL 3LS | 28.4 | l/kg seed | 80.2 a | 79.2 a | 4.2 c | 2415 a |
| Maxim 4FS + | 9.5 | l/kg seed | | | | |
| Systhane 40 WP + | 79.5 | l/kg seed | | | | |
| STP27159 | 514.8 | l/kg seed | | | | |
| Cruiser 5 FS | 0.34 | mg/seed | | | | |
| 9. Apron XL 3LS | 28.4 | l/kg seed | 77.0 a | 73.4 a | 4.4 c | 2988.a |
| Maxim 4FS + | 9.5 | l/kg seed | | | | |
| Systhane 40 WP + | 79.5 | l/kg seed | | | | |
| Allegiance LS + | 56.8 | l/kg seed | | | | |
| Baytan 150 SC + | 18.9 | l/kg seed | | | | |
| Trilex Flowable + | 37.9 | l/kg seed | | | | |
| Vortex 3.77 FS + | 7.6 | l/kg seed | | | | |
| Cruiser 5 FS | 0.34 | mg/seed | | | | |
| ***LSD (P≤ 0.10)*** | | | ***12.35*** | ***11.8*** | ***2.14*** | ***802.82*** |

**continued**

**STAND COUNT, SKIP INDEX, AND YIELD IN CENTRAL ALABAMA, 2007 (CONT)**

| Treatment | Rate | Rate unit | —Stand/10ft row[1]— 21 DAP[2] | 35 DAP | Skip Index[3] 35DAP | Seed cotton yield lb/A |
|---|---|---|---|---|---|---|
| High Disease Pressure | | | | | | |
| 1. Cruiser 5 FS | 0.34 | mg/seed | 21.8 a | 6.4 c | 21.2 a | 2046 a |
| 2. Apron XL 3LS | 28.4 | l/kg seed | 45.4 a | 20.2 bc | 13 b | 2622 a |
| Maxim 4FS + | 9.5 | l/kg seed | | | | |
| Systhane 40 WP + | 79.5 | l/kg seed | | | | |
| Cruiser 5 FS | 0.34 | mg/seed | | | | |
| 3. Apron XL 3LS | 28.4 | l/kg seed | 52.8 a | 42.4 a | 8.6 b | 2633 a |
| Maxim 4FS + | 9.5 | l/kg seed | | | | |
| Systhane 40 WP + | 79.5 | l/kg seed | | | | |
| A15701 + | 130.6 | l/kg seed | | | | |
| Cruiser 5 FS | 0.34 | mg/seed | | | | |
| 4. Apron XL 3LS | 28.4 | l/kg seed | 54.2 a | 52.8 a | 8.4 b | 2267 a |
| Maxim 4FS + | 9.5 | l/kg seed | | | | |
| Systhane 40 WP + | 79.5 | l/kg seed | | | | |
| A15423 + | 124.9 | l/kg seed | | | | |
| Cruiser 5 FS | 0.34 | mg/seed | | | | |
| 5. Apron XL 3LS | 28.4 | l/kg seed | 66.6 a | 48.6 a | 9.6 b | 2216 a |
| Maxim 4FS + | 9.5 | l/kg seed | | | | |
| Systhane 40 WP + | 79.5 | l/kg seed | | | | |
| A13012 + | 0.03 | mg/seed | | | | |
| Cruiser 5 FS | 0.34 | mg/seed | | | | |
| 6. Apron XL 3LS | 28.4 | l/kg seed | 57.6 a | 46.6 a | 8.0 b | 1603 a |
| Maxim 4FS + | 9.5 | l/kg seed | | | | |
| Systhane 40 WP + | 79.5 | l/kg seed | | | | |
| A14911 + | 204.4 | l/kg seed | | | | |
| Cruiser 5 FS | 0.34 | mg/seed | | | | |
| 7. Apron XL 3LS | 28.4 | l/kg seed | 52.0 bc | 32.4 ab | 8.6 b | 2437 a |
| Maxim 4FS + | 9.5 | l/kg seed | | | | |
| Systhane 40 WP + | 79.5 | l/kg seed | | | | |
| Allegiance LS + | 56.8 | l/kg seed | | | | |
| Baytan 150 SC + | 18.9 | l/kg seed | | | | |
| Trilex Flowable + | 37.9 | l/kg seed | | | | |
| Cruiser 5 FS | 0.34 | mg/seed | | | | |
| 8. Apron XL 3LS | 28.4 | l/kg seed | 62.4 a | 30.0 ab | 9.8 b | 1233 a |
| Maxim 4FS + | 9.5 | l/kg seed | | | | |
| Systhane 40 WP + | 79.5 | l/kg seed | | | | |
| STP27159 | 514.8 | l/kg seed | | | | |
| Cruiser 5 FS | 0.34 | mg/seed | | | | |
| 9. Apron XL 3LS | 28.4 | l/kg seed | 52.2 a | 36.4 ab | 9.8 b | 2245 a |
| Maxim 4FS + | 9.5 | l/kg seed | | | | |
| Systhane 40 WP + | 79.5 | l/kg seed | | | | |
| Allegiance LS + | 56.8 | l/kg seed | | | | |
| Baytan 150 SC + | 18.9 | l/kg seed | | | | |
| Trilex Flowable + | 37.9 | l/kg seed | | | | |
| Vortex 3.77 FS + | 7.6 | l/kg seed | | | | |
| Cruiser 5 FS | 0.34 | mg/seed | | | | |
| ***LSD ($P \leq 0.10$)*** | | | ***8.48*** | ***14.59*** | ***3.4*** | ***819.45*** |

[1] Plant stand was based on the number of plants per 10 feet of row. [2] Days after planting. [3] Skip index rating is equal to the footage of row greater than 1 foot not occupied by seedling. Means within columns followed by different letters are significantly different according to Fisher's LSD ($P \leq 0.10$).

# EVALUATION OF COTTON SEEDLING DISEASE MANAGEMENT IN CENTRAL ALABAMA, 2007

S. R. Moore and K. S. Lawrence

Selected fungicides were evaluated to determine their efficacy against early season cotton disease in south Alabama. The soil was a Compass loamy sand that had a history of seedling disease. Soil temperature was 72 degrees F at a 4-inch depth on the day of planting, with adequate soil moisture. All fungicide treatments were applied to the seed by the manufacturer. Temik 15G (5 pounds per acre) was applied at planting on April 4 in the seed furrow with chemical granular applicators attached to the planter. Orthene 90S at 0.12 pound per acre was applied to all plots as needed for thrips control. Plots consisted of 4 rows, each 25 feet long with 40 inch row spacing, and were arranged in a randomized complete block design with five replications. Adjacent blocks were separated by 15-foot wide alleys. Standard herbicides, insecticides, and fertility production practices, as recommended by the Alabama Cooperative Extension System, were used throughout the season. Stand counts were recorded 21 and 35 days after planting (DAP) to determine stand density and percent seedling loss resulting from cotton seedling disease. Plots were harvested on September 6. Data were statistically analyzed by GLM, and means compared using Fisher's protected least significant difference (LSD) test.

Seedling disease pressure was moderate for early planted cotton in 2007. At 21 DAP, 27.3 percent of the seeds planted did not emerge. At 35 DAP the RTU Baytan Thiram + Allegiance + Trilex + Vortex + Allegiance + Gaucho and the RTU Baytan Thiram + Allegiance + Dynasty + Gaucho combinations increased seedling stands ($P \leq 0.10$) as compared to the control and all other fungicide combinations. Skip indexes were lowered by all fungicide treatments compared to the control ($P \leq 0.10$) at 35 DAP indicating more evenly spaced plants. All fungicide combinations yielded as well as the untreated control ($P \leq 0.10$) with an average of 3162.7 pounds per acre of seed cotton produced over all fungicide treatments.

### STAND COUNT, SKIP INDEX, AND YIELD IN CENTRAL ALABAMA, 2007

| Treatment | Rate | Rate unit | —Stand/10ft row[1]— 21 DAP[2] | 35 DAP | Skip index[3] 35DAP | Seed cotton yield lb/A |
|---|---|---|---|---|---|---|
| 1. Untreated + Gaucho | 2.08 | ml/kg | 62.6 a[4] | 68.6 b | 5.6 a | 3536 a |
| 2. RTU Baytan Thiram + | 1.95 | ml/kg | 79.0 a | 83.4 ab | 3.0 b | 3463 a |
| Allegiance + Gaucho | 0.49 + 2.08 | ml/kg | | | | |
| 3. RTU Baytan Thiram + | 1.95 | ml/kg | 70.8 a | 80.2 ab | 3.0 b | 3528 a |
| Allegiance + Trilex | 0.49 + 0.42 | ml/kg | | | | |
| Allegiance + Baytan 30 | 0.49 + 0.16 | ml/kg | | | | |
| Vortex FL + Gaucho | 0.06 + 2.08 | ml/kg | | | | |
| 4. RTU Baytan Thiram + | 1.95 | ml/kg | 69.2 a | 83.2 ab | 2.0 b | 3463 a |
| Allegiance + Trilex | 0.49 + 0.42 | ml/kg | | | | |
| Allegiance + Baytan 30 | 0.49 + 0.16 | ml/kg | | | | |
| Gaucho | 2.08 | ml/kg | | | | |
| 5. RTU Baytan Thiram + | 1.95 | ml/kg | 76.6 a | 89.8 a | 2.6 b | 3567 a |
| Allegiance + Trilex | 0.49 + 0.42 | ml/kg | | | | |
| Vortex FL + Allegiance | 0.22 + 0.49 | ml/kg | | | | |
| Gaucho | 2.08 | ml/kg | | | | |
| 6. RTU Baytan Thiram + | 1.95 | ml/kg | 77.8 a | 94.2 a | 2.2 b | 3715 a |
| Allegiance + | 0.49 | ml/kg | | | | |
| DynastyCST + Gaucho | 2.57 + 2.08 | ml/kg | | | | |
| ***LSD ($P \leq 0.10$)*** | | | ***14.3*** | ***12.8*** | ***1.7*** | ***324.9*** |

[1] Plant stand was based on the number of plants per 10 feet of row. [2] Days after planting. [3] Skip index rating is equal to the footage of row greater than 1 foot not occupied by seedling. [4]Means within columns followed by different letters are significantly different according to Fisher's LSD (P ≤

# NEMATICIDE COMBINATION EFFECTS ON SELECTED NEMATODE SPECIES IN CENTRAL ALABAMA, 2007

N. S. Sekora, K. S. Lawrence, G. W. Lawrence, and S. Nightengale

The site was infested with the nematode species *Rotylenchulus reniformis* and *Meloidogyne incognita* and was a sandy loam. The temperature was 66.9 degrees F with copious moisture at the 4-inch planting depth. Seed treatments of the cotton cultivar DP 444 BG/RR were previously applied by the manufacturer. Vydate C-LV was applied with a two-row, $CO_2$-charged backpack sprayer as a foliar spray at the fourth true leaf plant stage. Temik 15G (15 pounds per acre) was applied at planting in the seed furrows by chemical granular applicators attached to the planter. Orthene 90S (0.12 pound per acre) was applied for thrips control in all plots. Plots were composed of two 25 foot rows spaced 40 inches apart in a randomized complete block design with five replications per treatment. Soil samples were taken at planting to determine the initial level of nematode infestation. Ten soil cores, 1 inch in diameter by 6 inches deep, were taken randomly from the two rows of each plot. Nematodes were extracted from the soil by gravity sieving and sucrose centrifugation. The average number of *R. reniformis* present was 66.2 nematodes per 150 cc of soil while the mean number of *M. incognita* present was 90.2. As prescribed by the Alabama Cooperative Extension System, normal fertility production, herbicide, and insecticide practices were observed throughout the growing season. At six weeks after planting (WAP), stand counts and vigor rating were taken to establish the impact of the nematodes on plant development. On September 18 all plot were harvested. Data means were compared with Fisher's protected least significant difference (LSD) and all data were analyzed with the GLM procedure. Rainfall totals for April through September were 2.01, 0.47, 1.15, 6.82, 3.26, 2.2 inches, respectively. Total rainfall was 15.91 inches. Monthly average minimum temperatures for April through September were 48.9, 58.2, 67.8, 71.4, 73.7, 66.4 degrees F with an average maximum temperature of 74.7, 87.4, 94.4, 91.8, 99.6, 88.6 degrees F, respectively.

At 6 WAP, *R. reniformis* numbers increased 25 percent to an average of 82.8 nematodes per 150 cc of soil while *M. incognita* numbers decreased 46 percent to 48.9 per 150 cc. The mean change of *R. reniformis* per plot ranged -32.6 percent to 2200 percent from the initial populations; *M. incognita* varied -66.7 percent to 305 percent from initial counts. Plant stands and vigor showed no significant difference ($P \leq 0.10$) between any of the treatments versus the control at 6 WAP. Seed yields ranged from 1435 to 418 pounds per acre over the control. All treatments showed a significant ($P \leq 0.10$) increase in yield over the control except the Temik 15G 5 pounds per acre side-dress treatment. The Temik 15G, Aeris + Temik 15G, and Avicta + Temik 15G treatments demonstrated the greatest increase in yield over the remaining treatments.

SUMMARY OF STAND COUNTS, VIGOR, NEMATODE VUMBERS, AND YIELD BY TREATMENT

| | Treatment | Rate | Stand 25 ft row[1] Jun 5 | Vigor 1-5 sc[2] Jun 5 | Total nematodes 150 cc soil[3] *R. reniformis* Jun 5 | *M. incognita* Jun 5 | *M. incognita* Jun 5 | Seed lb/A[4] Sep 18 |
|---|---|---|---|---|---|---|---|---|
| 1 | Control | | 70.4 | 2.8 | 135.5 | 45.2 | 679.8 | 540 c |
| 2 | Aeris | 48 mgai/seed | 75.0 | 3.2 | 105.4 | 45.2 | 334.8 | 1272 ab |
| 3 | Avicta | 500.4 mgai.seed | 75.2 | 3.0 | 60.2 | 60.2 | 391.4 | 1377 ab |
| 4 | Temik 15 G | 5 lb/A | 82.8 | 3.3 | 90.3 | 30.1 | 612.9 | 1975 a |
| 5 | Aeris<br>Vydate CLV | 48 mgai/seed<br>16 oz/a | 72.8 | 3.3 | 75.3 | 45.2 | 448.1 | 1260 ab |
| 6 | Avicta<br>Vydate CLV | 500.4 mgai.seed<br>16 oz/a | 78.0 | 3.3 | 45.2 | 45.2 | 391.4 | 1452 ab |
| 7 | Temik 15 G<br>Vydate CLV | 5 lb/A<br>16 oz/a | 73.4 | 2.9 | 60.2 | 45.2 | 525.3 | 1760 ab |
| 8 | Aeris<br>Temik 15 G | 48 mgai/seed<br>5 lb/A | 66.8 | 3.2 | 75.3 | 60.2 | 293.6 | 1859 a |
| 9 | Avicta<br>Temik 15 G | 500.4 mgai.seed<br>5 lb/A | 78.6 | 3.7 | 75.3 | 30.1 | 334.8 | 1975 a |
| 10 | Aeris<br>Temik 15 G | 48 mgai/seed<br>5 lb/A side dress | 63.0 | 3.7 | 120.4 | 105.4 | 468.7 | 1359 ab |
| 11 | Avicta<br>Temik 15 G | 500.4 mgai.seed<br>5 lb/A side dress | 79.2 | 3.2 | 75.3 | 30.1 | 381.1 | 1603 ab |
| 12 | Temik 15 G | 5 lb/A side dress | 68.8 | 3.2 | 75.3 | 45.2 | 293.6 | 958 bc |
| | ***LSD ($P \leq 0.10$)*** | | ***12.4*** | ***0.8*** | ***77.0*** | ***44.7*** | ***275.3*** | ***494.2*** |

[1] Counts based on number of plants/25 ft row.
[2] Vigor ratings based on scale from 1 – 5, 1 being the least vigorous and 5 being the most.
[3] Counts based on number of nematodes/150 cc soil.
[4] Means followed by same letter do not significantly differ ($P \leq 0.10$, Fisher's protected least significant difference (LSD)).

# NEMATICIDES

## On-Farm Field Trials to Test the Effectiveness of Seed Nematicides for Managing Reniform and Root-Knot Nematodes on Cotton in Alabama, 2007

L. Kuykendall, J.Clary, W. S. Gazaway, W. S. Birdsong, B. Dillard, W. G. Grffith, C. D. Monks, D. P. Delaney, H. Potter, and T. Reed

Fields for these trials with selected farmer cooperators (Table 1) were sampled prior to planting to confirm nematode pressure. All trial fields chosen had very high populations of either reniform or root-knot nematodes. Seed from the same seed lot was used for all treatments within each trial. The cotton cultivar DP 555BG/RR was used for all trials except for Lawrence County where DP 444BG/RR was used. Gaucho Grande was included as an untreated check treatment with no nematicide claims. All test treatments were planted in three to five randomized replications per location.

The severe heat and drought significantly impacted cotton yields and results from nematicide treatments (Table 2). Trials from Tuscaloosa and Macon Counties are not reported due to extremely poor yields or weighing equipment malfunctions. The trials in Elmore, Lawrence and Macon Counties with lint yields of 508 pounds per acre or less showed no differences in lint cotton yields between treatments. The two trials in Elmore County with lint cotton yields of 750 pounds and greater exhibited a significant yield increase for the seed treatments Aeris and Avicta when compared to the the untreated check and 5 pounds Temik at planting. In these two trials, the increase in lint yield over the untreated check averaged 146 pounds per acre for Aeris and 182 pounds per acre for Avicta. Dry weather at planting may have contributed to the lack of yield response of the traditional treatment of 5 pounds of Temik at planting. No significant yield differences were shown by any treatment based on stastical analysis.

**Table 1. Location of Trials**

| County | Farmer-Cooperator | Extension Agronomist |
|---|---|---|
| 1. Barbour | Walt Corcoran | William Birdsong/Brandon Dillard |
| 2. Elmore | Richard Edgar | Leonard Kuykendall |
| 3. Elmore | Carl and Paul Taylor | Leonard Kuykendall/Jeff Clary |
| 4 .Elmore | Mark and Dale Taylor | Leonard Kuykendall/Jeff Clary |
| 5. Lawrence | Mark Hamilton | Tim Reed/Heath Potter |
| 6. Macon | John T. Ingram and Sons | Leonard Kuykendall/Jeff Clary |
| 7. Macon | Segrest Brothers | Leonard Kuykendall/Jeff Clary |
| 8. Tuscaloosa | Clyde Lavelle | Warren Griffith |

**Table 2. Pounds Lint Cotton/Acre: Change from UTC (Untreated Check)**

| Farmer County | No repetitions | Nematode Species | Gaucho Grande UTC | Aeris | Avicta | Temik 5 lbs | C.V. % | LSD (P≤0.10) |
|---|---|---|---|---|---|---|---|---|
| Richard Edgar Elmore County | 4 | Reniform | 508 | + 25 | 0 | - 2 | | |
| Mark and Dale Taylor Elmore County | 3 | Reniform | 848 | + 106 | + 145 | + 6 | 14.3 | NS |
| Carl and Paul Taylor Elmore County | 3 | Reniform | 757 | + 186 | + 218 | + 13 | 12.6 | NS |
| Mark Hamilton Lawrence County | 3 | Reniform | 464 | -1 | -9 | +13 | 2.2 | NS |
| John T. Ingram and Sons Macon County | 5 | Rootknot | 407 | - 9 | - 2 | + 6 | 7.9 | NS |
| ***Average*** | | | | ***+ 61*** | ***+ 70*** | ***+ 7*** | | |

# EVALUATION OF AVICTA FORMULATION VARIANTS FOR RENIFORM NEMATODE MANAGEMENT IN COTTON IN NORTH ALABAMA, 2007

K.S. Lawrence, S. R. Moore, C. H. Burmester, and B. E. Norris

Avicta seed treatment and experimental variants were evaluated for the management of reniform nematodes in a naturally infested producer's field near the Tennessee Valley Research and Education Center in Belle Mina, Alabama. The field had a history of reniform nematode infestation, and the soil type was a Decatur silty loam. Avicta and the variants were applied to DP 444 BG/RR seed by the manufacturer. Orthene 90S at 0.12 pound per acre was applied to all plots as needed for thrips control. Plots consisted of two rows, 25 feet long, with a 40-inch row spacing and were arranged in a randomized complete block design with five replications. Blocks were separated by a 15 feet wide alley. All plots were maintained throughout the season with standard herbicide, insecticide, and fertility production practices as recommended by the Alabama Cooperative Extension System. Population densities of the reniform nematode were determined at 29, 59, 89 and 150 days after planting (DAP). Ten soil cores, 1 inch in diameter and 6 inches deep, were collected from the two rows of each plot in a systematic sampling pattern. Nematodes were extracted using the gravity sieving and sucrose centrifugation technique. Plots were harvested on October 1. Data were statistically analyzed by GLM and means compared using Fisher's protected least significant difference test ($P \leq 0.10$).

The drought was severe in 2007 with a total rainfall accumulation of only 6.15inches from planting through harvest. Thus reniform nematode pressure was secondary to the drought conditions. Reniform nematode numbers at planting averaged 2438 vermiform life stages per 150 $cm^3$ of soil at planting. Reniform numbers had not increased by 29 and 59 DAP most probably due to the drought (see table). By 89 DAP, reniform populations had increased in all seed treatments although no differences in population numbers were observed between any treatments. At harvest 150 DAP, nematode populations in all seed treatments declined to below at-plant populations. Seed cotton yields varied by 265 pounds per acre at harvest with an average of 1858 pounds per acre of seed cotton produced over all seed treatments. None of the nematicide seed treatments increased yields as compared to the Cruiser control under these drought conditions in north Alabama. The lack of rainfall probably attributed to the lack of response from the nematicide treatments.

## EVALUATION OF AVICTA FORMULATION VARIANTS FOR RENIFORM NEMATODE MANAGEMENT IN COTTON IN NORTH ALABAMA, 2007

| Treatment | Rate ai | *Rotylenchulus reniformis*/ 150 $cm^3$ soil May 30 | Jun 29 | Jul 29 | Oct 1 | Seed cotton lb/A |
|---|---|---|---|---|---|---|
| 1. Apron XL + Maxim 4FS + Systane 40WP + Dynasty CST + Cruiser 5FS | 7.5+2.5+21g/100kg + 0.34+0.03mg/seed | 402 a [1] | 108 | 2086 | 788 | 1873 |
| 2. Apron XL + Maxim 4FS + Systane 40WP + Dynasty CST + Cruiser 5 FS + Avicta | 7.5+2.5+21g/100kg + 0.34+0.03+0.15mg/seed | 371 a | 170 | 1576 | 494 | 1751 |
| 3. Apron XL + Maxim 4FS + Systane 40WP + Dynasty CST + Cruiser 5 FS + 14905A | 7.5+2.5+21g/100kg + 0.34+0.03+0.15mg/seed | 556 a | 77 | 1483 | 618 | 2016 |
| 4. Apron XL + Maxim 4FS + Systane 40WP + Dynasty CST + Cruiser 5 FS + A14905B | 7.5+2.5+21g/100kg + 0.34+0.03+0.15mg/seed | 139 a | 139 | 1205 | 618 | 1865 |
| 5. Apron XL + Maxim 4FS + Systane 40WP + Dynasty CST + Cruiser 5 FS + A15953 | 7.5+2.5+21g/100kg + 0.34+0.03+0.15mg/seed | 294 a | 77 | 1854 | 417 | 1824 |
| 6. Apron XL + Maxim 4FS + Systane 40WP + Dynasty CST + Cruiser 5 FS + STP15273 + STP 17217 | 7.5+2.5+21g/100kg + 0.34+0.03+0.38 + 0.38mg/seed | 433 a | 92 | 1638 | 587 | 1819 |
| ***LSD ($P \leq 0.05$)*** | | ***576*** | ***107*** | ***956*** | ***327*** | ***321*** |

[1] Column means followed by the same letter are not significantly different according to Fishers least significant difference test ($P \leq 0.05$).

# EVALUATION OF AVICTA VARIANTS ALONE AND IN COMBINATIONS WITH VYDATE C-LV OR TEMIK 15G FOR RENIFORM NEMATODE MANAGEMENT IN COTTON IN NORTH ALABAMA, 2007

K.S. Lawrence, C. H. Burmester, G. W. Lawrence, and B. E. Norris

Avicta variants, alone and in combination with Vydate C-LV or Temik 15G, were evaluated for the management of reniform nematodes in a naturally infested producer's field near the Tennessee Valley Research and Education Center in Belle Mina, Alabama. The field had a history of reniform nematode infestation, and the soil type was a Decatur silty loam. Avicta was applied to the seed, DP 444 BG/RR, by the manufacturer. Temik 15G (5 pounds per acre) was applied at planting on May 1 in the seed furrow with chemical granular applicators attached to the planter. Vydate C-LV was applied as a foliar spray at the fourth true leaf plant growth stage with a two-row, $CO_2$-charged backpack sprayer. Orthene 90S at 0.12 pound per acre was applied to all plots as needed for thrips control. Plots consisted of two rows, 25 feet long, with a 40-inch row spacing and were arranged in a randomized complete block design with five replications. Blocks were separated by a 15-foot wide alley. All plots were maintained throughout the season with standard herbicide, insecticide, and fertility production practices as recommended by the Alabama Cooperative Extension System. Population densities of the reniform nematode were determined at 29, 59, 89 and 150 days after planting (DAP). Ten soil cores, 1 inch in diameter and 6 inches deep, were collected from the two rows of each plot in a systematic sampling pattern. Nematodes were extracted using the gravity sieving and sucrose centrifugation technique. Plots were harvested on October 1. Data were statistically analyzed by GLM and means compared using Fisher's protected least significant difference test ($P \leq 0.10$).

The drought was severe in 2007; thus, reniform nematode pressure was low to moderate under these conditions. Rainfall was limited to 6.14 inches for the entire growing season. Reniform nematode numbers at planting averaged 608 vermiform life stages per 150 $cm^3$ of soil. Cotton seedling stand was similar among all treatments (data not shown). By 29 and 59 DAP, reniform numbers had not increased due to the drought, and no differences ($P \leq 0.10$) in population numbers were observed between any treatments (see table). Rainfall in July stimulated reniform populations and all seed treatments had lower nematode numbers ($P \leq 0.10$) as compared to Centric 40WG (11), Temik at plant with a side dress application (10), the STP15273 + STP17217 experimental combination (8), and A14905A (7). At harvest 150 DAP, A14905A (7) continued to support greater populations ($P \leq 0.10$) than all of the remaining 12 nematicide combinations. Seed cotton yields varied by 573 pounds per acre between the numerically highest yielding treatment, Apron XL + Maxim 4FS + Systane 40WP + Temik 15G + Temik 15G (sidedress), and the lowest yielding treatment, Apron XL + Maxim 4FS + Systane 40WP + Dynasty CST + Cruiser 5 FS + Avicta 4.17FS + Centric 40WG. An average of 3488 pounds per acre was produced over all nematicides. Yields averaged 3609 pounds per acre over the seed treatments plus Temik 15G followed by 3360 pounds per acre in the Avicta 4.17 FS seed treatments and 3441 pounds per acre in the Avicta experimental treatments. None of the nematicide treatments increase yields ($P \leq 0.10$) as compared to the Cruiser control.

### EFFECT OF SEED TREATMENTS ON NEMATODE NUMBERS AND SEED COTTON YIELD

| Treatment | Rate ai | *Rotylenchulus reniformis*/ 150 $cm^3$ soil May 30 | Jun 29 | Jul 29 | Oct 1 | Seed cotton lb/A |
|---|---|---|---|---|---|---|
| 1. Apron XL + Maxim 4FS + Systane 40WP + Cruiser 5FS | 7.5+2.5+21g/100kg + 0.03mg/seed | 93 | 93 | 2395 b [1] | 1298 a | 3382 |
| 2. Apron XL + Maxim 4FS + Systane 40WP + Temik 15G | 7.5+2.5+21g/100kg + 5 lb/A | 77 | 77 | 2549 b | 973 b | 3585 |
| 3. Apron XL + Maxim 4FS + Systane 40WP + Dynasty CST + Temik 15G | 7.5+2.5+21g/100kg + 0.34+ 5 lb/A/seed | 93 | 124 | 2039 b | 572 b | 3854 |
| 4. Apron XL + Maxim 4FS + Systane 40WP + Dynasty CST + Cruiser 5 FS + Avicta 4.17FS | 7.5+2.5+21g/100kg + 0.34+0.03+0.15mg/seed | 77 | 124 | 2627 b | 896 b | 3391 |
| 5. Apron XL + Maxim 4FS + Systane 40WP + A14905A | 7.5+2.5+21g/100kg + 0.15mg/seed | 77 | 155 | 1375 b | 664 b | 3494 |
| 6. Apron XL + Maxim 4FS + Systane 40WP + A14905B | 7.5+2.5+21g/100kg + 0.15mg/seed | 77 | 93 | 5160 a | 633 b | 3466 |
| 7. Apron XL + Maxim 4FS + Systane 40WP + A15953 | 7.5+2.5+21g/100kg + 0.15mg/seed | 77 | 77 | 2596 b | 3028 a | 3466 |
| 8. Apron XL + Maxim 4FS + Systane 40WP + STP 15273 + STP 17217 | 7.5+2.5+21g/100kg + 0.38+ 0.38mg/seed | 124 | 93 | 3708 a | 1545 b | 3344 |
| 9. Apron XL + Maxim 4FS + Systane 40WP + Dynasty CST + Cruiser 5 FS + Avicta 4.17FS + Temik 15G | 7.5+2.5+21g/100kg + 0.34+0.03+0.15mg/seed + 5 lb/A | 108 | 124 | 2178 b | 942 b | 3547 |
| 10. Apron XL + Maxim 4FS + Systane 40WP + Temik 15G + Temik 15G (SD[2]) | 7.5+2.5+21g/100kg + 5 lb/A + 5 lb/A | 108 | 155 | 3507 a | 865 b | 3862 |
| 11. Apron XL + Maxim 4FS + Systane 40WP + Dynasty CST + Cruiser 5 FS + Avicta 4.17FS + Centric 40WG | 7.5+2.5+21g/100kg + 0.34+0.03+0.15mg/seed + 56g/ha | 77 | 139 | 6983 a | 633 b | 3289 |
| 12. Apron XL + Maxim 4FS + Systane 40WP + Dynasty CST + Cruiser 5 FS + Avicta 4.17FS + Vydate CLV | 7.5+2.5+21g/100kg + 0.34+0.03+0.15mg/seed + 17 oz/A | 93 | 155 | 1391 b | 850 b | 3369 |

continued

**EFFECT OF SEED TREATMENTS ON NEMATODE NUMBERS AND SEED COTTON YIELD (CONT)**

| Treatment | Rate ai | *Rotylenchulus reniformis*/ 150 cm³ soil May 30 | Jun 29 | Jul 29 | Oct 1 | Seed cotton lb/A |
|---|---|---|---|---|---|---|
| 13. Apron XL + Maxim 4FS + Systane 40WP + Dynasty CST + Cruiser 5 FS + Temik 15G + Vydate CLV | 7.5+2.5+21g/100kg + 0.34+0.03mg/seed+ 5 lb/A + 17 oz/A | 108 | 216 | 1792 b | 742 b | 3395 |
| ***LSD (P ≤ 0.10)*** | | ***576*** | ***107*** | ***956*** | ***327*** | ***708*** |

[1]Column means followed by the same letter are not significantly different according to Fishers least significant difference test (P ≤ 0.10). [2]SD = sidederess application applied at pinhead square.

# EVALUATION OF THE EXPERIMENTAL AGST06012 ALONE AND IN COMBINATION WITH AVICTA CP, INHIBIT OR TEMIK 15G FOR RENIFORM NEMATODE MANAGEMENT IN COTTON IN NORTH ALABAMA, 2007

K.S. Lawrence, C. H. Burmester, and B. E. Norris

The experimental seed treatment AGST06012 was evaluated alone and in combination with Avicta, InHibit, or Temik 15G for the management of reniform nematodes in a naturally infested producer's field near the Tennessee Valley Research and Education Center in Belle Mina, Alabama. The field had a history of reniform nematode infestation, and the soil type was a Decatur silty loam. Dynasty CST, Cruiser, Avicta 4.17 FS, AGST06012, and Origin Ascend were applied to DP 444 BG/RR seed by the manufacturers. InHibit (0.3 mg per seed) was added as a slurry to the seed immediately before planting. On May 1, Temik 15G (5.0 pounds per acre) was applied at planting in the seed furrow with chemical granular applicators attached to the planter. Orthene 90S at 0.12 pound per acre was applied to all plots as needed for thrips control. Plots consisted of two rows, 25 feet long, with a 40-inch row spacing and were arranged in a randomized complete block design with five replications. Blocks were separated by a 15-foot wide alley. All plots were maintained throughout the season with standard herbicide, insecticide, and fertility production practices as recommended by the Alabama Cooperative Extension System. Population densities of the reniform nematode were determined at 29, 59, 89, and 150 days after planting (DAP). Ten soil cores, 1 inch in diameter and 6 inches deep, were collected from the two rows of each plot in a systematic sampling pattern. Nematodes were extracted using the gravity sieving and sucrose centrifugation technique. Plots were harvested on October 1. Data were statistically analyzed by GLM and means compared using Fisher's protected least significant difference test (P ≤ 0.10).

The drought was severe in 2007 with total rainfall equaling only 6.15 inches; thus, reniform nematode pressure was low to moderate under these conditions. Reniform nematode numbers at planting averaged 3260 vermiform life stages per 150 $cm^3$ of soil at planting. Cotton seedling stand was similar among all treatments (data not shown). By 29 and 59 DAP, reniform numbers had not increased due to the drought, and no differences (P ≤ 0.10) in population numbers were observed between any treatments (see table). Rainfall in July stimulated reniform populations and the AGST06012 + OriginAscend seed treatment alone and in combination with In-Hibit CST andAGST06012 + Temik 15G had lower nematode numbers as compared to the Dynasty CST + Cruiser + Avicta 4.17 FS treatment. At harvest 150 DAP, reniform populations had declined in all treatments. Seed cotton yields varied by 473 pounds per acre at harvest with an average of 1932 pounds per acre of seed cotton produced over all nematicides. Although no nematicide treatment was greater (P ≤ 0.10) than the control, the AGST06012 + Temik 15G combination increased (P ≤ 0.10) yields over the AGST06012 +InHibit CST seed treatment.

**EVALUATION OF AVICTA FORMULATION VARIANTS FOR RENIFORM NEMATODE MANAGEMENT IN COTTON IN NORTH ALABAMA, 2007**

| Treatment | Rate ai | *Rotylenchulus reniformis*/ 150 cm³ soil May 30 | Jun 29 | Jul 29 | Oct 1 | Seed cotton lb/A |
|---|---|---|---|---|---|---|
| 1. Untreated Check | | 256 | 93 | 4511 ab[1] | 726 | 1769 ab |
| 2. Dynasty CST + Cruiser + Avicta 4.17 FS | 0.34+0.03+0.15mg/seed | 316 | 124 | 7122 a | 278 | 1961 ab |
| 3. AGST06012 + Cruiser + Avicta 4.17 FS | 0.30+0.03+0.15mg/seed | 270 | 93 | 5207 ab | 324 | 2035 ab |
| 4. AGST06012 + InHibit CST | 7.5+2.5+21g/100kg + 0.30 + 0.15 mg/seed | 196 | 124 | 4110 ab | 572 | 1539 b |
| 5. AGST06012 + OriginAscend+InHibit CST... | 0.30+0.35+0.26mg/seed | 196 | 108 | 3399 b | 401 | 1859 ab |
| 6. AGST06012 + OriginAscend | 0.30+0.35+0.26mg/seed | 286 | 170 | 3538 b | 494 | 1955 ab |
| 7. AGST06012 + Temik 15G | 0.30mg/seed + 5 lb/A | 105 | 93 | 4172 b | 185 | 2242 a |
| ***LSD (P ≤ 0.10)*** | | ***261*** | ***105*** | ***2878*** | ***617*** | ***370*** |

[1] Column means followed by the same letter are not significantly different according to Fishers least significant difference test (P ≤ 0.05).

# Avicta, Aeris, Temik 15G, and Vydate C-LV Management Options for Reniform Nematode Management In Cotton in North Alabama, 2007

K.S. Lawrence, C. H. Burmester, G. W. Lawrence, and B. E. Norris

Avicta and Aeris seed treatments, Temik 15G, and Vydate C-LV were evaluated for the management of reniform nematodes in a naturally infested producer's field near the Tennessee Valley Research and Education Center in Belle Mina, Alabama. The field had a history of reniform nematode infestation, and the soil type was a Decatur silty loam. Avicta and Aeris were applied to the seed by the manufacturer. Temik 15G (5.0 pounds per acre) was applied at planting on May 1, in the seed furrow with chemical granular applicators attached to the planter. Vydate C-LV was applied at 17 ounces per acre as a foliar spray at the fourth true leaf plant growth stage with a two-row, $CO_2$-charged backpack sprayer. Orthene 90S at 0.12 pound per acre was applied to all plots as needed for thrips control. Plots consisted of two rows, 25 feet long, with a 40-inch row spacing and were arranged in a randomized complete block design with five replications. Blocks were separated by a 15-foot wide alley. All plots were maintained throughout the season with standard herbicide, insecticide, and fertility production practices as recommended by the Alabama Cooperative Extension System. Population densities of the reniform nematode were determined at 29, 59, 89, and 150 days after planting (DAP). Ten soil cores, 1 inch in diameter and 8 inches deep, were collected from the two rows of each plot in a systematic sampling pattern. Nematodes were extracted using the gravity sieving and sucrose centrifugation technique. Plots were harvested on October 1. Data were statistically analyzed by GLM and means compared using Fisher's protected least significant difference test ($P \leq 0.10$).

Rainfall was the limiting factor in the 2007 season; thus, reniform nematode pressure was low to moderate under these conditions. Only 15.3 inches of rain was recorded for the entire growing season. Reniform nematode numbers at planting averaged 1186 vermiform life stages per 150 $cm^3$ of soil. At 29 DAP, reniform numbers had not increased due to the drought; however, by 89 DAP, reniform populations had increased in all the Temik 15G treatment combinations as compared to the control, Aeris, and Avicta alone or in combination with Vydate. At harvest 150 DAP, nematode populations in all treatments declined and six nematicide treatments supported fewer nematodes than the control treatment. An average of 1630 pounds per acre of seed cotton was produced over all nematicide treatments. Avicta and Aeris combined with Temik 15G at planting increased seed cotton yields ($P \leq 0.10$) by an average of 258 pounds per acre as compared to the Cruiser control. Yields averaged 1349 pounds per acre over all Avicta treatments followed by 1683 pounds per acre in the Aeris treatments. Temik 15G yields with or without the seed treatments averaged 1545 pounds per acre. The addition of Vydate produced an average yield of 1421 pounds per acre.

**Effect of Avicta, Aeris, Temik, and Vydate on Reniform Numbers and Seed Cotton Yields**

| Treatment | Rate ai | *Rotylenchulus reniformis*/ 150 $cm^3$ soil May 30 29 DAP | Jun 29 59 DAP | Jul 29 89 DAP | Oct 1 150 DAP | Seed cotton lb/A |
|---|---|---|---|---|---|---|
| 1. Control | | 278 ab [1] | 278 b | 2024 b | 1669 a | 1322 b |
| 2. Aeris | 48 mgai/seed | 108 b | 124 b | 2256 b | 587 b | 1628 a |
| 3. Avicta 500.4 mgai seed | 500.4 mgai/seed | 232 ab | 139 b | 1221 b | 1004 ab | 1211 b |
| 4. Temik 15G | 840gm/ha | 433 a | 108 b | 3044 a | 927 ab | 1539 a |
| 5. Aeris + Vydate CLV | 48 mgai/seed+561g/ha | 108 b | 124 b | 2148 b | 1020 ab | 1587 a |
| 6. Avicta + Vydate CLV | 500.4 mgai/seed +561g/ha | 155 b | 510 a | 2070 b | 757 b | 1324 b |
| 7. Temik 15G + Vydate CLV | 561g/ha + 840gm/ha | 247 ab | 124 b | 3414 a | 541 b | 1352 b |
| 8. Aeris + Temik 15G | 48 mgai/seed+840gm/ha | 232 ab | 93 b | 4125 a | 757 b | 1805 a |
| 9. Avicta + Temik 15G | 500.4 mgai/seed + 840 gm/ha | 278 ab | 170 b | 3229 a | 1530 a | 1355 b |
| 10. Aeris + Temik 15G SD [2] | 48 mgai/seed+840gm/ha | 108 b | 201 b | 2503 ab | 556 b | 1713 a |
| 11. Avicta + Temik 15G SD | 500.4 mgai/seed + 840 gm/ha | 108 b | 185 b | 2719 ab | 1190 a | 1507 ab |
| 12. Temik 15G + Temik 15G SD | 840 gm/ha | 170 b | 139 b | 3167 a | 263 b | 1486 ab |
| ***LSD ($P \leq 0.10$)*** | | ***259*** | ***152*** | ***1671*** | ***777*** | ***322*** |

[1] Numbers in columns followed by the same letter are not significantly different by Fisher's LSD at $P \leq 0.10$.

[2] SD is the side dress application of Temik 15G at pin head square.

# EVALUATION OF AVICTA FORMULATION VARIANTS FOR RENIFORM NEMATODE MANAGEMENT IN COTTON IN SOUTH ALABAMA, 2007

K.S. Lawrence, S. R. Moore, and J. R. Akridge

Avicta seed treatment and experimental variants were evaluated for the management of reniform nematodes in a naturally infested producer's field near Huxford, Alabama. The field had a long history of reniform nematode infestation, and the soil type was classified as a loam. Avicta and the variants were applied to DP 555 BG/RR seed by the manufacturer. Temik 15G (5.0 pounds per acre) was applied at planting on May 1 in the seed furrow with chemical granular applicators attached to the planter. Vydate C-LV was applied at 16 ounces per acre as a foliar spray at the fourth true leaf plant growth stage with a two-row, $CO_2$-charged backpack sprayer. Orthene 90S at 0.12 pound per acre was applied to all plots as needed for thrips control. Plots consisted of two rows, 25 feet long, with a 36-inch row spacing and were arranged in a randomized complete block design with six replications. Blocks were separated by a 15-foot wide alley. All plots were maintained throughout the season with standard herbicide, insecticide, and fertility production practices as recommended by the Alabama Cooperative Extension System. Population densities of the reniform nematode were determined at monthly intervals. Ten soil cores, 1 inch in diameter and 8 inches deep, were collected from the two rows of each plot in a systematic sampling pattern. Nematodes were extracted using the gravity sieving and sucrose centrifugation technique. Plots were harvested on October 31. Data were statistically analyzed by GLM and means compared using Fisher's protected least significant difference test ($P \leq 0.10$).

The drought was severe in 2007 with a total of 15.3 inches of rainfall recorded at this location. Thus, reniform nematode pressure was secondary to the drought conditions. Reniform nematode numbers at planting averaged 377 vermiform life stages per 150 $cm^3$ of soil at planting. Cotton stand was uniform across all seed treatments with at least nine plants per 10 feet of row (see table). Reniform numbers had not increased at 34 DAP as observed in previous years most probably due to the drought. By 67 DAP, reniform populations had increased in all seed treatments although no differences ($P \leq 0.10$) in population numbers were observed between any nematicide treatment. At harvest, 161 DAP, nematode populations in all seed treatments had increased an average of 42 percent as compared to the mid-season sample, but no differences between seed treatments were observed. Seed cotton yields varied by 175 pounds per acre at harvest with an average of 1309 pounds per acre of seed cotton produced over all nematicide seed treatments. None of the nematicide seed treatments increased yields ($P \leq 0.10$) as compared to the Cruiser control under these drought conditions in south Alabama. The lack of rainfall probably attributed to the lack of response from the nematicide treatments.

**EVALUATION OF AVICTA FORMULATION VARIANTS FOR RENIFORM NEMATODE MANAGEMENT IN COTTON IN SOUTH ALABAMA, 2007**

| Treatment | Rate ai | Stand 10 ft row Jun 13 | *Rotylenchulus reniformis*/ 150 cm³ soil Jun 13 34 DAP | Jul 16 67 DAP | Oct 31 161 DAP | Seed cotton lb/A |
|---|---|---|---|---|---|---|
| 1. Apron XL + Maxim 4FS + Systane 40WP + Dynasty CST + Cruiser 5FS | 7.5+2.5+21g/100kg + 0.34+0.03mg/seed | 35[1] | 618 | 2348 | 3214 | 1408 |
| 2. Apron XL + Maxim 4FS + Systane 40WP + Dynasty CST + Cruiser 5 FS + Avicta | 7.5+2.5+21g/100kg + 0.34+0.03+0.15mg/seed | 31 | 448 | 2438 | 3770 | 1291 |
| 3. Apron XL + Maxim 4FS + Systane 40WP + Dynasty CST + Cruiser 5 FS + 14905A | 7.5+2.5+21g/100kg + 0.34+0.03+0.15mg/seed | 40 | 711 | 1791 | 2642 | 1324 |
| 4. Apron XL + Maxim 4FS + Systane 40WP + Dynasty CST + Cruiser 5 FS + A14905B | 7.5+2.5+21g/100kg + 0.34+0.03+0.15mg/seed | 35 | 340 | 1249 | 3059 | 1348 |
| 5. Apron XL + Maxim 4FS + Systane 40WP + Dynasty CST + Cruiser 5 FS + A15953 | 7.5+2.5+21g/100kg + 0.34+0.03+0.15mg/seed | 35 | 166 | 1565 | 2472 | 1360 |
| 6. Apron XL + Maxim 4FS + Systane 40WP + Dynasty CST + Cruiser 5 FS + STP15273 + STP 17217 | 7.5+2.5+21g/100kg + 0.34+0.03+0.38 + 0.38mg/seed | 35 | 355 | 1746 | 2827 | 1227 |
| ***LSD ($P \leq 0.10$)*** | | ***10*** | ***535*** | ***1583*** | ***2530*** | ***293*** |

# EVALUATION OF AVICTA VARIANTS ALONE AND IN COMBINATIONS WITH VYDATE C-LV OR TEMIK 15G FOR RENIFORM NEMATODE MANAGEMENT IN COTTON IN SOUTH ALABAMA, 2007

K.S. Lawrence, S. R. Moore, and J. R. Akridge

Avicta seed treatment and experimental variants were evaluated for the management of reniform nematodes in a naturally infested producer's field near Huxford, Alabama. The field had a long history of reniform nematode infestation, and the soil type was classified as a loam. Avicta and the variants were applied to the seed by the manufacturer. Temik 15G (5 pounds per acre) was applied at planting on May 1 in the seed furrow with chemical granular applicators attached to the planter. Vydate C-LV was applied as a foliar spray at the fourth true leaf plant growth stage with a two-row, $CO_2$-charged backpack sprayer. Orthene 90S at 0.12 pound per acre was applied to all plots as needed for thrips control. Plots consisted of two rows, 25 feet long, with a 40-inch row spacing and were arranged in a randomized complete block design with six replications. Blocks were separated by a 15-foot wide alley. All plots were maintained throughout the season with standard herbicide, insecticide, and fertility production practices as recommended by the Alabama Cooperative Extension System. Population densities of the reniform nematode were determined at monthly intervals. Ten soil cores, 1 inch in diameter and 8 inches deep, were collected from the two rows of each plot in a systematic sampling pattern. Nematodes were extracted using the gravity sieving and sucrose centrifugation technique. Plots were harvested on October 31. Data were statistically analyzed by GLM and means compared using Fisher's protected least significant difference test ($P \leq 0.10$).

The drought was severe in 2007; thus, reniform nematode pressure was low under these conditions. Rainfall was limited to 15.3 inches for the entire growing season. Reniform nematode numbers at planting averaged 371 vermiform life stages per 150 $cm^3$ of soil. Cotton seedling stand was similar among all seed treatments; however, treatments combined with Temik 15G produced lower stands (see table). By 34 and 67 DAP, reniform numbers had increased from the initial population levels but no differences ($P \leq 0.10$) in numbers were observed between any treatments. At harvest, 161 DAP, no seed treatment nematicide combination reduced nematode populations as compared to the Cruiser control. The seed treatment combinations with A15953 (7) and STP 15273 + STP 17217(8) supported greater reniform numbers than the cruiser control (1). Seed cotton yields varied by 493 pounds per acre at harvest with an average of 1642 pounds per acre of seed cotton produced over all nematicides. Yields averaged 1854 pounds per acre over the seed treatments plus Temik 15G followed by 1371 pounds per acre in the Avicta 4.17 FS experimental seed treatments. The addition of Vydate to Temik 15G or Avicta 4.17FS produced an average yield of 1463 pounds per acre. The Avicta 4.17 FS seed treatment with or without Vydate CLV increased yields ($P \leq 0.10$) as compared to the non-treated Cruiser 5FS control under these drought conditions in south Alabama.

## EFFECT OF SELECTED NEMATICIDES ON COTTON STAND, NEMATODE NUMBERS AND SEED COTTON YIELD

| Treatment | Rate ai | Stand 10 ft row Jun 13 | *Rotylenchulus reniformis*/ 150 $cm^3$ soil Jun 13 34 DAP | Jul 16 67 DAP | Oct 31 161 DAP | Seed cotton lb/A |
|---|---|---|---|---|---|---|
| 1. Apron XL + Maxim 4FS + Systane 40WP + Cruiser 5FS | 7.5+2.5+21g/100kg + 0.03mg/seed | 23.8 ab[1] | 618 | 1519 | 2060 b | 1317 b |
| 2. Apron XL + Maxim 4FS + Systane 40WP + Temik 15G | 7.5+2.5+21g/100kg + 5 lb/A | 15.2 bcd | 348 | 1597 | 2163 b | 1449 ab |
| 3. Apron XL + Maxim 4FS + Systane 40WP + Dynasty CST + Temik 15G | 7.5+2.5+21g/100kg + 0.34+0.03+0.15mg/seed | 9.5 d | 657 | 811 | 2433 ab | 1384 ab |
| 4. Apron XL + Maxim 4FS + Systane 40WP + Dynasty CST + Cruiser 5 FS + Avicta 4.17FS | 7.5+2.5+21g/100kg + 0.34+0.03+0.15mg/seed | 21.2 abc | 773 | 708 | 2871 ab | 1643 a |
| 5. Apron XL + Maxim 4FS + Systane 40WP + A14905A | 7.5+2.5+21g/100kg + 0.15mg/seed | 17.3 a-d | 670 | 1223 | 3218 a | 1327 b |
| 6. Apron XL + Maxim 4FS + Systane 40WP + A14905B | 7.5+2.5+21g/100kg + 0.15mg/seed | 24.7 ab | 489 | 759 | 2987 ab | 1553 a |
| 7. Apron XL + Maxim 4FS + Systane 40WP + A15953 | 7.5+2.5+21g/100kg + 0.15mg/seed | 19.7 abc | 296 | 1171 | 3592 a | 1386 ab |
| 8. Apron XL + Maxim 4FS + Systane 40WP + STP 15273 + STP 17217 | 7.5+2.5+21g/100kg + 0.38+ 0.38mg/seed | 26.3 a | 682 | 2498 | 3798 a | 1314 b |
| 9. Apron XL + Maxim 4FS + Systane 40WP + Dynasty CST + Cruiser 5 FS + Avicta 4.17FS + Temik 15G | 7.5+2.5+21g/100kg + 0.34+0.03+0.15mg/seed + 840gm/ha | 13.2 cd | 682 | 708 | 1622 b | 1209 b |
| 10. Apron XL + Maxim 4FS + Systane 40WP + Temik 15G + Temik 15G (SD[2]) | 7.5+2.5+21g/100kg + 5 lb/A + 5 lb/A | 17.7 a-d | 605 | 1442 | 2034 b | 1383a |
| 11. Apron XL + Maxim 4FS + Systane 40WP + Dynasty CST + Cruiser 5 FS + Avicta 4.17FS + Centric 40WG | 7.5+2.5+21g/100kg + 0.34+0.03+0.15mg/seed + 56g/ha | 24.7 ab | 592 | 914 | 3128 ab | 1438 ab |
| 12. Apron XL + Maxim 4FS + Systane 40WP + Dynasty CST + Cruiser 5 FS + Avicta 4.17FS + Vydate CLV | 7.5+2.5+21g/100kg + 0.34+0.03+0.15mg/seed + 561g/ha | 22.7 abc | 811 | 1467 | 2523 ab | 1702 a |

continued

**EFFECT OF SELECTED NEMATICIDES ON COTTON STAND, NEMATODE NUMBERS AND SEED COTTON YIELD (CONT)**

| Treatment | Rate ai | Stand 10 ft row Jun 13 | *Rotylenchulus reniformis*/ 150 cm³ soil Jun 13 34 DAP | Jul 16 67 DAP | Oct 31 161 DAP | Seed cotton lb/A |
|---|---|---|---|---|---|---|
| 13. Apron XL + Maxim 4FS + Systane 40WP + Dynasty CST + Cruiser 5 FS + Temik 15G + Vydate CLV | 7.5+2.5+21g/100kg + 0.34+0.03mg/seed+ 5 lb/A 17 oz/A | 13.0 cd | 528 | 978 | 2098 b | 1557 |
| ***LSD (P ≤ 0.10)*** | | ***5.8*** | ***335*** | ***1183*** | ***1568*** | ***343*** |

[1] Column means followed by the same letter are not significantly different according to Fishers least significant difference test (P ≤ 0.10). [2]SD = sidederess application applied at pinhead square.

## EVALUATION OF AVICTA CP, INHIBIT, OR TEMIK 15G WITH THE EXPERIMENTAL AGST06012 FOR RENIFORM NEMATODE MANAGEMENT IN COTTON IN SOUTH ALABAMA, 2007

K.S. Lawrence, S. R. Moore, and J. R. Akridge

AGST06012, alone and in combination with Avicta, InHibit, or Temik 15G, was evaluated for the management of reniform nematodes in a naturally infested producer's field near Huxford, Alabama. The field had a long history of reniform nematode infestation, and the soil type was classified as a loam. Dynasty CST, Cruiser, Avicta 4.17 FS, AGST06012, and Origin Ascend were applied to DP 555 BG/RR seed by the manufacturer. InHibit was added as a slurry to the seed immediately before planting. Temik 15G (5.0 pound per acre) was applied at planting on May 9 in the seed furrow with chemical granular applicators attached to the planter. Orthene 90S at 0.12 pound per acre was applied to all plots as needed for thrips control. Plots consisted of two rows, 25 feet long, with a 40-inch row spacing and were arranged in a randomized complete block design with six replications. Blocks were separated by a 15-foot wide alley. All plots were maintained throughout the season with standard herbicide, insecticide, and fertility production practices as recommended by the Alabama Cooperative Extension System. Population densities of the reniform nematode were determined at monthly intervals. Ten soil cores, 1 inch in diameter and 8 inches deep, were collected from the two rows of each plot in a systematic sampling pattern. Nematodes were extracted using the gravity sieving and sucrose centrifugation technique. Plots were harvested on October 31. Data were statistically analyzed by GLM and means compared using Fisher's protected least significant difference test ($P \leq 0.10$).

The drought was severe in 2007; thus, reniform nematode pressure was low to moderate under these conditions. Rainfall was limited to 15.3 inches for the entire growing season. Reniform nematode numbers at planting averaged 400 vermiform life stages per 150 $cm^3$ of soil at planting. Cotton seedling stand was similar among all treatments with stands averaging nine plants per 10 feet of row (see table). By 34 DAP on June 13, reniform numbers increased an average of six fold; however, no differences ($P \leq 0.10$) in population numbers were observed between any treatments and the untreated control. At mid-season, 67 DAP, reniform populations declined probably due to the severe drought. At harvest, 161 DAP, reniform populations had increased in all treatments without any differences ($P \leq 0.10$) in population numbers between the treatments. Seed cotton yields varied by 499 pounds per acre at harvest with an average of 1260 pounds per acre of seed cotton produced over all nematicides. AGST06012 combined with Cruiser + Avicta 4.17 FS (3) or Temik 15G (7) increased ($P \leq 0.10$) seed cotton yields over the untreated control and AGST06012 +InHibit CST.

**EVALUATION OF AVICTA CP, INHIBIT OR TEMIK 15G WITH THE EXPERIMENTAL AGST06012 FOR RENIFORM NEMATODE MANAGEMENT IN COTTON IN SOUTH ALABAMA, 2007**

| Treatment | Rate ai | Stand 10 ft row Jun 13 | *Rotylenchulus reniformis* / 150 cm³ soil Jun 13 34 DAP | Jul 16 67 DAP | Oct 31 161 DAP | Seed cotton lb/A |
|---|---|---|---|---|---|---|
| 1. Untreated Check | | 28.2 | 2974 | 1030 | 4262 | 999 c[1] |
| 2. Dynasty CST + Cruiser + Avicta 4.17 FS | 0.34+0.03+0.15mg/seed | 22.7 | 2008 | 1017 | 3773 | 1376 ab |
| 3. AGST06012 + Cruiser + Avicta 4.17 FS | 0.30+0.03+0.15mg/seed | 26.3 | 2318 | 953 | 4146 | 1353 ab |
| 4. AGST06012 +InHibit CST | 0.30+0.26mg/seed | 24.8 | 2948 | 592 | 5626 | 1030 c |
| 5. AGST06012+OriginAscend+InHibit CST | 0.30+0.35+0.26mg/seed | 26.8 | 2253 | 747 | 2846 | 1127 bc |
| 6. AGST06012+OriginAscend | 0.30+0.35+0.26mg/seed | 24.5 | 2163 | 592 | 3901 | 1177 bc |
| 7. AGST06012 + Temik 15G | 0.30mg/seed + 5 lb/A | 27.7 | 2009 | 476 | 4210 | 1498 a |
| ***LSD (P ≤ 0.10)*** | | ***5.2*** | ***1725*** | ***420*** | ***1386*** | ***176*** |

[1] Column means followed by the same letter are not significantly different according to Fishers least significant difference test (P ≤ 0.05).

# Efficacy of Aeris Seed Treatment in Combination with Biological GB 126 for Reniform Nematode Management in Cotton in South Alabama, 2007

K.S. Lawrence, S. R. Moore, G. W. Lawrence, and J. R. Akridge

Aeris seed treatment and the biological strains GB 126 were evaluated for the management of reniform nematodes in a naturally infested producer's field near Huxford, Alabama. The field had a long history of reniform nematode infestation, and the soil type was classified as a loam. All seed treatments were applied to DP 555 BG/RR seed by the manufacturer. Plots consisted of four rows, 25 feet long, with a 36-inch row spacing and were arranged in a randomized complete block design with six replications. Blocks were separated by a 15-foot wide alley. All plots were maintained throughout the season with standard herbicide, insecticide, and fertility production practices as recommended by the Alabama Cooperative Extension System. Population densities of the reniform nematode were determined at monthly intervals. Orthene 90S at 0.12 pound per acre was applied to all plots as needed for thrips control. Ten soil cores, 1 inch in diameter and 8 inches deep, were collected from the two rows of each plot in a systematic sampling pattern. Nematodes were extracted using the gravity sieving and sucrose centrifugation technique. Plots were harvested on October 31. Data were statistically analyzed by GLM and means compared using Fisher's protected least significant difference test ($P \leq 0.10$).

Rainfall was the limiting factor in the 2007 season; thus, reniform nematode pressure was low to moderate under these conditions. Only 15.3 inches of rain was recorded for the entire growing season. Reniform nematode numbers at planting averaged 109 vermiform life stages per 150 $cm^3$ of soil. Seed cotton stand was uniform between treatments (see table). Reniform numbers began to increase at 34 DAP, and the RTU Baytan Thiram + Allegiance FL standard seed treatment combined with either Gaucho 600 FS, Aeris, or Aeris + GB 126le7 reduced ($P \leq 0.10$) populations as compared to the standard control (1). At mid-season, 67 DAP, the Aeris + GB 126le7 or GB 126le6 reduced ($P \leq 0.10$) nematode populations as compared to Aeris alone. By harvest, reniform populations were equivalent across all treatments. Seed cotton yields varied by 328 pounds per acre at harvest with an average of 1463 pounds per acre of seed cotton produced over all nematicide treatments. Gaucho 600 FS, Aeris, and Aeris + GB 126le7 (treatments 2, 3, and 4) increased seed cotton yields ($P \leq 0.10$) by an average of 329 pounds per acre as compared to the standard seed treatment control.

**Efficacy of GB 126 on *Rotylenchulus reniformis* and Seed Cotton Yield**

| Treatment | Rate ai | Stand 10 ft row Jun 13 | *Rotylenchulus reniformis* / 150 $cm^3$ soil Jun 13 34 DAP | Jul 16 67 DAP | Oct 31 161 DAP | Seed cotton lb/A |
|---|---|---|---|---|---|---|
| 1. RTU Baytan Thiram + Allegiance FL | 195 + 49 ml/100kg | 21.3 | 837 a[1] | 1133 ab | 3824 | 1171 b |
| 2. RTU Baytan Thiram + Allegiance FL + Gaucho 600 FS | 195 + 49 ml/100kg + 0.375 mg ai/seed | 19.3 | 425 b | 1275 ab | 3348 | 1565 a |
| 3. RTU Baytan Thiram + Allegiance FL + Aeris | 195 + 49 ml/100kg + 0.750 mg ai/seed | 20.7 | 296 b | 1622 a | 2961 | 1435 a |
| 4. RTU Baytan Thiram + Allegiance FL + Aeris + GB126le7 | 195 + 49 ml/100kg + 0.750 + 0.750 mg ai/seed | 17.7 | 373 b | 592 b | 1880 | 1499 a |
| 5. RTU Baytan Thiram + Allegiance FL + Aeris + GB126le6 | 195 + 49 ml/100kg + 0.750 + 0.750 mg ai/seed | 16.7 | 669 ab | 386 b | 3927 | 1352 ab |
| ***LSD ($P \leq 0.05$)*** | | ***5.8*** | ***434*** | ***991*** | ***2306*** | ***186*** |

[1] Column means followed by the same letter are not significantly different according to Fishers least significant difference test ($P \leq 0.05$).

# EVALUATION OF THE BIOLOGICAL MUSCODOR FOR RENIFORM NEMATODE MANAGEMENT IN COTTON IN SOUTH ALABAMA, 2007

K.S. Lawrence, S. Moore, and J. R. Akridge

The biological Muscodor was evaluated for the management of reniform nematodes in a naturally infested producer's field near Huxford, Alabama. The field had a long history of reniform nematode infestation, and the soil type was classified as a loam. Muscodor was applied with the cotton seed and placed in the seed furrow. Temik 15G (5.0 pounds per acre) was applied at planting on May 9 in the seed furrow with chemical granular applicators attached to the planter. Orthene 90S at 0.12 pound per acre was applied to all plots as needed for thrips control. Plots consisted of two rows, 25 feet long, with a 36-inch row spacing and were arranged in a randomized complete block design with six replications. Blocks were separated by a 15-foot wide alley. All plots were maintained throughout the season with standard herbicide, insecticide, and fertility production practices as recommended by the Alabama Cooperative Extension System. Population densities of the reniform nematode were determined at monthly intervals. Ten soil cores, 1 inch in diameter and 8 inches deep, were collected from the two rows of each plot in a systematic sampling pattern. Nematodes were extracted using the gravity sieving and sucrose centrifugation technique. Plots were harvested on October 31. Data were statistically analyzed by GLM and means compared using Fisher's protected least significant difference test ($P \leq 0.10$).

The drought was severe in 2007; thus, reniform nematode pressure was low to moderate under these conditions. Rainfall was limited to 15.3 inches for the entire growing season. Reniform nematode numbers at planting averaged 363 vermiform life stages per 150 $cm^3$ of soil at planting. Cotton seedling stand was similar among all treatments with eight to nine seed per 10 feet of row (see table). By 34 DAP on June 13, no differences ($P \leq 0.10$) in nematode population numbers were observed between any treatments and the untreated control. The mid-season sample on July 16 at 67 DAP found reniform populations were lower in the Temik 15G plots as compared to Muscodor 300 at 1.9 gm. At harvest, 161 DAP, populations of reniform were lower in the Muscodor treatment applied at the low rate ($P \leq 0.10$) as compared to the untreated control. Seed cotton yields varied by 196 pounds per acre at harvest with an average of 1395 pounds per acre of seed cotton produced over all nematicides. No treatment increased yields over the untreated control. The lack of yield response was probably due to the intense drought.

**EVALUATION OF THE BIOLOGICAL MUSCODOR FOR RENIFORM NEMATODE MANAGEMENT IN COTTON IN SOUTH ALABAMA, 2007**

| Treatment | Rate ai | Stand 10 ft row Jun 13 | *Rotylenchulus reniformis* / 150 $cm^3$ soil Jun 13 34 DAP | Jul 16 67 DAP | Oct 31 161 DAP | Seed cotton lb/A |
|---|---|---|---|---|---|---|
| 1. Untreated Check | | 26.6 | 494 | 1422 ab[1] | 5778 a | 1473 |
| 2. Muscodor 300 | 1.9 gm liter soil | 21.2 | 602 | 2457 a | 4172 ab | 1306 |
| 3. Muscodor 300 | 0.95 gm liter soil | 21.6 | 525 | 1961 ab | 2487 b | 1387 |
| 4. Temik 15G | 5 lb/A | 22.6 | 417 | 1004 b | 4573 ab | 1492 |
| ***LSD ($P \leq 0.10$)*** | | ***11.7*** | ***324*** | ***1208*** | ***1669*** | ***303*** |

[1] Column means followed by the same letter are not significantly different according to Fishers least significant difference test ($P \leq 0.10$).

# Efficacy of Aeris Seed Treatment in Combination with Biological GB 126 for Root-Knot Nematode Management in Cotton in Alabama, 2007

K.S. Lawrence, G. W. Lawrence, and S. Nightingale

Aeris seed treatment and the biological strains GB 126 were evaluated for the management of the root-knot nematode at the Plant Breeding Unit in Tallassee, Alabama. The field had a long history of root-knot nematode infestation, and the soil type was classified as a sandy loam. Soil was 19.5 degrees C at a 4-inch depth at 10 a.m. with adequate moisture at planting on April 27. All seed treatments were applied to DP 444 BG/RR seed by the manufacturer. Plots consisted of two rows, 25 feet long, with a 40-inch row spacing and were arranged in a randomized complete block design with five replications. Blocks were separated by a 15-foot wide alley. All plots were maintained throughout the season with standard herbicide, insecticide, and fertility production practices as recommended by the Alabama Cooperative Extension System. Population densities of the root-knot nematode were determined at monthly intervals. Orthene 90S at 0.12 pound per acre was applied to all plots as needed for thrips control. Ten soil cores, 1 inch in diameter and 8 inches deep, were collected from the two rows of each plot in a systematic sampling pattern. Nematodes were extracted using the gravity sieving and sucrose centrifugation technique. Plots were harvested on September 18. Data were statistically analyzed by GLM and means compared using Fisher's protected least significant difference test ($P \leq 0.10$).

Rainfall and abnormally high temperatures were the limiting factors in the 2007 season; thus, root-knot nematode pressure was moderate under these severe environmental conditions. Root-knot nematode numbers at planting averaged 32 J2 life stages per 150 $cm^3$ of soil. Seeding cotton stand varied between treatments; however, no treatment was different ($P \leq 0.10$) from the control (see table). Plant vigor was visibly improved in all nematicide seed treatments over the fungicide control. Root-knot numbers began to increase at 39 DAP with the Gaucho 600 FS, Aeris, or Aeris + GB 126le7 reducing ($P \leq 0.10$) populations as compared to the RTU Baytan Thiram + Allegiance FL standard fungicide control. By harvest, root-knot populations were equivalent across all treatments. Seed cotton yields varied by 842 kg/ha at harvest with an average of 2126 kg/ha of seed cotton produced over all nematicide treatments. Gaucho 600 FS, Aeris alone, Aeris + GB 126le7, and Aeris + GB 126le6 increased seed cotton yields ($P \leq 0.10$) by an average of 784 pounds per acre as compared to the standard seed treatment control, RTU Baytan Thiram + Allegiance FL. The addition of GB 126 to RTU Baytan Thiram + Allegiance FL + Aeris + numerically increased seed cotton yields over the Aeris alone by 204 pounds per acre.

## Efficacy of Aeris Seed Treatment in Combination with Biological GB 126 for Root-Knot Nematode Management in Cotton in Alabama, 2007

| Treatment | Rate ai | Stand 3 m row Jun 5 | Plant vigor[1] Jun 5 | *M. incognita*/ 150 $cm^3$ soil Jun 5 | Sep 18 | Seed cotton lb/A |
|---|---|---|---|---|---|---|
| 1. RTU Baytan Thiram + Allegiance FL | 195 + 49 ml/100kg | 21.3 | 2.3 d[2] | 837 a | 911 | 1342 b |
| 2. RTU Baytan Thiram + Allegiance FL + Gaucho 600 FS | 195 + 49 ml/100kg + 0.375 mg ai/seed | 19.3 | 3.5 c | 425 b | 731 | 2126 a |
| 3. RTU Baytan Thiram + Allegiance FL + Aeris | 195 + 49 ml/100kg + 0.750 mg ai/seed | 20.7 | 3.7 bc | 296 b | 561 | 1917 a |
| 4. RTU Baytan Thiram + Allegiance FL + Aeris + GB126le7 | 195 + 49 ml/100kg + 0.750 + 0.750 mg ai/seed | 17.7 | 3.9 ab | 373 b | 581 | 2184 a |
| 5. RTU Baytan Thiram + Allegiance FL + Aeris + GB126le6 | 195 + 49 ml/100kg + 0.750 + 0.750 mg ai/seed | 16.7 | 4.1 a | 669 ab | 628 | 2056 a |
| ***LSD ($P \leq 0.10$)*** | | ***5.8*** | ***0.3*** | ***434*** | ***387*** | ***511*** |

[1] Plant vigor based on a 1-5 scale with 5 representing the healthiest and 1 the weakest seedlings. [2] Column means followed by the same letter are not significantly different according to Fishers least significant difference test ($P \leq 0.10$).

# NemOut Seed Treatment for Reniform Nematode Management

S. R. Moore and K. S. Lawrence

The nematicide NemOut® (*Paecilomyces lilacinus* 251) was tested in the field, alone, and in combination with other nematicides. The soil was a Ruston very fine sandy loam with a history of reniform nematode infestation. Soil temperature was 81 degrees F at a 4-inch depth on the day of planting with adequate soil moisture. Seed treatments were applied to the seed by the manufacturers and all other treatments were applied at planting, or 34 days after planting (DAP). Orthene 90S at 0.12 pound per acre was applied to all plots as needed for thrips control. Temik 15G (5 pounds per acre) was applied at planting on May 8 in the seed furrow with chemical granular applicators attached to the planter. Vydate C-LV was applied as a foliar spray at the fourth true leaf plant growth stage with a two-row, $CO_2$-charged backpack sprayer. Plots consisted of four rows, each 25 feet long with a 40-inch row spacing, and were arranged in a randomized complete block design with six replications. Adjacent blocks were separated by 15-foot wide alleys. Standard herbicides, insecticides, and fertility production practices, as recommended by the Alabama Cooperative Extension System, were used throughout the season. Population densities of the reniform nematode were determined at 0, 34, 67, and 161 DAP. Plant vigor and seedling stand per row were determined at 34 DAP. Nematodes were extracted using the gravity sieving and sucrose centrifugation technique. Plots were harvested on October 31. Data were statistically analyzed by GLM and means compared using Fisher's protected least significant difference test ($P \leq 0.10$).

Reniform nematode numbers at planting averaged 388.7 vermiform life stages per 150 $cm^3$. At 34 DAP, Temik 15G nematode numbers ($P \leq 0.10$) decreased compared with the untreated control. Seedling stand was reduced by the Temik + NemOut treatment. All treatments increased plant vigor as compared to the untreated control ($P \leq 0.10$) with the exceptions of the Temik + NemOut (treatment 6) and the NemOut alone (treatment 3). At 67 DAP, the Temik + NemOut (treatment 5) and the Aeris + NemOut (treatment 9) had lower nematode numbers as compared to the untreated control ($P \leq 0.10$). At 161 DAP, no differences were observed in nematode numbers compared to the untreated control ($P \leq 0.10$), which averaged 2952.4 vermiform life stages per 150 $cm^3$ per treatment. All treatments yielded as well as the untreated control ($P \leq 0.10$) with an average of 1380.8 pounds per acre of seed cotton produced over all treatments.

NemOut Seed Treatment for Reniform Nematode Management

| Treatment and Rate AI | Application date[1] DAP | Reniform 150cc 34 DAP | Stand 10 ft row[2] 34 DAP | Vigor[3] 34 DAP | Reniform 150cc 67 DAP | Reniform 150cc 161 DAP | Stand cotton lb/A |
|---|---|---|---|---|---|---|---|
| 1 Temik 15G 5.6 kg/ha | 0 | 399.1 b[4] | 16.5 ab | 3.0 ab | 1377.7 ab | 3309.2 a | 1347.2 a |
| 2 Avicta CP 500.4 mg/seed | 0 | 772.5 ab | 16.7 ab | 3.3 a | 1660.9 ab | 2510.8 a | 1307.9 a |
| 3 NemOut SP 0.17 kg/ha | 0 | 862.7 ab | 17.5 ab | 2.2 c | 1390.5 ab | 3244.5 a | 1405.8 a |
| 4 Avicta CP 500.4 mg/seed | 0 | | | | | | |
| Vydate CL-V 620.7 ml/ha | 34 | 1197.4 a | 18.7 ab | 3.0 ab | 2072.9 a | 3012.8 a | 1672.6 a |
| 5 Temik 15G 5.6 kg/ha | 0 | | | | | | |
| NemOut SP 0.17 kg/ha | 34 | 656.6 ab | 8.8 bc | 2.7 abc | 733.9 b | 2395.0 a | 1272.8 a |
| 6 Temik 15G 5.6 kg/ha | 0 | | | | | | |
| NemOut SP 0.17 kg/ha | 34 | 772.5 ab | 6.8 c | 2.3 bc | 862.7 a | 2034.5 a | 1330.2 a |
| 7 Avicta CP 500.4 mg/seed | 0 | | | | | | |
| NemOut SP 0.17 kg/ha | 34 | 1042.9 a | 18.3 ab | 3.0 ab | 1068.7 ab | 2549.2 a | 1453.6 a |
| 8 Aeris 48.0 mg/seed | 0 | 862.6 ab | 19.8 a | 3.0 ab | 1274.7 ab | 4673.8 a | 1270.4 a |
| 9 Aeris 48.0 mg/seed | 0 | | | | | | |
| NemOut SP 0.17 kg/ha | 34 | 939.9 a | 14.2 abc | 3.0 ab | 798.3 b | 2523.7 a | 1456.6 a |
| 10 Untreated | N/A | 1030.0 a | 17.0 ab | 2.2 c | 1776.8 a | 3270.5 a | 1290.9 a |
| ***LSD ($P \leq 0.10$)*** | ***N/A*** | ***534.6*** | ***5.9*** | ***0.5*** | ***960.0*** | ***1649.2*** | ***277.8*** |

[1] Application date of chemical measured in days after planting. [2] Plant stand based on the number of seedlings/3m row. [3] Plant vigor rated over the plot on a 1-5 scale. [4] Numbers in columns followed by the same letter are not significantly different by Fisher's LSD at P ≤ 0.10.

# NEMATICIDE COMBINATION EFFECTS ON SELECTED NEMATODE SPECIES IN CENTRAL ALABAMA, 2007

N. S. Sekora, K. S. Lawrence, G. W. Lawrence, and S. Nightengale

A nematicide seed treatment test was extablished at the Plant Breeding Unit of the E. V. Smith Research and Education Center. The manufacturer applied all fungicidal seed treatments to *Gossypinum hirsutum* cultivar DP 444 BG/RR. Temik 15G (15 pounds per acre) was applied in the seed furrows at planting by chemical granular applicators attached to the planter. Vydate C-LV was applied as a foliar spray with a two-row, $CO_2$-charged backpack sprayer at the fourth true leaf plant stage. Thrips insect control was established by spraying each plot with Orthene 90S (0.12 pound per acre). Plots consisted of two 25 foot rows spaced 40 inches apart arranged in a complete randomized block design. Nematode samples were taken by randomly collecting ten soil cores, 1 inch diameter by 6 inch deep, from the two rows of each plot. Nematodes were extracted from the soil samples by gravity sieving and sucrose centrifugation. The initial counts of *Meloidogyne incognita* at planting on April 27 ranged from 26 to 344 nematodes per 150 cc of soil with a mean number of 64.5. All other regulatory management of herbicide, fertility production, and insecticides was carried out as per the Alabama Cooperative Extension System. Test plots were picked on September 18. GLM was used to analyze the data and Fisher's protected least significant difference (LSD) was used for comparisons. Monthly average maximum temperatures for April through September were 74.7, 87.4, 94.4, 91.8, 99.6, and 88.6 degrees F with an average minimum temperature of 48.9, 58.2, 67.8, 71.4, 73.7, and 66.4 degrees F, respectively. Rainfall totals for each month April through September, respectively, were 2.01, 0.47, 1.15, 6.82, 3.26, and 2.2 inches. Total rainfall over the growing season was 15.91 inches.

Six weeks after planting (WAP) stand counts ranged from 89 to 46 percent of emergence with an average vigor rating of 3.8. Six WAP *M. incognita* counts increased 32 percent to a mean of 85.1 per 150 cc of soil. At 12 WAP stand counts decreased to a mean value of 69.7 percent among all plots. A maximum number of nine plants with Fusarium wilt signs were recorded from the test plots with a mean number of 2.6 plants per plot demonstrating symptoms. The ratio of *M. incognita* eggs per gram of root tissue had a mean value of 718 and ranged from 17 to 1775 eggs per gram. Mean plot yields ranged from 1742 to 2312 pounds per acre with a mean value of 1915 pounds per acre. No significant differences ($P \leq 0.10$) was indicated among any of the treatments for *M. incognita* eggs/gram of root tissue, plants with Fusarium symptoms, plant stand, or yield.

## FUSARIUM WILT COMPLEX AVERAGES LISTED BY TREATMENT

| | | | | | | Total nematodes/150 cc soil[5] | | |
|---|---|---|---|---|---|---|---|---|
| Treatment | Rate | Stand 8 m row[1] Jul 23 | FW plants[2] Jul 23 | Galling[3] Jul 23 | Eggs/gram[4] Jul 23 | *M. incognita* Jun 5 | *M. incognita* Sep 13 | Seed cotton lb/A Sep 18 |
| 1 Cruiser 5 FS | 0.342 mg ai/seed | 60.2 | 2.4 | 4.8 | 622.2 | 60.0 | 798.3 | 1841 |
| 2 Apron XL 3 LS | 7.5 g ai/100 kg | 69.4 | 2.2 | 4.6 | 700.0 | 122.8 | 648.9 | 1812 |
| Maxim 4 FS | 2.5 g ai/100 kg | | | | | | | |
| Systhane 40 WP | 21 g ai/100 kg | | | | | | | |
| A13012 | 0.03 mg ai/seed | | | | | | | |
| Cruiser 5 FS | 0.342 mg ai/seed | | | | | | | |
| 3 Apron XL 3 LS | 7.5 g ai/100 kg | 68.0 | 3.6 | 4.4 | 760.1 | 45.0 | 767.4 | 1742 |
| Maxim 4 FS | 2.5 g ai/100 kg | | | | | | | |
| Systhane 40 WP | 21 g ai/100 kg | | | | | | | |
| A13012 | 0.03 mg ai/seed | | | | | | | |
| Cruiser 5 FS | 0.342 mg ai/seed | | | | | | | |
| Avicta 4.17 FS | 0.15 mg ai/seed | | | | | | | |
| Mycobutanil | 21 g ai/100 kg | | | | | | | |
| 4 Apron XL 3 LS | 7.5 g ai/100 kg | 69.8 | 3.8 | 4.4 | 485.2 | 121.4 | 963.1 | 1835 |
| Maxim 4 FS | 2.5 g ai/100 kg | | | | | | | |
| Systhane 40 WP | 21 g ai/100 kg | | | | | | | |
| A13012 | 0.03 mg ai/seed | | | | | | | |
| Cruiser 5 FS | 0.342 mg ai/seed | | | | | | | |
| Avicta 4.17 FS | 0.15 mg ai/seed | | | | | | | |
| Mycobutanil | 21 g ai/100 kg | | | | | | | |
| Dividend 0.15 FS | 8 g ai/100 kg | | | | | | | |
| 5 Apron XL 3 LS | 7.5 g ai/100 kg | 74.2 | 2.0 | 4.6 | 934.8 | 60.0 | 1194.8 | 2021 |
| Maxim 4 FS | 2.5 g ai/100 kg | | | | | | | |
| Systhane 40 WP | 21 g ai/100 kg | | | | | | | |
| A13012 | 0.03 mg ai/seed | | | | | | | |
| Cruiser 5 FS | 0.342 mg ai/seed | | | | | | | |
| Avicta 4.17 FS | 0.15 mg ai/seed | | | | | | | |
| Mycobutanil | 21 g ai/100 kg | | | | | | | |
| Dividend 0.15 FS | 16 g ai/100 kg | | | | | | | |

**continued**

**FUSARIUM WILT COMPLEX AVERAGES LISTED BY TREATMENT (CONT)**

| | Treatment | Rate | Stand 8 m row[1] Jul 23 | FW plants[2] Jul 23 | Galling[3] Jul 23 | Eggs/gram[4] Jul 23 | Total nematodes/150 cc soil[5] *M. incognita* Jun 5 | Total nematodes/150 cc soil[5] *M. incognita* Sep 13 | Seed cotton lb/A Sep 18 |
|---|---|---|---|---|---|---|---|---|---|
| 6 | Apron XL 3 LS | 7.5 g ai/100 kg | 74.2 | 3.6 | 4.8 | 1005.9 | 75.0 | 700.4 | 1893 |
| | Maxim 4 FS | 2.5 g ai/100 kg | | | | | | | |
| | Systhane 40 WP | 21 g ai/100 kg | | | | | | | |
| | A13012 | 0.03 mg ai/seed | | | | | | | |
| | Cruiser 5 FS | 0.342 mg ai/seed | | | | | | | |
| | Avicta 4.17 FS | 0.15 mg ai/seed | | | | | | | |
| | Mycobutanil | 21 g ai/100 kg | | | | | | | |
| | Bion 50 WG | 0.6 g ai/100 kg | | | | | | | |
| 7 | Apron XL 3 LS | 7.5 g ai/100 kg | 72.8 | 2.0 | 4.4 | 733.3 | 91.4 | 757.1 | 1795 |
| | Maxim 4 FS | 2.5 g ai/100 kg | | | | | | | |
| | Systhane 40 WP | 21 g ai/100 kg | | | | | | | |
| | A13012 | 0.03 mg ai/seed | | | | | | | |
| | Cruiser 5 FS | 0.342 mg ai/seed | | | | | | | |
| | Avicta 4.17 FS | 0.15 mg ai/seed | | | | | | | |
| | Mycobutanil | 21 g ai/100 kg | | | | | | | |
| | Bion 50 WG | 1 g ai/100 kg | | | | | | | |
| 8 | Apron XL 3 LS | 7.5 g ai/100 kg | 67.0 | 1.6 | 4.4 | 995.6 | 45.0 | 715.9 | 2074 |
| | Maxim 4 FS | 2.5 g ai/100 kg | | | | | | | |
| | Systhane 40 WP | 21 g ai/100 kg | | | | | | | |
| | A13012 | 0.03 mg ai/seed | | | | | | | |
| | Cruiser 5 FS | 0.342 mg ai/seed | | | | | | | |
| | Avicta 4.17 FS | 0.15 mg ai/seed | | | | | | | |
| | Mycobutanil | 21 g ai/100 kg | | | | | | | |
| | Thiabendazole | 8 g ai/100 kg | | | | | | | |
| 9 | Apron XL 3 LS | 7.5 g ai/100 kg | 71.2 | 2.8 | 4.8 | 717.0 | 122.8 | 664.4 | 1830 |
| | Maxim 4 FS | 2.5 g ai/100 kg | | | | | | | |
| | Systhane 40 WP | 21 g ai/100 kg | | | | | | | |
| | A13012 | 0.03 mg ai/seed | | | | | | | |
| | Cruiser 5 FS | 0.342 mg ai/seed | | | | | | | |
| | Avicta 4.17 FS | 0.15 mg ai/seed | | | | | | | |
| | Mycobutanil | 21 g ai/100 kg | | | | | | | |
| | Thiabendazole | 16 g ai/100 kg | | | | | | | |
| 10 | Apron XL 3 LS | 7.5 g ai/100 kg | 70.2 | 1.8 | 3.2 | 226.9 | 107.8 | 582.0 | 2312 |
| | Maxim 4 FS | 2.5 g ai/100 kg | | | | | | | |
| | Systhane 40 WP | 21 g ai/100 kg | | | | | | | |
| | A13012 | 0.03 mg ai/seed | | | | | | | |
| | Temik 15G | 5 lb/A | | | | | | | |
| | ***LSD (P≤0.10)*** | | ***7.5*** | ***2.4*** | ***1.0*** | ***512.3*** | ***104.7*** | ***628.1*** | ***456.22*** |

[1] Counts based on number of plants/25 ft row.
[2] Counts based on the number of plants showing symptoms/row.
[3] Root galling ratings based on a scale from 0 – 10, 0 with no galling and 10 being severe galling.
[4] Measurement of the number of *M. incognita* eggs/gram of fresh root tissue.
[5] Counts based on number of nematodes/150 cc soil.

# MOLECULAR

## Facilitating Breeding Cotton for Reniform Nematode Resistance

R. D. Locy, D. B. Weaver, N. K. Singh, and K. S. Lawrence

We have selected germplasm that shows significant resistance to reniform nematodes and developed F2 populations of crosses of these lines with commercial varieties. We now have developed F3 lines derived from F2 individuals that will be tested for reniform nematode resistance as a means of assessing the resistance of the F2 individuals from which they were derived. Such a lengthy measure is required because of difficulties in reliably evaluating F2 individual plants and the destructive nature of evaluation.

In order to facilitate this screening at the whole plant level, we are developing genomic and/or proteomic markers to facilitate the evaluation of this material for nematode resistance. Our efforts focus on obtaining gene expression profiles or proteomic profiles during various stages of nematode infection. These will then be utilized to identify uniquely up- or down-regulated genes and proteins in resistant versus non-resistant genotypes. We have produced root-viewing chambers that allow us to observe cotton plant roots during nematode application and infection and are establishing exactly when we should look at samples to determine whether plants are expressing resistance determinants. We are interested in establishing whether young roots express the critical genes prior to, or early on, in the infection process, or whether the necessary proteins are only expressed later in the development of a plant. We have found root tissues of older plants to be a more refractive tissue with which to work than are younger roots. However, it is not clear whether meaningful differences can be determined using the young root tissue (plants less than 21 days of age) or whether we will require older tissue for analysis following extensive root colonization.

Proteomic analysis of gene expression during nematode infection to examine the changes in protein expression during the development of a reniform nematode infection (or lack thereof) in resistant and susceptible materials is underway. Initially, our efforts focused on developing protein extraction techniques that are effective in quantitatively extracting proteins and total RNA from cotton root tissue across the period during which we will be examining reniform nematode resistance. We have utilized three techniques for protein extraction from cotton roots (Carpentier et al., 2005; Giavalisco et al., 2003; Wang et al., 2003). Despite the fact that these techniques are considered useful for “recalcitrant” plant tissues, we have been unable to obtain consistent results using these techniques. Sample-to-sample variation is greater than treatment variations in protein patterns on two-dimensional gels. We have attempted to modify these procedures, to work better for cotton, and have improved the consistency of results, but this has delayed the analysis of our breeding lines.

Using the hot-borate RNA extraction technique, we are able to obtain high-quality RNA from cotton roots at all stages of development, and we are presently looking at using massively parallel signature sequencing to analyze samples. This approach appears at this point to be more straight-forward than the proteomic approach we were planning.

## Breeding New Varieties of Cotton for Heat and Drought Tolerance: Elite Germplasm Development Using Molecular Markers

R. D. Locy, D. B. Weaver, and N. K. Singh

Using a chlorophyll fluorescence screening procedure we developed, we have screened 1782 accessions of the cotton *(Gossypium hirsutum)* germplasm collection (US National Cotton Germplasm Collection, College Station, Texas). Twenty-two of these accessions demonstrated photosynthesis that was dramatically more heat stress stabile than existing commercial varieties. These accessions were evaluated for whole plant heat stress stability in growth chambers, and their performance compared to that of DP 90, a variety considered to be among the most heat and drought tolerant available. While all 22 of the accessions performed better than DP 90, seven of the elite 22 were clearly superior in performance during heat stress to DP 90 and the other accessions. We have attempted to make crosses between these seven elite accessions and commercial varieties to generate F1 hybrids and subsequent F2 populations for breeding. However we have had great difficulty obtaining flowers to use for crossing. This is because these materials are highly photoperiodic land races that do not flower readily in the Auburn, Alabama, environment. Consequently, we have sent all accessions to the Cotton, Inc. winter nursery to obtain crosses. However, only one cross yielded F1 seeds. These F1 plants were grown in the field in summer 2007. The plants flowered and were self manually pollinated. However, due to the severe summer drought conditions, all flowers aborted and did not yield any F2 seed.

In the meantime, we have had plants of each of the seven elite accessions growing in the greenhouse in pots for 2.5 years. These plants are now prolifically flowering, and we have now made a significant number of crosses to DP 90 with all seven elite accessions. We expect to have a significant number of F1 plants to take to the field in summer 2008 with which to make F2 populations.

At the same time we are developing a set of molecular markers that we expect to utilize as markers in breeding to move the genes for heat tolerance into commercial germplasm. We have completed the differential display analysis of gene expression during 2- and 20-hour heat stress in DP 90 and have identified approximately 100 cDNA sequences that are differentially displayed during heat stress in DP 90. We are presently analyzing these sequences in more detail and are preparing to examine cDNA sequences from the other seven elite genotypes.

Additionally, we have initiated a proteomic analysis of differentially expressed proteins during heat stress in DP 90 and the seven elite accessions. We have obtained preliminary data to demonstrate the workability and cost effective application of the technique in a breeding situation where multiple samples must be screened. We have demonstrated that there are proteins that are differentially expressed in response to heat stress that vary between the accessions examined to date, but we have not been successful in reducing sampling variation to obtain good quality samples for analysis from all accessions of interest. It appears that in species without a complete genomic sequence (such as cotton), there may be additional difficulties in using this technique for gene identification although the emergence of a larger cotton Unigene set and the BLAST utility we have developed (discussed above) may make this less of a concern.

## Production and Characterization of Bt Resistance in Cotton Bollworm, *Helicoverpa zea*

W. J. Moar

Since 2004, we have selected for Bt resistance in cotton bollworm (CBW), *Helicoverpa zea,* the last major cotton caterpillar pest in which there is no Bt resistant colony, and the more difficult of the two major caterpillar pests to control in Bt and non-Bt cotton. We currently have a population of CBW with greater than 100-fold resistance to Cry1Ac (the Bt in Bollgard and Widestrike).

For 2007 we proposed to:

(1) Continue laboratory selection with our Cry1Ac toxin resistant strain of CBW

(2) Determine the characteristics in MVPII that negatively impact the resistant strain

(3) Once 100-fold resistance is achieved, the following experiments will be conducted:

- a) Evaluate fitness costs
- b) Determine level of resistance needed to survive on Bollgard cotton
- c) Select for resistance using Cry1Ac protoxin

(4) Select for Cry2a resistance

Laboratory selection with the Cry1Ac toxin resistant strain of CBW continued throughout 2007. Although selection pressure remained the same (500 ppm Cry1Ac toxin), resistance did increase to 150 to 200 fold. Cry1Ac-resistant CBW had negligible cross resistance to protoxin (Cry1Ac form found in MVPII). There were no binding differences for both Cry1Ac, Cry1Aa, and GalNac, further suggesting that the primary mechanism of resistance to Cry1Ac toxin **is not** an alteration in binding which is typically observed for protoxin selection and resistance, and a mechanism of resistance in pink bollworm and tobacco bud worm. Crossing studies confirm previous reports that resistance is inherited as a co-dominant trait

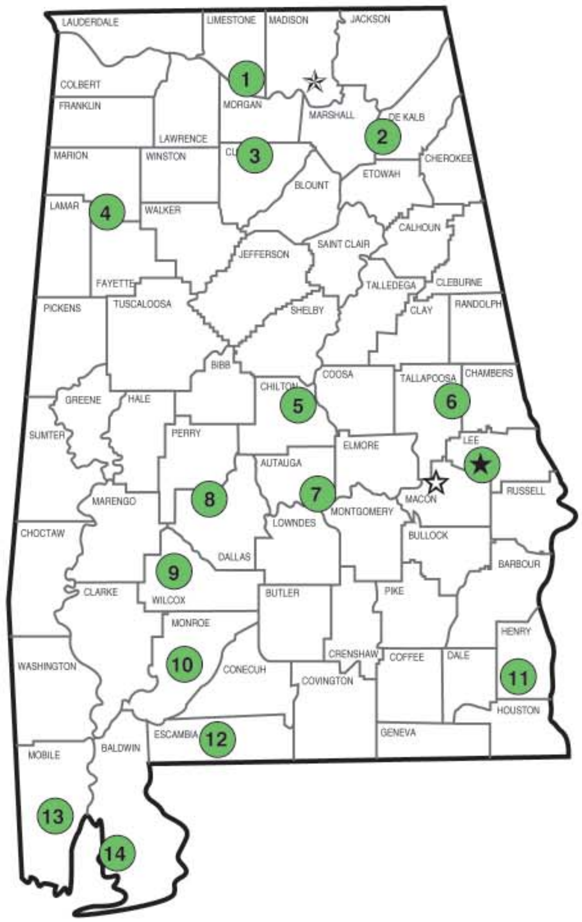
There appears to be significant fitness costs associated with Cry1Ac resistance in CBW such as significantly increased pupal mortality, a male-biased sex ratio, lower mating success, significantly higher larval mortality, lower larval weight, longer larval developmental period, lower pupal weight, longer pupal duration, and produced significantly higher number of morphologically abnormal adults over three generations. Although several attempts were made to select for Cry2A resistance, the significant fitness costs observed with adults resulted in only one to two generations of survivors before the colony crashed.

Cry1Ac-resistant CBW was also tested on field-grown Bt (DP 555BG/RR) and non Bt-cotton (DP 491). The Bt resistance colony (AR) had significantly higher larval survivorship, number of larval instar reached, and duration of larval survival after feeding on Bt cotton squares. However, AR could still not complete larval development on Bt cotton. These results support the difficulty of maintaining Cry1Ac resistant populations of *H. zea* in the laboratory, and may help explain why field-evolved resistance has yet to be observed in this major pest of Bt cotton.

# Contributors Index

# Alabama's Agricultural Experiment Station
# AUBURN UNIVERSITY

With an agricultural research unit in every major soil area, Auburn University serves the needs of field crop, livestock, forestry, and horticultural producers in each region in Alabama. Every citizen of the state has a stake in this research program, since any advantage from new and more economical ways of producing and handling farm products directly benefits the consuming public.




## Research Unit Identification

- ★ Main Agricultural Experiment Station, Auburn.
- ✯ Alabama A&M University.
- ☆ E. V. Smith Research Center, Shorter.

1. Tennessee Valley Research and Extension Center, Belle Mina.
2. Sand Mountain Research and Extension Center, Crossville.
3. North Alabama Horticulture Research Center, Cullman.
4. Upper Coastal Plain Agricultural Research Center, Winfield.
5. Chilton Research and Extension Center, Clanton.
6. Piedmont Substation, Camp Hill.
7. Prattville Agricultural Research Unit, Prattville.
8. Black Belt Research and Extension Center, Marion Junction.
9. Lower Coastal Plain Substation, Camden.
10. Monroeville Agricultural Research Unit, Monroeville.
11. Wiregrass Research and Extension Center, Headland.
12. Brewton Agricultural Research Unit, Brewton.
13. Ornamental Horticulture Research Center, Spring Hill.
14. Gulf Coast Research and Extension Center, Fairhope.