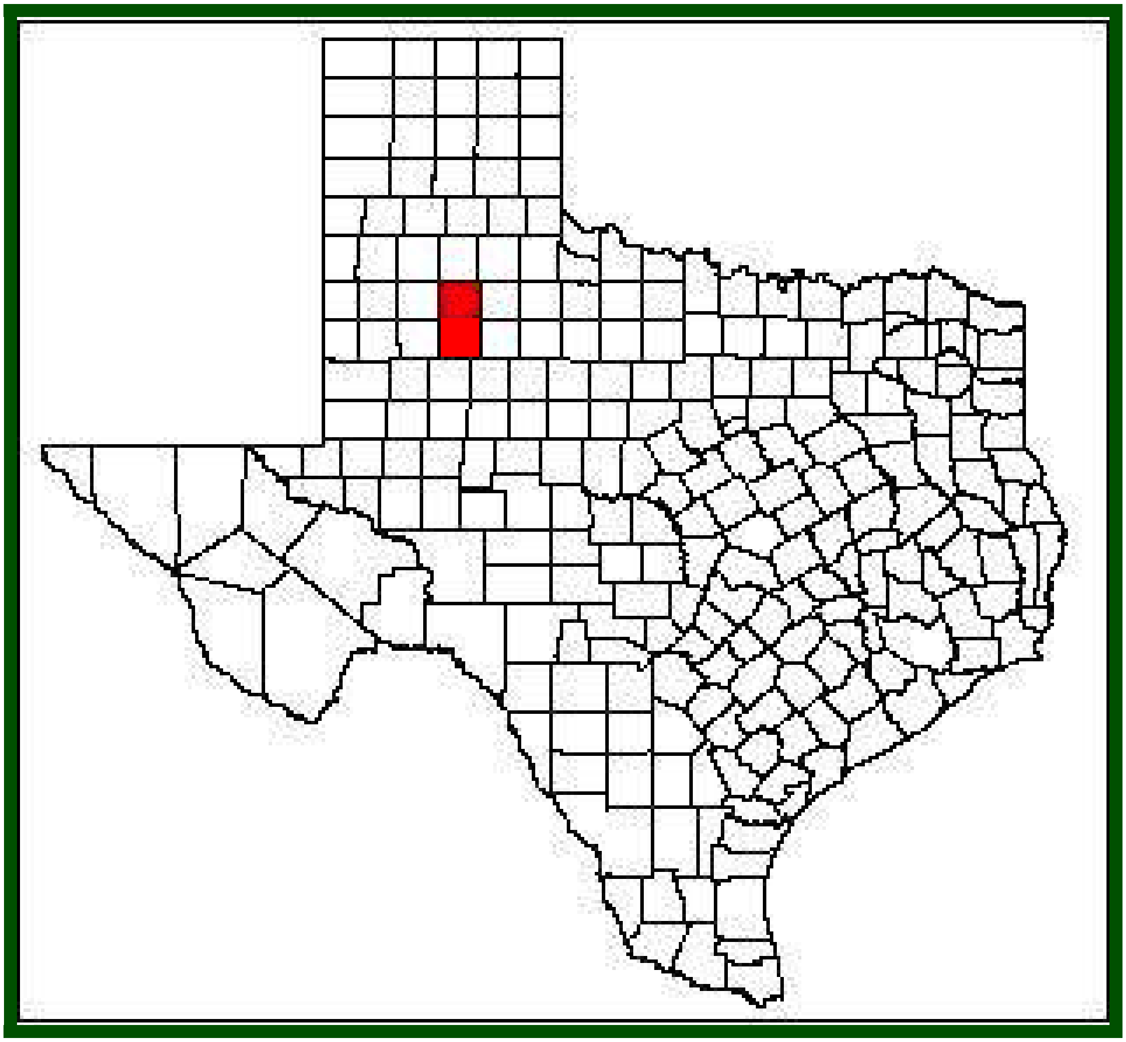
# INTEGRATED PEST MANAGEMENT



**Crosby and Floyd Counties**
**IPM Program**
**2010**

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# CROSBY/FLOYD COUNTY
# PEST MANAGEMENT PROGRAM
# 2010 ANNUAL REPORT

**Prepared by**
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**Extension Agent- Integrated Pest Management**
**Crosby/Floyd Counties**

In cooperation with
Texas Pest Management Association

# ACKNOWLEDGMENTS

The success and achievements of any Extension program depend on the support and participation provided by area producers, agribusinesses and others.

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Mr. Miles Dabovich ………………………………District Administrator, Lubbock
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Dr. David Ragsdale……………..Head of Entomology Department, College Station
Dr. Chris Sansone………………..Head of Extension Entomology, College Station
Dr. Charles Allen……..Extension Entomologist and IPM Coordinator, San Angelo

**Crosby/Floyd Integrated Pest Management Committee**

Danny Caddell…………………………………………………………President
Robert Carter…………………………………………………..Secretary/Treasurer
Mark Appling…………………………………………………..TPMA Representative

The support and assistance of David Oefinger and the staff of the Texas Pest Management Association is greatly appreciated.

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## 2010 EDUCATIONAL ACTIVITIES

Newsletter:
No. Issues Written…………..…………………………………………….12

No. Non-Extension Clientele on Mailing
List…………………………………………………………..…………311

No. Non-Extension Clientele on E-Mail
List…………………………………………………………..…………256

Total Non-Extension
Clientele……………………………………………..………………456

Newspaper Articles:
No.Prepared…………………………………………………….…………..8

No. Newspapers Carrying……….……………………………..…………...2

Farm Visits…………………………………………………….…………739

CEU Credits Offered…………………………………...……..………...15

Pest Management Committee Meetings…………………………..……...2

Presentations Made:
County Field Days/Crop Tours…………………………………………...7

RegionalMeetings………………………………………………….……..2

Schools……………………………..…..…………………………..……..1

Professional Meetings…………………………………..……………..….2

No. Applied Research Projects……………….…………………………..…..13

No. Direct Ag Contacts…………………………………….……………...1089

# REVIEW OF 2010 FIELD SCOUTING PROGRAM

## COTTON

The 2010 cotton crop had a rough start due to cool, wet conditions which delayed planting for many producers in Crosby and Floyd counties. Many producers who were able to plant early found themselves having to replant due to poor plant stands. The first couple of weeks in July saw above normal precipitation and very cool temperatures. The wet conditions in July leached the majority of nitrogen of the top foot of soil profile resulting in yellow cotton in many fields throughout both counties. Producers who applied 1/3 of their nitrogen in the second and third week of July came out in pretty good shape. When the fields dried enough to get into, many producers missed the window to apply their nitrogen in a timely manner. The 2010 cotton crop saw a wide open fall with above average heat unit accumulation resulting in one of the largest cotton crops ever.

The pest situation varied throughout the season. Early season pests were relatively light with Thrips being the predominant pest. Thrips numbers were average to below average with a few foliar applications being applied for control. Aphid numbers in a few cases were way above threshold resulting in an insecticide application. In other cases the populations crashed before the cotton took economic damage. Mixed populations of bollworms and fall armyworms made their way through most non Bt cotton fields but remained below economic threshold. A few fields however did need to be treated for these mixed populations.

# 2010 APPLIED RESEARCH PROJECTS

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# Potential for using Boll Damage as a Threshold Indicator for Lygus in the Texas High Plains, 2010

**Cooperators: Texas AgriLife Research and Extension Center, Lubbock**

**David Kerns, Dustin Patman, and Brant Baugh**
**Extension Entomologist-Cotton, EA-IPM Crosby/Floyd Counties and EA-IPM Lubbock County**

**Lubbock County**

**Summary:**

These data support the current action threshold during this developmental time period of 4 Lygus per 6 ft-row using the drop cloth sampling method. Based on dime size bolls, our data suggests that 67 internally damaged locules, or 400 external stings per 100 bolls is correlated with the threshold of 4 Lygus per 6 ft-row and has potential utility as a Lygus action threshold. More data is required for confirmation.

**Objective:**

The objectives of this study were to investigate the relationships between Lygus density, damage and yield, and to determine the possibility of developing an action threshold based on damage.

**Materials and Methods:**

The data presented were collected from four irrigated cotton fields in the Texas High Plains in 2008-2010. All test sites consisted of insecticide efficacy tests in cotton that were beyond cutout, with the nodes above white flower = 2-4. Thus, all of the yield loss associated with these sites was the result of Lygus feeding on bolls rather than squares.

All test sites were RCB designs with 4 replicates. Plots were 4 rows X 60 ft in length. The Lygus population at each site was estimated by the drop cloth method (3 ft x 2 ft) and expressed as mean density/6 ft-row. The Lygus populations at all locations were predominately nymphs and counts were made at 0, 7, 14 and 21 DAT. To assess boll damage, 10-15 dime size bolls that were approximately 15 to 20-mm diameter (~150 to 200 HU maturity) were collected at random from each plot for damage assessment at 0 and 7 DAT. Ten to fifteen bolls were collected, sealed in Ziploc bags and stored in a refrigerator until damage observations could be made.

The external damage assessment was made by counting the number of feeding punctures using a 10x magnifying lens. For internal damage, bolls were cut cross sectional with two cuts, one at about one-third and one at two-thirds of the distance from the tip. The number of damaged locules were counted and recorded as internal damage.

In 2008 and 2009, three of the tests had their plots harvested using an 28" hand basket stripper. Six samples were pulled from the middle two rows of each plot totaling 1/1000 acre. The 2010 test site had each plot harvested in its entirety using a mechanized cotton stripper. All harvest samples were ginned at the Texas AgriLife Ginning Facility in Lubbock.

In order to produce more data points, data from all four locations were pooled for analysis and the yields were normalized by converting the yields at each site into a proportion of the highest yielding plot. For correlation purposes, data from the 7 DAT evaluations and yield (lint-lbs per acre) were used for analysis. Beyond seven days, the Lygus populations at all sites did not return and should not have impacted our results. Data were analyzed using simple linear regression models (Sigma Plot 10, Systat Software Inc, 2006).

**Results and Discussion:**

The current action threshold for Lygus on cotton after peak bloom is 4 per 6 ft-row (Table 1). However, this threshold was developed prior to cutout and represents damage associated primarily with square feeding. It is not known whether this threshold fits cotton that has reached cutout, when damage is solely from boll feeding.

Based on our test sites, yield was negatively correlated with Lygus density (Figure 1). Although the *P*-value was significant at 0.01, the $R^2$ value was relatively low, accounting for only 23% of the differences in yield. The reason for the low $R^2$ value is undoubtedly the variability in yield when Lygus densities were less than 1 per 6 ft-row. Additionally, because we are pooling data from four locations over a three year period, variability in data is expected. Thus, the low $R^2$ value is not necessarily indicative of a weak relationship. Using this linear relationship, we can determine the approximate number of Lygus necessary to cause various degrees of associated yield loss. Using our model, and a 10% yield reduction as the initial point of unacceptable yield loss, we find that we can tolerate no more than approximately 5 Lygus per 6 ft-row. Thus, our current threshold appears to be acceptable. However, much more data needs to be added to the model to strengthen it and increase the $R^2$ value.

Lygus feeding on bolls results in external feeding injury or stings. However, not all stings result in boll damage, and its internal boll damage that is of economic concern. Because of the difficulty of utilizing drop cloth or sweep net samples to estimate late season Lygus populations, many consultants have stated that they would prefer a Lygus action threshold based on damage. Also, due to the timeliness associated with boll dissection for internal damage, there is much interest in a threshold based on external stings, which are quick and easy to assess.

Before we can utilize a threshold based on external stings, we must first understand the linear relationship between external and internal damage to bolls that measure 15-20 mm in diameter (target size of the bolls to sample). As expected, there is a close relationship between external and internal injury (Figure 2). Based on this model, it appears that approximately 16% of external stings result in a damaged locule.

Internal boll damage was correlated with Lygus density (Figure 3A). Using our current action threshold of 4 Lygus per 6 ft-row, we can estimate that an insecticide application is justified if 67 damaged locules are detected per 100 bolls along with the presence of Lygus. Similarly, based on external stings, we can deduce that if 400 or more external stings are detected per 100 bolls, along with the presence of Lygus, an insecticide application is justified (Figure 3B). The number of external stings needed to trigger an insecticide application in this experiment, based on the relationship between external stings and internal damage (16% of stings result in a damaged locule) (Figure 2), equals 418 external stings.

Based on the above relationships, it appears that 67 internal damaged locules, or 400 external stings, per 100 dime to nickel size bolls along with the presence of Lygus, may be a viable action threshold. However, more data is needed to strengthen these models, especially the relationship between Lygus density and yield production.

**Acknowledgments:**

This project was funded in part by the Plains Cotton Improvement Program.

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Table 1. Texas action threshold for lygus damage.

| | Sampling method* | |
|---|---|---|
| **Cotton stage** | **Drop cloth** | **Sweep net** |
| 1st two weeks of squaring | 1-2 per 6 ft-row with unacceptable square set | 8 per 100 sweeps with unacceptable square set |
| 3rd week of squaring to 1st bloom | 2 per 6 ft-row with unacceptable square set | 15 per 100 sweeps with unacceptable square set |
| After peak bloom | 4 per 6 ft-row with unacceptable fruit set the first 4-5 weeks | 15- 20 per 100 sweeps with unacceptable fruit set first 4-5 weeks |

*Sweep net – standard 15-inch net, sample 1-row at a time taking 15-25 sweeps. Recommended before peak bloom.

Drop cloth – black is recommended; 3-ft sampling area, sample 2-rows. Recommended after peak bloom.

Cease sampling and treating when NAWF = 5+ 350 DD60's.

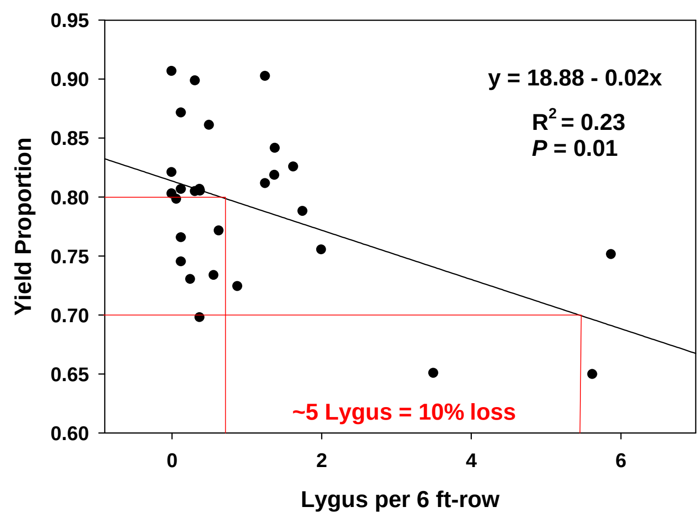


Figure 1. Linear relationship between yield and Lygus density.

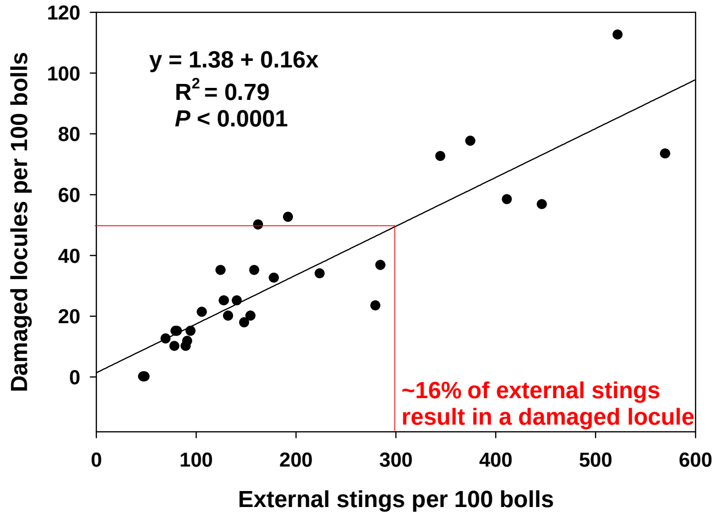


Figure 2. Relationship between the external and internal Lygus damage to dime sized (15-20 mm diameter) bolls.

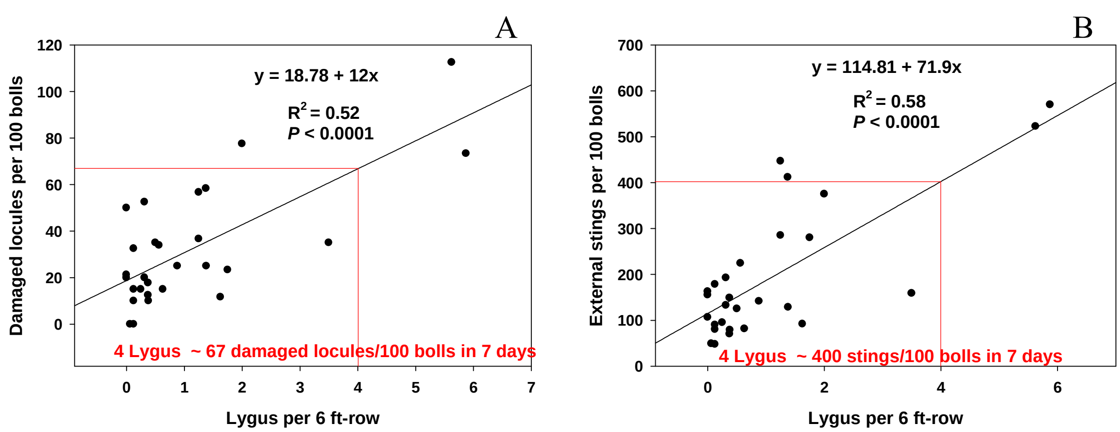


Figure 3. (A) Relationship between damaged locules and Lygus density (B) relationship between external stings and Lygus density.

AgriLIFE EXTENSION
Texas A&M System

**Boll Damage Survey of Bt and Non-Bt Cotton Varieties in the South Plains Region of Texas 2007-10**

**Cooperators: Texas AgriLife Extension Service**

**David Kerns, Monti Vandiver, Emilio Nino, Tommy Doederlein, Manda Cattaneo, Greg Cronholm, Kerry Siders, Brant Baugh, Scott Russell and Dustin Patman**
**Extension Entomologist-Cotton, EA-IPM Bailey/Parmer Counties, EA-IPM Castro/Lamb Counties, EA-IPM Lynn/Dawson Counties, EA-IPM Gaines County, EA-IPM Hale/Swisher Counties, EA-IPM Hockley/Cochran Counties, EA-IPM Lubbock County, EA-IPM Terry/Yoakum Counties and EA-IPM Crosby/Floyd Counties**

**South Plains**

**Summary:**

Late-season boll damage surveys were conducted in 2007, 2008 and 2009 to evaluate the amount of Lepidoptera induced damage in Bt cotton varieties relative to non-Bt cotton varieties. Additional, data was collected on the number of insecticide applications required for these varieties to manage lepiopterous pests, and the number of bolls damaged by sucking pests in 2009. Boll damage was light in 2007; however, more damaged bolls where found in the non-Bt fields (3.11%) than in the Bollgard (0.52%) and Bollgard II (0.25%) fields, but did not differ from the Widestrike fields (1.29%). Very few insecticide applications were made targeting bollworm in any of the 2007 survey fields and there were no significant differences among variety types. None of the Bt cotton fields were treated for bollworms, whereas 9% on the non-Bt field received a single insecticide application. Late season bollworm damage in 2008 was similar to 2007. All of the Bt cotton variety types had significantly fewer damaged bolls than the non-Bt varieties and none of the Bt varieties required insecticide applications for lepidopterous pests, but unlike 2007, more non-Bt cotton was treated for bollworm and/or beet armyworms in 2008 (41% of the fields received a single insecticide application). In 2009, none of the surveyed fields were treated for lepidopterous pests. Worm damaged bolls were 2.83, 0.13 and 0.40% in non-Bt, Bollgard II and Widestrike varieties respectively. There were no

differences among the variety types in sucking bug damaged which averaged 1.96% across all varieties. In 2010, 3.08% of bolls in the non-Bt fields were damaged, and 0.45 insecticide applications were required per field on average. Damage did not exceed 0.27% in Bt cotton, and no Bt cotton field required treatment for lepidoterous pests. There were no differences among variety types regarding Lygus or stinkbug damaged bolls, which slight over 1% per field.

**Objective:**

The objective of this study was to compare the qualitative value of Bollgard II, Widestrike and Bollgard insect control traits in grower fields relative to each other and to non-Bt cotton varieties.

**Materials and Methods:**

In 2007, 2008, 2009 and 2010, boll damage surveys were conducted to quantify bollworm damage in late season Bt and non-Bt cotton varieties. Although the source of the damage is not certain, most of it is suspected to have come from cotton bollworms although beet armyworms were present in some fields in 2008, and fall armyworms were present in 2009 and 2010. Two of the non-Bt were treated for a mixed population of bollworms and beet armyworms in Bailey County in 2008, and non-Bt field in Gaines County in 2009 and 2010 contained about 20% fall armyworms and 80% bollworms. Fall armyworms were also present in Bailey County and Hale County experienced isolated beet armyworms problems. Additionally, cotton square borers were common throughout the southwestern and western areas of the South Plains in 2010. The survey was conducted late season because Bt levels in mature/senescent cotton tends to deteriorate relative to rapidly growing plants. Thus, late season would represent the time period when Bt levels would be less intensely expressed and damage would be more likely to occur.

Grower fields of non-Bt, Bollgard, Bollgard II and Widestrike cotton were sampled throughout the South Plains region of Texas (Table 1). Samples were taken after the last possible insecticide applications and before approximately 20% of the boll were open. Three distinct areas were sampled within each field, and 100 consecutive harvestable bolls were sampled from each location. Each field by variety type served as a replicate. Bolls were considered damaged if the carpal was breached through to the lint. The insecticide history in regard to insecticides targeting bollworms was recorded. In addition to bollworm damage, external Lygus and/or stinkbug damage to bolls was sampled for in most fields in 2009 and within 14 fields in 2010.

All data were analyzed using PROC MIXED and the means were separated using an F protected LSD ($P \leq 0.10$).

**Results and Discussion:**

In 2007, damage was very light across all of the field types. However, more damaged bolls where found in the non-Bt fields (3.11%) than in the Bollgard (0.52%) and Bollgard II (0.25%) fields, but did not differ from the Widestrike fields (1.29%) (Table 2). Damage in the Widestrike fields did not differ from the Bollgard and Bollgard II fields. The fact that Widestrike did not differ from the non-Bt fields does not appear to indicate a lack of efficacy, but probably indicates a lack of area wide bollworm pressure. Very few insecticide applications were made targeting bollworm in any of the 2007 survey fields and there were no significant differences among variety types. None of the Bt cotton fields were treated for bollworms, whereas 9% on the non-Bt field received a single insecticide application.

Late season bollworm damage in 2008 was similar to 2007. All of the Bt cotton variety types had significantly fewer damaged bolls than the non-Bt varieties (Table 3). There were no differences in boll damage among the Bt types. Similar to 2007, none of the Bt varieties required insecticide applications for bollworms, but unlike 2007, more non-Bt cotton was treated for bollworms and/or beet armyworms in 2008 (41% of the fields received a single insecticide application).

Bollworm populations were exceptionally light during 2009 with the exception of Gaines County. Both Bollgard II and Widestrike varieties suffered very low damage to boll feeding lepidopterous pest in 2009 and had significantly fewer damaged bolls than the non-Bt varieties (no Bollgard fields were sampled in 2009) (Table 4). There were no differences in damaged bolls between the Bt types, and there were no differences among any of the varietal types in sucking bug damage. None of the fields sampled in the 2009 survey were treated for lepipoterous pests. Much of the South Plains had significant acreage of late-planted grain sorghum and corn, and these crops tended to act as trap crops, essentially preferentially attracting bollworms and fall armyworms away for the cotton.

In 2010, bollworm populations were moderate to high in portions of Gaines, Terry, Hockley, and Lubbock counties, and occurred late in the season in areas north of Lubbock. Dawson County reported no damage from bollworms or armyworms. Boll damage in 2010 was greatest in the non-Bt varieties, and the Bollgard II and Widestrike varieties did not differ from one another (Table 5). As in previous years, damage was numerically higher in the Widestrike varieties than the Bollgard II, suggesting a slight trend in lesser efficacy. However, no Bt cotton field, Widestrike or Bollgard II, ever required treatment for ledipoterous pests, indicating that both Bt technologies provide excellent control. The non-Bt varieties required 0.45 insecticide applications per field for lepidopterous pests.

Based on these data, Bt cotton appears to continue to be highly effective in preventing boll damage by lepidopterous pests in the South Plains region of Texas.

**Acknowledgments:**

Appreciation is expressed to the Monsanto Company and the Plains Cotton Improvement Program for financial support of this project.

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Table 1. Number of fields sampled by county and Bt trait in 2007-10.

| County | Non-Bt | Bollgard | Bollgard II | Widestrike |
|---|---|---|---|---|
| Year 2007 | | | | |
| Bailey | 0 | 3 | 1 | 0 |
| Castro | 4 | 0 | 3 | 0 |
| Dawson | 1 | 3 | 2 | 4 |
| Floyd | 3 | 0 | 4 | 0 |
| Gaines | 0 | 0 | 0 | 1 |
| Hale | 7 | 0 | 6 | 3 |
| Hockley | 3 | 2 | 2 | 2 |
| Lubbock | 1 | 5 | 2 | 1 |
| Parmer | 2 | 1 | 0 | 1 |
| Terry | 1 | 0 | 3 | 4 |
| TOTAL | 22 | 14 | 23 | 16 |
| Year 2008 | | | | |
| Bailey | 5 | 0 | 5 | 0 |
| Castro | 6 | 0 | 6 | 1 |
| Dawson | 0 | 0 | 0 | 2 |
| Gaines | 4 | 0 | 3 | 10 |
| Hale | 3 | 0 | 2 | 1 |
| Hockley | 5 | 5 | 5 | 3 |
| Lubbock | 6 | 0 | 5 | 0 |
| TOTAL | 29 | 5 | 26 | 17 |
| Year 2009 | | | | |
| Bailey | 1 | 0 | 1 | 0 |
| Castro | 1 | 0 | 2 | 1 |
| Crosby | 1 | 0 | 1 | 0 |
| Dawson | 0 | 0 | 1 | 1 |
| Gaines | 2 | 0 | 2 | 2 |
| Hale | 1 | 0 | 1 | 0 |
| Hockley | 1 | 0 | 1 | 0 |
| Swisher | 1 | 0 | 1 | 0 |
| TOTAL | 8 | 0 | 10 | 4 |
| Year 2010 | | | | |
| Bailey | 2 | 0 | 2 | 2 |
| Crosby | 1 | 0 | 2 | 0 |
| Dawson | 3 | 0 | 3 | 3 |
| Floyd | 1 | 0 | 0 | 0 |
| Gaines | 2 | 0 | 2 | 2 |
| Hale | 3 | 0 | 3 | 1 |
| Hockley | 3 | 0 | 3 | 4 |
| Lubbock | 3 | 0 | 3 | 2 |
| TOTAL | 20 | 0 | 20 | 16 |

Table 2. Percentage of damaged bolls and insecticide applications for non-Bt and various Bt technology varieties grown in the South Plains of Texas, 2007.

| Variety type | n[a] | % damaged bolls[b] | Mean no. sprays per site[c] |
|---|---|---|---|
| Non-Bt | 22 | 3.11 a | 0.09 a |
| Bollgard | 14 | 0.52 b | 0.00 a |
| Bollgard II | 23 | 0.25 b | 0.00 a |
| WideStrike | 14 | 1.29 ab | 0.00 a |

Means in a column followed by the same letter are not significantly different based on an F protected Mixed Procedure LSD ($P \leq 0.10$).
[a]Number of fields sampled.
[b]Percentage of damaged bolls from three locations in each field, 100 bolls sampled per locations, 300 bolls per field.
[c]Mean number of insecticide applications targeting lepidopterous pests per site.

Table 3. Percentage of damaged bolls and insecticide applications for non-Bt and various Bt technology varieties grown in the South Plains of Texas, 2008.

| Variety type | n[a] | % damaged bolls[b] | Mean no. sprays per site[c] |
|---|---|---|---|
| Non-Bt | 29 | 3.16 a | 0.41 a |
| Bollgard | 5 | 0.53 b | 0.00 b |
| Bollgard II | 26 | 0.04 b | 0.00 b |
| WideStrike | 17 | 0.18 b | 0.00 b |

Means in a column followed by the same letter are not significantly different based on an F protected Mixed Procedure LSD ($P \leq 0.10$).
[a]Number of fields sampled.
[b]Percentage of damaged bolls from three locations in each field, 100 bolls sampled per locations, 300 bolls per field.
[c]Mean number of insecticide applications targeting lepidopterous pests per site.

Table 4. Percentage of damaged bolls and insecticide applications for non-Bt and various Bt technology varieties grown on the South Plains of Texas, 2009.

| Variety type | n[a] | % worm damaged bolls[b] | % sucking bug damaged bolls[b] | Mean no. sprays per site[c] |
|---|---|---|---|---|
| Non-Bt | 8 | 2.83 a | 3.83 a | 0.00 a |
| Bollgard II | 10 | 0.13 b | 2.06 a | 0.00 a |
| WideStrike | 4 | 0.40 b | 0.00 a | 0.00 a |

Means in a column followed by the same letter are not significantly different based on an F protected Mixed Procedure LSD ($P \leq 0.10$).
[a]Number of fields sampled.
[b]Percentage of worm or sucking bug damaged bolls from three locations in each field, 100 bolls sampled per locations, 300 bolls per field.
[c]Mean number of insecticide applications targeting lepidopterous pests per site.

Table 5. Percentage of damaged bolls and insecticide applications for non-Bt and various Bt technology varieties grown on the South Plains of Texas, 2010.

| Variety type | n[a] | % worm damaged bolls[b] | % sucking bug damaged bolls[b] | Mean no. sprays per site[c] |
|---|---|---|---|---|
| Non-Bt | 20 | 3.08 a | 1.87 a | 0.45 a |
| Bollgard II | 20 | 0.15 b | 1.00 a | 0.00 b |
| WideStrike | 16 | 0.27 b | 0.58 a | 0.00 b |

Means in a column followed by the same letter are not significantly different based on an F protected Mixed Procedure LSD ($P \leq 0.10$).
[a]Number of fields sampled.
[b]Percentage of worm or sucking bug damaged bolls from three locations in each field, 100 bolls sampled per locations, 300 bolls per field; only 14 fields sampled for bug damage.
[c]Mean number of insecticide applications targeting lepidopterous pests per site.

# Impact of Thiamethoxam Seed Treatments on the Efficacy of Subsequent Foliar Applications of Thiamethoxam Towards Cotton Aphids in Texas, 2010

**Cooperators: Texas AgriLife Research and Extension Center – Lubbock, TX**

**David Kerns, Brant Baugh , Dustin Patman and Bo Kesey**
**Extension Entomologist-Cotton, EA-IPM – Lubbock County, EA-IPM – Crosby/Floyd Counties, Extension Program Specialist-Cotton**

**Lubbock County**

**Summary:**

At 30 days after planting (DAP), prior to the foliar applications, cotton that was planted with Cruiser-treated seed had fewer aphids than the untreated, and most of this activity appeared to be in the lower portion of the plant canopy. However, the aphid population was still high enough in the Cruiser–treated plots to warrant an insecticide application. These data suggest that it is possible for seed treatments to exert selective pressure on mid-season populations of cotton aphids and possibly contribute to selection of resistant individuals. However, we could not detect any impact of Cruiser seed treatment on the efficacy of subsequent foliar applications of Centric. Neither rate of Centric performed very well in this test regardless if Cruiser was used or not which may be indicative of the pre-existing resistance to Centric. The only interaction detected was for yield. All of the treatments yielded significantly more than where no insecticides were used. Centric at 2.5 oz applied over untreated seed had the highest yield, and was significantly greater than where Centric was applied at 1.5 oz without a seed treatment. However, it was not significantly different from Centric at 1.5 oz applied over Cruiser-treated seed. Why Centric at 2.5 oz without the seed treatment yielded more than Centric at 2.5 oz applied over the top of Cruiser-seed treatment is not certain. Cruiser applied with no foliar over sprays yielded equally to where Cruiser received over sprays.

**Objective:**

The objective of this study was to determine if using a neonicotinoid seed treatment affected our ability to control aphids with similar chemistry later in the season

**Materials and Methods:**

This test was conducted at the Texas AgriLife Research and Extension Center in Lubbock, TX. The field was planted on 25 May on 40-inch rows, and was irrigated using row irrigation. The variety used was DP 174RF. The test was a 2×3 factorial design with four replications. Factor A treatments were an untreated and a seed treatment of Centric. Factor B consisted of an untreated and foliar applications of Cruiser at 1.5 and 2.5 oz per acre. Plots were 4-rows wide × 60 ft in length. The entire study site was treated with Karate at 5 fl-oz on 20 and 28 Jul.

Foliar insecticide treatments were applied with a $CO_2$ pressurized hand-boom sprayer calibrated to deliver 10 gpa through TX-6 hollow cone nozzles (2 per row) at 40 psi. on 30 Jul. Evaluations were made on 30 Jul, and 2, 6 and 11 Aug. The number of cotton aphids per leaf were estimated by sampling 5, 3 to 4$^{th}$ node leaves and 5 leaves from the lower 50% of the plant canopy. Entire plots were harvested on 11 Nov using a cotton stripper.

Data were analyzed using ANOVA, and means were separated using an F-protected LSD ($P \leq 0.05$).

**Results and Discussion:**

At 30 days after planting (DAP), prior to the foliar applications, cotton that was planted with Cruiser-treated seed had fewer aphids than the untreated, and most of this activity appeared to be in the lower portion of the plant canopy (Table 1). Thus it is possible for seed treatments to exert selective pressure on mid-season populations of cotton aphids and possibly contribute to selection of resistant individuals.

At 3 day after the foliar applications (DAT), both rates of Centric had fewer aphids than the untreated with the exception of the 1.5 oz rate within the lower canopy. However, the cotton aphid populations were high across all plots, exceeding the action threshold of 50 aphids per leaf.

By 7 DAT, the aphid populations had declined across the entire test but were still above the action threshold within all treatments; no differences were detected among any of the treatments (Table 2).

At 12 DAT, the cotton aphids had declined to sub-threshold levels. The influence of Cruiser seed treatment on the ability of subsequent applications of Centric to control cotton aphids was not certain and no interactions were detected. Neither rate of Centric performed very well in this test regardless if Cruiser was used or not which may be indicative of the pre-existing resistance to Centric.

The only interaction detected was for yield (Tables 2 and 3). All of the treatments yielded significantly more than where no insecticides were used (Table 2). Centric at 2.5 oz applied over untreated seed had the highest yield, and was significantly greater than where Centric was applied at 1.5 oz without a seed treatment. However, it was not significantly different from Centric at 1.5 oz applied over Cruiser-treated seed. Why Centric at 2.5 oz without the seed treatment yielded more than Centric at 2.5 oz applied over the top of Cruiser-seed treatment is not certain. Cruiser applied with no foliar over sprays yielded equally to where Cruiser received over sprays.

**Acknowledgments:**

Appreciation is expressed to the Plains Cotton Improvement Program for financial support of this project.

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Table 1.

| | Rate amt product/acre | Cotton aphids per leaf: 30 Jul (30 DAP, pre-foliar) 3-4th node leaf | Lower canopy leaf | Mean | 2 Aug (3 DAT) 3-4th node leaf | Lower canopy leaf | Mean |
|---|---|---|---|---|---|---|---|
| Factor A | | | | | | | |
| Untreated | -- | 107.58a | 354.58a | 231.08a | 93.10a | 256.03a | 174.57a |
| Cruiser ST | 0.34[a] | 115.38a | 154.83b | 135.11b | 52.55a | 234.50a | 143.53a |
| Factor B | | | | | | | |
| Untreated | -- | 91.55a | 179.88a | 135.71a | 127.43a | 341.25a | 234.34a |
| Centric 40WG | 1.5 oz | 131.50a | 270.85a | 201.18a | 51.20b | 242.83ab | 147.01b |
| Centric 40WG | 2.5 oz | 111.40a | 313.40a | 212.40a | 39.85b | 151.73b | 95.79b |
| A*B Interaction | | ns | ns | ns | ns | ns | ns |

Table 2.

| | Rate amt product/acre | Cotton aphids per leaf: 6 Aug (7 DAT) 3-4th node leaf | Lower canopy leaf | Mean | 11 Aug (12 DAT) 3-4th node leaf | Lower canopy leaf | Mean | 11 Nov Yield lint (lbs/acre) |
|---|---|---|---|---|---|---|---|---|
| Factor A | | | | | | | | |
| Untreated | -- | 26.88a | 120.15a | 73.52a | 3.27a | 22.55a | 12.91a | 1484.72a |
| Cruiser ST | 0.34[a] | 27.13a | 119.62a | 73.40a | 2.60a | 17.38a | 9.99a | 1540.63a |
| Factor B | | | | | | | | |
| Untreated | -- | 34.00a | 103.25a | 68.63a | 3.40a | 22.03a | 12.71a | 1350.91b |
| Centric 40WG | 1.5 oz | 25.58a | 165.13a | 95.35a | 2.93a | 15.58a | 9.25a | 1550.96a |
| Centric 40WG | 2.5 oz | 21.53a | 91.13a | 56.40a | 2.48a | 22.30a | 12.39a | 1636.15a |
| A*B Interaction | | ns | ns | ns | ns | ns | ns | $P$ = 0.01 |

Table 3.

| Factor A | Factor B | Rate amt product/acre | 11 Nov Yield lint (lbs/acre) |
|---|---|---|---|
| | Untreated | -- | 1230.76c |
| Untreated | Centric 40WG | 1.5 oz | 1469.14b |
| | Centric 40WG | 2.5 oz | 1754.25a |
| | Untreated | -- | 1471.05b |
| Cruiser ST[a] | Centric 40WG | 1.5 oz | 1632.78ab |
| | Centric 40WG | 2.5 oz | 1518.05b |

Values in a column followed by the same letter are not significantly different based on an F-protected LSD ($P \geq 0.05$).
[a]rate = 0.34 mg(AI)/seed.

Developing an Action Threshold for Thrips in the Texas High Plains, 2010

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**High Plains**

**Summary:**

In the Texas high plains and most of the cotton growing areas of the United States, thrips are a dominating pest during the pre-squaring stage of cotton. The most dominate thrips species affecting irrigated cotton fields in the Texas high plains is the western flower thrips, *Frankliniella occidentalis* (Pergande). In irrigated cotton where thrips populations are historically high (usually areas where there is significant acreage of wheat), many growers opt to utilize preventative insecticide treatments such as in-furrow applications or seed treatments to control thrips. However, where thrips populations are not "guaranteed" to be especially troublesome, preventive treatments may not be necessary and represent an unnecessary expense. In these situations, well timed banded foliar insecticide applications for thrips control may be more profitable. Currently, the treatment threshold for thrips on irrigated cotton in the Texas high plains occurs when the average total thrips per plant equals or exceeds the number of true leaves. This was the fourth year conducting this study. This study was conducted in irrigated cotton across the Texas high plains. Based on the data collected thus far, cotton appears to be most susceptible to thrips at the cotyledon stage and susceptibility decreases as the plant grows. It has been commonly observed that cotton suffers more damage from thrips under cool temperatures. However, cool temperatures do not make the thrips more damaging, rather the plant's growth is slowed and remains at a more susceptible stage for a longer period of time. Although not certain, the current Texas action threshold for thrips requires revamping to cotyledon stage = 0.5 thrips per plant,

1 true leaf = 1 thrips per plant, 2 true leaves = 1-1.5 thrips per plant, and 3-4 true leaves = 2 thrips per plant. However, more data is required to confirm these thresholds.

**Objective:**

To determine at what population density western flower thrips should be subjected to control tactics to prevent yield reduction and significant delayed maturity, to compare two action thresholds for thrips and to determine whether there is a relationship between thrips induced yield reduction and temperature.

**Materials and Methods:**

This study was conducted on irrigated cotton during 2007-2010 across 19 locations (Table 1). However, not all sites yielded usable data. In 2007-08, plots at all locations were 2-rows wide × 100-ft long, while in 2009-10 all plots were 4-rows wide × 100-ft. Plots were arranged in a RCB design with 4 replicates. The foliar treatment regimes are outlined in (Table 2). These treatments were simply a means of manipulating the thrips populations at different times in an attempt to focus on when thrips feeding is most damaging.

All foliar sprays consisted of Orthene 97 (acephate) applied at 3 oz-product/acre with a $CO_2$ pressurized hand boom calibrated to deliver 10 gallons/acre. Thrips were counted weekly by counting the number of larvae and adult thrips from 10 plants per plot. Whole plants were removed and inspected in the field. Each plot was harvested in its entirety in 2007, using a stripper with a burr extractor. In 2008-2009, a 1/1000th acre portion was harvested from each plot using an HB hand stripper. Yields were converted to proportion of yield relative to the highest yielding plot for each test site. Data were analyzed using linear regression (Sigma Plot 2008). Total thrips by crops stage and temperature were correlated with yield. Crops stages included cotyledon, 1 true leaf, 2 true leaves, 3 true leaves and 4 true leaves. Only leaves approximately the size of a quarter were counted as true leaves. Temperature was segregated based on minimum daily temperature. Those with minimum daily temperatures of 60° F or less were considered cold and those above that threshold were considered warm. A 10% reduction in yield was considered unacceptable.

**Results and Discussion:**

Under cool conditions, yield of cotton in Moore County was negatively correlated with thrips at the cotyledon stage (Figure 1, top). At this stage, based on the regression model, approximately 0.5 thrips per plant resulted in a 10% yield reduction. Results were similar for the Gaines County in 2008 (Figure 1, bottom). However, the cotton in Gaines County was approaching the 1 true leaf stage when the thrips were counted.

At the 1 true leaf stage under cool conditions, approximately 1 thrips per plant was correlated with a 10% yield reduction (Figure 2), while approximately 2 thrips per plant were required at the 2 true leaf stage (Figure 3). None of the sites experienced temperatures ≤ 60° F at the 3-4 true leaf stage.

Under warm conditions (minimum daily temperatures > 60° F), the relationship between thrips at the cotyledon stage and yield was negatively correlated, although the $R^2$ was low (Figure 4). Similar to the data collected under cool conditions, the model suggests that 0.4 thrips per plant resulted in a 10% yield reduction. Also, similar to the relationships observed under cool conditions, at the 1 and 2 true leaf stages, 0.9 and 1.4 thrips per plant respectively to result in a 10% yield reduction, respectively.

After 2 true leaves, under warm conditions, the cotton at all locations was rapidly growing and relationships were difficult to discern. However, in Hale County in 2008 when the cotton was a mixture of 3 and 4 true leaves, a weak but significant relationship between thrips and yield was detected (Figure 5). At this point, 2 thrips per plant appeared to result in a 10% yield reduction.

Based on these correlations, temperature did not appear to affect the number of thrips necessary to cause a 10% reduction in yield, regardless of crop stage. Because of this lack of differences, the data were pooled across temperature and sites in accordance with stage of growth (Figure 6). Although statistically significant, the $R^2$ values for the pooled data were much lower than desired. This was unavoidable and due to differences in field conditions, varieties, etc. across test sites. However, the pooled data continued to reflect similar trends observed at individual sites with some exception. The number of thrips necessary to result in a 10% yield reduction by crop stage were as follows: cotyledon stage = 0.65 thrips per plant, 1 true leaf stage = 0.7 thrips per plant, 2 true leaf stage = 1 thrips per plant and 3-4 true leaf stage = 2.1 thrips per plant.

It is obvious that thrips are most damaging to cotton during the early stages of growth, particularly cotyledon to 1 true leaf, and that susceptibility declines with plant growth. Additionally, common observation suggests that thrips damage is most severe during periods of cool conditions. However, the impact of cool temperatures does not appear to be an effect on the thrips as much as an impact on the plant. Additionally, cool temperatures do not necessarily make the cotton more susceptible to thrips, but appears to suppress cotton development, thus keeping the plant at a more susceptible stage for a longer period of time.

Based on the data collected thus far, it is obvious that the Texas action threshold for thrips in cotton does need to be altered, but should remain dynamic based on plant growth stage (Table 3).

**Acknowledgments:**

This project was funded by Cotton Incorporated, Texas State Support, and in part by the Plains Cotton Improvement Program.

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| Table 1. Tests sites and reliability of data. | | | | | | | |
|---|---|---|---|---|---|---|---|
| 2007 | | 2008 | | 2009 | | 2010 | |
| Bailey | Acceptable | Bailey | Acceptable | Bailey | Hailed out | Bailey | Nematodes |
| | | Crosby | Acceptable | Crosby | Hailed out | Crosby | Acceptable |
| | | Gaines | Acceptable | Gaines | Insufficient thrips | Dawson | Insufficient thrips |
| | | Hale | Acceptable | Hale | Weedy | Lamb | Acceptable |
| | | Hockley | Acceptable | Moore | Herbicide damage | Moore | Acceptable |
| | | Lubbock | Insufficient thrips | Lubbock | Insufficient thrips | Castro | Insufficient irrigation |
| | | | | | | Hale | Poor stand |

| Table 2. Foliar treatment regime timings. | | | |
|---|---|---|---|
| | 2007 | 2008 | 2009-10 |
| 1) Untreated check | X | X | X |
| 2) Automatic treatment on week 1 | X | X | X |
| 3) Automatic treatment on weeks 1 and 2 (only week 2 in 2008) | X | | X |
| 4) Automatic treatment on weeks 1, 2 and 3 | X | X | X |
| 5) Automatic treatment on week 2 | | X | X |
| 6) Automatic treatment on weeks 2 and 3 | X | X | X |
| 7) Treatment based on the Texas AgriLife Extension Threshold[a] | X | X | X |
| 8) Treatment based on the above threshold with 30% larvae | X | X | |
| [a]One thrips per plant from plant emergence through the first true leaf stage, and one thrips per true leaf thereafter until the cotton has 4 to 5 true leaves | | | |

| Table 3. Threshold comparison | | |
|---|---|---|
| Threshold | Cotton Stage | No. Thrips per Plant |
| Old Threshold | Cotyledon – 1 true leaf | 1 |
| | 2 true leaves | 2 |
| | 3 true leaves | 3 |
| | 4 true leaves | 4 |
| Possible New Threshold | Cotyledon | 0.5 |
| | 1 true leaf | 1 |
| | 2 true leaves | 1-1.5 |
| | 3-4 true leaves | 2 |

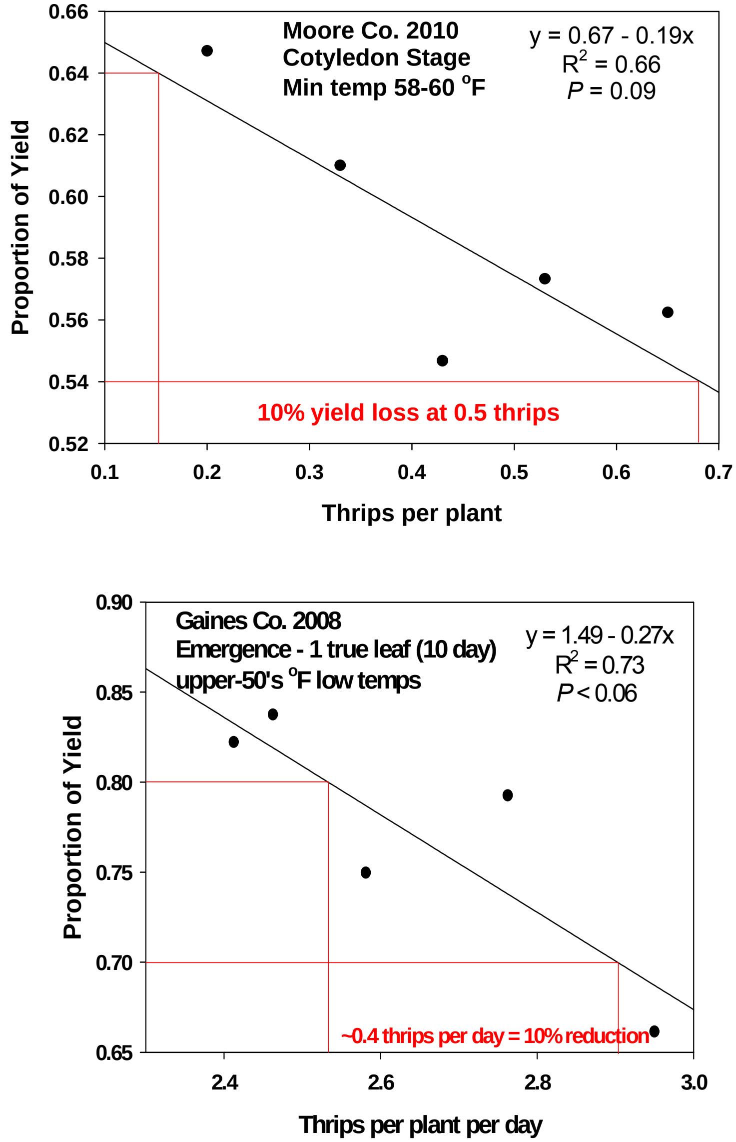



Figure 1. Relationship between thrips per plant and proportion of yield at the cotyledon stage under cool conditions in Moore (top) and Gaines (bottom) counties.

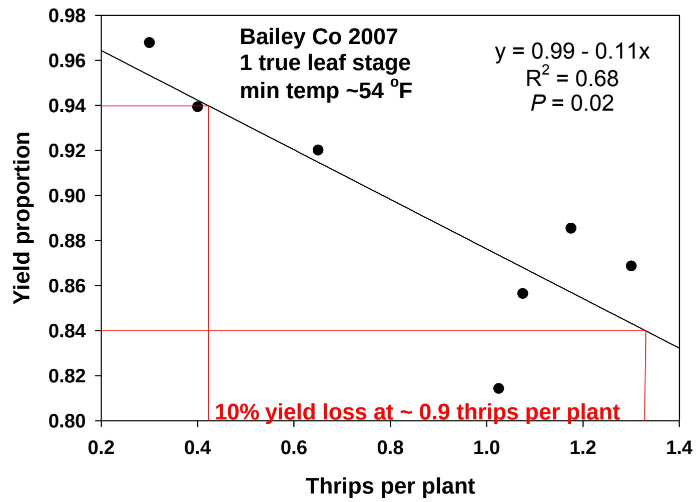
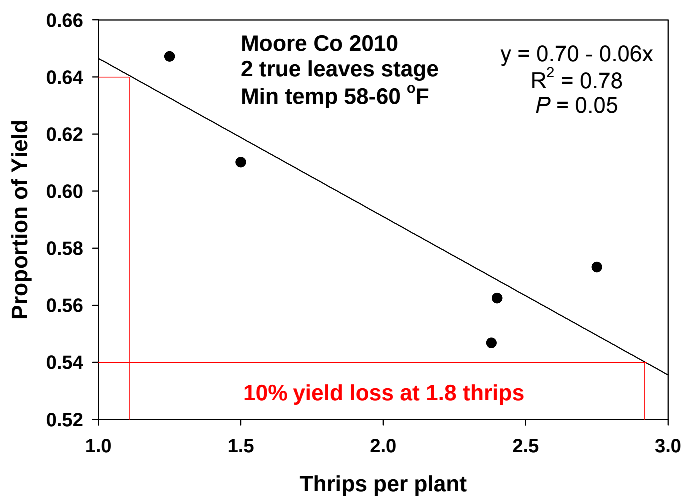



Figure 2. Relationship between thrips per plant and proportion of yield at the 1 true leaf stage under cool conditions in Bailey county.



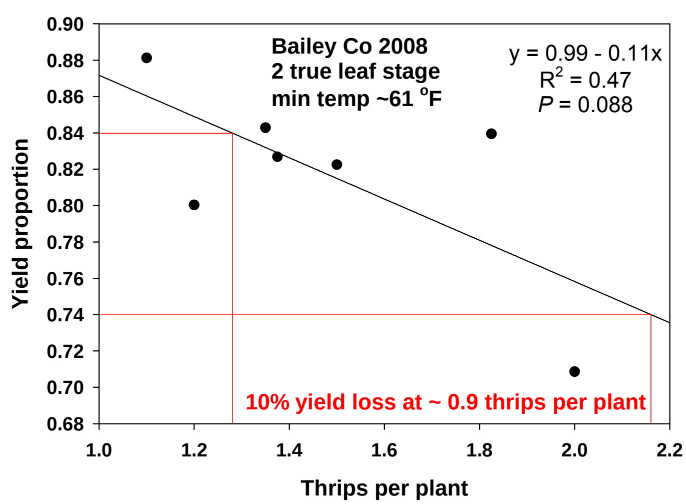




Figure 3. Relationship between thrips per plant and proportion of yield at the 2 true leaf stage under cool conditions in Moore (top) and Bailey (bottom) counties.

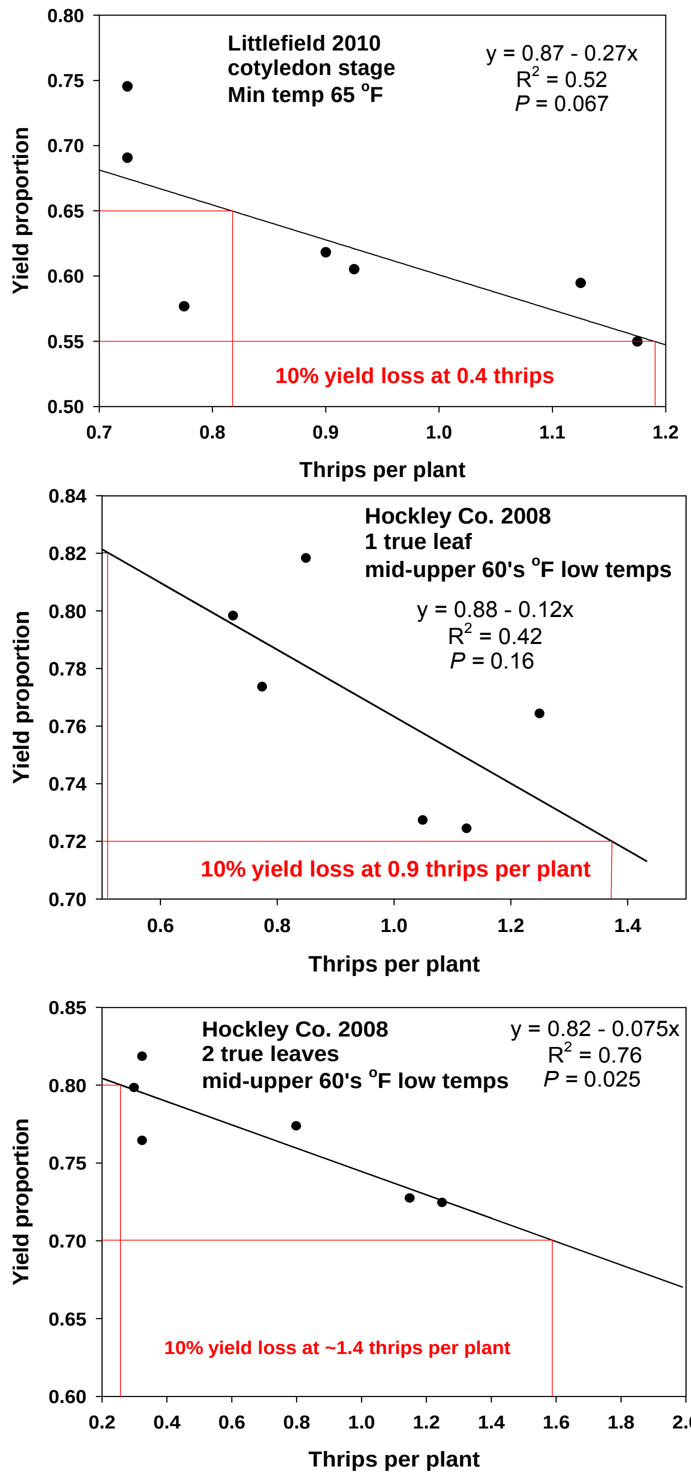



Figure 4. Relationship between thrips per plant and proportion of yield under warm conditions at the 1 true leaf stage (top), 2 true leaf stage (middle) and 3-4 true leaf stage (bottom).

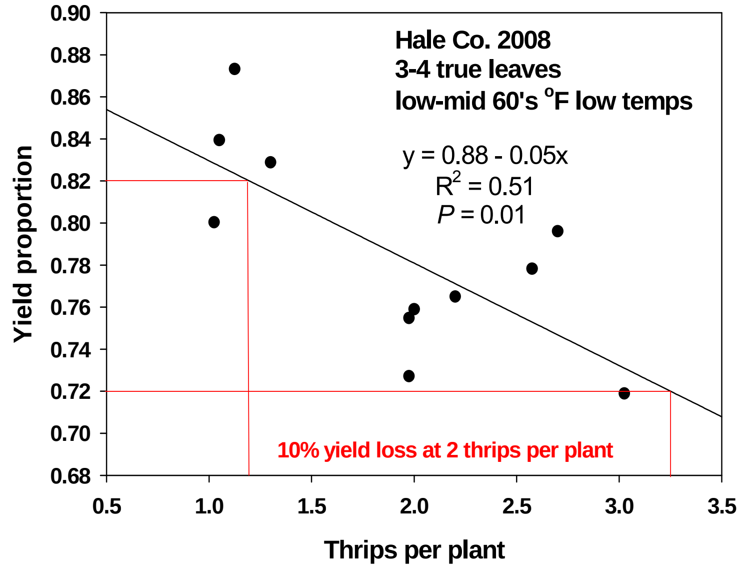



Figure 5. Relationship between thrips per plant and proportion of yield under warm conditions at the 3-4 true leaf stage.

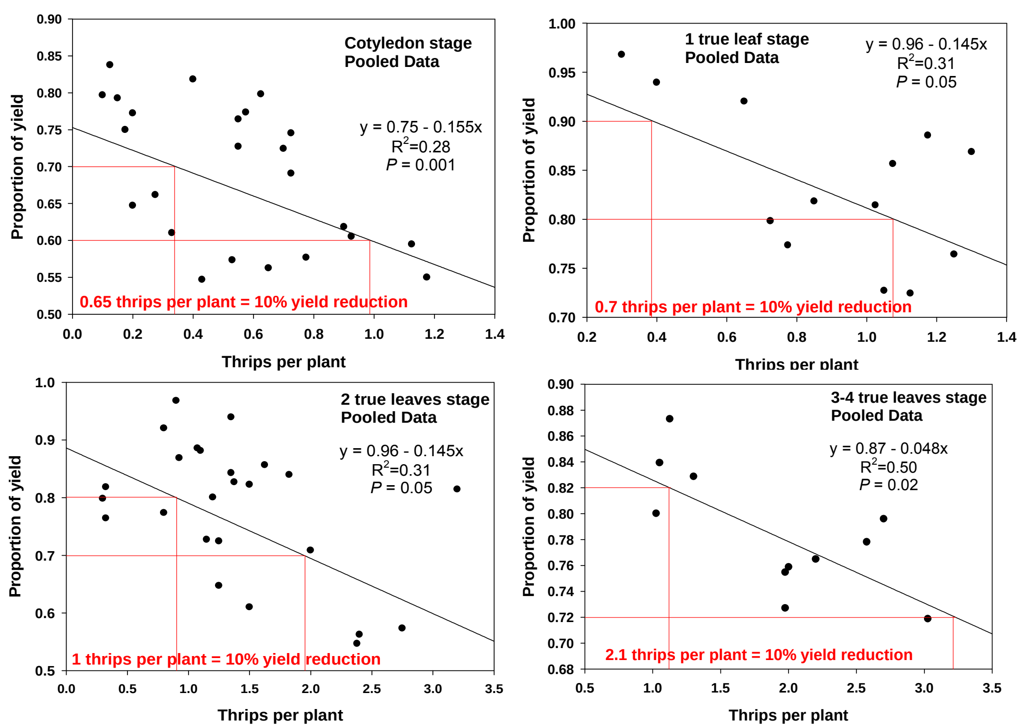



Figure 6. Relationship between thrips per plant and proportion of yield from pooled temperature data (cool and warm) at various stages of crop development.

# Development of a Binomial Sampling Plan to Estimate Thrips Populations in Cotton to Aid in IPM Decision Making

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**South Plains, High Plains, Permian Basin, Trans Pecos**

**Summary:**

Thrips are problematic throughout much of the U.S. cotton belt and can negatively impact early-season cotton if curative action is not taken. In this study we compare two different methods (visual and cup) for sampling thrips on seedling cotton, and using these sampling methods we began the process of developing a binomial sampling plan. This study was conducted in a variety of locations across the Texas high plains and far west Texas in commercial cotton fields. The sample data collected from both methods of sampling were used to determine how many cotton leaves were infested to mean thrips density relationship needed to develop the binomial sample plan using the following formula ($P(I)=1-e^{-m[LN(amb-1)/(amb-1-1)]}$). Taylor's power law effectively modeled the thrips sample data from both sample methods. Taylor's coefficients suggested that thrips nymphs tended to be more closely grouped than adult thrips. Development of the sample plans indicated that the binomial sample plan, regardless of sample method, required significantly fewer samples to make a management decision. Sample size requirements between the sample methods for the binomial sample plan, although similar, favored the cup sample method, as it required only 90% of the effort of the visual sample plan. The binomial sample plan will be field tested in 2011.

**Objective:**

Objectives of this study are as follows: 1. Develop and compare enumerative and binomial sampling plans for estimating thrips densities in seedling cotton, 2. Evaluate to thrips sampling techniques (visual & cup), 3. Develop the most cost reliable sample plan and method for making thrips management decisions in seedling cotton.

**Materials and Methods:**

This study took place in a number of commercial cotton fields located across far west Texas and the Texas High Plains. Western flower thrips were sampled in each cotton field that was left untreated by foliar and/or preventative insecticides. Individual plants were examined for thrips from crop emergence to the five true leaf stage. 50 sampling bouts per field were conducted for each sampling method. Each sampling bout consisted of three plants.

Two sample plans (enumerative and binomial) and two methods (visual and 16oz plastic cup) were evaluated (Figure 1). Individual plants were removed from the soil by gently grasping the cotton stem at the soil line and pulling straight up. Then, the cotton plant was either subjected to the visual or cup sample method. Visual inspection was accomplished using a sharpened pencil to pry apart folded or creased leaf tissue to expose hidden thrips. Adults and nymphs were then counted and recorded. The cup method was employed by inserting the cotton plant into the cup and shaking vigorously for several seconds to dislodge any thrips into the cup. Adult and nymph thrips dislodged into the cup were counted, recorded and discarded.

Taylor's parameters were determined for thrips adult and nymph age classes and were pooled across age classes. Different age classes may have different spatial patterns, resulting in substantial differences in required sample number for estimating population densities. Sample data from both methods were used to determine the proportion of cotton leaves infested to mean thrips density (Wilson and Room 1983). The relationship of the mean and proportion of thrips infested cotton leaves was determined by:

$$P(I)=1-e^{-m[LN(amb-1)/(amb-1-1)]}$$

Where P(I)=the proportion of thrips infested leaves, a and b are parameters from Taylor's power law (1961) and m=the mean density at which a management decision is needed. Taylor's power law parameters were determined by iterative non-linear regression. Science based economic thresholds have not been established for thrips in cotton. Therefore, an empirically derived nominal threshold of 1 thrips per true cotton leaf was used in this study. The optimal sample size for estimating this threshold for enumerative and binomial sampling was determined using the following equations presented by Wilson et. al. (1983b).

Enumerative sampling: $n=t^2_\alpha * d^{-2} * amb^{-2}$ ; Binomial sampling: $n=t^2_\alpha * d^{-2} * q * p^{-1}$

Where n=sample size, $t_\alpha$=standard normal variate, d=a fixed level of precision (defined as a proportion of the ratio of half the desired confidence interval to the mean). A and b are Taylor's coefficients, q=1-p and p=the proportion of thrips infested leaves.

A consideration of cost, expressed as time to collect the sample, is especially important in selecting sampling methods and plans for use in commercial field monitoring programs. Relative-cost reliability (Wilson 1994) is the ratio of the costs of two or more sampling methods and was computed as:

$$C_1/C_2 = n_1(T_1 + t_1)/n_2(T_2 + t_2)$$

Where $C$ = cost per sample for each sample method or sample unit size, $n$ = required number of samples needed to provide a density estimate with a specified level of precision, $T$ = time required to collect a sample for each sample method or sample unit size and $t$ = time to move from sample unit to sample unit. The time in seconds to move from one sample unit to the next was standardized at $t$ = 15 sec. The visual sampling method employeed in Texas was used as the standard to which the other sample methods/plans were compared. Relative cost-reliability was used to select the optimum sample method and plan. The lowest relative cost reliability value represents the optimum sample method.

**Results and Discussion:**

Taylor's power law effectively modeled the mean/variance relationship for all thrips age classes and both sample methods (Table 1). Except for visual sampling of thrips nymphs, Taylor's a-coefficient was less than one for all thrips age classes and sample methods. This result is likely an artifact of curve fitting or random sample variability (Wilson 1994).

The effect of age class on thrips aggregation was evident for both sample methods. Higher values of Taylor's parameters for nymphs relative to adults, and the decrease in the proportion of immature thrips infested plants for a given mean, indicate that immature thrips exhibit a more aggregated spatial pattern relative to adult thrips (Table 1). This behavioral attribute was not unexpected, as immature thrips tend to hide in the terminals of the cotton plant and are less mobile than winged adults. Wilson and Room (1983a) reported similar findings for *Heliothis* spp. age classes.

The relationship between observed and estimated proportion of infested leaves was strong, with $R^2$ values in excess of 0.83 for both sample methods across all age classes. The estimated P(I) for the nominal economic threshold of one thrips per leaf was very similar between the two sample methods and thrips age classes (Table 2). Nevertheless, these slight differences resulted in significant differences in the required number of samples needed to estimate a mean thrips density of one thrips per leaf. As a means of simplification, the estimated P(I) was standardized across all cotton maturity stages. The cup sample method would require a maximum sample number of 28, compared to 31 for the visual. However, the time needed to take a sample for the binomial plans has yet to be calculated, so the most cost reliable sample method remains to be determined.

Regardless of sample method, the enumerative sample plans required a >56% increase in the number of samples needed to estimate the same density as the binomial sample plans (Table 3 and Figure 2). The average sample times for the enumerative sample plans were 79.1 and 43.6 seconds per sample for the visual and cup sample methods, respectively. Sample number requirements were similar for both sample methods, however, the cup sample method was more cost effective, with a relative efficiency of 0.55. Even though the cup sample method is more cost efficient when using enumerative sampling, the binomial sampling plan requires far fewer samples to make a management decision and will undoubtedly be much more cost effective.


**Acknowledgments:**

This project was funded by Cotton Incorporated CORE Projects and in part by the Plains Cotton Improvement Program.


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| Table 1. a and b of Taylor's power law and coefficient of determination. | | | |
|---|---|---|---|
| Thrips age classes | a | b | $R^2$ |
| Cup Sample Method | | | |
| Adult | 0.6147 | 1.0760 | 0.92 |
| Nymph | 0.9389 | 1.3149 | 0.95 |
| Pooled | 0.7166 | 1.2205 | 0.89 |
| Visual Sample Method | | | |
| Adult | 0.6889 | 1.1291 | 0.96 |
| Nymph | 1.1608 | 1.4473 | 0.88 |
| Pooled | 0.9171 | 1.1569 | 0.86 |

| Table 2. Relationship between proportion infested cotton leaves and a mean thrips density of one per cotton leaf. | | |
|---|---|---|
| | Proportion Infested (PI) | |
| Thrips age classes | Cup | Visual |
| Adult | 0.73 | 0.72 |
| Nymph | 0.69 | 0.67 |
| Pooled | 0.72 | 0.67 |

| Table 3. Required number of samples needed to estimate the nominal threshold of one thrips per cotton leaf. | | | | |
|---|---|---|---|---|
| | Enumerative Sampling | | Binomial Sampling | |
| | Cup | Visual | Cup | Visual |
| Adult | 47 | 43 | 26 | 25 |
| Nymph | 72 | 72 | 28 | 31 |
| Combined | 54 | 57 | 24 | 30 |

Figure 1. Visual sampling method (left) and cup sampling method (right).

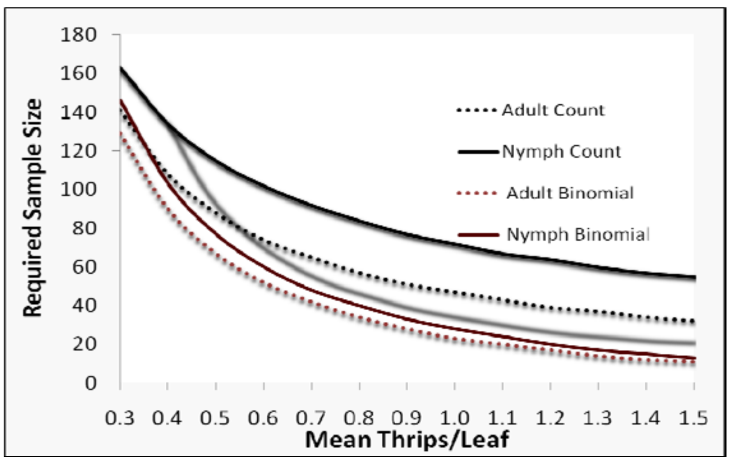


Figure 2. Sample size as a function of thrips mean density per cotton leaf (cup sample method).

**Evaluation of Insecticides for Aphid Control and Impact on Lady Beetle Larvae, 2010**

**Cooperators: Texas AgriLife Research and Extension Center, Lubbock**

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**Extension Entomologist-Cotton, EA-IPM Lubbock County and EA-IPM Crosby/Floyd Counties**

**Lubbock County**

**Summary:**

The aphid population in this study was averaging over 200 aphids/leaf before curative treatments were applied. The action threshold for aphids is 50 aphids/leaf. Thus this represents a rescue type situation. However, the automatic applications of CMT-4586, applied 21 and 8 days before the other insecticide applications, prevented the aphid outbreak. These automatic applications probably eliminated the early colonizing aphids. Although all of the remaining treatments demonstrated some activity, Centric, Trimax Pro and Belay failed to reduce the aphid population below threshold within 7 days. Curative applications of CMT-4586, Intruder, Carbine, Bidrin and sulfoxaflor all exhibited excellent activity within 7 days. All of the neonicotinoid insecticides (Intruder, Centric, Belay, Trimax Pro and CMT-4586) were extremely harsh towards lady beetle larvae. Bidrin and sulfoxaflor were moderately harsh, while Carbine was least harsh towards lady beetle larvae.

**Objective:**

The objective of this study was to evaluate the efficacy of various insecticides on aphids infesting cotton, and to evaluate their impact of lady beetle larvae.

**Materials and Methods:**

This test was conducted at the Texas AgriLife Research and Extension Center in Lubbock, TX. The field was planted on 25 May on 40-inch rows, and was irrigated using row irrigation. The test was a RCB design with four replications. Plots were 4-rows wide × 60 ft in length.

The entire study site was treated with Karate at 5 fl-oz on 20 and 28 Jul. Comparative insecticide treatments were applied with a $CO_2$ pressurized hand-boom sprayer calibrated to deliver 10 gpa through TX-6 hollow cone nozzles (2 per row) at 40 psi.

One treatment, CMT-4586 (spirotetramat + imidacloprid), received an automatic application at pinhead sized square on 7 Jul and again 15 days later on 22 Jul. The remaining treatments were applied once the action threshold of 50 aphids per leaf was exceeded on 30 July. Evaluations were made on 22 and 30 Jul, and 2, 6 and 11 Aug.

The insecticides evaluated included CMT-4586, Intruder Centric, Bidrin, Trimax Pro, Belay, Carbine and XDE-208. CMT-4586 is a mixture of imidacloprid (same active ingredient as Trimax Pro) and spirotetramat (same active ingredient in Bayer's Movento). Spirotetramat is a true systemic and similar to Vydate will move from the leaf down. It is popular in the vegetable market for aphid and whitefly control. XDE-208 is sulfoxaflor. This is a new chemistry being developed by Dow and will be sold under the name Transform. It has demonstrated excellent activity on Lygus. Belay is a neonicotinoid being marketed by Valent, and thus has the same mode of action as Intruder, Centric, and Trimax Pro.

On 22 Jul, the number of cotton aphids, *Aphis gossypii* (Glover), were counted on 10, 3 to $4^{th}$ node leaves. On the remaining sample dates, in addition to 5, 3 to $4^{th}$ node leaves, 5 leaves from the lower 50% of the plant canopy were also sampled.

Predators were estimated on 30 Jul and 2 Aug utilizing a 36-inch x 40-inch black drop cloth. Drop cloths were laid between the rows and approximately 1.5 ft-row of cotton were shaken onto the drop cloth from each row, after which the type and number of predators were counted. Predators counted included lady beetles, minute pirate bugs, big-eyed bugs, damsel bugs, syrphid fly larvae, lacewing larvae and spiders; only lady beetle larvae data are presented. The dominate lady beetle was *Hippodamia convergens* Guérin-Méneville.

Data were analyzed using ANOVA, and means were separated using an F-protected LSD ($P \leq 0.05$).

**Results and Discussion:**

Differences between the untreated and the automatic applications of CMT-4586 were non-detectable until 8 day following the second application (Table 1). At this time the untreated was averaging 179 aphids per leaf while CMT-4586 was averaging 32.6. It was evident that the two applications of CMT-4586 prevented the aphid outbreak.

At 3 days after the remaining treatments were applied, all of the treatments had fewer aphids than the untreated (Table 2). The automatic applications of CMT-4586 had the fewest aphids at 14.23 per leaf, but did not statistically differ from the threshold applications of CMT-4586, Intruder, Bidrin or XDE-208 (sulfoxaflor).

At 7 days following the threshold application, the threshold timed application of CMT-4586 had the fewest aphids, but was not statistically different from the automatic CMT-4586 application or Intruder, Centric, Bidrin, Carbine or XDE-208. Although all of the insecticides had significantly fewer aphids than the untreated, Trimax Pro and Belay at 4 and 6 fl-oz did not provide adequate control, and aphids in the Centric treated plots were still slightly above threshold.

At 21 days after the threshold timed applications, the aphid population had declined substantially, averaging only 22.28 per leaf in the untreated (Table 3). At this time the only treatments that differed from the untreated included the threshold timed application of CMT-4586, Intruder, Carbine and XDE-208.

On 30 Jul, prior to the threshold timed applications, there were fewer lady beetle larvae where the automatic CMT-4586 application occurred than in the untreated. None of the other treatment had been applied and did not differ from the untreated.

At 3 days following the threshold applications, all of the insecticide treatments had fewer lady beetle larvae than the untreated. Carbine appeared to have the least impact on lady beetle larvae, averaging 6.13 per ft-row, but did not differ from XDE-208. Belay at 6 fl-oz was harshest to lady beetle larvae, averaging 0.38 pre ft-row and did not differ from any other treatment containing a neonicotinoid (CMT-4586, Intruder, Centric and Trimax Pro). Bidrin appeared moderate in lethality toward lady beetle larvae relative to the other treatments and did not differ from Centric, Carbine or XDE-208.

**Acknowledgments:**

Appreciation is expressed to Gowan Company Ag Chemicals, Bayer CropScience and the Plains Cotton Improvement Program for financial support of this project.

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Table 1.

| Treatment/ formulation | Rate amt product/acre | Timing | Aphids per leaf: 22 Jul (15 DAAP 1) 3-4th node leaf | 30 Jul (8 DAAP 2) 3-4th node leaf | Lower canopy leaf | Mean |
|---|---|---|---|---|---|---|
| Untreated | -- | -- | 34.15a | 136.75a | 221.20a | 178.98a |
| CMT-4586[a] + Dyne-Amic + UAN 28% | 8.0 fl-oz + 0.25% v/v + 2.5% v/v | Pinhead + 14 d | 33.90a | 42.45a | 22.75a | 32.60b |
| CMT-4586 + Dyne-Amic + UAN 28% | 8.0 fl-oz + 0.25% v/v + 2.5% v/v | threshold | 25.30 | 108.50 | 265.6 | 187.05 |
| Intruder 70WP | 0.6 oz | threshold | 30.20 | 107.50 | 361.05 | 234.28 |
| Centric 40WG | 2.5 oz | threshold | 27.53 | 151.05 | 539.35 | 345.20 |
| Bidrin 8 | 8.0 fl-oz | threshold | 27.20 | 116.30 | 308.85 | 212.58 |
| Trimax Pro 4.44SC | 1.8 fl-oz | threshold | 28.03 | 151.80 | 487.50 | 319.65 |
| Belay 2.13SC | 4 fl-oz | threshold | 26.63 | 114.00 | 260.00 | 187.00 |
| Belay 2.13SC | 6 fl-oz | threshold | 28.83 | 88.15 | 284.75 | 186.45 |
| Carbine 50WG | 1.5 oz | threshold | 36.18 | 160.40 | 272.90 | 216.65 |
| XDE-208 50WG | 0.35 oz | threshold | 22.90 | 165.15 | 402.75 | 283.95 |

Values in a column followed by the same letter are not significantly different based on an F-protected LSD ($P \leq 0.05$).

[a]Treatment was applied only at pinhead sized square stage (application 1) and again 14 days later (application 2); none of the other treatments were applied at this time and were excluded from analysis.

Table 2.

| Treatment/ formulation | Rate amt product/acre | Aphids per leaf: 2 Aug (11 DAAP 2[a]; 3 DAAP 3): 3-4th node leaf | Lower canopy leaf | Mean | 6 Aug (15 DAAP 2[a]; 7 DAAP 3): 3-4th node leaf | Lower canopy leaf | Mean |
|---|---|---|---|---|---|---|---|
| Untreated | -- | 166.80a | 666.70a | 416.75a | 90.70a | 525.95a | 308.33a |
| CMT-4586[a] + Dyne-Amic + UAN 28% | 8.0 fl-oz + 0.25% v/v + 2.5% v/v | 16.55f | 11.90e | 14.23e | 27.05cd | 35.75b | 31.40cd |
| CMT-4586 + Dyne-Amic + UAN 28% | 8.0 fl-oz + 0.25% v/v + 2.5% v/v | 37.55ef | 47.65e | 42.60e | 7.35d | 6.15b | 6.75d |
| Intruder 70WP | 0.6 oz | 43.75def | 30.00e | 36.88e | 26.75cd | 14.00b | 20.38cd |
| Centric 40WG | 2.5 oz | 114.90abc | 235.25bcd | 175.08bcd | 30.80cd | 74.85b | 52.83bcd |
| Bidrin 8 | 8.0 fl-oz | 38.35ef | 38.65e | 38.50e | 14.55cd | 26.35b | 20.45cd |
| Trimax Pro 4.44SC | 1.8 fl-oz | 104.75a-d | 372.35b | 238.55bcd | 48.45bc | 155.40b | 101.93bc |
| Belay 2.13SC | 4 fl-oz | 133.60ab | 338.55b | 236.08b | 51.40abc | 153.20b | 102.30bc |
| Belay 2.13SC | 6 fl-oz | 88.60b-e | 295.35bc | 191.98b | 84.55ab | 171.65b | 128.10b |
| Carbine 50WG | 1.5 oz | 101.05b-e | 113.20cde | 107.13b | 20.30cd | 19.60b | 19.95cd |
| XDE-208 50WG | 0.35 oz | 63.00c-f | 88.25de | 75.63de | 18.35cd | 18.25b | 18.30cd |

Values in a column followed by the same letter are not significantly different based on an F-protected LSD ($P \leq 0.05$).

[a]Treatment was applied only at pinhead sized square stage (application 1)and again 14 days later (application 2); remaining treatments were applied on 30 Jul (application 3).

Table 3.

| Treatment/ formulation | Rate amt product/acre | Aphids per leaf, 11 Aug (21 DAAP 2[a]; 12 DAAP 3): 3-4th node leaf | Lower canopy leaf | Mean | Lady beetle larvae per 6 ft-row: 30 Jul (8 DAAP 2)[a] | 2 Aug (11 DAAP 2[a]; 3 DAAP 3) |
|---|---|---|---|---|---|---|
| Untreated | -- | 4.90a | 39.65ab | 22.28a | 13.00a | 9.25a |
| CMT-4586[a] | 8.0 fl-oz | | | | | |
| + Dyne-Amic | + 0.25% v/v | 3.70a | 31.95abc | 17.83ab | 2.38b | 1.13d |
| + UAN 28% | + 2.5% v/v | | | | | |
| CMT-4586 | 8.0 fl-oz | | | | | |
| + Dyne-Amic | + 0.25% v/v | 1.20a | 8.30cd | 4.75bc | 13.50a | 1.25d |
| + UAN 28% | + 2.5% v/v | | | | | |
| Intruder 70WP | 0.6 oz | 2.70a | 4.30d | 3.50bc | 14.13a | 1.63d |
| Centric 40WG | 2.5 oz | 2.55a | 46.05a | 24.30a | 15.13a | 1.88cd |
| Bidrin 8 | 8.0 fl-oz | 3.05a | 18.20bcd | 10.63abc | 11.00a | 4.13bc |
| Trimax Pro 4.44SC | 1.8 fl-oz | 6.30a | 39.00ab | 22.65a | 9.38a | 1.13d |
| Belay 2.13SC | 4 fl-oz | 6.95a | 32.10abc | 19.53a | 11.63a | 1.13d |
| Belay 2.13SC | 6 fl-oz | 3.90a | 35.10ab | 19.50a | 7.75a | 0.38d |
| Carbine 50WG | 1.5 oz | 0.95a | 2.90d | 1.93c | 11.00a | 6.13b |
| XDE-208 50WG | 0.35 oz | 1.30a | 2.00d | 1.65c | 12.13a | 5.13b |

Values in a column followed by the same letter are not significantly different based on an F-protected LSD ($P \leq 0.05$).

[a]Treatment was applied only at pinhead sized square stage (application 1) and again 14 days later application 2; remaining treatments were applied on 30 Jul (application 3).

## Ability of Cotton to Compensate for Early-Season Fruit Loss and Impact on Yield and Lint Quality, 2010

**Cooperators: Texas AgriLife Research and Extension Center, Lubbock**

**David Kerns, Tommy Doederlein, Brant Baugh and Dustin Patman**
**Extension Entomologist-Cotton, EA-IPM Dawson/Lynn Counties, EA-IPM Lubbock County and EA-IPM Crosby/Floyd Counties**

**Lubbock County**

**Summary:**

Given sufficient time, similar to that experienced during 2010, cotton can fully compensate yield from 100% square loss at 18 days into squaring. However, compensated lint may be of lower quality than non-compensated lint. Like yield, the degree of lint quality degradation in compensated lint is undoubtedly associated with length of season.

**Objective:**

The objectives of this test were to assess the ability of cotton to compensate for early season square loss and the impact compensated fruit has on lint quality.

**Materials and Methods:**

This test was conducted at the Texas AgriLife Research and Extension Center in Lubbock, TX. The cotton variety, 'Phytogen 375 WRF', was planted on 1 June 2010 on 40-inch rows and was irrigated as needed using furrow run irrigation. Plots were 1 row wide x 14-feet long. The test was a randomized complete block design with 4 replicates.

Plots were evenly thinned to 28 plants per plot (26,136 plants per acre) on 13 July 2010. All abnormally small or deformed plants were removed leaving a uniform plant population.

Treatments consisted of 0, 20, 40, 60, 80 and 100% manual square removal on pre-bloom cotton. On 13 July 2010, all of the squares in each plot were counted and numbered. The numbered squares from each plot were then randomized and removed based on the treatment percentage. Squares slated for removal were removed using fine forceps on 13 July 2010. At that time the plants were approximately 18 days into squaring and averaged 13.7 nodes across all treatments.

At harvest on 10 November 2010, 10 plants from each plot were plant mapped and the entire plot was hand harvested. Samples were ginned at the Texas AgriLife Ginning Facility in Lubbock. Lint samples were submitted to the International Textile Center at Texas Tech University for HVI analysis, and USDA Commodity Credit Corporation (CCC) loan values were determined for each treatment by plot.

All count data were analyzed using PROC GLM and the means were separated using an F protected LSD ($P \leq 0.05$). Relationships were determined by using linear regression models.

**Results and Discussion:**

**Impact on Yield**

The 2010 growing season in Lubbock was marked by wet weather in June and July, dry conditions in August, and a prolonged warm fall that facilitated cotton maturation. Thus, the possibility of achieving full compensation for yield and fiber maturity were high during this test. Consequently, we could not detect any differences in yield among the treatments. This suggests that even the 100% square removal treatment was able to compensate (Figure 1).

**Impact on Bolls and Node Quantity**

Although plots had as much as 100% of their early squares removed, there were no significant differences among treatments in the total number of bolls produced or the number of fruiting nodes per plant (Figures 2A & B). Thus, it appears that compensation in yield was primarily from adding bolls to replace missing fruit rather than increasing the size or quantity of the surviving fruit.

**Impact on Fruiting Pattern**

Plants in the 20, 40 and 100% square removal treatments had fewer bolls on the lower portion of the plant (nodes 11+) than plants where there were no squares removed (Figure 3A). This would be expected since we physically removed squares from this area. However, if the plant compensated by adding second and third position squares, primarily in this area, one would expect there to be no differences. Additionally, there were no differences among treatments in the ratio of lower bolls to upper bolls, which further supports the conclusion that replacement fruit was uniformly distributed from top to bottom (Figure 3B).

There were more first position bolls where no squares were removed, no differences in second position squares, and it appeared that third position squares increased relative to the number of squares removed . (Figure 4A). This is also evident when comparing boll distribution relative to total bolls per plant (Figure 4B). Thus, it appears that the compensated fruit were third position bolls and, based on vertical distribution (Figure 3A & B), were uniformly distributed from top to bottom.

### Impact on Lint Quality

Significant differences in qualitative parameters among the square removal treatments were not detected based on GLM ($P > 0.05$), but trends were observed. Compensated bolls tended to have lower micronaire and higher fiber strength qualities (Figures 5A and B). Lower micronaire is indicative of immature cotton fibers and suggests that compensated bolls did not have sufficient time to mature. This is not uncommon for cotton with a truncated growing season, especially for fruit produced later in the season (i.e. third position bolls).

The trend detected for increased fiber strength with more square removal is a function of micronaire (Figure 5B). Increased strength is commonly associated with decreasing micronaire.

A trend was also detected for the degree of yellowness (+b) (Figure 6). Yellowness increased with increasing early square removal. Similar to low micronaire, increased yellowness is indicative of immature cotton fibers. Thus, further supporting the premise that compensated bolls are more likely to suffer qualitatively.

Although we detected trends in reduced lint quality with regard to increasing square removal (Figures 5 & 6), it did not significantly impact loan value based on GLM ($P > 0.05$) (Figure 7). Thus, even 100% pre-bloom square removal did not significantly affect yield or overall quality as it relates to loan values. However, keep in mind that these data are representative of the Lubbock area during a year with a prolonged growing season. In coolers climates or in situations favoring a shorter growing season, the impact on lint maturity and/or yield may be adversely affected.

**Acknowledgments:**

This project was funded in part by the Plains Cotton Improvement Program.

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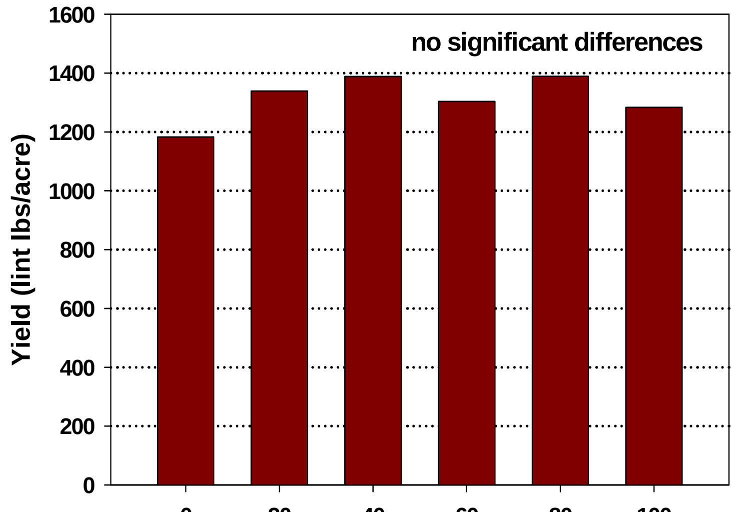
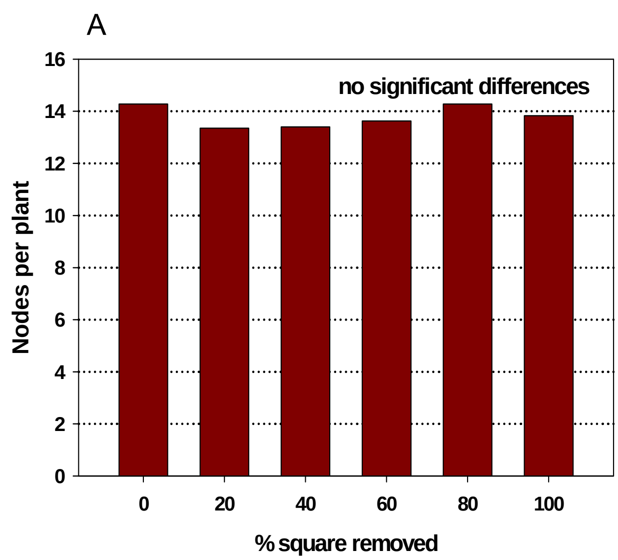


Figure 1. Impact of pre-bloom square removal on yield; no significant differences among treatments based on an F protected LSD ($P$ > 0.05).



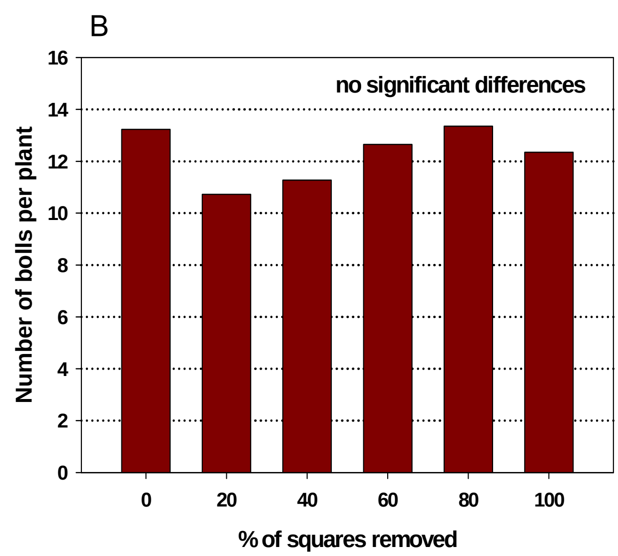



Figure 2 (A) Impact of pre-bloom square removal on the number of nodes per plant and (B) bolls per plant; no significant differences among treatments based on an F protected LSD ($P$ > 0.05).

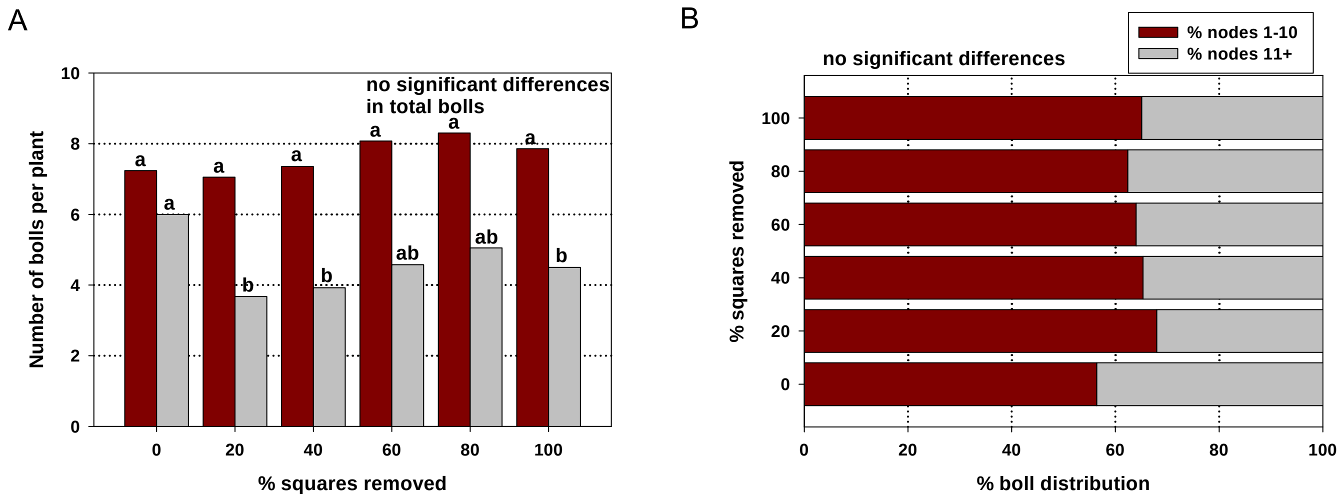



Figure 3. A) Number of bolls in the upper (nodes 1-10) and lower (nodes 11+) portions of the plant and B) vertical distribution as % of bolls within the top and bottom portions of the plant; similar colored bars capped by the same letter are not different based on an F protected LSD (*P* > 0.05).

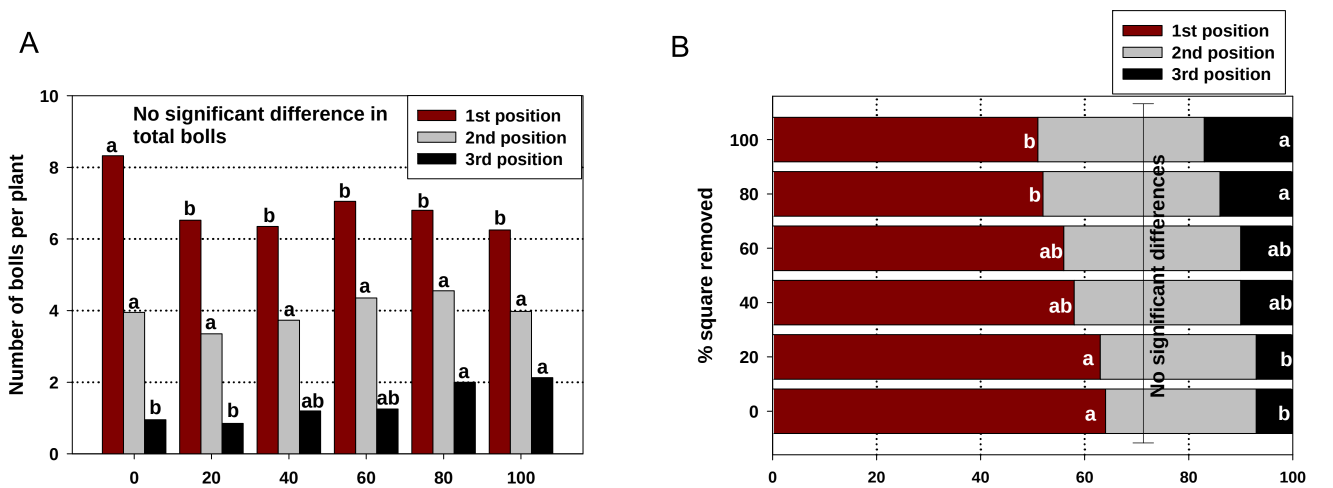



Figure 4. (A) Number of bolls in the upper (nodes 1-10) and lower (nodes 11+) portions of the plant and (B) vertical distribution as % of bolls within the top and bottom portions of the plant; similar colored bars capped by the same letter are not different based on an F protected LSD (*P* > 0.05).

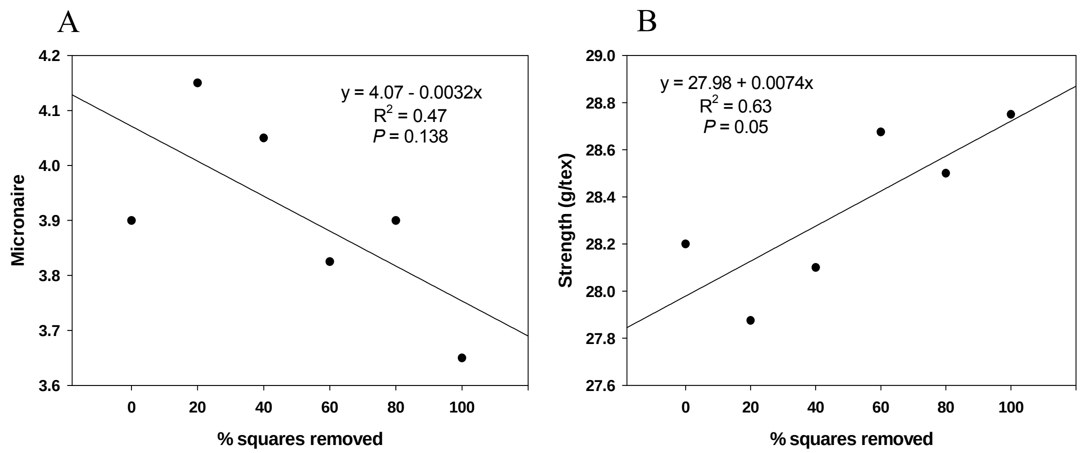



Figure 5. Linear relationships between % of squares removed and fiber (A) micronaire and (B) strength

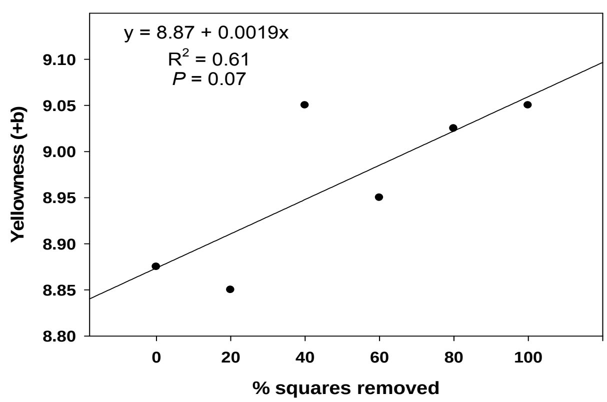



Figure 6. Linear relationship between % of squares removed and fiber yellowness.

Controlling Mixed Populations of Bollworm and Fall Armyworm in Non-Bt Cotton

**Cooperators: Glen Shook, Grower**

**David Kerns, Manda Cattaneo, Brant Baugh, Dustin Patman**
**Extension Entomologist-Cotton, EA-IPM Gaines County, EA-IPM Lubbock County, EA-IPM Crosby/Floyd Counties**

**Gaines County**

**Summary:**

Non-Bt cotton comprises approximately 50% of the cotton acreage planted in the Texas High Plains, and damage caused by bollworms and fall armyworms often results in significant yield loss. When fall armyworms are present, they usually occur concurrently with bollworms. Bollworms are typically controlled using pyrethroid insecticides while fall armyworms are better controlled with alternative chemistries. In this study, several pyrethroids (Karate, Holster and a high and low rate of Mustang Max) were evaluated for their efficacy towards a mixed population of bollworms and fall armyworms. Additionally, an alternative chemistry, Belt, was tested at its low rate and mixed with the low rate of Mustang Max. At 7 DAT, all of the treatments had fewer medium and large bollworms than the untreated with the exception of Belt alone. There were no differences among the other treatments. Generally, Belt is thought to be relatively more efficacious towards fall armyworms than bollworms. As expected, at its lowest labeled rate, Belt did not provide effective bollworm control; especially in growthy cotton where many of the small larvae were feeding under bloom tags. Against fall armyworms, the only treatment that differed from the untreated was the tank mix of Mustang Max + Belt. Pyrethoids are generally considered weak against fall armyworms. Belt is known to have good activity towards fall armyworms. However, Belt at the lower rate (2.0 fl-oz/acre) failed to achieve adequate control. It is not certain if increasing the rate of Belt would alleviate this problem, but much of the difficulty in control may be related to the need for Belt to be consumed to maximize activity. Although Belt is translaminar, larvae moving from fruit to fruit are less likely to encounter toxicant than if it were a contact poison. Although Belt alone appeared to be ineffective, it did not differ in yield from the best performing treatment. Yield was negatively correlated with the total worm population. Based on this regression, approximately 9,000 larvae per acre resulted in a 10% yield reduction. The ratio of small larvae to medium and large larvae was approximately 7:3. Considering an action threshold of 10,000 small or 5,000 medium and large larvae per acre threshold, 9,000 total larvae per acre is close to the estimated threshold of 8,500 larvae based on the 7:3 ratio we encountered.

**Objective:**

Objectives of this study were as follows: 1. Determine the efficacy of several commonly used pyrethroids for control of bollworms and fall armyworms in cotton, 2. Determine if the low labeled rate of Belt (2 fl-oz/acre) is effective in controlling bollworms and fall armyworms, 3. Determine if tank mixing a lower rate of Belt (2 fl-oz/acre) with a pyrethroid provides cost effective control.

**Materials and Methods:**

This test was conducted on a commercial farm located in Gaines Co., south of Loop, TX. The cotton variety 'Dyna-Grow 2400RF' was grown on 40-inch rows and irrigated using a pivot irrigation system. Plots were 4-rows wide × 60-feet long. Plots were arranged in a randomized complete block design with 4 replicates. The insecticide treatments and rates are outlined in Table 1. Treatments were applied on 17 August 2010.

Bollworm and fall armyworm populations were estimated by counting the number of worms on 10 whole plants per plot.

Larvae were separated by species, and size was estimated by length: small larvae (<1/4 inch), medium larvae (1/4 to 5/8 inch) and large larvae (>5/8 inch). Small larvae were not separated by species because they could not be distinguished from one another in the field.

The test was harvested on 5 November 2010, using a 28-inch hand basket stripper. Six samples were harvested per plot and pooled. All samples were weighed, ginned and classed.

All data were analyzed using ARM and the means were separated using an F protected LSD ($P < 0.05$).

**Results and Discussion:**

On 17 August, prior to insecticide application, the population of medium and large worms averaged 11,440 and 2,280 bollworms and fall armyworms per acre, respectively (estimated plant population = 40,000 per acre) (Figures 1A & 1B). This is well above the action threshold of 5,000 worms per acre. Although smaller worms could not be speciated, the population of small worms across both species was estimated to be 25,440 worms per acre (Figure 1C). The action threshold for small larvae is 10,000 worms per acre.

Using speciation of medium sized worms in the untreated plots at 7 DAT, the number of small bollworms and fall armyworms were estimated before treatment. The worm population at this test site was estimated to be ~70% bollworms. By size, bollworms comprised 52%, 85% and 73% of the small, medium and large sized larvae respectively (Figure 2). Total larvae across both species and all sizes averaged 38,840 worms per acre (Figure 1D). During pretreatment counts, it was noted that many of the small worms were feeding under bloom tags. Additionally, the cotton in this test was growthy (~46 inches in height); thus obtaining adequate insecticide coverage was likely to be difficult.

At 7 DAT, all of the treatments had fewer medium and large bollworms than the untreated with the exception of Belt at the lower rate (2 fl-oz/acre) (Figure 3A). There were no differences among the other treatments. Generally, Belt is thought to be relatively more efficacious towards fall armyworms than bollworms. As expected, at its lowest labeled rate, Belt did not provide effective bollworm control; especially in growthy cotton where many of the small larvae were feeding under bloom tags.

Against fall armyworms, the only treatment that differed from the untreated was the tank mix of Mustang Max + Belt (Figure 3B). Pyrethoids are generally considered weak against fall armyworms. Belt is known to have good activity towards fall armyworms. However, Belt at the lower rate (2.0 fl-oz/acre) failed to achieve adequate control. It is not certain if increasing the rate of Belt (3 fl-oz/acre) would alleviate this problem, but much of the difficulty in control may be related to the need for Belt to be consumed to maximize activity. Although Belt is translaminar, larvae moving from fruit to fruit are less likely to encounter toxicant than if it were a contact poison.

When evaluating activity across both species, because the population was predominately bollworms, the high rates of the pyrethroids and the low rate of Mustang Max + Belt all reduced the population significantly lower than the untreated (Figure 3C).

There were no significant differences in yield among the high rates of the pyrethroids, Belt alone or the tank mix of the low rate of Mustang Max + the low rate of Belt (Figure 3D).

Although Belt alone (2.0 fl-oz/acre) appeared to be ineffective, it did not differ in yield from the best performing treatment. The reason for this is not certain; it could be an aberration in the data, or Belt may be providing undetectable control. Similar results were observed in a test conducted in 2008.

Yield was negatively correlated with the total worm population (Figure 4). Based on this regression, approximately 9,000 larvae per acre resulted in a 10% yield reduction. The ratio of small larvae to medium and large larvae was approximately 7:3. Considering an action threshold of 10,000 small or 5,000 medium and large larvae per acre threshold, 9,000 total larvae per acre is close to the estimated threshold of 8,500 larvae based on the 7:3 ratio we encountered.

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Table 1. Insecticide treatments and rates.

| Treatment[a] | Active Ingredient | Rate (product/ac) |
|---|---|---|
| 1) Untreated | -- | -- |
| 2) Mustang Max 0.83EC | Zeta-cypermethrin | 3.6 fl-oz |
| 3) Mustang Max 0.83EC | Zeta-cypermethrin | 2.6 oz |
| 4) Karate 1EC | Lambda-cyhalothrin | 5.12 fl-oz |
| 5) Holster 2.5EC | Cypermethrin | 5.0 fl-oz |
| 6) Belt 480SC | Flubendiamide | 2.0 fl-oz |
| 6) Mustang Max 0.83EC + Belt 480SC | Zeta-cypermethrin +Flubendiamide | 2.6 fl-oz + 2.0 fl-oz |

[a]*All treatments included Dyne-Amic non-ionic surfactant at 0.25% v/v.*

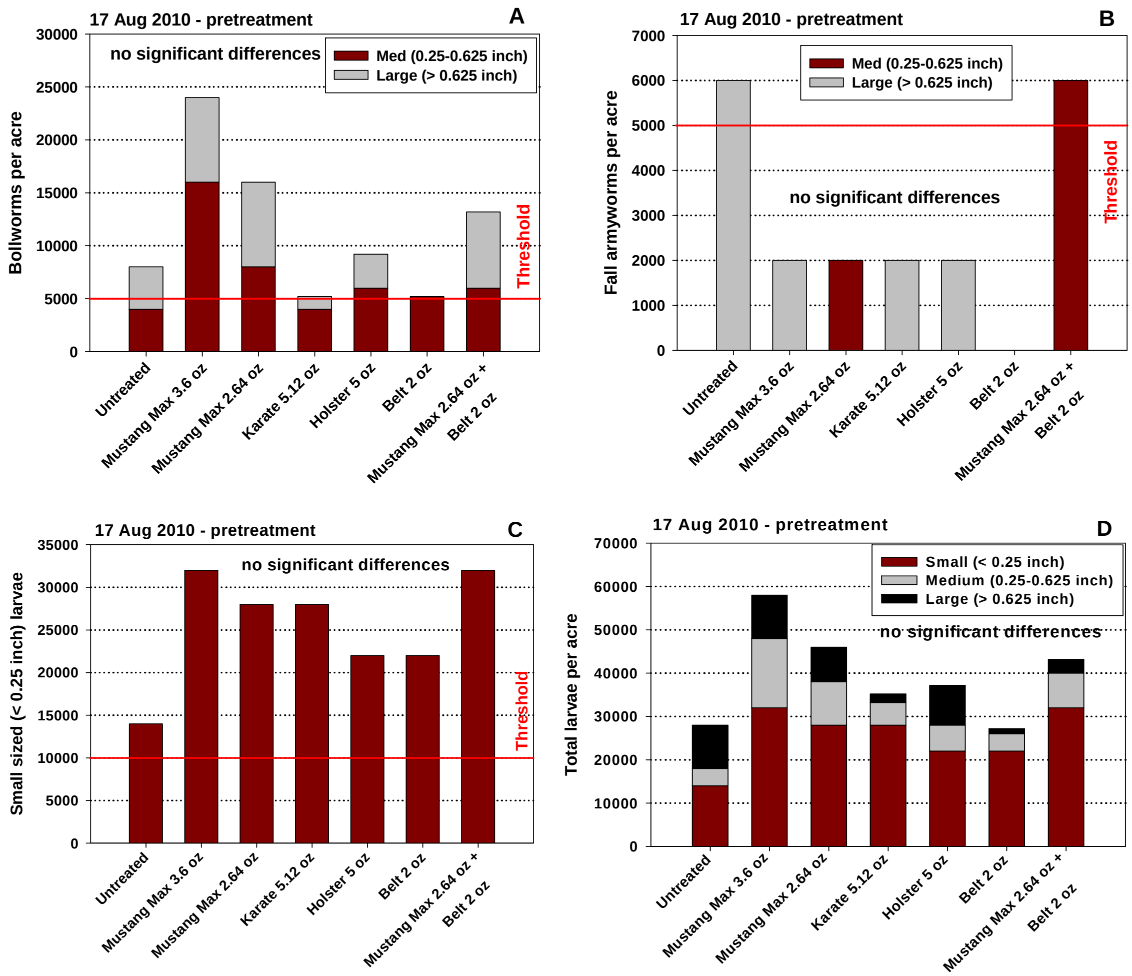


Figure 1. Number of medium and large bollworm larvae per acre before application (A), medium and large fall armyworms (B), total small larvae (C), and total larvae by size (D); no significant differences were detected among any of the treatments for any parameter based on an F protected (LSD, $P \geq 0.05$).

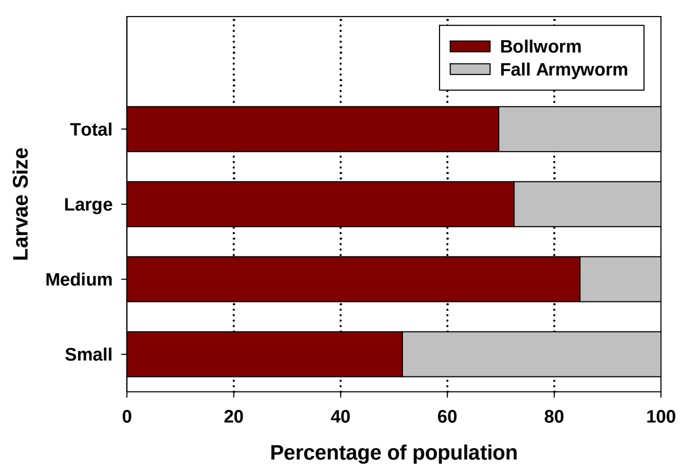


Figure 2. Percentages of bollworms and fall armyworms by size on 17 August, prior to treatment.

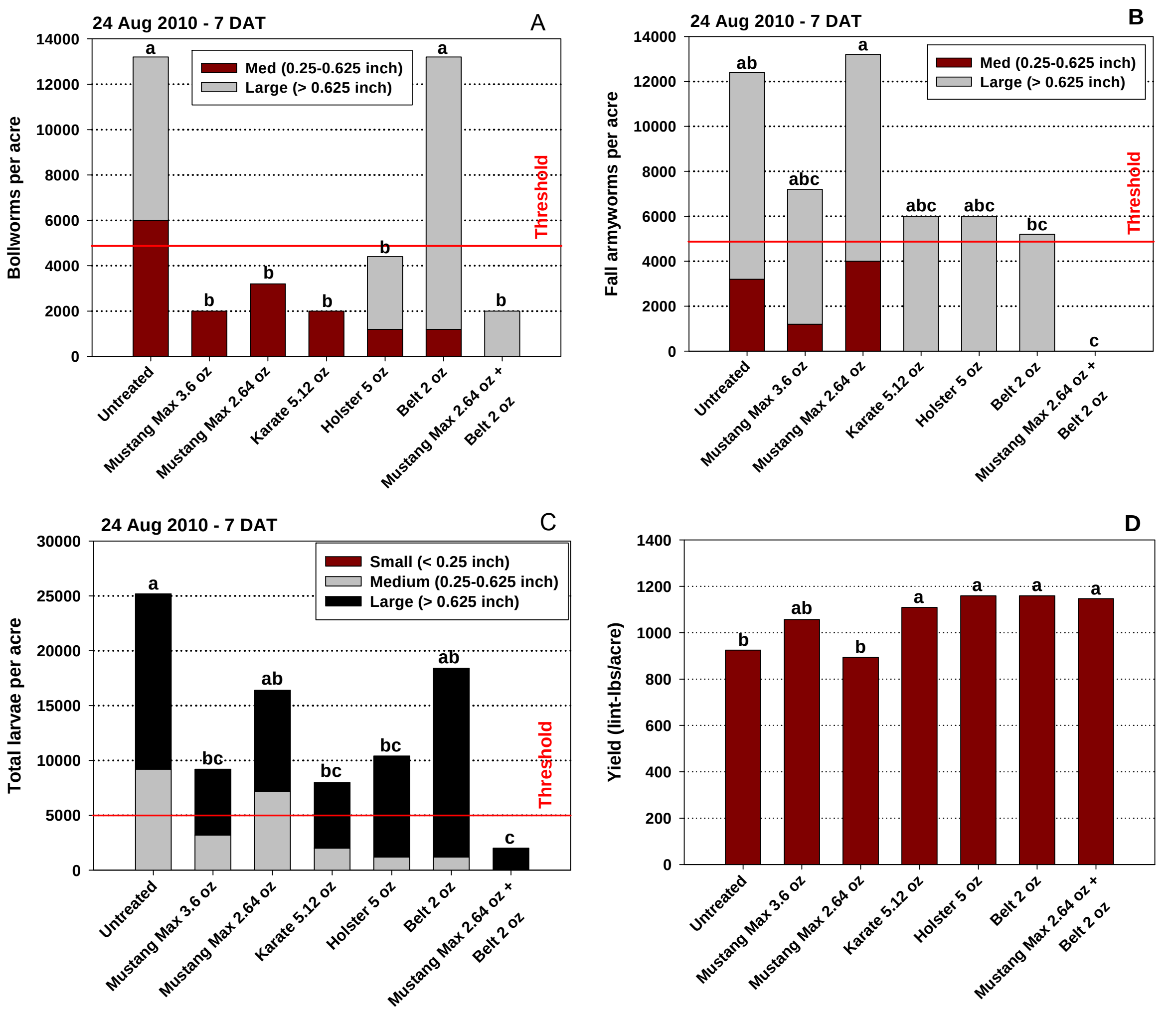


Figure 3. Number of medium and large bollworm larvae per acre 7 days after treatment (A), medium and large fall armyworms (B), total larvae (C), and yield (D); Columns within a chart capped by the same letter are not significantly different based on an F protected (LSD, *P* > 0.05).

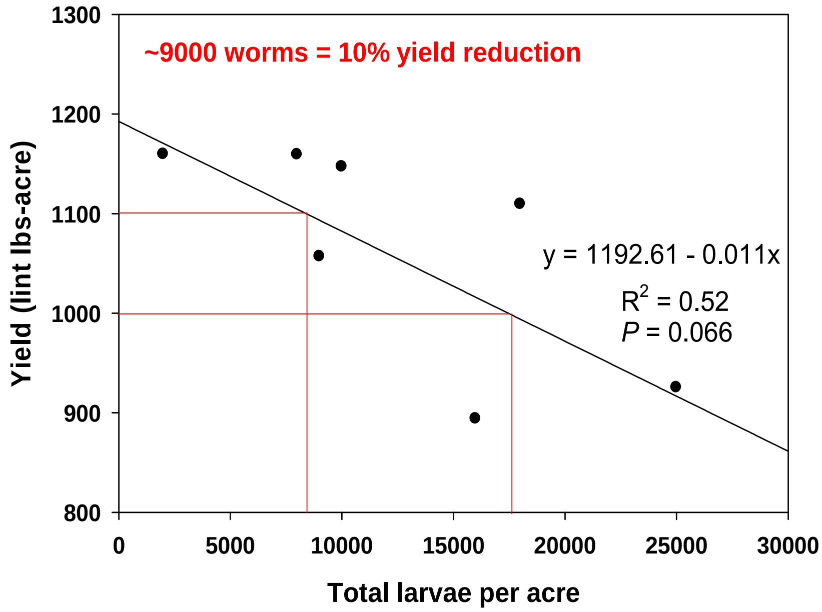


Figure 4. Linear relationship between all sizes of bollworms and fall armyworms and yield.

AgriLIFE EXTENSION
Texas A&M System

**Replicated Dryland Cotton Variety Demonstration,**
**Blanco, TX - 2010**

**Cooperator: Mark Appling**

**Tyler Hawthorne, J. W. Wagner, Dustin Patman, Randy Boman,**
**Mark Kelley and Chris Ashbrook**
**EA-AG/NR Crosby County, EA-AG/NR Floyd County,**
**EA-IPM Crosby/Floyd Counties, Extension Agronomist - Cotton,**
**Extension Program Specialist II - Cotton,**
**and Extension Assistant - Cotton**

**Floyd County**

**Summary:** **<u>Stand establishment was variable due to hot and dry conditions following planting.</u>** Significant differences were observed among varieties for all yield and economic and most fiber quality parameters measured. Lint turnout ranged from 30.5% for Deltapine 1032B2RF to 27.0% for All-Tex Patriot+ RF. Lint yields varied from a low of 495 lb/acre (All-Tex Patriot+ RF) to a high of 703 lb/acre (All-Tex Epic RF). Lint loan values ranged from a low of $0.5237/lb to a high of $0.5717/lb for Deltapine 0912B2RF and FiberMax 9170B2F, respectively. When subtracting ginning, seed costs and technology fees, the net value/acre among varieties ranged from a high of $368.44 (All-Tex Epic RF) to a low of $254.18 (All-Tex Patriot+ RF), a difference of $114.26. Micronaire values ranged from a high of 5.0 for Deltapine 0912B2RF to a low of 4.2 for FiberMax 9170B2F with a test average of 4.5. The test average staple was 35.4 and FiberMax 9058F and FiberMax 9180B2F had the highest with 36.7 while Americot 1532B2RF and Deltapine 0912B2RF had the lowest with 34.1. Uniformity averaged 81.3% and strength averaged 29.1 g/tex. Elongation averaged 8.1% and ranged from a high of 9.8% for Deltapine 1044B2RF to a low of 6.3% for FiberMax 9058F. Leaf grades were mostly 1 and 2. Color grades were mostly 21 and 31. These data indicate that substantial differences can be obtained in terms of net value/acre due to variety selection.

**Objective:** The objective of this project was to compare agronomic characteristics, yields, gin turnout, fiber quality, and economic returns of transgenic cotton varieties under dryland production in the Texas High Plains.

**Materials and Methods:**

Varieties: Americot 1532B2RF, All-Tex Epic RF, All-Tex Patriot+ RF, Deltapine 0912B2RF, Deltapine 1032B2RF, Deltapine 1044B2RF, FiberMax 1740B2F, FiberMax 9058F, FiberMax 9170B2F, FiberMax 9180B2F, NexGen 3348B2RF, NexGen 4111RF, PhytoGen 375WRF, and Stoneville 4288B2F

Experimental design: Randomized complete block with 3 replications

Seeding rate: 3.2 seeds/row-ft in solid planted 40-inch row spacing (Case IH 1200 vacuum planter)

Plot size: 4 rows by 1600 ft length

Planting date: 24-May on the flat in grain sorghum stalks

Weed management: Trifuralin was applied preplant incorporated at 1.0 qt/acre across all varieties. Two applications of Roundup OriginalMax was applied over-the-top at 22 oz/acre in June and August with AMS.

Rainfall: Based on the nearest Texas Tech University - West Texas Mesonet station at Floydada, rainfall amounts were:

| | | | |
|---|---|---|---|
| April: | 7.42 | July: | 7.30 |
| May: | 3.31 | August: | 1.01 |
| June: | 4.70 | September: | 2.09 |

Total rainfall: 25.83

Insecticides: No insecticides were applied by the producer at this site. This location is in an active boll weevil eradication zone, but no applications were made by the Texas Boll Weevil Eradication Program.

Fertilizer: Applied 25 lbs N/acre using 32-0-0 fertilizer preplant.

Harvest aids: No harvest aids were utilized at this location (left to freeze)

Harvest: Plots were harvested on 18-November using a commercial John Deere 7455 with field cleaner. Harvested material was transferred into a weigh wagon with integral electronic scales to determine individual plot weights. Plot yields were adjusted to lb/acre.

Gin turnout: Grab samples were taken by plot and ginned at the Texas AgriLife Research and Extension Center at Lubbock to determine gin turnouts.

Fiber analysis: Lint samples were submitted to the Fiber and Biopolymer Research Institute at Texas Tech University for HVI analysis, and USDA Commodity Credit Corporation (CCC) Loan values were determined for each variety by plot.

Ginning cost and seed values: Ginning costs were based on $3.00 per cwt. of bur cotton and seed value/acre was based on $175/ton. Ginning costs did not include checkoff.

Seed and technology fees: Seed and technology costs were calculated using the appropriate seeding rate (3.2 seed/row-ft) for the 40-inch row spacing and entries using the online Plains Cotton Growers Seed Cost Comparison Worksheet available at: http://www.plainscotton.org/Seed/PCGseed10.xls .

**Results and Discussion:**

Weed pressure at this site would generally be considered light and consisted mainly of silverleaf nightshade and lake weed. **Stand establishment was variable due to hot and dry conditions following planting.**

Agronomic data including plant population, nodes above white flower (NAWF), and storm resistance are included in Table 1. Stand counts taken on 16-June indicated significant differences among varieties with a test average of 21,091 plants/acre and ranged from a high of 26,435 plants/acre for FiberMax 9180B2F to a low of 16,293 plants/acre for Deltapine 1032B2RF. NAWF counts were taken on a weekly basis from 5-August to 19-August. Significant differences were observed for the 19-August date only. Test averages for the 5-August and 12-August were 6.4 and 4.2, respectively. All varieties had reached cutout (NAWF=5) by the 12-August observation. Values on 19-August ranged from a low of 1.9 for All-Tex Patriot+ RF and PhytoGen 375WRF to a high of 3.8 for Deltapine 1032B2RF and Deltapine 1044B2RF. Just prior to harvest on 18-November, a visual observation of storm resistance was recorded for each variety in all three replications. The ratings were on a scale of 1-9 where 1 represents the least storm resistance. Significant differences were observed among varieties and values ranged from a high of 7.3 (FiberMax 9058F) to a low of 2.8 (Deltapine 0912B2RF).

Significant differences were noted for all yield and most fiber quality parameters measured (Tables 2 and 3). Lint turnout ranged from 30.5% for Deltapine 1032B2RF to 27.0% for All-Tex Patriot+ RF. Bur cotton yield averaged 2049 lb/acre and ranged from a high of 2337 lb/acre for All-Tex Epic RF to a low of 1832 lb/acre for All-Tex Patriot+ RF. Lint yields varied from a low of 495 lb/acre (All-Tex Patriot+ RF) to a high of 703 lb/acre (All-Tex Epic RF). Lint loan values ranged from a low of $0.5237/lb to a high of $0.5717/lb for Deltapine 0912B2RF and FiberMax 9170B2F, respectively. After adding lint and seed value, total value/acre ranged from a low of $355.10 for All-Tex Patriot+ RF, to a high of $484.51 for All-

Tex Epic RF. When subtracting ginning, seed costs and technology fees, the net value/acre among varieties ranged from a high of $368.44 (All-Tex Epic RF) to a low of $254.18 (All-Tex Patriot+ RF), a difference of $114.26.
Micronaire values ranged from a high of 5.0 for Deltapine 0912B2RF to a low of 4.2 for FiberMax 9170B2F with a test average of 4.5. The test average staple was 35.4 and FiberMax 9058F and FiberMax 9180B2F had the highest with 36.7 while Americot 1532B2RF and Deltapine 0912B2RF had the lowest with 34.1. Uniformity averaged 81.3% with a high of 82.3% for NexGen 4111RF and a low of 80.5% for Americot 1532B2RF. Strength values ranged from a high of 32.0 g/tex for NexGen 4111RF to a low of 27.6 g/tex for PhytoGen 375WRF. Elongation averaged 8.1% and ranged from a high of 9.8% for Deltapine 1044B2RF to a low of 6.3% for FiberMax 9058F. Leaf grades were mostly 1 and 2 at this location and were not significantly different. Color grade components of Rd (reflectance) and +b (yellowness) averaged 79.7 and 8.4, respectively. This resulted in color grades of mostly 21 and 31.

These data indicate that substantial differences can be obtained in terms of net value/acre due to variety selection. Additional multi-site and multi-year applied research is needed to evaluate varieties across a series of environments.

**Acknowledgments:**

Appreciation is expressed to Mark Appling for the use of his land, equipment and labor at this location. Further assistance was provided by Dr. Jane Dever - Texas AgriLife Research and Extension Center, Lubbock, and Dr. Eric Hequet - Associate Director, Fiber and Biopolymer Research Institute, Texas Tech University. We also greatly appreciate the Texas Department of Agriculture - Food and Fiber Research for funding of HVI testing.

**Disclaimer Clause:**

Trade names of commercial products used in this report are included only for better understanding and clarity. Reference to commercial products or trade names is made with the understanding that no discrimination is intended and no endorsement by the Texas A&M System is implied. Readers should realize that results from one experiment do not represent conclusive evidence that the same response would occur where conditions vary.

Table 1. In-season plant measurement results from the dryland large plot replicated systems variety demonstration
Mark Appling Farm, Blanco, TX, 2010.

| Entry | Plant population | | Nodes Above White Flower (NAWF) for week of | | | Storm resistance |
|---|---|---|---|---|---|---|
| | 16-Jun | | 5-Aug | 12-Aug | 19-Aug | 18-Nov |
| | plants/row-ft | plants/acre | | | | rating (1-9) |
| Americot 1532B2RF | 1.5 | 19,951 | 6.9 | 4.7 | 3.0 | 3.3 |
| All-Tex Epic RF | 1.7 | 22,445 | 6.6 | 5.0 | 2.5 | 4.8 |
| All-Tex Patriot+ RF | 1.6 | 20,616 | 5.8 | 4.0 | 1.9 | 4.5 |
| Deltapine 0912B2RF | 1.4 | 17,956 | 6.4 | 3.9 | 2.2 | 2.8 |
| Deltapine 1032B2RF | 1.2 | 16,293 | 6.5 | 4.1 | 3.8 | 3.2 |
| Deltapine 1044B2RF | 1.7 | 22,113 | 7.1 | 4.2 | 3.8 | 5.5 |
| FiberMax 1740B2F | 1.4 | 18,455 | 7.0 | 4.4 | 2.5 | 5.0 |
| FiberMax 9058F | 1.6 | 20,782 | 5.9 | 4.4 | 2.5 | 7.3 |
| FiberMax 9170B2F | 1.6 | 20,949 | 6.5 | 4.3 | 2.8 | 6.7 |
| FiberMax 9180B2F | 2.0 | 26,435 | 6.0 | 4.2 | 2.3 | 7.2 |
| NexGen 3348B2RF | 1.8 | 23,110 | 6.2 | 3.3 | 2.0 | 6.2 |
| NexGen 4111RF | 1.5 | 19,619 | 6.3 | 3.7 | 2.2 | 6.2 |
| PhytoGen 375WRF | 1.8 | 23,276 | 6.1 | 3.9 | 1.9 | 4.0 |
| Stoneville 4288B2F | 1.8 | 23,276 | 6.1 | 4.3 | 2.2 | 4.2 |
| Test average | 1.6 | 21,091 | 6.4 | 4.2 | 2.5 | 5.1 |
| CV, % | 14.0 | 14.1 | 8.9 | 17.8 | 15.2 | 9.8 |
| OSL | 0.0427 | 0.0326 | 0.1603 | 0.5648 | <0.0001 | <0.0001 |
| LSD | 0.4 | 4,981 | NS | NS | 0.6 | 0.8 |

For NAWF, numbers represent an average of 10 plants per variety per rep (30 plants per variety).
For Storm resistance, ratings based on a scale of 1-9 where 9 represents maximum storm resistance.
CV - coefficient of variation.
OSL - observed significance level, or probability of a greater F value.
LSD - least significant difference at the 0.05 level, NS - not significant.

Table 2. Harvest results from the dryland large plot replicated systems variety demonstration, Mark Appling Farm, Blanco, TX, 2010.

| Entry | Lint turnout | Seed turnout | Bur cotton yield | Lint yield | Seed yield | Lint loan value | Lint value | Seed value | Total value | Ginning cost | Seed technology cost | Net value | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | -------- % -------- | | ------------- lb/acre ------------- | | | $/lb | ------------------------------------------------ $/acre --------------------------------------------------------- | | | | | | |
| All-Tex Epic RF | 30.1 | 44.4 | 2337 | 703 | 1037 | 0.5600 | 393.76 | 90.75 | 484.51 | 70.12 | 45.95 | 368.44 | a |
| Deltapine 1044B2RF | 29.2 | 44.8 | 2205 | 644 | 987 | 0.5545 | 357.06 | 86.37 | 443.43 | 66.16 | 57.16 | 320.11 | b |
| Americot 1532B2RF | 29.6 | 42.5 | 2167 | 642 | 921 | 0.5465 | 350.60 | 80.56 | 431.16 | 65.01 | 51.93 | 314.21 | bc |
| FiberMax 9170B2F | 29.9 | 45.0 | 2058 | 615 | 927 | 0.5717 | 351.38 | 81.11 | 432.49 | 61.75 | 58.08 | 312.66 | bc |
| Deltapine 1032B2RF | 30.5 | 42.7 | 2021 | 617 | 863 | 0.5692 | 351.44 | 75.48 | 426.92 | 60.64 | 58.99 | 307.29 | bc |
| NexGen 4111RF | 27.7 | 43.6 | 2139 | 592 | 933 | 0.5702 | 337.56 | 81.68 | 419.24 | 64.16 | 51.93 | 303.15 | bc |
| FiberMax 1740B2F | 30.2 | 45.0 | 2008 | 607 | 903 | 0.5577 | 338.25 | 79.04 | 417.29 | 60.24 | 58.08 | 298.98 | bc |
| FiberMax 9180B2F | 28.2 | 45.3 | 2087 | 588 | 945 | 0.5698 | 335.12 | 82.71 | 417.83 | 62.60 | 57.14 | 298.09 | bc |
| FiberMax 9058F | 27.9 | 45.0 | 2036 | 569 | 917 | 0.5692 | 323.88 | 80.23 | 404.11 | 61.09 | 50.29 | 292.72 | cd |
| NexGen 3348B2RF | 28.5 | 46.8 | 1915 | 546 | 896 | 0.5555 | 303.05 | 78.41 | 381.46 | 57.46 | 51.93 | 272.07 | de |
| Stoneville 4288B2F | 27.4 | 46.3 | 2002 | 549 | 928 | 0.5625 | 308.55 | 81.19 | 389.73 | 60.07 | 58.08 | 271.58 | de |
| PhytoGen 375WRF | 29.0 | 46.3 | 1876 | 544 | 869 | 0.5650 | 307.49 | 76.02 | 383.51 | 56.27 | 56.98 | 270.25 | de |
| Deltapine 0912B2RF | 28.9 | 43.3 | 2005 | 580 | 867 | 0.5237 | 303.60 | 75.90 | 379.50 | 60.15 | 58.99 | 260.36 | e |
| All-Tex Patriot+ RF | 27.0 | 47.1 | 1832 | 495 | 863 | 0.5647 | 279.60 | 75.50 | 355.10 | 54.97 | 45.95 | 254.18 | e |
| Test average | 28.9 | 44.9 | 2049 | 592 | 918 | 0.5600 | 331.52 | 80.35 | 411.88 | 61.48 | 54.39 | 296.01 | |
| CV, % | 4.6 | 2.3 | 4.1 | 4.1 | 4.1 | 1.2 | 4.1 | 4.1 | 4.1 | 4.1 | -- | 4.8 | |
| OSL | 0.0469 | <0.0001 | <0.0001 | <0.0001 | 0.0002 | <0.0001 | <0.0001 | 0.0002 | <0.0001 | <0.0001 | -- | <0.0001 | |
| LSD | 2.2 | 1.7 | 140 | 40 | 63 | 0.0112 | 22.57 | 5.53 | 28.09 | 4.21 | -- | 23.89 | |

For net value/acre, means within a column with the same letter are not significantly different at the 0.05 probability level.
CV - coefficient of variation.
OSL - observed significance level, or probability of a greater F value.
LSD - least significant difference at the 0.05 level.
Note: some columns may not add up due to rounding error.

Assumes:
$3.00/cwt ginning cost.
$175/ton for seed.
Value for lint based on CCC loan value from grab samples and FBRI HVI results.

Table 3. HVI fiber property results from the dryland large plot replicated systems variety demonstration Mark Appling Farm, Blanco, TX, 2010.

| Entry | Micronaire | Staple | Uniformity | Strength | Elongation | Leaf | Rd | +b | Color grade | |
|---|---|---|---|---|---|---|---|---|---|---|
| | units | $32^{nds}$ inch | % | g/tex | % | grade | reflectance | yellowness | color 1 | color 2 |
| Americot 1532B2RF | 4.5 | 34.1 | 80.5 | 28.0 | 8.1 | 1.7 | 80.1 | 8.3 | 2.0 | 1.0 |
| All-Tex Epic RF | 4.5 | 35.2 | 81.1 | 28.5 | 9.4 | 1.3 | 79.2 | 8.9 | 2.0 | 1.0 |
| All-Tex Patriot+ RF | 4.5 | 35.9 | 81.6 | 29.6 | 8.3 | 1.3 | 79.2 | 8.2 | 2.7 | 1.0 |
| Deltapine 0912B2RF | 5.0 | 34.1 | 81.3 | 28.4 | 8.7 | 1.3 | 78.9 | 8.5 | 2.7 | 1.0 |
| Deltapine 1032B2RF | 4.6 | 35.7 | 81.0 | 29.1 | 7.6 | 1.0 | 80.5 | 8.5 | 2.0 | 1.0 |
| Deltapine 1044B2RF | 4.7 | 34.6 | 81.5 | 28.7 | 9.8 | 1.3 | 79.6 | 8.5 | 2.0 | 1.0 |
| FiberMax 1740B2F | 4.5 | 35.0 | 81.1 | 28.2 | 8.0 | 1.0 | 80.0 | 8.2 | 2.3 | 1.0 |
| FiberMax 9058F | 4.4 | 36.7 | 81.3 | 29.2 | 6.3 | 1.7 | 80.4 | 8.0 | 2.0 | 1.0 |
| FiberMax 9170B2F | 4.2 | 36.3 | 81.0 | 29.9 | 7.0 | 1.3 | 81.4 | 7.9 | 2.0 | 1.0 |
| FiberMax 9180B2F | 4.5 | 36.7 | 82.5 | 30.4 | 7.4 | 1.3 | 81.1 | 7.7 | 2.3 | 1.0 |
| NexGen 3348B2RF | 4.3 | 35.2 | 81.2 | 29.4 | 7.7 | 2.3 | 78.0 | 8.5 | 3.0 | 1.0 |
| NexGen 4111RF | 4.5 | 35.6 | 82.3 | 32.0 | 8.6 | 1.0 | 78.6 | 9.0 | 2.0 | 1.0 |
| PhytoGen 375WRF | 4.5 | 35.3 | 80.9 | 27.6 | 8.3 | 1.3 | 79.4 | 8.6 | 2.0 | 1.0 |
| Stoneville 4288B2F | 4.8 | 35.3 | 80.8 | 28.4 | 8.0 | 1.3 | 79.5 | 8.7 | 2.0 | 1.0 |
| Test average | 4.5 | 35.4 | 81.3 | 29.1 | 8.1 | 1.4 | 79.7 | 8.4 | 2.2 | 1.0 |
| CV, % | 1.8 | 1.1 | 0.6 | 2.3 | 3.5 | 42.9 | 0.7 | 2.3 | -- | -- |
| OSL | <0.0001 | <0.0001 | 0.0059 | <0.0001 | <0.0001 | 0.4786 | <0.0001 | <0.0001 | -- | -- |
| LSD | 0.1 | 0.6 | 0.9 | 1.1 | 0.5 | NS | 0.9 | 0.3 | -- | -- |

CV - coefficient of variation.
OSL - observed significance level, or probability of a greater F value.
LSD - least significant difference at the 0.05 level, NS - not significant.

# Replicated Dryland RACE Variety Demonstration, Floydada, TX - 2010

**Cooperator: Gary Nixon**

**J. W. Wagner, Dustin Patman, Randy Boman, Mark Kelley and Chris Ashbrook**
**Former CEA-ANR Floyd County, EA-IPM Crosby/Floyd Counties, Extension Agronomist - Cotton, Extension Program Specialist II - Cotton, and Extension Assistant - Cotton**

**Floyd County**

**Summary:** Significant differences were observed for all yield and economic parameters measured. Lint turnout of field cleaned cotton from grab samples averaged 34.9%. Lint yields varied with a low of 638 lb/acre (NexGen 3348B2RF) and a high of 748 lb/acre (All-Tex Epic RF). Lint loan values ranged from a low of $0.5198/lb (Deltapine 1044B2RF) to a high of $0.5655/lb (FiberMax 9170B2F). When subtracting ginning, seed and technology fee costs, the net value/acre among varieties ranged from a high of $388.18 (All-Tex Epic RF) to a low of $330.78 (Deltapine 1044B2RF), a difference of $57.40. Significant differences were observed among varieties for most HVI parameters measured. Micronaire ranged from a low of 4.0 for FiberMax 9170B2F to a high of 4.7 for Stoneville 4288B2F. Staple averaged 33.9 across all varieties with a high of 35.6 for FiberMax 9170B2F and a low of 32.7 for Deltapine 1044B2RF. Percent uniformity averaged 80.2%, and strength values averaged 27.8 g/tex. Leaf grades were mostly 1 at this location and color grades of mostly 21 were observed across varieties. These data indicate that substantial differences can be obtained in terms of net value/acre due to variety and technology selection.

**Objective:** The objective of this project was to compare agronomic characteristics, yields, gin turnout, fiber quality, and economic returns of transgenic cotton varieties under no-till dryland production in the Texas High Plains

**Materials and Methods:**

| | |
|---|---|
| Varieties: | All-Tex Epic RF, Croplan Genetics 3220B2RF, Deltapine 1044B2RF, Dyna-Gro 2570B2RF, FiberMax 9170B2F, NexGen 3348B2RF, PhytoGen 375WRF, and Stoneville 4288B2F |
| Experimental design: | Randomized complete block with 3 replications. |
| Seeding rate: | 3.0 seed/row-ft in 40 inch row spacing (John Deere 1700 Vacuum planter) |
| Plot size: | 8 rows by variable length of field (1320 to 1542 feet) |
| Planting date: | 24-May |
| Weed management: | A burndown application of Roundup PowerMax at 22 oz/acre and 32 oz/acre Direx was applied the day after planting (25-May). One application of Roundup PowerMax was applied at 22 oz/acre on 24-June. This location was under no-till production and therefore, no cultivations were performed. |
| Rainfall: | Based on the nearest Texas Tech University - West Texas Mesonet station at Floydada, rainfall amounts were: |

| | | | |
|---|---|---|---|
| April: | 7.42 | July: | 7.30 |
| May: | 3.31 | August: | 1.01 |
| June: | 4.70 | September: | 2.09 |

Total rainfall: 25.83

| | |
|---|---|
| Insecticides: | No insecticides were applied by the producer at this site. This location is in an active boll weevil eradication zone, but no applications were made by the Texas Boll Weevil Eradication Program. |
| Fertilizer management: | 38 lbs N/acre were applied in July via coulter rig. |
| Harvest aids: | Harvest aids included 21 oz/acre of Prep applied by producer at this location on 21-October followed by 32 oz/acre Firestorm with 0.25% v/v non-ionic surfactant on 31-October. |
| Harvest: | Plots were harvested on 10-November using a commercial John Deere 7460 with field cleaner. Harvested material was transferred to a weigh wagon with integral electronic scales to record individual plot weights. Plot weights were subsequently converted to lb/acre basis. |

| | |
|---|---|
| Gin turnout: | Grab samples were taken by plot and ginned at the Texas AgriLife Research and Extension Center at Lubbock to determine gin turnouts. |
| Fiber analysis: | Lint samples were submitted to the Texas Tech University – Fiber and Biopolymer Research Institute for HVI analysis, and USDA Commodity Credit Corporation (CCC) loan values were determined for each variety by plot. |
| Ginning cost and seed values: | Ginning cost were based on $3.00 per cwt. of burr cotton and seed value/acre was based on $175/ton. Ginning cost did not include checkoff. |
| Seed and Technology fees: | Seed and technology costs were calculated using the appropriate seeding rate (3.0 seed/row-ft) for the 40-inch row spacing and entries using the online Plains Cotton Growers Seed Cost Comparison Worksheet available at: http://www.plainscotton.org/Seed/PCGseed10.xls . |

**Results and Discussion:**

Significant differences were observed among varieties for plant population on 16-June (Table 1). Plant stands ranged from a high of 33,584 for Dyna-Gro 2570B2RF to a low of 27,433 for NexGen 3348B2RF. Nodes above white flower (NAWF) counts were taken on 5-August, 12-August, and 19-August. Significant differences were observed among varieties on all dates. NAWF values reported represent averages from 10 plants per plot or 30 plants per variety. The test average for NAWF on 5-August was 6.9 and ranged from a high of 7.6 for All-Tex Epic RF to a low of 6.1 for Stoneville 4288B2F. On 12-August all but two varieties had reach physiological cutout (NAWF=5) and values ranged from a high of 5.8 for All-Tex Epic RF to a low of 3.6 for Stoneville 4288B2F with a test average of 4.6. All varieties had reached cutout by the 19-August observation and All-Tex Epic RF again had the highest value of 3.4 and Stoneville 4288B2F had the lowest value of 2.0. Just prior to harvest on 10-November, a visual observation for storm resistance was recorded for each variety in all three replications. The ratings were on a scale of 1-9 where 1 represents the least storm resistance. Significant differences were observed among varieties and values ranged from a high of 7.8 (NexGen 3348B2RF) to a low of 4.5 (PhytoGen 375WRF).

Significant differences were observed for all yield and economic parameters measured (Table 2). Lint turnout of field cleaned cotton from grab samples averaged 34.9%. Bur cotton yields averaged 2012 lb/acre with a high of 2102 lb/acre for Stoneville 4288B2F, and a low of 1901 lb/acre for NexGen 3348B2RF. Lint yields varied with a low of 638 lb/acre (NexGen 3348B2RF) and a high of 748 lb/acre (All-Tex Epic RF). Lint loan values ranged from a low of $0.5198/lb (Deltapine 1044B2RF) to a high of $0.5655/lb (FiberMax 9170B2F). After adding lint and seed value, total value/acre for varieties ranged from a low of $438.63 for NexGen 3348B2RF to a high of $405.42 for All-Tex Epic RF. When subtracting ginning, seed and technology fee costs, the net value/acre among varieties ranged from a high of $388.18 (All-Tex Epic RF) to a low of $330.78 (Deltapine 1044B2RF), a difference of $57.40.

Significant differences were observed among varieties for most HVI parameters measured. Micronaire ranged from a low of 4.0 for FiberMax 9170B2F to a high of 4.7 for Stoneville 4288B2F. Staple averaged 33.9 across all varieties with a high of 35.6 for FiberMax 9170B2F and a low of 32.7 for Deltapine 1044B2RF. Percent uniformity averaged 80.2%, and no significant differences were observed. Strength values averaged 27.8 g/tex with a low of 26.1 g/tex for Stoneville 4288B2F, and a high of 29.6 g/tex for FiberMax 9170B2F. Elongation averaged 8.8 with a high of 10.1 for Deltapine 1044B2RF and a low of 7.4 FiberMax 9170B2F. Leaf grades were mostly 1 at this location and color grades of mostly 21 were observed across varieties.

These data indicate that substantial differences can be obtained in terms of net value/acre due to variety and technology selection. It should be noted that no inclement weather was encountered at this location prior to harvest and therefore, no pre-harvest losses were observed. Additional multi-site and multi-year applied research is needed to evaluate varieties and technology across a series of environments.

**Acknowledgments:**

Appreciation is expressed to Gary Nixon for the use of his land, equipment and labor for this demonstration. Further assistance with this project was provided by Dr. Jane Dever - Texas AgriLife Research and Extension Center, Lubbock, and Dr. Eric Hequet - Associate Director, Fiber and Biopolymer Research Institute, Texas Tech University. Furthermore, we greatly appreciate the Texas Department of Agriculture - Food and Fiber Research for funding of HVI testing.

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Table 1. In-season plant measurement results from the dryland RACE variety demonstration, Gary Nixon Farm, Floydada, TX, 2010.

| Entry | Plant population | | Nodes Above White Flower (NAWF) for week of | | | Storm resistance |
|---|---|---|---|---|---|---|
| | 16-Jun | | 5-Aug | 12-Aug | 19-Aug | 10-Nov |
| | plants/row-ft | plants/acre | | | | rating (1-9) |
| All-Tex Epic RF | 2.4 | 31,922 | 7.6 | 5.8 | 3.4 | 6.2 |
| Croplan Genetics 3220B2RF | 2.3 | 29,428 | 6.9 | 4.6 | 3.3 | 6.2 |
| Dyna-Gro 2570B2RF | 2.6 | 33,584 | 7.0 | 4.9 | 3.1 | 6.5 |
| Deltapine 1044B2RF | 2.3 | 30,592 | 7.3 | 4.9 | 3.4 | 6.5 |
| FiberMax 9170B2F | 2.4 | 31,257 | 6.8 | 4.1 | 2.3 | 7.7 |
| NexGen 3348B2RF | 2.1 | 27,433 | 6.4 | 4.0 | 2.8 | 7.8 |
| PhytoGen 375WRF | 2.3 | 30,259 | 7.3 | 5.2 | 2.8 | 4.5 |
| Stoneville 4288B2F | 2.1 | 27,599 | 6.1 | 3.6 | 2.0 | 5.8 |
| Test average | 2.3 | 30,259 | 6.9 | 4.6 | 2.9 | 6.4 |
| CV, % | 10.3 | 10.2 | 4.6 | 8.5 | 6.5 | 6.2 |
| OSL | 0.3307 | 0.2834 | 0.0013 | 0.0002 | <0.0001 | <0.0001 |
| LSD | NS | NS | 0.6 | 0.7 | 0.3 | 0.7 |

For NAWF, numbers represent an average of 10 plants per variety per rep (30 plants per variety).
For Storm resistance, ratings based on a scale of 1-9 where 9 represents maximum storm resistance.
CV - coefficient of variation.
OSL - observed significance level, or probability of a greater F value.
LSD - least significant difference at the 0.05 level, NS - not significant.

Table 2. Harvest results from the dryland RACE variety demonstration, Gary Nixon Farm, Floydada, TX, 2010.

| Entry | Lint turnout | Seed turnout | Bur cotton yield | Lint yield | Seed yield | Lint loan value | Lint value | Seed value | Total value | Ginning cost | Seed technology cost | Net value | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | -------- % -------- | | ------------- lb/acre ------------- | | | $/lb | ------------------------------------------------ $/acre ------------------------------------------------ | | | | | | |
| All-Tex Epic RF | 37.0 | 49.0 | 2022 | 748 | 990 | 0.5418 | 405.42 | 86.60 | 492.01 | 60.65 | 43.18 | 388.18 | a |
| Croplan Genetics 3220B2RF | 36.1 | 50.1 | 2027 | 732 | 1016 | 0.5410 | 395.77 | 88.89 | 484.65 | 60.82 | 52.53 | 371.30 | b |
| Dyna-Gro 2570B2RF | 34.5 | 49.2 | 2086 | 720 | 1027 | 0.5410 | 389.51 | 89.85 | 479.36 | 62.59 | 53.38 | 363.39 | bc |
| FiberMax 9170B2F | 34.9 | 48.1 | 1949 | 680 | 937 | 0.5655 | 384.45 | 81.96 | 466.41 | 58.47 | 54.58 | 353.36 | cd |
| Stoneville 4288B2F | 33.6 | 50.9 | 2102 | 707 | 1070 | 0.5227 | 369.67 | 93.66 | 463.33 | 63.07 | 54.58 | 345.68 | de |
| PhytoGen 375WRF | 35.5 | 49.1 | 1973 | 701 | 968 | 0.5270 | 369.42 | 84.68 | 454.10 | 59.18 | 53.55 | 341.37 | de |
| NexGen 3348B2RF | 33.6 | 51.2 | 1901 | 638 | 974 | 0.5537 | 353.44 | 85.20 | 438.63 | 57.02 | 48.80 | 332.81 | e |
| Deltapine 1044B2RF | 33.8 | 49.1 | 2036 | 689 | 999 | 0.5198 | 358.13 | 87.45 | 445.58 | 61.08 | 53.72 | 330.78 | e |
| Test average | 34.9 | 49.6 | 2012 | 702 | 998 | 0.5391 | 378.23 | 87.28 | 465.51 | 60.36 | 51.79 | 353.36 | |
| CV, % | 2.4 | 1.1 | 2.2 | 2.2 | 2.2 | 2.4 | 2.2 | 2.2 | 2.2 | 2.2 | -- | 2.5 | |
| OSL | 0.0011 | <0.0001 | 0.0011 | <0.0001 | 0.0001 | 0.0103 | <0.0001 | 0.0001 | 0.0001 | 0.0011 | -- | <0.0001 | |
| LSD | 1.4 | 1.0 | 79 | 27 | 39 | 0.0230 | 14.59 | 3.41 | 17.99 | 2.35 | -- | 15.64 | |

For net value/acre, means within a column with the same letter are not significantly different at the 0.05 probability level.
CV - coefficient of variation.
OSL - observed significance level, or probability of a greater F value.
LSD - least significant difference at the 0.05 level.
Note: some columns may not add up due to rounding error.

Assumes:
$3.00/cwt ginning cost.
$175/ton for seed.
Value for lint based on CCC loan value from grab samples and FBRI HVI results.

Table 3. HVI fiber property results from the dryland RACE variety demonstration, Gary Nixon Farm, Floydada, TX, 2010.

| Entry | Micronaire | Staple | Uniformity | Strength | Elongation | Leaf | Rd | +b | Color grade | |
|---|---|---|---|---|---|---|---|---|---|---|
| | units | 32nds inch | % | g/tex | % | grade | reflectance | yellowness | color 1 | color 2 |
| All-Tex Epic RF | 4.3 | 33.8 | 80.0 | 27.9 | 9.6 | 1.0 | 79.8 | 8.9 | 2.0 | 1.0 |
| Croplan Genetics 3220B2RF | 4.5 | 33.7 | 80.2 | 27.3 | 9.3 | 1.0 | 80.9 | 8.6 | 2.0 | 1.0 |
| Dyna-Gro 2570B2RF | 4.5 | 33.9 | 81.0 | 28.0 | 9.5 | 1.0 | 80.5 | 8.6 | 2.0 | 1.0 |
| Deltapine 1044B2RF | 4.3 | 32.7 | 79.9 | 27.6 | 10.1 | 1.0 | 80.1 | 8.5 | 2.3 | 1.0 |
| FiberMax 9170B2F | 4.0 | 35.6 | 80.3 | 29.6 | 7.4 | 1.0 | 82.3 | 7.8 | 2.0 | 1.0 |
| NexGen 3348B2RF | 4.1 | 34.6 | 80.5 | 28.9 | 7.8 | 1.3 | 79.6 | 8.2 | 2.3 | 1.0 |
| PhytoGen 375WRF | 4.3 | 33.4 | 80.0 | 27.0 | 8.1 | 1.0 | 80.6 | 8.4 | 2.0 | 1.0 |
| Stoneville 4288B2F | 4.7 | 33.3 | 79.5 | 26.1 | 8.7 | 1.3 | 80.3 | 8.6 | 2.0 | 1.0 |
| Test average | 4.3 | 33.9 | 80.2 | 27.8 | 8.8 | 1.1 | 80.5 | 8.5 | 2.1 | 1.0 |
| CV, % | 2.9 | 1.3 | 0.8 | 2.6 | 3.4 | 27.6 | 0.7 | 1.6 | -- | -- |
| OSL | <0.0001 | <0.0001 | 0.3091 | 0.0014 | <0.0001 | 0.6004 | 0.0024 | <0.0001 | -- | -- |
| LSD | 0.2 | 0.8 | NS | 1.3 | 0.5 | NS | 1.0 | 0.2 | -- | -- |

CV - coefficient of variation.

OSL - observed significance level, or probability of a greater F value.

LSD - least significant difference at the 0.05 level, NS - not significant.

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# Replicated Sub-Surface Drip Irrigated RACE Variety Demonstration, Ralls, TX - 2010

## Cooperator: David Crump

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**Summary:** Significant differences were observed for all yield and economic parameters measured with exception of lint loan value. Lint turnout ranged from a low of 30.2% to a high of 34.9% for Croplan Genetics 3220B2RF and Deltapine 1032B2RF, respectively. Lint yields varied with a low of 1047 lb/acre (Croplan Genetics 3220B2RF) and a high of 1389 lb/acre (Deltapine 1032B2RF). When subtracting ginning, seed and technology fee costs, the net value/acre among varieties ranged from a high of $776.98 (Deltapine 1032B2RF) to a low of $597.33 (Croplan Genetics 3220B2RF), a difference of $179.65. Fiber quality data indicated significant differences among varieties for some parameters measured. No significant differences were observed among varieties for micronaire (3.8 average), staple (36.1 32$^{nd}$ inch average) or uniformity (80.3% average). Strength values averaged 29.2 g/tex with a high of 30.5 g/tex for NexGen 3348B2RF and a low of 27.6 g/tex for All-Tex Apex B2RF. Elongation averaged 8.3% and ranged from a high of 9.1% for Dyna-Gro 2570B2RF to a low of 7.6 for NexGen 3348B2RF. Significant differences were observed among varieties for leaf (1.7 avg), Rd or reflectance (78.9 avg), and +b or yellowness (9.0 avg). Color grades of mostly 21 and 31 were observed at this location. These data indicate that substantial differences can be obtained in terms of net value/acre due to variety and technology selection.

**Objective:** The objective of this project was to compare agronomic characteristics, yields, gin turnout, fiber quality, and economic returns of transgenic cotton varieties under sub-surface drip irrigated production in the Texas High Plains.

**Materials and Methods:**

Varieties: All-Tex Apex B2RF, Croplan Genetics 3220B2RF, Deltapine 1032B2RF, Dyna-Gro 2570B2RF, FiberMax 1740B2F, NexGen 3348B2RF, PhytoGen 367WRF, and Stoneville 4288B2F

Experimental design: Randomized complete block with 3 replications

Seeding rate: 3.5 seeds/row-ft in 40-inch row spacing (John Deere 1700 vacuum planter)

Plot size: 8 rows by length of field (~1626 ft long)

Planting date: 21-May

Weed management: A burndown application of glyphosate at 40 oz/acre was applied prior to planting on 26-April. Glyphosate was applied during the growing season at 40 oz/acre with 1 pt/acre Barron (non-ionic surfactant) and 2 qts/acre Duke (ammonium sulfate) on 27-May, 6-June, and 8-Aug. One cultivation was conducted on 16-June for weed escapes and volunteer Roundup Ready Flex cotton.

Irrigation: The field had a 4 gpm/acre irrigation capacity. This provided for 0.21 acre-inches/day. From 15-May to 15-September (shut down for 2 weeks in July due to rainfall), a total of approximately 22.9 inches of irrigation were applied.

Rainfall: Based on the nearest Texas Tech University- West Texas Mesonet station at Ralls, Rainfall amounts were:

| | | | |
|---|---|---|---|
| April: | 4.29 | July: | 8.47 |
| May: | 1.17 | August: | 0.32 |
| June: | 1.85 | September: | 0.51 |

Total rainfall: 16.71

Insecticides: No insecticides were applied by the producer at this site. This location is in an active boll weevil eradication zone, but no applications were made by the Texas Boll Weevil Eradication Program.

Fertilizer management: 60 lbs N/acre was applied using composted manure in February, and 60 lbs N/acre using 28-0-0 was applied via fertigation during the growing season.

| | |
|---|---|
| Harvest aids: | Harvest aids included 1 qt/acre of ethephon and 1 oz/acre Aim applied by producer at this location on 4-October followed by 24 oz/acre Gramoxone Inteon with 0.25% v/v non-ionic surfactant on 24-November. |
| Harvest: | Plots were harvested on 28-October using a commercial John Deere 7460 with field cleaner. Harvested material was transferred to a weigh wagon with integral electronic scales to record individual plot weights. Plot weights were subsequently converted to lb/acre basis. |
| Gin turnout: | Grab samples were taken by plot and ginned at the Texas AgriLife Research and Extension Center at Lubbock to determine gin turnouts. |
| Fiber analysis: | Lint samples were submitted to the Texas Tech University - Fiber and Biopolymer Research Institute for HVI analysis, and USDA Commodity Credit Corporation (CCC) loan values were determined for each variety by plot. |
| Ginning cost and seed values: | Ginning costs were based on $3.00 per cwt. of bur cotton and seed value/acre was based on $175/ton. Ginning costs did not include checkoff. |
| Seed and technology fees: | Seed and technology costs were calculated using the appropriate seeding rate (3.5 seed/row-ft) for the 40-inch row spacing and entries using the online Plains Cotton Growers Seed Cost Comparison Worksheet available at: http://www.plainscotton.org/Seed/PCGseed10.xls . |

**Results and Discussion:**

Significant differences were observed among varieties for plant population on 11-June (Table 1). Plant stands averaged 36,896 plants/acre and ranged from a high of 41,500 plants/acre for Dyna-Gro 2570B2RF to a low of 30,500 for Deltapine 1032B2RF. Nodes above white flower (NAWF) counts were taken on a weekly basis beginning 23-July to 12-August. Significant differences were observed among varieties for 6-August (alpha=0.10) and 12-August observation dates only. On 23-July, NAWF values averaged 6.9. The test average on 30-July was 5.0. By 6-August all varieties had reached cutout (NAWF=5) and values ranged from a high of 4.9 for Dyna-Gro 2570B2RF to a low of 4.2 for PhytoGen 367WRF. On 12-August, values ranged from a high of 4.9 (FiberMax 1740B2F) to a low of 3.7 (PhytoGen 367WRF). Just prior to harvest on 28-October, a visual observation of storm resistance was recorded for each variety in all three replications. The ratings were on a scale of 1-9 where 1 represents the least storm resistance. Significant differences were observed among varieties and values ranged from a high of 7.3 (NexGen 3348B2RF) to a low of 3.5 (Stoneville 4288B2F).

Significant differences were observed for all yield and economic parameters measured with exception of lint loan value (Table 2). Lint turnout ranged from a low of 30.2% to a high of 34.9% for Croplan Genetics 3220B2RF and Deltapine 1032B2RF, respectively. Bur cotton yields averaged 3723 lb/acre with a high of 3978 lb/acre for Deltapine 1032B2RF, to a low of 3469 lb/acre for Croplan Genetics 3220B2RF. Lint yields varied with a low of 1047 lb/acre (Croplan Genetics 3220B2RF) and a high of 1389 lb/acre (Deltapine 1032B2RF). Lint loan values averaged $0.5622/lb and were not significantly different. After adding lint and seed value, total value/acre for varieties ranged from a low of $762.69 for Croplan Genetics 3220B2RF to a high of $960.99 for Deltapine 1032B2RF. When subtracting ginning, seed and technology fee costs, the net value/acre among varieties ranged from a high of $776.98 (Deltapine 1032B2RF) to a low of $597.33 (Croplan Genetics 3220B2RF), a difference of $179.65. Fiber quality data indicated significant differences among varieties for some parameters measured (Table 3.)

No significant differences were observed among varieties for micronaire (3.8 average), staple (36.1 32$^{nd}$ inch average) or uniformity (80.3% average). Strength values averaged 29.2 g/tex with a high of 30.5 g/tex for NexGen 3348B2RF and a low of 27.6 g/tex for All-Tex Apex B2RF. Elongation averaged 8.3% and ranged from a high of 9.1% for Dyna-Gro 2570B2RF to a low of 7.6 for NexGen 3348B2RF. Significant differences were observed among varieties for leaf (1.7 avg), Rd or reflectance (78.9 avg), and +b or yellowness (9.0 avg). Color grades of mostly 21 and 31 were observed at this location.

These data indicate that substantial differences can be obtained in terms of net value/acre due to variety and technology selection. It should be noted that inclement weather was encountered at this location prior to harvest; however, minimal pre-harvest losses were observed for less storm resistant varieties. Additional multi-site and multi-year applied research is needed to evaluate varieties and technology across a series of environments.

**Acknowledgments:**

Appreciation is expressed to David Crump for the use of his land, equipment and labor for this demonstration. Further assistance with this project was provided by Dr. Jane Dever - Texas AgriLife Research and Extension Center, Lubbock, and Dr. Eric Hequet - Associate Director, Fiber and Biopolymer Research Institute, Texas Tech University. Furthermore, we greatly appreciate the Texas Department of Agriculture - Food and Fiber Research for funding of HVI testing.

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**Table 1. In-season plant measurement results from the subsurface drip irrigated RACE variety demonstration David Crump Farm, Ralls, TX, 2010.**

| Entry | Plant population | | Nodes Above White Flower (NAWF) for week of | | | | Storm resistance |
|---|---|---|---|---|---|---|---|
| | 11-Jun | | 23-Jul | 30-Jul | 6-Aug | 12-Aug | 28-Oct |
| | plants/row-ft | plants/acre | | | | | rating (1-9) |
| All-Tex Apex B2RF | 2.9 | 38,500 | 7.0 | 5.0 | 4.7 | 4.3 | 5.2 |
| Croplan Genetics 3220B2RF | 2.7 | 35,833 | 6.8 | 5.1 | 4.7 | 4.0 | 4.3 |
| Dyna-Gro 2570B2RF | 3.2 | 41,500 | 7.0 | 5.1 | 4.9 | 4.4 | 5.0 |
| Deltapine 1032B2RF | 2.3 | 30,500 | 6.9 | 5.0 | 4.8 | 4.6 | 4.8 |
| FiberMax 1740B2F | 3.1 | 40,667 | 6.9 | 5.0 | 4.8 | 4.9 | 5.7 |
| NexGen 3348B2RF | 2.7 | 34,833 | 7.1 | 5.0 | 4.4 | 3.9 | 7.3 |
| PhytoGen 367WRF | 3.1 | 40,167 | 6.7 | 4.9 | 4.2 | 3.7 | 4.5 |
| Stoneville 4288B2F | 2.5 | 33,167 | 7.0 | 4.9 | 4.5 | 3.9 | 3.5 |
| Test average | 2.8 | 36,896 | 6.9 | 5.0 | 4.6 | 4.2 | 5.0 |
| CV, % | 10.6 | 10.9 | 3.4 | 3.5 | 6.2 | 9.3 | 7.1 |
| OSL | 0.0362 | 0.0433 | 0.7318 | 0.5418 | 0.0995† | 0.0231 | <0.0001 |
| LSD | 0.5 | 7,039 | NS | NS | 0.4 | 0.6869 | 0.6 |

For NAWF, numbers represent an average of 10 plants per variety per rep (30 plants per variety).

For Storm resistance, ratings based on a scale of 1-9 where 9 represents maximum storm resistance.

CV - coefficient of variation.

OSL - observed significance level, or probability of a greater F value.

LSD - least significant difference at the 0.05 level, †indicates significance at the 0.10 level, NS - not significant.

**Table 2. Harvest results from the subsurface drip irrigated RACE variety demonstration, David Crump Farm, Ralls, TX, 2010.**

| Entry | Lint turnout | Seed turnout | Bur cotton yield | Lint yield | Seed yield | Lint loan value | Lint value | Seed value | Total value | Ginning cost | Seed technology cost | Net value | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | -------- % -------- | | ------------- lb/acre ------------- | | | $/lb | ---------------------------------------------- $/acre -------------------------------- | | | | | | |
| Deltapine 1032B2RF | 34.9 | 48.9 | 3978 | 1389 | 1945 | 0.5692 | 790.80 | 170.19 | 960.99 | 119.33 | 64.67 | 776.98 | a |
| Dyna-Gro 2570B2RF | 34.7 | 53.2 | 3968 | 1377 | 2113 | 0.5563 | 765.89 | 184.87 | 950.75 | 119.05 | 62.28 | 769.43 | a |
| PhytoGen 367WRF | 32.4 | 49.6 | 3814 | 1235 | 1891 | 0.5693 | 702.86 | 165.48 | 868.35 | 114.43 | 62.47 | 691.45 | b |
| FiberMax 1740B2F | 33.1 | 52.0 | 3670 | 1215 | 1907 | 0.5668 | 688.51 | 166.86 | 855.36 | 110.11 | 63.68 | 681.58 | bc |
| All-Tex Apex B2RF | 31.2 | 52.5 | 3619 | 1128 | 1902 | 0.5688 | 641.74 | 166.38 | 808.12 | 108.58 | 57.89 | 641.66 | cd |
| Stoneville 4288B2F | 31.4 | 54.7 | 3625 | 1137 | 1981 | 0.5565 | 632.69 | 173.37 | 806.06 | 108.76 | 63.68 | 633.63 | d |
| NexGen 3348B2RF | 30.8 | 54.9 | 3641 | 1120 | 2000 | 0.5395 | 604.00 | 175.01 | 779.01 | 109.22 | 56.93 | 612.86 | d |
| Croplan Genetics 3220B2RF | 30.2 | 54.3 | 3469 | 1047 | 1885 | 0.5710 | 597.80 | 164.89 | 762.69 | 104.08 | 61.29 | 597.33 | d |
| Test average | 32.3 | 52.5 | 3723 | 1206 | 1953 | 0.5622 | 678.04 | 170.88 | 848.92 | 111.69 | 61.61 | 675.61 | |
| CV, % | 4.0 | 1.9 | 3.7 | 3.6 | 3.7 | 1.9 | 3.7 | 3.7 | 3.7 | 3.7 | -- | 4.0 | |
| OSL | 0.0027 | <0.0001 | 0.0046 | <0.0001 | 0.0234 | 0.0318 | <0.0001 | 0.0234 | <0.0001 | 0.0046 | -- | <0.0001 | |
| LSD | 2.3 | 1.8 | 241 | 77 | 126 | 0.0185 | 43.40 | 11.07 | 54.41 | 7.24 | -- | 47.18 | |

For net value/acre, means within a column with the same letter are not significantly different at the 0.05 probability level.
CV - coefficient of variation.
OSL - observed significance level, or probability of a greater F value.
LSD - least significant difference at the 0.05 level.
Note: some columns may not add up due to rounding error.
Assumes:
$3.00/cwt ginning cost.
$175/ton for seed.
Value for lint based on CCC loan value from grab samples and FBRI HVI results.

Table 3. HVI fiber property results from the subsurface drip irrigated RACE variety demonstration, David Crump Farm, Ralls, TX, 2010.

| Entry | Micronaire | Staple | Uniformity | Strength | Elongation | Leaf | Rd | +b | Color grade | |
|---|---|---|---|---|---|---|---|---|---|---|
| | units | $32^{nds}$ inch | % | g/tex | % | grade | reflectance | yellowness | color 1 | color 2 |
| All-Tex Apex B2RF | 3.8 | 36.5 | 80.3 | 27.6 | 8.2 | 1.7 | 78.7 | 9.3 | 2.0 | 1.0 |
| Croplan Genetics 3220B2RF | 3.6 | 36.5 | 80.5 | 30.3 | 8.5 | 1.0 | 79.4 | 9.1 | 2.0 | 1.0 |
| Dyna-Gro 2570B2RF | 3.8 | 35.7 | 79.9 | 29.4 | 9.1 | 1.7 | 78.6 | 8.9 | 2.3 | 1.0 |
| Deltapine 1032B2RF | 4.0 | 36.6 | 80.3 | 29.0 | 7.8 | 1.0 | 80.0 | 8.9 | 2.0 | 1.0 |
| FiberMax 1740B2F | 4.0 | 35.8 | 80.3 | 29.1 | 7.8 | 1.3 | 80.4 | 8.8 | 1.7 | 1.0 |
| NexGen 3348B2RF | 3.4 | 36.4 | 81.1 | 30.5 | 7.6 | 3.3 | 78.2 | 8.5 | 3.0 | 1.0 |
| PhytoGen 367WRF | 3.9 | 36.4 | 80.8 | 30.0 | 8.7 | 2.0 | 77.5 | 9.4 | 2.0 | 1.0 |
| Stoneville 4288B2F | 4.0 | 35.1 | 79.5 | 28.1 | 8.6 | 1.7 | 78.5 | 9.0 | 2.3 | 1.0 |
| Test average | 3.8 | 36.1 | 80.3 | 29.2 | 8.3 | 1.7 | 78.9 | 9.0 | 2.2 | 1.0 |
| CV, % | 6.6 | 1.8 | 0.9 | 2.4 | 3.2 | 42.1 | 0.8 | 1.8 | -- | -- |
| OSL | 0.1182 | 0.1375 | 0.2263 | 0.0016 | <0.0001 | 0.0302 | 0.0008 | 0.0004 | -- | -- |
| LSD | NS | NS | NS | 1.2 | 0.5 | 1.3 | 1.1 | 0.3 | -- | -- |

CV - coefficient of variation.
OSL - observed significance level, or probability of a greater F value.
LSD - least significant difference at the 0.05 level, NS - not significant.