# EVALUATION OF COTTON VARIETIES FOR THRIPS RESISTANCE

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## RESEARCH PROBLEM

Host plant resistance to thrips in cotton has the potential to reduce input costs for producers. Two trials were conducted in Keiser and Marianna, Arkansas, to evaluate several cotton varieties for thrips resistance.

## BACKGROUND INFORMATION

Thrips infest approximately 85% of U.S. cotton annually (Williams, 2001); however, crop damage sustained from this pest differs from year to year with respect to economic severity. As a result, most cotton producers utilize in-furrow insecticides or seed treatments at a cost of $10 to 15 per acre as an insurance policy against thrips infestation.

While the presence of thrips has been observed throughout the cotton growing season (Leigh, 1995), the cotton plant is most vulnerable during the seedling stage. Thrips feed on the terminal area, disrupting normal plant growth. Early-season thrips injury will certainly affect the plant throughout its life cycle. Cotton plant responses to thrips feeding include pre-bloom square loss, reduced leaf area, poor root development, delayed crop maturity, and decreased lint yield (Johnson et al., 1996; Roberts and Rechel, 1996; Hawkins et al., 1966; Cater et al., 1989; Fairbanks et al., 2000).

Morphological and physiological traits have allowed some cotton cultivars to establish a level of tolerance to thrips damage; however, these traits are not present in common varieties (Jenkins, 1994). Older cotton varieties such as Empire have genetic backgrounds indicating thrips resistance (Tugwell and Waddell, 1964; Hawkins et al., 1966). Other research has indicated no differences in growth or yield for certain variet-

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ies with respect to thrips treatment (Sadras and Wilson, 1988; Fairbanks et al., 2000). The mechanism for thrips resistance in the older cultivars must be fully understood before the implementation into common cotton varieties is achieved.

The objective of this research was to evaluate the potential resistance to thrips damage for several cotton cultivars by observing growth and yield responses to a thrips seed treatment.

## RESEARCH DESCRIPTION

Eighteen cotton varieties (Tables 1 and 2) were planted at the University of Arkansas Northeast Research and Extension Center in Keiser, AR, on 10 May and at the Cotton Branch Station in Marianna on 14 May. Plots consisted of two 38-inch rows 35 ft. in length arranged in a randomized complete block design with four replications. Each variety was subjected to two treatments prior to planting: Gaucho seed treatment and untreated. Visual damage ratings were recorded on a scale of one (low damage) to ten (high damage) on 29 May, 12 June, and 19 June. Thrips evaluations were made at both locations on 29 May, 5 June, 12 June, and 19 June by randomly selecting five plants from each plot. Each plant was cut and immediately placed into a mason jar containing 70% ethyl alcohol. In the laboratory, thrips were rinsed from the plants with alcohol. To separate thrips from the alcohol, rinsate was poured onto a coffee filter lining the inside of a Buchner funnel. A vacuum pump was used to quickly evacuate the alcohol leaving the thrips on the coffee filter. The thrips on the coffee filter were rinsed with alcohol into a petri dish. Immature and adult thrips were then visually counted using a dissecting microscope. All plots at both locations were harvested with a commercial cotton picker. The cotton was weighed and lint yield was determined based upon a 36% gin turnout. All data were processed using Agriculture Research Manager Ver. 6.0.1 and analyzed via ANOVA and LSD (P = 0.05).

## RESULTS AND DISCUSSION

In 2001, thrips pressure was substantially lower at Keiser than at Marianna (Tables 1 and 2). The Gaucho seed treatment was effective in decreasing the number of thrips present on all varieties at both locations. The difference in treatments was more evident at the Marianna location due to increased thrips pressure.

At Marianna, Gaucho was effective in reducing the number of thrips observed throughout the season for all varieties (Table1). Two varieties, St 474 and DP 428 B, actually had higher thrips numbers with the Gaucho treatment, while all others were lower (Table 2). Although thrips pressure was higher at Marianna, average thrips damage ratings were higher at Keiser, possibly due to environmental differences between locations. As with total number of thrips observed, the Gaucho treated varieties had lower visual damage ratings for most varieties. Little difference in damage rating

between the untreated and Gaucho treatments was observed with DP 428 B at Keiser and Asiatic A1 49 at both locations. These varieties were the only ones to exhibit possible thrips resistance characteristics from a visual damage-rating standpoint.

The yield data for the untreated and Gaucho treatments was subjected to regression analysis to further evaluate the yield response of the varieties. Figures 1 and 2 display the results for Marianna and Keiser, respectively. Data points that fall on the regression trendline had equal yields between untreated and Gaucho treatments. Data points above the regression line represent varieties that had greater yields with the untreated treatment, while those points below had greater yields with Gaucho.

As expected, the older cotton varieties seemed to display more consistent thrips resistance characteristics across both locations. Coker 100A, Auburn 56, and Asiatic A1 49 had similar yields at both locations. Although Empire WR61 has historically exhibited thrips resistance potential, difference in yield at Keiser was 106 lb/acre while no yield difference was observed at Marianna. The modern variety DP 428 B exhibited thrips resistance potential at both locations with respect to yield and thrips damage rating. At Keiser, no yield difference was observed between treatments for three experimental varieties: 9101-97-09, 9108-23-05, and 9111-57-20. Variety 9108-04-17 had similar yields between treatments at Marianna; however, no experimental line was consistent with respect to thrips resistance potential in this study.

## PRACTICAL APPLICATION

Thrips host plant resistance is a distinct possibility, particularly in older cotton varieties. The modern variety DP 428 B indicated resistance potential in this study along with older, less common varieties. Older varieties Coker 100A, Auburn 56, and Asiatic A1 49 exhibited resistance characteristics at both locations. DP 428 B was the only current variety to indicate resistance potential from both damage rating and yield parameters. Further evaluation of these varieties is necessary to pinpoint genetic characteristics that provide the resistance mechanism. Utilizing host plant resistance can reduce dependence on thrips insecticides, resulting in fewer inputs and reducing environmental impact.

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**Table 1. Evaluation of cotton cultivars for thrips resistance, Marianna, AR, 2001.**

| | Total seasonal thrips[z] | | Thrips damage rating[y] | | Lint yield | |
|---|---|---|---|---|---|---|
| Variety | Untreated | Gaucho | Untreated | Gaucho | Untreated | Gaucho |
| | | | | | ----- (lb/acre) ----- | |
| 9101-97-09 | 139.3 | 65.3 | 3.8 | 1.7 | 884 | 954 |
| 9101-97-10 | 177.5 | 81.0 | 4.1 | 1.8 | 848 | 1008 |
| 9108-04-17u | 204.0 | 69.8 | 4.4 | 1.8 | 1183 | 1111 |
| 9108-23-03 | 173.0 | 70.8 | 4.5 | 2.1 | 879 | 934 |
| 9108-23-05 | 158.5 | 70.3 | 4.6 | 2.3 | 1023 | 1154 |
| 9111-57-12 | 121.5 | 71.3 | 4.6 | 2.3 | 769 | 905 |
| 9111-57-20 | 178.8 | 65.0 | 4.3 | 2.0 | 836 | 949 |
| Ark 8712 | 165.5 | 58.8 | 4.3 | 2.3 | 1053 | 1051 |
| St 474 | 176.3 | 40.0 | 4.8 | 2.5 | 782 | 870 |
| PM 1560 BG | 165.3 | 76.0 | 3.9 | 2.5 | 652 | 753 |
| SG 105 | 164.0 | 51.3 | 3.9 | 2.1 | 793 | 929 |
| DP NuCotn 33B | 103.0 | 33.8 | 4.7 | 2.2 | 674 | 788 |
| DP 428 B | 136.0 | 86.8 | 4.2 | 2.0 | 938 | 939 |
| Coker 100A | 193.8 | 37.3 | 3.8 | 1.9 | 616 | 666 |
| Rex | 193.8 | 59.3 | 3.6 | 1.8 | 708 | 776 |
| Auburn 56 | 163.8 | 62.0 | 4.3 | 1.8 | 575 | 583 |
| Empire WR61 | 152.3 | 84.8 | 3.4 | 1.8 | 628 | 635 |
| Asiatic A1 49 | 94.5 | 54.8 | 1.2 | 1.1 | 146 | 174 |
| LSD (P=0.05) | 70.1 | | 0.6 | | 133.4 | |

[z] Total number from five plants per plot at four sampling dates.

[y] Visual damage rating average: 1 (low damage) to 10 (high damage).

**Table 2. Evaluation of cotton cultivars for thrips resistance, Keiser, AR, 2001.**

| | Total seasonal thrips[z] | | Thrips damage rating[y] | | Lint yield | |
|---|---|---|---|---|---|---|
| Variety | Untreated | Gaucho | Untreated | Gaucho | Untreated | Gaucho |
| | | | | | ----- (lb/acre) ----- | |
| 9101-97-09 | 59.5 | 35.0 | 5.4 | 1.9 | 1015 | 938 |
| 9101-97-10 | 47.0 | 33.5 | 5.5 | 1.4 | 948 | 1064 |
| 9108-04-17 | 56.5 | 19.3 | 6.0 | 1.8 | 1015 | 1207 |
| 9108-23-03 | 55.8 | 9.0 | 5.8 | 1.4 | 879 | 918 |
| 9108-23-05 | 59.8 | 31.8 | 5.4 | 3.3 | 1009 | 968 |
| 9111-57-12 | 47.8 | 35.0 | 5.5 | 2.4 | 892 | 925 |
| 9111-57-20 | 60.0 | 38.8 | 5.9 | 3.6 | 937 | 913 |
| Ark 8712 | 66.3 | 28.8 | 5.5 | 2.6 | 918 | 1052 |
| St 474 | 58.0 | 62.0 | 6.0 | 3.5 | 764 | 785 |
| PM 1560 BG | 46.5 | 24.0 | 6.1 | 3.5 | 840 | 830 |
| SG 105 | 63.8 | 24.8 | 5.1 | 3.0 | 929 | 1070 |
| DP NuCotn 33B | 64.5 | 29.8 | 5.6 | 2.4 | 896 | 925 |
| DP 428 B | 43.0 | 56.3 | 4.1 | 3.5 | 937 | 936 |
| Coker 100A | 57.3 | 36.3 | 4.6 | 2.8 | 891 | 871 |
| Rex | 54.3 | 39.0 | 3.9 | 2.6 | 847 | 872 |
| Auburn 56 | 88.8 | 52.3 | 6.3 | 2.8 | 730 | 725 |
| Empire WR61 | 63.3 | 29.8 | 4.0 | 1.5 | 686 | 792 |
| Asiatic A1 49 | 45.3 | 19.5 | 2.6 | 1.8 | 347 | 347 |
| LSD (P=0.05) | 34.5 | 1.5 | 172.8 | | | |

[z] Total number from five plants per plot at four sampling dates.
[y] Visual damage rating average: 1 (low damage) to 10 (high damage).

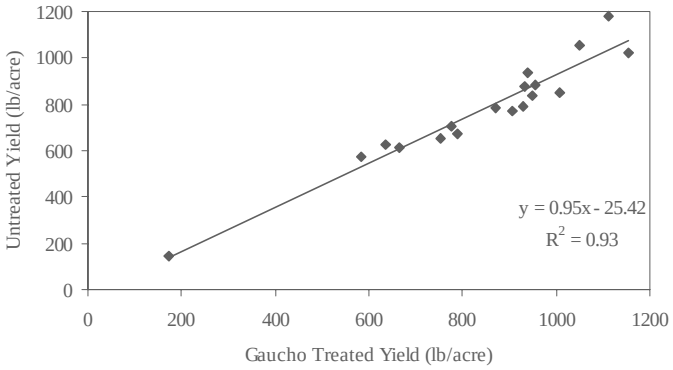


**Fig. 1. Lint yield comparison of untreated and Gaucho-treated cotton varieties, Marianna, AR. 2001.**

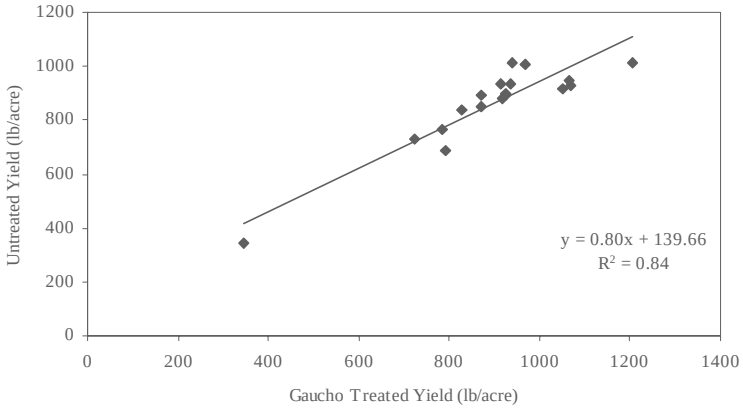


**Fig. 2. Lint yield comparison of untreated and Gaucho-treated cotton varieties, Keiser, AR. 2001.**