EVALUATION OF THRYVON TECHNOLOGY FOR CONTROL OF THRIPS AND TARNISHED PLANT BUGS IN COTTON

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Abstract

Tobacco thrips and tarnished plant bug (TPB) are two of the most important pests in mid-south cotton production. Thrips are a pest in seedling cotton, feeding on the leaf tissue of plants which can result in stunted growth, delayed fruiting, loss of apical dominance and possible stand loss. TPB is considered the number one insect pest of cotton causing square loss, deformed flowers, and damaged bolls ultimately reducing yield. TPB are difficult to control and growers average 4-6 insecticide applications per year. Field studies were conducted in 2021 to evaluate Thryvon, a new transgenic trait in cotton that produces the *B*t toxin, Cry51Aa. Management strategies for thrips and tarnished plant bugs were evaluated to determine the benefit Thryvon will provide growers. When a choice test was conducted on thrips, a behavioral response was observed Thrips preferred to feed on the non-Thryvon cotton over the Thryvon cotton. For thrips, Thryvon was tested across two locations which showed as good or better control than an insecticide-based approach. Thryvon cotton required fewer insecticide applications to adequately control TPB when compared to the non-Thryvon cotton. Based on our standard threshold, Thryvon required 2 applications for plant bugs compared to 5 in non-Thryvon. Yields showed that no differences were present between the sprayed and unsprayed Thryvon plots and both were better than the unsprayed nonthryvon. Results from this study indicate that Thryvon will be a valuable tool in controlling both thrips and TPB.

Introduction

Tobacco thrips, *Frankiella fusca,* are the most important pest of seedling cotton in Arkansas. Feeding injury on cotton seedlings can result in ragged and crinkled leaves, silver or whitish appearance, and size of the first true leaf can be greatly reduced. In Arkansas, cotton producers will typically use an Insecticide seed treatment for control of tobacco thrips. Tarnished plant bug (TPB), *Lygus lineolaris*, will typically feed on cotton terminals, squares, blooms, and bolls, causing a reduction of overall lint yield as well as lint quality. Arkansas cotton producers typically make 4-6 insecticide applications to control tarnished plant bug making it the number one insect pest of cotton. Multiple insecticide applications become very expensive for the producers. Mid-south cotton producers are seeking alternative methods of control that offer season long protection. Thryvon technology is the first cotton biotech trait that will provide season long protection against tarnished plant bug and thrips species and may help reduce the need for some insecticide applications. Thryvon technology is also stacked with Bollgard 3 XtendFlex technology offering protection against bollworm, tobacco bud worm, other common worm pests and is tolerant to glyphosate, glufosinate, and dicamba. Currently, researchers have established an action threshold of 2-5 thrips per plant with damage present for thrips management, and for plant bugs it is 3 total plant bugs per 5 row feet. The objectives of this study were to evaluate Thryvon technology for control of tobacco thrips and determine if thresholds for tarnished plant bugs will need to be changed.

Methods

Thrips Evaluation

A thrips choice test was conducted in 2021 at the Lonoke Extension office, Lonoke, AR. Five Thryvon seedlings and five non-Thryvon seedlings were randomly placed inside of a 2 ft. x 1 ft. x 1 ft. cage with five cages per rep. This trial was replicated 8 times. Fifty adult tobacco thrips were placed in each cage and after 24 hours seedlings were separated and placed in a jar of ethanol. Samples were washed and filtered, and thrips were counted using a dissection microscope. A thrips field evaluation was conducted in 2021 at two locations, the Lon Mann research center located in Marianna, Arkansas and in Tillar, AR. The Plot size was 37.5 ft. (12 rows) by 600 ft. Samples were collected at 2 to 3 true leaf in a jar with 70% alcohol solution and 4 samples were taken per plot (5 plants per sample). An additional thrips field evaluation was conducted in 2021 at the Lon Mann Cotton Research Center located in Marianna, Arkansas. Plot sizes were 25 ft. (8 rows) by 300 ft. The four treatments included Untreated non-Thryvon, Untreated Thryvon, insecticide seed treated non-Thryvon and Thryvon. Samples were collected in a jar with 70% alcohol solution and 4 samples were taken per plot (5 plants per sample).

Tarnished Plant Bug Evaluation

A TPB study was conducted in 2021 at two locations, the Lon Mann research Center located in Marianna, AR and in Tillar, AR. Plot sizes were 12.5 ft. (4 rows) by 50 ft. Samples were taken with a 2.5 ft drop cloth and 2 samples were taken per plot for a total of 10 row ft per plot. Treatment Thresholds included untreated check, 6 per 10 row ft. of any size (current threshold), 6 Large nymphs per 10 row ft., 12 per 10 row ft. of any size (2x threshold), 12 large nymphs per 10 row ft., and 18 per 10 row ft. of any size (3x threshold). Plots were scouted twice per week. When target threshold was met, a mudmaster was used to apply 1.75 oz. of Transform. Data was processed using Agriculture Research Manager Version 10, AOV, and Duncan's New Multiple Range Test (P=0.10) to separate means.

Results

Thrips Evaluation

When a choice test was conducted, thrips preferred non-Thryvon cotton over Thryvon (Figure 1). During field evaluations, non-Thryvon seedlings showed a higher number of thrips when compared to Thryvon seedlings (Figure 2 and 3). When comparing insecticide seed treated Thryvon to untreated Thryvon, there was no significant difference between the number of thrips on the cotton seedlings, and both treated and untreated Thryvon performed better than non-Thryvon (Figure 4).

Tarnished Plant Bug Evaluation

Thryvon plots receiving an insecticide application consistently increased square retention, staying well above the target threshold of 80% square retention while non-Thryvon remained below the 80% square retention threshold (Figure 5 and 6). Across both locations, the need for insecticide applications was greatly reduced in all of the Thryvon plots when compared to non-Thryvon plots (Table 1). Yield showed that sprayed and unsprayed Thryvon plots yielded consistently better than non-Thryvon plots (Figure 7). Thryvon will be a valuable tool in controlling both thrips and TPB.

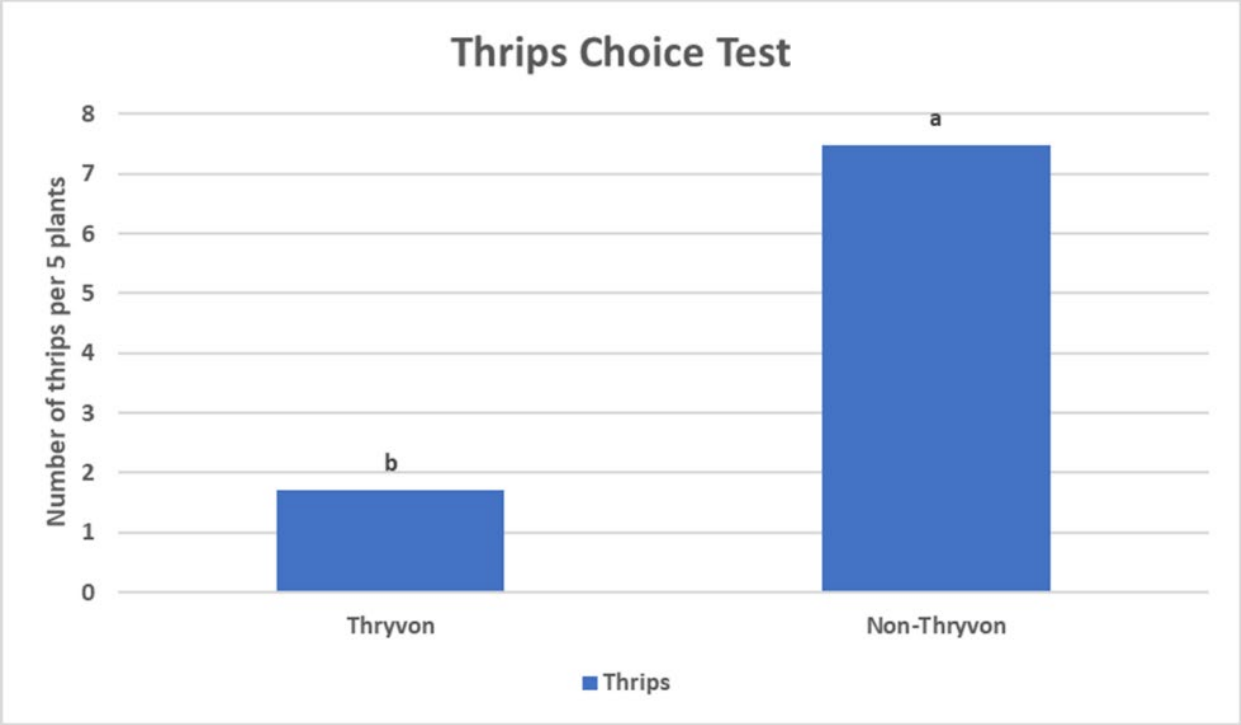

Figure 1. Results from a thrips choice assay comparing Thryvon and non-Thryvon cotton.

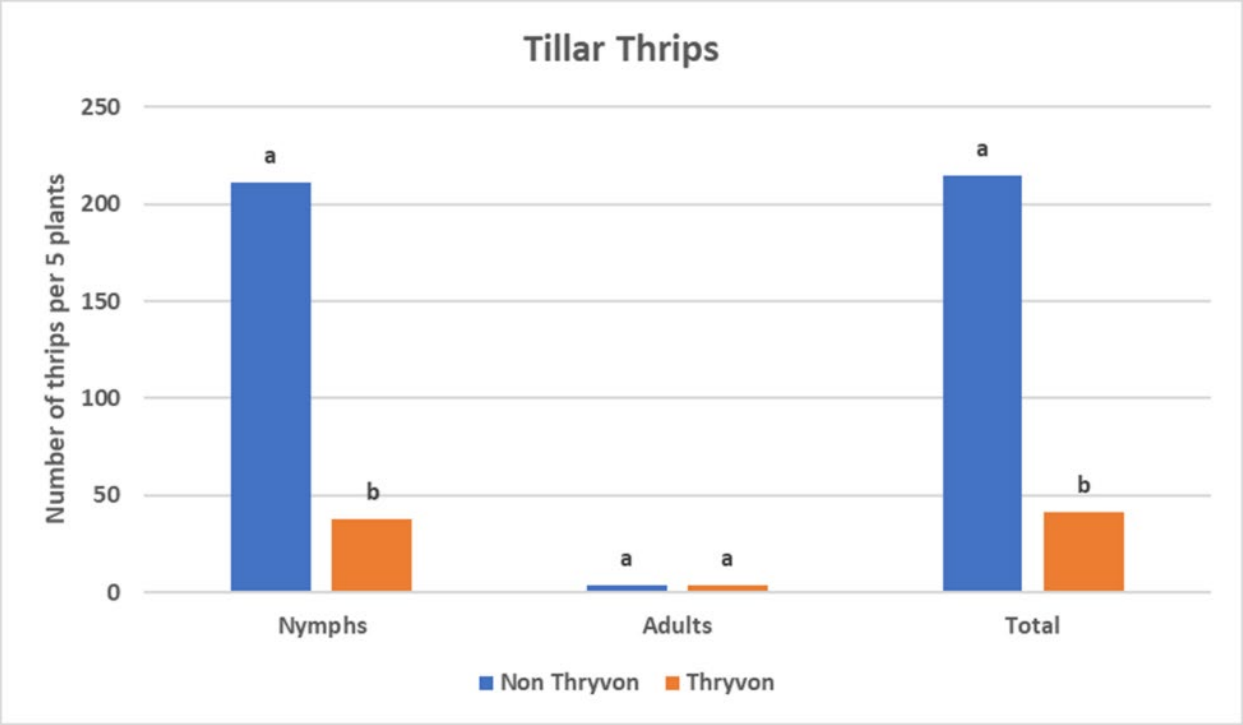

Figure 2. Results from a thrips field evaluation comparing Thryvon seedlings to non-Thryvon seedlings in Tillar, AR.

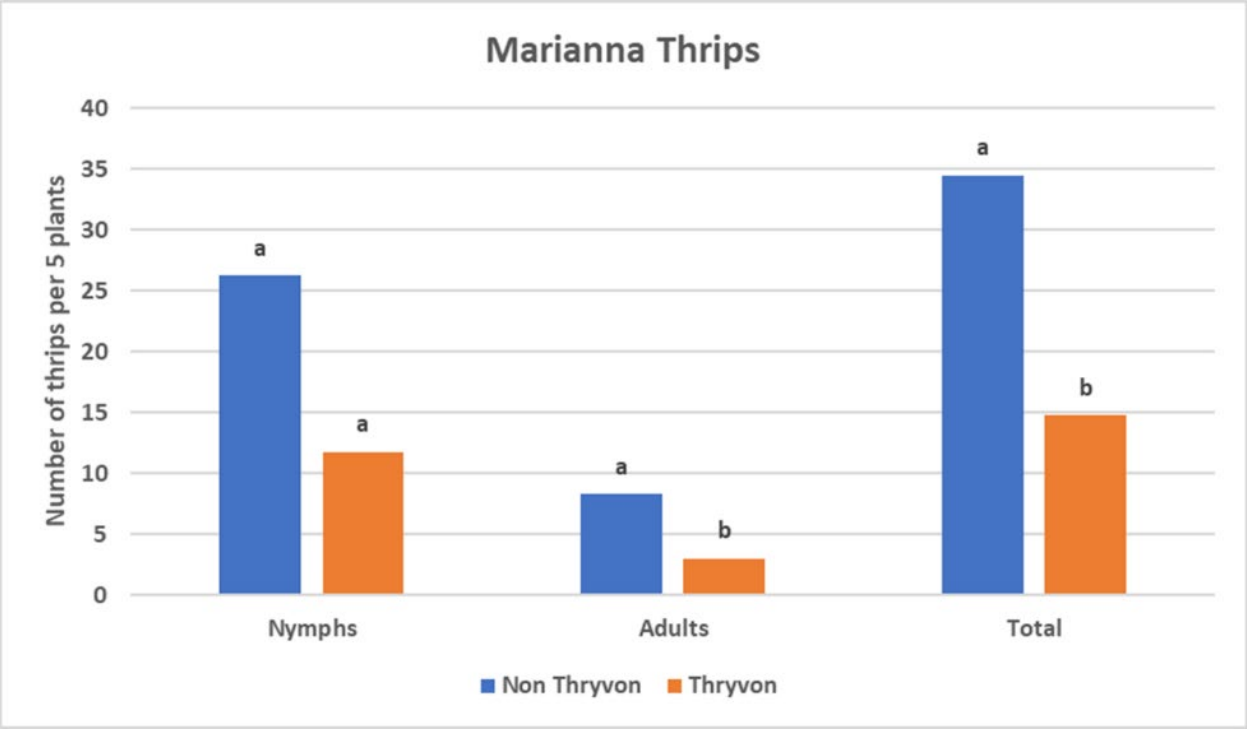

Figure 3. Results from a thrips field evaluation comparing Thryvon seedlings to non-Thryvon seedlings in Marianna, AR.

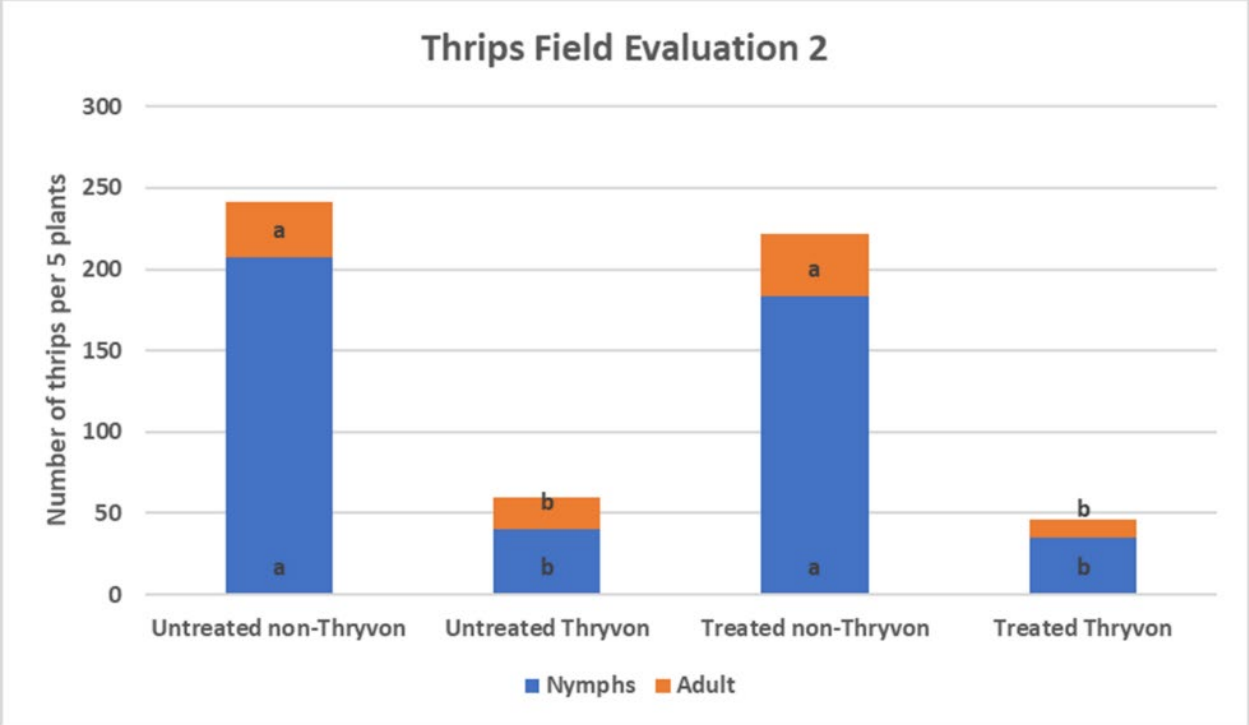

Figure 4. Results from a thrips field evaluation comparing untreated non-Thryvon, untreated Thryvon, insecticide seed treated non-Thryvon and Thryvon in Marianna, AR.

Table 1. Number of sprays for control of TPB at Marianna and Tillar, AR				
Threshold Level	Thryvon, Marianna	Non-Thryvon, Marianna	Thryvon, Tillar	Non-Thryvon, Tillar
Normal Threshold	2	5	4	4
3 Large Nymph	0	1	0	2
2x Threshold	2	3	3	5
3x Threshold	1	1	1	4
Total	5	10	8	15

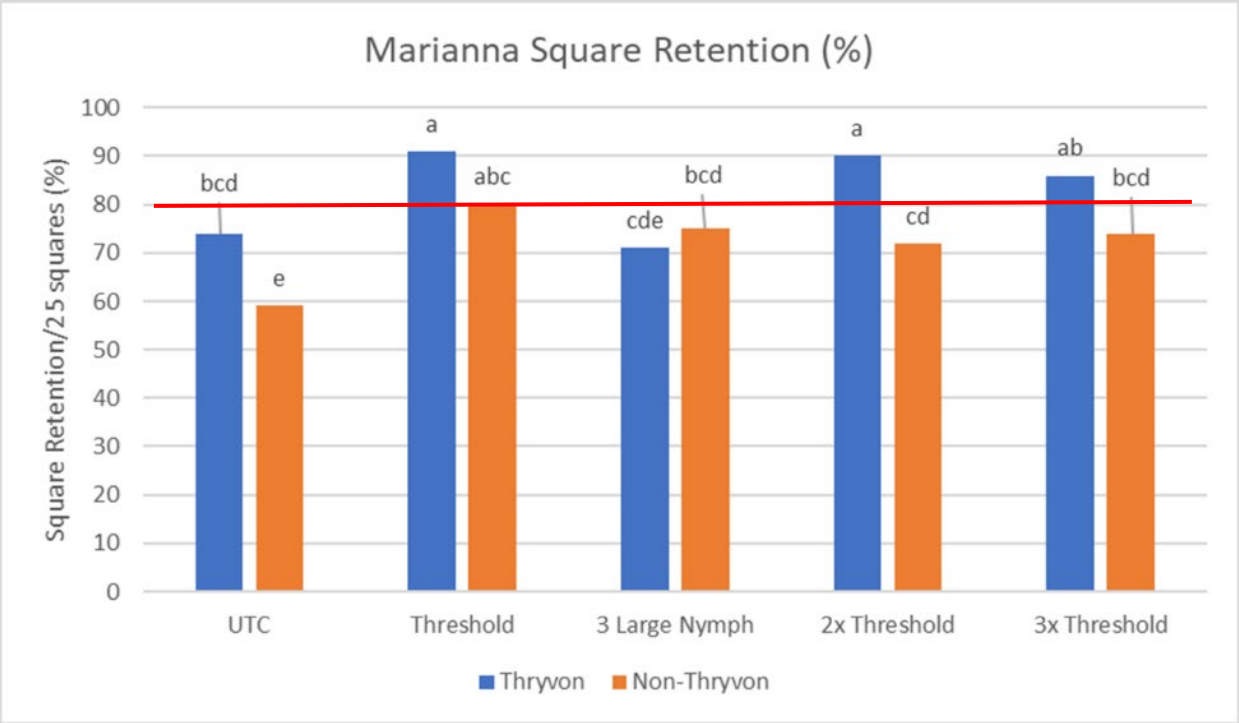

Figure 5. Results from a field trial in Marianna, AR comparing square retention in Thryvon and non-Thryvon cotton.

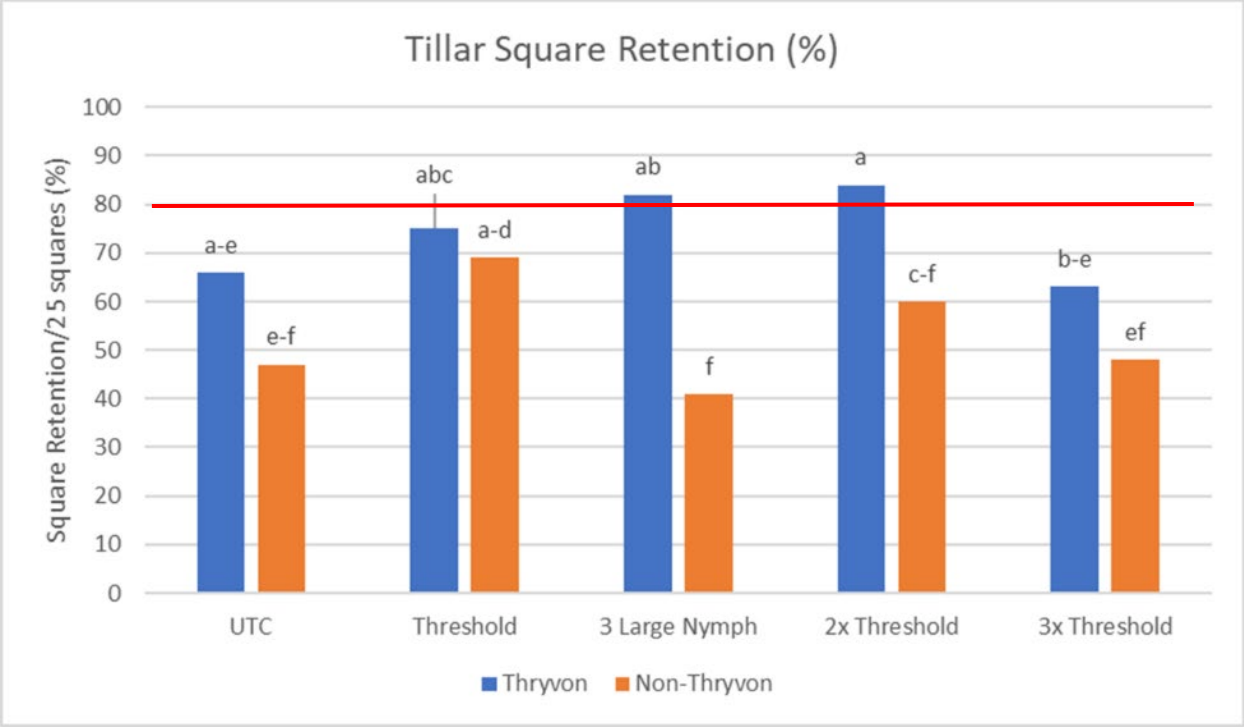

Figure 6. Results from a field trial in Tillar, AR comparing square retention in Thryvon and non-Thryvon cotton.

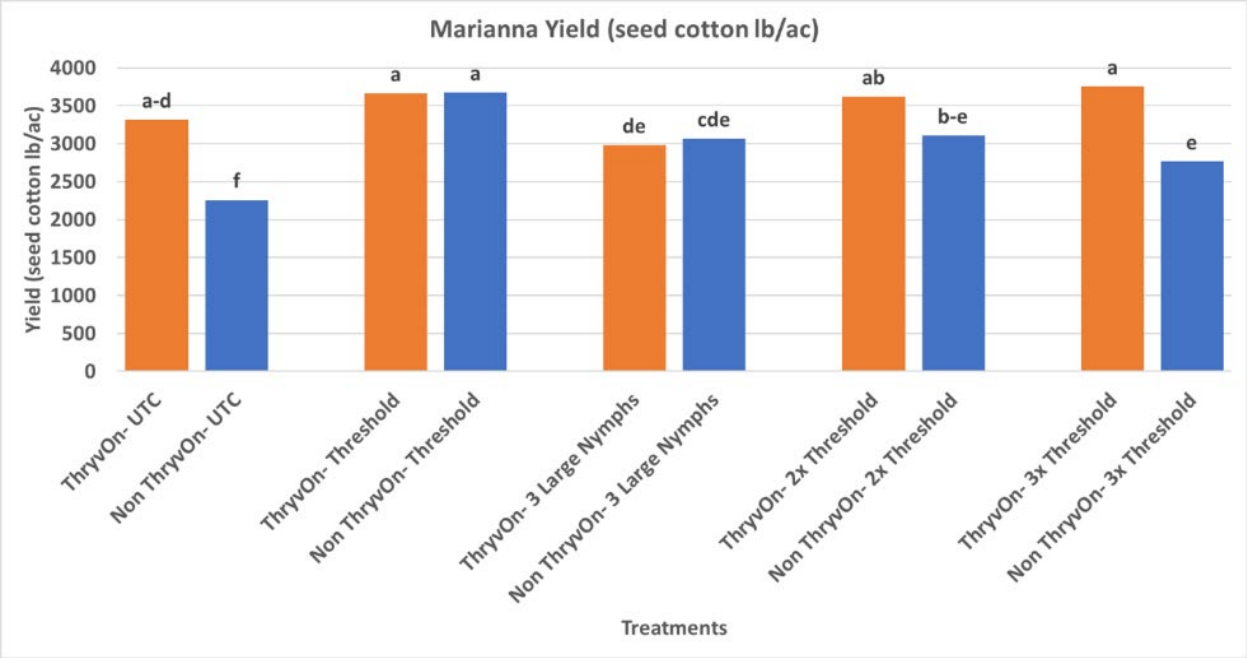

Figure 7. Results from a field trial in Marianna, AR comparing yield in Thryvon and non-Thryvon cotton.

Summary

This data suggests that Thryvon will be a valuable tool in controlling thrips and TPB. When a choice test was conducted, thrips consistently chose to feed on non-Thryvon cotton over Thryvon cotton showing that there is a behavioral response in thrips to avoid the Thryvon technology when given a choice between two different varieties.

When field evaluations were conducted, there was a significant difference between the total number of thrips on non-Thryvon cotton when compared to Thryvon cotton. When comparing varieties with or without seed treatments, there was no significant difference between Thryvon cotton with an IST and Thryvon cotton without an IST. During TPB evaluations there was a consistent trend showing that if you increased the action threshold, there was a decrease in the number of applications for control as well as higher fruit retention when compared to non-Thryvon. Our results from this evaluation indicate that Thryvon performs consistently better than a non-Thryvon variety when it comes to controlling thrips and TPB.

Acknowledgments

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