VALUE OF NEONICOTINOIDS IN MID-SOUTH ROW CROP SYSTEMS

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Abstract

Neonicotinoid insecticides have recently come under public scrutiny worldwide for their potential link to the decline in honey bee populations. Neonicotinoids are used in all row crops throughout the mid-south as seed treatments and foliar insecticides. They are currently the only effective seed treatment option and are incorporated in integrated pest management programs throughout the mid-south. A study was conducted to determine the value of neonicotinoid insecticides, compare production systems, and determine the benefit of all insecticide classes used in an overall systems approach to insect management. Value of neonicotinoids were estimated from two cotton trials in Mississippi in 2014. The treatments in this study included cotton treated with all available classes of insecticides, cotton treated with all classes except neonicotinoids, cotton treated with all classes except pyrethroids, cotton treated with all classes except carbamates and organophosphates, and an untreated control. Plots were scouted weekly and insecticide applications were made with the best available insecticides for each treatment when that treatment reached threshold for a particular insect pest. All treatments were sprayed independently of the other treatments. Where any class of insecticide was included from the program, an economic loss of $32.63 to $59.08 was observed compared to the program where all classes of insecticides were used.

Introduction

Neonicotinoids are used widely throughout the mid-south in all row crops. Their high degree of efficacy along with low mammalian toxicity make it a popular insecticide class. Yields tend to be greater where neonicotinoids are used and they can lower application costs throughout the year. Neonicotinoids have been scrutinized in the recent years due to the potential link to pollinator decline. Also, the long half-life in the soil and potential leaching in groundwater pose a potential risk to the environment. To date, the majority of research surrounding neonicotinoid insecticides has focused on the potential risks to pollinators and the environment. There is currently little research that attempts to quantify the value of neonicotinoids and their usage in row crops. The objectives of this research is to determine the value of insecticide classes and compare production systems with different chemical classes used in an overall systems approach to insect management.

Materials and Methods

An experiment was conducted in 2014 to quantify the value of all insecticide classes and compare production systems in an overall systems approach to insect management. DeltaPine 0912 B2RF was planted at two locations in Mississippi. One trial was conducted at Mississippi State University, MS located on the R.R. Foil North Farm. The second trial was conducted at the Delta Research and Extension Center located in Stoneville, MS. Trials consisted of 40 foot plots with 4 replications. The two trials consisted of 5 treatments: treatment 1) untreated check, treatment 2) no neonicotinoid insecticides, treatment 3) all classes of insecticides, treatment 4) no pyrethroids, treatment 5) no organophosphates/carbamates. For treatment 1, no insecticides were used throughout the entire growing season. For treatment 2, Orthene was applied to the seed at 6.4 oz/cwt. For treatments 3-5, imidacloprid was applied to the seed at the currently labeled rate. Plots were scouted weekly for the presence of insect pests and insecticide applications were made with the best available insecticides for each treatment when that treatment reached threshold for a particular insect pest. Thresholds for all insects were based on suggestions in the 2014 Mississippi State University insect control guide for agronomic crops. Agronomic data were recorded and included stand counts, node counts, percent square retention, NAWF, and height measurements.

Results

Hills Location. Pest pressure in the trial located in the hills region was minimal when compared to the trial located in the delta. Because of the low pest pressure, no foliar insecticide applications were made at the hills location in 2014. As a result, the only differences among treatments included the use of an at-planting insecticide. Therefore, the data were combined across all treatments that had imidacloprid applied as a seed treatment (Treatments 3-5). The no neonicotinoid insecticides treatment was sprayed one time for thrips; while, all of the treatments with a neonicotinoid seed treatment did not require an insecticide application. The treatments that included a neonicotinoid seed treatment was sprayed once for tarnished plant bugs. No differences in yields were observed among treatments for the trial located in the hills. Application costs were $4.10 greater for the treatments that included a neonicotinoid seed treatment compared to the treatment that included acephate as a seed treatment. Overall, treatments where a neonicotinoid seed treatment was used resulted in a $9.26 profit compared to the treatment where acephate was used as a seed treatment.

Table 1. List of insecticides used for all treatments at the hills location in 2014.

All Classes	No Pyrethroids	No OP's/Carbamates	No Neonics
Gaucho IST	Gaucho IST	Gaucho IST	Orthene IST
Admire Pro (1.7 oz)	Admire Pro (1.7 oz)	Admire Pro (1.7 oz)	Acephate (.22 lbs)

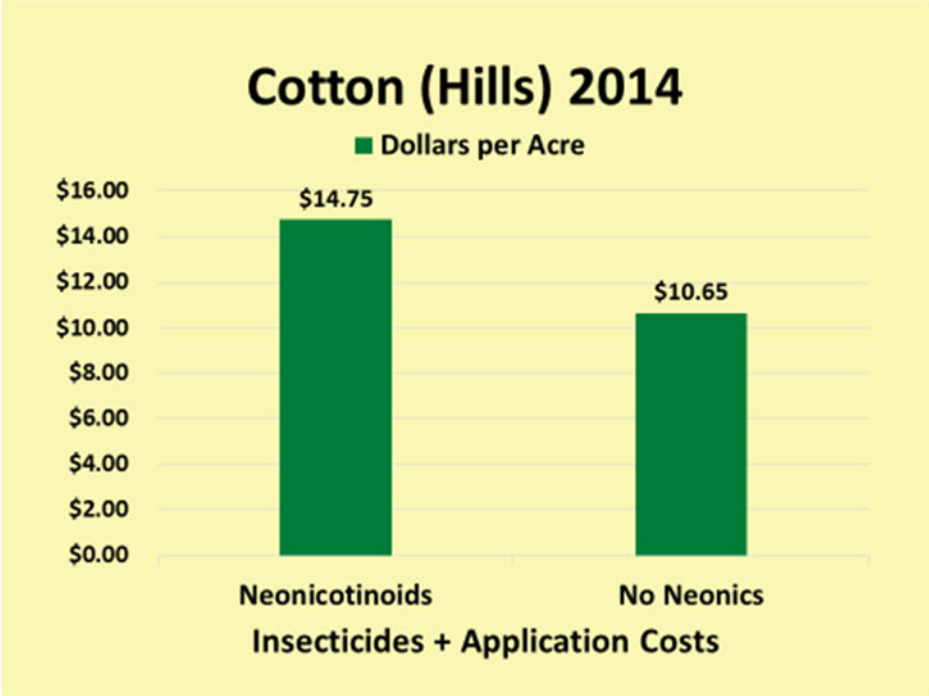

Figure 1. Insecticide costs by treatment at the hills location in 2014.

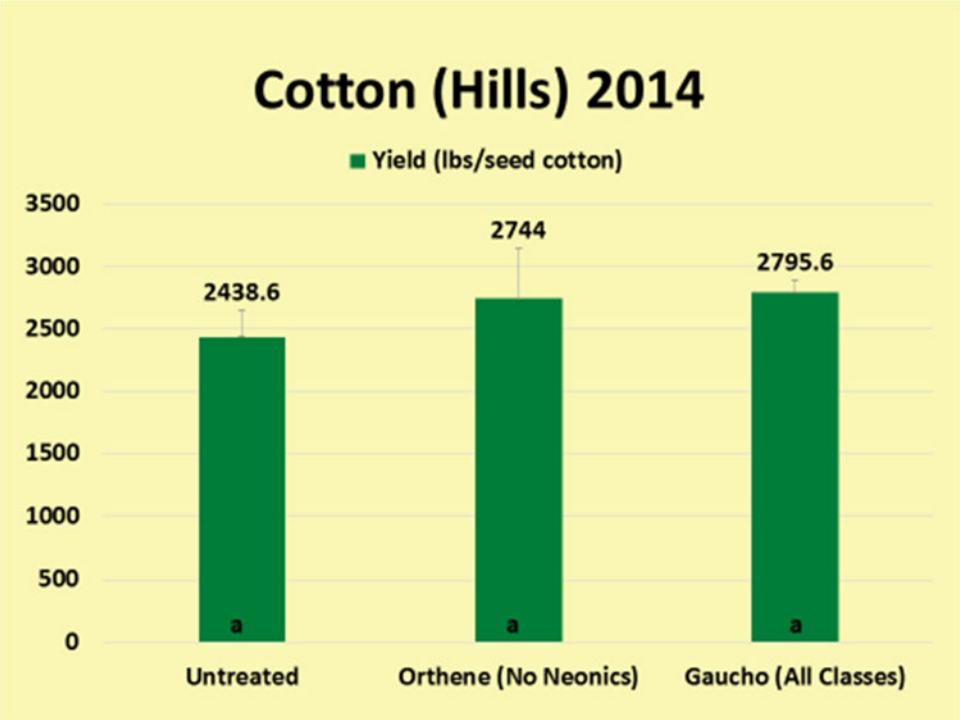

Figure 2. Seed cotton yields for each treatment at the hills location in 2014.

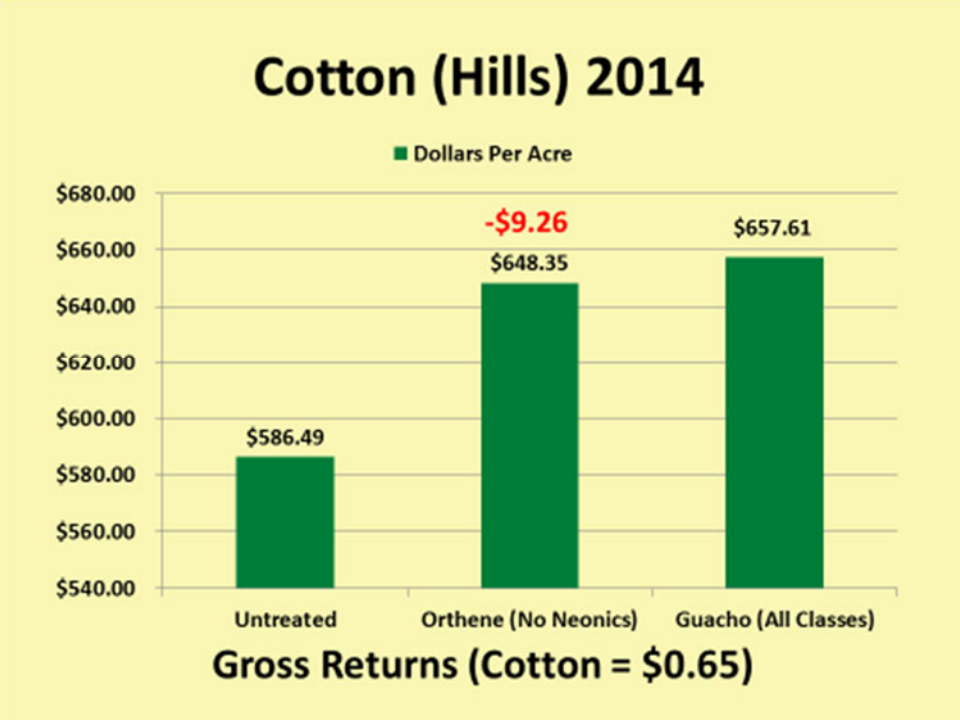

Figure 3. Gross economic returns for all treatments at the hills location in 2014.

Delta Location. Insect pressure in the cotton trial located in the delta was higher compared to the hills region, but overall lower than previous years. All treatments had to be sprayed five times for insects that reached threshold following the at-planting insecticide. The untreated check was never treated for insects. In terms of control costs (insecticide + application cost), the ratings for treatments from lowest cost to highest costs are: no neonicotinoids <

All Classes < No Pyrethroids < No Organophosphates/Carbamates. For yields, all insecticide treatments had greater yields than the untreated control. The All Classes treatment had significantly greater yields than the no pyrethroids and no neonicotinoids treatments. Neonicotinoid IST (All Classes) was the most profitable followed by no organophosphates/carbamates, no neonics, no pyrethroids, and untreated control.

Table 2. List of insecticides used for all treatments at the delta location in 2014.

All Classes	No Pyrethroids	No OP's/Carbamates	No Neonics
Gaucho IST	Gaucho IST	Gaucho IST	Gaucho IST
Acephate (.22 lbs)	Acephate (.22 lbs)	Radiant (1.5 oz) + COC	Acephate (.22 lbs)
Acephate (.75 lbs)	Admire Pro (1.7 oz)	Admire Pro (1.7 oz)	Acephate (.75 lbs)
Bidrin (8 oz) + Diamond (6 oz)	Transform (1.5 oz) + Diamond (6 oz)	Transform (1.5 oz) + Diamond (6 oz)	Bidrin (8 oz) + Diamond (6 oz)
Befenthrin (5 oz) + Acephate (.75 lbs)	Transform (1.5 oz)	Transform (1.5 oz)	Bifenthrin (5 oz) + Acephate (.75 lbs)
Bidrin (8 oz) + Karate (2.56 oz) + Acephate (.75 lbs)	Prevathon (14 oz) + Acephate (.75 lbs)	Centric (2 oz) + Prevathon (14 oz)	Bidrin (8 oz) + Karate (2.56 oz) + Acephate (.75 lbs)

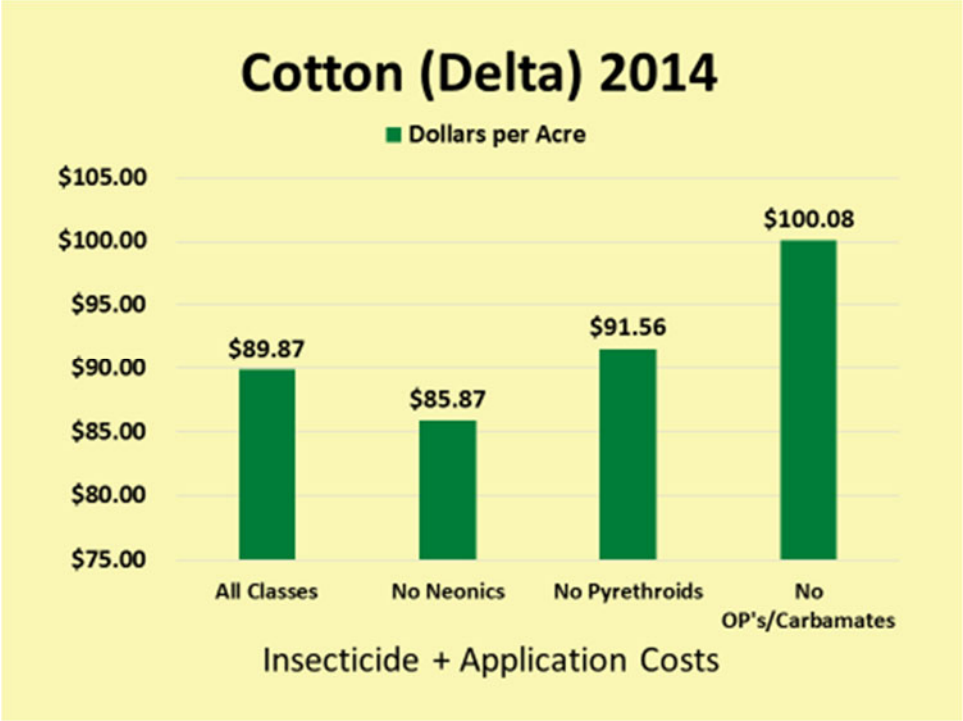

Figure 4. Insecticide costs by treatment at the delta location in 2014.

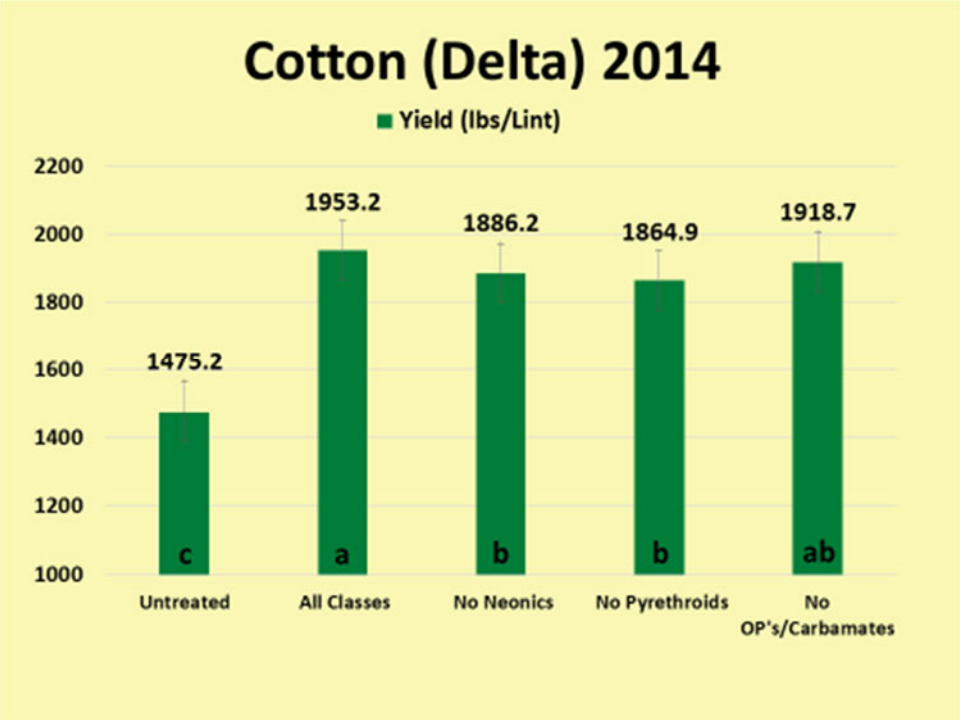

Figure 5. Seed cotton yields for each treatment at the delta location in 2014.

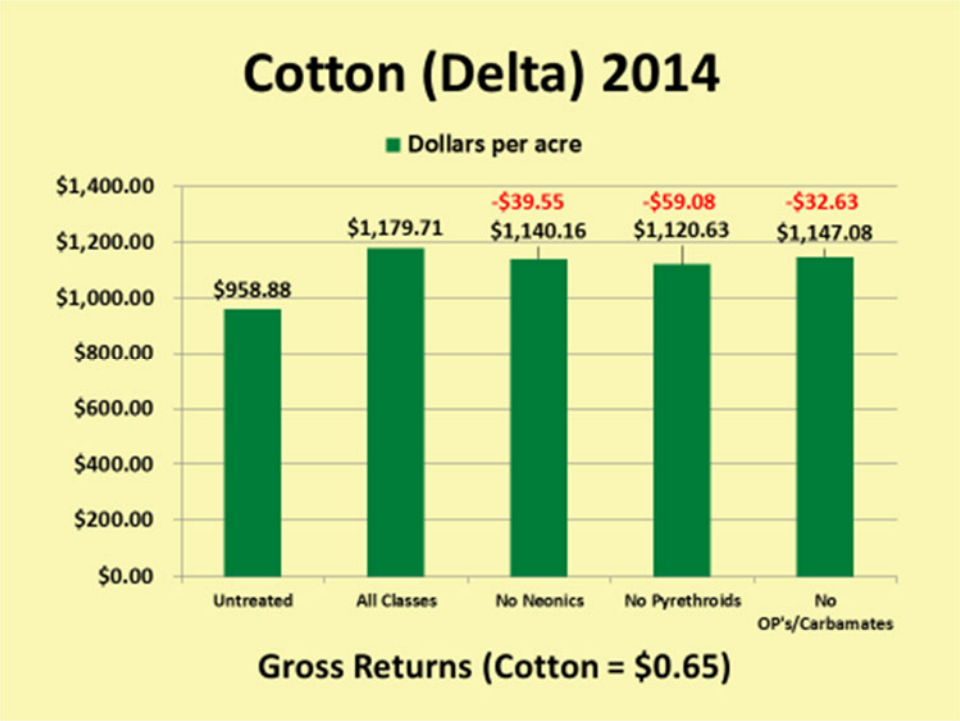

Figure 6. Gross economic returns for all treatments at the hills location in 2014.

Summary

Neonicotinoids are currently the only effective seed treatment option for control of early season insect pests in cotton. Based on the results of this experiment, all classes of insecticides are essential for cotton production in Mississippi. Compared to the treatments where no neonicotinoids and no pyrethroids were used, the treatment that utilized all

classes of insecticides resulted in improved yields. Additionally, the economic returns were greater for the treatment where all classes of insecticides were used compared to all other treatments. These data will be important for future decisions about the economic benefit of insecticides for cotton production in the Mid-South.