EFFICACY OF DOWAGROSCIENCE SEED TREATMENT FUNGICIDE STP 20143 FOR THE MANAGEMENT OF THE SEEDLING DISEASE COMPLEX OF COTTON

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Abstract

A cotton seedling disease study sponsored by DowAgroChemicals was conducted in a cotton field with a history of severe cotton seedling disease. Seed applied treatments consisted of a Crusier 5 FS control, Apron XL+ Cruiser 5 FS, Apron XL+ Cruiser 5 FS+ Maxim 4 FS, Apron XL+ Cruiser 5 FS+ Maxim 4 FS+ STP 20143 (0.019mg ai/seed), Apron XL+ Cruiser 5 FS+ Maxim 4 FS+ STP 20143 (0.125 mg ai/seed) and Apron XL+ Cruiser 5 FS+ Maxim 4 FS+ Systhane. All treatments were applied to the seed by DowAgroScience. Seed treatments used in this study had a significant effect on both the seedling stand and seed cotton yields. The experimental seed treatment from DowAgroScience STP 20143 in combination with Apron XL+ Cruiser 5 FS+ Maxim 4 FS numerically improved seedling stand and significantly improved seed cotton yields.

Introduction

Seed borne and soil borne organisms, acting singly or in combination, produce the seedling disease complex of cotton. The seedling disease complexes composed of several fungi which cause serious problems wherever cotton is grown. Seedling disease of cotton is a major problem across the cotton belt. Losses attributed to seedling disease have averaged approximately 2.7% (474956 bales lost) over the past 20 years. In Alabama and Mississippi, an estimated reduction of 4.54 and 3.46% or 23,980 and 23,980 bales respectively was attributed to the seedling disease complex in 2009. The soil borne pathogens most commonly involved in the seedling disease complex in Alabama and Mississippi includes *Pythium spp*., *Fusarium spp*., *Rhizoctonia solani* and *Thielaviopsis basicola*. These soil fungal organisms may produce symptoms on cotton alone or in combimation. Plant-pathogenic nematodes are often associated with these fungi and in combination can produce disease more severe than the fungi alone. Each pathogen produces effects that become a complex of interrelated symptoms caused by several organisms simultaneously. The seedling disease pre-emergence damping off, post-emergence dampening off and seedling root rot. The effects of seedling root rot are often subtle and thereby reduce yields. Most of the pathogens involved in the seedling disease complex are ubiquitous fungi that are associated with many other hosts as well as with cotton. The fungi that cause these diseases are carried in the soil and can attach either to the seed or the seedling. The organisms that cause seedling disease are found in all cotton producing areas of the United States but populations and virulence differ from area to area thus demonstrating the necessity of testing the various management products across a wide geographical area. The object of our research was to examine the influence of the Dow AgroScience experimental seed treatment for the management of the seedling disease complex of cotton and subsequent effects on the growth and development of the cotton plant and yield response.

Material and Methods

A cotton fungicide test was conducted in a cotton field with a history of severe cotton seedling disease. The field location had a previous history of cotton and soybean production. Treatments consisted of seed treatments of Apron (0.0068 mg ai/seed), Cruiser 5FS (0.34 mg ai/seed), Maxim 4 FS (0.0023 mg ai/seed), and Systhane (0.019 mg ai/seed) in various combinations with and without the experimental compound STP 20143 at 0.019 and 0.0125 mg ai/seed. All seed treatments were applied to the seed by Dow AgroSciences. The treatments consist of 4-rows 25 feet long with 40-inch row spacing. Two of the rows were enriched with the addition of a combination of *Pythium spp*., *Fusarium spp*., *Rhizoctonia solani* and *Thielaviopsis basicola* growing on millet seed. The two remaining rows remained natural. Treatments were arranged in a randomized complete block design with five replications. Plots

were planted on April 15, 2010. Seedling stand was rated at 14 and 28 days after planting on April 29 and May 13, 2010, respectively. Plant uniformity was rated on May 13, 2010. All plots were mechanically harvested on Sept. 14, 2010 to determine the effects of treatments on cotton yields.

Results

Cotton seedling emergence was slow due to cool temperatures. At 14 days after planting (Table 1) seedling stand in the natural soil was numerically greater in the seed treatments that included the two STP 20143 treatments plus Apron XL+ Cruiser 5 FS+ Maxim 4 FS compared with Apron XL+ Cruiser 5 FS+ Maxim 4 FS, Apron XL+ Cruiser 5 FS and the control. Cotton seedling stand was reduced in all treatments in the enriched versus the natural soil. In the high disease pressure enriched soil the benefits of using a seed treatment was more evident. Seedling stand was significantly greater in the seed treatment that included Systhane+Apron XL+ Cruiser 5 FS+ Maxim 4 FS compared with Apron XL alone. The addition of STP 20143 (0.125mg ai/seed) plus Apron XL+ Cruiser 5 FS+ Maxim 4 FS numerically improved seedling stand over all other treatments.

At 28 days after planting seedling (Table 1) stand was similar in all treatments compared with the control in both the natural and enriched soil plots. Numerically more plants were found in the Apron XL+ Cruiser 5 FS+ Maxim 4 FS+ STP 20143 (0.019 mg ai/seed) compared with the control. Seedling stand was only higher in the Apron XL+ Cruiser 5 FS+ Maxim 4 FS+ Systhane seed treated plots. Uniformity of plant growth was recorded at 28 days after planting (Table 2). Plant growth uniformity was similar for all seed treated plots compared with the control in the natural and the enriched soil plots. Therefore there were no adverse effects from the seed treatments on cotton seedling growth.

Table 1. Effect of Dow AgroScience cotton seed treatment STP20143 on cotton plant stand.

Treatment and Rate	Seedling stand			
	14 days after plant		28 days after plant	
	Natural	Enriched	Natural	Enriched
Apron XL + Cruiser 5FS 0.0068 + 0.34 mg ai/seed……	13.8	4.2	14	1.6
Apron XL + Cruiser 5FS + Maxim 4FS 0.0068 + 0.34 + 0.0023 mg ai/seed…….	15.8	5.2	20	2.2
Apron XL + Cruiser 5FS + Maxim 4FS + STP20143 0.0068 + 0.34 + 0.0023 + 0.019 mg ai/seed……..	17	5.2	21.4	4
Apron XL + Cruiser 5FS + Maxim 4FS + STP20143 0.0068 + 0.34 + 0.0023 + 0.125 mg ai/see……	18.4	6.4	16.6	2.4
Apron XL + Cruiser 5FS + Maxim 4FS + Systhane 0.0068 + 0.34 + 0.0023 + 0.019 mg ai/seed……..	20.4	7.6	22.6	4.2
Cruiser 5FS 0.34 mg ai/seed……..	16.6	5	17.8	3.8
FLSD $\leq$ 0.10	7.98	3.02	7.09	1.8

Seed cotton yields were collected on September 14, 2010 (Table 2). In the natural soil seed cotton yields ranged from 2911.9 to 3514.9 lb/acre in the Apron XL+ Cruiser 5 FS and Apron XL+ Cruiser 5 FS+ Maxim 4 FS+ Systhane seed treated plots, respectively. The addition of STP 20143 (0.125 mg ai/a) plus Apron XL+ Cruiser 5 FS+ Maxim 4 FS numerically improved yields over Apron XL+ Cruiser 5 FS+ Maxim 4 FS and Apron XL+ Cruiser 5 FS seed treatments. Effects of the seed treatments were more apparent in the enriched soil plots. Yields were noticeably lower in all plots with a range of 1066 to 2533.9 lbs seed cotton /acre in the Apron XL+ Cruiser 5 FS and Apron XL+ Cruiser 5 FS+ Maxim 4 FS+ Systhane seed treated plots. The addition of STP 20143 plus Apron XL+ Cruiser 5 FS+ Maxim 4 FS significantly increased seed cotton yields over the untreated control. Yields were improved by 570.30 and 470 lbs of seed cotton per acre where STP 20143 was included at 0.019 mg ai/seed and 0.125 mg ai/seed, respectively.

Table 2. Effect of seed treatment STP20143 on cotton plant uniformity and seed cotton yield.

Treatment and Rate	Plant uniformity		Seed cotton yield (lb/a)	
	Natural	Enriched	Natural	Enriched
Apron XL + Cruiser 5FS 0.0068 + 0.34 mg ai/seed	11.8	23	2911.9	1066
Apron XL + Cruiser 5FS + Maxim 4FS 0.0068 + 0.34 + 0.0023 mg ai/seed	7.4	22.6	3111	1462
Apron XL + Cruiser 5FS + Maxim 4FS + STP20143 0.0068 + 0.34 + 0.0023 + 0.019 mg ai/seed	8.2	22.4	3159	1945.7
Apron XL + Cruiser 5FS + Maxim 4FS + STP20143 0.0068 + 0.34 + 0.0023 + 0.125 mg ai/see	10.2	22	2947.3	1845.4
Apron XL + Cruiser 5FS + Maxim 4FS + Systhane 0.0068 + 0.34 + 0.0023 + 0.019 mg ai/seed	8.6	21.2	3514.9	2533.9
Cruiser 5FS 0.34 mg ai/seed	11.6	22.8	3039.2	1375.4
FLSD $\leq$ 0.10	4.8	1.3	444.6	523.5

Conclusion

The effects of the seedling disease complex on cotton, as demonstrated in this study, may be subtle depending on the specific pathogens present and the environmental conditions necessary for disease development. To overcome these two factors we add the fungal pathogens into two rows of our plots. This effect is seen by the comparison of overall yields in the natural and enriched soil treated plots. This also lets us compare the effects of specific seed treatments in two environments in one year.

The seed treatments used in this study had a significant effect on both the seedling stand and seed cotton yields. The experimental seed treatment from DowAgroScience STP 20143 in combination with Apron XL+ Cruiser 5 FS+ Maxim 4 FS numerically improved seedling stand and significantly improved seed cotton yields. This was most apparent in the Enriched soil which contained high inoculum and shows the benefit of using seed treatments to manage the seedling disease complex on cotton. The addition of STP 20143 at a rate of 0.019 mg ai/seed and 0.125 mg ai/seed resulted in a yield increase of 570.30 and 470 lbs of seed cotton per acre over the control. Additionally the addition of STP 20143 to Apron XL+ Cruiser 5 FS+ Maxim 4 FS improved yields 483.4 and 383 lbs of seed cotton per acre over Apron XL+ Cruiser 5 FS+ Maxim 4 FS alone. The value of the additional seed cotton yields once converted to lint averaged $98.83, $148.25 and $197.65 dollars per acre for cotton selling for $00.50, $00.75 and $100.00 per pound, respectively.

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