EVALUATION OF PHYTOGEN SEED TREATMENT AND VARIETY FOR RENIFORM NEMATODE MANAGEMENT IN MISSISSIPPI

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Abstract

The reniform nematode, *Rotylenchulus reniformis,* is observed throughout the cotton growing areas of the southern United States. In situations where soil populations exceed economic thresholds (≥ 1,000/pint of soil in spring and ≥ 5,000/pint of soil post-harvest), the reniform nematode can be a severe yield reducer. Additional management options including seed-applied nematicides may be beneficial since at present, no resistant varieties are commercially available. The specific objectives of these trials were to determine the benefits of variety and seed treatment combinations (a base package and Trio that includes a seed-applied nematicide product) in managing the reniform nematode. Field trials were established in two locations to include two seed treatment packages in combination with eight cotton varieties. Soil samples were collected from each plot at pre-plant, mid-season, and harvest to assess nematode population. Throughout the season nematode populations were above threshold. A significant decrease of 72% was observed when the base + Trio was compared to the base alone combined with PX3B07W3FE. Significance was observed in seed cotton yield collected from Field 1 with the base + Trio combination applied to PX3D32W3FE. Combinations of varietal resistance and seed treatment may provide and integrative management option to reduce the losses due to the reniform nematode.

Introduction

Rotylenchulus reniformis, the reniform nematode, is one of three major nematode pests in Mississippi cotton and current management options are limited. Southern cotton-growing areas including Alabama, Arkansas, Georgia, Louisiana, Mississippi, Missouri, and Texas where continuous cotton production has been common. In field situations where cotton has been historically grown, the reniform nematode has resulted in heavily infested fields. In field situations where the soilborne population of reniform nematode is greater than the economic threshold significant yield reductions can be observed. The reniform nematode populations reported to result in yield losses ranges from 1,000 to 5,000 reniform nematodes/pint between spring and harvest soil sample timings in Mississippi. At present, reniform-resistant cotton varieties are not commercially available and in severe situations, the reniform nematode has been reported to result in yield losses of between 30 and 40%. The specific objectives of these trials were to determine the benefits of variety and seed treatment combinations in managing the reniform nematode.

Materials and Methods

Two fields (Field 1 and Field 6) at the Delta Research and Extension Center in Stoneville, MS, with a history of moderate reniform nematode infestation were used in 2019. Trials were planted in a randomized complete block design (RCBD) with a split-plot constraint (variety; n=7). Plots consisted of four rows of cotton (40” centers) and were 35 feet long. Treatment combinations consisted of several seed-applied nematicide treatments in combination with variety tolerance. Seed treatments consisted of either a base treatment (fludioxonil + mefenoxam + myclobutanil + imidacloprid) or the base treatment + Trio (azoxystrobin/fluidoxonil/mefenoxam + sedexane + BioST VPH). The BioST VPH serves as the seed-applied nematicide component. Soil samples were collected pre-plant, mid-season and approximately harvest to assess the reniform nematode population present and determine the effects of treatment combinations on soilborne nematode populations. Nematodes were extracted from 200 cc of sampled soil and numbers are presented by pint of soil. Nematodes were extracted by elutriation followed by sucrose centrifugation. Stand counts and vigor were assessed. The center two rows from all plots were machine-harvested post-defoliation with a two row Case IH cotton picker outfitted with a harvest weigh cell system. All data were analyzed in PROC GLIMMIX at the 95% confidence interval.

Results

Spring reniform nematode populations were above the economic threshold (1,000/pint) at the first sampling regardless of field location. Nematode populations increased throughout the season and remained above threshold by the harvest sampling. Reniform nematode numbers were significantly different between cultivar and seed treatment combinations in the Field 1 location (Table 1). A 16% increase in percent stand was observed with PHY480W3FE plus the base + Trio combination when locations were combined. Seed cotton (lb./A) was significantly different for Field 1 with both the base and base + Trio applied to PX3D32W3FE when compared to most other seed treatment × variety combinations (Fig. 1A).

Table 1. Results from variety and seed treatment combinations across two field locations conducted during 2019 in Stoneville, MS.

			Reniform nematode numbers (per pint)	
Variety	Seed treatment[a]	Stand (%)	Field 1	Field 6
PHY 480W3FE	Base	64.2 d	3,561 b-e	5,101
PHY 480W3FE	Base + Trio	76.4 abc	4,043 b-e	6,064
PHY 350W3FE	Base	75.1 abc	6,738 bcd	4,813
PHY 350W3FE	Base + Trio	80.1 ab	4,428 b-e	3,456
PHY 340W3FE	Base	80.1 ab	7,508 ab	7,893
PHY 340W3FE	Base + Trio	68.6 cd	4,524 b-e	3,561
PHY 580W3FE	Base	74.3 abc	4,139 b-e	5,583
PHY 580W3FE	Base + Trio	82.5 a	7,123 abc	3,176
PX3B07W3FE	Base	71.8 bcd	11,165 a	6,256
PX3B07W3FE	Base + Trio	75.4 abc	3,080 cde	7,604
PX3B09W3FE	Base	79.3 ab	6,160 b-e	6,930
PX3B09W3FE	Base + Trio	82.4 a	7,604 ab	9,240
PX3D32W3FE	Base	80.3 ab	2,791 de	5,101
PX3D32W3FE	Base + Trio	80.2 ab	5,005 b-e	2,118
PX3D43W3FE	Base	74.4 abc	2,310 e	2,791
PX3D43W3FE	Base + Trio	77.9 abc	4,524 b-e	1,829
	p-value	0.0.0223	0.0231	0.0753

[a] Base treatment = (fluidoxonil + metaxyl + myclobutanil + imidacloprid)
Base treatment + Trio = base treatment chemicals + Trio (azoxystrobin/fludioxonil/mefenoxam + sedexane + BioST VPH).

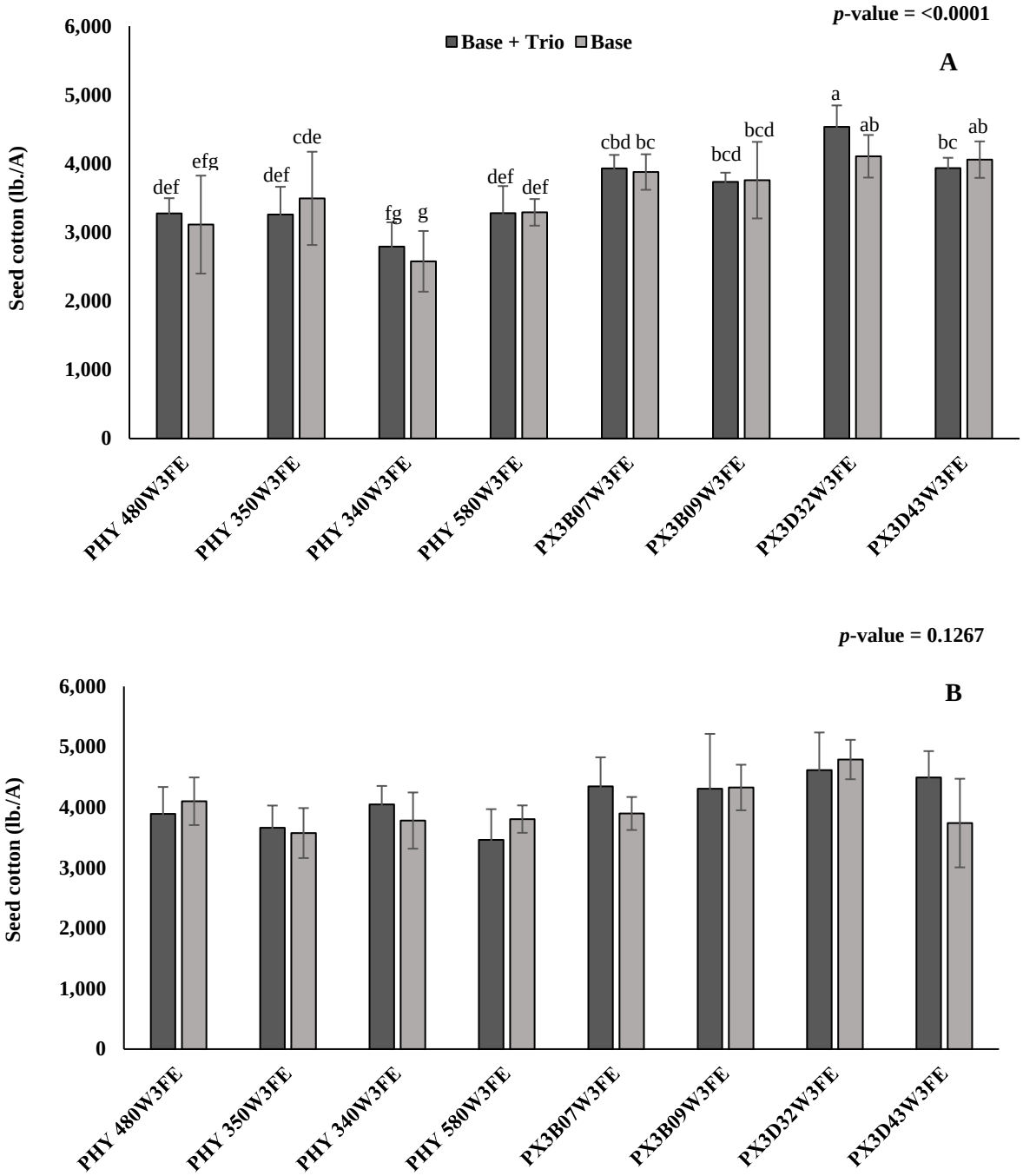

Figure 1. Yield in seed cotton per acre from two different study sites in Stoneville, MS. **A)** study site labeled as Field 1 and **B)** study site labeled Field 6.

Discussion

Seed treatments alone did not provide significant increases in seed cotton; however, mathematical differences observed between treatments suggest that specific seed treatment and varietal combinations may be beneficial depending on the reniform nematode population present in a commercial field situation.