EVALUATION OF NEMATICIDES AND RESISTANT CULTIVAR COMBINATIONS FOR RENIFORM NEMATODE MANAGEMENT IN MISSISSIPPI

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Abstract

In Mississippi, cotton yield can be severely reduced in situations where soil populations of reniform nematode, *Rotylenchulus reniformis*, exceed economic thresholds (e 1,000/pint of soil in spring and e 5,000/pint of soil post-harvest). Resistant cultivars and seed-applied/in-furrow products with nematicidal activity remain potential management options. The specific objectives of this trial was to determine the benefits of cultivars, with tolerance to the reniform nematode, and seed-applied/in-furrow nematicide treatment combinations in managing the reniform nematode. Field trials were established during 2019-2021 and included treatment combinations of some reniform-resistant cotton germplasm compared to a susceptible commercial standard in combination with seed-applied or in-furrow nematicide products. Soil was sampled at three different timings during the season to confirm treatment efficacy in managing the nematode. In most years reniform populations increased during the season, and were consistently above threshold at harvest sampling regardless of treatment combination. Across years, numerically, up to a 6% increase in seed cotton was observed with all reniform tolerant cotton lines with the base seed treatment when compared to the commercial check with the base treatment. Combinations of reniform nematode-resistant cultivars and seed-applied nematicide treatments may provide an integrative management option to reduce the losses due to the reniform nematode.

Introduction

Yield losses have been documented in cotton fields across the southern U.S. especially in field situations where continuous cotton has been planted in Alabama, Arkansas, Georgia, Louisiana, Mississippi, Missouri, and Texas often times resulting in increased populations of the reniform nematode*, Rotylenchulus reniformis*. Currently, management options are limited; however, resistant cultivars and seed/in-furrow treatments are potential options. Economic thresholds serve as a guideline to determine when yield losses may occur based on nematode numbers present. In Mississippi, economic thresholds suggest that reniform nematode populations ranging from 1,000 reniform nematodes/pint in the spring to 5,000 reniform nematodes/pint at harvest may cause yield losses. In field situations where the soilborne population of reniform nematode is greater than the economic threshold significant yield reduction, up to 40%, can be observed. The specific objectives of these trials were to determine the benefits of cultivars, previously observed to be tolerant of the reniform nematode, and seed/in-furrow treatment combinations in managing the reniform nematode with an integrated approach.

Materials and Methods

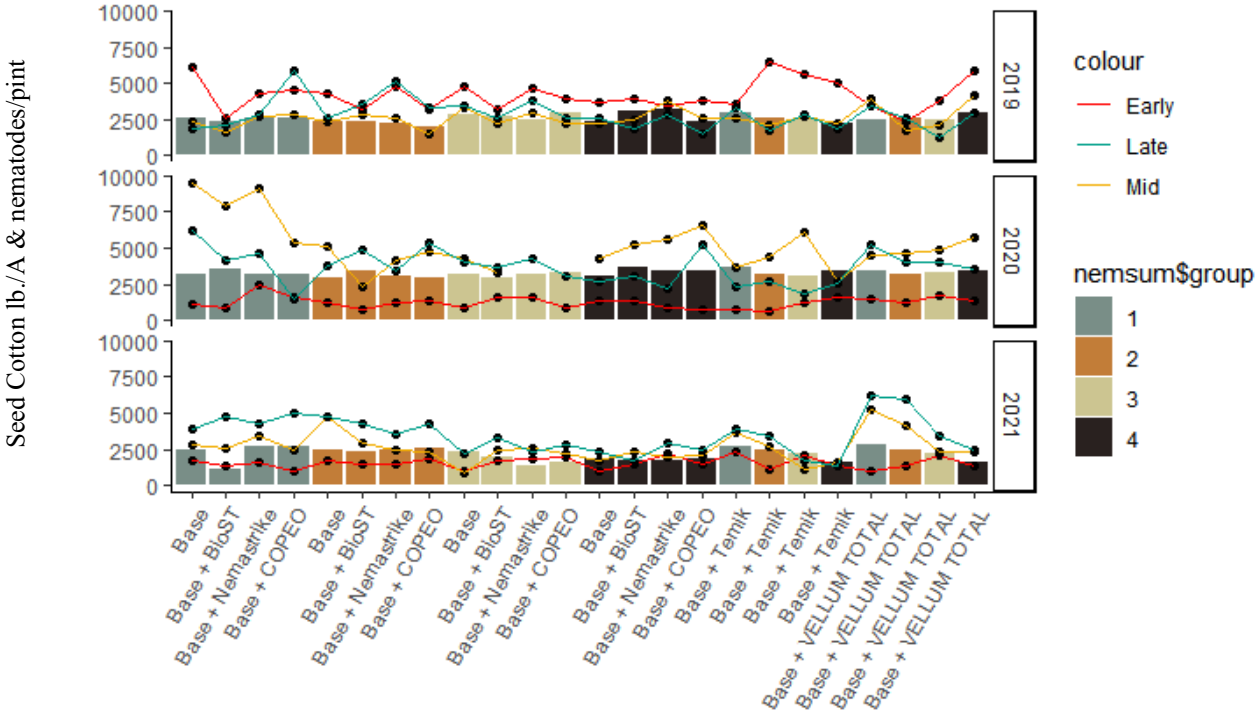
During 2019, 2020 and 2021, trials were established at the Delta Research and Extension Center in Stoneville, MS, in two fields with a history of moderate reniform nematode infestations. Trials were planted in a randomized complete block design (RCBD) with a split-plot constraint (cultivar; n= 4). Plots consisted of four rows of cotton (40 in centers), 35 ft in length, separated by a fallow alley. Treatment combinations consisted of either seed or in-furrow nematicide products in combination with three cotton lines developed with reniform nematode tolerance and one susceptible commercial check. Seed treatments consisted of a base treatment (prothioconazole + penflufen + metalaxyl + myclobutanil + imidacloprid) or the base treatment + toxazfen (Nemastrike), fluopyram (COPeO), aldicarb (Temik), or fluopyram + imidacloprid (Velum Total). Soil samples were collected pre-plant, mid-season and approximately at

harvest to assess the reniform nematode population present and determine the effects of treatments on nematode populations. Reniform nematodes were extracted from 200 cc of soil representing a composite sample from each plot by elutriation followed by sucrose centrifugation. Reniform nematode numbers are presented on a per pint of soil basis. Stand counts and vigor were assessed. Yield was collected by machine harvesting the center two rows of each plot post-defoliation with a two row Case IH cotton picker outfitted with a harvest weigh cell system. All data were analyzed in R using ANOVA at a 95% confidence interval.

Results

In most cases spring reniform nematode populations were above the economic threshold (1,000/pint) at the first sampling during both seasons. Nematode populations fluctuated throughout each season but remained above threshold by the harvest sampling with most treatment combinations. Reniform nematode numbers were significantly different between cultivar and seed treatment combinations over the three years (Fig. 1). Up to an 88% numerical difference was observed in nematode numbers from planting to harvest when all reniform tolerant cotton lines and treatment combinations were compared to the commercial susceptible check and all treatment combinations. Furthermore, a 47% reduction was observed with the BioST treatment. Up to a 6% increase in seed cotton was observed with all reniform tolerant cotton lines with the base seed treatment when compared to the commercial check with the base treatment, albeit not significant (Fig. 1).

Fig. 1 Reniform nematode numbers at three sample timings during 2019, 2020, and 2021 and the associated yield (seed cotton/A) from 1 field site located in Stoneville, MS. Colored bars represent each cotton line/cultivar used in the study. An asterisk (*) denotes the commercial susceptible check A) 2019, B) 2020, and C) 2021. Bars with different colors represent each of the cotton lines used.



Panel A	p= 0.8923	p=0.3978	p=0.9213	p=0.0646
Panel B	p=0.5410	p=0.0311	p=0.0029	p=0.0320
Panel C	p=0.028	p=0.845	P=0.0175	P=0.0526
Legend	Seed Cotton lb./A	At-Planting	Mid-Season	End of Season

Discussion

Treatment combinations may be beneficial in managing reniform nematode populations and reducing the subsequent yield losses that may result. Seed treatments alone did not provide significant increases in seed cotton; however, seed/in-furrow treatment and reniform nematode-tolerant cotton line combinations did provide numerical differences when compared to the commercial check.

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