SOILBORNE PATHOGENIC FUNGI AND SEEDLING DISEASES IN COTTON FOLLOWING WINTER COVER CROPS

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Abstract

Cotton was grown following fallow or winter cover crops of crimson clover, subterranean clover, or rye from 1992 to 1996. In-row conservation tillage was compared with conventional tillage in 1995 and 1996. Populations of Rhizoctonia solani AG-4 in soil after cotton was planted were low, but were increased by crimson clover compared with fallow. Post-emergence damping-off was increased by in-row tillage compared with conventional tillage, especially following legumes, compared with fallow. Final plant stands were variable from year to year among treatments.

Introduction

Moldboard plowing reduces populations of Rhizoctonia solani in topsoil and reduces root diseases in many agronomic and horticultural cropping systems. However, to prevent soil erosion, winter cover crops and conservation tillage practices are used frequently on erodible land. Previous research in Georgia has shown that legume cover crops may increase populations of R. solani anastomosis group (AG) 4 in soil, and increase seedling and root diseases in vegetables. This research was initiated to determine the influence of different winter cover crop and tillage systems on seedling and root diseases in a subsequent cotton crop.

Materials and Methods

Winter cover crops were grown in five experiments from 1992 to 1996. Crimson clover (Trifolium incarnatum L. `Dixie'), subterranean clover (T. subterranean L. `Mt. Barker') , and rye (Secale cereale L. `Wrens Abruzzi', planted in only four experiments) were compared with fallow. Conservation tillage was used in all experiments, and in 1995 and 1996 conservation tillage was compared with conventional tillage. Randomized complete block or split-plot designs with 4 or 6 replications were used. Each plot was 18 ft x 25-40 ft. Cover crops were planted in October or November each year, except in the last experiment they were planted in February. In late April or early May cover crops were mowed and two strips on each 6 ft bed were killed with glyphosate (Roundup). In conservation tillage cotton was row-till planted into the dead strips in mid- to late-May. In conventional tillage cover crops were incorporated 5 to 6 in. deep with a rotary tiller 1 to 13 days before planting.

Stand counts were taken weekly on 30 to 90 ft of row in each plot beginning 7-10 days after planting and continuing until 4-5 weeks after planting. Post-emergence damping off was calculated, and fungi from dying lesions on diseased seedlings were isolated and identified. Soil samples (10 cores, 1 in. diameter, 6 inches deep) were collected in each plot after cotton was planted. Soil was assayed in the laboratory on selective media for populations of Rhizoctonia solani, Rhizoctonia spp., and Pythium spp.

Results and Discussion

Populations of R. solani AG-4 in soil were low, but occasionally were increased by the legume cover crops, but not by rye (Table 1). Differences were not detected between tillage treatments. In contrast, populations of Pythium spp. in soil were high, and often greater

following cover crops than following fallow, and in conventional tillage than in conservation tillage (data not shown).

Plant stands of cotton 4 to 5 weeks after planting were occasionally greater in fallow than when interplanted into the cover crops, but frequently there were no significant differences among treatments. Post-emergence damping-off was variable, but usually not different among treatments (Table 2). In contrast, post-emergence damping-off was significantly increased by conservation tillage compared with conventional tillage. There were cover crop x tillage interactions, and post-emergence damping-off was significantly increased in conservation tillage following legumes compared with fallow.

The primary fungi isolated from lesions on diseased seedlings were Fusarium spp., Rhizoctonia spp., and R. solani AG-4, but only R. solani AG-4 was highly virulent on cotton seedlings in greenhouse experiments. Pythium spp. were isolated rarely, but P. irregulare is pathogenic on seeds and seedlings of cotton.

Summary

Legume cover crops may increase populations of R. solani and Pythium spp. in soil. With conservation tillage, post-emergence damping-off may be increased and final stands reduced slightly following legume crops compared with fallow. In contrast, seedling diseases were not increased following rye.

Reprinted from the *Proceedings of the Beltwide Cotton Conference*
Volume 1:88-89 (1997)
National Cotton Council, Memphis TN

This research was supported by state, Hatch, Georgia Cotton Commission, and Cotton Incorporated funds provided to the University of Georgia Agricultural Experiment Station.

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Table 1. Populations of Rhizoctonia solani in soil following different winter cover crops.

	Year			
	1994			
Crop	Site A	Site B	1995	1996
Rye	0.5	-	0.0	0.0 b
Crimson clover	0.2	5.6 a	0.2	1.9 a
Subclover	1.2	0.9 b	0.2	0.4 b
Fallow	2.4	0.0 b	0.3	0.2 b
Tillage				
Conventional	-	-	0.2	0.5
Notill	-	-	0.7	0.7

Colony-forming units/100 g of soil. Numbers followed by the same letter within crop or tillage treatments are not different according to Fisher's LSD, P = 0.05. No letters indicate no significant differences.

Table 2. Post-emergence damping-off (%) in cotton following different winter cover crops.

	Year				
		1994			
Crop	1993	Site A	Site B	1995	1996
Rye		4	28 b	-	5	3 b
Crimson clover		10	25 b	15	6	4 b
Subclover		11	52 a	9	5	9 a
Fallow		5	41 ab	5	4	2 b
Tillage						
Conventional-			-	-	4 b	3 b
Notill		-	-	-	6 a	6 a

Numbers followed by the same letter within crop or tillage treatments are not different according to Fisher's LSD, P = 0.05. No letters indicates no significant differences.