Table 4. Heard Cotton Grass Control

Herbicide	Lb/A	Average % Grass Control			
		Tail 1/3	Center 1/3	Head 1/3	Mean
Prowl	.75	96	98	92	95
Prowl + Caparol	.75 + 1.00	96	96	92	95
Caparol	1.00	77	70	48	65
Caparol	1.00	3	13	15	11
Caparol	1.00	0	0	10	3
Caparol	1.00	50	27	63	46
Untreated		0	10	25	12

Control of Texas Root Rot of Cotton with Propiconazol in Arizona

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Summary

During the 1982 growing season, replicated field plots were established in cotton fields in Marana, AZ known to have Texas Root Rot (Phymatotrichum Root rot, caused by the fungus Phymatotrichum omnivorum), in order to evaluate propiconazol (CGA-64250 or Tilt) for disease control. Foliar sprays of propiconazol at 0.5 lbs a.i./A and side-dress applications of granules at 1.0 and 2.0 lbs a.i./A produced signicant reductions in percent disease and increases in yield in upland cotton (DPL-55), but not in Pima cotton (Pima S-5). This is the first report of a systemic fungicide applied to the foliage of cotton to control Phymatotrichum root rot. Injection of propiconazol with anhydrous ammonia as a carrier, at rates similar to the granule applications, did not result in significant disease reductions or yield increases.

1) The authors would like to thank the following cooperators in Marana; Tom Clark, Pete Hershberger, Art Pacheco, and Harold Reyher.

Introduction

In laboratory studies at the University of Arizona, we have observed that propiconazol (CGA-64250 or TILT), a triazole fungicide produced by the Ciba-Geigy Corporation, reduced mycelial growth of Phymatotrichum omnivorum, in vitro, at concentrations as low as 1.0 ng/ml or 1.0 part per billion (1). This unusual sensitivity led to further studies to determine if this chemical could be used to control Phymatotrichum root rot in the field. The purpose of this paper is to report on our field studies conducted in Arizona during the 1982 growing season.

Materials and Methods

Replicated field plots were established in cotton fields of three cooperating growers at Marana, Arizona. The fields were chosen because of long histories of Phymatotrichum root rot and past cooperation by the growers involved. The field tests were conducted in two fields of upland cotton (DPL-55) and one field of Pima cotton (S-5). Two formulations of propiconazol (emulsifiable concentrate and granular), and three application methods were evaluated: emulsifiable concentrate (EC) applied as a foliar spray at rates of 0.12, 0.25, and 0.5 lbs a.i./A in 25 gal water/A on 5 wk old plants and 50 gal of water/A on older plants; side-dress application of granules, 4 inches from the base of the plants and 4 inches deep, at rates of 1.0 and 2.0 lbs a.i./A; EC injected 8 inches into the soil and 8 inches from the base of the plants, using anhydrous ammonia (120 lbs nitrogen/A.) Plant age at time of treatment ranged from 4 to 12-weeks. Irrigations in the granular and EC-injected plots ranged from 24 hours to 3 weeks after application. All plots were single row, 50 ft long (25 ft for granular treatments) and replicated 4 times (5 times for EC-injected). Yield estimates were made by hand picking 6.5 ft of row (1/2000th acre) per plot.

Results and Discussion

All three application methods (foliar spray, sidedress granular, and EC-injected) produced reductions in the incidence of Phymatotrichum root rot and increased the seed cotton yield of upland cotton, relative to the controls (Tables 1-3). However, these changes were only significant with foliar applications of 0.5 lbs a.i./A and side-dress granular applications of 1.0, and 2.0 lbs a.i./A.

Treatments of Pima cotton with foliar and granular applications of propiconazol also produced reductions in the incidence of the disease and increases in yield. These changes were not of the magnitude of those produced on upland cotton, and none were significantly different from the controls.

The foliar applications represent the first example of control of Phymatotrichum root rot with a systemic fungicide. It is encouraging that significant yield increases were obtained at a rate of 0.5 lbs a.i./A, a rate which enhances the economic feasibility of the eventual use of this product.

The results from the field plot where propiconazol was injected into the soil with anhydrous ammonia were less than anticipated. Although slight reductions in disease and yield increases were recorded (Table 3), the differences between treatments were not significant.

Field trials planned for 1983 will expand the foliar and granular applications to larger field plots and concentrate on the variables of application timing, irrigation scheduling, and other management practices.

Table 1. Combined results of field trials to control Phymatotrichum root rot of cotton using foliar applications of propiconazol

Treatment (lbs a.i./A)	Percent Disease		Yield (seed cotton)	
	Upland[1/]	Pima[2/]	Upland[1/]	Pima[2/]
Control	79a[3/]	50a	1,193a	1,465a
0.12	73a	46a	1,800ab	1,656a
0.25	67ab	43a	1,843ab	1,800a
0.50	49b	42a	2,255b	1,703a

1/ Upland cotton (DPL-55) Percent disease=means of 4 field trials; yield= means of 2 field trials. Two treatment made 6/9/82, two on 6/24/82. Percent disease and yield data collected 9/21/82 and 10/12/82, respectively.
2/ Pima cotton (S-5). Means of 2 field trials.
Treatments made 6/14/82 and 7/1/82. Percent disease and yield data collected 10/18/82 and 10/21/82, respectively.
3/ Means followed by the same letter are not significantly different (LSD=0.5).

Table 2. Combined results of field trials to control Phymatotrichum root rot of cotton using side-dress applications of granular propiconazol

Treatment (lbs a.i./A)	Percent Disease		Yield (seed cotton)	
	Upland[1/]	Pima[2/]	Upland[1/]	Pima[2/]
Control	94a[3/]	32a	960a	1,799a
1.0	58 b	27a	1,805 b	1,720a
2.0	36 b	29a	2,483 b	1,748a

1/ Upland cotton (DPL-55). Means from 2 field sites.
Treatments made 6/7/82 and 10/13/82. Yield data collected 10/13/82.
2/ Pima cotton (S-5). Means from 1 test plot.
Treatment made 6/7/82. Percent disease and yield data collected 10/18/82 and 10/20/82, respectively. 3/ Means followed by the same letter are not significantly different (LSD=0.05).

Table 3. Results of field trials to control Phymatotrichum root rot of cotton by injecting the EC formulation of propiconazol into the root zone of established plants, using anhydrous ammonia as a carrier

Treatment (lbs a.i./A)	Upland 1/ Percent Disease	Upland 1/ Yield (seed cotton)	Pima 2/ Percent Disease
Control	74a	2,000a	85a
0.5	59a	2,548a	78a
1.0	64a	2,081a	61a
2.0	64a	2,622a	64a

1/ Upland cotton (DPL-55). Means for percent disease from 2 field plots, yield from 1 field plot. Treatments made 5/25/82 and 6/10/82. Percent disease readings made 9/28/82 and and 10/5/82. Yield data collected 10/28/82.
2/ Pima cotton (S-5). Means from 1 test plot. Treatment made 6/3/82, percent disease data collected 10/14/82.
3/ Means followed by the same letter are not significantly different (LSD=0.05).

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Estimating Cotton Crop Loss Caused By Phymatotrichum omnivorum.

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Summary

In September, 1981, 37 fields of Upland and 9 fields of Pima cotton were surveyed as part of the cotton crop loss assessment project. Total seed cotton yields for Pima and Upland cotton were reduced by 13% and 10%, respectively by Phymatotrichum omnivorum infection. Losses were most severe in Upland fields in cotton monocultures. Fiber and seed quality were also significantly lower on infected plants of both varieties.

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Phymatotrichum root rot continues to be a major production constraint for Arizona cotton growers. In the Marana area, it is the single largest contributor to yield reduction. While there is an abundance of literature on fiber losses attributable to root rot, a precise measurement of the economic losses associated with this disease have been elusive. Other potential loss factors, such as fiber and seed quality, have not been adequately studied.

Accurate crop loss information can be an essential management tool in assisting growers in deciding: whether to plant cotton or rotate; whether cultural and chemical disease control strategies can economically be employed; how best to manage his cost inputs relative to his estimated yields; and what financial return he can expect from his crop. The data summarized in this report represents the initial phase of what is intended to be a long term project aimed at the development of accurate and economical methods of cotton crop loss assessment. A total of 37 fields of Upland (2454 acres) and 9 Pima fields (532.3 acres) in the Marana area were surveyed on September 18-19,