FLUTRIAFOL CONTROL OF COTTON ROOT ROT CAUSED BY *PHYMATOTRICHOPSIS OMNIVORA*

T. Isakeit
Texas AgriLife Extension Service
College Station, TX
Rick Minzenmayer
Texas AgriLife Extension Service
Ballinger, TX
Chris Sansone
Texas AgriLife Extension Service
San Angelo, TX

Abstract

The objective of this work was to evaluate fungicides applied via drip irrigation for control of root rot (PRR) of cotton (*Gossypium hirsutum* L.), caused by *Phymatotrichopsis omnivora* . The experiment was done in a field near San Angelo, TX with a history of PRR. Commercial formulations of fungicides were injected with a pump into drip tape when plants were at match head square growth stage on 23 June 2008 and again, three weeks later. The drip tape was 1 ft under the row, with emitters every 2 ft. The treatments and rates (lb/A active ingredient) for each application were: propiconazole (2.6), azoxystrobin (1), prothioconazole combined with tebuconazole (2 of each), tetraconazole (2) and flutriafol (2). Each treatment was replicated three times. Each replicate was a single row, 650-750 ft long. At the time of the initial application, a few plants outside the plot were wilted. On 2 September, the mean PRR incidence of control rows was 75%. PRR incidence was significantly ($P<0.05$) less with flutriafol treatment: only 2%. PRR with tetraconazole and propiconazole treatments were also significantly ($P<0.05$) less, 60% and 53% incidence, respectively. PRR incidences with prothioconazole combined with tebuconazole, and azoxystrobin treatments were 74% and 73%, respectively, which were not significantly ($P<0.05$) different from the control. The data suggests that flutriafol may have efficacy for PRR management, if future experiments demonstrate a high degree of control using lower, economical rates.

Introduction

Cotton root rot, also known as Phymatotrichopsis root rot (PRR), caused by the fungus *Phymatotrichopsis omnivora* (Duggar) Hennebert (synonym: *Phymatotrichum omnivorum*), is a serious disease of cotton (*Gossypium hirsutum* L.) in many production areas of Texas, Arizona and New Mexico. To date, there are no effective, economical control measures. PRR can be more devastating to cotton under drip irrigation, particularly with cotton monoculture.

We have previously reported the results of experiments evaluating fungicides for control of PRR, including fungicides applied via drip irrigation (Isakeit *et al*., 2007). The objective of this study was to evaluate new fungicides applied via drip irrigation for control of PRR.

Materials and Methods

The experiment was done in a drip-irrigated field in San Angelo, TX, which was an Angelo clay loam. Rows (650-750 ft) were on 40 in centers and drip tape was 12 in deep under the row, with emitters every 24 in. The emitter output was 0.2 gal/hr. The field was plant 8 May 2008 to cotton ('FiberMax 9180 B2RF'). The fungicides were injected in a volume of 1.3 gal at a T-connection using an Iwaki EH-E metering pump operating at approximately 150 psi with an output of 5.5 gal/hr. Commercial formulations of six fungicides (Table 1) were applied 23 June 2008 when plants were at match head square growth stage, and again three weeks later. Treatments were arranged in a randomized complete block with three replications. Each replication consisted of one row. PRR symptoms were visible in a few plants outside of the experimental plots at the time of the first fungicide application.

The incidence of diseased plants (wilted or dead) was assessed for all treatments, starting 16 days after the first fungicide treatment and continuing weekly for the next five weeks. Diseased plants for the control and flutriafol treatment were counted for an additional two weeks. On 2 September 2008, 71 days after the first fungicide application, row length measurements of diseased plants were made for all treatments.

In order to determine if flutriafol treatment caused any phytotoxicity that affected yield or fiber quality, cotton in 13-ft row lengths from each of three rows with no disease symptoms were harvested from the flutriafol and the control replicates in early October, 2008. The cotton was ginned, weighed, and fiber quality was analyzed by the Texas Tech University International Textile Center in Lubbock.

Data were subjected to an analysis of variance and when the analysis of variance was significant at $P<0.05$, the least significant difference was calculated.

Results and Discussion

Flutriafol significantly ($P<0.05$) reduced PRR in comparison with the control and the other fungicide treatments (Table 1). Flutriafol reduced PRR to 3% of the control. Disease suppression with this fungicide was observed 38 days after the first application and persisted throughout the growing season (Figs. 1 & 2). Propiconazole and tetraconazole treatments also significantly ($P<0.05$) reduced PRR, to 71% and 80%, respectively, of the control. Azoxystrobin and prothioconazole + tebuconazole treatments did not significantly ($P<0.05$) reduce PRR.

Table 1. Effect of fungicides applied via drip irrigation on PRR 71 days after the first application.

Fungicide	Rate (lb. a.i./A)*	% Diseased Plants**
None	-	75 a
Azoxystrobin	1	73 a
Propiconazole	2.6	53 b
Tetraconazole	2	60 b
Prothioconazole + tebuconazole	2 + 2	74 a
Flutriafol	2	2 c

*a.i. = active ingredient, rate applied on each of two dates, 23 June & 15 July.
**% diseased plants/650-750 ft. row, mean of 3 replicates. Evaluated 2 September. Numbers within a column followed by the same letter are not significantly ($P<0.05$) different using LSD mean separation.

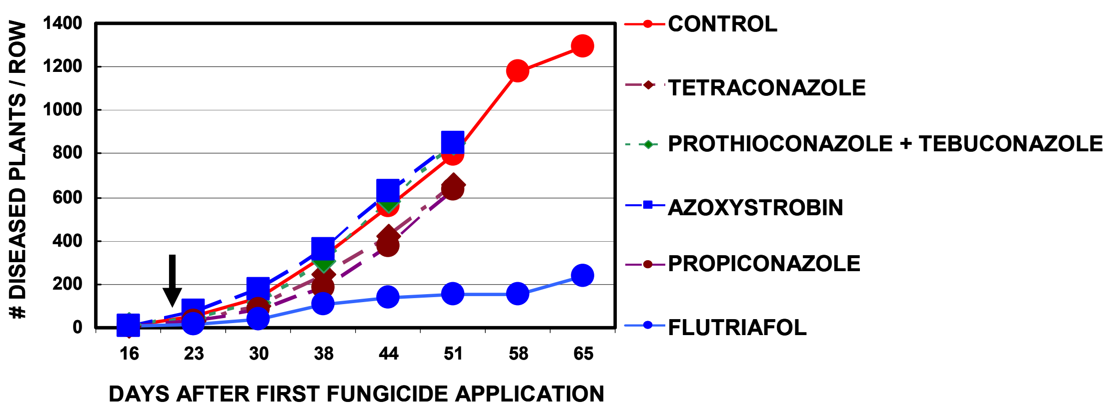

Figure 1. Mean incidence of diseases plants in rows of cotton plants treated with fungicides applied via drip irrigation. Arrow indicates timing of second fungicide application.

Figure 2. Middle row treated with flutriafol, flanked by other, less-effective fungicide treatments on 4 August 2008, 42 days after the first application of fungicides via drip irrigation.

Foliar phytotoxicity was seen with flutriafol treatment (Fig. 3), but not with the other fungicide treatments. Treatment with flutriafol apparently did not affect the lint or seed yield, or lint quality (Table 2).

Figure 3. Foliar phytotoxicity observed with flutriafol: A. 42 days after treatment (4 August); B. 71 days after treatment (2 September).

Table 2. Effect of flutriafol treatment on cotton yield and fiber quality in the absence of visible Phymatotrichopsis root rot symptoms.

Treatment	Lint (lb/A)*	Seed (lb/A)	Uniformity	Micronaire	Length	Strength	Elongation
None	1379	2229	79.23	3.73	1.12	29.50	9.40
Flutriafol	1327	2125	79.70	4.10	1.12	29.77	9.17

*Values are the means of 3 replicates. Values within a column are not significantly different ($P<0.05$) by ANOVA.

Olsen and George (1987) reported that either propiconazole or triadimenol, at either 0.5 lb/A (a.i.) or 0.75 lb/A (a.i.), applied through a drip irrigation system, reduced PRR mortality. Prior to our study, this was the only published report of effective control of PRR with a fungicide delivered via drip irrigation. In our previous research, we did not obtain PRR control with 0.75 lb/A (a.i.) propiconazole applied via drip irrigation (Isakeit *et al*., 2007).

The *in vitro* inhibitory activity of flutriafol against *P. omnivora* was previously reported (Lyda and Riggs, 1987; Riggs and Lyda, 1988), but the fungicide was never apparently evaluated in field trials. To our knowledge, our study is the first report of the inhibitory activity of flutriafol against *P. omnivora* in a field experiment.

However, a flutriafol rate of 4 lb/A (active ingredient) costs approximately $662/A and is not economical. Our data suggests that flutriafol may have efficacy for PRR management, if future experiments demonstrate a high degree of control using lower, more economical rates.

Acknowledgements

We thank our cooperating growers, John and Doug Wilde. We also thank Pam Halfmann, Katie Moses, and Mary Joe Schronk for dedicated counting. This work was partially funded by the Texas State Support Committee.

References

Isakeit, T., R.R. Minzenmayer, J. Stapper, and C.G. Sansone. 2007. Evaluation of fungicides for control of cotton root rot caused by *Phymatotrichopsis omnivora*. Beltwide Cotton Prod. Res. Conf. 2007: 181-184.

Lyda, S.D. and J.L. Riggs. 1987. Evaluation of triazole fungicides for control of Phymatotrichum root rot of cotton. Beltwide Cotton Prod. Res. Conf. 1987: 47-48.

Olsen, M.W. and S. George. 1987. Applications of systemic fungicides through subsurface drip irrigation for control of Phymatotrichum root rot of cotton. Phytopathology 77:1748 (Abstract).

Riggs, J.L. and S.D. Lyda. 1988. Laboratory and field tests with triazole fungicides to control Phymatotrichum root rot of cotton. Beltwide Cotton Prod. Res. Conf. 1988: 45-48.