CONTROL OF PHYMATOTRICHOPSIS ROOT ROT OF COTTON WITH FLUTRIAFOL

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Abstract

Phymatotrichopsis root rot (PRR), caused by the fungus *Phymatotrichopsis omnivora*, is a serious disease in many of the cotton production areas of Texas and other southwestern states. The objective of this study was to evaluate control of PRR with flutriafol, which was shown previously to have activity against PRR. Several rates of the fungicide was applied to young plants, prior to flowering, via drip irrigation, as a spray directed towards the lower stem, and as a side dress. When applied via drip irrigation, the rates of flutriafol from 0.125 lb a.i./A to 2 lb a.i./A significantly($P<0.05$) reduced PRR and increased yield, in comparison with the control. Two applications each of 0.0625 lb a.i./A, separated by three weeks, did not significantly reduce PRR, but significantly increased yield. Rows treated in 2008 with 4 lb a.i./A, but not treated in 2009, also had significantly reduced PRR and increased yield. Rates of 0.0625 lb a.i./A to 0.25 lb a.i./A applied as a spray to the stem significantly reduced PRR at the trial in Williamson county, but not the two other locations. There was no reduction in disease when flutriafol was applied as a side dress. This fungicide shows promise for control of PRR, but additional experiments are needed to optimize effectiveness.

Introduction

Phymatotrichopsis root rot (PRR), caused by the fungus *Phymatotrichopsis omnivora*, is a serious disease in many of the cotton production areas of Texas. The objective of this study was to evaluate flutriafol for control of PRR. Our previous work showed that this fungicide had activity against PRR (Isakeit *et al*., 2009).

Materials and Methods

Several methods of application of a commercial formulation of flutriafol were evaluated:

Drip Irrigation:
The experiment was conducted in the same Tom Green County field used in 2008, using the same methods (Isakeit *et al*., 2009). Flutriafol was applied June 29, 2009 at third set square. The rates were 0.0625, 0.5, 1 and 2 lb. a.i./A. Two applications of 0.0625 and 2 lb a.i./A were made three weeks later. Rows treated with flutriafol in 2008 were not treated, to determine if there was any carry-over to the next season.

Stem Drench:
Applications were made by hand with a CO_2 sprayer, directing a coarse stream to the lower stem.. The rates were 0.0625, 0.125 and 0.25 lb a.i./A in 40 gpa. Each plot was 4 rows by 40 feet, with four replications per treatment. Treatments were applied June 29, 2009 in the same Tom Green County field used in the drip experiment, July 6, 2009 at 4-5 NAWF in a field at the Stiles Farm in Williamson County, and July 2, 2009 at one-third full square in Navarro County.

Spoke Wheel Applicator:
The fungicide was applied May 27, 2009 to cotton at pinhead square in a field in Caldwell County. The rates were 0.25, 0.5 and 1 lb a.i./A in 25 gpa. Each plot was 8 rows by 100 feet and there were four replications per treatment.

Coulter Applicator:
The fungicide was applied at a rate of 0.5 lb a.i./A in 23 gpa on July 8, 2009 in the same Stiles Farm field used in the stem drench experiment. Each plot was 8 rows by 100 feet and there were five replications.

Knife Side Dress:
Flutriafol was knifed in, using the same Tom Green County field used in the other two experiments. The rates were 0.0625 and 0.5 lb. a.i./A in 15 gpa. Each plot was 8 rows by 100 feet and there were four replications per treatment.

Results and Discussion

Applied Via Drip Irrigation:
The rates of flutriafol from 0.125 lb a.i./A to 2 lb a.i./A significantly *(P<0.05)* reduced PRR (Fig. 1).

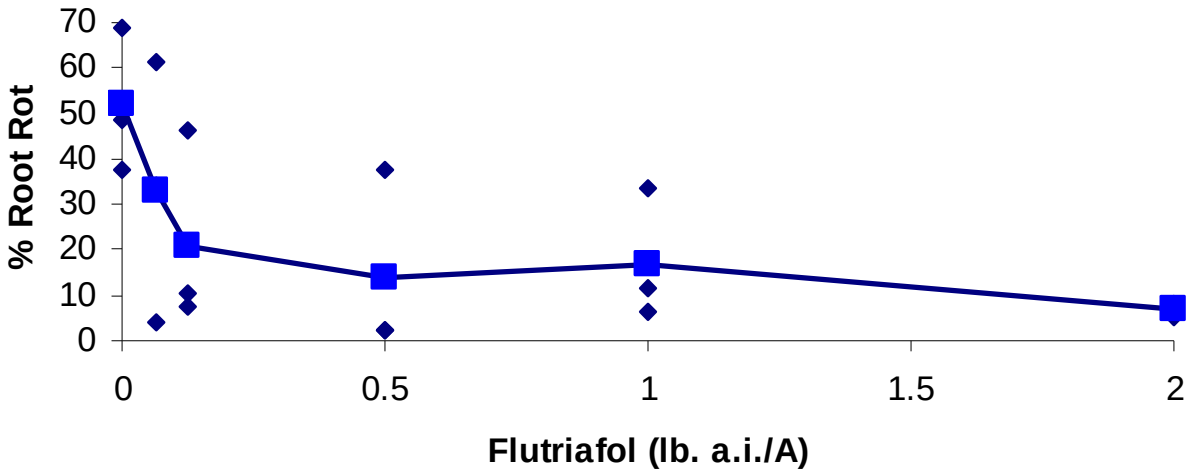

Figure 1. Effect of flutriafol rate (lb a.i./A), applied via drip irrigation, on PRR. The solid line is the average of three measurements of row lengths, done September 24, 2009. Individual measurements are shown as points

Two applications each of 0.0625 lb a.i./A and separated by three weeks did not significantly (P<0.05) reduce PRR in comparison with the control, but significantly (P<0.05) increased yield by 30% (Table 1). Rates of 0.125 lb a.i./A and 0.5 lb a.i./A significantly (P<0.05) reduced PRR and significantly increased yield by approximately 50% (Table 1). Replicates treated with 4 lb a.i/A in 2008, but no fungicide in 2009, had the lowest level of PRR and a yield increase of 48% (Table 1).

Table 1. Effect of flutriafol applied via drip irrigation on PRR and yield.

Rate (lb. a.i./A)[1]	% PRR[3,5]	Yield (lb/A)[4,5]
None (control)	52 a	5016 c
0.0625, applied twice[2]	33 ab	6519 b
0.125	18 bc	7405 ab
0.5	9 bcd	7809 a
4 (applied in 2008 only)	2 d	7614 ab

[1]a.i. = active ingredient, amount applied on June 29.
[2]Another application July 20.
[3]% diseased plants/650-750 ft. row, mean of 3 replicates. Evaluated September 24.
[4]Yield (lint+seed)/row, mean of 3 replicates. Evaluated November 16.
[5]Numbers within a column followed by the same letter are not significantly (*P*<0.05) different by LSD.

Applied as a Lower Stem Spray:
Rates of 0.0625 lb a.i./A to 0.25 lb a.i./A significantly *(P<0.05)* reduced PRR at the Williamson county site (Fig.2 and Table 2), but not at the sites in Tom Green and Navarro counties.

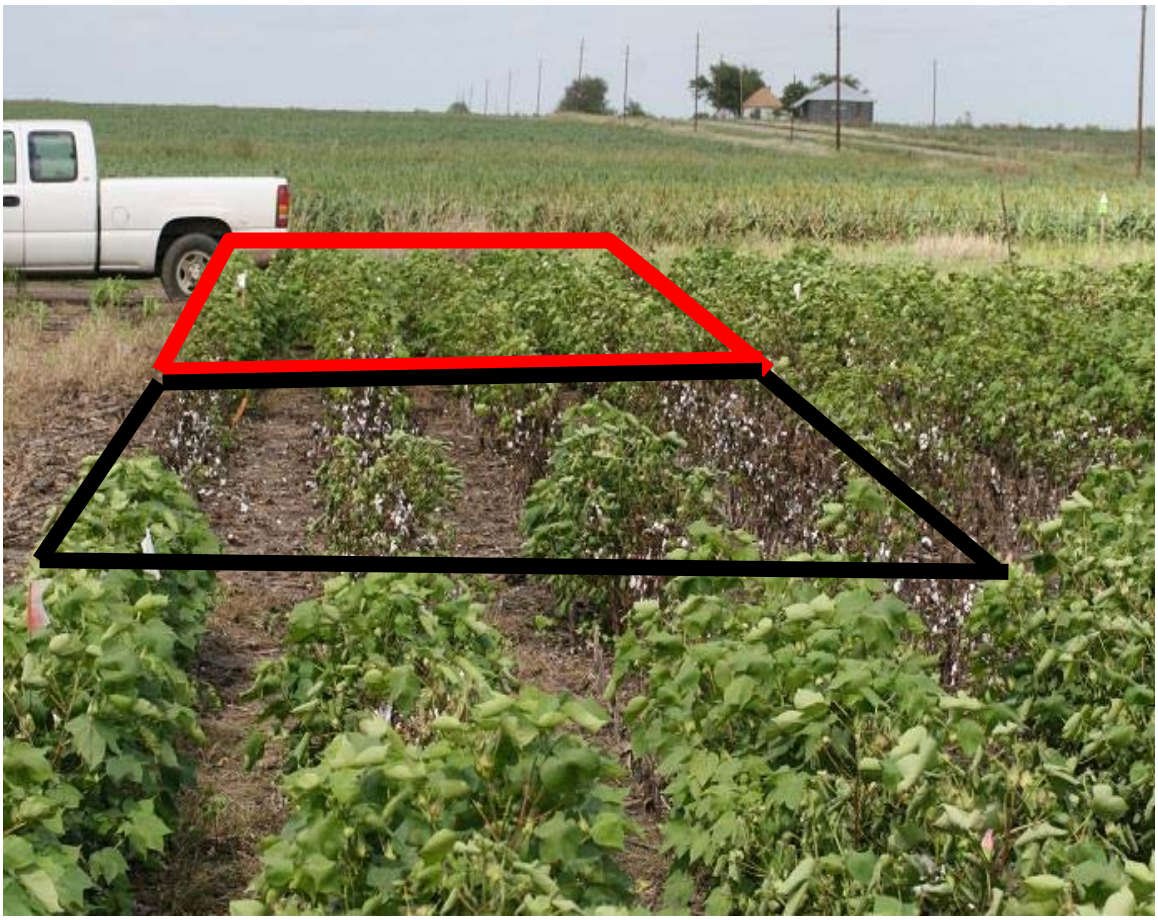

FIGURE 2. Reduction in PRR in one replicate (within red outline) following stem drench application of 0.25 lb. a.i./A flutriafol on July 8, 2009 at 4-5 NAWF, in comparison with control (within black outline). Oct. 8, 2009, Stiles Farm, Williamson County.

Drought conditions at the Navarro county location suppressed disease development. The Williamson county field was planted late and disease development was suppressed by drought from June through August. However, frequent rain showers in September promoted plant growth and root rot development. It is possible that rain effectively redistributed fungicide at a time when the pathogen was becoming active. In comparison, there was no substantial rain at the Tom Green county location during the experiment. It remains to be determined whether lower stem sprays with flutriafol will be consistently effective with a low volume of water, in the absence of rain. Additional work needs to be done to optimize control when this method of application is used.

Table 1. Effect of flutriafol applied via stem drench on % PRR at fields in three Texas counties.

Rate (lb. a.i./A)[1]	% PRR – Williamson[2]	% PRR – Tom Green	% PRR – Navarro
None (control)	55 a	57	8
0.0625	20 b	37	10
0.125	22 b	43	11
0.25	12 b	32	4

[1]a.i. = active ingredient, amount applied on June 29.
[2]Numbers within a column followed by the same letter are not significantly (P<0.05) different using LSD mean separation.

Side Dress Methods of Application:

There was no reduction in disease when flutriafol was applied via knife, spoke wheel applicator, or Coulter applicator. A drought at the Caldwell county location suppressed disease development. However, at the Tom Green location, knifing did not reduce disease, while application of the fungicide through the drip irrigation lines did, and at the Williamson county location, the stem-directed sprays reduced the disease, but not the Coulter applicator. More work needs to be done to determine if side dress methods could effectively be used to deliver flutriafol. Such methods could be used in dryland farming and, in combination with precision agriculture, can allow for the application of the fungicide only to portions of fields prone to PRR.

Summary

In these experiments, flutriafol shows excellent potential as a fungicide for managing PRR. However, the results are not consistent and more research is needed to optimize timing and application method.

Acknowledgements

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Reference

Isakeit, T., R. Minzenmayer, and C. Sansone. 2009. Flutriafol control of cotton root rot caused by *Phymatotrichopsis omnivora*. p. 130-133 *In* Beltwide Cotton Prod. Res. Conf. San Antonio, TX 5-8 Jan. 2009. Natl. Cotton Counc. Am., Memphis, TN.