

Evaluation of Fosphite Rates Against *Pythium ultimum*, Damping-off Disease on Corn

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Abstract

Fosphite was applied as a foliar application at different rates compared to Alliette at the labeled rate, to evaluate the efficacy and to provide protection against damping-off disease *Pythium ultimum* on Corn plants (*Zea mays* ssp). The result showed those Fosphite treatments at 0.50% and 1.0% and Alliette significantly ($p \leq 0.05$) reduced the damping off disease symptoms on Corn plants.

Introduction

Corn plants are susceptible to soilborne disease fungi that cause damping-off. Infection can occur before or after emergence, and severity of disease may vary. Symptoms of damping-off caused by *Pythium* spp. consist of soft rot stem tissues and water-soaked regions. Wilting, stunting, and yellowing of leaves are also symptoms but may not always be apparent. This trial aimed to evaluate the efficacy of different Fosphite rates and Aliette (as the standard fungicide) for the control of damping-off disease on Corn.

Materials and Methods

Forty-eight Corns seedlings were used in this trial. Eight plants were used for each treatment as replications. Two fungicides were tested for effectiveness. Fosphite was used at rates of 0.125 %, 0.25 %, 0.5 % and 1 % v/v, and Chipco Aliette WDG (Rhone Poulenc) was used at a rate of 4 pounds per 100 gallons of water. All were applied as a foliar spray (spray until wet). Control plants were untreated and sprayed with water.

Corn plants were infected with *Pythium ultimum*. The fungus was grown on 10% vegetable juice agar for five days at 25 °C. Culture dishes were flooded with sterile deionized water and incubated at room temperature for one hour before zoospore suspensions from several dishes were collected. The zoospore concentration was determined using a hemacytometer and the suspension was adjusted to 10,000 zoospores per milliliter.

Corn plants were transplanted on soil that was inoculated with *Pythium ultimum*. Inoculation of the soil with fungus was carried out 7 days before transplanting. The fungus was allowed 7 days to grow in the soil before it was used for transplanting. The experimental design was randomized complete block with eight replications. Treatment was applied with a hand-sprayer to the plants once on the first week. Aliette was applied at the recommended rate of 4-lb./100 gallon of water also on the first week. Corn plants were completely wet after application. They were rated prior to the initial application and also each week for the next four weeks. Ratings were based on University of California Pathogenically Rating Scale 0-5 (0 is no disease, 5

is terminally infected). The plants were visually evaluated. The following scale was used:

- 0 No spots
- 1 1-3 spots present on leaves but not obvious
- 2 1-3 spots obviously present on bracts
- 3 4-12 spots present on bracts and leaves
- 4 Spots present on bracts, leaves
- 5 Plant totally blighted

Results:

The *Pythium ultimum* disease rating at the pre-count for all Corn plants ranged from 1.00 to 1.25. There was no significant ($p \leq 0.05$) difference on the disease ratings among all the plants.

At the first week post treatment, all the treatment applications had no significant ($p \leq 0.05$) difference on disease rating. Smillie et al. (1989) indicated that phosphite when present in the plant might cause modification of the fungal cell surface in such a way the plant start recognizing it as foreign and respond with its normal defense mechanisms which happen very slowly. Fosphite treatments 0.5%, and 1.0% and Aliette significantly ($p \leq 0.05$) reduced the disease over the control at the second week. Although the Fosphite treatments 0.125% and 0.25% at the second week had lower disease rating than the control but the difference was not statistically significant ($p \leq 0.05$). These results match with those of Fenn and Coffey (1985) as they stated that low concentrations of phosphorus lightly reduce the disease. There were no significant ($p \leq 0.05$) differences for the disease rating among all the treatments of Fosphite and Aliette at the third week. The disease rating for the control plants increased to 2.50 at the fourth week after treatment applications. However, Fosphite at 0.50% and 1.0% and Aliette had significantly ($p \leq 0.05$) lower disease rating than the control at the fourth week. Fosphite at 0.50% and 1.0% and Aliette had the lowest disease rating.

The results indicated that Fosphite treatments at 0.50% and 1.0% are effective on the control of disease caused by *Pythium ultimum*.

Table 1. Effect of Fosphite and Aliette on disease control by *Pythium ultimum* on Corn plants.

	Disease Rating				
	Pre-count*	Week 1*	Week 2*	Week 3*	Week 4*
Fosphite 0.125 %	2.00 a	2.25 a	2.25 ab	2.25 ab	2.25 ab
Fosphite 0.25 %	2.00 a	2.25 a	2.25 ab	2.25 ab	2.25 ab
Fosphite 0.5%	2.00 a	2.00 a	1.75 b	1.75 b	1.75 b
Fosphite 1.0%	2.00 a	2.00 a	1.75 b	1.75 b	1.75 b
Control	2.00 a	2.00 a	2.50 a	2.50 a	2.50 a
Aliette 4 lb./100 gallon of water	2.00 a	2.00 a	1.75 b	1.75 b	1.75 b

*Means in the same column not followed by the same letter differ significantly ($p \leq 0.05$) as determined by DMRT.

References

Fenn, M. and M. Coffey, 1985: Further evidence for direct mode of action of Fosetyl-Al and phosphorous acid. *Phytopathology* 75 (9) 1064-1068.

Smillie R, Grant, B. and Guest, D., 1989: The mode of action of phosphite: evidence for both direct and indirect modes of action on three *Phytophthora spp.* In plants. *Phytopathology* 79 (9): 921-926

Appendix 2. Analysis of Variance

Pre-count

<i>Source of Variation</i>	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	
Treatment	5	0.000	0.000	65535.0	ns
Block	7	0.000	0.000	65535.0	ns
Error	35	0.000	0.000		
Total	47	0.000			

Week 1

<i>Source of Variation</i>	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	
Treatment	5	0.750	0.150	1.465	ns
Block	7	0.917	0.131	1.279	ns
Error	35	3.583	0.102		
Total	47	5.250			

Week 2

<i>Source of Variation</i>	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	
Treatment	5	2.854	0.571	3.165	*
Block	7	1.313	0.188	1.040	ns
Error	35	6.313	0.180		
Total	47	10.479			

Week 3

<i>Source of Variation</i>	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	
Treatment	5	2.500	0.500	3.387	*
Block	7	1.583	0.226	1.532	ns
Error	35	5.167	0.148		
Total	47	9.250			

Week 4

<i>Source of Variation</i>	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	
Treatment	5	2.500	0.500	3.387	*
Block	7	1.583	0.226	1.532	ns
Error	35	5.167	0.148		
Total	47	9.250			

ns = Not significant at $p \leq 0.05$

* = Significant at $p \leq 0.05$