

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

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Abstract

Fosphite was applied as a foliar application at different rates compared to Aliette at the labeled rate, to evaluate the efficacy and to provide protection against *Pythium ultimum* disease on Artichoke. Results showed that all Fosphite treatments and Aliette significantly ($p \leq 0.05$) reduced the disease symptoms on Artichoke over the control.

Introduction

Damping-off is a soilborne disease that occurs wherever plants are grown. Artichokes are susceptible to the disease, and a low yield occurred as a result of the disease. Artichoke with damping-off disease has brown, watery, soft rot on the stem and leaves and stunted growth. The disease is a significant concern because of the economic loss that it can bring to the growers. This trial aimed to evaluate the efficacy of different Fosphite rates and Aliette (as the standard fungicide) for the control of *Pythium* disease on Artichoke.

Materials and Methods

Thirty Artichoke seedlings were used in this trial. Five 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, 25-ml./ plant (spray until wet). Control plants were untreated and sprayed with water.

Artichoke 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.

Artichoke 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 five 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. Artichoke 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, and stems
- 5 Plant totally diseased

Results and Discussion:

The *Pythium ultimum* disease rating at the pre-count for all Artichoke plants ranged from 2.6 to 3.0. There was no significant ($p \leq 0.05$) difference on the disease ratings among all the plants.

At the first and second week post treatment, all the treatment applications had significant ($p \leq 0.01$) difference on disease rating over the control. Treatments of Fosphite 0.125%, 0.25%, 0.5%, 1.0% and Aliette significantly ($p \leq 0.01$) reduced the disease over the control. At the third week, Fosphite 0.125%, .50% and Aliette significantly ($p \leq 0.05$) reduced the disease ratings, there were no significant ($p \leq 0.05$) differences on the disease rating among the treatments of Fosphite 0.125%, 0.50%, and Aliette at the third week. Fosphite 0.125%, .50% and 1.0% significantly ($p \leq 0.05$) reduced the disease ratings over the control. These results match with those of Fenn and Coffey (1985) as they stated that different concentrations of phosphorus have different effect on the disease control. The disease rating for the control plants increased to 3.6 at the fourth week after treatment applications. At the fourth week after the treatment application, all treatments had significant ($p \leq 0.05$) lower disease rating than control. Fosphite at 0.125%, 0.25%, 0.50% and 1.0% significantly ($p \leq 0.05$) reduced the disease ratings over Aliette and control. The results indicated that Fosphite treatments at 0.125%, 0.25%, 0.50% and 1.0% are effective on the control of disease caused by *Pythium ultimum* on Artichoke.

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

	Disease Rating				
	Pre-count*	Week 1*	Week 2*	Week 3*	Week 4*
Fosphite 0.125%	2.6a	2.2 b	2.0 b	1.6 bc	1.6 c
Fosphite 0.25%	3.0a	2.4 b	1.8 b	1.2 c	1.2 c
Fosphite 0.5%	3.0a	2.0 b	1.6 b	1.6 bc	1.4 c
Fosphite 1.0%	2.6a	2.0 b	1.6 b	1.2 c	1.2 c
Control	3.0a	3.4a	3.4a	3.4a	3.6a
Alliette 4 lb./100 gallon of water	3.0a	2.2 b	2.0 b	2.0 b	2.4 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

Appendix 2. Analysis of Variance

Pre-count

Source of Variation	df	SS	MS	F	
Treatment	5.0	1.067	0.213	2.207	ns
Block	4.0	0.467	0.117	1.207	ns
Error	20.0	1.933	0.097		
Total	29.0	3.467			

Week 1

Source of Variation	df	SS	MS	F	
Treatment	5.0	6.967	1.393	9.721	**
Block	4.0	1.133	0.283	1.977	ns
Error	20.0	2.867	0.143		
Total	29.0	10.967			

Week 2

Source of Variation	df	SS	MS	F	
Treatment	5.0	11.467	2.293	11.862	**
Block	4.0	0.533	0.133	0.690	ns
Error	20.0	3.867	0.193		
Total	29.0	15.867			

Week 3

Source of Variation	df	SS	MS	F	
Treatment	5.0	16.967	3.393	16.159	**
Block	4.0	1.000	0.250	1.190	ns
Error	20.0	4.200	0.210		
Total	29.0	22.167			

Week 4

Source of Variation	df	SS	MS	F	
Treatment	5.0	22.300	4.460	15.205	**
Block	4.0	2.533	0.633	2.159	ns
Error	20.0	5.867	0.293		
Total	29.0	30.700			

ns = Not significant at $p \leq 0.05$

** = Significant at $p \leq 0.01$

