

Evaluation of Fosphite rates against *Phytophthora parasitica*, Root Rot Disease on Strawberries

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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 damping-off disease *Phytophthora parasitica* on Strawberry (*Fragaria ananassa*). Results showed that Fosphite 1.0% treatment reduced the disease rating but the reduction was not statically significant ($p \leq 0.05$). There was no significant ($p \leq 0.05$) difference on the disease ratings between Fosphite 1.0% and Aliette treatments.

Introduction:

Crown and root rot disease is caused by *Phytophthora spp.*, a soil borne fungi. They are widely spread and serious plant diseases, causing losses that will severely affect the crop at market. If infection occurs at later stages, plants may appear wilted and yellow. Rotting of the crown may also be evident of the disease. Infected plants loses vigor, foliage loses shiny green luster. Young and old leaves wilt during warmest part of the day. Roots blackened and or rotted. The plants collapse early in the second growing season. This trial aimed to evaluate the efficacy of different Fosphite rates and Aliette (as the standard fungicide) for the control of *Phytophthora* root and crown rot disease on Strawberry.

Materials and Methods:

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

Strawberry plants were infected with *Phytophthora parasitica*. 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.

Strawberry plants were transplanted on soil that was inoculated with *Phytophthora parasitica*. 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. Strawberry plants were completely wet after application. They were rated prior to the initial application and also each week for the next two 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:

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, flowers and stems
5	Plant totally blighted

Results and Discussion:

The *Phytophthora parasitica* disease rating at the pre-count at week one, for all Strawberry plants ranged from 0.00 to 0.50. 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. The disease rating for the control plants increased to 2.00 at the fourth week after treatment applications. Treatments of Fosphite 0.125%, 0.25%, 0.5%, 1.0% had no significant ($p \leq 0.05$) difference on disease rating over the control at the second week. Although the Fosphite treatments 1.0-% had lower disease rating than the control but the difference was not statistically significant ($p \leq 0.05$) at the second week. There were no significant ($p \leq 0.05$) differences on the disease rating among the treatments of Fosphite 1.0% and Aliette at the same week. Aliette had significantly ($p \leq 0.05$) lower disease rating than the control at the second week. The results indicated that Fosphite treatments at 1.0% might reduce the disease caused by *Phytophthora parasitica*.

Table 1. Effect of Fosphite and Aliette on disease control by *Phytophthora parasitica* on Strawberry plants

	Disease Rating		
	Pre-count*	Week 1*	Week 2*
Fosphite 0.125 %	0.125 a	1.125 a	2.125 a
Fosphite 0.25 %	0.250 a	1.250 a	2.000 a
Fosphite 0.5%	0.500 a	1.125 a	2.125 a
Fosphite 1.0%	0.000 a	0.875 a	1.500 ab
Control	0.375 a	1.250 a	2.000 a
Aliette 4 lb./100 gallon of water	0.500 a	1.125 a	1.125 b

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

References:

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	1.667	0.333	1.944	ns
Block	7	2.250	0.321	1.875	ns
Error	35	6.000	0.171		
Total	47	9.917			

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	0.441	ns
Block	7	10.583	1.512	4.441	ns
Error	35	11.917	0.340		
Total	47	23.250			

Week 2

<i>Source of Variation</i>	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	
Treatment	5	6.688	1.338	3.963	**
Block	7	4.813	0.688	2.037	ns
Error	35	11.813	0.338		
Total	47	23.313			

ns = Not significant at $p \leq 0.05$

** = Significant at $p \leq 0.01$