Effect of Fosphite against *Phytophthora parasitica,* Root Rot Disease on Salvia

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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 root rot disease *Phytophthora parasitica* on Salvia (*Sclarea splendens*). The result showed that Fosphite treatment at 1% significantly ($p \leq 0.05$) the root rot disease symptoms on Salvia plants.

Introduction:

Root rot disease on Salvia plants can cause severe damage that leads to economic losses. The pathogen in the soil can infect roots or the base of the plant. Plants can wilt, rots may appear on the crown and stem and leaves may turn yellow. Plants usually die, but if not, infected plants will have stunted growth. This research aimed to study the effect of different Fosphite rates along with Aliette (as the standard fungicide) on root rot disease *Phytophthora parasitica.*

Materials and Methods:

Forty-eight of Salvia 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 (Rhone 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.

Salvia 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.

Salvia 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. Salvia plants were completely wet after application. They were rated prior to the initial application and also each week for the next three 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 week, for all Salvia plants ranged from 0.000 to 0.375. There was no significant ($p \leq 0.05$) difference on the disease ratings among all the plants. The first week after treatment showed no significant ($p \leq 0.05$) difference on disease rating among all treatments application.

At the second week post treatment, the Fosphite treatment applications 0.125% had significantly ($p \leq 0.05$) reduced the disease rating than the control and Aliette treatment. Smillie at 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. Although the Fosphite treatments 0.25%, 0.50% and 1.0% at the second week after treatment had lower disease rating than the control but the difference was not statistically significant ($p \leq 0.05$). The disease rating for the control plants increased to 1.750 at the third week after treatment applications. All other treatments had lower disease rating than control but the difference was not statistically ($p \leq 0.05$) significant. Fosphite treatments at 1.0% significantly ($p \leq 0.05$) reduced the disease rating than the control. The results indicated that Fosphite treatments at 1.0% are effective on the control of disease caused by *Phytophthora parasitica.* Dolan and Coffey (1988) indicated that phosphorous acid treatments have different inhibition range on mutant *Phytophthora* strains. Fenn and Coffey (1985) stated that concentrations of phosphorous acid have highly inhibitory antifungal effect on several *Phytophthora* species.

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

	Disease Rating			
	Pre-count*	Week 1*	Week 2*	Week 3*
Fosphite 0.125 %	0.375 a	0.500 a	1.125 b	1.625 a
Fosphite 0.25 %	0.250 a	0.375 a	1.375 ab	1.500 a
Fosphite 0.5%	0.375 a	0.500 a	1.625 ab	1.500 a
Fosphite 1.0%	0.250 a	0.375 a	1.500 ab	1.000 b
Control	0.125 a	0.750 a	1.750 a	1.750 a
Aliette 4 lb./100 gallon of water	0.000 a	0.250 a	1.875 a	1.625 a

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

References:

Dolan, T. and M. Coffey, 1988: Correlative in vitro and vivo behavior of mutant strains of *Phytophthora palmivora* expressing different resistance to phosphorous acid and Fosetyl-Na, 78 (7): 974-978.

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