

Effect of Different Rates of Fosphite against *Pythium ultimum*, Root Rot Disease on Primrose

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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 *Pythium ultimum* on Primrose (*Pacaulis obconica*). The result proved that Fosphite treatments at 0.25%, 0.50% and 1.0% and Aliette were significantly ($p \leq 0.05$) efficient in reducing the damping-off disease on Primrose plants.

Introduction

Root rot disease on Primrose plants cause economic losses to the floriculture industry. The disease is common on flowers and the extent damages varies from the death of the seedling to poor quality surviving plants. In the late stages of the disease plants turn yellowish and wilt. 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 Primrose plants.

Materials and Methods

Forty-eight of Primrose 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.

Primrose 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.

Primrose 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. Primrose 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:
Pathogenically Rating Scale 0-5 (0 is no disease, 5 is terminally infected). The plants were visually evaluated. The following scale was used:

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

Results and Discussion:

The *Pythium ultimum* disease rating at the pre-count week, for all Primrose plants ranged from 0.375 to 0.625. 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, the Fosphite treatment applications and Aliette 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. All the Fosphite treatment applications and Aliette at the third week significantly ($p \leq 0.05$) reduce the disease at the third week than the control. Dolan and Coffey (1988) indicated that phosphorous acid treatments have different inhibition range on mutant *Phytophthora* strains. The disease rating for the control plants increased to 2.75 at the fourth week after treatment applications. Fosphite treatment applications 0.25%, 0.50%, 1.0% and Aliette had significantly ($p \leq 0.05$) reduced the disease rating. Although at the fourth week post treatment, the Fosphite treatment applications 1.0% had lower disease rating than the 0.25%, 0.50% and Aliette treatments but the difference was not statistically significant ($p \leq 0.05$). Although Fosphite 0.125% treatment had lower disease rating than the control but the difference was not statistically ($p \leq 0.05$) significant. Fenn and Coffey (1985) stated that low concentrations of phosphorus lightly reduce the disease. The results indicated that Fosphite treatments at 0.25%, 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 Primrose plants

	Disease Rating				
	Pre-count*	Week 1*	Week 2*	Week 3*	Week 4*
Fosphite 0.125 %	0.500 a	0.625 a	1.125 a	1.500 b	2.375 ab
Fosphite 0.25 %	0.375 a	0.500 a	0.875 a	1.250 b	1.875 bc
Fosphite 0.5 %	0.375 a	0.500 a	0.750 a	1.375 b	1.875 bc
Fosphite 1%	0.500 a	0.625 a	0.875 a	1.125 b	1.375 c
Control	0.625 a	0.625 a	0.875 a	2.650 a	2.750 a
Aliette rate 4 lb./100 gallon	0.500 a	0.625 a	0.875 a	1.250 b	1.500 c

*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