

Evaluation of Fosphite[®] Rates Against *Pythium ultimum*, Damping-off Disease on Bush Beans

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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 Blight disease of beans *Pythium ultimum*. Results showed that all Fosphite[®] treatments and Aliette significantly ($p \leq 0.05$) reduced the *Pythium* blight disease symptoms on Bush Beans over the control.

Introduction

Pythium blight disease has been observed to occur on beans. The disease is a significant concern because of the economic loss that it can bring to the growers. Symptoms include infected tissue that is water-soaked and brownish. A white, mycelial fungus often grows over the infected tissue, and when stems are split open, the pith may have a cottony appearance. Leaves and pods will turn yellow and plants may wilt and die. Defoliation may also occur. This trial aimed to evaluate the efficacy of different Fosphite[®] rates and Aliette (as the standard fungicide) for the control of *Pythium* blight disease on Bush Beans.

Materials and Methods

Forty-eight Bush Bean 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.

Bush Bean 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.

Bush Bean 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. Bush Bean 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:

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|---|--|
| 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 *Pythium ultimum* disease rating at the pre-count for all Bush Bean 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. Treatments of Fosphite[®] 0.25%, 0.5%, and 1.0% significantly ($p \leq 0.05$) reduced the disease over the control at the second week. Although the Fosphite[®] treatments 0.125% and Aliette 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. At the third week, Fosphite[®] 0.50%, 1.0% 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[®] 0.25%, 0.50%, 1.00% and Aliette at the third week. The disease rating for the control plants increased to 2.75 at the fourth week after treatment applications. At the fourth week after the treatment application, all treatments except the Fosphite[®] at 0.125% had significant ($p \leq 0.05$) lower disease rating than control. Fosphite[®] at 0.50% and 1.0% had the lowest disease rating followed by Aliette.

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 Bush Bean plants.

	Disease Rating				
	Pre-count*	Week 1*	Week 2*	Week 3*	Week 4*
Fosphite [®] 0.125%	1.000 a	1.500 a	1.750abc	2.000ab	2.375ab
Fosphite [®] 0.25 %	1.000 a	1.500 a	1.500 c	1.750abc	2.000 b
Fosphite [®] 0.5%	1.125 a	1.750 a	1.375 c	1.250 c	1.375 c
Fosphite [®] 1.0%	1.125 a	1.750 a	1.375 c	1.375 c	1.375 c
Control	1.000 a	2.125 a	2.125a	2.125a	2.750a
Aliette 4 lb./100 gallon of water	1.000 a	1.375 a	2.000ab	1.500 c	1.875 bc

*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