Trunk Application of Phosphorous Acid and Two Other Fungicides for Control of Phytophthora Gummosis of Citrus.

Mike Matheron and Joe Matejka

ABSTRACT

Gummosis caused by Phytophthora parasitica and P. citrophthora is a serious problem in Arizona citrus groves. In a 15-year-old Orlando tangelo planting at the Yuma Mesa Agricultural Center, a 20 cm section of trunk on each tree was painted with phosphorous acid , metalaxyl or fosetyl-Al. After treatment, pieces of bark were periodically removed from within, as well as below, the treated area and inoculated with P. parasitica and P. citrophthora. After 117 days, both Phytophthora species were inhibited on bark treated with phosphorous acid, metalaxyl or fosetyl-Al. Canker development was also reduced on bark tissue sampled 10 cm below the site of treatment. The results suggest that trunk application of phosphorous acid, metalaxyl or fosetyl-Al can provide effective protection against Phytophthora gummosis of citrus.

INTRODUCTION

Phytophthora gummosis is a serious and unfortunately common disease problem in Arizona citrus groves. Disease incidence can be high in groves where the graft union is at or below the soil surface, exposing the susceptible scion tissue to possible colonization by Phytophthora. Flood-irrigation in these groves, as well as plantings on susceptible rootstocks, can result in increased incidence of Phytophthora gummosis.

In recent years, systemic fungicides have been tested for their effectiveness in controlling gummosis and root rot of citrus. Two materials, metalaxyl (Ridomil) and fosetyl-Al (Aliette), have been proven to be effective fungicides for control of Phytophthora gummosis and root rot (2). Phosphorous acid, thought to be the active ingredient in fosetyl-Al (3), has also shown activity against some Phytophthora species.

The purpose of this research was to determine the effectiveness of phosphorous acid, as well as metalaxyl and fosetyl-Al, in reducing the activity of Phytophthora when each material was applied as a trunk paint.

MATERIALS AND METHODS

In a 15-year-old high density planting of Orlando tangelo trees, 20 cm sections of trunk were painted with either water, metalaxyl, fosetyl- Al or phosphorous acid. Twelve days after treatment, a bark strip (10 cm long x 1.5 cm wide) was removed from each treated zone and inoculated on the cambium side with a mycelial plug of Phytophthora parasitica and P. citrophthora. These inoculated bark strips were then incubated for 4 days at 24° C in moist chambers, after which the lengths of resulting Phytophthora lesions were recorded.

To monitor the downward translocation of these materials, a bark strip was also removed 10 cm below the treated zone and processed in the same way as the bark sample taken from the treated bark.

Bark samples were also collected 43, 71, 117 and 160 days after treatment to determine the effective duration of a single fungicide application.

RESULTS AND DISCUSSION

Our findings are summarized in Tables 1 and 2. The percent inhibition of canker development was determined by comparing canker size on bark treated with fungicide to canker size on bark treated with water.

Table 1. Inhibition of canker development on bark painted with metalaxyl, Fosetyl-Al or phosphorous acid.

Test pathogen and fungicide	Rate (g a.i./liter)	Percent inhibition of canker development after				
		12 days	43 days	71 days	117 days	160 days
P. Parasitica						
Metalaxyl	60	100	90	100	82	69
Fosetyl-Al	300	100	100	88	27	0
Phosphorous acid	200	100	100	100	27	43
P. Citrophthora						
Metalaxyl	60	76	88	71	61	61
Fosetyl-Al	300	100	100	100	50	22
Phosphorous acid	200	100	100	100	61	56

Table 2. Inhibition of canker development on bark tissue 10 cm below the area treated with metalaxyl, fosetyl-Al or phosphorous acid.

Test pathogen and fungicide	Rate (g a.i./liter)	Percent inhibition of canker development after				
		12 days	43 days	71 days	117 days	160 days
P. parasitica						
Metalaxyl	60	38	42	50	27	50
Fosetyl-Al	300	43	33	50	45	14
Phosphorous acid	200	28	33	33	27	21
P. citrophthora						
Metalaxyl	60	7	18	38	45	32
Fosetyl-Al	300	75	50	50	64	36
Phosphorous acid	200	43	73	54	54	41

In this test, a single trunk application of metalaxyl, fosetyl-Al or phosphorous acid was highly effective in suppressing growth of Phytophthora parasitica and P. citrophthora for at least 71 days after treatment (Table 1). After longer periods of time, the inhibitory effect of the tested materials declined.

The data presented in Table 2 shows that all 3 tested compounds translocated downward in the tangelo trees, although the degree of inhibition of Phytophthora was less than that observed on directly treated bark tissue.

Trunk application of metalaxyl, fosetyl-Al or phosphorous acid appears to be an effective approach for control of Phytophthora gummosis. The downward translocation of these materials within the citrus tree could also control Phytophthora root rot as well.

Other advantages of trunk application of fungicides are: 1) ease of application; 2) less fungicide waste when compared to foliar or soil drench methods of application; 3) degradation of fungicide by microorganisms in the soil avoided (1).

Currently, only metalaxyl (Ridomil) is registered for application as a trunk spray.

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