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Efficacy of TerraClean in Control of Phytophthora Blight and Root-Knot on Tomato

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INTRODUCTION

Phytophthora blight caused by *Phytophthora capsici* is a devastating disease in the production of cucurbits, peppers, tomatoes, and several other vegetable crops in Georgia and other states. *P. capsici* is favored by wet and humid weather conditions that are typical in the southeastern states of the U.S. The efficacy of current strategies for management of this disease is limited. No single fungicide has shown to consistently and effectively suppress losses related to *P. capsici* epidemics. Due to the destructive nature of the disease and lack of efficient control measures, development of alternative or complementary approaches for effective management of this disease is highly desirable. This study was conducted to evaluate the efficacy of TerraClean in control of Phytophthora blight on tomato. The efficacy of TerraClean in reduction of root-knot on tomato was also evaluated.

MATERIALS AND METHODS

This trial was conducted at University of Georgia Coastal Plain Experiment Station (Black Shank Farm) located in Tifton, GA. The field site has been used as a *P. capsici* nursery and was inoculated with the pathogen. Raised beds were prepared for tomato growth that were 6-inch-high by 30-inch-wide and centered 6 feet apart. Tomato seedlings (cv. Crista) were transplanted at 18 inch spacing within a row into raised beds in the field on August 14. The experimental plots consisted of a single 20 foot row. Buffer zones of 4 feet were maintained between plots. A randomized complete block design was employed with five replications. The drip tape used was Aquatraxxtm with a 12-inch emitter spacing and a flow rate of 0.45 gal/min with a 12-PSI regulator.

TerraClean and other products were applied through drip irrigation tubes as described in Table 1. Prior to application of TerraClean, the field was irrigated, running TerraClean in the last 45–60 minutes of the cycle. Non-treated plots and Ridomil Gold 480SL and Methyl Bromide applied alone were used as controls. Plants with Phytophthora blight were counted weekly after first appearance of symptoms in the field. Vigor ratings were taken on August 24, 31, September 7, 17, 24, 28, October 5, 15, 30, November 2 and 8 based on a scale of 0-10, where 10 represents most vigorous plants and 0 represents dead plants. All plots were hand harvested on November 8. Marketable and unmarketable yields were determined and the number of P. capsici infected fruit was recorded. Root gall index (0-10 scales where 0 = no root galling and 10 = 100% of the root system galled) was evaluated at the end of the experiment by sampling 6 plants per plot. Analysis of variance (ANOVA) was used to determine the effect of the treatments on disease incidence and tomato yield using the Statistical Analysis System (SAS Institute, Cary, NC).

RESULTS

TerraClean reduced both *Phytophthora* and *Root-Knot* while Methyl Bromide and Ridomil Gold only reduced one or the other. Results of the study are shown in Table 2. All the TerraClean treatments reduced *Phytophthora* blight incidence with disease reductions ranging from 22.6% to 54.9%. TerraClean applied once every 2 weeks at 2 gal/acre significantly reduced Phytophthora blight (% infected plants) compared to the non-treated control. Application of TerraClean, either at 1 gal/acre for 10 applications or 2 gal/acre for 5 or 10 applications, significantly reduced *Root-Knot* on tomato (Table 2). Application of TerraClean at 1 or 2 gal/acre for 10 applications also significantly increased plant vigor and tomato yield. No fruit infection by *Phytophthora capsici* was recorded. Ridomil Gold reduced *Phytophthora* blight incidence significantly but not *Root-Knot*. Methyl bromide reduced *Root-Knot* significantly but not *Phytophthora* blight in this study. TerraClean's sustainable chemistry and superior results make it an economical and effective choice for soil borne pathogen control.

TABLE 1. TREATMENTS FOR CONTROL OF PHYTOPHTHORA BLIGHT AND ROOT-KNOT

TREATMENTS	RATE/A	APPPLICATION SCHEDULE
Non-treated control	----	----
TerraClean	1 gal.	Pre-plant Post-transplant, once every wk, 10 applications
TerraClean	1 gal.	Pre-plant Post-transplant, once every 2 wks, 5 applications
TerraClean	2 gal.	Pre-plant Post-transplant, once every wk, 10 applications
TerraClean	2 gal.	Pre-plant Post-transplant, once every 2 wks, 5 applications
Ridomil Gold 480SL	2 pts.	Pre-plant
Methyl Bromide (67% MeBr + 33% chloropicrin)	77.6 gal.	Pre-plant

TABLE 2. EFFICACY OF TERRACLEAN IN CONTROL OF PHYTOPHTHORA BLIGHT AND ROOT-KNOT (FALL 2007, TIFTON, GA)

TREATMENTS	VIGOR[1,2]	MARKETABLE YIELD		TOTAL YIELD		PHYTOPHTHORA BLIGHT		ROOT-KNOT INDEX[1,9]
		Number[1,3]	Weight (lb)[1,4]	Number[1,5]	Weight (lb)[1,6]	Index[1,7]	Infected Plant (%)[1,8]	
Non-treated control	6.1 b	12.0 d	1.9 b	12.0 d	1.9 c	**4.0 a**	44.3 a	**4.1 a**
TerraClean (1 gal/A) Once a week	7.5 a	25.4 a	4.0 a	26.8 a	4.1 a	2.9 ab	34.3 ab	1.6 b
TerraClean (1 gal/A) Once every 2 weeks	7.0 ab	15.4 bcd	2.3 b	16.0 bcd	2.4 bc	2.1 ab	22.9 ab	2.0 ab
TerraClean (2 gal/A) Once a week	7.2 a	23.6 ab	3.9 a	24.4 ab	3.9 ab	2.2 ab	24.3 ab	1.4 b
TerraClean (2 gal/A) Once every 2 weeks	7.7 a	14.2 cd	2.2 b	15.0 bcd	2.2 c	**1.8 b**	20.0 b	**1.7 b**
Ridomil Gold (2 pts/A)	7.4 a	21.4 abc	3.3 ab	21.6 abc	3.3 abc	1.7 b	18.6 b	2.5 ab
Methyl Bromide (77.6 gal)	7.3 a	12.0 d	1.9 b	13.6 cd	2.0 c	2.1 ab	22.8 ab	1.4 b

1 Data are means of five replications. Means within a column followed by the same letter are not significantly different (P=0.05) according to Duncan's multiple range test.

2 Vigor was rated on a scale of 0-10 where 10= most healthy plants and 0 = dead plants. Values are an average of vigor rated on August 24, 31, September 7, 17, 24, 28, October 5, 15, 30, November 2 and 8.

3 Total number of marketable fruit each plot.

4 The weight of marketable fruit for each plot.

5 Total number of fruit for each plot including marketable fruit and culls.

6 Total yield for each plot including marketable fruit and culls.

7 Disease index was calculated by averaging the percent disease incidence (infected plants) of eleven ratings.

8 Final disease incidence calculated by dividing the total dead plants by the initial stand count and multiplying by 100.

9 Root gall index (0-10 scales where 0 = no root galling and 10 = 100% of the root system galled) was evaluated at the end of the experiment.