

ORGANIC METHODS OF RASPBERRY PRODUCTION AND ROOT ROT CONTROL

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INTRODUCTION

Root rot (*Phytophthora fragariae* var. *rubi*) is of primary concern to all raspberry growers in Washington, and is of particular concern to organic growers who have fewer options for disease control. This study is focused on organic root rot control, however all raspberry growers will benefit from new disease management options.

Our study builds upon research led by Dr. Pete Bristow from 1995 to 1998. That work demonstrated that raised beds reduced the habitat for *Phytophthora* by increasing drainage, but that raised beds alone were not sufficient to control root rot. In spring 1999, in cooperation with Jan Pigman at Pigman's Organic Produce Patch, and with the funding support of the Organic Farming Research Foundation (OFRF), we began to study six organic treatments for the control of raspberry root rot. In the summer of 1999, we were able to match OFRF funds with funding from the Washington State Commission for Pesticide Registration (WSCPR) and we moved the study to the WSU Vancouver Research and Extension Unit (VREU). At WSU VREU we included five organic treatments, one chemical treatment, and a control in order to compare the effectiveness of organic disease control treatments to the standard chemical control treatment.

STUDY OBJECTIVES

- ♦ Analyze performance of organic methods to control raspberry root rot and compare to standard chemical control at Vancouver REU.
- ♦ Explore the effects of manure on the suppression of the root rot pathogen and impact on raspberry plant health and fruit yield.

PROCEDURES AND METHODS

In the fall of 1999, organically managed raspberry research plots were established at WSU VREU. The raspberry variety at this site is Meeker, and the planting was 4 years old at the time of study establishment. The study is a randomized complete block design with 4 replications. Plot length is 25 feet and plots are one row wide. All raspberry rows in the study area are on raised beds with trickle irrigation. Treatments were applied November 29, 1999, April 3, 2000, and April 9, 2001 ([Table 1.](#)).

Table 1. Dates and rates of treatment applications for organic raspberry root rot study at WSU VREU, 1999-2001.

Treatment	Treatment Application Rates		
	November 1999	April 2000	April 2001
<i>Trichoderma</i> (T-22)	20 lbs/A	20 lbs/A	100 lb/A
<i>Gliocladium</i> (G-41)	20 lbs/A	20 lbs/A	100 lb/A
Dairy manure	1.75 tons/A	1.75 tons/A	1.5 tons/A
Dairy manure +T-22	1.75 tons/A + 20 lbs/A	1.75 tons/A + 20 lbs/A	1.5 tons/A + 100 lbs/A
Ridomil	0.5 lb ai/A	0.5 lb ai/A	0.5 lb ai/A
Gypsum	1.75 tons/A	no application	2 tons/A
Control	no application	no application	no application

Treatments were applied in four-foot wide bands centered on the row and were not incorporated in 1999 or 2000 but were incorporated in 2001. The *Trichoderma* and *Gliocladium* granules were mixed with potting soil to aid in spreading, and sprinkled on top of the raised beds. Ridomil was applied in liquid form using a backpack sprayer. Manure was applied as mulch. In plots that received manure plus *Trichoderma*, the manure was applied first and the *Trichoderma* was sprinkled on top. Gypsum was applied in fall 1999 in preparation for the 2000 growing season. On April 13, 2000, blood meal was mechanically banded near the root zone at a rate of 60 lbs N per acre. On June 9, an additional 40 lbs N per acre was applied to try and alleviate what appeared to be nitrogen stress in the plots. On April 5, 2001, Biogro (7-7-2) was applied at a rate of 28 lbs N per acre. On May 29 we applied a foliar application of Kelp (10.7 oz/A) and Biogro (4 lbs/A) as a source of micronutrients. Nitrogen application rates were inadvertently low in 2001, and in 2002 they will be increased to 100-150 lbs N per acre.

Yield was collected by hand harvest from late June through early August 2001. Cane length and primocane number were measured September 25 and 26.

RESULTS AND DISCUSSION

In 2000, dairy manure was the only treatment to significantly increase yield (Table 2). While *Trichoderma* and *Gliocladium* (both certified for organic production but not labeled for root rot control in raspberries) produced fruit yields equal to the chemical standard (Ridomil), none of these treatments significantly outyielded the untreated check. Berry yields in 2001 were comparable to those in 2000, but there were no significant differences between any of the treatments. Treatments also had no effect on florican length or number in 2001 (Table 3). After two years, there is little evidence to show that the treatments have enhanced yield or impacted the number and size of canes. Three years are required to transition from conventional to organic production and it may take more than two years for organic methods to become established.

Table 2. Berry yield per plot (g), weight per berry (g) plus percent change relative to the untreated check for raspberry fruit harvested at WSU Vancouver REU in 2000 and 2001.

Year	Treatment	Berry yield (g)		% Increase	Berry Wt (g)		% Increase
2000	Dairy manure	3307	A*	32.9	1.90	A	9.8
	Ridomil	3012	AB	21.1	1.93	A	11.6
	G-41	2878	AB	15.7	1.86	A	7.5
	T-22	2819	AB	13.3	1.90	A	9.8
	Dairy manure + T-22	2619	B	5.3	1.91	A	10.4
	Gypsum	2618	B	5.2	1.81	A	4.6
	Untreated check	2488	B		1.73	A	
2001	Dairy manure	2794	A	-4.8	3.06	A	28.6
	Ridomil	4107	A	40.0	3.10	A	30.3
	G-41	3944	A	34.4	3.75	A	57.6
	T-22	3544	A	20.8	2.87	A	20.6
	Dairy manure + T-22	2722	A	-7.3	2.60	A	9.2
	Gypsum	3627	A	23.6	2.75	A	15.6
	Untreated check	2934	A		2.38	A	

* Treatments with different letters are significant at p=0.05 level by Tukey's multiple range test.

Table 3. Average florican height (inches) and number, and percent increase relative to the control at WSU Vancouver REU in 2001.

Treatment	Cane Ht. (In)		% Increase	Cane No.		% Increase
Dairy manure	78	A*	-3.7	154	A	-6.7
Ridomil	80	A	-0.8	161	A	-2.4
G-41	80	A	0.0	171	A	3.6
T-22	77	A	-5.0	144	A	-12.7
Dairy manure + T-22	82	A	1.9	177	A	7.3
Gypsum	78	A	-3.4	156	A	-5.5
Untreated check	81	A		165	A	

* Treatments with different letters are significant at p=0.05 level by Tukey's multiple range test.

OUTREACH

- A poster presentation of the study was presented at the American Society of Horticultural Sciences in 2001.
- Research results were presented at the Small Fruit Growers Workshops in Vancouver and Lynden in both 2000 and 2001.
- A photograph of this study appeared on the cover of HortTechnology October-December 2000 and the accompanying article briefly discussed the organic component of this study.
- An article discussing the study outline and preliminary results appeared in the Western Fruit Grower, September 2000.
- In November 1999, Anne Schwartz, Jan Pigman, Carol Miles, and Dawn Youmans, presented an overview of the study at the Washington State Tilth Producers Conference in Port Townsend.
- A preliminary report was presented at the Washington State University Master Gardener conference in Seattle, October 1999.
- A brief article announcing funding for this project and an outline of the study appeared in the Washington Tilth Journal, summer 1999, Volume 7, Issue 3.

Our annual report and photos of the study are available on the WSU Agricultural Systems website, <http://agsyst.wsu.edu>.



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