Exploring applications of Ridomil® Gold and Orondis® Gold in the planting hole for the control of Phytophthora Crown Rot of Strawberry

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Summary

Phytophthora crown rot (PhCR), caused mainly by *Phytophthora cactorum*, is an important disease in Florida strawberry fields. Mefenoxam, the active ingredient of Ridomil® Gold, is highly effective and widely used, however isolates resistant to this product have been found. Oxathiapiprolin, one of the active ingredients of Orondis® Gold, is in the final stages of registration for strawberry use and is also effective in managing Phytophthora, including isolates resistant to mefenoxam. Chemical controls of PhCR are usually applied via drip tape after overhead watering is terminated. However, applying products in the planting hole before planting was successful for the control of PhCR. Since the major source of inoculum for PhCR are the strawberry transplants, this application method could greatly improve management of PhCR while reducing chemical inputs.

Methods

In-hole application of Ridomil® Gold and Orondis® Gold for control of PhCR of strawberry compared with the standard drip tape application.

Plants of Sensation® 'Florida127' were artificially inoculated at transplant with a mixture of isolates collected from Florida strawberry fields during previous seasons. The trial was carried out at GCREC from 11 Oct 2019 to 10 Jan 2020. Twenty plants per replication and 4 replications per treatment were used. Products in water were added to individual planting holes using 50 ml Falcon tubes. Treatments applied were:

1) Non-inoculated control;
2) Inoculated control;
3) Ridomil 1 pint/A - 1.7 fl oz/hole;
4) Ridomil 1 pint/A - 0.85 fl oz/hole;
5) Ridomil 0.5 pint/A - 1.7 fl oz/hole
6) Orondis 28 fl oz/A - 1.7 fl oz/hole;
7) Orondis 28 fl oz/A - 0.85 fl oz/hole;
8) Orondis 14 fl oz/A - 1.7 fl oz/hole;
9) Ridomil via drip tape (1 pint/A);
10) Orondis via drip tape (28 fl oz/A).

Wilting and dead plants were recorded weekly to track disease development in each treatment. At the end of the trial, final plant mortality (%) and Area Under Disease Progress Curve (AUDPC) were calculated, and statistical analyses were carried out to compare difference among treatments.

In-hole application of Ridomil® Gold applied as a granular formulation.

In field trials, Sensation® 'Florida127' frigo plants were inoculated as previously described. The trial was carried out at GCREC from 10 Feb 2020 to 23 Mar 2020. Twelve plants per replication and 4 replications per treatment were used. The planting-hole application was carried out using 2-ml eppendorf tubes with the specific amounts of product according to the treatment. Trial evaluation and statistical analyses were done as described above. Treatments applied were:

1) Non-inoculated control;
2) Inoculated control;
3) Ridomil (19,166 lb/A) - 1.1g/hole;
4) Ridomil (9,583 lb/A) - 0.55g/hole.

Results

In-hole application of Ridomil® Gold and Orondis® Gold for control of PhCR compared with the standard drip tape application.

When the final evaluation was made on 10 Jan (10 weeks after inoculation), plant mortality ranged from 0 to 50%, and was 50% in the inoculated control and 3.75% in the non-inoculated control. Regardless of the method, dose, and volume of application, all the treatments reduced plant mortality. The non-inoculated control had 3.8% mortality, suggesting the plants came with a low level of inoculum. Even though there was no statistical difference, Ridomil® applied at 1 pint/A – (0.85 fl oz/hole), and 0.5 pint/A (1.7 fl oz/hole), as well as drip applications of both products did not completely eliminate mortality due the natural inoculum. However, all other treatments had no mortality (Table 1).

In-hole application of Ridomil® Gold in granular formulation to control PhCR

After five weeks, plant mortality was 64.6% in the inoculated control (Table 1). All other treatments completely eliminated disease development. Because cut-top frigo plants are more susceptible to PhCR than fresh, leaf-on bare-root plants, we observed the effect of the treatments faster than the previous trial. Phytotoxicity symptoms were not observed in either trial.

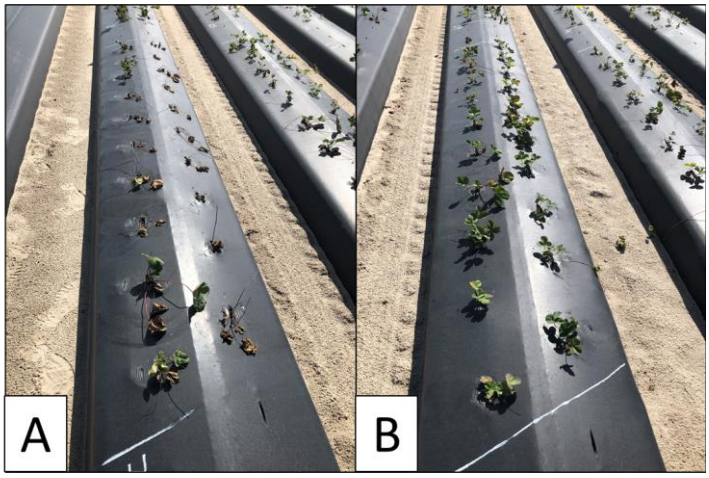

Figure 1. (A) Two-week-old Sensation® 'Florida127' plants inoculated with a mixture of isolates of *P. cactorum* and (B) plot with products (Ridomil® Gold, or Orondis® Gold) applied in the planting hole before planting.

Summary and Recommendations

Since the major source of inoculum for PhCR are the strawberry transplants, a fungicide application is recommended as soon as possible after transplanting. Ridomil is highly effective but resistance has recently been detected. Orondis is a new fungicide from Syngenta in the final stages for registration on strawberry. If available for the 2020-2021 season, a rotation of Ridomil and Orondis is recommended.

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Table 1. Effectiveness of Ridomil® Gold and Orondis® Gold applied using different methods, volumes, and doses of application in controlling Phytophthora Crown Rot of Strawberry, caused by *Phytophthora cactorum*.

Treatments	Plant mortality (%) [a]	AUDPC [b]
Inoculated - non-treated	50.0 a[d]	593 a
Inoculated - Ridomil via drip tape (1 pint/A)	5.0 b	32 b
Inoculated - Orondis via drip tape (28 fl oz/A)	3.8 b	28 b
Inoculated - Ridomil 1 pint/A – 0.85 fl oz/hole	2.5 b	11 b
Inoculated - Ridomil 0.5 pint/A - 1.7 fl oz/hole	2.5 b	10 b
Inoculated - Orondis 28 fl oz/A – 0.85 fl oz/hole	0.0 b	0 b
Inoculated - Orondis 28 fl oz/A - 1.7 fl oz/hole	0.0b	0 b
Inoculated - Orondis 14 fl oz/A - 1.7 fl oz/hole	0.0 b	0 b
Inoculated - Ridomil 1 pint/A - 1.7 fl oz/hole	0.0b	0 b
Non-inoculated – non-treated	3.8 b	22 b

[a] Plant mortalities (%) observed 10 weeks after inoculation.

[b] Area Under Disease Progress Curve (AUDPC) accounts for all repeated disease assessments over time.

Table 2. Effectiveness of Ridomil® Granular formulation (not labeled for strawberry) applied in the planting hole for controlling Phytophthora Crown Rot of Strawberry, caused by *Phytophthora cactorum*.

Treatments	Plant mortality (%) [a]	AUDPC [b]
Inoculated – non-treated	64.6 a	202 a
Ridomil (19,166 lb/A) – 0.04oz/hole	0.0 b	0 b
Ridomil (9,583 lb/A) - 0.02oz/hole	0.0 b	0 b
Non-inoculated – non-treated	0.0 b	0 b

[a] Plant mortalities (%) observed 5 weeks after inoculation.

[b] Area Under Disease Progress Curve (AUDPC) accounts for all repeated disease assessments over time.