

RESEARCH REPORT 2024

Project Title: Efficacy of Fungicides for Downy Mildew Control in Processing Cucumbers

Prepared for: Ontario Processing Vegetable Growers,
Ontario Cucumber Research Committee

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Objective: Cucurbit downy mildew (CDM), an aggressive plant pathogen (*Pseudoperonospora cubensis*), can develop at any time during the cucumber season and have devastating consequences for cucumber growers. It is a very destructive disease and progresses rapidly under favourable weather conditions. In 2006, downy mildew appeared early in Ontario causing extensive crop defoliation and yield losses. The severity of the disease resulted in some growers only meeting about 70% of the contracted tonnage. From 2007 to 2009, with the availability of more fungicides through emergency registrations, the severity of the disease was reduced, and crop yields were maintained. Disease pressure in Ontario varies from year to year, depending on when it first appears in the field. The last couple of years CDM has been detected mid-July. In 2024, the disease was first detected in Norfolk County on June 25, which is 10 days earlier than detection in 2023. It was first observed in cucumber trials at the research centre in Simcoe on July 15, which is also earlier than in previous years.

Over the past few years, we have seen disease resistance to some fungicides that were effective in the past in controlling downy mildew in cucumbers. Testing of current registered products is necessary for making informed recommendations on spray programs that will continue to be effective in controlling downy mildew. Evaluating new products is important for the registration of new effective fungicides to control downy mildew, which is a great benefit to the Ontario processing cucumber industry. In addition, the cucumber processing industry in North America has shifted to planting more parthenocarpic-type varieties. Current research on fungicide efficacy should be on the varieties being grown and processed, thus a parthenocarpic variety was planted for the 2024 trial. One variety was evaluated this year instead of comparing two that might show differences in their tolerance to cucumber downy mildew. The focus of the trial was to expand the number of products for efficacy evaluation including experimental products, thus the number of treatments made it difficult to include two varieties in the trial without risking the trial becoming too large.

Methodology: A fungicide efficacy trial was conducted at Ontario Crops Research Center – Simcoe, in 2024. The parthenocarpic variety “Springsteen” was seeded using a precision seeder on July 3 in rows 30 inches apart with in-row plant spacing of 8" to give a target plant population of 28,000 plants/acre. The crops were grown according to accepted commercial practices used in Ontario. The trial was set up as a randomized complete block design with four replications. Treatments were applied using a hand-held CO₂ backpack sprayer with air induction, low drift (AI TeeJet 110015-VS) nozzles at a pressure of 40 psi and water volume of 250 L/ha. Twelve treatments were evaluated, including an untreated control. Treatments were applied to plots on July 23, July 29 and August 7.

Downy mildew visual ratings were made at weekly intervals starting on July 23. Mature fruit were harvested by hand on August 15. Fruit ranged in size from grade 1 to 3B with the majority being in the 2A/2B grade size at harvest. Typically, this trial targets a crop at approximately 10% grade 4 (2" in diameter), but due to timing this trial was harvested slightly early. Yields were measured as graded fruit numbers and weights. Plot yields were converted to tons/acre and US \$/acre for reporting purposes. Due to the early timing of harvest, overall yields are less but this is consistent across all treatments.

Results: In 2024, downy mildew infection was similar to 2023, however symptoms in the field were observed earlier. The disease was detected in significant amounts (>5%) in untreated trial plots on July 29, prior to flowering. By August 6 disease was observed in all plots. A week later, disease had increased in all plots due to favourable weather conditions. By the last rating on August 12, three days prior to harvest, infection in untreated plants was 78%. Orondis Ultra and confidential products, Exp 1, Exp 2 and Exp 3 provided the best control of the disease with approximately 10% leaf infection. Intermediate disease control was observed from plants treated with Allegro, Torrent, Zampro and Tattoo C at the August 6 rating, but disease progressed with all these treatments by August 12 in which there was over 50% leaf infection (Table 1).

Final harvest yields were significantly reduced for the treatments with the highest downy mildew infection when compared to the best treatments of Orondis Ultra, Exp 1, Exp 2 and Exp 3 (Table 1). Confidential products of Exp 1, Exp 2 and Exp 3 are currently unregistered products for cucumber downy mildew, but provided excellent control of downy mildew and have yields similar to Orondis Ultra.

These results show that Orondis Ultra is still effective at controlling downy mildew to levels that do not have an economic impact on the final yield of cucumbers even under high disease pressure. Torrent, Allegro and Zampro provided intermediate control suggesting that if used in a program with Orondis, these products remain the best downy mildew control option. Tattoo C also provided comparable control to Zampro.

Table 1: Incidence of cucumber leaves with downy mildew symptoms and yield of cucumbers, variety ‘Springsteen’, harvested from plots sprayed with different fungicides, Simcoe, ON, 2024.

Product**	Rate per Hectare	% Downy Mildew Infection*			Yield	
		July 29	Aug 6	Aug 12	t/acre	\$/acre
Bravo ZN	4.8 L	15	40	68	3.2 c-ef	813 b-e
Torrent + Sylgard	200 mL 0.1 % v/v	7	24	53	6.1 abc	1,686 ab
Zampro + Sylgard	1 L 0.1 % v/v	11	31	58	5.0 a-d	1,364 abc
Orondis Ultra	600 mL	0	5	10	6.5 abc	1,647 ab
Exp 1	1.31 L	4	6	10	7.1 ab	1,717 ab
Tattoo C	2.70 L	4	18	59	4.3 b-e	1,152 a-d
Allegro	1.75 L	10	30	43	6.3 abc	1,592 ab
Exp 2	0.75 L	0	6	10	6.7 ab	1,673 ab
Exp 3	1 L	0	4	9	7.7 a	1,949 a
Torrent, alt Diplomat + Phostrol	200 mL 0.75; 5.0 L	11	33	55	2.0 def	525 cde
Diplomat + Phostrol	0.75; 5.0 L	13	38	68	1.8 ef	438 de
Untreated Control		24	58	78	0.3 f	49 e

Planting Date : July 3
Plant Population : 28,000 plants/Ac

Date of First Application : July 23
Harvest Date : August 15

* Based on % leaves infected

** First application was applied at the 3-4-leaf stage, subsequent applications were made on a 7-day spray interval, 3 applications total.

Means followed by the same letter do not significantly differ (P=0.05, Tukey's HSD)