

Project Title: Cucumber Downy Mildew Fungicide Evaluation Trial 2017

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Objective: Downy mildew, an aggressive plant pathogen, 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 favorable 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. In 2015 downy mildew showed up early in mid-June and infection on many crops was severe by the end of the month. Disease pressure was high, but was kept in check with regular, weekly spray applications. In 2016, disease pressure was low due to dry and hot conditions, however downy mildew was still present. 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. Also, 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.

Methodology: One trial was conducted at the Simcoe Research Station, University of Guelph in 2017. Cucumber cultivar 'Vlaspik' was seeded using a precision seeder on June 29th in rows 28 inches apart with in-row plant spacing of 4" to give a plant population of 56,000 plants/per acre. The crops were grown according to accepted commercial practices used in Ontario. The trial was setup as a randomized complete block design with 4 replications per treatment. Treatments were applied using a hand-held CO₂ backpack sprayer with air induction, low drift (BFS 015) nozzles at a pressure of 40 psi and water volume of 200 L/ha. There were a total of 10 treatments evaluated, including an untreated control (Table 1). Treatments were applied to plots on July 14, 20, 27 and August 3.

Downy mildew visual ratings were made at weekly intervals starting on July 13th. The first observation of downy mildew in this trial was made on July 26th. Visual ratings taken included % leaves infected (Table 2), % area of symptomatic leaves affected and an overall % whole plot infection was assessed.

Mature fruit were harvested by hand on August 16th, targeting a crop that was at approximately 10% grade 4 (2" in diameter). Yields were measured as graded fruit #'s and weights. Plot yields were converted to tons/acre for reporting purposes. Oversize fruit (>2 1/8" in diameter) were not included in the yield data.

Results: The severity of downy mildew infection was more in 2017 than in 2016 due to more favorable weather conditions such as rains and dews. The disease first showed up in research plots in late July and by harvest the untreated control plots were showing about 76% infection.

There was a significant yield reduction of about a 70% in the untreated check compared to the treatments that performed the best in this trial. The best yielding treatments with no significant differences included Torrent, Zampro, Orondis Ultra, Allegro, Zing! and Gavel.

Orondis Ultra (the copack of Orondis Ultra A and Orondis Ultra B) gave the best downy mildew control with no infection apparent at harvest (Table 2). The next best treatments were Torrent and Allegro at 19 and 23% leaves infected at harvest. Infection with all other treatments ranged from 45 to 66%. There was a significant yield reduction with Tattoo C and Lifegard alternated with Bravo ZN of about 33% and 49% when compared to the highest yielding treatment of Torrent (8.7 t/acre).

These results show that cucumbers can tolerate some downy mildew infection resulting in no yield reduction when it is kept at low levels up to the time of fruit development. However, with continued harvests and earlier season infection, Orondis Ultra should significantly outperform most of the other treatments. Torrent and Allegro should also provide acceptable control of downy mildew.

Table 1: Treatment list description for cucumber downy mildew fungicide evaluations, Simcoe, ON, 2017.

| Product Name | Active Ingredient(s) | Registration Notes |
|---------------------------|--|--|
| Bravo ZN | chlorothalonil | Registered in Canada for use on cucumbers |
| Torrent + Sylgard | cyazofamid silicone surfactant | Registered in Canada for use on cucumbers |
| Tattoo C | propamocarb/chlorothalonil | Registered in Canada for use on cucumbers |
| Zampro + Sylgard | ametoctradin/dimethomorph silicone surfactant | Registered in Canada for use on cucumbers |
| Orondis Ultra | manndipropamid/oxthiapiroprolin | Registered in Canada as a copack of Orondis Ultra A and Orondis Ultra B for use on cucumbers |
| Allegro | fluazinam | Registered in Canada on beans, brassica crops, carrots & potatoes. Registered in U.S. on cucumbers |
| Zingl | zoxamide/chlorothalonil | Registered in U.S. on cucumbers |
| Gavel | zoxamide/mancozeb | Registered in Canada on potatoes and in the U.S. on cucumbers |
| Lifegard alt. Bravo ZN | <i>Bacillus mycooides</i> chlorothalonil | Biological plant activator, registered in U.S. for use on various vegetable crops This product was applied every 2nd application, alternating with Bravo ZN |

Table 2: Incidence of cucumber leaves with downy mildew symptoms and yield of cucumbers harvested from plots sprayed with different fungicides, Simcoe, ON, 2017.

| Product** | Rate per Acre | % Downy Mildew Infection* | | | | Yield t/acre |
|---------------------------|--------------------|---------------------------|--------|--------|--------|-----------------|
| | | Jul-19 | Jul-26 | Aug-03 | Aug-15 | |
| Bravo ZN | 1.9 L | 0 | 12 | 33 | 45 | 7.0 ab |
| Torrent + Sylgard | 81 mL 0.1 % v/v | 0 | 0 | 26 | 19 | 8.7 a |
| Tattoo C | 1.1 L | 0 | 7 | 33 | 54 | 5.8 bc |
| Zampro + Sylgard | 0.4 L 0.1 % v/v | 0 | 8 | 39 | 40 | 8.2 ab |
| Orondis Ultra A | 162 mL | 0 | 0 | 0 | 0 | 7.0 ab |
| Orondis Ultra B | 35 mL | | | | | |
| Allegro | 1.0 L | 0 | 0 | 16 | 23 | 8.4 ab |
| Zing! | 1.1 L | 0 | 3 | 29 | 55 | 7.2 ab |
| Gavel | 0.9 kg | 0 | 3 | 20 | 54 | 6.8 abc |
| Lifegard alt. Bravo ZN | 30 g 1.9 L | 0 | 2 | 36 | 66 | 4.4 cd |
| Untreated Control | | 0 | 43 | 51 | 76 | 2.4 d |

Planting Date : June 29
Plant Population : 56,000 plants/Ac

Date of First Application : July 14
Harvest Date : August 16

* Based on % leaves infected

** First application was applied at the 1-2-leaf stage, subsequent applications were made on a 7-day spray interval, 4 applications total.

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