2020 Cucumber Research Funding			
	Project	Researcher	$ Amount Funded
1	Cucumber downy mildew monitoring program, 2020	Tomecek Agronomy	$3,800
2	Processing Cucumber Variety Evaluation	J. O'Sullivan	$15,000
3	Efficacy of Fungicides for Downy Mildew Control in Processing Cucumbers	J. O'Sullivan	$7,500
4	Weed Control Evaluations in Processing Cucumbers	D. Robinson	$4,000
5	Neonicotinoid alternatives for management of cucumber beetle in cucurbits	C. Trueman	$1,750*
6	Integrating fungicide programs and host resistance for cucurbit downy mildew management	C. Trueman	$5,000
		Total	**$37,050**

* This funding request is split 50/50 between Vegetable Research and Cucumber Research Committees

October 21, 2020

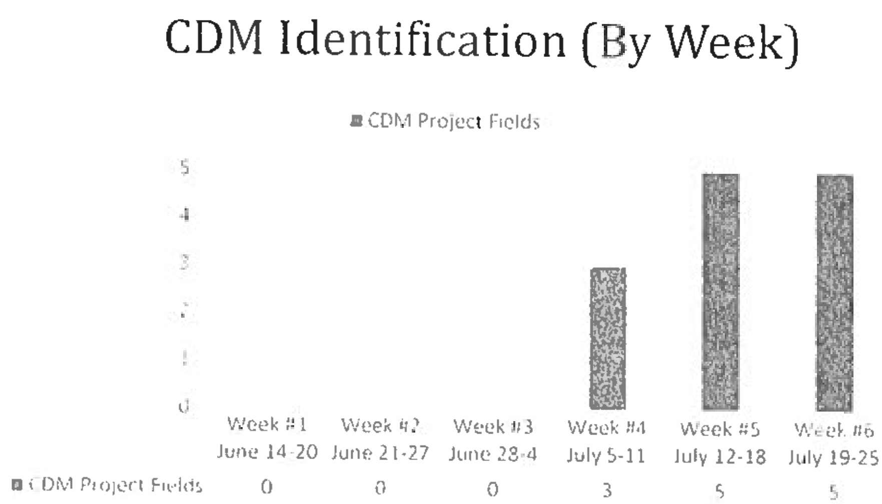
To: Ontario Cucumber Research Committee (OCRC),

Re: Cucumber Downy Mildew Monitoring Program 2020 - Final Report

Tomecek Agronomy monitored five hand-harvest cucumber fields within Chatham-Kent this season for the presence of downy mildew. Scouting began the week of June 14th – 20th. The five fields selected were located in Wallaceburg, Dresden, Chatham, Kent Bridge and Blenheim.

Scouting continued for a total of 6 weeks, ending the week of July 19th – 25th. Fields were walked in a "W" pattern, with special attention being given to low-lying areas and field edges near windbreaks or woodlots that have longer leaf wetness periods, where downy mildew is likely to initially be found. The scout stopped at 20 locations per field, at each visit and randomly inspected 10 leaves at each location. The scout was primarily looking for downy mildew symptoms but would also report any other in-field issues identified to the grower.

On July 6th, 2020 Tomecek Agronomy was contacted by a cucumber grower in Kent County (who was not part of this year's CDM project) who was concerned he may have spotted Downy Mildew in one of his cucumber fields. After visiting the field, and then consulting with Ms. Elaine Roddy, it was confirmed that this was in fact the first incidence of Downy Mildew identified in Kent County. The Ontario Cucumber Research Committee, OPVG and OMAFRA Extension were notified immediately. Shortly after, on July 9th (Week #4), Downey Mildew was identified by our scout in 3 out of 5 of the CDM Project's fields in Kent County. By the following week (Week#5), it was detected in all 5 of the project's fields. By Week#6, the incidence of lesions remained fairly stable over Week#5, with only a slight increase in severity (% leaf area covered by lesions) over the last week.



Thank you for allowing us to be part of this project. We would certainly be interested in participating again next year and have submitted a proposal to you for the 2021 season.

Kind regards,
Joe Tomecek, CCA, 4RNMS
Tomecek Agronomy Services Inc.

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Processing Cucumber Variety Evaluation Trials 2020

John O'Sullivan, Rachel Riddle & Peter White
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Objective: The objectives of these studies were to evaluate new cucumber varieties for yield performance, quality, adaptability and acceptability to North American processors for hand-pick and machine harvest applications. New superior yielding cucumber varieties are required to ensure that the industry can compete effectively. New varieties are being introduced by seed companies each year, therefore, variety evaluation is essential in order to recommend the best varieties to the industry, in particular, varieties that have local adaptability and market acceptance, together with higher yields, improved fresh quality, improved brining quality and better disease tolerance are needed.

Methodology: Three cucumber variety trials were conducted at the Simcoe Research Station located in Simcoe, Ontario, Canada, in 2020: (1) Parthenocarpic (seedless) Multipick (hand harvest), (2) Conventional Machine Harvest (simulated once-over harvest) and (3) Parthenocarpic Machine Harvest (simulated once-over harvest). Due to research scaling back required by the University in response to Covid-19, the decision, in consultation with Josh Duley (Hartung Brothers), was made to not conduct the conventional hand harvest trial this year. The priority was given to the parthenocarpic trials where there has been a focus in variety development by the industry.

Processing cucumber varieties were evaluated to compare how they perform under the same environmental conditions. Trials were set up as a randomized complete block design with three replications for the hand harvest trial and four replications for machine harvest trials. Commercial and experimental varieties were evaluated in all trials. Experimental varieties are not included in this report.

Hand Harvest Trial

The parthenocarpic multipick variety trial included 9 commercial varieties for evaluation. The trial was seeded on June 11 using a standard cone seeder mounted on a John Deere planter. The plot size for this trial was 5 ft by 20 ft. Plants were thinned to 6" in the row to give a plant population of 18,000 plants/acre. Cucumber plots were harvested two times per week for a total of 9 harvests from July 21 to August 18.

Machine Harvest Trials

The conventional machine harvest trial included 5 commercial varieties for evaluation and the parthenocarpic machine harvest trial included 7 commercial varieties. Trials were seeded on June 11 and June 24 for the conventional and parth machine harvest trials, respectively, using a standard cone seeder. The plot size for these trials were 2.5 ft by 20 ft. Plants were thinned to 4" and 8" for the conventional and parth trials, respectively, giving a plant population of 55,000 and 28,000 plts/acre. Cucumber plots were harvested as a simulated once-over destructive pick, where plants were pulled by hand, and all cucumbers harvested into bushels down to a 1A/B size. Varieties were harvested to target correct maturity and thus harvest date is dependent on the variety. For the conventional machine trial, the harvest day for varieties in this report was July 27 (47 DTH). For the parth machine trial, the harvest days were Aug 5 (41 DTH), Aug 7 (43 DTH) and Aug 13 (49 DTH).

For all trials, the crop was grown according to accepted commercial practices used in Ontario. Data was taken on fruit length to diameter ratios (L/D) on a weekly basis for hand harvest and once for machine harvest. In addition, yields were measured at harvest as fruit weights (ton/acre) and dollar value per acre. Selected varieties from all trials were brined at Simcoe, for evaluation by the industry in October 2020 (data not shown).

Results:
Yields shown are for each graded size and a total yield which includes grades #1 to #4 (including nubs and crooks) in ton/acre, US $/acre and a percent breakout by graded size. LD's and brine quality evaluation data is also included. Please note that yields are for comparative purposes only. Small plots yields may not accurately reflect commercial yields.

Multipick Parthenocarpic (hand harvest): Liszt, Gershwin and newly released variety Lennon were the highest yielding varieties with approximately US $12,000, $10,800 and $10,700 per acre and 33, 30 and 29 tons/acre, respectively. Most varieties were in the US $10,000 to $8,000 and 24 to 28 tons per acre range (Table 1). LD's were taken weekly on 2A's, 2B's and 3A's (Table 2).

Conventional Machine Harvest: Chaperon and Logan were the highest yielding varieties with approximately US $2,600 and $2,200 per acre and 13 and 10 tons/acre, respectively (Table 3). LD's were taken on 2B's, 3A's and 3B's (Table 4).

Parthenocarpic Machine Harvest: Liszt and V 5031 were the highest yielding varieties with approximately US $3,300 and $3,200 per acre and 14 tons/acre, respectively. Most varieties were in the US $2,000 per acre and 9 to 11 tons per acre range (Table 5). LD's were taken on 2B's, 3A's and 3B's (Table 6).

Cucumber Downy Mildew Fungicide Evaluation Trial 2020

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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. Disease pressure was low in Ontario from 2016 to 2019, detected late in the season and having minimal effect on cucumber crops. In 2020 the disease was first detected in Ontario in Kent county on July 6th and in cucumber trials at the Simcoe Research Station on July 27th.

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. In addition to this, there are now three downy mildew tolerant cucumber varieties that are commercially available. These varieties are Peacemaker, Citadel and Chaperon and are marketed as DM-Defense varieties by Seminis Vegetable Seeds (Bayer Crop Science). This intermediate form of resistance can be used, along with the application of effective fungicides to help ensure acceptable levels of control of downy mildew.

Methodology: One trial was conducted at the Simcoe Research Station, University of Guelph in 2020. Two cucumber varieties, 'Vlaspik' and 'Chaperon (DM-Defense variety)', were seeded using a precision seeder on June 30 in rows 30 inches apart with in-row plant spacing of 4" to give a plant population of 55,000 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 a split-plot arrangement and 4 replications with fungicide treatment as main plot and variety as subplot. Treatments were applied using a hand-held CO_2 backpack sprayer with air induction, low drift (AI TeeJet 110015-VS) nozzles at a pressure of 40 psi and water volume of 450 L/ha. There was a total of 12 treatments evaluated, including an untreated control (Table 1). Treatments were applied to plots on July 14, 21, 28 and August 5.

Downy mildew visual ratings were made at weekly intervals starting on July 14th. Mature fruit were harvested by hand on August 12th, 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 and US $/acre for reporting purposes. Oversize fruit (>2 1/8 " in diameter) were not included in the yield data.

Results: In 2020 downy mildew infection was more severe than in 2018 and 2019. The disease was detected in significant amounts (>5%) in trial plots on July 28th, just as the crop was flowering. By the time the crop was ready for harvest on August 12th, infection in untreated plants was 54 and 61% for the cucumber cultivars Chaperon and Vlaspik, respectively. The Orondis Ultra alternated with Bravo treatment provided the best control of the disease with 5% and 13% leaf infection for Chaperon and Vlaspik respectively. Intermediate control was observed from plants treated with Torrent, Zampro and Tattoo C. The highest levels of disease infection was observed in the Cueva and OxiDate treatments. Torrent alternated with Diplomat and Phostrol had 13% and 6% more disease infection when compared to the Torrent only treatment for Vlaspik and Chaperon respectively (Tables 2 & 3).

Final harvest yields were significantly reduced for several treatments with high downy mildew infection when compared to the best treatment of Orondis Ultra alternated with Bravo (Tables 2 & 3). 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. Torrent and Zampro provide intermediate control suggesting that if used in a program with Orondis, these products remain the best downy mildew control option.

When comparing the level of disease between the two varieties, 'Vlaspik' and 'Chaperon (DM-tolerant)', it was observed that Chaperon had less disease infection in all treatments. This difference of disease infection was in a range of 3 to 13% less disease with Chaperon when compared to Vlaspik. Chaperon yielded better than Vlaspik in all treatments, 39% and 50% higher yields for the Orondis (alt. Bravo) and untreated treatments, respectively (Tables 2 & 3). Differences in final yield between treatments was overall less for Chaperon than Vlaspik, thus some products such as Torrent alternated with Diplomat+Phostrol and Allegro could have a role in a spray program if used on Chaperon.

TRIAL 1: EFFECT OF SANDEA RATE ON CUCUMBER TOLERANCE TO TANK MIXES OF SANDEA AND COMMAND

Objective: Determine the tolerance of cucumber to preemergence tank mixes of Sandea and Command at increasing rates of Sandea.

Materials & Methods:

Crop: Cucumber
Variety: Vlasstar
Planting rate: 113750 seeds/ha
Row spacing: 75cm

Planting date: May 28/20
Depth: 2 cm

Design: Randomized Complete Block Design
Plot width: 2m
Reps: 4

Plot length: 10m

Field Preparation: Trial fertilized with 19-19-19 at 600 kg/ha on May 24/20.

Soil Description:
Sand: 56%
Silt: 20%
Clay: 24%

OM: 3.9%
pH: 7.6
CEC 14

Texture: sandy clay loam
Soil: Watford/Brady Series

Application Information:

	A
APPLICATION DATE	MAY 22
TIME OF DAY	8:00 AM
TIMING	PRE
AIR TEMP (c)	14
RH (%)	78
WIND SPEED (KPH)	8
SOIL TEMP (c)	18
CLOUD COVER (%)	50
CROP STAGE	PRE

Spray Equipment:

Application Method: CO2 Backpack
Nozzle Type: Air Induction
Nozzle Spacing: 50 cm (20")
Spray Volume: 200 L/ha (20 GAL/AC)

Pressure: 207 KPA (30 PSI)
Nozzle Size: ULD120-02
Boom Width: 1.5 m (60")

Table 1.1. Effect of herbicide treatment on cucumber visual injury 7, 14 and 28 days after application and cucumber #1, #2, #3 yield.

HERBICIDE	RATE	VISUAL INJURY			YIELD (T/AC)		
		7D	14D	28D	#1	#2	#3
1. Check (WEEDFREE)		0	0	0	0.7A	0.6A	9.1A
2. Check (WEEDY)		0	0	0	0.7A	0.7A	9.2A
3. COMMAND	0.45 L/AC	0	0	0	0.8A	0.4A	9.0A
4. SANDEA	25 G/AC	0	0	0	0.9A	0.7A	9.6A
5. SANDEA	37.5 G/AC	0	0	0	1.0A	0.5A	10.1A
6. SANDEA	50 G/AC	0	0	0	0.9A	0.9A	11.4A
7. COMMAND +	0.45 L/AC	0	0	0	0.9A	0.8A	11.1A
SANDEA	25 G/AC						
8. COMMAND +	0.45 L/AC	1	0	0	0.9A	0.8A	10.5A
SANDEA	37.5 G/AC						
9. COMMAND +	0.45 L/AC	0	0	0	1.1A	0.7A	9.9A
SANDEA	50 G/AC						
LSD (P <0.05)		NS	NS	NS	0.4	0.4	2.3

Note: Means followed by the same letter are not significantly different (P=0.05, LSD).

Table 1.2. Effect of herbicide treatment on control of redroot pigweed (AMARE), lambsquarters (CHEAL), and velvetleaf (ABUTH) 56 days after application.

HERBICIDE	RATE	PERCENT CONTROL		
		AMARE	CHEAL	ABUTH
1. Check (WEEDFREE)				
2. Check (WEEDY)				
3. COMMAND	0.45 L/AC	60B	41C	74AB
4. SANDEA	25 G/AC	73AB	55C	53B
5. SANDEA	37.5 G/AC	76AB	64BC	56B
6. SANDEA	50 G/AC	76AB	69AB	58B
7. COMMAND + SANDEA	0.45 L/AC 25 G/AC	69AB	73AB	81A
8. COMMAND + SANDEA	0.45 L/AC 37.5 G/AC	73AB	75AB	84A
9. COMMAND + SANDEA	0.45 L/AC 50 G/AC	85A	78A	87A
LSD (P <0.05)		24	17	22

Note: Means followed by the same letter are not significantly different (P=0.05, LSD).

Conclusions:

This trial determined the effect of preemergence applications of tank mixes of Sandea plus Command at different rates of Sandea. Growers' observations have been that tank mixes that include Sandea can sometimes injure cucumber at high label rates, and there is concern about whether this will translate into yield loss. None of the treatments caused injury or yield loss in 2018 or 2019. In 2017, we observed a trend for greater injury as Sandea rate increased when tank mixed with Command, but we did not observe any reduction in yield. There was a benefit in greater control of lambsquarters and velvetleaf as Sandea rate increased, though again – there was no beneficial impact on yield.

TRIAL 2. TOLERANCE OF CUCUMBER TO PREEMERGENCE HERBICIDES

Objective: Determine the tolerance of cucumber to preemergence applications of pethoxamid, Zidua, Prowl H2O and Shieldex.

Crop: Cucumber
Variety: Vlasstar
Planting rate: 113750 seeds/ha
Row spacing: 75cm
Planting date: May 24/20
Depth: 2 cm

Design: Randomized Complete Block Design
Plot width: 2m
Reps: 4
Plot length: 10m

Field Preparation: Trial fertilized with 19-19-19 at 600 kg/ha on May 22/20.

Soil Description:
Sand: 56%
Silt: 20%
Clay: 24%
OM: 3.9%
pH: 7.6
CEC 14
Texture: sandy clay loam
Soil: Watford/Brady Series

Application Information:

	A
APPLICATION DATE	MAY 23/20
TIME OF DAY	7:00 AM
TIMING	PRE
AIR TEMP (c)	14
RH (%)	98
WIND SPEED (KPH)	8
SOIL TEMP (c)	21
CLOUD COVER (%)	0
CROP STAGE	PRE

Table 2.1. Effect of herbicide treatment on cucumber visual injury 7, 14 and 28 days after application, cucumber plant number per plot and yield.

HERBICIDE	RATE	VISUAL INJURY 7D	14D	28D	#/PLOT	YIELD T/AC
1. Check (WEEDFREE)		0	0	0C	14	31
2. pethoxamid	1200 G/HA	0	0	18B	13	23
3. pethoxamid	2400 G/HA	0	0	29A	11	12
4. ZIDUA	47 G/AC	0	0	12C	11	29
5. ZIDUA	94 G/AC	0	0	18B	9	21
6. PROWL H20	0.96 L/AC	0	0	0C	13	33
7. PROWL H20	1.92 L/AC	0	0	3C	13	29
8. SHIELDEX	16.3 G/AC	0	0	0C	13	28
9. SHIELDEX	32.6 G/AC	0	0	0C	12	30
LSD (P <0.05)		0	0	5	NS	5

Note: Means followed by the same letter are not significantly different (P=0.05, LSD).

Conclusions:

The tolerance of cucumber to the treatments in this trial has been variable depending upon the year. In this year's study, both pethoxamid and Zidua caused considerable injury (mostly leaf puckering and stunting), and though the number of harvestable cucumber plants per plot was not affected, yields were decreased. In 2019 and 2018, though pethoxamid injured cucumber, it did not cause any reductions in yield in 2018. In 2017, pethoxamid caused considerable injury, loss of stand and yield loss. The difference in results is hypothesized to be due to cool, wet conditions at time of emergence in 2017 and again in 2020. Zidua and Prowl H20 caused less than 10% injury at twice the proposed label rate; stand and marketable yield were not reduced.

2020 Research Report

Neonicotinoid alternatives for management of cucumber beetle

Prepared for the Ontario Processing Vegetable Growers (OPVG) and the Ontario Cucumber Research Committee (OCRC)
October 14, 2020

Research Team:

- Cheryl Trueman, Ph.D., Assistant Professor, Dept of Plant Ag, University of Guelph – Ridgetown Campus
- Phyllis May, Research Technician
- Andrew Wylie (OMAFRA) was unable to assist with the trial due to restrictions for on-campus visitors related to COVID-19. Elain Roddy (OMAFRA, on leave) assisted with proposal development Fall 2019.

Highlights/Summary:

- The objective was to obtain efficacy data on neonicotinoid alternatives for cucumber beetle using in-furrow and foliar insecticides. In consultation with crop protection companies, the Group 28 diamide insecticides Coragen (chlorantraniliprole), Exirel (cyantraniliprole, foliar formulation), and Verimark (cyantraniliprole, soil formulation) were identified as potential solutions. Untreated seed of the cucumber beetle attractive buttercup squash 'Burgess' was used in both trials.
- *Foliar insecticides:* None of the insecticide treatments reduced cucumber beetle populations or feeding injury compared to the nontreated control.
- *In-furrow insecticides:* Treatments were applied in-furrow at the time of planting. Striped and spotted cucumber beetles were present in the trial, but populations remained relatively low and there was very little feeding damage observed in all treatments.
- Our strategy to plant late and expose seedlings to second generation beetles, in the hopes of a more intense and consistent population compared to trials in 2018 and 2019 seeded in late June or early July was unsuccessful. Our efforts to collect data on the efficacy of Verimark from 2018-2020 have not been successful due to low or inconsistent cucumber beetle populations. It is recommended that this research be completed elsewhere, where there are consistently high populations of cucumber beetles. For now, we will not pursue further research in this area.

Funding: Ontario Cucumber Research Committee, Ontario Processing Vegetable Growers, Ontario Ministry of Agriculture, Food, and Rural Affairs

TITLE: Foliar insecticides for the control of cucumber beetles in squash

PEST(S): Striped cucumber beetle (*Acalymma vittatum*), spotted cucumber beetle (*Diabrotica undecimpunctata howardi*)

MATERIALS: Matador 120 EC (lambda-cyhalothrin 120 g/L), Coragen (chlorantraniliprole 200 g/L), Exirel (cyantraniliprole 100 g/L)

METHODS: One trial was completed at Ridgetown Campus, University of Guelph. Buttercup squash 'Burgess', which is highly attractive to cucumber beetle, was seeded with a cone seeder on July 24 at a rate of 4 seeds per meter. A late July planting date was chosen to improve the likelihood that peak beetle populations would be present during crop establishment. Seed was not treated with any insecticides. Rows were spaced 3 m apart. Each treatment plot was 7 m long. Trials were setup as a randomized complete block design with four replications per treatment. The insecticide treatment was applied using a hand-held CO_2 2.0 m. Water volume of 300 L Ha^{-1} was used to apply the treatments.

Whole plots were monitored for cucumber beetles every 3-5 days at 7:00 am, to align with peak beetle activity, except for ratings on August 31, which began at 8:30 am. Insect counts and foliar feeding damage (% leaf area affected on 5% incremental scale) were evaluated in the whole plots on August 11, 14, 18, 21, 25, 28, 31, Sept 4 and 10. The foliar insecticide treatment was applied on August 17. The spray threshold of 0.5-1 beetles per plant was not yet met, but we anticipated it would reach threshold before the next assessment date based on experience from running similar trials in 2018 and 2019. On August 14, populations per plant ranged from 0.1 to 0.2.

Harvest was not completed because squash was underdeveloped due to the late planting date. Late planting was done on purpose to try and expose seedlings to the second generation of cucumber beetles.

Statistical analysis was conducted using ARM (Gylling Data Management, Brookings, SD). Data were tested for normality using Bartlett's homogeneity of variance test. Data which were not normal ($P \leq 0.05$) were transformed using an arsine, log, or square root transformation as appropriate. Analysis of variance was conducted using Tukey's HSD and means comparisons were performed when $P \leq 0.05$.

RESULTS & CONCLUSIONS: Cucumber beetle populations were generally low throughout the season. None of the insecticide treatments reduced cucumber beetle populations or feeding injury compared to the nontreated control (Table 1, Table 2). There were also no differences among treatments for the number of dead beetles (*data not shown*). No symptoms of bacterial wilt were observed. Our strategy to plant late and expose seedlings to second generation beetles, in the hopes of a more intense and consistent population compared to trials in 2018 and 2019 seeded in late June or early July were unsuccessful.

Cheryl Trueman – RCUG
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2020 Research Report

Integrating fungicide programs and host resistance for cucurbit downy mildew management

Prepared for the Ontario Cucumber Research Committee (OCRC)
October 29, 2020

Research Team:

- Cheryl Trueman, Ph.D., Assistant Prof, Dept of Plant Ag, Ridgetown Campus – Univ. of Guelph
- Phyllis May, Research Technician

Highlights/Summary:

- The objective was to evaluate low and high input fungicide programs using cucurbit downy mildew (CDM) susceptible and resistant hybrids for effects on CDM intensity and yield. The low input programs included the broad-spectrum fungicide, Bravo, applied either at the beginning or end of the fungicide program while the high input program included Orondis Ultra, Torrent, and Zampro, with Orondis Ultra being applied either once or twice during the season.
- Disease pressure in the trial was moderate. Symptoms were first observed in mid-July, and by Aug 11, 90% of leaves in the susceptible 'Vlaspik' nontreated control had downy mildew, with 75% of the whole plot leaf area affected.
- All fungicide programs reduced yield loss to similar levels, suggesting that the low input programs beginning or ending with two applications of Bravo as just as effective as the high input programs for both 'Vlaspik' (susceptible) and 'Peacemaker' (resistant).
- This work should be repeated to assess cultivar and fungicide program response under a variety of environmental conditions since growing seasons with higher disease pressure (ie. Near or complete burn down in nontreated susceptible control plots), might result in greater separation of treatments for yield variables. This is supported by the observation of differences in leaf symptom incidence and leaf area affected among fungicide programs and cultivars (ie. treatments differences we saw for disease this year might translate to yield differences in a year where disease severity is higher).
- A further advantage of using fungicide programs that reduce disease more than others, with no effect on yield, is that this helps reduce the overall inoculum load in a growing region. In this trial, the fungicide program that reduced disease the most varied by cultivar. The only program to reduce whole plot severity below 10% for 'Vlaspik' was the high input-2x Orondis program, while for 'Peacemaker' all programs resulted in less than 10% of the whole plot leaf area affected. Thus, it might be possible to use less expensive fungicide programs for 'Peacemaker' while limiting the inoculum load in a region.

Funding: Ontario Cucumber Research Committee. We also thank Seminis for providing cucumber seed.