2019 Cucumber Research reports			
	Project	Researcher	$ Amount Funded
1	Integrating fungicide programs and host resistance for cucurbit downy mildew management	C. Trueman	$5,000
2	Neonicotinoid alternatives for management of cucumber beetle in cucumber and squash*	C. Trueman	$1,750*
3	Cucumber downy mildew monitoring program, 2019	Tomecek Agronomy	$3,800 (total Incl. HST)
4	Processing Cucumber Variety Evaluation	J. O'Sullivan	$8,000
5	Efficacy of Fungicides for Downy Mildew Control in Processing Cucumbers	J. O'Sullivan	$5,000
6	Weed Control Evaluations in Processing Cucumbers	D. Robinson	$2,750

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

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2019 Research Report

Integrating fungicide programs and host resistance for cucurbit downy mildew management

Prepared for the Ontario Cucumber Research Committee (OCRC)
October 25, 2019

Research Team:

- Cheryl Trueman, Ph.D., College Research Professor, University of Guelph – Ridgetown Campus
- Phyllis May, Research Technician

- We thank Dr. Kris McNaughton for preparing this report

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.
- Unfortunately there was no downy mildew observed during the 2019 season and therefore no CDM efficacy data was collected. Results presented include yield and program value for the low and high input options. Trial harvest was slightly delayed until August 20 in hopes that downy mildew symptoms might start. At the time of harvest there was a number of oversized cucumbers, resulting in greater than expected unmarketable fruit count and yield values. Thus, yield results should be interpreted with caution.

Funding: Ontario Cucumber Research Committee.

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TITLE: Integrating fungicide programs and host resistance for cucurbit downy mildew management

PEST(S): Cucumber downy mildew (*Pseudoperonospora cubensis*)

MATERIALS: Bravo ZN (chlorothalonil 500 g L^{-1}), Orondis Ultra (oxathiapiprolin 100 g L^{-1}), Torrent (cyazofamid 34.5%), Zampro (ametoctradin 27% + dimethomorph 20.3%).

METHODS: The trial was conducted at Ridgetown Campus, University of Guelph. Two cucumber cultivars, 'Vlaspik' and 'Peacemaker', were used to identify differences between host resistance to CDM. Previous research at Ridgetown showed that 'Vlaspik' was susceptible to CDM, while 'Peacemaker' was more resistant. The trial was seeded with a cone seeder on June 28 at a rate of 10 seeds per meter. The planting date was late to increase probability of high disease pressure conditions. Rows were spaced 0.75 m apart. Each treatment plot was 7 m long and consisted of 3 rows. The left most row was planted to the pollinator, while the second and third rows were planted with the treatment cultivar. The trial was designed as a 2 x 5 factorial with four replications. Factor A is the host resistance to CDM and Factor B is the fungicide treatment. Treatments were applied using a hand-held CO_2 boom sprayer with ULD 120-02 nozzles at a pressure of 40 psi and water volume of 200 L ha^{-1}. A 2.0 boom width was used for all applications. Each treatment received six fungicide applications (application codes A-F) which were applied approximately one week apart on July 9, 16, 24, 31, August 7 and 14. Treatments included: untreated control, Bravo ZN (application codes AB) + Orondis Ultra (C) + Torrent and Sylgard 309 (DF) + Zampro and Sylard 309 (E), Orondis Ultra (A) + Torrent and Sylgard 309 (BD) + Zampro and Sylard 309 (C) + Bravo ZN (EF), Orondis Ultra (A) + Torrent and Sylgard 309 (BDF) + Zampro and Sylgard 309 (CE), and Orondis Ultra (AD) + Torrent and Sylgard 309 (BE) + Zampro and Sylgard 309 (CF). Fungicide rates used were Bravo ZN (4.8 L ha^{-1}), Orondis Ultra (500 ml ha^{-1}), Torrent + Sylgard 309 (200 ml ha^{-1} + 150 ml ha^{-1}) and Zampro + Sylgard 309 (1 L ha^{-1} + 150 ml ha^{-1}). The trial was irrigated as needed using drip irrigation.

Downy mildew was not detected in the trial so we were unable to evaluate fungicide program efficacy or host resistance. Fruit was harvested on August 20 from a 7 m section of the center row of each plot. Harvested fruit was graded based on width and the number and weight of each grade documented. Grades used were: Grade 1 < 2.75 cm, Grade 2 > 2.75 cm, but < 3.5 cm, Grade 3 > 3.5 cm, but < 4.0 cm, Grade 4 > 4.0 cm, but < 5.75 cm, Oversize > 5.75 cm, and Nubs. Crop value for each treatment was also calculated based on the graded yields for each treatment multiplied by price per ton for each grade in US dollars (USD). The calculated prices per ton for each grade were then summed to determine the crop value for each treatment. Prices used were based on Hartung Brothers 2019 grower agreement for machine harvested cucumbers (Grade 1 = $20 USD per ton, Grade 2 = $280 USD per ton, Grade 3 = $228 USD per ton, Grade 4 = $70 USD per ton, and nubs $30 USD per ton).

Statistical analysis was conducted using Proc Glimmix in SAS v9.4 (SAS Institute Inc., Cary, NC). Means comparisons were performed when $P \leq 0.05$ using Tukey's HSD. Data which did not fit a Gaussian distribution had a gamma or lognormal error distribution applied to the analysis. The back-transformed means are presented for ease of interpretation. There was no interaction between the two factors, host resistance and fungicide treatment, meaning any differences observed were either a result of cultivar or fungicide treatments singly, and not a combination of the two.

RESULTS:

There was no downy mildew observed during the course of the trial. As expected with a lack of CDM disease pressure, no differences among fungicide treatments for marketable, non-marketable, or total cucumber yield or fruit count (Table 1) was observed. All fungicide treatments behaved similar to the untreated control. The only differences observed were not a result of the fungicide treatments, rather the result of the two cucumber cultivars examined, Peacemaker and Vlaspik. Treatments planted with Peacemaker cucumber had a greater number, and therefore yield and calculated program value than those planted with Vlaspik (Table 1). Trial harvest was slightly delayed until August 20 in hopes that downy mildew symptoms might start. At the time of harvest there was a number of oversized cucumbers, resulting in greater than expected unmarketable fruit count and yield values.

CONCLUSIONS: In the absence of disease pressure all fungicide treatments resulted in similar marketable and non-marketable yields as the untreated control. Likewise, the calculated program value for each treatment was comparable. All differences in yield and program value were a result of cultivar differences and not the actual fungicide treatment.

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Table 1: Yield of cucumbers harvested from 7m plots treated with different fungicides for management of downy mildew, Ridgetown, August 20 2019.

Main Effects[a]	Yield (# fruit)			Yield (ton/ac)			Program Value (USD ac^{-1})[f]
	Marketable[d,e]	Unmarketable	Total	Marketable	Unmarketable	Total	
Host CDM Resistance	*	NS	NS	*	NS	NS	*
Vlaspik	**40.8 b**	134.5 a	178.0 a	**1.3 a**	1.4 a	4.5 a	**29.67 a**
Peacemaker	**52.8 a**	126.9 a	180.0 a	**1.5 b**	1.4 a	4.4 a	**46.18 b**
SE	**2.7**	3.8	4.2	**0.03**	0.09	0.08	**2.86**
Fungicide Treatment[b,c]	NS	NS	NS	NS	NS	NS	NS
Untreated control	53.0 a	133.9 a	191.1 a	1.5 a	4.1 a	4.6 a	44.83 a
Bravo ZN (AB), Orondis Ultra (C), Torrent + Sylgard 309 (DF), Zampro + Sylgard 309 (E)[c]	39.2 a	119.5 a	159.4 a	1.4 a	3.7 a	4.1 a	34.07 a
Orondis Ultra (A), Torrent + Sylgard 309 (BD), Zampro + Sylgard 309 (C), Bravo ZN (EF)	49.5 a	131.8 a	182.0 a	1.5 a	4.0 a	4.5 a	35.82 a
Orondis Ultra (A), Torrent + Sylgard 309 (BDF), Zampro + Sylgard 309 (CE)	49.4 a	126.8 a	178.1 a	1.5 a	3.9 a	4.4 a	38.84 a
Orondis Ultra (AD), Torrent + Sylgard 309 (BE), Zampro + Sylgard 309 (CF)	42.4 a	141.5 a	184.1 a	1.4 a	4.4 a	4.8 a	32.71 a
SE	2.7	3.8	4.2	0.03	0.09	0.08	2.86
Interaction							
Variety x Fungicide treatement	NS	NS	NS	NS	NS	NS	NS

[a] Significance at $P < 0.05$ denoted by an '*' and a non-significant difference by 'NS' for each main effect factor and their interaction.
[b] Fungicides applied on: A=July 9, B= July 16, C=July 24, D=July 31, E=August 7, and F=August 14.
[c] Fungicide rates applied were: Bravo (4.8 L ha^{-1}), Orondis Ultra (500 ml ha^{-1}), Torrent + Sylgard 309 (200 ml ha^{-1} + 150 ml ha^{-1}), Zampro + Sylgard 309 (1 L ha^{-1} + 150 ml ha^{-1}).
[d] Means followed by the same letter within a column are not significantly different at $P \leq 0.05$, Tukey's adjustment. Means for a main effect were separated only if there was no significant interaction involving that main effect.
[e] Marketable fruit number and yield include nubs and Grades 1, 2, 3, and 4. Unmarketable fruit number and yield include oversized fruit, while total fruit number and yield represents the sum of marketable and unmarketable fruit.
[f] Program Value was calculated using yields for each cucumber grade (data not shown) and Hartung Brothers 2019 agreement pricing for each grade.
Abbreviations: CDM=Cucurbit Downy Mildew; USD=US dollars.

2019 Research Report

Neonicotinoid alternatives for management of cucumber beetle

Prepared for the Ontario Processing Vegetable Growers (OPVG) and the Ontario Cucumber Research Committee (OCRC)
November 21, 2019

Research Team:

- PI: Cheryl Trueman, Ph.D., Assistant Professor, Dept of Plant Ag, University of Guelph – Ridgetown Campus
- Collaborator: Elaine Roddy, OMAFRA

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.
- *Foliar insecticides:* Untreated seed of the cucumber beetle attractive buttercup squash 'Burgess' was used. Insecticides were applied according to scouting thresholds of 0.5-1 beetle per plant. Despite having adjusted the planting dates to target peak beetle activity and completing the assessments early in the morning when beetle activity is highest, cucumber beetle populations in the trial were low again in 2019. There were no significant differences between any of the treatments and the control for the number of beetles, percent feeding injury or yield.
- *In-furrow insecticides:* Untreated seed of the cucumber beetle attractive buttercup squash 'Burgess' was used. Treatments were applied in-furrow at the time of planting. Whole plots were monitored from emergence until August 6th (6 weeks). No differences in beetle populations or feeding damage were observed among treatments, except on August 6th when the population for Admire was lower than the high rate of Verimark. The reason for this difference is unknown. Despite having adjusted the planting dates to target peak beetle activity and completing the assessments early in the morning when beetle activity is highest, cucumber beetle populations in the trial were low again in 2019.

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 Buttercup', which is highly attractive to cucumber beetle, was seeded with a cone seeder on June 27 at a rate of 4 seeds per meter. A late June 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 4 m apart. Each treatment plot was 7 m long. Trials were setup as a randomized complete block design with four replications per treatment. Treatments were applied using a hand-held CO_2 2.0 m. Water volume of 300 L Ha^{-1} was used to apply the treatments. Preventative fungicide applications for powdery mildew and downy mildew were made on August 2 (Fontelis (1.25 L/ha) + Zampro (1 L/ha)) and Aug 15 (Quintec (440 mL/ha) and Torrent (200 mL/ha)).

Whole plots were monitored for cucumber beetles every 3-5 days at 7:00 am, to align with peak beetle activity. Assessments were made on July 5, 8, 11, 16th with no beetles recorded. The spray threshold of 0.5-1 beetles per plant was met on July 20th, at which time foliar feeding assessments were taken (% leaf area affected on 5% incremental scale).

Foliar insecticide applications were applied on July 22nd. Insect counts, foliar feeding and blossom feeding assessments were also taken at 3, 5 and 10 days after application (July 25, July 27 and August 1st, respectively).

Statistical analysis was conducted using ARM 2019.3 (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. 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 and Table 2). Flower feeding was not identified on any of the assessment dates. No symptoms of bacterial wilt were observed. There were no differences among treatments for squash yield (*data not shown*).

Table 1. Number of striped cucumber beetles on foliage in butternut squash 'Burgess' treated with foliar insecticides, Ridgetown, ON, 2019.

Treatment (rate per Ha) [a]	Population (number of live beetles per plot) [b]							
	July 5	July 8	July 11	July 16	July 20	July 25	July 27	Aug 1
Control	0	0	0	0	0.8a [c]	1.3a	2.3a	0.8a
Matador @ 210 mL	0	0	0	0	1.5a	0.3a	0.3a	0.5a
Coragen @ 375 mL	0	0	0	0	1.0a	0.3a	1.3a	0.0a
Exirel @ 1000 mL	0	0	0	0	1.5a	0.3a	2.3a	0.8a

[a] Foliar insecticide applied on July 22.

[b] Striped cucumber beetles were the dominant type observed.

[c] Numbers in a column followed by the same letter are not significantly different at $P \leq 0.05$, Tukey's HSD.

Table 2. Leaf area with cucumber beetle feeding damage on foliage in butternut squash 'Burgess' treated with foliar insecticides, Ridgetown, ON, 2019.

Treatment (rate per Ha) [a]	% Foliar Feeding Damage							
	July 5	July 8	July 11	July 16	July 20	July 25	July 27	August 1
Control	0	0	0	0	0.20a [b]	1.75a	2.88a	1.25a
Matador @ 210 mL	0	0	0	0	0.20a	0.30a	0.90a	0.53a
Coragen @ 375 mL	0	0	0	0	0.30a	0.55a	0.88a	1.05a
Exirel @ 1000 mL	0	0	0	0	0.68a	0.40a	0.88a	0.20a

[a] Foliar insecticide applied on July 22.

[b] Numbers in a column followed by the same letter are not significantly different at $P \leq 0.05$, Tukey's HSD.

Table 3. Squash yield in butternut squash 'Burgess' treated with foliar insecticides, Ridgetown, ON, 2019.

Treatment (mL per 100 m of row) [a]	Yield (#/plot)			Yield (kg/plot)		
	Marketable	Unmarketable	Total	Marketable	Unmarketable	Total
Control	24.8a [b]	3.2a	28.0a	27.055a	0.875a	27.930a
Matador @ 210 mL	24.3a	9a	33.3a	26.300a	1.82a	28.120a
Coragen @ 375 mL	27.3a	5.2a	32.5a	30.350a	0.83a	31.180a
Exirel @ 1000 mL	25.5a	5a	30.5a	29.190a	1.14a	30.330a

[a] Foliar insecticide applied on July 22.

[b] Numbers in a column followed by the same letter are not significantly different at $P \leq 0.05$, Tukey's HSD.

TITLE: In-furrow insecticides for the control of cucumber beetles in squash

PEST(S): striped cucumber beetle (*Acalymma albidovittata*), spotted cucumber beetle (*Diabrotica undecimpunctata howardi*)

MATERIALS: Admire (imidacloprid 240 g/L), Verimark (cyantraniliprole 200 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 June 28 at a rate of 4 seeds per meter. Seed was not treated with any insecticides. Rows were spaced 4 m apart. Each treatment plot was 7 m long. Trials were setup as a randomized complete block design with four replications per treatment. Treatments were applied in-furrow behind the shoe. A spray nozzle was placed through the spring for the press wheels and secured using cable ties. It was connected with tubing to the CO_2 sprayer. The insecticide solution was allowed to fill the tube leading to the shoe before starting to plant. The system was flushed with clean water after treatment application and before a new treatment was applied. Applications were made using pressure of 30 psi with Lurmark 015-F110 nozzles. The band width was 7 cm and application volume 40.8 L/Ha. Preventative fungicide applications for powdery mildew and downy mildew were made on August 2 (Fontelis 1.23 L/ha and Zampro 1 L/ha)) and August 15 (Quintec 400 mL/ha and Torrent 200 mL/ha).

Squash were monitored two times per week for six weeks, except for the week of August 29th, due to standing water in the field. Insect assessments were taken at 7:00 am to align with the daily period of peak beetle activity. There was no presence of insects for the first three evaluations on July 5, 9 and 11. Insect counts and foliar feeding damage (% leaf area affected on 5% incremental scale) were evaluated in the whole plots on July 15, 19, 23, and 26, August 1 and 6. Ratings were concluded after six weeks due to overall low pest pressure. Squash were harvested on September 17 and the number and weight of marketable and unmarketable fruit was recorded.

Statistical analysis was conducted using ARM 2019.3 (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. Analysis of variance was conducted using Tukey's HSD and means comparisons were performed when $P \leq 0.05$.

RESULTS & CONCLUSIONS: On August 6, there was a significant difference between the number of cucumber beetles in the Admire and the Verimark (40 mL) treatments. The reason for this difference is not clear. There were no differences among treatments for cucumber beetle foliar feeding (Table 2) or yield (Table 4). No bacterial wilt was observed in the trial. Cucumber beetle populations in the trial were low in the weeks following seeding.

Table 1. Number of striped cucumber beetles on foliage in squash treated with insecticides in-furrow, Ridgetown, ON, 2019.

Treatment (mL per 100 m of row) [a]	Population (number of live beetles per plot) [b]					
	July 15	July 19	July 23	July 26	August 1	August 6
Control	0.8a	3.5a	2.5a	10.3a	2.3a	6.8ab
Admire @ 18 mL	0.5a	4.3a	2.5a	4.5a	0.8a	3.3b
Verimark @ 30 mL	2.0a	4.3a	2.0a	3.0a	2.0a	3.5ab
Verimark @ 40 mL	2.0a	4.5a	5.0a	16.5a	2.3a	7.3a

[a] In-furrow treatments were applied June 28.

[b] Striped cucumber beetles were the dominate type observed.

[c] Numbers in a column followed by the same letter are not significantly different at $P \leq 0.05$, Tukey's HSD.

Table 2. Leaf area (%) with cucumber beetle feeding damage in squash treated with insecticides in-furrow, Ridgetown, ON, 2019.

Treatment (mL per 100 m of row) [a]	Leaf Area Damaged (%) [b]					
	July 15	July 19	July 23	July 26	August 1	August 6
Control	0.0a	3.9a	5.8a	5.5a	3.0a	1.3a
Admire @ 18 mL	0.0a	0.7a	3.3a	2.0a	1.5a	0.2a
Verimark @ 30 mL	0.0a	1.5a	2.5a	3.3a	3.5a	0.3a
Verimark @ 40 mL	0.0a	2.0a	5.5a	4.5a	3.3a	2.8a

[a] In-furrow treatments were applied June 28.

[b] Striped cucumber beetles were the dominate type observed.

[c] Numbers in a column followed by the same letter are not significantly different at $P \leq 0.05$, Tukey's HSD.

Table 3. Squash yield in plots treated with insecticides in-furrow for management of cucumber beetle, Ridgetown, ON, 2019.

Treatment (mL per 100 m of row) [a]	Yield (#/plot)			Yield (kg/plot)		
	Marketable	Unmarketable	Total	Marketable	Unmarketable	Total
Control	22.5a	5.0a	27.5a	23.58a	0.91a	24.49a
Admire @ 18 mL	26.3a	5.1a	31.4a	27.78a	1.10a	28.88a
Verimark @ 30 mL	22.3a	3.3a	25.6a	21.64a	1.00a	22.75a
Verimark @ 40 mL	22.3a	5.0a	27.3a	22.72a	0.46a	23.18a

[a] In-furrow treatments were applied June 13.

[b] Numbers in a column followed by the same letter are not significantly different at $P \leq 0.05$, Tukey's HSD.

Tomecek Agronomy Services Inc.

October 31, 2019

Cucumber Downy Mildew Monitoring Program 2019 - Final Report

To: Ontario Cucumber Research Committee (OCRC),

Tomecek Agronomy monitored five hand-harvest cucumber fields within Chatham-Kent this season for the presence of downy mildew. Scouting began a week later than originally planned due to prolonged wet spring weather. The fields selected were located in Wallaceburg, Dresden, Chatham, Kent Bridge and Blenheim.

Scouting began the week of June 17-21 and continued until the week of July 22-26, for a total of 6 weeks of scouting. 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, per 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 they identified to the grower.

Zero cases of downy mildew were observed in the fields involved in the project. Moreover, downy mildew had not been identified and reported in any other cucumber field in the province at the conclusion of the project.

We appreciated the opportunity to work with the OCRC this past season and would look forward to doing so again next year.

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PROCESSING CUCUMBER VARIETY EVALUATION TRIALS 2019

John O'Sullivan
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Rachel Riddle
Peter White

University of Guelph
Department of Plant Agriculture
Simcoe Research Station

Project Title: Processing Cucumber Variety Evaluation 2019

Researcher: Dr. John O'Sullivan, Dept. of Plant Agriculture, University of Guelph, Simcoe

Objective: The objectives of these studies were to evaluate new cucumber varieties for yield performance, quality, adaptability and acceptability to Ontario processors for hand-pick 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: Two cucumber variety trials were conducted at the Simcoe Research Station in 2019: Conventional Multipick (hand harvest) and Parthenocarpic Multipick (hand harvest). Varieties were evaluated to compare how these varieties perform under the same environmental conditions. Trials were set up as a randomized complete block design with three replications. The conventional multipick variety trial included 9 commercial varieties for evaluation and the parthenocarpic multipick variety trial included 14 commercial varieties. Both trials were seeded on June 6 using a standard cone seeder mounted on a John Deere planter. The plot size for these trials was 30 ft by 5 ft. In the multipick conventional trial, plants were thinned to 4" in the row to give a plant population of 27,000 plants/acre. In the multipick parthenocarpic trial, plants were thinned to 6" in the row to give a plant population of 18,000 plants/acre. Cucumber plots were harvested two to three times per week for a total of 10 and 8 harvests during the season for the conventional and parth trials, respectively. The crops were grown according to accepted commercial practices used in Ontario. Data was taken on fruit length to diameter ratios (L/D – 2B, 3A, 3B) on a weekly basis. In addition, yields were measured at each harvest as fruit weights (ton/acre) and dollar value per acre. Varieties were brined at Simcoe, for evaluation by the industry and seed companies in October, 2019.

Results:

Multipick Conventional Variety Trial: Yields shown are for grades #1 to #4 (including nubs and crooks). SV 5479 was the highest yielding variety with a yield of approximately US $8,900 and 35 tons per acre. Most of the varieties were in the US $7,000 to $8,000 per acre range (Table 1). LD's were taken weekly on 2B's, 3A's and 3B's (Table 2).

Multipick Parthenocarpic Variety Trial: Rubinstein and Liszt were the highest yielding varieties with approximately US $9,800 and $9,700 per acre and 31 and 38 tons/acre respectively. Most varieties were in the US $7,000 to US $8,000 and 26 to 28 tons per acre range (Table 3). LD's were taken weekly on 2B's, 3A's and 3B's (Table 4).

Table 1: Yield of cucumbers harvested from the conventional multipick (hand harvest) variety trial, Simcoe, ON, 2019.

Cultivar	Source	Total Yield* 1-4, NC T/ac	Total Yield* 1-4, NC $/ac	Fruit/ plant #	N/C (%)	1AB (%)	2A (%)	2B (%)	3A (%)	3B (%)	4 (%)	O/S (%)
SV5479CN	Seminis	35.4 a	8,926 a	15	5	5	9	19	23	19	9	12
Vlasstar	Seminis	32.0 a	8,276 a	13	4	5	10	18	25	19	7	12
Chaperon	Seminis	32.2 a	8,181 a	15	5	5	9	21	21	24	6	8
Allianz	Bejo	31.3 a	8,127 a	14	3	5	10	21	21	22	7	11
Peacemaker	Seminis	31.0 a	8,072 a	14	5	5	9	21	22	18	7	14
Atlantis	Bejo	31.8 a	7,695 a	13	6	4	9	18	21	22	9	10
Fancipak	Seminis	30.6 a	7,620 a	14	3	4	8	20	21	22	9	14
Arabian	Seminis	27.7 a	7,432 a	16	4	6	11	24	24	18	5	8
Atomic	Bejo	27.7 a	7,145 a	12	2	5	9	18	22	21	9	13

Soil Type	: Fine sandy loam	Fertility	: 100 lbs/acre of N, 73 lbs/acre of P,
Soil pH; % OM	: 6.3; 1.3		: 90 lbs/acre of K
Planting Date	: June 6	Herbicides	: Command 0.4 L/ac (PRE)
Row Spacing	: 5'		
Plant Spacing	: 4"	Harvest Dates	: July 23 - August 21 (10 Total)

* Yields are for comparative purposes only. Small plot yields may not accurately reflect commercial yields.

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

Table 2: Length-diameter (L/D) ratio of cucumbers harvested from the conventional multipick (hand harvest) variety trial on three separate harvests, Simcoe, ON, 2019.

July 23 - Harvest #1

Cultivar	Source	L/D 2B	3A	3B
SV5479CN	Seminis	*	*	*
Vlasstar	Seminis	3.1	3.3	*
Chaperon	Seminis	3.4	2.9	*
Allianz	Bejo	3.1	2.5	*
Peacemaker	Seminis	3.3	3.0	*
Atlantis	Bejo	3.1	2.8	*
Fancipak	Seminis	3.2	2.6	*
Arabian	Seminis	3.2	2.7	*
Atomic	Bejo	3.2	2.9	*

* Not enough fruit samples to do assessment

August 1 - Harvest #4

Cultivar	Source	L/D 2B	3A	3B
SV5479CN	Seminis	3.4	3.4	3.2
Vlasstar	Seminis	3.3	3.0	3.2
Chaperon	Seminis	3.2	3.1	3.0
Allianz	Bejo	3.1	3.0	2.9
Peacemaker	Seminis	3.3	3.2	3.1
Atlantis	Bejo	3.3	3.0	2.9
Fancipak	Seminis	3.2	3.0	2.8
Arabian	Seminis	3.3	3.0	3.0
Atomic	Bejo	3.1	3.1	3.3

August 12 - Harvest #7

Cultivar	Source	L/D 2B	3A	3B
SV5479CN	Seminis	3.2	3.0	3.2
Vlasstar	Seminis	2.8	2.9	2.8
Chaperon	Seminis	3.2	2.8	2.9
Allianz	Bejo	2.9	2.8	2.7
Peacemaker	Seminis	2.9	3.1	3.1
Atlantis	Bejo	2.9	3.0	2.8
Fancipak	Seminis	3.0	2.8	2.8
Arabian	Seminis	3.0	3.1	3.0
Atomic	Bejo	3.1	3.0	2.8

Table 3: Yield of cucumbers harvested from the parthenocarpic multipick (hand harvest) variety trial, Simcoe, ON, 2019.

Cultivar	Source	Total Yield* 1-4, NC T/ac	Total Yield* 1-4, NC $/ac	Fruit/ plant #	N/C	1AB	2A	2B	3A	3B	4	O/S
					Breakout by Graded Size (%)							
Rubinstein	Rijk Zwaan	30.8 ab	9,817 a	23	1	10	25	32	18	9	3	1
Liszt	Rijk Zwaan	37.6 a	9,742 a	21	0	3	13	22	23	25	7	7
Bowie	Rijk Zwaan	28.5 ab	9,503 ab	21	1	14	23	25	15	16	4	2
NUN1	Nunhems	28.5 ab	9,188 ab	23	1	11	25	27	21	13	2	0
Amarok	Bejo	27.2 ab	8,633 ab	22	0	9	23	31	20	12	2	4
Aristan	Bejo	28.0 ab	8,251 ab	20	1	7	19	31	22	13	4	3
Absolut	Bejo	26.6 ab	8,187 ab	21	1	8	22	29	21	13	3	4
Ansor	Bejo	26.5 ab	8,044 ab	21	1	9	20	27	19	15	5	4
Gershwin	Rijk Zwaan	27.2 ab	7,865 ab	21	3	8	19	25	19	16	5	5
Artist	Bejo	27.6 ab	7,768 ab	23	1	5	17	27	23	16	4	7
Merengue	Seminis	23.6 ab	7,748 ab	25	0	12	22	30	18	10	3	4
Puccini	Rijk Zwaan	21.9 b	7,190 ab	17	1	13	27	25	17	11	4	2
Bernstein	Rijk Zwaan	19.8 b	6,728 ab	21	0	13	28	27	12	12	3	4
NUN2	Nunhems	20.4 b	5,955 b	17	1	7	19	30	19	15	5	4

Soil Type	: Fine sandy loam	Fertility	: 100 lbs/acre of N, 73 lbs/acre of P,
Soil pH; % OM	: 7.0; 1.7		: 90 lbs/acre of K
Planting Date	: June 6	Herbicides	: Command 0.4 L/ac (PRE)
Row Spacing	: 5'		
Plant Spacing	: 6"	Harvest Dates	: July 22 - August 16 (8 Total)

* Yields are for comparative purposes only. Small plot yields may not accurately reflect commercial yields.

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

Table 4: Length-diameter (L/D) ratio of cucumbers harvested from the parthenocarpic multipick (hand harvest) variety trial on three separate harvests, Simcoe, ON, 2019.

July 30 - Harvest #3

			L/D	
Cultivar	**Source**	**2B**	**3A**	**3B**
Rubinstein	Rijk Zwaan	3.3	3.3	2.8
Liszt	Rijk Zwaan	3.3	3.0	2.7
Bowie	Rijk Zwaan	3.2	3.3	3.0
NUN1	Nunhems	3.3	2.9	2.9
Amarok	Bejo	3.2	3.0	2.8
Aristan	Bejo	3.2	3.0	3.1
Absolut	Bejo	3.1	3.2	3.0
Ansor	Bejo	3.1	3.1	2.8
Gershwin	Rijk Zwaan	3.4	3.2	2.8
Artist	Bejo	3.5	3.0	3.0
Merengue	Seminis	3.3	3.2	3.1
Puccini	Rijk Zwaan	3.4	3.1	2.8
Bernstein	Rijk Zwaan	3.2	2.7	2.7
NUN2	Nunhems	3.4	3.0	*

* Not enough fruit samples to do assessment

August 6 - Harvest #5

			L/D	
Cultivar	**Source**	**2B**	**3A**	**3B**
Rubinstein	Rijk Zwaan	3.4	3.7	3.0
Liszt	Rijk Zwaan	3.2	3.1	3.0
Bowie	Rijk Zwaan	3.9	3.5	3.1
NUN1	Nunhems	3.5	3.1	3.0
Amarok	Bejo	3.1	3.3	2.9
Aristan	Bejo	3.5	3.2	3.0
Absolut	Bejo	3.4	3.2	3.2
Ansor	Bejo	3.4	3.1	3.1
Gershwin	Rijk Zwaan	3.6	3.8	3.3
Artist	Bejo	3.4	3.0	3.0
Merengue	Seminis	3.3	3.2	3.2
Puccini	Rijk Zwaan	3.2	3.2	2.9
Bernstein	Rijk Zwaan	3.7	3.4	2.9
NUN2	Nunhems	3.0	3.0	2.8

August 13 - Harvest #7

			L/D	
Cultivar	**Source**	**2B**	**3A**	**3B**
Rubinstein	Rijk Zwaan	3.7	3.3	3.2
Liszt	Rijk Zwaan	3.2	3.3	2.9
Bowie	Rijk Zwaan	3.3	3.3	3.3
NUN1	Nunhems	3.2	2.9	3.0
Amarok	Bejo	3.2	3.0	3.0
Aristan	Bejo	3.1	3.1	2.8
Absolut	Bejo	3.3	3.5	3.1
Ansor	Bejo	3.3	3.3	3.0
Gershwin	Rijk Zwaan	3.3	3.4	3.3
Artist	Bejo	3.3	3.3	2.9
Merengue	Seminis	3.1	3.4	3.2
Puccini	Rijk Zwaan	3.1	3.1	3.1
Bernstein	Rijk Zwaan	3.1	3.3	3.1
NUN2	Nunhems	2.9	3.0	2.9

CUCUMBER DOWNY MILDEW FUNGICIDE EVALUATION TRIAL 2019

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Rachel Riddle
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Department of Plant Agriculture
Simcoe Research Station

Project Title: Cucumber Downy Mildew Fungicide Evaluation Trial 2019

Researcher: Dr. John O'Sullivan, Dept. of Plant Agriculture,
University of Guelph, Simcoe

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 2019. Cucumber cultivar 'Vlaspik' was seeded using a precision seeder on July 2 in rows 28 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 4 replications per treatment. 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 200 L/ha. There were a total of 13 treatments evaluated, including an untreated control (Table 1). Treatments were applied to plots on July 19, 25, and August 1.

Downy mildew visual ratings were made at weekly intervals starting on July 12th, however the disease never developed on any of the plots, not even a couple weeks after harvest was complete. Mature fruit were harvested by hand on August 14th, 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: Downy mildew did not appear at all at the location of the trials, not even weeks after harvest was complete. Consequently there were no downy mildew control ratings during the season on this trial. Final yield results reflect the absence of downy mildew. There were no significant differences between treatments. The treatments did not have a negative effect on yield in the absence of disease, which is expected.

Table 1: Treatment list description for cucumber downy mildew fungicide evaluations, Simcoe, ON, 2019.

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 alt. Bravo ZN	mandipropamid/oxthiapiprolin	Registered in Canada for use on cucumbers. Applied every other application alternated with Bravo
Allegro	fluazinam	Registered in Canada on beans, brassica crops, carrots & potatoes. Registered in U.S. on cucumbers
OxiDate	Hydrogen peroxide/peroxyacetic acid	Registered in Canada for use on cucumbers
Torrent alt. Diplomat + Phostrol	cyazofamid polyoxin d zinc salt phosphites	Applied every other application alternated with Diplomat + Phostrol. Non-conventional product registered in Canada on fruits and vegetables
Cueva	Copper octanoate	Registered in Canada for use on cucumbers

Table 2: Incidence of cucumber leaves with downy mildew symptoms and yield of cucumbers harvested from plots sprayed with different fungicides, Simcoe, ON, 2019.

Product**	Rate per Acre	% Downy Mildew Infection* July 19	July 25	August 1	August 8	Yield t/acre
Bravo ZN	1.9 L	0	0	0	0	9.0 a
Torrent + Sylgard	81 mL 0.1 % v/v	0	0	0	0	10.9 a
Zampro + Sylgard	400 mL 0.1 % v/v	0	0	0	0	14.0 a
Orondis Ultra alt. Bravo ZN	160 mL 1.9 L	0	0	0	0	9.3 a
Tattoo C	1.1 L	0	0	0	0	11.6 a
Allegro	460 mL	0	0	0	0	12.4 a
Allegro	715 mL	0	0	0	0	10.2 a
OxiDate Sylgard	0.4 % v/v 0.1 % v/v	0	0	0	0	10.4 a
OxiDate Sylgard	1.1 % v/v 0.1 % v/v	0	0	0	0	12.1 a
Torrent alt. Diplomat + Phostrol	81 mL 400 mL 1.2 L	0	0	0	0	12.5 a
Torrent alt. Diplomat	81 mL 400 mL	0	0	0	0	10.7 a
Cueva	1 % v/v	0	0	0	0	12.9 a
Untreated Control		0	0	0	0	13.0 a

Planting Date : July 2
Plant Population : 55,000 plants/Ac
Date of First Application : July 19
Harvest Date : August 14

* Based on % leaves infected

** First application was applied at the 2-4-leaf stage, subsequent applications were made on a 7-day spray interval, 3 applications total.

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

Bonduelle

2019 Processing pea cultivar evalutation

Team: Ontario Agriculture Ingersoll Strathroy Tecumseh
Assistance: Ian Burhwaite Katherine Teeter Mackenzie Gould Miranda McCallum
Partners: Ecologistics Research Services OPVG Stoegerdale Farms

Location: North of Belmont Ontario GPS 42.93277, -81.09937
Details: 2 planting date May 18th & June 4th
54 varieties planted: 10 Standards
44 New breeding varieties

Ontario Processing Vegetable Growers

Supplier	Variety		Type	Planting Date	Obs Date	Growing Days	HU	Leaf Type	Sieve 1 (lbs)	Sieve 2 (lbs)	Sieve 3 (lbs)	Sieve 4 (lbs)	Sieve 5 (lbs)	Average Sieve	Expected Sieve	Yield (Tons/acre)	4 repetitions: Average TD (spl)	10 repetitions: Avg Nodes with Pods	Avg Pods/Plant	Average Berries/Pod	Berries/Plant
Columbia Seeds	Avorette	new	mini	May-18	Jul-12	55	1319	Normal	0.52	0.86	3.74	0.16	0.44	2.96	1.40	3.16	119.25	3.20	5.50	5.13	28.20
Brotherton Seed	905	standard	mini	May-18	Jul-14	57	1377	Normal	1.22	1.46	1.32	0.64	0.82	2.85	1.40	2.24	116.75	3.00	4.93	6.05	24.65
Brotherton Seed	EXP 098	new	mini	May-18	Jul-14	57	1377	Normal	0.76	1.06	3.38	0.60	0.07	2.67	1.80	2.51	116.50	2.50	5.00	6.17	31.66
Seminis	Nitro	standard	mini	May-18	Jul-14	57	1377	Normal	1.14	1.40	2.42	0.04	0.00	2.33	2.00	2.75	110.00	2.10	4.33	4.53	28.23
Brotherton Seed	BSC 489	new	mini	May-18	Jul-15	58	1402	Alfa	1.08	1.54	1.74	0.06	0.00	2.16	2.00	2.21	107.00	2.50	5.50	6.31	34.80
Brotherton Seed	Jupiter	new	mini	May-18	Jul-18	61	1498	Normal	2.80	2.38	0.32	0.00	0.00	1.54	1.30	2.80	117.25	3.70	9.90	6.36	62.83
Brotherton Seed	Louise	new	mini	May-18	Jul-18	61	1498	Normal	1.36	2.46	0.64	0.00	0.00	1.84	1.30	2.23	116.00	2.50	4.20	3.88	65.00
PureLine Seeds Inc	Rhianna	new	mini	May-18	Jul-19	62	1533	Normal	1.20	2.06	0.90	0.07	0.00	1.94	1.80	2.09	117.75				
Seminis	SV7441OC	new	mini	May-18	Jul-19	62	1533	Normal	0.96	1.66	0.90	0.04	0.00	2.01	1.70	1.76	124.50	2.90	7.30	6.42	44.89
PureLine Seeds Inc	Wax 202	new	mini	May-18	Jul-19	62	1533	Alfa	0.28	1.50	2.22	0.14	0.00	2.54	1.80	2.07	109.75	2.70	6.20	6.60	40.92
Syngenta	Cours	new	mini	Jun-4	Jul-31	57	1610	Normal	0.76	0.78	0.40	0.00	0.00	1.61		1.70	127.00				
Seminis	SV0982OB	new	mini	Jun-4	Jul-31	57	1610	Normal	0.84	1.06	0.88	0.07	0.00	1.98	2.00	2.54	114.50				
Gallatin Valley Seed Company	8137	new	mini	Jun-4	Aug-1	58	1631	Normal	1.50	0.46	0.36	0.02	0.00	1.57	2.00	2.22	119.00				
Brotherton Seed	EXP588	new	mini	Jun-4	Aug-2	59	1663	Alfa	1.36	1.00	0.44	0.02	0.00	1.88	1.40	2.47	112.50				
Syngenta	Fastnet	new	mini	Jun-4	Aug-4	61	1720	Alfa	0.64	1.40	0.40	0.04	0.00	1.92		2.21	117.75				
Syngenta	Zomvert	new	mini	Jun-4	Aug-4	61	1720	Normal	0.50	0.28	0.10	0.00	0.00	1.55		0.77	98.50				
Seminis	Spearmint	standard	regular	May-18	Jul-8	51	1185	Normal	3.04	0.54	1.04	1.22	1.04	3.86	3.30	1.79	104.50	3.30	4.50	5.55	24.98
Columbia Seeds	Linnet	new	regular	May-18	Jul-11	54	1285	Normal	0.28	0.38	3.44	0.14	0.00	2.81	2.80	2.12	103.50	3.90	7.40	4.41	32.67
Crites Seed Inc	CS-455AF	new	regular	May-18	Jul-12	56	1319	Alfa	0.32	0.46	1.90	2.04	3.64	4.10	3.70	3.73	128.00	2.30	3.80	4.71	17.88
Crites Seed Inc	Portage	standard	regular	May-18	Jul-12	56	1319	Alfa	0.20	0.48	1.16	2.18	3.74	4.08	3.80	3.54	120.25				
Gallatin Valley Seed Company	518	new	regular	May-18	Jul-13	56	1345	Alfa	0.12	0.24	1.10	0.92	0.68	3.59	3.80	1.53	94.00				
Crites Seed Inc	CS-476AF	new	regular	May-18	Jul-13	56	1345	Alfa	0.00	0.06	0.76	1.74	2.14	4.27	3.60	2.36	110.00	2.60	4.40	7.41	32.61
Seminis	LE55	standard	regular	May-18	Jul-14	57	1377	Normal	1.50	3.14	1.74	1.47	0.28	[illegible]	2.50	2.44	124.75	4.50	4.40	6.70	37.62
Seminis	SV7401OH	new	regular	May-18	Jul-14	57	1377	Normal	0.22	0.30	2.76	1.94	0.46	3.37	3.20	2.84	112.00	2.50	5.50	6.22	34.21
Storm Seeds	ASR 271	new	regular	May-18	Jul-15	58	1402	Alfa	0.20	0.38	1.32	1.24	0.44	3.37	3.40	1.79	97.00	3.00	5.80	6.23	36.15
Seminis	Reliance	standard	regular	May-18	Jul-15	58	1402	Alfa	0.12	0.38	1.70	2.38	1.32	3.79	3.20	2.65	110.25	2.10	4.20	6.00	25.19
Gallatin Valley Seed Company	389	new	regular	May-18	Jul-16	59	1428	Alfa	0.27	0.54	2.46	1.80	0.24	3.25	2.60	2.63	115.50	3.40	7.40	5.78	42.76
Seminis	DA1470	standard	regular	May-18	Jul-16	59	1428	Alfa	0.06	0.74	1.52	2.88	1.66	3.95	3.20	3.13	104.25	2.80	7.60	5.43	41.24
PureLine Seeds Inc	167	new	regular	May-18	Jul-17	60	1462	Alfa	0.18	0.60	1.56	1.52	0.18	3.23	3.00	2.02	112.75	4.10	8.40	7.50	63.00
Gallatin Valley Seed Company	828	new	regular	May-18	Jul-17	60	1462	Alfa	0.00	0.18	0.78	1.72	1.62	4.12	3.80	2.14	123.50	2.60	6.50	6.62	36.38
PureLine Seeds Inc	Nemella II	new	regular	May-18	Jul-17	60	1462	Alfa	0.00	0.10	0.74	2.10	3.90	4.43	3.60	3.42	110.50	2.80	6.00	6.10	30.48
Brotherton Seed	BSC 599	new	regular	Jun-4	Jul-27	53	1476	Alfa	0.06	0.60	0.44	1.70	1.78	3.98	4.10	3.99	128.50				
PureLine Seeds Inc	98-376	new	regular	May-18	Jul-18	61	1498	Alfa	0.20	0.50	2.26	0.60	0.02	2.93	2.80	1.78	116.00				
Crites Seed Inc	CS-464AF	new	regular	May-18	Jul-18	61	1488	Alfa	0.06	0.22	1.00	2.90	1.74	4.01	3.50	2.97	113.00	3.00	5.60	5.85	32.77
Gallatin Valley Seed Company	5802	new	regular	Jun-4	Jul-28	54	1504	Alfa	0.68	0.70	1.40	0.12	0.00	2.34	3.00	2.02	105.75				
Gallatin Valley Seed Company	8069	new	regular	Jun-4	Jul-28	54	1508	Alfa	0.10	0.28	1.64	0.84	0.10	3.13	unk	1.93	116.00				
Columbia Seeds	BL403	new	regular	May-18	Jul-19	62	1533	Normal	0.14	0.34	1.12	1.90	1.16	3.78	4.70	2.35	108.50				
Columbia Seeds	BL415	new	regular	May-18	Jul-19	62	1533	Normal	0.16	0.50	1.44	2.28	1.32	3.72	4.30	2.85	108.00	3.10	6.78	6.17	41.84
PureLine Seeds Inc	Dancer	new	regular	May-18	Jul-19	62	1533	Alfa	0.04	0.16	0.96	1.92	0.58	3.77	3.50	1.84	108.75	2.20	5.00	7.16	35.82
Seminis	SV3946OB	new	regular	May-18	Jul-19	62	1533	Normal	0.42	1.24	2.36	0.30	0.00	2.59	2.30	2.16	124.25	3.50	10.30	6.18	63.60
Crites Seed Inc	Ambassador	standard	regular	May-18	Jul-19	62	1533	Alfa	0.24	0.64	1.80	0.99	0.16	3.05	2.70	1.92	119.00	2.80	4.50	6.41	41.64
Storm Seeds	ASR 338	new	regular	May-18	Jul-20	63	1573	Alfa	1.18	1.52	0.98	0.00	0.00	1.85	3.40	2.58	123.00	4.40	10.20	6.43	65.58
Storm Seeds	ASR153	new	regular	May-18	Jul-20	63	1573	Normal	0.47	0.58	2.02	0.96	0.10	2.91	3.00	2.69	113.00	4.00	9.30	8.03	74.71
Brotherton Seed	Concept	standard	regular	May-18	Jul-20	63	1573	Alfa	0.14	0.28	1.10	2.34	2.06	4.00	3.70	2.95	120.25	3.40	6.90	5.45	37.63
Crites Seed Inc	CS 461AF	new	regular	May-18	Jul-20	63	1573	Alfa	0.54	0.82	1.82	1.19	0.08	2.88	2.40	3.12	117.25				
Brotherton Seed	BSC 494	new	regular	Jun-4	Jul-30	56	1576	Alfa	0.20	0.34	0.92	0.24	0.04	2.78	2.80	1.52	118.25				
Crites Seed Inc	Tyne	standard	regular	Jun-4	Jul-31	57	1610	Alfa	0.12	0.22	0.70	0.32	0.24	3.29	3.30	1.56	105.75				
PureLine Seeds Inc	98W-370	new	regular	May-18	Jul-21	64	1613	Normal	0.04	0.14	0.64	0.96	2.20	4.29	3.80	2.78	121.00	3.30	6.00	4.76	28.55
Columbia Seeds	Monarque	new	regular	Jun-4	Aug-1	58	1631	Alfa	0.18	0.34	1.16	1.14	0.72	3.53	4.30	3.10	108.75				
Syngenta	PN 063	new	regular	Jun-4	Aug-1	58	1637	Normal	0.14	0.28	0.82	0.10	0.00	2.66	#N/A	1.17	124.67				
Syngenta	PN 103	new	regular	Jun-4	Aug-1	58	1631	Normal	0.81	0.40	0.74	0.08	0.00	2.38	#N/A	1.35	104.00				
Storm Seeds	ASR 163	new	regular	May-18	Jul-22	65	1646	Alfa	0.08	0.12	1.02	0.52	0.46	3.54	3.40	2.56	103.50	3.20	7.70	6.79	52.32
Storm Seeds	ASR 511	new	regular	Jun-4	Aug-2	59	1663	Alfa	0.14	0.20	0.76	0.07	0.00	2.26	2.50	0.54	99.00				
Seminis	SV5485OG	new	regular	May-18	Jul-29	72	1851	Normal	0.00	0.02	0.34	0.34	0.84	4.34	3.40	1.44	111.50				

CUCUMBER DOWNY MILDEW FUNGICIDE EVALUATION TRIAL 2019

John O'Sullivan
Rene Van Acker
Rachel Riddle
Peter White

University of Guelph
Department of Plant Agriculture
Simcoe Research Station

Project Title: Cucumber Downy Mildew Fungicide Evaluation Trial 2019

Researcher: Dr. John O'Sullivan, Dept. of Plant Agriculture,
University of Guelph, Simcoe

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 2019. Cucumber cultivar 'Vlaspik' was seeded using a precision seeder on July 2 in rows 28 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 4 replications per treatment. 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 200 L/ha. There were a total of 13 treatments evaluated, including an untreated control (Table 1). Treatments were applied to plots on July 19, 25, and August 1.

Downy mildew visual ratings were made at weekly intervals starting on July 12th, however the disease never developed on any of the plots, not even a couple weeks after harvest was complete. Mature fruit were harvested by hand on August 14th, 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: Downy mildew did not appear at all at the location of the trials, not even weeks after harvest was complete. Consequently there were no downy mildew control ratings during the season on this trial. Final yield results reflect the absence of downy mildew. There were no significant differences between treatments. The treatments did not have a negative effect on yield in the absence of disease, which is expected.

Table 1: Treatment list description for cucumber downy mildew fungicide evaluations, Simcoe, ON, 2019.

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 alt. Bravo ZN	mandipropamid/oxthiapiprolin	Registered in Canada for use on cucumbers. Applied every other application alternated with Bravo
Allegro	fluazinam	Registered in Canada on beans, brassica crops, carrots & potatoes. Registered in U.S. on cucumbers
OxiDate	Hydrogen peroxide/peroxyacetic acid	Registered in Canada for use on cucumbers
Torrent alt. Diplomat + Phostrol	cyazofamid polyoxin d zinc salt phosphites	Applied every other application alternated with Diplomat + Phostrol. Non-conventional product registered in Canada on fruits and vegetables
Cueva	Copper octanoate	Registered in Canada for use on cucumbers

Table 2: Incidence of cucumber leaves with downy mildew symptoms and yield of cucumbers harvested from plots sprayed with different fungicides, Simcoe, ON, 2019.

Product**	Rate per Acre	% Downy Mildew Infection* July 19	July 25	August 1	August 8	Yield t/acre
Bravo ZN	1.9 L	0	0	0	0	9.0 a
Torrent + Sylgard	81 mL 0.1 % v/v	0	0	0	0	10.9 a
Zampro + Sylgard	400 mL 0.1 % v/v	0	0	0	0	14.0 a
Orondis Ultra alt. Bravo ZN	160 mL 1.9 L	0	0	0	0	9.3 a
Tattoo C	1.1 L	0	0	0	0	11.6 a
Allegro	460 mL	0	0	0	0	12.4 a
Allegro	715 mL	0	0	0	0	10.2 a
OxiDate Sylgard	0.4 % v/v 0.1 % v/v	0	0	0	0	10.4 a
OxiDate Sylgard	1.1 % v/v 0.1 % v/v	0	0	0	0	12.1 a
Torrent alt. Diplomat + Phostrol	81 mL 400 mL 1.2 L	0	0	0	0	12.5 a
Torrent alt. Diplomat	81 mL 400 mL	0	0	0	0	10.7 a
Cueva	1 % v/v	0	0	0	0	12.9 a
Untreated Control		0	0	0	0	13.0 a

Planting Date : July 2
Plant Population : 55,000 plants/Ac

Date of First Application : July 19
Harvest Date : August 14

* Based on % leaves infected

** First application was applied at the 2-4-leaf stage, subsequent applications were made on a 7-day spray interval, 3 applications total.

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

EXECUTIVE RESEARCH SUMMARY

WEED CONTROL IN PROCESSING CUCUMBERS (2019)

BY: DARREN ROBINSON, RIDGETOWN CAMPUS

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

The objective of this study was to determine the tolerance of cucumber to preemergence tank mixes of Sandea and Command at increasing rates of Sandea.

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 2019 (or in 2018). In 2019 – as 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. We hypothesize that the dry conditions after herbicide application in 2018 led to a lack of "activation" of the herbicides, compared with 2017 and 2019. In growers' fields were injury has been observed, anecdotal accounts typically relate to heavy rainfall events while cucumbers are emerging. This was particularly evident in 2019. 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.

In 2019, pethoxamid caused visual injury, and reduced plant stand and yield in cucumber. This was in contrast to what happened in 2018 - though pethoxamid injured cucumber, it did not reduce 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 a heavy (>2") rainfall event just as cucumbers were emerging in 2019, and cool, wet conditions at time of emergence in 2017. In 2018, rain did not fall for approximately 2 weeks after emergence. Zidua caused some injury in cucumber, though plant stand and yield were not significantly different than the untreated control. Prowl H20 and Shieldex caused less than 10% injury at twice the proposed label rate; stand and marketable yield were not reduced.

PROJECT TITLE: Weed Control Evaluations in Processing Cucumbers

RESEARCH SCIENTISTS: D. E. Robinson

RESEARCH INSTITUTION: Ridgetown Campus,
University of Guelph,
Ridgetown, Ontario
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SUMMARY OF BUDGETING EXPENDITURES:

Summer Student Salaries	$ 2,750.00
FUNDING REQUEST FROM OCRC	$ 2,750.00

OBJECTIVES:

1) To evaluate pethoxamid (CHA-2735), Shieldex, Zidua and Prowl H2O for tolerance in cucumbers. Pethoxamid and Zidua are new herbicides being developed for use in field crops in Canada, and there is no information on the tolerance of cucumber to this herbicide. These herbicides have activity on a number of important grass and broadleaf species commonly found in production areas, including crabgrass, eastern black nightshade, lambsquarters and pigweed.

EXPERIMENTAL PROCEDURES:

Research studies will be established at Ridgetown Campus and in growers' fields to ensure a particular weed species (e.g. proso millet) or to locate on a particular soil type (e.g. sandy loam). Research trials will be established as a randomized complete block design with four replications.

Herbicide treatments will be applied with a small plot sprayer (200 L/ha, 240 kPa). The data collected will include weed control ratings, crop injury ratings, and yield.

Results will be presented at the annual OPVG meeting, reported in their annual reports, reported to chemical company representatives and in the Research Report of the Expert Committee on Weeds.

ANTICIPATED BENEFITS TO THE INDUSTRY:

Weed control options for cucumbers are limited to Command, Dual II Magnum, Venture L and Poast Ultra. Cultivation and hand-weeding are expensive, and difficult to continue once vining begins. Prowl H2O is being evaluated as part of a federal minor use priority – these data will be used to support the submission. Pethoxamid, Shieldex and Zidua may have potential for use in vine crops, but nothing is known of cucumber tolerance to these herbicides.

WEED CONTROL IN PROCESSING CUCUMBERS

RESEARCH RESULTS – 2019

PREPARED BY DARREN ROBINSON,
RIDGETOWN CAMPUS

FOR THE ONTARIO CUCUMBER RESEARCH COMMITTEE

NOVEMBER 1, 2019

ACKNOWLEDGEMENTS

Purpose Of This Report

This report is provided to present results and conclusions from the 2019 processing cucumber weed control research control plots. The experiments outlined in this booklet are located at Ridgetown Campus. We appreciate the funding, cooperation and assistance provided by the Ontario cucumber research committee (cucumber growers and processing companies). As well, we would like to thank the chemical companies and their representatives, agextension personnel, and other research scientists for their ideas, plant material and herbicide samples that were used in these trials. Funding for the 2019 research program was provided by the Ontario Cucumber Research Committee & Ontario Food Processors Association, Agchemical Companies and the OMAFRA-UG Alliance.

Technical Assistants

Research Technician
David Bilyea

Research Assistants
Ryan Mallott

We trust that the information provided by this research will further the science of weed control by assisting with the registration of herbicides through the minor use system. We also hope this information will be of use in the extension of proper herbicide recommendations, thereby enabling growers to achieve consistent, broad spectrum weed control with a minimum of crop damage.

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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: June 3/19
Depth: 2 cm

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

Field Preparation: Trial fertilized with 19-19-19 at 600 kg/ha on June 2/19.

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	June 4
TIME OF DAY	8:00 AM
TIMING	PRE
AIR TEMP (c)	23
RH (%)	78
WIND SPEED (KPH)	8
SOIL TEMP (c)	26
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)		0B	0	0	1.1A	0.7A	10.1A
2. Check (WEEDY)		0B	0	0	0.5B	0.3B	4.2B
3. COMMAND	0.45 L/AC	0B	0	0	1.2A	0.8	10.0A
4. SANDEA	25 G/AC	0B	0	0	1.1A	0.7A	10.6A
5. SANDEA	37.5 G/AC	5B	2	0	1.0A	0.9A	10.6A
6. SANDEA	50 G/AC	9A	2	0	1.1A	0.7A	10.9A
7. COMMAND +	0.45 L/AC	3B	0	0	1.3A	0.9A	10.5A
SANDEA	25 G/AC						
8. COMMAND +	0.45 L/AC	8A	0	0	1.2A	0.8A	10.8A
SANDEA	37.5 G/AC						
9. COMMAND +	0.45 L/AC	11A	0	0	1.0A	0.8A	10.9A
SANDEA	50 G/AC						
LSD (P <0.05)		3	NS	NS	0.4	0.3	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	40B	41B	89A
4. SANDEA	25 G/AC	78A	75A	67B
5. SANDEA	37.5 G/AC	86A	77A	70B
6. SANDEA	50 G/AC	89A	83A	74B
7. COMMAND +	0.45 L/AC	87A	78A	91A
SANDEA	25 G/AC			
8. COMMAND +	0.45 L/AC	89A	85A	94A
SANDEA	37.5 G/AC			
9. COMMAND +	0.45 L/AC	90A	88A	97A
SANDEA	50 G/AC			
LSD (P <0.05)		14	17	12

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 2019 (or in 2018). In 2017 – and again in 2019, 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. We hypothesize that the dry conditions after herbicide application in 2018 led to a lack of "activation" of the herbicides, compared with 2017 and 2019. In growers' fields were injury has been observed, anecdotal accounts typically relate to heavy rainfall events while cucumbers are emerging. This was particularly evident in 2019. 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: June 3/19
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 June 2/19.

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	June 4
TIME OF DAY	9:00 AM
TIMING	PRE
AIR TEMP (c)	26
RH (%)	60
WIND SPEED (KPH)	8
SOIL TEMP (c)	26
CLOUD COVER (%)	50
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)		0C	0	0C	15A	29A
2. pethoxamid	1200 G/HA	3B	15B	12B	12A	23B
3. pethoxamid	2400 G/HA	8A	32A	26A	6B	15C
4. ZIDUA	47 G/AC	0C	3C	3C	14A	27AB
5. ZIDUA	94 G/AC	0C	12B	12B	10A	26AB
6. PROWL H20	0.96 L/AC	0C	0C	0C	14A	30A
7. PROWL H20	1.92 L/AC	0C	4C	3C	13A	29A
8. SHIELDEX	16.3 G/AC	0C	1C	0C	14A	31A
9. SHIELDEX	32.6 G/AC	0C	1C	0C	13A	29A
LSD (P <0.05)		2	4	5	4	5

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

Conclusions:

In 2019, pethoxamid caused visual injury, and reduced plant stand and yield in cucumber. 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 a heavy (>2") rainfall event just as cucumbers were emerging in 2019, and cool, wet conditions at time of emergence in 2017. In 2018, rain did not fall for approximately 2 weeks after emergence. Zidua caused some injury in cucumber, though plant stand and yield were not significantly different than the untreated control. Prowl H20 and Shieldex caused less than 10% injury at twice the proposed label rate; stand and marketable yield were not reduced.