Ontario Pest Management Conference 2019

17th Annual

IPM in Action – Success Stories

November 5, 2019

Victoria Park East Golf Course
1096 Victoria Road South
(1 km south of Stone Road E.)

Website: www.opmconference.ca

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CONFERENCE GOLD SUPPORTERS

CONFERENCE SILVER SUPPORTERS

Table of Contents

Table of Contents 3
Agenda 4
Invited Speaker Biographies 6
CropLife Student Competition Presentations and Judges 10
Regular Poster Presentations 11
Oral Presentation Abstracts 12
  Morning Session 12
  Afternoon Session 15
Poster Presentation Abstracts 19
  Student Competition 19
  Regular Posters 23
Evaluation Survey 24

OPMC Organizing Committee

Kristen Obeid, Chair - OPMC, Ontario Ministry of Agriculture, Food and Rural Affairs
Melanie Filotas, Ontario Ministry of Agriculture, Food and Rural Affairs
Roselyne Labbé, Agriculture and Agri-Food Canada, Harrow
Robert Nurse, Agriculture and Agri-Food Canada, Harrow
Cynthia Scott-Dupree, School of Environmental Sciences, University of Guelph
Sean Westerveld, Ontario Ministry of Agriculture, Food and Rural Affairs
Harold Wright, Syngenta Canada

AGENDA

8:30 a.m – 9:00 a.m **Registration and Coffee**
Poster Set Up

MORNING SESSION

Morning Session Chair: Terri Stewart, CropLife Canada

9:00 am **Welcome: Kristen Obeid**, Chair, Ontario Pest Management Conference
Opening Remarks and Introduction of Student Poster Presenters

9:10 am Enhancing uncultivated canal berms to support natural enemy populations at the Holland Marsh, ON. **Dillon Muldoon,** A. Stinson, M.R. McDonald and C. Scott-Dupree. (Student Competition)

9:25 am Glyphosate-resistant Canada fleabane (*Conyza canadensis* L. Cronq.) and giant ragweed (*Ambrosia trifida* L.) control in winter wheat with halauxifen-methyl applied POST. **Jessica Quinn,** J. Ashigh, D. Hooker, D. Robinson and P. Sikkema. (Student Competition)

9:40 am Effects of solarization, anaerobic soil disinfestation (ASD) and mustard biofumigation on ginseng replant disease. **Amy Fang Shi** and S. Westerveld. (Student Competition)

9:55 am IPM in Action 1:

The sterile onion fly success story

Anne Marie Fortier, PRISME and **Guillaume Cloutier**, Grower and Agronomist

10:25 am – 10:55 am Coffee Break and Poster Viewing

10:55 am IPM in Action 2:

Let them eat cake: How we successfully combatted the pepper weevil

Cara McCreary, OMAFRA and **Josiah Barkhouse**, Independent Consultant

11:25 am Timely solutions: Determining the most effective insecticide application timing to prevent carrot weevil (*Listronotus oregonensis*) damage. **Alexandra Stinson,** D. Muldoon, MR McDonald and C. Scott-Dupree. (Student Competition)

11:40 am Manage resistance now. **Terri Stewart,** CropLife Canada. (Invited Speaker)

12:00 pm - 1:00 pm Lunch and Poster Viewing

AFTERNOON SESSION

Afternoon Session Chair: Dr. Geneviève Marchand, Agriculture and Agri-Food Canada

1:00 pm Evaluation of acetolactate synthase inhibitors in *Chenopodium album* L. populations in Ontario. **Clement Mo,** F. Tardif, I. Rajcan and M. Cowbrough. (Student Competition)

1:15 pm Fungicide application timing for the control of Stemphylium leaf blight of onion. **Sara Stricker,** B. Gossen and M.R. McDonald. (Student Competition)

1:30 pm Revysol® – A new fungicide for horticulture crops and turf. **Anne McRae**, BASF Canada. (Industry Speaker)

1:45 pm Overview of the Canadian Plant Health Council. **Annette Anderson**, Ontario Ministry of Agriculture, Food and Rural Affairs. (Invited Speaker)

2:00 pm Three Minute Thesis Competition – Ontario Agriculture College Winners. **Alexandra Stinson, Hayley Tompkins** and **Cynthia Scott-Dupree**, University of Guelph. (Invited Speaker)

2:10 pm-2:40 pm Coffee Break and Poster Viewing

2:40 pm IPM in Action 3:

Data with decisions

Jennifer Thompson, Bonduelle and **Aaron Breimer**, Veritas Farm Business

3:10 pm IPM in Action 4:

Decades of IPM in the Holland Marsh: Changes and Challenges

Mary Ruth McDonald, University of Guelph and **Doug Van Luyk**, Holland Acres Inc.

3:40 pm IPM in Action 5:

Working together to provide scouting excellence in Ontarionursery production

Jennifer Llewellyn, OMAFRA and **Dan Vanderkruk**, AVK Nursery Holdings, Inc.

4:10 pm **Presentation of Student Competition Award Winners – Harold Wright**, CropLife Canada

Closing Remarks and Adjourn

INVITED SPEAKER BIOGRAPHIES

Anne-Marie Fortier – Entomologist, Phytodata Inc and PRISME

Anne-Marie is an entomologist at Phytodata research company since 2009. This company is a part of PRISME consortium, a group of growers and professionals whose mission is to develop, offer and promote solutions to improve the productivity of vegetable farms while reducing the environmental footprint of the sector. Anne-Marie is assistant scientific director and principal investigator in entomology, particularly on *Delia* flies in vegetable crops. She is also the lead coordinator for the production and release of sterile onion flies and responsible for developing the SIT to control the cabbage maggot.

Guillame Cloutier - Producer and Agronomist, Delfland, Inc

Guillaume is an agronomist and co-owner Delfland Inc. Delfland, a farm specialized in vegetable production for three generations, grows French shallots, yellow and red onions, Chinese radish, lettuce and carrots on 1000 acres of muck soils in Napierville, Montérégie. Sustainable agriculture is highly valued at Delfland and they attach great importance to biodiversity, soil conservation, integrated pest management, water management and equipment accuracy to minimize their ecological footprint. They collaborate with research centres, including Phytodata, universities, marketing partners, suppliers and customers, to conduct multiple research projects each year.

Cara McCreary – Greenhouse Vegetable IPM Specialist, Ontario Ministry of Agriculture, Food and Rural Affairs

Cara McCreary is the Greenhouse Vegetable IPM Specialist with OMAFRA and is working out of the Harrow Research Centre. Cara joined the ministry in January, 2015 from a position as a Research Associate in the Edible Bean Program at the University of Guelph Ridgetown Campus. Prior to joining the University of Guelph, Cara spent 6 months as the Acting Field Crop Entomologist in the Agriculture Development Branch. She also has several years of experience as a greenhouse scout and supervisor and as a horticultural advisor. Cara has a Master of Science in Environmental Biology from the University of Guelph, a Bachelor of Commerce in Business Administration from the University of Windsor and an Associate Diploma in Horticulture from the University of Guelph. During her Master's degree, she studied the life cycle, temperature-dependent development and economic impact of an agricultural pest, the bean leaf beetle. Pest management has been her focus and passion through both work experience and education.

Josiah Barkhouse – Independent Consultant, Cedarline Greenhouses

Josiah Barkhouse is an independent consultant for the greenhouse industry. With over 10 years of experience in the vegetable greenhouse industry, he has grown a wide range of crops, and dealt with many pests and disease infestations. In more recent years as a consultant he has specialized in developing systems, regarding labour management, growing strategizing, and improving irrigation methods in companies that are struggling to meet the fast pace changes of the industry. Josiah received a Bachelor of Applied Science in Horticulture Production from Olds College and a diploma from Niagara Colleges Greenhouse Technician Program. With his educational background, extensive experience and passion to see the industry succeed, he is able to look at problems as industry opportunities to unite and be over-comers!

Terri Stewart, Director of Science and Regulatory Affairs-Chemistry, CropLife Canada

Terri joined the CropLife Canada team as the Director of Science and Regulatory Affairs in March 2019, after working over 16 years with Health Canada's Pest Management Regulatory Agency (PMRA). During her time with PMRA, Terri worked in pre- and post-market regulation first as an evaluator and later as a senior science coordinator, which included leading joint reviews with international regulatory bodies. Terri's most recent role with the agency was developing and leading the Agricultural Stakeholder Engagement Unit, which gave her the opportunity to engage on current and emerging re-evaluation issues relevant to agriculture. Terri has a Masters of Science in environmental biology from the University of Guelph.

Annette Anderson, Director, Agriculture Development Branch, Ontario Ministry of Agriculture, Food and Rural Affairs

Annette has been with OMAFRA since 1987. She recently accepted the position of Director, Agriculture Development Branch in September 2018. The branch is involved in development and delivery of integrated pest management, applied research and technology transfer programs as well as provincial coordination of minor use/emergency use registrations and other plant health initiatives. Annette spent several years in the Deputy Minister's office as Executive Assistant and has held management positions in Greenhouse, Agroforestry and Specialty Crops, Business Management and Research and Innovation. Annette also has private sector experience working in the fertilizer and crop protection industry. Annette is a graduate of the University of Guelph and the Ivey Executive Program.

Hayley Tompkins, MSc Candidate, School of Environmental Science, University of Guelph

Hayley is a masters student in the Raine Lab at the University of Guelph. Her research, in collaboration with Wildlife Preservation Canada (WPC), focuses on the use of artificial nest boxes to study the nesting habits and colony development of wild bumble bees. Since 2016, Hayley has worked as a biologist for WPC's Native Pollinator Initiative and was selected as a LoyaltyOne Young Conservation Leader. She holds a Bachelor's degree in Geography with a minor in GIS and Environmental Analysis from the University of Guelph, and is a graduate of Seneca College's Environmental Technician – Sampling and Monitoring program. Hayley is a passionate field biologist and enjoys studying bumble bees and other pollinators.

Alexandra Stinson, MSc Candidate, School of Environmental Science, University of Guelph

Alexandra is a M.Sc. student in the School of Environmental Science, University of Guelph, Ontario, under the supervision of Dr. Cynthia Scott-Dupree and Dr. Mary Ruth McDonald. Previously, she received her B.Sc. in Environmental Science at the University of Guelph in 2016. Her current research is focused on improving various aspects of the integrated pest management program for both carrot weevil and carrot rust fly at the Holland Marsh. In 2017, she was awarded the Highly Qualified Personnel scholarship by the Ontario Agri-Food Innovation Alliance to fund her graduate degree. Alexandra has served as an Executive on both the SES and OAC Graduate Student Councils and hopes to someday use the skills she has learned during her graduate studies to help find sustainable solutions to local growers' pest problems.

Jennifer Thompson, Ingersoll Agriculture Manager, Bonduelle Americas Long Life - Canada

Jennifer has been employed at Bonduelle for the past sixteen years. Jennifer graduated from Ridgetown College (University of Guelph) with a diploma in Agriculture (2002) and received a designation as a Certified Crop Advisor (2009). Currently, she holds the role as the Ingersoll Plant Agriculture Manager & Agriculture Technical Programs Manager for the Bonduelle North America Group with a focus on programs associated with Agriculture including Sustainability, Integrated Pest Management and Crop Traceability with a passion for innovation and standardization. Jennifer has been involved with the Bonduelle group's Corporate Social Responsibility objectives both locally and Internationally. Jennifer has played an instrumental role in the development and direction of the Internal Bonduelle crop and field traceability program. This custom program allows for numerous key indications to be recorded by staff or growers, regarding the crops progress throughout the growing season, which provides Bonduelle with valuable records for traceability and Quality Assurance.

Aaron Breimer, Veritas Farm Business

Aaron Breimer defines what it means to be passionate about production agriculture. This love of agriculture started by growing up on a family cash crop farm in Middlesex County, followed by 4 years at the University of Guelph where he completed his B.Sc. (Agr.) degree in agronomy. Since his graduation in 2001, he has worked for 10 years in agriculture retail and the last 8 years with Veritas Farm Business Management. He is currently the general manager at Veritas which focuses on developing and measuring the effectiveness of precision ag solutions. Aaron continues to maintain his Certified Crop Advisor (CCA) designation since he obtained it in 2003 as well as being nominated as CCA of the year in 2018 and is a current member of the CCA board of directors. He also has his Professional Agrologist (P.Ag.) and is a graduate of the Advanced Ag Leadership Program (AALP).

Mary Ruth McDonald, Professor, Department of Plant Agriculture, University of Guelph and **Doug Van Luyk,** Grower, Holland Acres, Inc.

Dr. Mary Ruth McDonald is a professor in the Department of Plant Agriculture at the University of Guelph in Ontario. She is also a Research Program Coordinator at the university. Her research focuses on plant diseases and integrated pest management of vegetable crops, including Brassica vegetables, plus some field crops such as canola and pulse crops. Mary Ruth worked as a pest management scout in the Holland Marsh in the early days of the Muck Crops IPM program and was also the IPM Specialist for Muck Crops with OMAFRA for six years. She remains actively involved in the current IPM program in the Holland Marsh. Mary Ruth teaches a graduate course on plant disease epidemiology. She has published over 75 scientific papers including several on disease forecasting and pest management and has received national and international awards for excellence in research, extension and integrated pest management. Doug Van Luyk grows parsnips, carrots and onions on the Holland Marsh. He collaborates with Mary Ruth in the Muck Crops IPM program.

Jennifer Llewellyn, Nursery and Landscape Specialist, Ontario Ministry of Agriculture, Food and Rural Affairs

Jen is the Provincial Nursery and Landscape Specialist with OMAFRA and has been since 1999. She holds a B.Sc. and M.Sc. in Horticulture from the University of Guelph. She is also a Certified Arborist. Jen has the privilege of working closely with the nursery, landscape and arboriculture sectors to troubleshoot all kinds of issues regarding the production and maintenance of woody and herbaceous ornamental plants. She writes for several industry publications and is well known for her column, What's Bugging Your Trees? in the Ontario Arborist as well as her blog: ONnurserycrops. She is also co-author of "BugFinder", the ultimate scouting app for nursery and landscape. Jen also lectures and delivers plant health workshops across the province.

Dan Vanderkruk, General Manager, AVK Nursery Holdings

Dan grew up in a wholesale nursery and is a third-generation nurseryman. He is currently the general manager of AVK Nursery Holdings; which is a company that ships plants to Garden Centres and Landscapers from as far as Newfoundland, Edmonton and parts of the Northern USA. Shipping plants across provincial and federal borders, as well as to high end retail stores has taught Dan that plants need to be clean of both insects and pathogens. With the demand of an ever growing and expanding retail client, Dan has learned to grow plants within the regulations of the CFIA. He and his team have relied on good scouting practices and have learned and continue to learn how to grow cultivars with strategically applied pesticides and fungicides. Dan's passion is to supply people with the right plant for the right location. Seeing people succeed with the specimens they have chosen is very satisfying to him.

–CROPLIFE STUDENT COMPETITION–

Student Oral Presentations:

OP-1 Enhancing uncultivated canal berms to support natural enemy populations at the Holland Marsh, ON. **Dillon Muldoon,** A. Stinson, M.R. McDonald and C. Scott-Dupree. **(Presentation Time: 9:10-9:25 am)**

OP-2 Glyphosate-resistant Canada fleabane (*Conyza canadensis* L. Cronq.) and giant ragweed (*Ambrosia trifida* L.) control in winter wheat with halauxifen-methyl applied POST. **Jessica Quinn,** J. Ashigh, D. Hooker, D. Robinson and P. Sikkema. **(Presentation Time: 9:25-9:40 am)**

OP-3 Effects of solarization, anaerobic soil disinfestation (ASD) and mustard biofumigation on ginseng replant disease. **Amy Fang Shi** and S. Westerveld. **(Presentation Time: 9:40-9:55 am)**

OP-4 Timely solutions: Determining the most effective insecticide application timing to prevent carrot weevil (*Listronotus oregonensis*) damage. **Alexandra Stinson,** D. Muldoon, M.R. McDonald and C. Scott-Dupree. **(Presentation Time: 11:25-11:40 am)**

OP-5 Evaluation of acetolactate synthase inhibitors in *Chenopodium album* L. populations in Ontario. **Clement Mo,** F. Tardif, I. Rajcan and M. Cowbrough. **(Presentation Time: 1:00-1:15 am)**

OP-6 Fungicide application timing for the control of Stemphylium leaf blight of onion. **Sara Stricker,** B. Gossen and M.R. McDonald. **(Presentation Time: 1:15-1:30 pm)**

Judges: Sean Westerveld - OMAFRA and Roselynne Labbé - AAFC (Judging Supervisors)

1. Erica Pate – OMAFRA
2. John Purdy – Abacus Consulting Services Limited
3. Hannah Fraser – OMAFRA
4. Scott Hodgins – BASF

-Student Poster Presentations-

GP-1 Fumigant toxicity of allyl isothiocyanate on eggs and adults of the spotted wing Drosophila (*Drosophila suzukii)*: an environmentally sustainable alternative to methyl bromide for post-harvest fumigation. **Ayesha Jabeen**, LT Lim and C. Scott-Dupree. **(Time of judging 1:30-1:45 pm**).

GP-2 Susceptibility of the swede midge parasitoid, Synopeas myles (Hymenoptera: Platygastridae) to foliar applied insecticides. **Carol McLennan**, A. Gradish and R. Hallett. **(Time of judging 9:10 -9:25 am)**

GP-3 Physiological host range assessment of *Trissolcus japonicus*, a parasitoid of brown marmorated stink bug, and a survey for its presence in southern Ontario. **Caitlin MacDonald**, T. Gariepy, H. Fraser, and C. Scott-Dupree. **(Time of judging 11:40-11:55 am)**

GP-4 Improved traps for detection and monitoring of pepper weevil (*Anthonomus eugenii*). **Cassie Russell** and R. Hallett. **(Time of judging 1:00-1:15 pm)**

GP-5 Effect of hexanal on host recognition and oviposition behaviour of spotted wing drosophila (*Drosophila suzukii* (Matsumura)). **Laxmi Khadka**, G. Paliyath and C. Scott-Dupree. **(Time of judging 9:40-9:55 am)**

GP-6 Visual assessment of peach and hazelnut injury caused by *Halyomorpha halys*. **Jared Harris**, H. Fraser and C. Scott-Dupree. **(Time of judging 11:25 –11:40 am)**

GP-7 Developing a bioassay to find resistance to purple spot in asparagus. **George Austin,** D. Wolyn and M.R. McDonald. **(Time of judging 9:25-9:40 am)**

GP-8 Establishment of the pesticide resistance monitoring tool for the two-spotted spider mite, *Tetranychus urticae*. **Hannah Varonina,** J. Spenler, V. Zhurov and V. Grbic. **(Time of judging 1:15 -1:30 pm)**

**** Judging time - Students should be present at their poster at the time indicated.***

Judges: Sean Westerveld - OMAFRA and Roselynne Labbé - AAFC (Judging Supervisors)

1. Travis Cranmer - OMAFRA
2. Ashley Dickson – Syngenta Canada
3. Ian Scott – AAFC
4. Amanda Tracey – OMAFRA

-REGULAR POSTER PRESENTATIONS-

RP-1 Identification of novel RNAi targets to control brown marmorated stink bug (*Halyomorpha halys*) using proteomics. A. Sébastien, L. Foster, N. Stoynov and **Cynthia Scott-Dupree.**

RP-2 Development of regional management strategies and decision making tools for control of Colorado potato beetle (CPB). **Sophie Krowlikowski,** I. Scott, P. MacKinley, S. Hann and C. Moffat.

ORAL PRESENTATION ABSTRACTS
MORNING SESSION

CROPLIFE STUDENT COMPETITION (OP-1):

Enhancing uncultivated canal berms to support natural enemy populations at the Holland Marsh, ON

Dillon Muldoon[1], A. Stinson[1], M.R. McDonald[2] and C. Scott-Dupree[1]
[1]School of Environmental Sciences, University of Guelph, Guelph, ON
[2]Department of Plant Agriculture, University of Guelph, Guelph, ON

The Holland Marsh (HM), Ontario, is an agroecosystem with a primary focus on carrot and onion production. Sales of vegetable crops from the HM total over $1 billion CDN annually. This intensively cultivated agroecosystem contains negligible uncultivated habitat to support natural enemies of insect pests. Recent upgrades to the HM drainage system have provided an opportunity to investigate how enhancements to the uncultivated canal berms can affect natural enemy populations. Five berm plots were established at the HM, each with three treatments: (1) non-managed control – grasses that were planted on the berms after construction to reduce erosion; (2) managed floral enhancement - a pollinator seed mix that included clover, timothy, birdsfoot trefoil, common tansy, and butterfly milkweed; and (3) managed floral and shrub enhancement – combination of the pollinator seed mix, butterfly milkweed, and two herbaceous shrubs species, red currant and haskap. Active and passive trapping was used to determine the abundance and diversity of natural enemies and insect pests on the berm plots throughout the growing season. Natural enemy abundance was higher in the managed enhancement treatments, and therefore, berm enhancements may promote biological control of insect pests in the HM by supporting natural enemy populations. Insect pest abundance on the berm plots was similar to nearby fields, indicating that the enhancements do not provide a refuge for pests. The results can be used to develop best-management practices for the utilization and restoration of uncultivated canal berms at the HM to ensure the long-term sustainability of this unique agroecosystem.

CROPLIFE STUDENT COMPETITION (OP-2):

Glyphosate-resistant Canada fleabane (*Conyza canadensis* L. Cronq.) and giant ragweed (*Ambrosia trifida* L.) control in winter wheat with halauxifen-methyl applied POST

Jessica Quinn[1], J. Ashigh[2], D. Hooker[1], D. Robinson[1] and P. Sikkema[1]
[1]Department of Plant Agriculture, University of Guelph, Ridgetown, ON
[2]Corteva Agriscience, London, ON

Canada fleabane is a competitive summer or winter annual weed that produces small seeds capable of travelling more than 500 km via wind. Giant ragweed is a large summer annual weed that is highly competitive. Giant ragweed plants can be found in varying environments, reaching heights of 6 m when competing with surrounding plants. Populations of glyphosate-resistant Canada fleabane and glyphosate-resistant giant ragweed can be found across the United States and Canada, posing significant challenges to wheat production. Halauxifen-methyl is a new selective broadleaf herbicide for use as a preplant burndown in corn and soybean, and postemergence in cereal crops. A total of 12 field experiments were conducted to determine the efficacy of halauxifen-methyl applied POST, alone and in a tank-mix, for the control of GR Canada fleabane and giant ragweed in wheat. Experiments were conducted in 2018 and 2019 at 9 locations across southwestern Ontario with confirmed populations of GR Canada fleabane and giant ragweed. At 8 weeks after application (WAA), halauxifen-methyl, fluroxypyr/halauxifen, fluroxypyr/halauxifen + MCPA EHE, fluroxypyr + MCPA ester, 2,4-D ester, clopyralid, and pyrasilfotole/bromoxynil + AMS controlled GR Canada

fleabane 92, 96, 96, 93, 96, 96, and 96%, respectively. At 8 WAA, fluroxypyr, fluroxypyr/halauxifen, fluroxypyr/halauxifen + MCPA EHE, fluroxypyr + MCPA ester, fluroxypyr/halauxifen + MCPA EHE + pyroxsulam, 2,4-D ester, clopyralid, and thifensulfuron/tribenuron + fluroxypyr + MCPA ester controlled GR giant ragweed 86, 88, 90, 94, 96, 96, 98, and 93%, respectively. Halauxifen-methyl applied alone did not control GR giant ragweed equivalent to the weed-free check.

CROPLIFE STUDENT COMPETITION (OP-3):

Effects of Solarization, Anaerobic Soil Disinfestation (ASD) and Mustard Biofumigation on Ginseng Replant Disease

Amy Fang Shi[1] and S. Westerveld[2]
[1]School of Environmental Sciences, University of Guelph, Guelph ON and Ontario Ginseng Growers Association, Simcoe ON
[2]Ontario Ministry of Agriculture, Food and Rural Affairs, Simcoe ON

Ginseng replant disease threatens the survival of the industry. As a result, ginseng cannot be grown on the same land twice without considerable crop losses. To assess the effects of various soil treatments on replant disease, a research trial was established in Ontario in 2016. The site was seeded eight years after a previous ginseng crop had been harvested. The trial was arranged in a split-block design with fumigant (metam-sodium) as the main-plot and treatment as the sub-plot with four replications. The treatments included solarization, ASD (orchard grass), ASD (molasses), ASD (orchard grass + molasses), mustard seed meal (*Brassica juncea* + *Sinapis alba*) (6.7 ton/ha), mustard seed meal (3.35 ton/ha), mustard cover crop (*B. juncea* + *S. alba*) and untarped control. Plant stands were recorded during each growing season from 2017 to 2019. Roots from each experimental unit were assessed at the end of each growing season. Fumigated treatments had much higher yield than unfumigated treatments. The results suggest that fumigation does have a positive impact on controlling ginseng replant disease. When analyzing fumigated and unfumigated treatments together, the mustard cover crop treatment had the highest total and marketable yield. When comparing them separately, marketable yield did not differ among the unfumigated treatments due to high disease severity and variability. Mustard biofumigation and conventional fumigation with metam-sodium showed the best results on controlling replant disease. Based on previous research, the success of this combination of treatments may be due to different breakdown products having varying impacts on soil microbial populations.

IPM IN ACTION 1:

The sterile onion fly success story

Anne-Marie Fortier[1] and **Guillaume Cloutier[2]**
[1]Phytodata Inc. and Productions en Régie Intégrée du Sud de Montréal enr. (PRISME), Sherrington, QC
[2]Delfland Inc., Napierville, QC

The onion maggot, *Delia antiqua*, is an important pest of onion in Quebec and Ontario. For several years, the control of this insect has relied mainly on the use of chlorpyrifos, identified as a major contaminant of surface water in vegetable production areas of Quebec. This active ingredient is now regulated in Quebec and Health Canada has proposed cancellation of almost all agricultural uses. The sterile insect technique (SIT) consists in 1) producing a large amount of the target insect, 2) sterilizing the insects, and 3) releasing them in crop fields to be protected. The mating of wild and sterile flies results in sterile eggs unable to produce larvae, thus reducing pest populations without using pesticides. This SIT initiative is aimed to provide growers with an alternative method to maintain onion yields while eliminating preventive (chlorpyrifos) and unnecessary foliar pesticide applications.

Keeping natural populations at a minimum level within a region both significantly reduces the impact of the target pest and decreases the on-farm costs associated with the use of sterile flies within a few years of use.

IPM IN ACTION 2:

Let them eat cake: How we successfully combatted the pepper weevil

Cara McCreary[1] and **Josiah Barkhouse**[2]
[1]OMAFRA, Harrow, ON
[2]Cedarline Greenhouses, Dresden, ON

The pepper weevil, *Anthonomus eugenii*, is a serious and economically damaging pest of pepper crops in North America. Due to its cryptic biology, it can be incredibly difficult to detect early on and manage effectively using conventional methods. As a relatively recent arrival in Ontario, there are currently no commercially available biological control agents and only a few registered insecticides providing suppression of adults. Therefore, exponential population growth during hot summers and a lack of effective tools, can quickly render it unmanageable.We will discuss the current available integrated pest management strategies for greenhouse pepper producers and demonstrate how Cedarline Greenhouses went above and beyond in their efforts and successfully got ahead of the pepper weevil.

CROPLIFE STUDENT COMPETITION (OP-4):

Timely solutions: Determining the most effective insecticide application timing to prevent carrot weevil (*Listronotus oregonensis*) damage.

Alexandra Stinson[1], D. Muldoon [1], M.R. McDonald[2] and C. Scott-Dupree[1]
[1]School of Environmental Sciences, University of Guelph, Guelph, ON
[2]Department of Plant Agriculture, University of Guelph, Guelph, ON

Carrot weevil (CW, *Listronotus oregonensis*) causes direct damage to carrots grown at the Holland Marsh (HM), ON, resulting in yield losses of up to 40%. There is an integrated pest management program in place, but CW damage has increased, likely due to two factors: an increase in CW resistance to phosmet, the primary insecticide used by HM carrot growers for CW control, and changes in CW behavior. Carrot weevils are emerging earlier in the spring and there is very likely a second generation in the fall. In 2014, a new insecticidal active ingredient, novaluron, was registered for use on carrots and has been shown to be more effective at preventing CW damage than phosmet. The most effective application timing schedule of novaluron needs to be determined for CW management. In 2018 and 2019, insecticide-timing trials at the University of Guelph Muck Crops Research Station were conducted, taking into consideration the earlier seasonal activity of CW. Applying novaluron at least twice over the growing season, starting at the 2nd true leaf stage (TLS) of carrots, and again at either the 4th or 6th TLS, resulted in significantly less CW damage and higher carrot yields at harvest. Overall, this research will benefit growers by providing recommendations for the optimal timing of novaluron to effectively minimize damage caused by the CW, while preventing over-application, increasing environmental sustainability, and reducing insecticide input costs.

INVITED SPEAKER:

Manage resistance now

Terri Stewart
CropLife Canada, Ottawa, ON

Crop protection products are vital tools used by growers to protect their crops. While crop protection products have allowed growers to effectively and economically control weeds, insects and diseases, certain patterns of use have rendered these products less effective. CropLife Canada recognizes the importance of ensuring that existing crop protection technologies are viable long into the future. For this reason, CropLife Canada has launched Manage Resistance Now (ManageResistanceNow.ca), a new online resource to help increase awareness of pest resistance issues in Canada. The goal of Manage Resistance Now is to increase awareness of pest resistance in Canada through delivering reliable, consistent messaging that features chemical, biological, mechanical and cultural best practices.

AFTERNOON SESSION

CROPLIFE STUDENT COMPETITION (OP-5):

Evaluation of acetolactate synthase inhibitors in *Chenopodium album* L. populations in Ontario

Clement Mo[1], F. Tardif [1], I. Rajcan[1] and M. Cowbrough[2]
[1]Department of Plant Agriculture, University of Guelph, Guelph, ON
[2]Ontario Ministry of Agriculture, Food and Rural Affairs, Guelph, ON

Common lamb's-quarters (*Chenopodium album* L.) is an annual dicot plant that is highly adaptable and competitive with major global crops. Left uncontrolled, common lamb's-quarters can cause a 55-95% and 60-75% yield loss in Ontario corn and soybeans, respectively. Long seed dormancy and high fecundity make this species persistent and hard to manage. Historical uses of acetolactate synthase (ALS) inhibitors, a group of herbicides that inhibit branched-chain amino acid production, were efficacious in common lamb's-quarters control. However, common lamb's-quarters was documented to be resistant to two subclasses of ALS inhibitors in Canada. Differential response to the ALS herbicide subgroups were examined in this study. Four post-emergent ALS inhibitor classes were evaluated against two susceptible and two resistant biotypes of common lamb's-quarters at different biologically active rates. Above ground biomass was collected and dry weight was plotted to determine GR_{50} values. Resistant biotypes displayed anywhere from 2 to 20 fold resistance to the ALS inhibitors used, suggesting cross-resistance between four of the five subclasses of this herbicide group, two more than previously documented. Thiencarbazone-methyl; a newer molecule, was more effective at controlling common lamb's-quarters populations than historically used ALS inhibitors. Pyrithiobac-sodium, currently not registered in Eastern Canada, also displayed control at doses much lower than field rate. The results suggest that an underlying mechanism or mutation is responsible for the rapid development of acetolactate synthase resistance in Ontario populations of common lamb's-quarters.

CROPLIFE STUDENT COMPETITION (OP-6):

Fungicide application timing for the control of Stemphylium leaf blight of onion

Sara Stricker[1], B. Gossen[2] and M.R. McDonald[1]
[1]Department of Plant Agriculture, University of Guelph, Guelph, ON
[2]Agriculture and Agri-Food Canada, Saskatoon, SK

Stemphylium leaf blight of onion, caused by *Stemphylium vesicarium*, can cause severe defoliation and lead to small, unmarketable bulbs. Growers typically use calendar-based schedules to apply fungicides, which do not depend on weather conditions or pathogen biology. This can result in more applications than necessary, which increases both input costs and the risk of fungicide insensitivity. A field trial of onion cv. LaSalle was established on high organic soil at the Muck Crops Research Station, King, Ontario, to evaluate the efficacy of fungicide-timing treatments compared to a non-treated check in 2018 and 2019. The treatments included two fungicide seed treatments (Evergol Prime [penflufen] or FarMore F300 [azoxystrobin, mefenoxam, and fludioxonil]) followed by foliar sprays every 7–10 days, weekly foliar sprays every 7–10 days, and two forecasting models (slightly modified versions of TOMcast or BSPcast). The weekly schedules resulted in seven applications of fungicides in both years. Disease pressure was high in 2018, and low in 2019. The TOMcast forecasting models recommended five (2018) or six (2019) applications and BSPcast recommended six (2018) or five (2019) applications. The forecasting model treatments resulted in comparable disease as the weekly calendar sprays and used less fungicide product. Weekly foliar applications did not suppress blight incidence or severity in both years, but the penflufen seed treatment with weekly foliar applications reduced disease symptoms by 53% (2018) and 42% (2019) relative to the non-treated control. The penflufen seed treatment also reduced incidence of onion smut, caused by *Urocystis cepulae*, by 97% in 2019.

INDUSTRY PRESENTATION:

Revysol® - A new fungicide for horticulture crops and turf

Anne McCrae
BASF Canada, Elmira ON

Revysol® (mefentrifluconazole) fungicide is an innovative active ingredient for crop protection that was discovered and developed by BASF. Revysol belongs to the group of the sterol biosynthesis inhibitors (SBI); within the SBIs, it belongs to the sub-group of demethylation inhibitors (DMI) and the chemical group of triazoles. Revysol is a unique fungicide amongst the triazole group and is the first Isopropanol-Azole. Its chemical characteristics allow for rapid uptake and steady translocation through the plant. The molecular shape binds strongly to the target enzyme for effective disease control. Revysol is highly effective against key fungal diseases in specialty crops including apple, grape, and turf. In research trials conducted across North America, Revysol was highly effective against apple scab in pome fruit, powdery mildew in grape, and a variety of diseases in turf. Revysol is not registered by the Pest Management Regulatory Agency (PMRA) but is currently being assessed for registration under the *Pest Control Products Act*.

INVITED SPEAKER:

Overview of the Canadian Plant Health Council

Annette Anderson
Ontario Ministry of Agriculture, Food and Rural Affairs, Guelph, ON

The Canadian Plant Health Council was implemented in October 2018 to collaboratively implement the Plant and Animal Health Strategy for Canada. Collaboration between Canadian governments, industry, academia and other partners in plant health is essential to protect our resources from new and emerging risks, drive innovation and ensure that the Canadian industry remains competitive and sustainable. This presentation will provide an overview of the Canadian Plant Health Council, their mandate and current priorities as well as an update on plant health initiatives underway in Ontario.

INVITED SPEAKER:

Three Minute Thesis Competition – Ontario Agriculture College Finalists

Alexandra Stinson, Hayley Tompkins and **Cynthia Scott-Dupree**
School of Environmental Sciences, University of Guelph, Guelph, ON

The Three Minute Thesis (3MT®) competition challenges graduate students at Canadian universities to present their complex research in an engaging and accessible fashion. Participants must present their research in 3 minutes in a form that can be understood by audiences with no background in the subject area. Dr. Cynthia Scott-Dupree will introduce the 2019 3MT finalists from the Ontario Agricultural College - Alexandra Stinson, presenting “Do you carrot-all about combatting resistance?” and Haley Tompkins, presenting “Building the buzz: Artificial nest boxes as a conservation and monitoring tool for bumble bees”.

IPM IN ACTION 3:

Data with decisions

Jennifer Thompson[1] and **Aaron Brimer**[2]
[1]Bonduelle, Ingersoll, ON
[2]Veritas Farm Business, Chatham, ON

Collaboratively Bonduelle Americas has been working with Veritas Farm Management to create a very specific tool set for application of precision field management in Processing Vegetable Crops. This specific project outlines the successes and challenges that Bonduelle and Veritas have seen while using Machine Learning from Green Eye Technology to enhance crop and field management strategies. Machine learning has been applied in different crop scenarios at a testing level to identify pre-harvest field quality issues and allow field staff time to react and work with growers to solve field issues. The Green Eye Technology uses specific data algorithms to identify and reference specific findings in each field that drone imagery data has been collected on. Since the start of this project in 2018 which is now expanded across all 12 Bonduelle North America plants field staff are learning how to make data-based decisions on crops in season. Jennifer and Aaron will discuss how this current project has impact on crop decisions and the next steps to move this into part of the full crop management strategy.

IPM IN ACTION 4:

Decades of IPM in the Holland Marsh: Changes and Challenges

Mary Ruth McDonald[1] and **Doug Van Luyk**[2]
[1]Department of Plant Agriculture, University of Guelph, Guelph, ON
[2]Holland Acres Inc, King, ON

The integrated pest management (IPM) program for vegetable crops in the Holland Marsh began as a pilot project of the University of Guelph in 1980 and has been operating in various forms since then. Onions and carrots are the major crops, but lettuce and celery, and sometimes Brassica vegetables and potatoes, are also included. The major insect pests and diseases are monitored and forecasted to inform growers of the risk and if control measures are recommended. Fields are 'scouted' twice a week. Growers get individual information and summaries are posted on the web. Onion maggot flies, and the diseases botrytis leaf blight and onion downy mildew, were the main concerns of onions, and monitoring for onion thrips has been added. Carrot weevil, carrot rust fly, and carrot leaf blights continue to be the main problems on carrots. Botrytis leaf blight of onion has been supplanted by Stemphylium leaf blight, which is proving very challenging to control. Recent additions are risk assessments for onion white rot and white mold (*Sclerotinia*) of carrots. The IPM program reduces unnecessary pesticide sprays every year. In combination with effective crop protection materials, IPM has reduced crop losses, especially losses due to onion downy mildew and botrytis leaf blight, and reduced populations of onion flies. In carrots, carrot rust fly populations appear to be declining while carrot weevil is more damaging, probably because a late summer second generation has developed. Pesticide insensitivity is a continuing concern that is addressed by IPM, but effective alternatives are needed.

IPM IN ACTION 5:

Working together to provide scouting excellence in Ontario nursery production

Jennifer Llewellyn[1] and **Dan Vanderkruk**[2]
[1]OMAFRA, Guelph, ON
[2]AVK Nursery Holdings, Cambridge, ON

Ontario nursery growers produce a diverse set of plant species with a correspondingly diverse set of plant health and cultural problems. Most nursery growers rely on the OMAFRA ONnurserycrops blog for information on monitoring and IPM. Some employ a crop scout in a part-time capacity on the farm. The Nursery Scout position is a new IPM support role to help Ontario nursery growers improve their management of plant health and physiological problems with a focus on effective monitoring and communication to the grower. Supervised and trained by OMAFRA Nursery and Landscape Specialist, the Nursery Scout is a trained biologist who shares identification, monitoring skills and observations with nursery clients via custom reports and communication. The larger nursery and landscape sector also benefits as the monitoring observations are shared with the OMAFRA ONnurserycrops blog. Participating growers received custom weekly/bi-weekly reports indicating what crop issues were detected at their nurseries and management recommendations provided by the OMAFRA Nursery and Landscape Specialist. Participating nurseries also received one-on-one consultation from the Nursery Scout during each visit to problem-solve, learn about pest id and detection methods. The desired impact of the Nursery Scout position is to create a steady flow of technical information between the scout, growers, OMAFRA and the University of Guelph.

POSTER PRESENTATION ABSTRACTS

STUDENT POSTER COMPETITION

GP-1:

Fumigant toxicity of allyl isothiocyanate on eggs and adults of the spotted wing Drosophila (*Drosophila suzukii)*: an environmentally sustainable alternative to methyl bromide for post-harvest fumigation

Ayesha Jabeen[1], L. Lim[2] and C. Scott-Dupree[1]
[1] School of Environmental Sciences, University of Guelph, Guelph, ON
[2] Food Science, University of Guelph, Guelph, ON

Spotted wing Drosophila (SWD) (*Drosophila suzukii*) is an invasive vinegar fly, native to southeast Asia. It was first detected in Ontario in 2010 and is also present in British Columbia, Alberta, Manitoba, and Quebec, and many other parts of the world. It causes extensive economic damage to tender fruit and soft-skinned berries. Unlike other drosophilids, SWD attacks ripening fruit and oviposits on healthy fruits, reducing yield and market value. To eliminate SWD in fruit post-harvest, pre-shipment fumigation is required. Previously, methyl bromide was the fumigant used for this purpose in many countries, but it is being phased out because of ozone depletion properties and high toxicity. Alternative fumigants for pre-shipment or during-shipment (i.e., active packaging) purposes are needed by the industry. The goal of this study was to evaluate the toxicity of allyl isothiocyanate (AITC), a plant derived volatile compound, to SWD eggs and adults when exposed through fumigation. One hundred percent mortality (100%) of adults and eggs was recorded following exposure (fumigation) to AITC for 24-h at concentration of 0.10µl/L and 0.50µl/L air respectively. Thus, our findings suggest that AITC is an environmentally sustainable fumigant for SWD that should be considered for post-harvest use in pre-shipment or during-shipment application, eliminating the dependence on methyl bromide.

GP-2:

Susceptibility of the swede midge parasitoid, *Synopeas myles* (Hymenoptera: Platygastridae) to foliar applied insecticides

Carol McLennan, A. Gradish and R. Hallett
School of Environmental Sciences, University of Guelph, Guelph, ON

Swede midge *Contarinia nasturtii* (Keiffer) (Diptera: Cecidomyiidae) is a major pest to cruciferous vegetable and canola production in North America. Native to Eurasia, the swede midge is now distributed from the east coast of North America to Minnesota. In 2016 a swede midge parasitoid, *Synopeas myles* (Walker) *(*Hymenoptera: Platygastridae*)*, was discovered in Ontario. Establishment of this natural enemy, also native to Europe, has developed an interest in conservation biological control efforts. Foliar insecticides containing the active ingredients chlorantraniliprole and lambda-cyhalothrin and spirotetramat are currently registered in Canada for swede midge management in canola. Determining susceptibility of *Synopeas myles* to these insecticides is important for determining the compatibility of insecticide use and conservation biological control.

GP-3:

Physiological host range assessment of *Trissolcus japonicus*, a parasitoid of brown marmorated stink bug, and a survey for its presence in southern Ontario

Caitlin MacDonald[1], T. Gariepy[2], H. Fraser[3], and C. Scott-Dupree[1]
[1]School of Environmental Sciences, University of Guelph, Guelph, ON
[2]Agriculture and Agri-Food Canada, London Research and Development Centre, London, ON
[3]Ontario Ministry of Agriculture, Food and Rural Affairs, Guelph, ON

The samurai wasp, *Trissolcus japonicus*, is known to attack the eggs of *Halyomorpha halys*, the brown marmorated stink bug (BMSB) in Asia. Brown marmorated stink bug is an invasive agricultural pest in North America and poses a significant threat to the agri-food industry in Ontario. It attacks over 35 fruit and vegetable crops including peaches, pears, apples, grapes, and soybeans, inflicting economic damage which renders the crop unmarketable. Currently in Canada, there are no effective insecticides for this pest, therefore alternative control tactics are being investigated. The parasitoid, *T. japonicus,* is being considered as a candidate biological control agent for BMSB in Ontario. Prior to the release of *T. japonicus* for BMSB in Ontario, the potential impact of this parasitoid on native stink bugs must be explored. In order to complete this *T. japonicus'* ability to parasitize and develop on 9 native stink bugs is being tested in order to assess its physiological host range. Native stink bugs being tested include *Chinavia hilare, Euschistus variolarius, Euschistus tristigmus, Banasa dimidate, Thyanta pallidovirens, Cosmopepla biomaculata, Podisus maculiventris, Holcosethus limbolaris,* and *Brochymena quadripustulata.* In addition, the current distribution of *T. japonicus* in Ontario is being explored following its recent discovery in several states in the northeastern USA; preliminary data suggests it may already be present in Southern Ontario.

GP-4:

Improved traps for detection and monitoring of pepper weevil (*Anthonomus eugenii*)

Cassandra Russell and R. Hallett
School of Environmental Sciences, University of Guelph, Guelph, ON

The pepper weevil (PW, *Anthonomus eugenii*) is a significant pest of field and greenhouse peppers in southwestern Ontario. Currently, pheromone lures paired with sticky cards are used to monitor PW; however, this method often fails to detect PW before economic damage to the crop occurs, partially because PW can escape from the sticky cards. As the current action threshold is one PW/sticky card, traps require a high retention rate to ensure pioneer PW are being detected immediately. To improve the detection and monitoring of PW, we assessed current sticky cards and other commercially available traps for their ability to retain PW. In preliminary experiments, we confirmed that PW are able to escape from currently used yellow sticky traps, and we quantified their escape rate and distance travelled on the cards. Previously, researchers assessed a series of trap designs for PW under field conditions; however, many trapping advancements have been made in the past two decades. Therefore, we are currently revaluating alternative trap designs and novel adhesive formulations to determine the best trapping techniques for early and reliable PW detection.

GP-5:

Effect of hexanal on host recognition and oviposition behaviour of spotted wing drosophila (*Drosophila suzukii* (Matsumura))

Laxmi Khadka[1], G. Paliyath[1], and C. Scott-Dupree[2]
[1] Dept. of Plant Agriculture, University of Guelph, Guelph, ON
[2] School of Environmental Sciences, University of Guelph, Guelph, ON

Hexanal is a volatile aldehyde synthesized naturally in plants. Hexanal based technologies (preharvest spray, postharvest dips or vapour treatment) delay senescence in fruit and ensure longer shelf-life. In addition, hexanal exhibits antimicrobial and antifungal properties, and may repel insect pests. Spotted wing drosophila (SWD) (*Drosophila suzukii*) causes damage to a wide range of tender fruit. This insect pest oviposits in ripening fruit which results in rapid deterioration and decreased crop value. It has been suggested that SWD is more attracted to olfactory cues or kairomones associated during the early fruit ripening stages. My research measured the fruit choice behaviour and oviposition efficacy of SWD exposed to blueberries at three different stages of maturity (early, mid and late) either dipped in 1 ml of a hexanal formulation (100 ml ethanol, 100 ml twueen-20 and 10 ml hexenal) per 100 ml of distilled water or undipped. Hexanal formulation had no effect on the fruit choice behaviour of SWD for the 3 blueberry ripening stages. In addition, it had no effect on SWD oviposition and resulting adult emergence. When a comparison was made between blueberry ripening stages, there was no significant difference in egg laying rate, however a significantly lower number of SWD adults were emerged from the early blueberries (green fruits). This indicates that all the stages of fruit development were susceptible to SWD infestation. Thus, control strategies should apply as early as fruits set on the plants/trees.

GP-6:

Visual assessment of peach and hazelnut injury caused by *Halyomorpha halys*

Jared Harris[1], H. Fraser[2], and C. Scott-Dupree[1]
[1] School of Environmental Sciences, University of Guelph, Guelph, ON
[2]Ontario Ministry of Agriculture, Food and Rural Affairs, Guelph, ON

Halyomorpha halys, an invasive species that originated in Asia, was first detected as a threat to Ontario growers in 2012. Currently, studies show that feeding injury caused by *H. halys* may leave fruit unmarketable. Feeding injury may not be correctly identified by growers thus, this project aims to help growers by providing them with a visual catalogue of feeding damage on hazelnuts (cv. Americana) and peaches (cv. Redhaven). To create this catalogue, two separate field trials following the same treatment of 32 exclusion cages containing 5 nymph and adult *H. halys* were setup at the Simcoe Research Station ON. Exposure to fruit was 48h. Each trial followed a destructive sampling method where damaged fruit was assessed over 8 weeks allowing injury to develop through multiple physiological development stages. The hazelnut trial ran July-August 2019 through the shell development and kernel expansion phase. Early sampling results (wk 1-4) showed that feeding injury caused the development of the kernel to cease leaving blanks shells. In contrast, late sampling (wk 5-8) demonstrated malformed and shriveled kernels. The peach trial ran August-September 2019 through the S3 and harvest phase. Results revealed external surface depressions during early sampling and internal necrosis damage during late sampling. These trials demonstrated that both fruits are susceptible to damage caused by *H. halys* through multiple physiological development stages and ultimately render the fruit unmarketable. With the assistance of this report, growers in Ontario will be able to identify BMSB damage easier and adjust their management methods accordingly.

GP-7

Developing a bioassay to find resistance to purple spot in asparagus

George Austin, D. Wolyn and M.R. McDonald
Department of Plant Agriculture, University of Guelph, Guelph, ON

Purple spot of asparagus, caused by *Stemphylium vesicarium*, decreases the marketability of spears and causes premature defoliation leading to reduced yields in subsequent years. The creation of a bioassay which can consistently reproduce the small differences in incidence and severity of purple spot seen across cultivars in the field will be valuable to breeeders. Four cultivars were monitored for purple spot in plots in Simcoe where *S. vesicarium* was naturally present. Spears of these cultivars were subject to application of conidia of S. vesicarium on both wounded and unwounded sections in a bioassay. Three isolates were used, an isolate from Ontario asparagus was only able to infect wounded spears and consistently showed differences in both the incidence and number of lesions formed across the four cultivars. An isolate from Nova Scotia asparagus was able to infect both wounded and unwounded spears, however, no difference in incidence nor number of lesions was found at the wound. This isolate however did show the same differences between cultivars on unwounded spears as the Ontario isolate did on wounded spears. A third isolate collected from Simcoe in 2019 was only available for a single run of the bioassay and gave results similar to the Nova Scotia isolate. The use of lighting and the location of the wounds on the spear were also found to be significant in the bioassay. Conidia germination rates and germ tube growth was the same across all cultivars. Collecting more isolates of *S. vesicarium* from across Ontario asparagus farms for the bioassay may improve the importance of the bioassay.

GP-8

Establishment of the pesticide resistance monitoring tool for the two-spotted spider mite, *Tetranychus urticae*

Hanna Varonina, J. Spenler, V. Zhurov and V. Grbic
Department of Biology, University of Western Ontario, London, ON

Spider mites are known for their rapid development of resistance to pesticides. We are establishing TSSM pesticide resistance monitoring tool for detection of pesticide resistance patterns in TSSM based on genetic markers. Identified genetic patterns will then be used to provide recommendations on pesticide use to growers. Our research focuses on the establishment of the TSSM pesticide resistance monitoring tool. It consists of several components: a) pesticide resistance markers, b) TSSM resistance status determined by bioassays, and c) the correlation between the genetic markers and resistance status. We will initially establish pesticide resistance monitoring tool using known pesticide resistance markers but will also be searching for new ones. In the Fall of 2018, 19 TSSM populations from different greenhouses and different crops (tomato, eggplant, cucumber, pepper) were collected. These populations were genotyped for the presence of known SNPs associated with pesticide resistance. Various target site mutations were found in all 19 greenhouse collected populations. We are also conducting a genome-wide screen for novel SNPs and patterns of metabolic resistance by means of RNA-seq on the same populations. Currently, we are conducting bioassays testing 14 pesticides registered for TSSM control in Canada. We are specifically focusing on bifenazate, cyflumetofen, and spiromesifen used on greenhouse tomatoes. Based on these data, a model that will convert the genotyping information into an IPM decision support will be developed.

REGULAR POSTERS

RP-1

Identification of novel RNAi targets to control brown marmorated stink bug (*Halyomorpha halys*) using proteomics

Alexandra Sébastien[1], L. Foster[2], N. Stoynov1[2] and C. Scott-Dupree[1]
[1] School of Environmental Sciences, University of Guelph, Guelph, ON
[2] Faculty of Medicine, Department of Biochemistry and Molecular Biology, University of British Columbia, Vancouver, BC

Originally from East Asia, and now established in Europe and North America, brown marmorated stink bug (*Halyomorpha halys*; BMSB) is an invasive pest that causes severe damage to an extensive number of crops. While generalist chemical controls are failing to meet growers' needs, RNA interference (RNAi) has shown remarkable potential in killing most of the treated BMSB individuals by disrupting the expression of specific target genes. Further development of dsRNA to target multiple genes could result in the rotation of control treatments in the field, and avoid resistance development in BMSB populations, thus insuring a potential long-term usage of RNAi for BMSB control. To this end, we have analysed the proteins present in all BMSB life stages (from eggs to adult, both males and females) using a Tims TOFF mass spectrometer and the MaxQuant program. We present here the results of our data analysis on the differences in protein profiles between stages, and highlight which pathways are especially enriched. Furthermore, we discuss novel potential targets for RNAi, which could affect most BMSB life stages, and which we are planning to validate in vivo. This research is the first step to support the development of an efficient, multi-target RNAi control for BMSB.

RP-2

Development of regional management strategies and decision-making tools for control of Colorado potato beetle (CPB)

Sophie Krolikowski[1], I. Scott[1], P. MacKinley[2], S. Hann[2] and C. Moffat[2]
[1]London Research and Development Centre, Agriculture and Agri-Food Canada, London ON; [2]Fredericton Research and Development Centre, Agriculture and Agri-Food Canada, Fredericton, NB

CPB are the most economically important insect pest of Canadian potato. Control of CPB relies heavily on applications of systemic and foliar insecticides, predominately neonicotinoids and spinosyns, respectively. Growers are at high risk of local CPB populations developing resistance to insecticides and require both up-to-date knowledge of local development of resistance and new management tools. The project objectives are to: (1) determine local susceptibility of CPB populations to different classes of insecticides through a national resistance-monitoring network; (2) better characterize molecular basis of developing resistance; and (3) develop novel extension tools to improve resistance management practices. In 2018, a total of 37 populations of CPB were obtained from 6 provinces for resistance screening. Many showed either resistance or reduced susceptibility to neonicotinoids and spinosyns in comparison to the anthranilic diamide products being tested. Insecticide use surveys accompanied most populations submitted and indicated that in the last five years, 69% of respondents applied neonicotinoids, 40% applied spinosyns and 21% had applied diamides and/or pyrethroids. Samples will continue to be collected for the next four growing seasons (2019-2022) to determine susceptibility to registered insecticides and contribute to the mapping tool that growers can access for improved resistance management decision making.

Post Event Evaluation – Ontario Pest Management Conference

Background

Profession: (Please circle) Research Government Grower Consultant Industry Rep

Input Supplier (retail/distribution) Student Other_____

Overall Feedback

1. How would you rate the following aspects of the conference? (circle the most appropriate number)

	Poor	Fair	Average	Good	Excellent
The content of the sessions	1	2	3	4	5
The speakers	1	2	3	4	5
The length of the sessions	1	2	3	4	5
The media used by the speakers	1	2	3	4	5
Practical information on pest management	1	2	3	4	5
The poster session	1	2	3	4	5

2. What session did you like the best/find most effective (and why)?

3. What sessions did you find the least helpful (and why)?

4. Please suggest changes we could make that would significantly improve the conference.

5. Please indicate the extent to which you agree or disagree with the following statements concerning the conference:

	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
Topics were current.	1	2	3	4	5
It improved my understanding of new directions in pest management.	1	2	3	4	5
The information will influence my planning/work within the next two years.	1	2	3	4	5
In the end, I got what I needed from the conference.	1	2	3	4	5
The registration process was convenient and easy to use.	1	2	3	4	5

Overall, how satisfied were you with the conference?

Very Dissatisfied	Dissatisfied	Neutral	Satisfied	Very Satisfied
1	2	3	4	5

Thank you very much for taking the time to complete this survey. Your feedback will help us in organizing future events. If you would like to be included in a draw to thank you for completing the survey, please fill out your name and contact information below, then detach it from this form and place it in the container provided.

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