OPMC Ontario Pest Management Conference 2013

11th Annual

November 7, 2013

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

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Ian Scott, Agriculture and Agri-Food Canada, London

Cynthia Scott-Dupree, School of Environmental Sciences, University of Guelph

Harold Wright, CropLife Canada (Ontario Council)

AGENDA

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

We thank Mike Celetti for IT support throughout the morning and afternoon sessions.

MORNING SESSION

Morning Session Chair: Jonathan Schmidt, University of Guelph

9:00 am **Welcome:** Kristen Obeid, Chair, Ontario Pest Management Conference

9:10 am Food and Oviposition Preference in Diamondback Moth. **Kiera Newman** and L. Vasseur. (Student Competition).

9:25 am Managing foliar diseases of asparagus (*Asparagus officinalis* L.) with fungicides and forecasting. **Jennifer Foster** and M.R. McDonald (Student Competition).

9:40 am **Plenary Speaker:**

Dr. Helen Thompson

Principal Technical Expert, Syngenta

"Pesticide risk assessment for pollinators and pesticides in the EU – recent advances and challenges"

10:15 am – 10:45 am **Coffee Break and Poster Viewing**

10:45 am Demographic trends in mixed *Bemisia tabaci* (Hemiptera: Aleyrodidae) cryptic-species populations in commercial poinsettia under biological control- and insecticide- based management. **Andrew Frewin**, C. Scott-Dupree, G. Murphy and R. Hanner (Student Competition).

11:00 am Long-term survival of sclerotia of *Botrytis squamosa, Sclerotinia sclerotiorum,* and *Sclerotium cepivorum* treated with three biological controls under field conditions. **Laura Barbison**, M.R. McDonald and G. Boland (Student Competition).

11:15 am Control of Glyphosate resistant Canada fleabane (*Conyza Canadensis* (L.) Cronq) with glyphosate/2,4-D choline (Enlist Duo ©) in Roundup Ready corn. **Laura Ford**, N. Soltani, D. Robinson, R. Nurse, A. McFadden and P. Sikkema (Student Competition).

11:30 pm Media are from Mars, Scientists are from Venus – Why the research community must reach out. **Tim Lougheed.**

11:55 pm - 1:10 pm Lunch and Poster Viewing

AFTERNOON SESSION

Afternoon Session Chair: Denise Beaton, OMAF and MRA

1:10 pm Managing planting dates for asynchronous host plant susceptibility and peak flight activity of the swede midge, *Contarinia nasturtii.* **Braden Evans**, K. Jordan, M. Brownbridge, R. Hallett (Student Competition).

1:25 pm **Plenary Speaker:**

Dr. Steve Savage

Independent Consultant, California

"Progress in Agriculture Pest Management: The Story No One Knows"

2:00 pm The two spotted spider mite, *Tetranychus urticae*: a herbivore that is eating your plants as well. V. Zhurov, K. Bruinsma, N. Wybouw, E. Osborne, M. Grbic, R. Clark, T. Van Leeuwen**, Vojislava Grbic.**

2:25-2:55 pm **Coffee Break and Poster Viewing**

2:55 pm FMC-New for 2014. **Wayne Myers**, FMC Corporation.

3:05 pm Cyflumetofen - a new miticide for Canadian growers from BASF. **Andreas Boon**, BASF**.**

3:15 pm **Panel Discussion:**

Myth Busting: Challenging Commonly Held Beliefs About IPM

Moderator: Clarence Swanton

Panel Participants:

Helen Thompson, Steve Savage, Hugh Martin and Tim Lougheed

4:00 pm Presentation of Student Competition Award Winners **– Kristen Obeid**

Closing Remarks and Adjourn

PLENARY SPEAKERS

Dr. Helen Thompson – Principal Technical Expert, Syngenta Crop Protection, Jealott's Hill International Research Centre, UK

Biography

Helen Thompson recently left the Environmental Risk Team at Fera where she worked as a scientist for 25 years, to join Syngenta in the UK as a Principle Technical Expert. She will be speaking at OPMC after her years at Fera where the research team comprised 50 scientists (including 12 PhD students) specialising in strategic and applied research into the risks by chemicals, including pesticides and veterinary medicines, to the environment and includes environmental fate, ecotoxicology, analytical chemistry and application hazard specialists. The team's role is in assessing and managing the risks posed to the environment from chemical pollutants and contaminants through delivery of sound science to government and the private sector.

Helen gained her BSc (Hons) (Physiology and Biochemistry) in 1985 and her PhD (Exposure of birds to pesticides) in 1988 from Reading University, UK. She also holds a Diploma in Management from Henley Management College. She joined Fera (previously the Central Science Laboratory) in 1988 as an environmental biochemist but has also trained in honeybee disease diagnosis and beekeeping with 4 years in the National Bee Unit at Fera as laboratory technical manager. Helen undertook research for UK government and for industry on the impacts of pesticides on terrestrial wildlife including honeybees and has expertise in GLP compliant laboratory, semi-field and field studies. Recent projects on honeybees included assessments of the impacts of synergism between fungicides and insecticides, the role of guttation as a route of exposure and the interpretation of honeybee brood studies. She is also currently co-supervising a PhD student at the University of Exeter looking at the long term effects of pesticides on honeybees and bumble bees.

Helen has over 75 peer reviewed publications in the area of terrestrial ecotoxicology and is a member of the OECD working group on 2 generation testing in birds; the OECD working group on honeybee larval testing, the EFSA working group on residues on food items for the revision of the bird and mammal guidance document; the EFSA Working Group on honeybee risk assessment; SETAC since 1989 (including terms as SETAC UK Treasurer, Vice-President and President) and was a member of the SETAC Europe Council 1998-2004. Helen has been secretary of the ICPBR Bees and Pesticides working group recently standing down as Chair, and organized meetings in York, Bucharest and Wageningen. Helen also peer reviews for journals including Pest Management Science, Ecotoxicology and Environmental Toxicology and Chemistry.

"Pesticide Risk Assessment for Pollinators and Pesticides in the EU – Recent Advances and Challenges"

Formal pesticide risk assessment for honeybees has been in place within the EU for over 30 years and for sprayed pesticides have been validated using incident data. However, over the intervening period both the types of chemical and application methods have changed resulting in parallel evolution of risk assessment methodology, e.g. systemic pesticides. The recent publication of the EU "Guidance on the risk assessment of plant protection products on bees" has both widened the species of interest to include bumble bees and solitary bees and formally quantified protection goals at both the individual and colony level. Pesticide risk assessment continues to be based on a well-established tiered testing strategy with the results of laboratory studies, which have been extended to include chronic exposure of both adults and larvae, used to identify whether additional higher tier, semi-field and field, studies are required. The philosophy of this tiered approach is to ensure resources (more detailed studies) are directed at those pesticides where concerns may be raised whilst retaining an appropriate level of "protectiveness". However, the proposed guidance document is over-protective, resulting in most pesticides failing the lower tier and requiring impractical field studies to address highly conservative protection goals. This failure of the system is based on both significant gaps in our current understanding and unrealistic extrapolations which will be highlighted in this presentation. For example, current extrapolations result in highly protective exposure estimates for a wide range of routes of exposure in foraging honeybees. Furthermore, risk assessment for bumble bees and solitary bees is still in its infancy and the data needs in this area will be discussed.

Dr. Steve Savage – Independent Consultant, California

Biography

Steve Savage has been involved in agricultural technology for 35 years. Since 1996 he has been an independent consultant. His clients include large, international ag technology players, small companies, venture capital firms, Universities, food companies, and grower groups. He has extensive experience in biological control, chemical pest control, biotechnology, plant genetics, biofuels and sustainability. In 2009 Steve began blog posting about food, agriculture, and technology (Applied Mythology). Steve's educational background began with a B.S. in biology from Stanford University in 1977. He completed an M.S. and Ph.D. in Plant Pathology at the University of California, Davis. Prior to consulting, Steve worked for Colorado State University, DuPont, and Mycogen. He lives with his wife in Northern San Diego County, California.

"Progress in Agriculture Pest Management: The Story No One Knows"

It has been more than 50 years since Rachel Carson's "Silent Spring" sounded alarms about pollution issues in general and pesticide issues in particular. What followed was the birth of the modern Environmental Movement and the establishment of regulatory agencies such as the US Environmental Protection Agency (EPA) in 1970. Since then there have been dramatic, positive changes in how pests are managed in agriculture. A wide range of practices are employed as part of Integrated Pest Management systems, many of which avoid or minimize the need for applied pesticidal treatments. Billions of dollars have been invested to discover and develop new generations of pesticide options with low intrinsic hazard. Application improvements and label restrictions have been employed to significantly mitigate environmental or health risks for products with hazard issues. Intensive monitoring of pesticide residues in the food and water supplies clearly documents the fact that all of these changes combine to yield a safe and productive food system. Unfortunately, few consumers have any idea how much has changed, nor do they have the level of confidence in the food supply that is justified. This presentation will survey the communication failures and sources of disinformation that have combined to prevent this positive story from being heard. It will also address potential strategies to alter that paradigm.

PANEL DISCUSSION

"Myth Busting: Challenging Commonly Held Beliefs About IPM"
Moderator: Clarence Swanton

Panel Participants:

Helen Thompson – Principal Technical Expert, Syngenta
Steve Savage - Consultant
Tim Lougheed – Science Writer
Hugh Martin – Organic Consultant

Join the panel members to discuss how we can educate media and policy makers about the science of integrated pest management to promote our work and environmental stewardship.

– CROP LIFE STUDENT COMPETITION –

Student Oral Presentations:

OP-1 Food and Oviposition Preference in Diamondback Moth. **Kiera Newman** and L. Vasseur.

OP-2 Managing foliar diseases of asparagus (*Asparagus officinalis* L.) with fungicides and forecasting. **Jennifer Foster** and M.R, McDonald.

OP-3 Demographic trends in mixed *Bemisia tabaci* (Hemiptera: Aleyrodidae) cryptic-species populations in commercial poinsettia under biological control- and insecticide- based management. **Andrew Frewin**, C. Scott-Dupree, G. Murphy and R. Hanner.

OP-4 Long-term survival of sclerotia of *Botrytis squamosa, Sclerotinia sclerotiorum,* and *Sclerotium cepivorum* treated with three biological controls under field conditions. **Laura Barbison**, M.R. McDonald and G. Boland.

OP-5 Control of Glyphosate resistant Canada fleabane (*Conyza Canadensis* (L.) Cronq) with glyphosate/2,4-D choline (Enlist Duo ©) in Roundup Ready corn. **Laura Ford,** N. Soltani, D. Robinson, R. Nurse, A. McFadden and P. Sikkema.

OP-6 Managing planting dates for asynchronous host plant susceptibility and peak flight activity of the swede midge, *Contarinia nasturtii.* **Braden Evans**, K. Jordan, M. Brownbridge and R. Hallett.

Judges: Ian Scott - AAFC (Judging Supervisor)

1. Beth Connor – Valent
2. John Purdy – Canpolin
3. Cary Gates – Flowers Canada (Ontario)
4. Meghan Garlough – Monsanto

Student Poster Presentations:

PP-1 New approaches to obtain pesticides from biomass pyrolysis. **Mohammad Hossain**, I. Scott, K. Conn, B. McGarvey, J. Mohammad, L. Ferrante, F. Berruti and C. Briens **(Time of judging 9:00-9:15**).

PP-2 The Sterile Leafminer Release Program – Does Size Matter? **Maryam Sultan**, C. Scott-Dupree, R. Buitenhuis and G. Murphy **(Time of judging 9:15-9:30).**

PP-3 Life History Measures of Spotted Wing Drosophila (SWD), *Drosophila suzukii,* in Southern Ontario. **Lisa Emiljanowicz,** G. Ryan and J. Newman **(Time of judging 10:30 to 10:45).**

PP-4 Treatment of duck manure with naturally-occurring substances to reduce suitability for house fly (*Musca domestica*) landing and breeding. **Justine Shiell**, C. Scott-Dupree and S.

Lachance **(Time of judging 10:45 to 11:00).**

PP-5 Optimizing efficacy of *Heterorhabditis bacteriophora* in cold temperatures using the homozygous inbred line approach. **Shahram Sharifi Far**, D. Shapiro Ilan and R.Hallett **(Time of judging 11:00 to 11:15).**

PP-6 Insecticide application timing for control of swede midge in canola. **Jon Williams**, J. Heal, H. Earl and R. Hallett **(Time of judging 11:15 to 11:30).**

PP-7 Clubroot incidence and severity on canola in relation to environmental conditions. **Travis Cranmer**, B. Gossen and M.R. McDonald **(Time of judging 11:30 to 11:45).**

PP-8 Polymerase chain reaction and spiders (Araneae): a method for evaluating pest consumption in field margins. **Brandes Struger-Kalkman** and J. Schmidt **(Time of judging 11:45 to 12:00).**

PP-9 Effects of Coragen™, a ryanoid insecticide, on *Enoplognatha ovata* (Araneae: Theridiidae), a representative agroecosystem spider. **Michael Tomascik** and J. Schmidt **(Time of judging 12:45 to 1:00).**

PP-10 Host plant interactions and insecticide efficacy of western bean cutworm, *Striacosta albicosta* (Smith) Lepidoptera: Noctuidae, in dry bean. **Lindsey Goudis**, R. Hallett and C. Gillard **(Time of judging = 1:00 to 1:15).**

PP-11 Identifying spinach cultivars with reduced susceptibility to Fusarium wilt. **Brian Collins** and M.R. McDonald **(Time of judging 2:00 to 2:15).**

PP-12 Evaluating nematicides for the control of root-knot nematodes on carrots in Ontario. **Dennis Van Dyk**, K. Jordan and M.R. McDonald **(Time of judging 2:15 to 2:30).**

PP-13 Monitoring pests and beneficial insect populations in sprayed and unsprayed hop yards. **Sean Cole**, M. Filotas, E. Elford and S. Westerveld **UNDERGRADUATE (Time of judging 2:30 to 2:45).**

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

Judges: Ian Scott – AAFC (Judging Supervisor)

1. Jason Deveau – OMAF and MRA
2. Justin Renkema – University of Guelph
3. Sean Westerveld – OMAF and MRA
4. Coralee Sopher – University of Guelph

-REGULAR POSTER PRESENTATIONS -

RP-1 The influence of fungicide program and timing on the incidence of fruit rot in mature and overripe Ontario processing tomatoes. **Cheryl Trueman.**

RP-2 Application method impacts coverage. **Jason Deveau.**

RP-3 Evaluation of fungicides and cultivars for management of asparagus Phytophthora Crown, spear and root rot. **Catarina Saude**, C. Bakker and M.R. McDonald.

RP-4 Organically-acceptable insecticides as potential management options for the swede midge, *Contarinia nasturtii.* **Braden Evans**, K. Jordan, M.Brownbridge and R. Hallett.

RP-5 Fungicide spray timing for the management of stemphylium leaf blight in onions. **Michael T. Tesfaendrias** and M.R. McDonald

RP-6 Evaluation of Fumigants and Nematode-Suppressive Cover Crops for Control of Soil-Borne Pests of Ginseng. **Sean Westerveld**, M. Filotas, C. Saude and C. Atkinson.

RP-7 Brown Marmorated Stink Bug on the Move: A Survey in Southern Ontario during 2013. **Cynthia Scott-Dupree,** H. Fraser, T. Gariepy and T. Baute.

RP-8 Pesticide risk assessment for non-target invertebrate pollinators. **Loren Knopper**, E. McGregor and R. Breton.

RP-9 ***Colletotrichum acutatum* in Ontario horticultural crops. Michael Celetti**, K. Grigg-McGuffin, M. Filotas, P. Fisher and M. Paibomesai.

ABSTRACTS

Crop Life Student Competition Abstracts

Student Oral Presentations:

OP-1:

Food and Oviposition Preference in Diamondback Moth

Kiera Newman[1] and L. Vasseur[1]
[1]Dept. of Biological Science, Brock University, St. Catharines, ON, L25 3A1

Plutella xylostella (Diamondback Moth (DBM)) is a small Lepidoptera that feeds almost exclusively on plants in the Brassicaceae family, including economically important crops such as canola, cabbage, and mustard. This pest is now considered a global pest and is found in almost all countries, including Canada. High phenotypic plasticity and polymorphism in DBM may account for its high adaptability and may explain why it has become resistant to every currently used pesticide class, including Bt (*Bacillus thuriniensis*). Damage to crops due to DBM is estimated at four billion dollars (US) per year. We aim to examine the preference of DBM among crop, wild and ornamental Brassicas and how selection may vary with life stage (targeting the most voracious larval stages III and IV). Considering that some of the studied species contain compounds (e.g. saponin) toxic to DBM, we also test the preference of oviposition by females when exposed to conventional and trap crops. Experiments include exposing larvae from five populations coming from different origins in Canada to six Brassica species and evaluating the rate of herbivory and behaviour over one hour. Then adults (one male, one female) will be exposed to these same species and their oviposition preferences examined. The ultimate goals of our study are to understand food selection of DBM in Canada, the role of ornamental and wild mustard species in possibly maintaining populations in Ontario and to evaluate the possibility of trap crops for controlling DBM populations in crop fields.

OP-2:

Managing foliar diseases of asparagus (*Asparagus officinalis* L.) with fungicides and forecasting

Jennifer Foster[1] and M. R. McDonald[1]
[1]Department of Plant Agriculture, University of Guelph, Guelph, ON, N1G 2W1

Stemphylium leaf spot (*Stemphylium vesicarium*) and rust (*Puccinia asparagi*) are foliar diseases of asparagus (*Asparagus officinalis* L.). Stemphylium vesicarium can infect the spears during harvest, reducing quality, and both pathogens can quickly defoliate the fern, causing significant economic loses. Currently, few commercial fungicides are available for use. The objectives of this research were to evaluate commercial and experimental fungicides for control of foliar diseases of asparagus and test TOM-Cast thresholds for control of stemphylium leaf spot. In 2011, two trials were established in fields planted with 'Millennium' asparagus to evaluate 13 commercial and experimental products applied to full fern on a 14-day interval. In 2012 and 2013, two and four field plots, respectively, were initiated in fields established with either 'Millennium' or 'Jersey Giant' asparagus.

Quadris Top and Bravo were applied on a 14-day interval or according to the forecasting system TOM-Cast at three thresholds, 15, 20, and 30 disease severity values (DSV). In the fungicide screen, there was a high incidence of foliar disease , and the most effective rust products were Quadris Top, Quadris Xtra, Experimental 1, and Folicur, whereas the most effective stemphylium leaf spot products were Polyram and products that contained strobilurin fungicides. In the forecasting trials differences were observed among fungicides and fungicide timings. In general, applications of Quadris Top at 15, 20 and 30 DSV thresholds provided similar control to Bravo applied on a 14-day interval. Further research is required to evaluate TOM-Cast in commercial asparagus fields.

OP-3:

Demographic trends in mixed *Bemisia tabaci* (Hemiptera: Aleyrodidae) cryptic-species populations in commercial poinsettia under biological control- and insecticide- based management

Andrew Frewin[1], C. Scott-Dupree[2], G. Murphy[3] and R. Hanner[1]
[1]Centre for Biodversity Genomics and Dept. of Integrative Biology, University of Guelph, Guelph, ON, N1G 2W1
[2]School of Environmental Sciences, University of Guelph, Guelph, ON, N1G 2W1
[3] Ontario Ministry of Agriculture and Food and the Ministry of Rural Affairs, Vineland, ON L0R 2E0

Bemisia tabaci (Gennadius) is an economically important pest of agricultural and ornamental plants world-wide and is now widely recognized as a cryptic species complex. In North America, *B. tabaci* is a particularly important pest of greenhouse poinsettia. In poinsettia production two-cryptic species from the *B. tabaci* complex, *Mediterranean* and *Middle East Minor 1* (MEAM1) often infest crops simultaneously. Differences in pesticide susceptibility between these two cryptic-species have the potential to influence growers' management decisions including the use of biological control or insecticides, and the choice of insecticide active ingredient. However, the demographic behaviour of mixed species infestations in commercial greenhouses has yet to be investigated. We conducted a survey of *B. tabaci* populations in commercial greenhouses in Ontario, Canada and provide evidence that under biological control based management, MEAM1 can displace *Mediterranean*, whereas under insecticide based management *Mediterranean* populations will persist. Furthermore, we comment on implications of this behaviour on the management of *B. tabaci*, and comment on methods used to identify *B. tabaci* cryptic species.

OP-4:

Long-term survival of sclerotia of *Botrytis squamosa, Sclerotinia sclerotiorum,* and *Sclerotium cepivorum* treated with three biological controls under field conditions

Laura Barbison[1], M.R. McDonald[2] and G. Boland[1]
[1]School of Environmental Sciences, University of Guelph, Guelph, ON, N1G 2W1
[2]Dept. of Plant Agriculture, University of Guelph, Guelph, ON, N1G 2W1

The primary overwintering inoculum of *Botrytis squamosa* Walker, *Sclerotinia sclerotiorum* (Lib.) de Bary, and *Sclerotium cepivorum* Berk are melanised resting bodies, known as sclerotia. Management of these pathogens is difficult due to the resilience of sclerotia within the soil; however, this common life stage is an ideal target for a multihost biological control agent (BCA). The objective of this research was to determine the impact of three BCAs, *Coniothyrium minitans* Campbell, *Microsphaeropsis ochracea* (Carisse & Bernier), and *Trichoderma atroviride* (Karsten), on the survival of sclerotia of *B. squamosa*, *S. sclerotiorum,* and *S cepivorum* under field conditions within a two year time span. Laboratory-produced sclerotia of *B. squamosa*, *S. sclerotiorum,* and *S. cepivorum* were treated with spore suspensions of the individual BCAs. All sclerotia were buried 5-10 cm deep in pots containing muck (organic) soil and placed in the field on December 12, 2011. Percent survival was assessed at one to three month intervals post-burial. Once recovered, sclerotia were surface disinfested, plated onto acidified PDA, and observed for germination and formation of daughter sclerotia. Twenty months post-burial, percent survival of untreated control sclerotia decreased by 78, 32 and 1% for *S. sclerotiorum, B. squamosa*, and *S. cepivorum*, respectively, when compared to survival at one month post burial. Among the BCAs, *T. atroviride* was able to consistently reduce survival of all three pathogens. Percent survival of *S. sclerotiorum, B. squamosa,* and *S. cepivorum* were reduced to 24, 20, and 0%, respectively.

OP-5:

Control of Glyphosate resistant Canada fleabane (*Conyza Canadensis* (L.)) with glyphosate/2,4-D choline (Enlist Duo ©) in Roundup Ready corn

Laura Ford[1], N. Soltani[1], D. Robinson[1], R. Nurse[2], A. McFadden[3] and P. Sikkema[1]
[1] University of Guelph-Ridgetown, Ridgetown, ON, N0P 2C0
[2] Agriculture and Agri-Food Canada, Harrow, ON, N0R 1G0
[3] Dow AgroSciences Canada, Guelph, ON, N1H 4S5

Glyphosate resistant Canada fleabane (GRCF) was confirmed in Ontario from seed collections made in the fall of 2010. The repeated use of glyphosate on Roundup Ready (RR) crops has contributed to the selection of the resistant biotypes. An integrated approach that uses multiple modes of action is one component of an overall strategy to address this glyphosate resistant weed. Single versus sequential applications of glyphosate/2,4-D choline (Enlist Duo) and two-pass weed control programs using pre-emergence residual herbicides followed by post-emergence applied Enlist Duo have been evaluated. Results from this research will help farmers implement the most efficacious herbicide program thereby maximizing GRCF control, corn yield and net returns.

OP-6:

Managing planting dates for asynchronous host plant susceptibility and peak flight activity of the swede midge, *Contarinia nasturtii*

Braden Evans[1], K. Jordan[2], M. Brownbridge[3] and R. Hallett[1]
[1]School of Environmental Sciences, University of Guelph, Guelph, ON, N1G 2W1
[2] Department of Plant Agriculture, University of Guelph, Guelph, ON, N1G 2W1
[3] Vineland Research and Innovation Centre, Vineland Station, ON, L0R 2E0

The swede midge, *Contarinia nasturtii*, is an invasive pest insect, attacking the developing meristem of cruciferous vegetables such as broccoli, cabbage and cauliflower. Host plants are most susceptible to larval feeding damage prior to the formation of floral buds. With 4-5 overlapping generations per year in southern Ontario, swede midge are active in the field as adults and larvae throughout the growing season. Flight activity of the adult population is characterized by a series of distinct peaks in May and June, followed by lower numbers of active individuals in July, August and September. Avoiding peak flight activity by manipulating planting dates minimizes the overlap between host plant susceptibility and high populations of adult swede midge, potentially reducing feeding damage to the developing meristem. Field trials conducted in 2012 and 2013 at Elora, ON, compared swede midge larval feeding damage to cabbage and broccoli based on 6 different planting dates (May 3, May 24, June 15, July 6, July 27 and August 15), with 2013 trials including fast-developing (Bay Meadows) and slow-developing (Windsor) broccoli cultivars as an additional factor. Results suggest that swede midge damage is lower for early cabbage planting dates and late broccoli planting dates. Lower damage levels typically exceed acceptable levels for marketability purposes, underlining the need for a combination of management tactics for effective swede midge control.

Student Poster Presentations:

PP-1:

New approaches to obtain pesticides from biomass pyrolysis

Mohammad Hossain[1], I. Scott[2], K. Conn[2], B. McGarvey[2], J. Mohammad[1], L. Ferrante[1], F. Berruti[1] and C. Briens[1].

[1] Institute for Chemicals and Fuels from Alternative Resources, Dept. of Chemical and Biochemical Engineering, Western University, London, ON, N6A 5B9

[2] Agriculture and Agri-Food Canada, London, ON, N5V 4T3

Fuels and value-added products including pesticides can be obtained from agricultural and forestry wastes through thermochemical process, like pyrolysis. Two types of pyrolysis reactor can be applied for thermochemical conversion: bubbling bed reactor (BBR) and mechanically fluidized reactor (MFR). BBR can produce bio-oil from the biomass at set temperatures between 300 and 800°C, while the MFR slowly increases temperature from ambient to 600°C. The objective of this study was to pyrolyze lignin biomass for the separation and identification of potential pesticide compounds using both reactors. BBR lignin bio-oil produced at 550°C demonstrated higher pesticidal activity than the 450°C bio-oil against Colorado potato beetle (CPB) *Leptinotarsa decemlineata*, pea aphid *Acyrthosiphon pisum*, fungi *Pythium ultimum* and bacteria *Streptomyces scabies*. CPB bioassay-guided isolation of lignin bio-oil required many steps including liquid-liquid separation and fractionation by semi-preparative high performance liquid chromatography (HPLC). Chemical analysis by gas chromatography-mass spectrometry (GC-MS) identified many undesirable polycyclic aromatic hydrocarbons (PAHs) present in the BBR lignin bio-oil fractions. In contrast, most of the compounds associated with high pesticidal activity observed with the MFR lignin bio-oil were isolated directly between 250-300°C during the heating process. Many compounds were detected by GC-MS including catechol and guaiacol. PAHs were not detected. The MFR bio-oil pesticidal activity and chemical analyses indicate that the lower temperature pyrolysis process may be more efficient for isolating biomass pesticidal compounds intact compared to higher temperature pyrolysis with BBR where these molecules are broken down and PAHs produced.

PP-2:

The Sterile Leafminer Release Program – Does Size Matter?

Maryam Sultan[1], C. Scott-Dupree[1], R. Buitenhuis[2] and G. Murphy[3]

[1]School of Environmental Sciences, University of Guelph, Guelph, ON, N1G 2W1

[2]Vineland Research and Innovation Centre, Vineland Station, ON, L0R 2E0

[3]Ontario Ministry of Agriculture and Food and the Ministry of Rural Affairs, Vineland Station, ON, L0R 2E0

American serpentine leafminer, *Liriomyza trifolii* (Burgess), is an important insect pest of cut and potted chrysanthemums and gerberas in Canadian ornamental greenhouses. The females cause stippling damage by using their ovipositor to puncture leaves for feeding and egg-laying. The larvae feed and tunnel through the upper mesophyll creating unsightly serpentine mines. Resistance in leafminer to all insecticides registered for its control in Canada has been documented. The sterile insect technique (SIT) has been advocated as a non-chemical alternative to supplement currently used control methods. SIT involves sterilizing large numbers of a particular insect species, using X-ray or γ-radiation. Since most damage is inflicted by females, the typical method involves releasing sterilized males which out-number their wild, fertile counterparts during mating. A cross between a sterile male and fertile female will result in an unviable egg. Fewer larvae will result in reduced damage to crops. Over time and with repeated introductions, this method can significantly reduce the insect population in the treated area. A new linear particle accelerator (Linac) at the Ontario Veterinary College is being used to irradiate leafminer pupae and induce sterility without affecting fitness or competitiveness. To decrease the proportion of females prior to irradiation and to improve the efficacy of leafminer SIT pupal size is being investigated as a measure for sex determination. Dorsal length, width and surface area of 6-8 day old pupae are measured using ImageJ software (US National Institutes of Health). This data is used to determine if an appropriate cut-off point exists that would minimize the number of female pupae.

PP-3:

Life History Measures of Spotted Wing Drosophila (SWD), *Drosophila suzukii,* in Southern Ontario

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Drosophila suzukii is an invasive fruit pest that has recently invaded North America. The general life history of this pest remains relatively unknown. In this study we measured various life history traits to construct an abridged life table, a reproductive schedule, and to calculate the intrinsic rate of increase (r) on a population of *D. suzukii* local to Ontario. Egg to adult survival was ~64 percent and this development time averaged 12.8 ± 1.0 days. The average total lifespan (egg to adult death) was 86.1 ± 24.8 days, however life expectancy at birth was 56.2 days. On average females produced ~5.7 eggs per day, with a total lifetime production of 635.6 eggs. The gross reproductive rate (GRR) was 317.8 daughter eggs per female and the net reproductive rate (R_o) was 240.4 daughter eggs per female. The intrinsic rate of natural increase (r) was 0.179, and the finite rate of increase (λ) was 1.196. The mean generation time (T) was 30.6 days, and the doubling time (DT) was 3.9 days. The stable age distribution (c_x) was comprised of 51 percent larvae, 25 percent eggs, 16 percent pupae, and 8 percent adults. The sex ratio of newly emerging adults was found to fluctuate closely around a 1:1 ratio through time. These data can be used in future modeling systems to monitor and control this pest.

PP-4:

Treatment of duck manure with naturally-occurring substances to reduce suitability for house fly (*Musca domestica*) landing and breeding

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Poultry manure provides a suitable environment for house flies to feed and lay eggs. Management techniques that render the manure less suitable for fly production can be important in decreasing infestations by creating unfavourable conditions for larval growth, egg-laying and adult feeding. Laboratory studies assessed fly emergence from manures treated with naturally-occurring substances. Duck manure treated with two concentrations (1.9 and 4.7%) of boric acid had significantly lower emergence rates than manure treated with the same concentrations of acetic acid, citric acid, diatomaceous earth, lime or the control manure. The manure treated with the naturally-occurring products, in laboratory and field experiments, showed no differences for fly landing and egg-laying. Significantly more flies, however, were landing on a house fly rearing substrate. Laboratory and field tests investigated house flies preference to duck manure of different humidity levels (0%, 55-95%). No significant differences were found to be favoured for fly contact.

PP-5:

Optimizing efficacy of *Heterorhabditis bacteriophora* in cold temperatures using the homozygous inbred line approach

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The consequences of serial culturing are a significant concern in the entomopathogenic nematode (EPN) production industry for both in vivo and in vitro methods. Continuous culturing of biological agents has repeatedly been shown to lead to efficacy reduction due to genetic or non-genetic processes. *Heterorhabditis bacteriophora* is one of the most susceptible species to this problem. The goal of this research project is to use the inbred line procedure as a method to enhance expression of the beneficial characters including cold tolerance and virulence of local EPN strains. The homozygous lines (after 7 generations) will be examined throughout several efficacy trials conducted at various cold temperatures and against several commercial pest targets.

PP-6:

Insecticide application timing for control of swede midge in canola

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The swede midge, *Contarinia nasturtii* (Kieffer), is a small gall midge native to Europe and an invasive pest in North America. Larval swede midge feed on cruciferous crops causing a range of serious damage symptoms. In 2005, the first instances of swede midge on canola in Canada were reported in Southern Ontario and Quebec by the Canadian Food Inspection Agency. Since then the swede midge has become an increasingly significant concern for canola growers in Ontario. Larval swede midge feed on young, fast growing plant tissue causing damage symptoms that may not become apparent until after larvae have vacated the plant. Using canola phenology to optimize insecticide application timing may be an effective method for reducing damage caused by swede midge larvae. Insecticide timing trials were conducted in Ontario canola grower fields in 2013 comparing foliar application of Coragen (Chlorantraniliprole 200g/L, DuPont) at the late vegetative and secondary bud stages on spring canola. The trials included three treatments; a single application of Coragen at the late vegetative stage, two applications at the late vegetative stage as well as the secondary bud stage, as well as an untreated control. Swede midge populations were also monitored throughout the

trials at each site using pheromone traps. Results describing the effects of the different treatments on plant damage symptoms and local swede midge populations will be presented.

PP-7:

Clubroot incidence and severity on canola in relation to environmental conditions

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Canola (*Brassica napus* L.), also known as rapeseed, is the third highest yielding agricultural commodity in Canada behind cattle and pig meat, generating $15.4 billion to the Canadian economy annually. *Plasmodiophora brassicae* Woronin, the causative agent of clubroot, can cause substantial decreases in yield of susceptible crucifer species. The objective of this study was to assess the effect of temperature and soil moisture on the incidence and disease severity on canola seeded in soils naturally infested with *P. brassicae* pathotype 6. Canola cv. Invigor 5030 LL was seeded approximately every two weeks starting on May 2nd and ending on August 7th, to provide different temperature and moisture conditions. The trial was arranged in a randomized complete block with four replications per seeding date and 50 plants from each experimental unit were assessed at two week intervals, starting four weeks after seeding. Rainfall in the first two weeks after seeding increased clubroot incidence and severity. This timing corresponds with root hair infection and early cortical infection of the host roots. These data plus data on temperature will be utilized to develop a clubroot forecast model to predict clubroot severity on canola based on temperature, rainfall and soil moisture.

PP-8:

Polymerase chain reaction and spiders (Araneae): a method for evaluating pest consumption in field margins

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Spiders (Araneae) are an important clade of natural enemies that are ubiquitous throughout arable field margins. The role of spiders living in such locations, however, remains generally unresolved with respect to pest management. By sampling soybean and corn field margins, I have discovered that predominant spider species include those belonging to the genera *Tibellus* (Philodromidae) and *Tetragnatha* (Tetragnathidae). Using the polymerase chain reaction (PCR) and genus-specific primers, I have developed molecular methods to detect the presence of a 500 base pair region of DNA belonging specifically to the cytochrome oxidase subunit I (COI) gene of *Drosophila* spp. (Diptera: Drosophilidae). Using this technique, I have demonstrated that this region of *Drosophila* DNA can be detected in spider guts for up to 24 hours, whilst unfed spiders amplify no DNA. Future studies exploiting species-specific primers for major agricultural pests are needed to identify agrobiont spiders that contribute to significant pest mortality.

PP-9:

Effects of Coragen™, a ryanoid insecticide, on *Enoplognatha ovata* (Araneae: Theridiidae), a representative agroecosystem spider

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The role of spiders as beneficial arthropods is compromised by their susceptibility to broad-spectrum insecticides. Although broad-spectrum insecticides are not designed with the intent of targeting spiders, the chemical properties of these insecticides persist to limit the efficacy of spiders in pest management and as biocontrols. A recently introduced ryanoid insecticide, Coragen™, is known to interfere with the proper functioning of insect musculature and has not yet been reported to have any effects on spiders. In this study, we determine the acute toxic effects of topically applied Coragen™ to candy-stripe spiders, *Enoplognatha ovata*. A mini spray tower was used to apply Coragen™ at doses ranging from 2.2417×10^{-2} mg/cm^2 (x10 maximum recommended field rate) to 1.1209×10^{-3} mg/cm^2 (x0.5 maximum recommended field rate). Each spider was then tested for responsiveness 1h, 24h, 48h, and 1 week after treatment. Preliminary findings indicate mortality was 67% for spiders treated with 1.7934×10^{-2} mg/cm^2 (x8 maximum recommended field rate) after 1 hour, while mortality within the control group was 0% after this time. After 1 week, mortality increased to 100% in the x8 maximum field rate treatment and remained at 0% for the control group. These findings suggest that more information is needed to resolve the effects of insecticides on spiders and that testing on non-target organisms needs to be more thorough.

PP-10:

Host plant interactions and insecticide efficacy of western bean cutworm, *Striacosta albicosta* (Smith) Lepidoptera: Noctuidae, in dry bean.

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The western bean cutworm is a recent pest in Ontario, and its impact to the dry bean industry is not well understood. Insecticide timing and efficacy trials were performed in the field to determine the impact different active ingredients have on western bean cutworm feeding on dry bean plants. Greenhouse and laboratory studies were also conducted to examine larval survival and oviposition preference. Low damage levels were seen in insecticide field trials with minor differences in efficacy between the differing active ingredients tested. Moths looking for oviposition sites do not appear to be influenced by dry bean market class when given access to eight market classes simultaneously. When examining larval feeding in a no-choice study, both market class and tissue type appear to be important factors in determining larval survival.

PP-11:

Identifying spinach cultivars with reduced susceptibility to Fusarium wilt

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Spinach cultivars were screened for susceptibility to Fusarium wilt caused by the soilborne pathogen *Fusarium oxysporum* f. sp. *spinaciae* (Sherb.) Snyd. & Hans. Field trials were conducted in July and August of 2012 and 2013 in naturally infested soils in Hamilton, Ontario. Disease severity was assessed six weeks after seeding using a 0-4 scale. A vascular discolouration index was also used to rate the infection within the taproot on a scale of 0-3. A total of 25 cultivars were screened in 2012, eight of which were selected to be repeated in 2013. The seed of all the cultivars was treated with the fungicides metalaxyl and thiram. In 2013, the disease incidence was 75% lower than in 2012. The cultivar Norgreen had the highest disease severity at 18% and the highest vascular discolouration at 44%. This cultivar was also highly susceptible in 2012 with a disease severity of 38% and vascular discolouration of 59%. Both cultivars Unipack 12 and Greyhound had a disease severity of 8% and vascular discolouration of 33% in 2013. The remaining cultivars used in 2013 (C2606, Carmel, Sardinia, POH-0438 and Imperial Green) experienced disease severity of less than 5% and vascular discolouration ranging from 16-28%. The Asian-leaf spinach varieties Imperial Green and POH-0438 were found to have lower disease severity than the standard-leaf spinach varieties. Although no spinach cultivars were identified as resistant to Fusarium wilt, the differences in the susceptibility of different cultivars can be useful for cultivar selection and possibly for breeding for resistance.

PP-12:

Evaluating nematicides for the control of root-knot nematodes on carrots in Ontario

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Recently 1,3-Dichloropropene and similar fumigants were removed from the market in Canada, so damage to carrots (*Daucus carota* L., subsp. *sativus* (Hoffm.) Arcang) caused by northern root-knot nematode (*Meloidogyne hapla* Chitwood) has become a constraint to production. In June 2013 a growth room trial was conducted to evaluate additional nematicides for registration. Muck soil was inoculated with *Meloidogyne hapla* and treated with Busan 1236 (metam sodium 42.5%) at 210 L a.i./ha, Dazitol (capsaicin 0.42%, allyl isothiocyanate 3.7%) at 59 L a.i./ha, MustGrow (oriental mustard seed meal 100%) at 840 kg a.i./ha, Movento (spirotetramat 240 g/L) at 685 g a.i./ha, Agri-Mek (abamectin 2%) at 2 L a.i./ha, and MCW-2 (fluensulfone 15%) at 4 kg a.i./ha. An inoculated and non-inoculated check was also included. Carrots cv. Cellobunch were seeded into conetainers in a randomized complete block design. The results indicated that carrots treated with Busan, abamectin and the non-inoculated check had a lower average gall rating than carrots treated with Movento and the inoculated check. Carrots treated with Busan, MCW-2, abamectin, and the non-inoculated check had a higher percentage of healthy plants than MustGrow, Dazitol, Movento, and the inoculated check. Carrots treated with Busan and abamectin had larger root weight per plant than Movento and the inoculated check. The treatment of Busan had lower percent germination than the inoculated check. Carrots treated with MCW-2 did not differ significantly from carrots treated with the grower standard of Busan in average gall rating or percentage of healthy plants.

PP-13 (Undergraduate Student):

Monitoring pests and beneficial insect populations in sprayed and unsprayed hop yards

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The Ontario hop industry is comprised of both conventional and organic growers. A survey was conducted in 2013 to identify the major insect and disease pests and beneficial insects in both conventional and organic hop yards and determine the impact of pesticide application on their populations. Insect and disease pests and beneficial insects were monitored biweekly from May to August in one conventionally sprayed and one unsprayed hop yard in Norfolk County, Ontario. 10 plants per yard were visually assessed for pests and beneficials. Additionally, sticky traps were placed at field edges each week and a sweep net was used to collect mobile insects. Plants were also tapped to detect other mobile insect species. 30 leaves were collected from the randomly selected plants at each scouting date and examined under a dissecting microscope for mites and presence of both damaging and beneficial insects and their eggs. Based on preliminary results, both pest and beneficial insect populations tended to be higher in the unsprayed hop yard than in conventionally sprayed yards. Despite the higher population of beneficials in the unsprayed yard, there was also more pest damage in these yards. The main pests identified in the survey were two-spotted spider mites, hop downy mildew, leaf hoppers, and Japanese beetles. Flea beetles, aphids and viruses were also identified. Beneficial insects identified in the hop yards included lacewings and predatory mites. The information collected in this project will eventually be used as part of the development of an integrated pest management program for Ontario hops.

Invited Oral Presentation Abstracts

Media are from Mars, Scientists are from Venus – Why the research community must reach out

Tim Lougheed
Science Writer and Journalist, Ottawa, ON, K1K 2A5

Discussions of making researchers better communicators generally start — and usually stop — with the notion of making them more media savvy. Workshops or handbooks advise scientists on how journalists go about their jobs and how best to deal with their inquiries, leaving a conviction that communication is best left in the hands of these same journalists, and that public outreach revolves around satisfying the interests of media. This may be convenient for busy researchers, but it falls far short of satisfying the interests of the scientific community. Few journalists have the necessary time, motivation, or background to seek out stories from this community, yet most members of that community would likewise insist that they themselves have neither the time, the motivation, or the background to develop formal communication strategies. Nevertheless, it is well worth taking active charge of the way your work is portrayed, rather than hoping some reporter will take on the daunting task of highlighting the value of research in an engaging, accurate fashion. You may never have wanted to be famous, but it is important to become more than a bit player in the stories that are told about you, and to serve as the author of those stories. It will mean more work for people who are already overworked, yet it may be the only way of overcoming the haphazard way in which Canadians now perceive and support the country's research enterprises.

The two spotted spider mite *Tetranychus urticae:* a herbivore that is eating your plants as well

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The two spotted spider mite *Tetranychus urticae* is a cosmopolitan agricultural pest with an extensive host plant range and an extreme record of pesticide resistance. *T. urticae* represents one of the most polyphagous arthropod herbivores, feeding on more than 1100 plant species belonging to more than 140 different plant families including species known to produce toxic compounds. It is a major pest in greenhouse production and field crops, destroying annual and perennial crops such as tomatoes, peppers, cucumbers, strawberries, maize, cotton, soy, apples, grapes, and citrus. Our international research consortium sequenced and annotated spider mite genome that represents the first complete chelicerate genome. The analysis of the spider mite genome reveals signatures of polyphagy and detoxification associated with feeding on different hosts. Deep transcriptome analysis of mites feeding on different plants shows how this pest responds to changing host environments. Molecular analysis of reciprocal spider mite-Arabidopsis and spider mite-tomato interaction responses provides new insights for understanding the fundamentals of plant-herbivore interactions and development of novel pest management strategies.

Cyflumetofen – a new miticide for Canadian growers from BASF

Andreas Boon
BASF Canada, Guelph, ON, N1H 8C8

Cyflumetofen belongs to the benzoylacetonitrile class of chemistry and is believed to represent a new mode of action in the management of phytophagous mites. Cyflumetofen had been investigated for use in various crops such as pome fruit, grapes, tomatoes and vegetables. The characteristics of this new class of chemistry and North American performance results will be reviewed.

FMC – New for 2014

Wayne Myers
FMC Corp, Mississauga, ON, L5K 2M1

Topics will include a short history of FMC, information on the Focus Herbicide Tank-Mix for 2014, and an overview of new products currently in development by FMC.

Regular Poster Abstracts

RP-1:

The influence of fungicide program and timing on the incidence of fruit rot in mature and overripe Ontario processing tomatoes.

Cheryl Trueman
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Tomato fruit rots such as anthracnose (*Colletotrichum* spp.) and black mould (*Alternaria* spp.) cause economic losses for processing tomato growers, particularly when weather conditions delay harvest or accelerate maturity late in the season. A trial was conducted at the Ridgetown Campus, University of Guelph, Ridgetown, ON, Canada in 2013 to evaluate the effect of fungicide program (chlorothalonil or azoxystrobin alternating with chlorothalonil), fruit maturity (normal or overripe), and the timing of the last fungicide application (28, 14, or 7 days before harvest (DBH)) on fruit rot incidence. A split-split-plot with fungicide program as the main plot, fruit maturity as the split-plot, and fungicide application timing as the split-split-plot was used. Nontreated controls for each level of fruit maturity were included. Total rots in overripe tomatoes treated with azoxystrobin alternating with chlorothalonil were 37 to 52 percent lower than the overripe control. Anthracnose incidence on overripe fruit was 64 percent lower in the azoxystrobin alternating with chlorothalonil treatment when fungicide applications ended 28 DBH than 7 DBH. Black mould incidence for fruit with normal maturity was 57 percent lower when fungicide applications ended 28 DBH than 7 DBH, regardless of fungicide program. Preliminary results indicate that applying fungicides up to 28 DBH is as or more effective than continuing applications up to 7 or 14 DBH for management of fruit rot. However, late season applications of broad-spectrum fungicides such as chlorothalonil may be beneficial for other reasons such as prevention of late blight (*Phytophthora infestans*).

RP-2:

Application method impacts coverage

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It has long been postulated that there is a significant difference in spray deposition when an agrichemical product is applied using an airblast sprayer versus a handgun. An airblast sprayer employs air to carry spray into a canopy, to open the canopy, and to expose all foliage surfaces to the spray. A hand gun relies on hydraulic pressure to propel droplets into a canopy and while there is some air-entrainment surrounding the spray, it cannot travel as far or displace as much canopy as an airblast sprayer. It is therefore surprising that a random environmental scan of products intended for use in an airblast sprayer and registered in the last 10 years in Canada and the US indicated that 20% were tested using a handgun. In 2012 and 2013, spray deposition was quantified and compared in grape, apple, peach, highbush blueberry and raspberry from an airblast sprayer, handgun and mistblower. The results demonstrate that spray deposition from the airblast sprayer and mistblower are comparable, but are 3 to 4 fold higher than deposition from a handgun. These results indicate that products intended for crops that traditionally employ airblast sprayers should be tested with either airblast or mist blowers. A standardized operations protocol should be devised for the Pest Management Regulatory Agency, AAFC's Pest Management Centre, agrichemical companies and independent consultants to test product efficacy and residuals using either airblast or mist blowers when the end-user is expected to employ an airblast sprayer.

RP-3:

Evaluation of fungicides and cultivars for management of asparagus Phytophthora Crown, spear and root rot

Catarina Saude, C. Bakker and M.R. McDonald
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Asparagus (*Asparagus oficinalis* L.) is an important vegetable crop in Ontario where 80% of the Canadian crop is produced. Phytophthora crown spear and root rot (PCSRR) caused by the oomycete *Phytophthora asparagi* was found on infected asparagus spears collected from production fields in Norfolk and Chatham-Kent counties in 2011. Water soaking, shrivelling of roots and spears, and spear curving are the characteristic symptoms associated with PCSRR. In 2012, field trials were conducted at the Simcoe Research Station, University of Guelph, to evaluate asparagus cultivars for resistance to *P. asparagi* and the efficacy of fungicides and biofungicides in controlling the pathogen. Asparagus cultivars Millennium, Jersey Giant, Pacific Challenger, UC 157, UG005 and UG020 inoculated with *P. asparagi* infected millet, and the fungicides Zampro (1L/ha), Phostrol (5.8L/ha) Ranman (0.44L/ha) Ridomil (25kg/ha) and Experimental A (1400mL/ha), and the biofungicides Sonata (9.4L/ha), Previcur N (1.5 mL/L), Actinovate (840g/ha), Oxidate (1.0L/100L) and Prev-Am(391mL/100L) were evaluated. Drench applications of the products were applied twice 30 days apart. Disease severity was rated monthly using a 0-5 scale and the disease ratings were used to calculate the disease severity index (DSI). Phytophthora crown spear and root rot of asparagus was reduced by the fungicides Experimental A and Zampro, followed by Ranman, Ridomil and Phostrol. The biofungicides were less effective in reducing PCSRR but reduced the disease when compared to the untreated check. All asparagus cultivars were susceptible to PCSRR but cultivars UG005 and UG020 were less infected.

RP-4:

Organically-acceptable insecticides as potential management options for the swede midge, *Contarinia nasturtii*

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The swede midge, *Contarinia nasturtii*, is an introduced species that has become established as a serious pest of cruciferous vegetables in North America. With 4-5 overlapping generations per year in southern Ontario, adult and larval stages of swede midge are present in crucifer fields throughout the growing season. Conventional producers achieve some control of swede midge with foliar insecticides. Organically-acceptable insecticides and cultivars with short developmental windows present potential management alternatives for organic producers. Organic insecticide trials conducted on field-grown broccoli in 2011 and 2013 compared foliar applications of Pyganic (1.4% Pyrethrins, McLaughlin Gormley King Company), Entrust (80% Spinosad, Dow AgroSciences LLC), Leaf Shine (pure neem oil with 2,000 ppm Azadirachtin, Biofert Manufacturing Inc.) and Botanigard (*Beauvaria bassiana* Strain GHA, 4.4×10^{13} conidia/kg, Laverlam International Corporation) on broccoli in the field. The 2013 trial also compared the fast-developing broccoli cultivar 'Bay Meadows' to the slower-developing 'Windsor' cultivar. In 2011, foliar applications of the entomopathogenic fungus *Beauvaria bassiana* reduced swede midge damage, whereas the other organic insecticides did not. Preliminary 2013 data suggest that, in addition to some effect from insecticides, the 'Bay Meadows' cultivar – with a shorter period of susceptibility – sustained lower levels of damage than the 'Windsor' cultivar. These results suggest that management of swede midge in organic systems requires an integrated approach, where a combination of tactics, could effectively reduce damage

and protect crop yields.

RP-5:

Fungicide spray timing for the management of stemphylium leaf blight in onions

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Stemphylium leaf blight of onion (*Allium cepa* L.), caused by *Stemphylium vesicarium* (Wallr.), has been observed in the Holland/Bradford Marsh, Ontario. The disease leads to yield losses. In 2013, disease forecasting systems were tested in a field trial conducted in the Holland/Bradford Marsh region of Ontario to determine if disease management could be improved. A randomized complete block design with four replicates per treatment was used. Treatments were: Application of fungicide following Botcast (the botrytis leaf blight forecasting model), Tomcast with Disease Severity Value 20 and 30 (forecasting model for early blight, septoria leaf spot and fruit anthracone), spraying following first time spore is found on spore trap rods and standard calendar spray schedule. For all the treatments, Quadris Top (azoxystrobin 18.2%, difenoconazole 11.4%) fungicide was used. An untreated control was also included. Treatments were applied using a CO_2 backpack sprayer. Plots were assessed weekly and rated for stemphylium leaf blight using a scale 0-9, where 9 = >85% foliar area diseased per plot. The rating was used to calculate the area under the disease progress curve (AUDPC). After the final fungicide application, ten plants from each replicate were pulled and assessed for percent of foliage infected. There were no significant differences among the treatments in the AUDPC, but differences in stemphylium leaf blight severity were found. The fungicide applied at various periods reduced disease severity by 24-34% compared to the untreated control. Three sprays applied following Botcast provided equivalent control as the other spray timings that resulted in five sprays.

RP-6:

Evaluation of Fumigants and Nematode-Suppressive Cover Crops for Control of Soil-Borne Pests of Ginseng

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With the loss of the industry standard fumigant Telone in 2011, the Ontario ginseng industry required information on the efficacy of alternatives to control soil-borne nematodes and diseases. A trial was established at a commercial ginseng farm in 2010 near Turkey Point, Ontario. Nematode suppressive cover crops (Cutlass mustard, daikon radish, and fodder rape) were seeded in June 2010 and incorporated at flowering six weeks later. The fumigants chloropicrin, metam-sodium, and telone + chloropicrin were applied in August 2010 according to label directions. Unfumigated and no cover crops controls were included in the trial which was arranged in a split block design with fumigant as the main plot and cover crop as the subplot and four replications. In a seedling assessment in 2011, damage from root lesion nematode (*Pratylenchus penetrans*) was lowest in the metam-sodium treatment and highest in the unfumigated control. At the final harvest assessment in 2013, total root yield was not significantly affected by fumigation due to variability in the trial, but was numerically highest in all fumigated plots. Metam-sodium-fumigated roots were more pencil shaped, a more desirable grade. Unfumigated plots had the highest level of rusty root disease and had more roots in less desirable grades. Based on both root assessments, metam-sodium may provide better control of root lesion nematodes and chloropicrin may provide better control of fungi causing rusty root. Both fumigants provided comparable yields to telone + chloropicrin. Cover crops had no impact on damage

from nematodes or diseases throughout the trial. Research is necessary on pre-plant soil pathogen tests to better match the available fumigants to specific ginseng fields.

RP-7:

Brown Marmorated Stink Bug on the Move: A Survey in Southern Ontario During 2013

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Brown marmorated stink bug (*Halyomorpha halys* Stål) is an invasive pest native to subtropical and temperate areas of East Asia. It has over 150 documented host plants in North America including important fruit, vegetable and agronomic crops, and ornamental trees and shrubs. Where established, BMSB causes significant widespread economic losses in a diversity of agroecosystems. In 2001, BMSB was identified in Pennsylvania, and has since been detected in 40 states – recently including California. It exhibits shelter-seeking behaviour in the fall, which contributes to widespread distribution in cargo, vehicles and railcars. In August 2012, an established breeding population was confirmed in Hamilton, ON. In 2013 an extensive survey of 264 sites placed in 4 landscape designations was initiated in southern Ontario. Egg masses, larvae and adults were collected using several techniques from May 1 to Sept. 30, 2013. Pheromone traps containing lures from the USDA were tested for efficacy from mid-August to mid-October in selected high-risk locations. Results of this survey will be presented in terms of overall counts and BMSB's apparent transition from urban to agricultural areas.

RP-8:

Pesticide risk assessment for non-target invertebrate pollinators

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Effects of pesticides on non-target invertebrate pollinators, specifically the honey bee (*Apis mellifera*), have been the focus of scientific interest for decades. For a number of reasons, including their adaptability to laboratory research, commercial value and importance in agriculture and global presence, honey bees have been widely adopted as the surrogate for other non-target terrestrial invertebrates and insect pollinators in pesticide risk assessments. Today, the issue of pollinator health and pesticides is a rapidly changing social, scientific and regulatory issue. Recent reports of honey bee collapses have been reported in the media, scientific studies are being conducted at an increasing pace, and regulatory agencies (e.g., US EPA, EFSA, OECD) are initiating new risk assessment and pesticide registration guidelines for bees. Here we present a history of scientific publications on the issue of bees and pesticides, a summary of past and recent government and international agency reports on bee risk assessment and toxicity testing approaches, a summary of government agency and international agency white papers and a summary of recent non-governmental organization papers.

RP-9:

Colletotrichum acutatum in Ontario horticultural crops

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Colletotrichum acutatum is a common plant pathogenic fungus that can infect and cause disease on a wide variety of hosts and is distributed worldwide. It is the causal agent of anthracnose in berries, bitter rot in apples and recently identified as the causal agent of leaf curl of celery. Under suitable conditions, the fungus can spread rapidly in susceptible plants, causing economic damage to crops before symptoms are recognized. In recent years, the incidence of diseases caused by *C. acutatum* in susceptible crops grown in Ontario has increased. We will describe some of the crops affected by this fungus, including increasing reports of bitter rot from apples throughout Ontario, strawberry anthracnose in day neutral strawberry and confirmations of *Colletotrichum acutatum* in both Ontario celery (Celery leaf curl) and goji berry (anthracnose).

NOTES

Post Event Evaluation – Ontario Pest Management Conference

Thank you for responding to the following questions. Your feedback will assist us in evaluating today's conference and improving future sessions.

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

6. 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.