ONTARIO PEST MANAGEMENT CONFERENCE
OPM 2011

9th Annual

November 3, 2011

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

Website: www.opmconference.ca

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AGENDA

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

We thank Kristen Callow for IT support throughout the morning and afternoon sessions.

MORNING SESSION

Morning Session Chair: Dr. Tara Gariepy (Research Scientist, AAFC)

9:00 am **Welcome: Jeff Tolman**, Chair, Ontario Pest Management Conference.
Opening Remarks: Rob Gordon, Dean, Ontario Agricultural College

9:15 am Tales from the thrypt: Microbes and management. **Michael Brownbridge**, T. Saito, A. Brommitt and R. Buitenhaus.

9:35 am Glyphosate-resistant giant ragweed in Ontario: Survey and Control. **Joe Vink**, F. Tardif and D. Robinson. (Student Competition)

9:50 am Differentiation between *Aphid pomi* and *Aphis spiraecola* using multiplex real-time PCR based on DNA barcode sequences. **Amanda Naaum**, R.G. Footit, H. E. L. Maw, R. Hanner. (Student Competition).

10:05 am **Plenary Speaker:**

Dr. George Sundin

"Detection and management of streptomycin resistance in fire blight and fungicide resistance in apple scab pathogens"

10:35 am – 11:05 am **Coffee Break and Poster Viewing**

11:05 am New crop registrations for PROWL H2O. **Greg Wilson**, BASF.

11:15 am Aphid Advisor: A smartphone app for soybean pest management. **Rebecca Hallett** and T. Baute.

11:35 am Efficacy of Serenade and Prestop against clubroot is affected by soil type. **Hema Kasinathan**, B.D. Gossen, G. Peng, M.R. McDonald. (Student Competition)

11:50 am Mechanisms of resistance to glyphosate in giant ragweed (*Ambrosia trifida* L.) in Ontario. **Amanda Green**, F. Tardif and P. Sikkema. (Student Competition).

12:05 pm - 1:15 pm **Lunch and Poster Viewing**

AFTERNOON SESSION

Afternoon Session Chair: Kristy Grigg-McGuffin (acting Apple IPM Specialist, OMAFRA)

1:15 pm **Plenary Speaker:**

Dr. David Mota-Sanchez

"Survival of the fittest: One hundred years of global arthropod adaptation to pesticides"

1:45 pm Phenology and degree day requirements of *Ceratoma trifurcate* (Coleoptera: Chrysomelidae) in Ontario and implications for pest management. **Cara McCreary**, J. Smith, T. Baute, G. Boland, A. Schaafsma and R. Hallett. (Student Competition)

2:00 pm Detection and quantification of airborne inoculum of *Sclerotinia sclerotiorum* using a SYRB quantitative PCR assay. **Monica Parker**, M.R. McDonald and G. Boland. (Student Competition)

2:15 pm The brown marmorated stink bug: Coming to a field near you? **Hannah Fraser**

2:35 pm TWINLINE, a new multiple mode of action cereal fungicide. **Trevor Kraus**, BASF.

2:45-3:00 pm **Coffee Break and Poster Viewing**

3:00 pm **Plenary Speaker:**

Dr. Ian Heap

"The world's worst herbicide-resistant weeds"

3:30 pm Corky root and vine decline in Ontario processing tomatoes. **Ken Conn**, J. Traquair, C. Trueman and J. LeBoeuf.

3:50 pm Sulfoxaflor, a new class of insecticide for the control of sap-feeding insects. **Paul Foran,** Dow AgroSciences

4:00 pm Herbicide selection using your smartphone. **Mike Cowbrough**

4:20 pm **Presentation of Student Competition Award Winners –** Jeff Tolman
Closing Remarks and Adjourn

PLENARY SPEAKERS

Dr. George Sundin – Professor, Department of Plant Pathology
Michigan State University

Biography

George W. Sundin is a Professor of Plant Pathology at Michigan State University. He received his B.S. degree in biology from Penn State University, M.S. degree in plant pathology from Michigan State University, and Ph.D. in plant pathology from Oklahoma State University. In 1997, he joined the faculty in the Department of Plant Pathology and Microbiology at Texas A&M University with a research emphasis in phytobacteriology. He subsequently moved to Michigan State University in 2002 maintaining his research program in phytobacteriology and adding research and extension responsibilities in tree fruit disease management. His current research centers on the *Erwinia amylovora* fire blight pathosystem with projects ranging from basic studies of pathogen-host interactions to developing improved chemical and biological approaches for fire blight management. The Sundin lab also works on bacterial plasmid genomics and on the development and management of bactericide and fungicide resistance in tree fruit pathogens.

"Detection and management of streptomycin resistance in fire blight and fungicide resistance in apple scab pathogen"

Streptomycin-resistant (Sm^R) strains of the fire blight pathogen *Erwinia amylovora* were first isolated in southwest Michigan in 1991. Since that time, resistant strains have progressed northward to other apple-producing regions in the state. A total of 98.7% of Sm^R strains isolated between 2003 and 2009 in Michigan harbored the *strA-strB* genes on transposon Tn*5393*. *strA* and *strB* encode phosphotransferase enzymes that modify streptomycin to a non-bactericidal form. Our genetic analyses of Sm^R strains have shown that only two genotypes are responsible for the current statewide distribution of resistance. Current strategies for managing resistance include using the alternative agricultural antibiotic kasugamycin and an increased emphasis on cultural practices. Some measure of host resistance is needed though for sustainable management of fire blight. Multiple fungicide resistance is present in *Venturia inaequalis* strains from Michigan and Indiana orchards including resistance to sterol inhibitors and more recently, the QoI class of fungicides. Spore germination assays and a PCR assay to detect the G143A mutation confirmed that QoI resistance was widespread in Michigan and in Ontario. Management of fungicide resistance for apple scab control now relies on protectant fungicides and means more applications. A new fungicide class available in 2012 is also at risk of resistance development. Thus, again host resistance is needed. Ironically, host resistance to apple scab is available, but most of those varieties are currently not economically viable.

Dr. David Mota-Sanchez - Assistant Professor, Department of Entomology
Michigan State University

Biography

Dr. David Mota-Sanchez is an Assistant Professor in the Department of Entomology at Michigan State University. His research focuses on the evolution of arthropod resistance to pesticides, IPM and insecticide resistance management at the global and local scale, and movement and metabolism of pesticides in insects and plants. In Colorado potato beetle, the fourth most resistant species to pesticides in the world, he has shown that resistance to imidacloprid conferred cross-resistance to another six neonicotinoids. He has also shown that resistant beetles metabolize more imidacloprid than susceptible beetles. In addition, he is also working on codling moth resistance in fruits. At MSU, in collaboration with Dr. Mark E. Whalon and Dr. Robert M. Hollingworth he manages the MSU Arthropod Pesticide Resistance Database (www.pesticideresistance.org) which tracks cases of arthropod resistance globally since 1908. The web site receives about 500,000 visits per year.

"Survival of the fittest: One hundred years of global arthropod adaptation to pesticides"

Resistance is a widespread phenomenon whereby arthropod populations develop the ability to avoid the lethal effects of normally fatal concentrations of one or more pesticides. The occurrence of pesticide resistance frequently leads to the increased use, overuse, and even misuse of pesticides that pose a risk to the environment, phytosanitation, market access, global trade, and public health. It can also result in serious economic loss and social disruption. Arthropods have been evolving for millions of years to defeat natural toxins, and now 574 species and 10,000 cases of pesticide resistance have been counted, most of which have been recorded over the last 60 years of intensive pesticide use (http://www.pesticideresistance.com). Most of the cases were found in agricultural, forest and ornamental plants (65.9%). Another 30.6% occurred in medical, veterinary and urban pests. Only 3.1% of the cases reported described the development of resistance in natural enemies such as predators and parasitoids, 0.4% in other species such as pollinators, and non-target insects. Conventional insecticides (organochlorines, organophosphates, carbamates and pyrethroids) made up about 85.2% of the total resistance cases. Limitations in the use of conventional insecticides should reduce the cases of resistance in these groups. In contrast, increased resistance cases have occurred in groups of compounds with novel chemistries and modes of action such as insect growth regulators, avermectins, neonicotinoids, IGRs, bacterial agents and spynosins, among others. It is our intention that this effort in reporting arthropod pesticide resistance should contribute to the design of better alternatives for resistance pest management; and in the end contribute to the world's effort to reduce hunger, and improve human and animal health and food security.

Dr. Ian Heap – Director, International Survey of Herbicide Resistant Weeds
Corvalis Oregon

Biography

Ian is an Australian weed scientist and completed his Ph.D. at the University of Adelaide on "Multiple-resistance in annual ryegrass (Lolium rigidum)" the first case of a herbicide resistant weed in Australia and multiple resistance worldwide. Ian then continued research on herbicide-resistant weeds at the University of Manitoba in Canada, and Oregon State University. Ian has published numerous papers and book chapters on herbicide-resistant weeds. He is currently resides in Corvallis, Oregon and is the director of the "International Survey of Herbicide-Resistant Weeds".

"The world's worst herbicide-resistant weeds"

There are now more than 365 biotypes of herbicide resistant weeds found in over 60 countries. Herbicide-resistant weeds threaten the sustainability of modern agriculture more today than in any time in the past. To add to the problem industry is no longer producing new herbicide modes of action and in many countries growers are relying on a narrow range of herbicides applied to herbicide tolerant crops. The most prominent example is the overreliance of glyphosate in Roundup Ready Soybean, Corn, Cotton, Canola, and Sugarbeets. Twenty one species have evolved resistance to glyphosate worldwide, in large part due to the massive increase in the use of glyphosate in Roundup Ready crops. The looming problem is not just the selection of glyphosate-resistant weeds, but the selection of weeds with resistance to multiple herbicide modes of action, potentially totally destroying the effectiveness of herbicides in our cropping systems. The "International Survey of Herbicide Resistant Weeds" (WeedScience.Com) has been tracking the appearance of resistant weeds globally for over three decades. The database itself is a useful tool to identify which herbicides and weeds are most prone to resistance and to serve as a tool to predict future herbicide-resistance problems. The world's worst herbicide resistant weed is Rigid Ryegrass (*Lolium rigidum)* which has evolved resistance to herbicides in 11 different herbicide modes of action in 12 countries and 9 cropping regimes over 1.5 million ha. Pigweeds (*Amaranthus sp*.), Fleabanes (*Conyza sp*.), Barnyardgrasses (*Echinochloa sp*.) and Ryegrasses (*Lolium sp.)* contain some of the world's worst herbicide resistant weeds and will present global agriculture with serious challenges over the next decades.

– CROP LIFE STUDENT COMPETITION –

Student Oral Presentations:

OP-1 Glyphosate-resistant giant ragweed in Ontario: Survey and control. **Joe Vink**, P. Sikkema, F. Tardif, D. Robinson, M. Lawton

OP-2 Differentiation between *Aphis pomi* and *Aphis spiraecola* using multiplex real-time PCR based on DNA barcode sequences. **Amanda Naaum**, R. G. Foottit, H. E. L. Maw, R. Hanner

OP-3 Efficacy of Serenade and Prestop against clubroot is affected by soil type. **Hema Kasinathan**, B.D. Gossen, G. Peng and M.R. McDonald.

OP-4 Mechanisms of resistance to glyphosate in giant ragweed (*Ambrosia trifida* L.) in Ontario. **Amanda Green**, F.J. Tardif, P.H. Sikkema.

OP-5 Phenology and degree day requirements of *Cerotoma trifurcata* (Coleoptera: Chrysomelidae) in Ontario and implications for pest management. **Cara McCreary**, J. Smith, T. Baute, G. Boland, A. Schaafsma, R. Hallett.

OP-6 Detection and quantification of airborne inoculum of *Sclerotinia sclerotiorum* using a SYRB quantitative PCR assay. **Monica Parker**, M.R, McDonald and G. Boland.

Judges: Kristen Callow - OMAFRA (Judging Supervisor)

1. Sean Westerveld – OMAFRA
2. John Purdy – Canpolin
3. Cary Gates – Flowers Canada (Ontario)
4. Pam Livingston – E.I. DuPont Canada

Student Poster Presentations:

PP-1 Use of the entomopathogenic fungus *Beauveria bassiana* to control Western flower thrips, *Frankliniella occidentalis*, in strawberry. **Maryam Sultan**, C. Scott-Dupree and M. Brownbridge. **UNDERGRADUATE (Time of judging = 9:05 to 9:20**)

PP-2 Temperature effects on the overwintering survival and date of emergence of the bean leaf beetle (*Cerotoma trifurcate*). **Emily Robinson**, R. Hallett, and J. Newman. **(Time of judging= 9:25 to 9:40)**

PP-3 Determining the influence of greenhouse climatic parameters on the use of predatory mites for management of western flower thrips (*Frankliniella occidentalis*) on ornamental crops. **Laura Hewitt**, C. Scott-Dupree, L. Shipp and R. Buitenhuis. **(Time of judging = 9:45 to 10:00)**

PP-4 New strategies to improve the efficiency of *Orius insidiosus* for western flower thrips biocontrol in greenhouse ornamental crops. **Meghann Waite**, C. Scott-Dupree, M. Brownbridge, R. Buitenhuis and G. Murphy. **(Time of judging = 11:05 to 11:20)**

PP-5 Too much work, not enough tarsi: Effect of group size on *Bombus impatiens* queen-less worker reproduction. **Angela Gradish**, C. Scott-Dupree, A. McFarlane and A. Frewin. **(Time of judging = 11:25 to 11:40)**

PP-6 Methods to control herbicide resistant pigweed (*Amaranthus retroflexus L., A. powellii*, S. Watson and *A. hybridus* L.). **Bridget Visser** and K. Callow. **UNDERGRADUATE (Time of judging = 11:45 to 12:00)**

PP-7 Barcoding of commercial biological control agents: Implications of observed divergence patterns. **Andrew Frewin**, R. Hanner and C. Scott-Dupree. **(Time of judging = 12:55 to 1:10)**

PP-8 Exclusion fencing and organic insecticides for control of the swede midge, *Contarinia nasturtii,* in organic agricultural systems. **Braden Evans**, K. Jordan, M. Brownbridge, R. Hallett. **(Time of judging = 1:55 to 2:10)**

PP-9 Monitoring for a new invasive species, brown marmorated stink bug, in Ontario field crops. **Morgan Kluka**, R. Hallett and T. Baute. **UNDERGRADUATE (Time of judging = 2:15 to 2:25)**

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

Judges: Kristen Callow – OMAFRA (Judging Supervisor)

1. Jason Deveau – OMAFRA
2. Peter White – AAFC
3. Marion Paibomesai – OMAFRA
4. Catarina Saude – University of Guelph

-REGULAR POSTER PRESENTATIONS -

RP-1 Herbicide resistant pigweed in Ontario. **Kristen Callow**, B. Visser and B. Annett.

RP-2 SR&ED grower scale herbicide resistant pigweed trial. **Kristen Callow** and B. Annett.

RP-3 When is resistance activated in canola cultivars resistant to clubroot? **Abhinandan Deora**, B. Gossen and M.R. McDonald.

RP-4 Evaluation of fungicides for control of downy mildew (*Pseudoperonospora cubensis* (Berk. & M. A. Curtis) Rostovzer) on slicing cucumber (*Cucurbita moschata* Dutch.). **Catarina Saude**, A. McKeown and M.R. McDonald.

RP-5 Does it work? Orius banker plants in commercial greenhouses. **Rose Buitenhuis**, A. Brommit, M. Waite.

RP-6 Tiny travelers - Are predatory mites homebodies or adventures? **Angela Brommit** and R. Buitenhuis.

RP-7 Demonstrating the carrot trimmer for the control of white mold in Ontario. M.R.McDonald and **Dennis Van Dyk**.

RP-8 Evaluation of foliar insecticides for the control of onion thrips in Ontario, Canada. M.R. McDonald and **Laura Riches**.

RP-9 Evaluation of different fungicides for control of stemphylium leaf blight in onions. **Michael Tesfaendrias** and M.R. McDonald.

RP-10 Integrated pest management for muck vegetable crops. **Michael T. Tesfaendrias** and M.R. McDonald.

RP-11 Update on spotted wing drosophila in Ontario. **Hannah Fraser**, M. Appleby, D. Beaton, P. Fisher, L. Huffman, J. LeBoeuf and W. McFadden-Smith.

ABSTRACTS

Crop Life Student Competition Abstracts

Student Oral Presentations:

OP-1:

Glyphosate-resistant giant ragweed in Ontario: Survey and control

Joe Vink[1], P. Sikkema[1], F. Tardif[2], D. Robinson[1], M. Lawton[3]
[1] Department of Plant Agriculture, University of Guelph-Ridgetown, Ridgetown, ON
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Giant ragweed (*Ambrosia trifida*) is an extremely competitive weed and lack of control in soybean could lead to significant yield losses for Ontario producers. In 2008, a giant ragweed biotype near Windsor, ON was not controlled with glyphosate and further testing confirmed it as the first glyphosate-resistant (GR) weed in Canada. Giant ragweed seed was collected from 102 sites in Essex (63), Kent (21), Lambton (10) and Waterloo (1) counties and Pelee Island (7) to document the occurrence and distribution of GR giant ragweed in Ontario. Giant ragweed seedlings were sprayed with glyphosate at 1800 g ae ha^{-1}, and evaluated 1, 7, 14 and 28 days after application. Results from the survey confirmed that there are at least 48 sites in southwestern Ontario with GR giant ragweed. The majority of the sites were found in Essex county, but there was one each in Chatham-Kent and Lambton. Five field trials were established at several sites with GR giant ragweed during the 2010 and 2011 growing seasons. The objectives were to determine the level of giant ragweed control with higher rates of glyphosate, glyphosate tank mixes applied preplant and glyphosate tank mixes applied postemergence. Control of giant ragweed increased with higher rates of glyphosate, but only at rates that are not economical for producers. The most effective glyphosate tankmixes were 2, 4-D, saflufenacil, linuron, and cloransulam-methyl providing 97, 87, 85 and 84% control 4 WAA, respectively. Dicamba, in dicamba tolerant soybeans, was very effective for the control of GR giant ragweed at the three confined field trial locations.

OP-2:

Differentiation between *Aphis pomi* and *Aphis spiraecola* using multiplex real-time PCR based on DNA barcode sequences

Amanda Naaum[1], R. G. Foottit[2], H. E. L. Maw[2], R. Hanner[1]
[1]Department of Integrative Biology, University of Guelph, Guelph, ON
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The green apple aphid (*Aphis pomi)* and the spirae aphid (*Aphis spiraecola*) are pests of apples in North America. Though management regimes exist to effectively control these pests, they differ significantly due to varying susceptibility of each species to common pesticides and differences in their life cycles. Accurate identification of these species is essential to pest control, but the identification process is complicated due to the morphological similarity between them and misidentification can occur. DNA barcoding has been proven to accurately identify species of Aphididae, and more specifically to differentiate *A. pomi* and *A. spiraecola*. DNA barcoding represents an important step towards rapid identification of these pests as distinctions can be easily made between morphologically similar species as well as from eggs and immature individuals in addition to adults. However, samples must still be sent to specially equipped facilities for analysis, which can take from several hours to days. Real-time PCR is emerging as a useful tool for more rapid pest identification. The purpose of this study was to develop a real-time PCR assay for differentiation of *A.pomi* and *A. spiraecola* based on DNA barcode sequences from the Barcode of Life Data System. This assay was designed on the portable SmartCycler II platform and can be used in field settings to differentiate these species in less than 2 hours. It was found to be an accurate and rapid method and has the potential to be a valuable tool to improve pest management of *A. pomi* and *A. spiraecola*

OP-3:

Efficacy of Serenade and Prestop against clubroot is affected by soil type.

Hema Kasinathan[1], BD. Gossen[2], G. Peng[2] and M.R. McDonald[1]
[1]Department of Plant Agriculture, University of Guelph, Guelph, ON
[2] Agriculture and Agri Food Canada Research Centre, Saskatoon SK
Email Contact: hkasinat@uoguelph.ca

Clubroot of canola is caused by *Plasmodiophora brassicae* (Woronin). A study was conducted to determine if soil type: muck soil (pH ~ 6.2), mineral soil (pH ~ 6.8), non-calcareous sand (pH ~ 6.5) and soil-less mix (pH ~ 6.0), influences the efficacy of the biofungicides Serenade (*Bacillus subtilis*) and Prestop (*Gliocladium catenulatum*) against *P. brassicae* under controlled environmental conditions (25°/20° C day/night). There were three factors: soil type, biofungicide, and pathotype (3 and 6). Canola seeds (cv: 46A76) were sown in muck soil and soil-less mix and transplanted into sand and mineral soil. Serenade (5% v/v) and Prestop (7.5 g L^{-1} of water) were applied 5 days after germination. Three days later, each seedling was inoculated with a suspension of 1 x 10^5 *P.brassicae* resting spores mL^{-1}. Clubroot severity was assessed 6 weeks after inoculation using a 0–3 scale**,** and a disease severity index (DSI, range 0–100) was calculated. Pathotype 3 resulted in slightly more clubroot (74% incidence, DSI = 52) than pathotype 6 (65% incidence, DSI = 43). The most important interaction was biofungicide x growing media. Incidence was low in plants treated with Prestop grown on mineral soil (53% incidence) and soil-less mix (32% incidence), and severity was lower on mineral soil (DSI = 33) and muck soil (DSI = 43) than the check (DSI = 58). Serenade was effective only in sand (55% incidence, DSI = 33). These results indicate that growing medium is an important factor in evaluation of biofungicides.

OP-4:
Mechanisms of resistance to glyphosate in giant ragweed (*Ambrosia trifida* L.) in Ontario

Amanda Green [1], F.J. Tardif[1], P.H. Sikkema[2]
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[2]Department of Plant Agriculture, University of Guelph-Ridgetown, Ridgetown, ON
Email Contact: agreen02@uoguelph.ca

Glyphosate resistant giant ragweed has been found in Ontario since 2008. The mechanism of resistance has yet to be determined. Resistant plants exhibit two different phenotypes after glyphosate treatment. One phenotype from Windsor exhibits an unusual rapid necrosis in mature leaves while the growing points escape injury. The other phenotype from Leamington exhibits similar symptomology to a susceptible plant but recovers and regrows after a week. The objectives of the experiments are to determine the level of resistance, and to investigate possible mechanisms of resistance. A dose response experiment comparing two resistant populations to two susceptible populations revealed the Windsor and Leamington populations to have a resistant index of 6.5 and 4, respectively. Target-site sensitivity was determined through a shikimate assay. Shikimate is the dephosphorylated substrate of the enzyme 5-enolpyruvylshikimate-3-phosphate synthase which is the target site of glyphosate. Leaf discs collected from young and mature tissue were placed in assay solutions of glyphosate in microtiter plates, incubated under light and shikimate was extracted and quantified. All populations had an accumulation of shikimate in the young tissue. In the old tissue the Windsor population had minimal accumulation and the Leamington population had similar accumulation to the susceptible population. [^{14}C]- glyphosate was used to measure absorption and translocation. Absorption levels of resistant and susceptible populations were similar. A greater amount of [^{14}C]- glyphosate was retained in the treated leaf, less translocated to the roots and a similar amount translocated in an upwards direction in the Windsor population compared to a susceptible population.

OP-5:
Phenology and degree day requirements of *Cerotoma trifurcata* (Coleoptera: Chrysomelidae) in Ontario and implications for pest management

Cara McCreary[1], J. Smith[2], T. Baute[3], G. Boland[4], A. Schaafsma[2], R. Hallett[1]
[1]School of Environmental Sciences, University of Guelph, Guelph, ON
[2] Department of Plant Agriculture, University of Guelph-Ridgetown, Ridgetown
[3] Ontario Ministry of Agriculture, Food and Rural Affairs, Ridgetown, ON
[4] Department of Plant Agriculture, University of Guelph, Guelph, ON
Email Contact: cmccrear@uoguelph.ca

Cerotoma trifurcata (Forster) (Coleoptera: Chrysomelidae), bean leaf beetles, are leaf feeding beetles that feed on plants belonging to Fabaceae. Adult feeding on leaves, stems, pods and peduncles and larval feeding on roots and rhizobium nodules can impact soybean health and production. Phenology of *C. trifurcata*, although unknown in Ontario, differs throughout North America. Cage studies were conducted in soybean fields to determine the number of generations that occur in three counties in southern Ontario. Cages were artificially infested with *C. trifurcata* and destructively sampled every 10 days. Soil and soybean root samples collected throughout the soybean growing season showed one cycle of eggs, larvae and pupae. Field-collected *C. trifurcata* were reared in environmentally controlled growth chambers using five temperature regimes. Mating pairs of adults were placed in containers with soybean foliage. Eggs collected from adult containers were distributed amongst the different temperatures and larvae were fed cowpea cotyledons until pupation occurred. Complete generations were successfully reared at four of the five temperatures and time required for life stage development was recorded. Degree day requirements for development of *C. trifurcata* from egg to adult were established from temperature data recorded within cages and from beetles reared in growth chambers. Pest management decisions based on one summer generation should target overwintered beetles post emergence.

OP-6:

Detection and quantification of airborne inoculum of *Sclerotinia sclerotiorum* using a SYRB quantitative PCR assay

M. Parker[1], M. R. McDonald[1] and G. Boland[2]
[1]Department of Plant Agriculture, University of Guelph, Guelph, Ontario
[2]School of Environmental Sciences, University of Guelph, Guelph, Ontario
Email Contact: parkerm@uoguelph.ca

Sclerotinia sclerotium is a destructive pathogen causing yield losses in a broad range of agricultural crops, including carrot. A quantitative polymerase chain reaction (qPCR) assay to detect and quantify airborne inoculum of *S. sclerotium* as a component of the Sclerotinia rot of carrot (SRC) forecast model is being developed. Various PCR primers and target genes have been evaluated to date and one primer pair has been particularly promising. This primer pair targets the mitochondrial small subunit rRNA intron and ORF1 DNA sequence. The sensitivity of the qPCR assay was high, having a limit of detection of 5 ascospores. The assay was also specific for *S. sclerotiorum*, and DNA from selected phylogenetically-related species and other fungi potentially occurring in bioaerosols of the Bradford Marsh was not amplified. The qPCR assay is being evaluated for its utility in detecting *S. sclerotiorum* from air samples collected using a Burkard Multi-Vial Cyclone Sampler. An endogenous control is being tested to monitor DNA extraction and amplification for each air sample and to detect inhibitors that may be present in the bioaerosols. The qPCR assay is further being compared to the blue plate test, which is the current method of the SRC forecast model to detect and quantify *S. sclerotiorum*. The preliminary results suggest that this qPCR assay is a reliable method that could be used as a component of the SRC forecast model.

Student Poster Presentations:

PP-1:

Use of the entomopathogenic fungus *Beauveria bassiana* to control western flower thrips, *Frankliniella occidentalis*, in strawberry

Maryam Sultan[1], C. Scott-Dupree[2], and M. Brownbridge[3].
[1] Department of Plant Agriculture, University of Guelph, Guelph, ON
[2] School of Environmental Sciences, University of Guelph, Guelph, ON
[3] Vineland Research and Innovation Centre, Vineland Station, ON
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Increased use of dayneutral varieties in commercial strawberry production systems has raised productivity and extended the growing season as plants are set at higher densities and produce several flushes of bloom. The continuous presence of strawberry bloom allows Western flower thrips (WFT) [*Frankliniella occidentalis*] populations to build up over an entire growing season as opposed to just a few weeks in fields grown using June-bearing varieties. WFT adults and larvae feed on flowers and berries and reduce fruit set, yield and market value of damaged fruit. At present, there is little information on population dynamics of WFT in commercial strawberry production systems in southern Ontario. Further, with WFT developing resistance to various classes of insecticides, alternative methods of control are being examined. The entomopathogenic fungus *Beauveria bassiana*, sold as BotaniGard® 22WP, has been registered in Canada for control of WFT in greenhouse crops. However, field applications might prove challenging as conidia are exposed to higher UV radiation levels. In this study, population dynamics of WFT in commercial strawberry fields in the Niagara region, Ontario were examined between May 6 and August 15, 2011. In addition, the persistence of viable conidia of *B. bassiana* was monitored under field conditions over a period of 9 days. Results indicated that WFT were present at above-threshold levels in commercial, dayneutral strawberry fields, and numbers of viable conidia rapidly declined on

sprayed leaf surfaces. Thus, there is a need for improved application methods for *B. bassiana* to control WFT in high-density production systems.

PP-2:

Temperature effects on the overwintering survival and date of emergence of the bean leaf beetle (*Cerotoma trifurcata*)

Emily Robinson, R. Hallett, and J. Newman
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With temperatures projected to increase substantially over the next fifty years, the success of agricultural pests could be affected in a number of ways, including by changes in overwintering survival. The bean leaf beetle (*Cerotoma trifurcata*), which has become a major pest of soybean in the Midwestern states and has spread into Canada, overwinters in the leaf litter of soybean fields or adjacent forests. While an increase in overwintering survival under higher temperatures has been observed in some insect pests, it is also possible that reduced snowpack from warmer air temperatures could make the litter layer colder and more vulnerable to freeze-thaw cycles, resulting in decreased overwintering survival. To look at these effects of temperature, adult beetles were placed outside in buried pots covered in leaf litter, and exposed to one of three treatment levels over the winter: heated to 4˚C above ambient using ceramic heat lamps; unheated, with snow cover left intact; and, unheated with snow manually removed, to determine the effect of the lack of snow cover versus heat. In the spring, the date of first beetle emergence and the proportion of beetles surviving the winter were determined. While there were few differences in overwintering survival between treatment levels, date of first emergence was approximately two weeks earlier in the heated pots. Earlier emergence times could prolong the season enough to allow for more than the current single generation per year, complicating management programs for this important pest.

PP-3:

Determining the influence of greenhouse climatic parameters on the use of predatory mites for management of western flower thrips (*Frankliniella occidentalis*) on ornamental crops

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The rapidly growing Ontario greenhouse industry provides a healthy supply of vegetables and plant material year-round to national and international markets. The industry holds a large share of the economic growth in Southern Ontario's main greenhouse areas of Essex and Norfolk County, as well as the Niagara region. Because greenhouse production is a very intensive agricultural practice, in order to balance costs and net profit while ensuring a quality product is delivered to the consumer, greenhouse growers are often faced with tough decisions of how funds will be allotted. Western flower thrips (*Frankliniella occidentalis)* (WFT) are a major pest of greenhouse flowers and vegetables. Their cryptic lifestyle and rapidly developed resistance to pesticides allows thrips to cause plant damage and crop reductions, which overall decreases profit. The predatory mites *Amblyseius swirskii* and *Neoseiulus cucumeris* are commercially available as biocontrol agents used for WFT control. *Amblyseius swirskii* often cost almost double that of *N. cucumeris*, and as a result their performance in summer and winter greenhouse conditions is being assessed to determine the most efficient pest management strategy involving their use. In a greenhouse experiment, small cages were used to monitor population levels of *A. swirskii* and *N. cucumeris*, and assess WFT damage under summer greenhouse conditions. WFT populations and plant damage decreased when *A. swirskii* and *N. cucumeris* were applied to individual plants. However, *A. swirskii* provided the greatest reduction in WFT numbers. These results will be compared to winter greenhouse data to determine which mite species is more advantageous based on the season.

PP-4:

New strategies to improve the efficiency of *Orius insidiosus* for western flower thrips biocontrol in greenhouse ornamental crops

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Successful use of the biological control agent, *Orius insidiosus* (Say), has been documented in greenhouse vegetable crops, such as sweet peppers, but has provided inconsistent results in ornamental crops. The objective of this study was to identify new strategies which could increase the efficiency of *O. insidiosus* as a biological control agent for western flower thrips (*Frankliniella occidentalis* (Pergande)) (WFT) in greenhouse ornamentals. The first strategy was to determine an optimal banker plant (BP) species which would provide a source of food and a location for *O. insidiosus* reproduce, thus resulting in a continuous supply of *O. insidious*. Seven potential BP species were compared by conducting 3 tests: i) ovipositional suitability; ii) nymphal development and survival; and iii) ability of a population to increase. Based on these tests, the Purple Flash ornamental pepper was determined to be the optimal banker plant species. The second strategy investigated was determining if the addition of supplemental food could augment the *O. insidiosus* population at times when there were minimal pests in the greenhouse. Two sources of supplemental food- cattail pollen (*Typha latifolia)* and eggs of the European flour moth (*Ephestia kuehniella) -* were added to the Purple Flash pepper (BP) and to Chrysanthemum crop plants. The third strategy investigated whether pheromone lures could be used to aggregate *O. insidiosus* into areas of the greenhouse where there are high concentrations of WFT. Three lures were tested including: i)'LUREM-TR' (Koppert); ii)'ThriPher' (BioBest); and iii) 'Predalure' (AgBio Inc.).

PP-5:

Too much work, not enough tarsi: Effect of group size on *Bombus impatiens* queen-less worker reproduction

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Bombus impatiens is a highly efficacious wild and commercial pollinator in North America. As pesticides generally remain a necessary resource for agricultural pest management, bumble bees are potentially at risk of exposure while visiting treated crops. Pesticides can induce detrimental sub-lethal changes to bumble bee life span, reproduction, or development, ultimately resulting in reduced pollination. To assess pesticides for such sub-lethal effects, a queen-less micro-colony method has been developed for *Bombus terrestris*, a species native to Europe. Groups of three workers are isolated and begin functioning as a colony, with one worker assuming the role of queen and laying unfertilized eggs destined to become males. The group then can be provided with treated pollen or nectar and observed for a variety of chronic, sub-lethal changes. Differences between these species in queen-right reproductive behaviour have been documented, and this may translate into a species difference in queen-less reproduction. Thus, to assess pesticide impacts to brood production, a modified, species-specific micro-colony method may be necessary for *B. impatiens*. Group size is known to influence reproduction in bees, and a higher number of *B. impatiens* workers may be required to achieve reproductive capacity comparable to *B. terrestris*. We investigated the influence of group size on *B. impatiens* queen-less worker reproduction in the context of developing a standardized method for assessing pesticide sub-lethal impacts on this species.

PP-6:

Methods to control herbicide resistant pigweed (*Amarathus retroflexus* L.*, A. powellii,* S. Watson *and A. hybridus* L.)

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Pigweed resistant to Group 7 (Lorox – linuron) and Group 5 (Gesagard / Sencor – prometryn / metribuzin) herbicides was documented in Simcoe County in 2010. In some cases, the weed species were resistant to both herbicide groups (multiple resistance) resulting in total crop failures from weed competition. Until herbicides with new modes of action are registered, growers need to find alternative methods to control resistant pigweed species. Three demonstration trials consisting of side by side comparisons of grower standards (control) and new techniques (treatment) were conducted. The control included herbicide applications, whereas, the treatment included various combinations of herbicide banding and cultivation. Weed counts were taken weekly, harvest assessments were collected and the economic costs of each treatment were calculated. There were very minor to no significant differences between the control and treatment for all evaluations. Therefore, growers can economically combine herbicide banding and cultivation to prevent the spread of herbicide resistant pigweed.

PP-7:

Barcoding of commercial biological control agents: Implications of observed divergence patterns

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Biological control is a key component of greenhouse integrative pest management (IPM) programs throughout the world. Numerous companies now rear and sell biological control agents (BCAs) for greenhouse pest control. Commercial arthropod colonies require replenishment with wild caught individuals on a regular basis to maintain high levels of fitness and hence BCA performance. However, this practice risks contaminating colonies with closely related species. These alternate species would eventually be sold to greenhouse producers with unknown ramifications for biological control programs. To facilitate the identification of BCAs for greenhouse producers, BCA suppliers, and researchers, we have constructed a DNA barcode reference library for many commercially available BCAs. We highlight instances of divergence within some 'species' and comment on potential management implications. Furthermore, we provide recommendations for researchers using commercially obtained BCAs.

PP-8:

Exclusion fencing and organic insecticides for control of the swede midge, *Contarinia nasturtii*, in organic agricultural systems

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Exclusion-barrier fencing trials and organic insecticide trials were conducted on broccoli in Elora and Zephyr, Ontario, in order to identify potential management options for the swede midge, *Contarinia nasturtii* Kieffer (Diptera: Cecidomyiidae), suitable for organic production systems. Fencing resulted in a reduction in swede midge damage compared to un-fenced plots, although a fencing-entomopathogenic nematode combination treatment did not present any enhanced reduction in damage as compared to the fencing alone. Late in the season, imported cabbage worm, *Pieris rapae* (L.), caused near-complete defoliation of broccoli plants within fenced plots compared to un-fenced controls. The organic insecticide trial 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 Botaniguard (*Beauvaria bassiana* Strain GHA, 4.4 x 10^{13} conidia/kg, Laverlam International Corporation). Foliar applications of the entomopathogenic fungus *Beauvaria bassiana* reduced swede midge damage, whereas the other organic insecticides did not. All fencing and foliar insecticide treatments sustained some swede midge damage over the course of the season. However fencing and *Beauvaria bassiana* limited swede midge damage to acceptable levels. 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.

PP-9:

Monitoring for a new invasive species, brown marmorated stink bug, in Ontario field crops

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The brown marmorated stink bug (BMSB), *Halyomorpha halys* (Stål), is an invasive species originating from Asia. First detected in Pennsylvania in 2001, the BMSB has since spread and established in over 30 states, and is considered a serious pest in the Mid Atlantic region. It was most recently found in a home in Hamilton Ontario in June 2011. The BMSB is an aggressive pest that will make a host out of an array of agricultural crops including field, vegetable and fruit, as well as ornamentals. As a proactive approach to detect its presence prior to it reaching economic levels, trap sites were established and field surveys conducted across southern Ontario in 2011. Several field corn and soybean fields were monitored during three sampling periods, targeting the reproductive stages of the crop when the pest would most likely be present. Results of the survey are discussed in detail.

Regular Presentation Abstracts

Oral Presentations Morning:

Tales from the thrypt: Microbes and management

Michael Brownbridge, T. Saito, A. Brommit and R. Buitenhuis
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Western flower thrips (WFT) is a pest of global significance, impacting many economically-important crops. Due to its high reproductive rate, cryptic habits, and lack of diapauses on greenhouse crops, repeated applications of active compounds have traditionally been required to achieve control. Consequently, WFT is now resistant to many classes of insecticide. Few conventional insecticides registered in Canada today effectively control WFT. Consequently, growers are increasingly turning to biological control agents as a means of regulating thrips in greenhouse floriculture. Recommendations and procedures developed for these natural enemies in vegetable crops though, do not translate directly to ornamentals. Furthermore, as tolerance for cosmetic damage is extremely low, a single biocontrol agent (the pesticide paradigm) rarely provides satisfactory levels of control. Strategic selection and use of several natural enemies together, within a bio-based IPM program, can provide an effective solution. Here, we report on trials to develop microbial biocontrol agents for thrips as fundamental components of a bio-based IPM strategy, including investigations on interactions between different microorganisms; by taking an integrated approach to their deployment, we are aiming to achieve maximum efficacy in the most cost-effective manner.

New crop registrations for PROWL H2O

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Prowl H20 is a new easier to use formulation that provides the same proven weed control. Prowl H20 is not only an easier product to use, but it will also be available in more crops. In 2012, growers will be able to use Prowl H20 in soybeans, adzuki, snap and lima beans.

Aphid advisor: A smartphone app for soybean pest management

Rebecca Hallett[1] and T. Baute[2]
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Aphid advisor is a pilot decision-making tool for growers and crop consultants to help determine whether a control action is warranted for soybean aphids (aphis glycines) on soybeans. Based on the scientific literature and research conducted at University of Guelph, this smartphone app uses aphid and natural enemy numbers, and aphid population growth rates, to indicate whether there are enough natural enemies to keep aphid

populations below action thresholds or if an insecticide application is needed.

Oral Presentations Afternoon:

The brown marmorated stink bug: Coming to a field near you?

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Insect pests rarely make the front page of national newspapers, nor do they feature prominently in some of the more popular forms of social media. The brown marmorated stink bug (BMSB), an invasive species native to Japan, Korea, Taiwan and China, has managed to achieve notoriety due to both its status as a nuisance pest in people's homes and its ability devastate agricultural crops. The first official North American detection of this pest occurred in Pennsylvania in the late 1990s. Due to its remarkable abilities as a hitchhiker, it has now spread to over 27 states (with sightings in several others) including those bordering Ontario, Quebec and British Columbia. In 2010 and again in 2011, BMSB emerged as a pest of unprecedented importance in orchard crops, small fruit, grape, vegetables, row crops, and ornamentals, causing severe losses in areas where it has become well-established. The presence of BMSB has disrupted many well-established IPM programs for horticultural crops, due to the difficulty in controlling migrating adults and the inability of most reduced-risk insecticides to provide acceptable levels of control. This presentation provides an overview of the biology, pest status, efficacy trials, monitoring efforts, management and prospects for biological control.

TWINLINE, a new multiple mode of action cereal fungicide

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TWINLINE is a new multiple mode of action fungicide for the control of key leaf diseases and AgCelence benefits in development by BASF. TWINLINE is made up of two proven active ingredients: metconazole and pyraclostrobin. Research trials have demonstrated that when applied on their own, both active ingredients are highly effective against all of the major leaf diseases in cereals as such the combination is also very effective.

Corky root and vine decline in Ontario processing tomatoes

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Symptoms of root rot were first reported in Ontario processing tomatoes in 2009. Several soilborne fungi have been isolated from the root lesions including *Pyrenochaeta terrestris*, *Pyrenochaeta lycopersici* (corky root rot), *Colletotrichum coccodes* (black dot), *Rhizopycnis vagum*, and *Fusarium* spp. Corky root rot symptoms are characterized by reddish-brown lesions that form bands around the roots. In severe cases many of the roots are rotted reducing the size of the root ball. Corky root rot appears to be associated with tomato vine decline which includes symptoms such as poor vine development, premature defoliation, and yield reduction. There have been instances of severe vine decline in Ontario tomato fields each year since 2009. Since 2009, research has been underway to better understand root rot and vine decline in Ontario tomato fields in order to potentially control this disease(s). Some of the questions that have been or are being addressed include what fungi are present in the root lesions, what is the role of all these fungi in this root disease complex, and what is the distribution of these fungi. Molecular tools are being developed for rapid detection of these fungi. The effectiveness of some potential control measures such as the fumigant Vapam and the plant defense inducer Actigard are being examined. A lot more research is needed to fully understand this disease complex and find potential control measures.

Sulfoxaflor, a new class of insecticide for the control of sap-feeding insects

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Sulfoxaflor controls economically important and difficult to control sap feeding insect pests such as tarnished plant bugs, many species of aphids, planter hoppers, scale, etc. An overview of Sulfoxaflor will be provided including mode of action, registration timelines and proposed crops, as well as field trial results.

Herbicide selection using your smartphone

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Herbicide selection can be overwhelming to Ontario producers since there are over 200 herbicides in the marketplace with significant variations in price, use rates, application timings, preharvest intervals, precautions and weed species that they control. In 2008 a herbicide selector, available at www.weedpro75.com was developed that would allow agronomists and producers to quickly narrow down to a handful of treatments that best address a particular field scenario. The database not only encompasses information from product labels, but has incorporated decades of publicly funded research projects that compared efficacy of herbicide programs on specific weed species and that identified the relative competitiveness of weed species. The inclusion of such information results in a decision tool that considers the biology of weeds, their impact on yield and the economic impact of individual management strategies. The database was recently been made available on mobile smartphones as a way for producers to glean information in the field during critical decision making moments. Since its launch in 2008, use of the herbicide selector has grown at a rate of 26% annually and was visited by over 3,500 people from May to August during the 2011 growing season. The most significant growth in the use of weedpro75 has been smartphone use. This project was made possible through support from the Grain Farmers of Ontario and the Agricultural Adaptation Council

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Regular Poster Abstracts

RP-1:

Herbicide resistant pigweed in Ontario

Kristen Callow[1], B. Visser[2] and B. Annett[1]
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Herbicide resistant pigweed is a distressing issue faced by vegetable producers across Ontario. A limited survey conducted in 2010 showed that there were pigweed plants resistant to Group 7 (Lorox – linuron) and

Group 5 (Gesagard / Sencor – prometryn / metribuzin).In response, OMAFRA, in partnership with the Holland Marsh Growers' Association and the University of Guelph, conducted a survey across Ontario to determine the extent and mechanism of the herbicide resistance. Over 50 fields with carrots in the rotation were sampled and the growers were surveyed to determine their herbicide use patterns. The pigweed samples were transplanted to a contained outside nursery. As the seed heads matured they were harvested and the seeds were cleaned and stored. The seeds from each field will be tested to identify what types of resistance have been found. Growers will then be provided with recommendations on how to manage their resistance problems.

RP-2:

SR&ED grower scale herbicide resistant pigweed trial

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Group 7 (Lorox – linuron) and Group 5 (Gesagard / Sencor – prometryn / metribuzin) resistant pigweed (redroot, green and smooth) have been identified in all carrot producing regions within Ontario. In partnership with a carrot grower, OMAFRA conducted a Randomized Complete Block Design (RCBD) farm scale trial to determine which herbicide treatment would be the safest on the carrots and provide the best control of the resistant pigweed. This trial was made possible through the Scientific Research and Experimental Development (SR&ED) Tax Incentive Program provided by the Canada Revenue Agency. The trial included five treatments: Untreated Control; Lorox PRE, Lorox POST (Grower Standard); Lorox + Dual II Magnum PRE, Goal Tender POST; Lorox + Prowl H_2O PRE, Goal Tender POST; Nortron PRE, Nortron POST. Each treatment was 60 m x 37 m. Three quadrants of 0.25 m^2 were used to count the number of carrots and the number of pigweed weekly throughout the duration of the experiment. The PRE herbicide applications did not have a significant impact on carrot emergence. The pigweed population was greater than 500/m^2, resulting in multiple weed flushes and a lack of total efficacy. The treatments that provided the best control were:
Lorox + Dual II Magnum PRE, Goal Tender POST and Lorox + Prowl H_2O PRE, Goal Tender POST

RP-3:

When is resistance activated in canola cultivars resistant to clubroot?

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Several commercial cultivars of canola (*Brassica napus* L.) with resistance to clubroot [*Plasmodiophora brassicae* Woronin] have been registered recently in Canada. However, little is known about the mechanism of resistance in these lines, e.g. how and when resistance is expressed. Time series assessments of root hair infection and cortical infection were made in inoculated seedlings of four commercial cultivars that differed in reaction to two pathotypes (P3 and P6, Williams system) of *P. brassicae*: cvs. '45H29' (resistant), 'Invigor 5030' (partially resistant), '46A76' (susceptible), and '45H21' (susceptible to P3, resistant to P6). For assessment of root hair infection (RHI), seedlings were harvested at 4, 8 and 12 days after inoculation (DAI). For assessment of cortical infection (CI), plants were harvested at 16, 22, and 28 DAI. RHI occurred quickly in compatible (susceptible cultivar x pathotype) combinations and more slowly in incompatible combinations. The maximum RHI for both reactions was about 65%, except on 'Invigor 5030' where RHI was >60%. At 28 DAI, CI was high in '46A76' (P3 = 45%, P6 = 35%), intermediate in 'Invigor 5030' (P3 = 23%, P6 = 16%), and no CI (0%) was observed for either pathotype in '45H29'. In '45H21', CI caused by P3 was high (35%), but P6 resulted in no CI (0%). CI caused by P3 was consistently higher than for P6 in compatible reactions. Although there were small differences in the pattern of RHI associated with resistance, the largest impact of resistance was on CI.

RP-4:

Evaluation of fungicides for control of downy mildew (*Pseudoperonospora cubensis* (Berk. & M. A. Curtis) Rostovzer) on slicing cucumber (*Cucurbita moschata* Dutch.)

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Cucumber Downy Mildew (CDM) is a devastating disease that is caused by the oomycete *Pseudoperonospora cubensis*. Effective fungicides are crucial for CDM control, but these must be applied before infection occurs. Monitoring CDM spores is essential in managing the disease since spores can be detected before plant infection. Field trials were conducted in 2010 at the Simcoe Research Station, to evaluate the efficacy of fungicides in controlling CDM, and the effectiveness of spore trapping in monitoring *P. cubensis*. A rotorod spore trap was placed on untreated cucumbers and rods were examined three times per week from 16 June to 26 July. Treatments were: Bravo, Ridomil Gold, Aliette, Ranman, Revus, Phostrol, Reason, Acrobat, Serenade Max, Ridomil Gold alternated with Bravo, Presidio and QGU42. Treatments were arranged in a randomized complete block design with four replications. A CO_2 backpack sprayer was used to apply the fungicides. Plots were assessed weekly for CDM incidence and severity. Downy mildew severity was rated using a 0-10 scale (0= no lesions, 10 = dead leaf) and the ratings were used to calculate disease severity index. *Pseudoperonospora cubensis* spores were detected on spore traps on 23 June. Product applications started on 25 June and the CDM. First CDM symptoms were observed on 5 July. QGU42 gave the best control and high yields, followed by Ranman and Presidio. Bravo alone or alternated with Ridomil provided moderate control and intermediate yields. Yields and CDM severity of treatments with Acrobat, Serenade Max, Reason, Ridomil alone, Aliette and Phostrol were similar to the untreated check.

RP-5:

Does it work? Orius banker plants in commercial greenhouses

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Growers of greenhouse ornamentals would like to use the predatory bug *Orius insidiosus* (Say) to improve biological control of western flower thrips (*Frankliniella occidentalis* (Pergande)) (WFT). The problem is that this predator is slow to establish in the crop, especially in ornamentals where pest tolerance is very low and prey is scarce. Regular repeated releases of *Orius* would be needed to maintain a population of predators in the crop, but this is not a cost effective strategy. Several growers are now experimenting with 'Black Pearl' pepper plants as banker plants for *Orius*. Banker plants provide supplemental food and reproduction sites to *Orius* to maintain a constant supply of predators into the crop for pest control. The objective of this study was to follow the populations of *Orius* and thrips on 'Black Pearl' pepper banker plants and in the crop in multiple commercial greenhouses growing ornamentals to determine factors for success or failure of this strategy. Over the course of several months we saw that populations of *Orius* were closely related to the number of flowers on the banker plants. Against all expectations, we found few *Orius* in the crop. Factors that contributed to these results are discussed and future studies to improve the performance of the *Orius* banker plant strategy are identified.

RP-6:

Tiny travelers - Are predatory mites homebodies or adventures?

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When using predatory mites for biological control in greenhouses, the most important question is: how do I get the mites on every plant? Nowadays we have the choice among several inventive solutions, including broadcasting, blowing and slow release sachets. Mites distribute themselves quickly throughout vegetable crops, but does this hold true for ornamentals, especially in potted flowers? We studied the dispersal of two predatory mites *Amblyseius swirskii* and *Neoseiulus cucumeris* on 3 different crops and production systems, potted chrysanthemum in final spacing, gerbera propagation trays and begonia cutting production trays. In all trials, predators were released from a central point and plants were sampled in order to determine how many mites dispersed and how far they went. Results showed that when plant canopies were not touching, about 90% of the mites remained on the release plants, with only 10% dispersing to neighboring plants. However, when canopies of the release plant and the neighboring plants were touching, mites distributed themselves among all the plants. The presence or absence of thrips as prey did not have any effect on mite dispersal behaviour. These results demonstrate that it is important to ensure good coverage of the crop when distributing predatory mites in a biological control program, especially when the leaves of individual plants are not touching. Although they are able, the predators seem very reluctant to walk over soil or ground cover.

RP-7:

Demonstrating the carrot trimmer for the control of white mold in Ontario

Mary Ruth McDonald and **D. Van Dyk**

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Sclerotinia rot of carrot (*Sclerotinia sclerotiorum (Lib) de Bary*) is one of the most destructive problems in the storage of carrots. In 2009, a project was established to develop and demonstrate a carrot trimmer in the Holland Marsh by the University of Guelph with the support of the Pesticide Risk Reduction Program of Agriculture and Agri-Food Canada's Pest Management Centre. Field trials were conducted at two sites in the Holland Marsh, Ontario in organic soil naturally infested with *S. sclerotiorum*. Carrot foliage was trimmed at both sites in mid-September using a tractor mounted custom built carrot trimmer to remove approximately 20% of the foliage between the raised beds. Disease assessments and yield samples were completed mid-October. Yield was determined by taking two 1.16 m sections of row which were then stored in Filacell storage at ≈ 1° C, 95% RH. A 2 m section was visually assessed for sclerotinia infection in petioles and in the between-row foliage mat. There were no carrots infected with *Sclerotinia* in the trimmed treatment, compared to 12% infected carrots in the untrimmed carrots at one site. Sclerotinia infection was very low (<2%) at the second site. No differences in marketable yield were found between trimmed and untrimmed carrots at harvest. The samples were assessed at 2, 4 and 6 months in storage and no differences in percent of infected carrots or marketable weight were found between the treatments.

RP-8:

Evaluation of foliar insecticides for the control of onion thrips in Ontario, Canada.

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Onion thrips (*Thrips tabaci* L.) is the most important foliar pest of onions in Ontario and it is important to test the effectiveness of new insecticides proposed for registration in Canada. A field trial was established in the Holland Marsh to evaluate several insecticides for control of thrips. On 11 May, onions, cv. Tahoe, were seeded into organic soil, pH ≈ 7.0, organic matter ≈ 57.0%. Thrips were first counted on 15 July when the threshold of one thrips per leaf was reached, followed by the first application of insecticides on 19 July. Five thrips counts and four treatment applications were made on a weekly basis. Spray applications were made using a tractor-mounted sprayer fitted with AI TeeJet® Air Induction Even Flat spray tips (AI9503 EVS) at 120 psi, delivering 500 L water/ha. Products used in treatments were: insecticides Concept (imidacloprid plus deltamethrin), Delegate (spinetoram), Movento (spirotetramat), Agri-Mek (abamectin), and Dibrom (naled), surfactants Agral 90, and Sylgard and bioinsecticide Met52. Thrips pressure was high throughout late July and August. At the 15 August assessment, the untreated check and onions treated with 4 applications of Met52 had 156 and 169 thrips per plant, while onions treated with four applications of Delegate or two applications of Movento followed by two applications of Delegate had 7 and 5 thrips per plant respectively.

RP-9:

Evaluation of different fungicides for control 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 since 2008. In 2010 yield losses were associated with this disease but there are no registered fungicides for stemphylium leaf blight of onions in Canada. In 2011, a field trial was conducted in the Holland/Bradford Marsh region of Ontario to determine the efficacy of several fungicides on stemphylium leaf blight incidence and severity. A randomized complete block design with four replicates per treatment was used. Treatments were: Pristine (pyraclostrobin 25.2%, boscalid 12.8%), Bravo 500 (chlorothalonil 50%), Manzate 750F (mancozeb 75%), Switch 62.5WG (cyprodinil 37.5%, fluodioxinil 25.0%), Fontelis 20SC (penthiopyrad 20%), Inspire (difenoconzole 23.2%) and Luna Tranquility (fluopyram 11.3%, pyrimethanil 33.8%). 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. All of the fungicides reduced disease compared to the untreated control. The new products, Fontelis, Luna Tranquility and Inspire were most effective in reducing stemphylium leaf blight with 19.8, 20.7 and 24.5% foliar leaf with symptoms respectively, as compared to 67% in the untreated control. There were no significant differences among the treatments in the AUDPC.

RP-10:

Integrated pest management for muck vegetable crops

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Integrated pest management (IPM) is an integrated approach to crop management with the primary aim of protecting crops from significant damage inflicted by pathogens, weeds and insect pests, while minimizing pesticide use. An IPM program is provided to growers in the Holland/Bradford Marsh, Ontario, by the Muck Crops Research Station in cooperation with of the Holland Marsh Growers' Association, the Agricultural Adaptation Council, the Bradford Coop and chemical companies. The main objectives of the project are: to scout growers' fields for diseases, weeds and insect pests, to provide growers with disease and insect forecasting information, and to identify and diagnose diseases, insect pests and weeds. In 2011, 70 commercial vegetable fields, totaling 808 acres, were intensively scouted for 30 growers. IPM updates also made available to all growers. From 2 May to 10 September, 2011, the research station received 157 samples for diagnosis as part of the IPM program. Of these, 87.3% were diseases. The distribution of samples was: onion (44%), carrot (18%), celery (7%), lettuce (2%) and other crops (29%). In the same period of 2011, there were 16 samples of insects and insect damage, and 4 weed identifications. The IPM program provides disease and insect forecasting based on insect traps, spore traps, disease forecasting models BOTCAST, DOWNCAST, and BREMCAST, and degree day models. The disease and insect forecasts, weather information and the IPM update are posted on the Muck Crops Research Station's web site (www.uoguelph.ca/muckcrop) and e-mailed to growers, industry, academia and OMAFRA experts.

RP-11:

Update on spotted wing drosophila in Ontario

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Spotted wing drosophila (SWD) is an invasive vinegar fly of Asian origin that has the potential to cause extensive damage to many soft-skinned crops including berries, stone fruit, some grapes, and possibly tomatoes. This insect was first identified in California in 2008, followed by Florida, Oregon, Washington and British Columbia (BC) in 2009. National surveys conducted by the Canadian Food Inspection Agency in 2010 resulted in additional finds in Quebec, Manitoba, Alberta and Ontario. In 2011, a network coordinated by OMAFRA was established to document the occurrence of SWD in Ontario. Commercial traps (Contech Enterprises Inc.) baited with apple cider vinegar (Heinz Canada) were deployed beginning in early May until the end of October at over 50 sites, on commercial farms in 16 counties and two urban markets. Trap contents were collected on a weekly basis to prevent the degradation of samples and to maintain the attractiveness of the bait. The first detection of SWD occurred in early July at an urban market. The first field detection occurred in the second week of August, and by mid September, SWD had been detected on 13 commercial farms in Essex, Halton, Kent, Norfolk, Niagara, Ottawa / Carleton and Oxford. While few individuals were captured, numbers in traps and the number of positive sites showed a general increase as the season progressed, consistent with reports of the pest in other jurisdictions. Late harvested crops are at a higher risk for damage. Berry crops (especially blackberries and fall-bearing raspberries) that are beginning to ripen are particularly attractive to SWD.

NOTES

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.

ONTARIO PEST MANAGEMENT CONFERENCE

OPM 2011