Canadian Weed Science Society

Société canadienne de malherbologie

65th Annual Meeting
November 21st-24th, 2011

65e Réunion annuelle
21 au 24 novembre 2011

Marriott Gateway on the Falls
Niagara Falls, Ontario

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CWSS-SCM 2011 Annual Meeting—Schedule

Date	Time	Topic	Location
Sunday November 20th	13:00 – 17:00	Board of Directors Meeting on Strategic Plan – review and update; determine strategic plan for upcoming year, assign responsibilities, milestones and deadlines.	Fallsview Private Dining Room
Date	**Time**	**Topic**	**Location**
Monday November 21st	08:30 - 17:00	Board of Directors Meeting (Continental Breakfast and Buffet Lunch in Room) Committee meetings if required.	Fallsview Private Dining Room
	12:00- 17:15	Niagara Wine and Scenery Pre-Conference Tour	Hotel Lobby
	16:00 – 20:00	Registration Poster and Commercial Display Setup	Oakes Foyer
	17:00- 18:00	Board Members and Graduate Students Meet & Greet	Oakes Foyer
	18:00- 21:00	General Membership Meet & Greet	Oakes Foyer
	19:00- 22:00	Presidents Dinner-Executive and Plenary Speakers	Fallsview Private Dining
Date	**Time**	**Topic**	**Location**
Tuesday November 22nd	07:30 – 08:30	Continental Breakfast. Commercial Displays & Poster Viewing – Authors Present	Oakes Foyer
	7:30 – 17:00	Registration	Oakes Foyer
	08:30 – 17:00	Poster and Commercial Display Viewing	Oakes Foyer
	08:00	Opening Welcome & Announcements	Oakes Ball Room
	8:15 – 10:00	**Plenary Session: Herbicide Resistance** 1. Plenary, part 1, Introduction - **Chris Hall** 2. Resistance to photosystem II inhibitors: more than just atrazine - **François Tardif** 3. Resistance to ALS inhibitors - **Mike Owen** 4. Managing Graminicide Resistance: Acetyl-CoA Carboxylase Inhibitors - **Hugh Beckie** 5. Resistance to glyphosate - **Jeff Stachler**	Oakes Ball Room

		6. Refreshment Break and Poster Viewing 7. Resistance to auxinic herbicides - **Chris Hall** 8. Resistance to HPPD inhibitors - **Aaron Hager** 9. Management of antibiotic resistance in livestock production - **Shiona Kaastra**	Oakes Foyer
	11:40 – 12:00	Plenary Session – Herbicide Resistance Cont'd	Oakes Ball Room
	12:00 – 13:30	Lunch	Oakes Ball Room
	13:30-15:00	**Graduate Student Research Project Presentations**. The latest in weed science research from universities across Canada.	Oakes Ball Room
	15:00-	**Refreshment Break & Poster Viewing**	Oakes Foyer
	15:30-17:00	**Graduate Student Research Project Presentations (cont'd)**	Oakes Ball Room
Date	**Time**	**Topic**	**Location**
Wednesday November 23rd	7:00 – 8:30	Continental Breakfast Poster and Commercial Display Viewing	Oakes Foyer
	7:30 – 17:00	Registration	Oakes Foyer
	8:00 – 10:00 10:00 – 10:30 10:30 – 12:00	**Crucial Conversations:** A training workshop designed to equip participants with a straight forward step-by-step process for identifying and resolving performance gaps- those unpleasant realities standing in the way of organisational success. Justin Hale, VitalSmarts **Refreshment Break** **Symposium – Alternatives for Weed Management in Landscape Environments** 1. **The role of Sarritor for biological weed control**. Al Watson, University of McGill 2. **IPM strategies for weed management**. Pam Charbonneau- Ontario Ministry of Agriculture, Food and Rural Affairs	Oakes Ball Room Oakes Foyer Hennepin South

		3. **Corn gluten and non-chemical alternatives**. G. Stephenson, University of Guelph	
	10:30-11:15	**Concurrent Workshops (CCU accredited)** 1. Graduate Student Workshop. **"So what? and Who cares? Making your science, media friendly".** Owen Roberts, University of Guelph OR **2.** Tillage the forgotten mode of action. Summary: With the increase in herbicide resistant weeds and weed shifts there is one mode of action that has never had a case of weed resistance; tillage. Tremendous advances in machinery and guidance systems have made tillage an incredible powerful management tool, but you need a game plan. Mike and Greg will walk you through the roadmap for success. Facilitators: Greg Stewart and Mike Cowbrough, OMAFRA	Auditorium Hennepin North
	11:30 - 12:15	**3. Smartphone Tips and Tricks**. Summary: Today's smart phones have the power of many personal computers and provide a number of practical tools to make the job of a crop consultant, research technician or professor easier. Ian will demonstrate the most powerful functions that many of us are unaware of. Facilitator: Ian McDonald, OMAFRA OR **4. CSI – Crop Scene Investigation**: Handling the product inquiry. Complaint calls are never easy and can result in huge liabilities if handled incorrectly. What are the critical things to document? What service can a professional provide that leaves the grower with a positive experience? Steve Johns, Syngenta	Auditorium Hennepin North
	12:30 – 14:00	**Awards Banquet**	Oakes Ball Room

	14:00-15:00	**Poster viewing** – Authors Present	Oakes Foyer
	15:00 – 17:00	**Concurrent Program Sessions** 1. **Weed Control in Corn, Soybean and Edible Beans.** 2. **PMRA, CFIA Regulatory Issues and Provincial Weed Reports** 3. **Forage, Rangeland, Forestry and Industrial Vegetation Management** 4. **Alternatives for Weed Management in Landscape Environments - Discussion Panel**	Hennepin South Salon A Auditorium Hennepin North
	17:00 – 18:00	Meeting of CWSS-SCM 2011 and 2012 Local Arrangements Committees	Niagara
	18:00	Crop Life -Sponsored Reception	Oakes Ball Room
Thursday November 24th	7:30 – 10:00	Breakfast and CWSS-SCM Annual Business Meeting Call to Order at 8:30.	Oakes Ball Room
	10:00 – 12:00	**Concurrent Program Sessions – Contributed Papers** 1. **Weed Control in Cereals, Oilseeds & Pulses.** 2. **Weed Control in Horticulture & Speciality Crops** 3. **Weed Biology and Ecology**	Hennepin South Auditorium Hennipen North
	12:00 – 15:00	Conference Conclusion followed by CWSS-SCM Board Meeting	Fallsview Private Dining Room
	12:00 –	Industry meetings as required	

2011 Local Arrangements Committee Members

Task	Person(s) Responsible (1st named is Lead)
Committee Chair	Clarence Swanton University of Guelph
Sponsorship (National)	Kate Hyatt Bayer CropScience Guelph ON
Sponsorship (Local)	Harold Wright Syngenta Al Hamill Clay Switzer Gerry Stephenson Pam Livingston Dupont
Program – Plenary Session plus four workshops	Francois Tardif University of Guelph Clarence Swanton University of Guelph Peter Sikkema University of Guelph, Ridgetown Campus Mike Cowbrough Ontario Ministry of Agriculture, Food and Rural Affairs Chris Hall University of Guelph Pat Lynch M. Jugulam
Hotel	Clarence Swanton University of Guelph
A/V	Kevin Chandler University of Guelph
Posters	Diane Benoit Agriculture and Agri-Food Canada | Agriculture et Agroalimentaire Canada, Saint-Jena-sur-Richelieu QC
Chair of the Graduate	Rob Nurse, Agriculture and Agri-Food Canada | Agriculture et

Student Session	Agroalimentaire Canada, Harrow ON
Commercial Displays	Allan Kaastra (work with Sponsorship) Bayer CropScience, Rockwood ON
CropLife Reception	Kate Hyatt Bayer CropScience, Guelph ON
Scholarships & Awards/Awards Banquet	Nathan Boyd Nova Scotia Agricultural College
Publicity- CWSS-SCM	Anita Drabyk
Publicity-Local	Katie Zuccala Communications Officer Agriculture and Agri-Food Canada | Agriculture et Agroalimentaire Canada, Guelph ON
Registration Desk	Anita Drabyk plus University of Guelph graduate students
Photo Contest	Peter Smith University of Guelph Rob Grohs, University of Guelph Christy Shopshire, University of Guelph, Ridgetown Campus
Signage	Rob Nurse Agriculture and Agri-Food Canada | Agriculture et Agroalimentaire Canada, Harrow ON
CCA / CCSC CEUs	Pat Lynch
Budget & Finance	Anita Drabyk Darren Robinson University of Guelph, Ridgetown Campus Kate Hyatt Clarence Swanton
Publication(s)	Francois Tardif University of Guelph Chris Hall University of Guelph
Pre-Conference Tour	Kristen Callow Ontario Ministry of Agriculture, Food and Rural Affairs Fred Vaughn Vaughn Agricultural Research Services Ltd.

The Program Sections (and chairs) are

Cereals, Oilseeds and Pulses Dr. Robert (Bob) Blackshaw Weed Management Research/ Recherche de la gestion en malherbologie Agriculture and Agri-Food Canada/Agriculture et Agroalimentaire Canada, Lethbridge, Alberta	**Forage, Rangeland, Forestry and Industrial Vegetative Management** Michael Irvine Ontario Ministry of Natural Resources Nancy Cain CAIN VEGETATION INC. Acton, ON L7J 2Y2
Horticulture and Special Crops Rob Nurse Greenhouse & Processing Crops Research Centre, Harrow, ON	**Weed Biology and Ecology / Invasive and Noxious Weeds** Stephen Murphy University of Waterloo (Session moderator is Darby McGrath, University of Waterloo)
Soybean, Corn, and Edible Beans Peter Sikkema U of Guelph, Ridgetown, ON	**Provincial Reports/Regulatory Issues** Dave Ralph BC Ministry of Agriculture & Lands, Kamloops, BC

Plenary Session "Herbicide Resistance"

Agenda Tuesday Morning, November 22, 2011 (Oakes Ball Room)

8.15	**Plenary, part 1, Introduction**	Chris Hall
8:15	**Resistance to photosystem II inhibitors: more than just atrazine**	François Tardif
8:40	**Resistance to ALS inhibitors**	Mike Owen
9:05	**Managing Graminicide Resistance: Acetyl-CoA Carboxylase Inhibitors.**	Hugh Beckie
9:30	**Resistance to glyphosate**	Jeff Stachler
9:55	**Break**	
10:25	**Resistance to auxinic herbicides**	Chris Hall
10:50	**Resistance to HPPD inhibitors**	Aaron Hager
11:15	**Management of antibiotic resistance in livestock production**	Shiona Kaastra
11:40	**Panel discussion and questions**	

Biographies of Plenary Session Speakers

FRANÇOIS TARDIF

François Tardif is an Associate Professor in the Dept. of Plant Agriculture, University of Guelph. His research programs focus on weed management and weed biology in field crops and turf. One emphasis of his program is the understanding of herbicide resistance in weeds, so as to develop better resistance management strategies. Dr Tardif received his B. Sc., M.Sc. and Ph.D. from Laval University in Québec City, Québec, Canada, where he specialized in crop production and weed science. After completion of his studies, he went on to work in Adelaide, Australia to specialise in herbicide resistance. Dr Tardif has been at the University of Guelph since 1996 where he has taught weed science to graduate, undergraduate and diploma students and supervised M. Sc and Ph. D students. François has taken up to running a few years ago and would eventually like to run in a marathon.

MIKE OWEN

Mike Owen obtained his B.S. and M.S at the University of Iowa and his Ph. D. in weed science at the University of Illinois. Owen has been at Iowa State University since December 1, 1982 and joined the Agronomy Department in 1986. He has directed research on a number of topics including weed seedbank population dynamics, the genetic and physiological control of weed seed dormancy, the genetics and physiology of herbicide resistance in weeds and the herbicide research/demonstration project. Owen has also been active in service to the university including serving as faculty adviser for many sports clubs. Owen has directed numerous graduate students and provided in-service educational opportunities for international students. Owen serves as the Associate Chair of the Agronomy Department and is the President of the Iowa State University Faculty Senate. Personal interests include family, hockey, hunting, softball and fishing. Owen is USA Hockey Level III referee and local Referee-in-Chief. He also is a long-time ASA and IHSGAU Softball umpire.

HUGH J. BECKIE *P.Ag*

Hugh is a weed scientist at the Agriculture and Agri-Food Canada Research Centre in Saskatoon since 1996, and Adjunct Professor in the Department of Agricultural, Food and Nutritional Science, University of Alberta in Edmonton. He obtained his B.S.A. and M.Sc. degrees from the University of Saskatchewan, and Ph.D. in 1992 from the University of Manitoba. His research program deals with monitoring, risk assessment, and management of herbicide-resistant weeds as well as impact assessment of crops with novel traits.

Managing Graminicide Resistance: Acetyl-CoA Carboxylase Inhibitors. Beckie, H.J. Agriculture and Agri-Food Canada, Saskatoon, SK

Worldwide, there are populations of 41 grass weed species resistant to acetyl-CoA carboxylase (ACC) inhibitors (group 1/A), first commercialized in the mid- to late 1970s. Weed species or genera with high incidence of ACC-inhibitor resistance include Alopecurus, Avena, Echinochloa, Lolium, Phalaris, and Setaria spp. Wild oat (Avena fatua L.) and green foxtail [Setaria viridis (L.) Beauv.] are the two most abundant weeds with widespread ACC inhibitor-resistant populations in the Prairies of western Canada. Both target-site and metabolism-based resistance have been confirmed in Prairie wild oat populations. Farmers in this region rarely proactively manage these weed species to prevent or delay the selection for ACC-inhibitor resistance; they usually increase the adoption of integrated weed management practices only after intergroup herbicide resistance has evolved. The effectiveness of herbicide and nonherbicide practices to proactively or reactively manage ACC inhibitor-resistant wild oat and green foxtail are described, based on 15 yr of field trials, field-scale experiments, and field surveys in western Canada. Nonherbicide weed management practices, such as enhanced crop seeding rate, competitive crops and cultivars, and side-banded fertilizer placement, and nonselective herbicides applied preplant or in-crop –with less frequent use of selective herbicides in diversified cropping systems – have helped mitigate the evolution, spread, and economic impact

JEFF STACHLER

Jeff Stachler grew up on a diversified crop and livestock farm in West Central, Ohio. He received his B.S. in Agronomy from The Ohio State University in December, 1992 and his M.S. in Weed Science from Michigan State University in August, 1995. He was then employed by The Ohio State University Extension Service as a Weed Science Program Specialist from September 1995 to May 2008. Upon receiving his PhD in Weed Science from The Ohio State University in June, 2008, he moved to North Dakota. Jeff has been employed as Extension Agronomist – Sugarbeet/ Weed Science and Assistant Professor at University of Minnesota and North Dakota State University since May 2008. His other interests include church, gardening, fishing, and supporting FFA and 4-H.

CHRIS HALL

Dr. J. Christopher Hall is a pioneer in recombinant antibody technology. His significant contributions to this rapidly evolving field are recognized and supported by his designation as the Canada Research Chair in Recombinant Antibody Technology. A professor in the University of Guelph's School of Environmental Sciences, he leads a dynamic research group dedicated to advancing our understanding of antibody technology and herbicide physiology/biochemistry. Dr. Hall is also a founder and the Chief Scientific Officer of PlantForm Corporation, established in 2008 to provide low-cost subsequent-entry biologic drugs for cancer and other critical illnesses. A native of Sault Ste. Marie, Ontario, Canada, Dr. Hall graduated from the University of Guelph with a B.Sc. in Physical Sciences in 1976, a B.Sc. in Agriculture in 1978 and an M.Sc. in herbicide physiology/biochemistry in 1980. In 1985, he received a PhD in herbicide physiology/biochemistry from the University of Alberta. In 1985, he joined the Department of Environmental Biology (now the School of Environmental Sciences) at the Ontario Agricultural College, University of Guelph. In 2002, Dr. Hall was awarded the Tier 1 Canada Research Chair in Recombinant Antibody Technology. Tier 1 Canada Research Chairs are awarded to outstanding researchers acknowledged by their peers as world leaders in their fields. In 2009, Dr. Hall's CRC was renewed for another seven-year period. Dr. Hall received a Society Fellow Award from the Weed Science Society of America in 2002. He is co-editor of Pesticide Biotransformation in Plants and Microorganisms: Similarities and Divergences, and the author of more than 160 peer-reviewed manuscripts, including several book chapters.

AARON HAGER

Aaron Hager is an associate professor of extension weed science in the Department of Crop Sciences at the University of Illinois. A native of west-central Illinois, he was raised on a corn and soybean family farm. He attended Southern Illinois University, Carbondale and received a B.S. in Plant and Soil Science in 1991. He then went to Michigan State University and received his M.S. in weed science in May, 1993. Later that month, he joined the University of Illinois as a weed science extension specialist. In 2001, he completed his Ph.D. in weed science and joined the Department of Crop Sciences faculty ranks in 2002. As an associate professor of weed science at the University of Illinois, Aaron is responsible for weed biology and management research in corn and soybean production systems. His research focuses on examining the biology and management of weed species that are becoming increasingly common and problematic in Illinois. Additionally, Dr. Hager has responsibility for the production and annual revision of extension-related publications and coordination for several weed science educational programs in Illinois.

SHIONA GLASS-KAASTRA

Shiona Glass-Kaastra is currently finishing her Ph.D. in epidemiology in the department of Population Medicine at the Ontario Veterinary College of the University of Guelph, where she is developing a surveillance system for antimicrobial resistance in pathogens from Ontario swine. Shiona started her academic career at the University of Guelph with a BSc. in molecular biology and genetics ('07), followed by an MSc. in epidemiology ('09). Shiona is also currently working for the Public Health Agency of Canada, and enjoys training for and competing in local road races and triathlons.

Graduate Student Presentations Agenda

Tuesday, November 22, 2011 (Oakes Ball Room)

Time	Speaker	University	Title
1:30pm - 1:42pm	Kim Walsh	University of Alberta	First report of outcrossing in camelina [*Camelina sativa* (L.) Crantz], a potential platform for bioindustrial oils
1:43pm - 1:55pm	Zhenyi Li	Nova Scotia Agriculture College	Hexazinone Alternatives for Wild Blueberry Production.
1:56pm - 2:08pm	Goutam Kuwar	Nova Scotia Agriculture College	Weed management options for organic wild blueberry production.
2:09pm - 2:21pm	Todd Larsen	Nova Scotia Agricultural College	Japanese knotweed (*Fallopia japonica*) in Nova Scotia: ecological impacts and management of an invasive weed.
2:22pm - 2:34pm	Eileen Beaton	Nova Scotia Agricultural College	Wild Chervil (*Anthriscus sylvestris* (L.) Hoffm.) Management on Nova Scotia Dykes.
2:35pm - 2:47pm	Margaret Eriavbe	Nova Scotia Agricultural College	Growth and vegetative characteristics of *Hieracium pilosella* L. (mouse ear hawkweed) and *Hieracium caespitosum* (meadow hawkweed) in wild blueberry (*Vaccinium angustifolium*) fields on Prince Edward Island.
2:48pm - 3:00pm	Scott N. White	University of Guelph	Emergence and development of red sorrel (*Rumex acetosella* L.) and wild blueberry (*Vaccinium angustifolium* AIT.) ramets in Nova Scotia.
3:01pm - 3:13pm	Breanne Laturnus	University of Alberta	Pyroxasulfone and Sulfentrazone Control of Herbicide Resistant Weeds in Field Pea.
3:14pm - 3:26pm	Rob Miller	University of Guelph	Weed Control and Cultivar Tolerance to Saflufenacil in Soybean (Glycine max).
3:28pm - 3:40pm	Sid Darras	University of Alberta	Improving field-pea competitive ability using genotypic mixtures.
3:41pm - 3:53pm	Julia Thompson	The University of Western Ontario	The influence of glyphosate treatment on the growth and fitness of glyphosate-resistant and -susceptible giant ragweed

			(*Ambrosia trifida* L.) biotypes
3:54pm - 4:06pm	Joe Vink	University of Guelph, Ridgetown Campus	Glyphosate-Resistant Giant Ragweed in Ontario: Distribution and Control.
4:07pm - 4:19pm	Amanda Green	University of Guelph	Mechanisms of resistance to glyphosate in giant ragweed (*Ambrosia trifida* L.) in Ontario.
4:20pm - 4:32pm	Megan MacEachern	Nova Scotia Agricultural College	Potential for spreading dogbane (*Apocynum androsaemifolium* L.) management with the dogbane leaf beetle (*Chrysochus auratus* Fab.).
4:33pm - 4:45pm	Rhoda deJonge	University of Toronto	Is it a 'dog' eat 'dog' world? -- "Will the native dogbane beetle adapt more quickly to dog strangling vine in restricted situations?"
4:46pm - 4:58pm	Fawn Turner	University of Guelph	The recruitment biology and ecology of small and large crabgrass in turfgrass: Implications for management in the context of a cosmetic pesticide ban
4:59pm - 5:11pm	Derek Lewis	University of Manitoba	Biennial Wormwood (*Artemisia biennis*) and Kochia (*Kochia scoparia*) Interference with Sunflowers.
5:12pm - 5:24pm	Eric Tozzi	University of Guelph	Overwintering Survival of Canada fleabane (Conyza canadensis) in a Changing Climate.

Abstracts for Graduate Student Presentations

1:30pm - 1:42pm Kim Walsh

First report of outcrossing in camelina [*Camelina sativa* (L.) Crantz], a potential platform for bioindustrial oils. Kimberly D. Walsh[1], Debra M. Puttick[2], Melissa J. Hills, Rong-Cai Yang[1], Keith C. Topinka[1], and Linda M. Hall[1] , [1]Department of Agricultural, Food, and Nutritional Science, University of Alberta; [2]Linnaeus Plant Sciences Inc; and [3]Department of Biological Sciences, Grant MacEwan University

Camelina [*Camelina sativa* (L.) Crantz] is a European old world oilseed crop of the Brassicaceae family being developed for cultivation in Canada. Presently camelina is used as a feedstock for the production of biodiesel; however, genetic engineering may expand the uses for production of bioindustrial oils. Prior to the release of genetically engineered camelina an environmental biosafety assessment must be conducted that includes characterization of outcrossing rates because transgenic plants may outcross to conventional varieties of the same species (intra-specific gene flow). Outcrossing rates have yet to be defined and may influence whether camelina is a suitable platform for bioproduct synthesis. The objective of this study was to ascertain, under field conditions, the short distance intra-specific outcrossing rate for camelina. Results from this initial, small scale, fifteen replicate strip trial found camelina outcrossing rates to be low (0.09 – 0.21%). Outcrossing in camelina was affected by planting date as well as direction and distance (20, 40 or 60cm) from the pollen source. The low levels of outcrossing suggest camelina is a primarily self-pollinated species. Quantification of pollen-mediated gene flow informs decisions about precautions such as isolation distances that may be required during varietal development of transgenic crops. The detection of pollen-mediated gene flow, albeit low, in camelina demonstrates that stewardship and due diligence should be employed to mitigate transgene movement from genetically engineered camelina. Data from this study will be used to plan medium field scale experiments to better define camelina outcrossing rates.

1:43pm - 1:55pm Zhenyi Li

Hexazinone Alternatives for Wild Blueberry Production. Zhenyi Li, Nova Scotia Agriculture College

Weeds compete for resources with blueberries and lower yields and reduce berry quality. Hexazinone is the most commonly used herbicide in wild blueberry fields, and may have the potential to create herbicide-resistant weeds. It is important to evaluate new herbicides that can be applied before blueberry emergence (PRE) and after blueberry emergence (POST) that have modes of action different than hexazinone. Experiments are Random Block Design, which have 15 treatments in general weedy trials and 6 treatments in sulfonylurea trials with 4 blocks. Herbicides, including Velpar, Ultim, Sinbar and other tank mixes, were applied to

experimental plots to determine their effect on blueberries, weeds, and grass biomass. Herbicides were applied in early May (PRE) and mid June (POST). Preliminary results show Sinbar WDG has the best grass control in the general weedy trial.

Key words: Hexazinone, weeds, wild blueberry, biomass.

1:56pm - 2:08pm Goutam Kuwar

Weed management options for organic wild blueberry production. Goutam Kuwar, Department of Environmental Science, Nova Scotia Agriculture College

Wild blueberry (*Vaccinium angustifolium* Ait.), one of the most important fruit crops in Eastern Canada, faces acute problem of weeds. While use of herbicides in organic production is not permitted, use of chemical herbicides (hexazinone for instance) is the customary method of weed control under conventional wild blueberry production. Therefore, the lack of weed management options is the major factor limiting organic production. Blueberries are adapted to low soil pH and lowering the pH may be a potential management strategy that could maximize nutrient uptake and minimize nutrient availability to the weeds. Similarly, burning could have positive effects on weed control and it also improves organic matters and soil nutrient contents. Thus, the main objective of this experiment is to investigate the effects of burning and pH manipulation on crop yield, weed dynamics, mycorrhizal colonization, soil nutrient status and soil moisture. Experiments are being conducted in two commercial blueberry fields in Collingwood and Earltown, NS. A 2 X 2 factorial design with four blocks was established after harvesting blueberry in 2009. Treatments included soil pH manipulation (sulfur versus no sulfur) and pruning method (burning versus mowing). Preliminary results show that burning and sulfur treatments have slightly higher organic matter, NPK, Ca, Mg and CEC in soil than other treatments in Collingwood site, while the difference in these parameters between the treatments are smaller in Earltown site. In Collingwood, burning and sulfur application show more yield and more blueberry coverage in the plots. Total numbers of flowers are higher in burning plot. Similarly, sulfur plots have lower weed density than no-sulfur plots. Surprisingly, in Earltwon site, there are no significant differences between the treatments in any blueberry and weed parameters except burning plots have significantly higher number of flowers per plant.

2:09pm - 2:21pm Todd Larsen

Japanese knotweed (*Fallopia japonica*) in Nova Scotia: ecological impacts and management of an invasive weed. Larsen T.G., Boyd N.S., Nams V.O., and Brewster G. Department of Environmental Science, Nova Scotia Agricultural College, Truro, NS

Japanese knotweed is a non-native invasive weed in North America where it readily establishes in riparian areas, dump sites, and along roadways. Its rapid growth causes mono-specific stands of knotweed to proliferate in the newly established range. Management options include pulling, cutting, covering with tarps, and herbicide application, however all methods have pros and cons, which suggests that a long-term integrated management approach is best. For this project, herbicide application was studied in terms of type and timing of application. Herbicide was applied at various times throughout the growing season: early emergence (May); maximum plant growth (July); flowering (August); and prior to senescence (October). All possible combinations of these treatment stages were tested, for a total of 16 different plots. Aminopyralid (Milestone) was applied at early emergence, and imazapyr (Arsenal) was applied to the three other stages. Herbicide efficacy was evaluated by measuring damage ratings, height, density, and leaf area index (LAI) at 2, 4, and 8 weeks after treatment. Preliminary results suggest that plots which received herbicide application at the early emergence stage and one other stage experienced the largest amount of damage, stunting, lowered density, and low LAI. The impacts of a knotweed stand on the local ecosystem were also analyzed. Three different plant community patches (knotweed, non-woody forbs, and woody shrubs) were compared for species composition, species density, and canopy/ground cover. From nine different blocks, knotweed was found to have the lowest species composition, followed by woody, and forbs. Forbs were the densest, followed by woody, and knotweed. Finally, the data suggest that small mammal density is highest in forbs, then knotweed, and woody habitats. These results suggest that a knotweed stand is quite different from other plant communities, but may not largely affect small mammal populations.

2:22pm - 2:34pm Eileen Beaton

Wild Chervil (Anthriscus sylvestris (L.) Hoffm.) Management on Nova Scotia Dykes.
Eileen Beaton, Nova Scotia Agricultural College

2:35pm - 2:47pm Margaret Eriavbe

Growth and vegetative characteristics of *Hieracium pilosella* L. (mouse ear hawkweed) and *Hieracium caespitosum* (meadow hawkweed) in wild blueberry (*Vaccinium angustifolium)* fields on Prince Edward Island. M. Eriavbe, Department of Environmental Science, Nova Scotia Agricultural College, Truro, Nova Scotia.

An invasive weed,*Hieracium spp* (Hawkweed) grow in patches in blueberry fields on Prince Edward Island. It is generally assumed that Hawkweed patches lower blueberry yields and interfere with harvest operations. To manage these weeds, growth pattern and mode of vegetative reproduction was studied to predict their time of establishment in the sprout year of wild blueberry fields. Six 1m^2 quadrats were randomly placed in each site and 5 plants labelled within each quadrat. Number and length of stolons were among the data collected biweekly. The two species identified have similar growth patterns. They thrive in soils with low PH, low organic matter and formation of daughter rosettes. It was observed that *H.pilosella* is a highly stoloniferous plant with an average of 6 stolons growing from a rosette compared to *H.caespitosum* which had an average of 1 stolon.Also secondary stolon development was not observed in *H.caespitosum*.The number of daughter rosettes growing from axillary buds of each specie was very low. H.*pilosella* had a higher number of daughter rosettes growing from the tips of the stolons compared to *H.caespitosum.* It is possible that daughter rosettes of *H.caespitosum* could also originate from the adventitious root buds located on the fibrous roots of the plants. This study shows that both species have the ability to rapidly colonise a field because daughter rosettes can grow from different vegetative structures.

2:48pm - 3:00pm Scott N. White

Emergence and development of red sorrel (*Rumex acetosella* L.) and wild blueberry (*Vaccinium angustifolium* Ait.) ramets in Nova Scotia, Canada. White, S.N.[1], Boyd N.S.[2], Van Acker R.C.[1], Swanton C.J.[1], and Newmaster S.[3]. [1]Department of Plant Agriculture, University of Guelph, Guelph, Ontario; [2]Department of Environmental Sciences, Nova Scotia Agricultural College, Truro, Nova Scotia; [3]Department of Integrative Biology, University of Guelph, Guelph, Ontario.

An experiment was established to monitor the emergence and development of red sorrel and wild blueberry ramet populations in sprout and crop year wild blueberry fields in Nova Scotia, Canada. Emergence and development was monitored in four 0.09m^2 quadrats in multiple sprout and crop year blueberry fields, and red sorrel emergence was monitored in four additional 0.09m^2 quadrats established in bare soil patches between blueberry clones at each site. Blueberry ramets emerged between 250 and 280 growing degree-days (GDD; T_{base}=0^oC) and reached 90% emergence by 600 to 800 GDD. Emergence was best explained by a four-parameter Weibull function fit to blueberry ramet emergence as a function of GDD (R^2>0.95), and analysis to calibrate and validate the model is in progress. Red sorrel ramets emerged continuously from late April until monitoring stopped in late November or early December, and cumulative emergence tended to follow a linear pattern as a function of GDD (T_{base}=0^oC). Total net gain to red sorrel ramet populations at sprout year sites was higher in blueberry clones (70% survival rate) than in bare soil patches (24% survival rate), but survival in both environments was low in crop year fields (about 39%). Bolting and flowering of red sorrel was primarily limited to ramets that over-wintered or emerged before 250 GDD, indicating specific temperature and photoperiodic requirements for flower induction. Greenhouse and growth chamber experiments indicate that flowering might be induced by vernalization, but results are preliminary and experiments are ongoing. However, autumn and spring gramoxone applications at two field sites reduced over-wintering ramet populations by 92 and 87%, respectively, and significantly reduced the density of flowering ramets. Timing of spring herbicide applications to reduce or eliminate flowering ramets can be improved through use of the proposed thermal model for wild blueberry emergence.

3:01pm - 3:13pm Breanne Laturnus

Pyroxasulfone and sulfentrazone control of herbicide resistant weeds in field pea. B.D. Laturnus, Department of Agricultural, Food and Nutritional Science, University of Alberta, Edmonton, Alberta.

Pyroxasulfone, a group 15, and sulfentrazone, a group 14, may provide new control options for herbicide resistant weeds in field pea. In spring of 2011, field trials were initiated at Edmonton, and Scott. Pyroxasulfone and sulfentrazone were applied pre-emergent at rates of 0, 80, 100, 150, and 200 g ai/ha (280 g ai/ha at Edmonton only), and 0, 105, 140 and 280 g ai/ha respectively in a factorial design that also included Viper as an industry standard. Cleavers (*Galium aparine*) and wild oat (*Avena fatua*) were seeded into the trials in locations without naturally occurring populations. At Edmonton, cleavers biomass was reduced to 18% of untreated control at the highest rate of sulfentrazone, but pyroxasulfone control was less consistent. Wild oat at Edmonton was most affected by pyroxasulfone, reducing biomass to 46-58% of the control at the highest rate. The highest rate of sulfentrazone decreased wild oat biomass to 70% of control. Pyroxasulfone was more effective on the wild oats at Scott, reducing biomass to 22% of the control whereas sulfentrazone efficacy was similar to that observed in Edmonton. Differences in sites may be due to soil organic matter, 12% at Edmonton compared to 3.5% at Scott, in addition to weather. Future research aims to determine the effect of organic matter on pyroxasulfone efficacy, to determine whether spring or fall applications are more efficacious, and to clarify the interaction between pyroxasulfone and sulfentrazone.

3:14pm - 3:26pm Rob Miller

Weed Control and Cultivar Tolerance to Saflufenacil in Soybean (*Glycine max*). Miller, R.T.[1], Van Acker[1], R.C., Robinson[2], D.E., Kraus[3], T.E., and Sikkema[2], P.H.[1]Dept. Plant Agriculture, University of Guelph, Guelph, ON; [2]University of Guelph, Ridgetown Campus, Ridgetown, ON; [3]BASF Canada, Mississauga, ON

Studies were conducted in 2009 and 2010 under field and growth room conditions to determine a) cultivar tolerance to preemergence (PRE) applications of saflufenacil in soybean, and b) the biologically effective rate of saflufenacil/dimethenamid-p applied PRE in soybean alone and prior to an in-crop application of glyphosate in glyphosate resistant soybean. Environmental conditions following application influenced the amount of soybean injury caused by saflufenacil, as well as the rate of saflufenacil/dimethenamid-p required for the control of annual weeds. Increased soybean injury from saflufenacil was observed when soybean emergence was delayed due to cool, wet conditions following planting. Injury decreased with time; however, sensitive soybean cultivars were unable to recover from early season injury sustained under adverse environmental conditions. OAC Hanover was the most sensitive cultivar in both field and hydroponic testing. With adequate moisture and above average temperatures in 2010, between 224 and 374 g a.i. ha^{-1} of saflufenacil/dimethenamid-p was required for 80% control of common ragweed, common lamb's quarters, and green foxtail 4 weeks after treatment (WAT). In contrast, below average temperatures and excessive moisture in 2009, between 528 and 613 g a.i. ha^{-1} of saflufenacil/dimethenamid-p was necessary for the same level of weed control. Pigweed species were least affected by environmental conditions after application with only 245 g a.i. ha^{-1} required for 80% control 4 WAT in both years. Excellent full season control of all weed species was achieved with saflufenacil/dimethenamid-p applied PRE followed by glyphosate postemergence (POST). However, there was no difference in yield when saflufenacil/dimethenamid-p was followed by glyphosate POST compared to a single glyphosate POST application.

3:28pm - 3:40pm Sid Darras

Can genotypic mixtures be used to improve the competitive ability of field pea (*Pisum sativum* L.). Darras, S.[1], McKenzie, R.[2], Olson, M.[2], Willenborg, C.J.[3] [1]University of Alberta, Edmonton, AB; [2]Alberta Agriculture and Rural Development, Lethbridge, AB; [3]University of Saskatchewan, Saskatoon, SK

Despite the large acreage of land in western Canada devoted to field pea production, a single major factor restricting the adoption of field pea is it's poor competitive ability with weeds. We conducted a study to determine whether growing field pea in two-way genotypic mixtures could improve crop yield and competitive ability. We were also interested in whether genetic relatedness had any effect on the mixing ability of genotypes and therefore, genotypes were chosen on the basis of pedigree and included two sister lines (CDC 1987-3 and CDC 1897-14), their common parent (Eclipse), and a distantly related genotype (Midas). Field experiments conducted at two locations in Alberta in 2010 revealed no differences between the average grain yield of all genotypes grown in pure stands vs. that of the mixtures both in the presence and absence of weeds. Nevertheless, differences in competitive ability were observed as the highest yielding mixture in weed-free stands was CDC1897-3 +Eclipse, but in the presence of weed competition CDC1897-14 + Midas and CDC1897-3 + Eclipse were the most competitive mixtures. In the greenhouse, a replacement series study assessed the competitive ability of each of the genotypes used in the field experiment relative to the other genotypes. This study also allowed us to assess the relative yield totals of each combination of genotypes to determine whether each mixture was synergistic or antagonistic relative to monoculture. Closely related genotypes (CDC 1897-3 + 1897-14 and CDC 1897-14 + Eclipse) tended to possess similar competitive abilities and generally over-yielded as compared to more distantly-related genotypes such as Eclipse + Midas, which were consistently antagonistic when combined in a mixture. The results show that there is the potential to increase yield and/or competitive ability in field pea by using genotypic mixtures; however, the magnitude of the benefit being will be dependent on the mixtures in question.

3:41pm - 3:53pm Julia Thompson

The influence of glyphosate treatment on the growth and fitness of glyphosate-resistant and -susceptible giant ragweed (*Ambrosia trifida* L.) biotypes. Thompson J.A.[1], Henry H.A.L.[1], Nurse R.E.[2] Department of Biology, The University of Western Ontario, London, ON; [2] Agriculture and Agri-Food Canada, Harrow, ON

Glyphosate resistance in giant ragweed has been confirmed in Southwestern Ontario. There are two responses based on biotype; one that shows a quick hypersensitive response to glyphosate treatment and one that mimics a susceptible plant for the first week after treatment, but then continues to grow from the apical meristems. Because the frequency of resistant alleles is low in the absence of a glyphosate selection pressure, it is thought that resistance may convey a fitness penalty in the absence of glyphosate. A greenhouse experiment was established at the Greenhouse and Processing Crops research center at Harrow, ON to compare the growth and reproductive output of untreated and treated (glyphosate at 900 or 1800 g·ae/ha) susceptible and resistant giant ragweed plants, showing both mechanisms of resistance. Herbicide injury scores confirmed that susceptible plants treated with glyphosate were completely necrotic by 28 days after treatment (DAT), while all resistant biotypes survived treatment. Resistant biotypes treated with glyphosate achieved similar heights to the untreated resistant controls at 28 DAT; however, the untreated susceptible biotypes were the tallest at 28 DAT. Finally, these data show that glyphosate resistance imparts a delay in flowering, seed set and maturation. Upcoming results will determine if these delays are correlated with impacts on dormancy and seed viability. Seed number and above ground biomass data are currently being processed.

3:54pm - 4:06pm Joe Vink

Glyphosate-resistant giant ragweed in Ontario: Survey and Control
Joe Vink[1], Peter Sikkema[1], François Tardif[2], Darren Robinson[1], Mark Lawton[3]. [1]University of Guelph, Ridgetown Campus, [2]Department of Plant Agriculture, University of Guelph, [3]Monsanto Canada Inc.

Giant ragweed (*Ambrosia trifida*) is an extremely competitive weed and interference in soybean can lead to yield losses of greater than 90% in studies conducted in Ontario. 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 (70), Kent (21), Lambton (10) and Waterloo (1) counties 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 concluded that there are 47 additional sites in southwestern Ontario with GR giant ragweed. The majority of the sites were found in Essex county, but there was one site in both Kent and Lambton counties. Field trials were

established at eight sites with GR giant ragweed during the 2010 and 2011 growing seasons. The objectives were to determine the level of giant ragweed control with increasing rates of glyphosate, and glyphosate tank mixes applied either preplant or postemergence. Control of giant ragweed increased with higher rates of glyphosate, but only at rates that are not economical for producers. The most effective tankmix was glyphosate + 2, 4-D ester; control ranged from 97 to 98%, 4 weeks after application (WAA). Sequential applications of glyphosate plus dicamba in dicamba-tolerant soybeans provided 100% control, 4 WAA at the three confined field trial locations.

4:07pm - 4:19pm Amanda Green

Mechanisms of resistance to glyphosate in giant ragweed (*Ambrosia trifida* L.) in Ontario. A.C. Green [1], F.J. Tardif[2], P.H. Sikkema[3]. [1]Department of Plant Agriculture, University of Guelph, [2]Department of Plant Agriculture, University of Guelph, Guelph and [3]Department of Plant Agriculture, University of Guelph, Ridgetown Campus

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.

4:20pm - 4:32pm Megan MacEachern

Potential for spreading dogbane (*Apocynum androsaemifolium* L.) management with the dogbane leaf beetle (*Chrysochus auratus* Fab.). M.C. MacEachern, N.S. Boyd and G.C. Cutler, Nova Scotia Agricultural College, Truro, NS

The dogbane leaf beetle (*Chrysochus auratus* Fab.) consumes spreading dogbane (*Apocynum androsaemifolium* L.), an important weed in lowbush blueberry fields. The potential of the beetle as a control agent against spreading dogbane was examined. Population dynamics were investigated through abundance counts within three separate lowbush blueberry fields. The beetle was present throughout the summer months, usually from early July until late September. Day of year had a significant effect upon beetle density, as expected, at all sites. Distance into the field had a significant effect at the smaller-scaled sites. All sites showed positive correlations between beetle density and dogbane ramet density, and negative correlations between beetle density and dogbane ramet growth stage. No-choice specificity tests suggested the beetle will feed on plants belonging to the same family as spreading dogbane, but not every genus within the family. Cage tests showed that a large number of beetles (at least 16 beetles/ramet) would likely be necessary to completely consume an individual dogbane ramet. Additional research would be needed to determine if the natural amount of defoliation by the beetle has a negative impact on the target weed.

4:33pm - 4:45pm Rhoda deJonge

"Is it a 'dog' eat 'dog' world?: Does the native dogbane (*Chrysochus auratus*) beetle have the potential to adapt to invasive dog-strangling vine (*Vincetoxicum* spp)?" Rhoda deJonge, University of Toronto, Faculty of Forestry

Many native insects can evolve to become herbivores of non-native invasive plants. Unfortunately, often this relationship can take many years to develop, and the invasive plant may have already damaged rare ecosystems. Dog strangling vine (*Vincetoxicum rossicum* and *V. nigrum*) is an invasive plant that threatens to upset the balance of Ontario's rare alvar communities, as well as take over pine plantations, old fields and disturbed environments. In Europe, the beetle, *Chrysochus asclepiadeus* feeds nearly exclusively on this vine. In North America, another beetle of this genus, the dogbane beetle, *Chrysochus auratus*, feeds exclusively on dog strangling vine's familial relative, dogbane (*Apocynum cannibinum* and *A. androsaemifolium*). This research aims to determine whether the dogbane beetle may have any capacity to develop an herbivory relationship with dog strangling vine as demonstrated through host-range testing. If a new relationship between this invasive plant and a native insect is shown, it may revolutionize how researchers go forward in determining biological control agents.

4:46pm - 4:58pm Fawn Turner

The recruitment biology and ecology of small and large crabgrass in turfgrass: Implications for management in the context of a cosmetic pesticide ban. Fawn Turner, University of Guelph

Large and small crabgrass have proven to be serious weeds in a broad variety of systems; including Canadian row crops, cultivated fields, and turfgrass. Despite this, minimal research has been conducted on either of these species nation-wide and much of the existing knowledge has been derived from agriculturally focussed investigations. In turf, crabgrass has previously been managed using herbicides, however, the Ontario-wide cosmetic pesticide ban has restricted their application on lawns, parks, school yards, and cemeteries since April, 2009. Observation of turfgrass in southern Ontario has confirmed a high incidence of crabgrass in many areas. As crabgrass has been noted as a dominant weed without the aid of herbicides and, the efficacy of bioherbicides is not yet sufficient, this trend is hypothesized to continue. Crabgrass biotypes have been proven to exist in other research related to their emergence timing and flowering and may also act to explain some differences seen in separate studies. Consequently, observational studies of crabgrass emergence timing in southern Ontario have been conducted to better characterize crabgrass in this region. Experimentation of crabgrass' response to common residential cultural management techniques including fertilization and disturbance by raking has also been investigated. Previous research has revealed a positive response of both large and small crabgrass seed to treatments of KNO_3 by breaking dormancy prematurely and enhancing the rate of germination. This treatment has been confirmed to have a significant effect with regional populations of dormant seed of both species. In addition, germination is significantly increased with non-dormant seed, as well. In climate controlled model turfgrass systems, this significant effect on both dormant and non-dormant seed can be replicated at high fertilization rates. However, preliminary results of field experimentation indicate that this may not have practical management implications, even at fertilization rates as high as 8 times the recommended rate. Furthermore, disturbance by raking does not appear to have any significant effects on the recruitment of crabgrass in turf. It is intended that a better understanding of southern Ontario's existing large and small crabgrass populations in turf, as well as the implications that common cultural management practices may have on their recruitment will contribute to their adequate management without the use of herbicides.

4:59pm - 5:11pm Derek Lewis

Biennial Wormwood (*Artemisia biennis*) and Kochia (*Kochia scoparia*) Interference with Sunflowers. Derek W. Lewis and Robert H. Gulden, Department of Plant Science, University of Manitoba

Kochia and biennial wormwood are two weeds commonly found in Manitoba sunflower fields. Between 2009 and 2011, field experiments were conducted across southern Manitoba with the objective of measuring the yield loss caused by kochia and biennial wormwood interference with sunflowers. The experiments were a split-plot, randomized complete block design. The main plots were the time of weed emergence relative to the sunflower crop, either at the same time as the sunflowers, or when the sunflowers were at about the 4 leaf stage. The sub-plots were the target weed densities ranging from 0 to 200 plants m^{-2}. Each weed species was treated as a separate experiment. Seven site-years of data were collected for kochia and five site-years for biennial wormwood were collected. Kochia and biennial wormwood seedling recruitment was variable among years. Significant yield loss was observed at several site-years and depended on actual weed recruitment densities and the time of weed emergence.

5:12pm - 5:24pm Eric Tozzi

Overwintering Survival of Canada fleabane (*Conyza canadensis*) in a Changing Climate. Eric Tozzi, Department of Plant Agriculture, University of Guelph

The facultative nature of some winter annuals has a large effect on the fitness or success of that organism in an area. Understanding the recruitment nature and survival of facultative winter annuals can provide insight into the mechanisms of their success and, in some cases, their invasiveness. This may be particularly relevant in the context of accelerating climate change.

Conyza canadensis (Canada fleabane) is a facultative winter annual native to North America that has since spread to several different continents, with prominence in the U.S.A, Canada, Europe, Brazil, and China. Canada fleabane flowers and sets seed in late summer, with some seed germinating and forming a rosette over winter, and other seed persisting and germinating in the spring of the following year.

Winter hardiness of both the rosette and seed is an important area of study when determining spring emergence mechanisms. Low temperatures keep Canada fleabane seed from germinating and the rosette from bolting throughout the winter period. Warm spells or winter breaks may affect winter survival and spring emergence. The frequency and severity of warm spells in Southern Ontario are expected to increase as global climate change progresses

(Shabbar and Bonsal 2003). Shorter warm spells (1 or 2 days) are even more frequent and may still affect the winter survival of Canada fleabane. Experiments on the effect of winter breaks on winter survival, fecundity, and aboveground biomass will provide data to further explore these hypotheses.

Canada Fleabane rosettes will be planted in small containers and placed within the ground over the winter. The containers will be removed, placed in warming chambers for 3 days, and returned outside for the remainder of the season.

Information gained on the survival, fecundity, and aboveground biomass of Canada fleabane after exposure to warming spells will help shed light on the effect of climate change will have on the pervasiveness of this species in the future.

Workshop – Crucial Conversations - Wednesday, Nov. 23, 2011

This year we will be profiling a workshop entitled, "Crucial Conversations". Crucial conversations (conversations where stakes are high, opinions vary and emotions run strong) happen every day and impact all of our results. Few people, however, invest in the time to learn the conversational skills necessary to deal with these situations.

Learn to step-up to high stakes conversations skillfully and respectively and begin to resolve the problems by: surfacing the best ideas, making important decisions and act on decisions with utility and commitment. This workshop will be led by Justin Hale. See more details on the following page.

Symposium – Alternatives for Weed Management in Landscape Environments
Wednesday, Nov. 23, 2011 (10:30 – 12:00)

1. **The role of Sarritor for biological weed control**. Al Watson, University of McGill

2. **IPM strategies for weed management**. Pam Charbonneau- Ontario Ministry of Agriculture, Food and Rural Affairs

3. **Corn gluten and non-chemical alternatives**. G. Stephenson, University of Guelph (Further information on Gerry Stephenson's subject is found below.)

Also participating in the panel will be **Gavin Dawson**, Region Technical Manager – Canada for GreenLawn, Ltd. a Division of TruGreen.

Alternatives to synthetic chemical herbicides for weed management in landscapes. G.R. Stephenson, K. Dodson and C.Civa, University of Guelph.

Ontario has now had at least two full seasons since new regulations prohibited the use of most 'synthetic' chemical pesticides for 'cosmetic' purposes in landscapes, including lawns, flower beds and patios. Products containing acetic acid are now being used as contact herbicides to control weeds in patios as replacements for the widely used, glyphosate. Formulated products are often mixtures of the 'naturally occurring' acetic acid and citric acid and a surfactant. Toxicologically these products as well as glyphosate have a wide margin of safety for humans. The acetic acid products are 'about as toxic as alcohol' but glyphosate is even less toxic. Corn gluten meal is one of the 'natural products' that is now being marketed for control of weeds in lawns and flower beds. It was patented and developed several years ago by Professor Nick Christians at Iowa State University. It is a former 'waste product' from the processing of corn that has been found to be active at 'high application rates' for the control of germinating weeds, including dandelions and some grasses. It should only be used in established lawns that have not been recently over-seeded. Best application times are during cool, moist periods that are optimum for seed germination in either the spring or the fall. Corn gluten meal has a nitrogen content of about 10% and it has non-herbicidal uses as an organic fertilizer and soil conditioner for established turfgrass. Its efficacy in lawns is most likely a combined effect of weed reduction with an enhancement of turfgrass growth.

Concurrent Workshops (CCU accredited)

Wednesday November 23rd

10:30-11:15 Graduate Student Workshop**. "So what? and Who cares? Making your science, media friendly".** Owen Roberts, University of Guelph

OR

10:30-11:15 Tillage the forgotten mode of action. Summary: With the increase in herbicide resistant weeds and weed shifts there is one mode of action that has never had a case of weed resistance; tillage. Tremendous advances in machinery and guidance systems have made tillage an incredible powerful management tool, but you need a game plan. Mike and Greg will walk you through the roadmap for success. Facilitators: Greg Stewart and Mike, OMAFRA.

11:30 -12:15 **Smartphone Tips and Tricks**. Summary: Today's smart phones have the power of many personal computers and provide a number of practical tools to make the job of a crop consultant, research technician or professor easier. Ian will demonstrate the most powerful functions that many of us are unaware of. Facilitator: Ian McDonald, OMAFRA

OR

11:30 -12:15 **CSI – Crop Scene Investigation**: Handling the product inquiry. Complaint calls are never easy and can result in huge liabilities if handled incorrectly. What are the critical things to document? What service can a professional provide that leaves the grower with a positive experience? Steve Johns, Syngenta

Weed Control in Corn, Soybean and Edible Beans Section - 2011 Oral Presentations

Thursday, November 24th
10:00 AM to 12:00 PM in the Room Hennepin South
Contributed papers and discussion
Chair, Peter Sikkema, U of Guelph, Ridgetown, ON

Time	Presenter	Author(s)	Title
15:00	Peter Sikkema	Sikkema*, Peter H.; Soltani, Nader; Tardif, Francois	Glyphosate resistant Canada fleabane in Ontario
15:15	Philip Westra	Philip Westra, Andrew Wiersma, Steve Chisholm, Darci Giacomini, Jan Leach, and Dale Shaner – Colorado State University, Fort Collins, CO, and Phil Stahlman, Amar Goodar, Kansas State University, Hays, KS	Use of Molecular Techniques to Understand Mechanisms of Glyphosate Resistance in Kochia, Palmer Amaranth, and Other Weeds
15:30	Francois Tardif	Tardif, Francois	Herbicide Resistance Education - A critical step in proactive management
15:45		Walter Thomas, Steve Bowe, Greg Wilson, Rob Miller, Sean Dilk, Shea Murdock	Stewardship of Dicamba in Dicamba Tolerant Cropping Systems
16:00	Brian Legassicke	Brian Legassicke	Weed Control Results with the MON 87708 System in Soybeans in Canada
16:15	Al McFadden	Al McFadden	Enlist Weed Control System for Corn and Soybeans
16:30	Eric Page	Page, E.R. , D. Cerrudo,, P. Westra, M.Loux, K. Smith, C. Foresman, H. Wright and C.J. Swanton.	Why early season weed control is important in maize.
16:45	Julie Schipper	Julie Schipper	Fierce - a low use rate preemergence residual herbicide for use in soybeans
17:00	Mike Cowbrough	Mike Cowbrough	Herbicide Selection using your smartphone - Weedpro75

Abstracts for Weed Control in Corn, Soybean and Edible Beans Section

Glyphosate resistant Canada fleabane in Ontario. Sikkema, P.H.[1], Soltani, N.[1] and Tardif, F.J.[2] [1]University of Guelph Ridgetown Campus, Ridgetown, ON; [2]Department of Plant Agriculture, University of Guelph, Guelph, ON

Glyphosate resistant (GR) Canada fleabane (*Conyza canadensis*) was first confirmed in Ontario, Canada from seed collections in the fall of 2010. It is now confirmed that there are 8 fields in Essex County in southwestern Ontario with GR Canada fleabane. Field studies were conducted during summer of 2011 to determine a) the biologically effective rate of glyphosate, b) the efficacy of herbicides tankmixes applied preplant, c) the efficacy of herbicides applied preemergence for full season residual weed control, and d) the efficacy of postemergence herbicide tankmixes in soybean for the control of GR Canada fleabane in soybean. GR Canada fleabane survived glyphosate rates as high as 21,600 g ai/ha which is 24 times the manufacturer's recommended rate. Among the preplant herbicide tankmixes evaluated, saflufenacil (98%), saflufenacil/dimethenamid-p (96%) and amitrol (93%) provided the best control while chlorimuron (87%), cloransulam-methyl (87%) and 2,4-D ester (86%) were also effective in controlling GR Canada fleabane. Glyphosate alone or tankmixed with carfentrazone, glufosinate, paraquat, flumioxazin and chlorimuron+flumioxazin provided poor/inconsistent control of GR Canada fleabane in soybean. Among the preemergence residual herbicide treatments evaluated, metribuzin (100%), flumetsulam (98%) and cloransulam-methyl (95%) provided the best control. Glyphosate alone or in combination with chlorimuron, linuron, imazethapyr, clomazone, flumioxazin, flumioxazin+chlorimuron or pyroxasulfone+flumioxazin provided poor/inconsistent control of GR Canada fleabane in soybean. Among postemergence herbicide tankmixes evaluated, cloransulam-methyl (64%) and chlorimuron (51%) provided marginal control of GR Canada fleabane in soybean. Glyphosate alone or in combination with acifluorfen, fomesafen, bentazon, thifensulfuron, imazethapyr, imazethapyr+bentazon or glyphosate/fomesafen applied POST provided poor/inconsistent control of GR Canada fleabane in soybean. In dicamba tolerant soybean, dicamba provided fair to excellent control of GR Canada fleabane depending on timing.

Use of Molecular Techniques to Understand Mechanisms of Glyphosate Resistance in Kochia, Palmer Amaranth, and Other Weeds. Philip Westra, Andrew Wiersma, Steve Chisholm, Darci Giacomini, Jan Leach, and Dale Shaner – Colorado State University, Fort Collins, CO, and Phil Stahlman, Amar Goodar, Kansas State University, Hays, KS

Molecular techniques are increasingly being applied to key weed science research projects including determination of the mechanisms of glyphosate resistance in multiple weed species. Once successful primers have been constructed for the EPSPS gene in a plant, the gene (or a key portion thereof) can be removed, cleaned up, and sent off for sequencing. This DNA sequencing is frequently used to look for known mutations that confer modest glyphosate resistance such as the Proline 106 mutation. Once this amount of molecular testing has been successful, Q-PCR can be used to determine gene copy number. If an increase in EPSPS gene copy number is detected, additional molecular research is used to determine if the amount of EPSPS enzyme protein produced correlates with the gene copy number. New generation deep sequencing coupled with advanced bioinformatics can then be used to construct DNA sequences surrounding amplified genes to begin to probe possible genetic mobile elements that may facilitate gene amplification under the stress imposed by glyphosate selection pressure. Examples will be provided to illustrate how these approaches are being used successfully with multiple weed species.

Herbicide Resistance Education - A critical step in proactive management. Francois Tardif, University of Guelph.

Herbicide resistance education and training have been identified as critical paths toward advancing the adoption of proactive best management practices to delay and mitigate the evolution of herbicide-resistant weeds. In September 2011, the Weed Science Society of America (WSSA) introduced a training program designed to educate certified crop advisors, agronomists, pesticide retailers and applicators, growers, students, and other interested parties on the topic of herbicide resistance in weeds. A peer reviewed, five-lesson curriculum is currently available at the Society's web page via web-based training and PowerPoint slides. Topics include: (1) An introduction to herbicide resistance in weeds (2) How do herbicides work? (3) What is herbicide resistance? (4) How do I scout for and identify herbicide resistance in weeds? and (5) How do I manage resistance? The lessons are unique among herbicide resistance training materials in that, for the first time, the WSSA presents a unified message on the causes of herbicide resistance and offers several strategies for identifying and mitigating herbicide resistance in weeds. The lessons contain the most up-to-date definitions for use in the field, including those for low- and high-level resistance, a video on how to scout for herbicide-resistant weeds, and an emphasis on proactive management. The lessons utilize animations to showcase these important points. A Spanish-language version has been also produced.

Weed Control Results with the MON 87708 System in Soybeans in Canada. Brian Legassicke, Monsanto Canada Inc.

Small plot replicated trials with the MON 87708 soybean weed control system were conducted in Ontario and Quebec from 2008-2010 on sites with no history of glyphosate weed resistance. Glyphosate and dicamba combinations showed effective weed control with enhanced control of several species. Crop tolerance was also excellent.

Enlist Weed Control System for Corn and Soybeans. Al McFadden, Dow AgroSciences Canada Inc.

Herbicide tolerant crops have enabled the widespread adoption of conservation tillage technology in corn and soybeans. However, increasing glyphosate resistant and hard-to-control weeds threaten the system and the associated benefits including reduced soil erosion and decreased input costs. The Enlist Weed Control System will give growers the tools to maintain the long term viability of the conservation tillage system. The Enlist Weed Control System offers broader spectrum weed control, including hard-to-control and glyphosate resistant weeds by combining the power of 2,4-D with other leading weed control programs.

Fierce - a low use rate preemergence residual herbicide for use in soybeans. Julie Schipper, Field Market Development Representative Valent Canada.

Herbicide selection using your smartphone. Mike Cowbrough Ontario Ministry of Agriculture, Food and Rural Affairs, Guelph, ON, Email Contact: mike.cowbrough@ontario.ca

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.

Program Session Agenda

PMRA, CFIA Regulatory Issues and Provincial Weed Reports

2011 Oral Presentations

10:00 AM to 12:00 PM in the Salon A
Contributed papers and discussion
Chair, Dave Ralph, BC Ministry of Agriculture & Lands, Kamloops, BC

Presenter	Title
Dave Ralph	Welcome and introductions
PMRA, CFIA and Provincial Reports and Report Questions	

An Insider's Guide to Value Assessment at the PMRA.

Michael Downs
Section Head / Chef de Section
Herbicides and Plant Growth Regulators / Herbicides et régulateurs de croissance
Value and Sustainability Assessment Directorate / Direction de l'évaluation de la valeur et de la pérennité
Pest Management Regulatory Agency / Agence de réglementation de la lutte antiparasitaire
2720 Riverside Drive / 2720, promenade Riverside
Ottawa, ON

The Canadian Food Inspection Agency's Plant Protection Regulatory Program: What it Means for You.

Wendy Asbil
National Manager/Gestionnaire nationale
Invasive Plants Section/Section des plantes envahissantes
Plant Health and Biosecurity Division/Division de la protection des végétaux et biosécurité
Canadian Food Inspection Agency/Agence Canadienne d'Inspection des Aliments
59 Camelot Dr./59 Prom. Camelot
Ottawa, ON K1A 0Y9

British Columbia Report for 2011. BC Ministry of Forests, Lands and Natural Resource Operation (see Appendix A for full report)

David Ralph
Invasive Plant Program, Range Branch
Ministry of Forests, Lands and Natural Resource Operations
Kamloops, BC

Alberta Weed Report: November 2011 (see Appendix A for full report)

Chris Neeser, Ph.D.
Weed Scientist, Alberta Agriculture and Rural Development
Pest Surveillance Branch, 301 Horticultural Station Rd E.
Brooks, AB

Manitoba Agriculture, Food and Rural Initiatives (MAFRI) (see Appendix A for full report)

Nasir Shaikh
Provincial weed specialist
Manitoba Agriculture, Food and Rural Initiatives
Crops Knowledge Centre, Box 1149, 65-3rd Ave NE
Carman, MB, R0G 0J0

Ontario Weed Committee – Summary of Activities (see Appendix A for full report)

Mike Cowbrough
OMAFRA – Agriculture Development Branch
Guelph, Ontario

RAPPORT DU QUÉBEC À LA SOCIÉTÉ CANADIENNE DE MALHERBOLOGIE (see Appendix A for full report)

Danielle Bernier, agronome-malherbologiste
Direction de la phytoprotection, MAPAQ

Program Session Agenda

Forage, Rangeland, Forestry and Industrial Vegetation Management Section - 2011 Oral Presentations

Wednesday, November 23rd
3:00 to 5:00 P.M. in the Auditorium
Contributed papers and discussion
Chair, Michael Irvine, Ontario Ministry of Natural Resources

Time	Presenter	Author(s)	Title
3:00-3:20 P.M.	Nelson Thiffault	Nelson Thiffault and François Hébert	Ericads : enemies or potential allies
3:20-3:40 P.M.	Pedro M. Antunes	Pedro M. Antunes	The last great forest: the status of invasive species in the Boreal
3:40-4:00 P.M.	Bill Summers	Bill Summers	Aminocyclopyrachlor - A new herbicide for Vegetation Management
4:00-4:20 P.M.	Linda Hall	A. Miller, J. Kaufmann, L.M. Hall, and E.W Bork	Short-term herbicide decay in Parkland pastures using legume bioassays
4:20-4:40 P.M.	Nancy Cain	Nancy P. Cain. and Michael Irvine	Control programs for dog-strangling vine (pale swallowwort) in forest plantations and rights-of-way
4:40-5:00 P.M.	Gerry Stephenson	G. R. Stephenson	A History of 2,4,5-T/Agent Orange Debates in Canada

Abstracts for Weed Control in Horticulture & Special Crops Section Program Session Agenda

Ericads : enemies or potential allies. Nelson Thiffault and François Hébert, Ministère des Ressources naturelles et de la Faune du Québec.

The last great forest: the status of invasive species in the Boreal. Antunes, P.M. and Sanderson, L.A. Invasive Species Research Institute, Algoma University, Sault Ste. Marie, Ontario, ON.

The boreal forest is the world's largest biome, covering all continents in the northern hemisphere. Much research has focused on the effects of forest management and climate change on biodiversity and ecosystem level processes of the boreal. However, despite the increasing rate of resource exploitation, which is likely to intensify the arrival and establishment of exotic species with potential to become invasive, we have little understanding of the status of invasive species in the boreal forest. Most likely, this is because the boreal forest has long been viewed as inhospitable to new species and not susceptible to invasions due to its relatively extreme climate, low biodiversity and poor resource availability. In addition, much of the forest remains relatively undisturbed, which reduces the likelihood of invasions. Another possibility is that the boreal forest is far from most research centers and thus costly to access. It might be that researchers are simply not looking. We reviewed the literature and compiled information on the current status of invasive species present in the North American Boreal forest. We will address the factors that will contribute to their increase as well as the hypothesis that the fewer invasive species in northern latitudes as compared to higher numbers found in warmer climates may be just as detrimental to biodiversity and ecosystem functioning.

Aminocyclopyrachlor - A new herbicide for Vegetation Management. Bill Summers, E.I. duPont Canada Company

Short-term herbicide decay in Parkland pastures using legume bioassays. A. Miller, J. Kaufmann, L.M. Hall, and E.W Bork, University of Alberta

Control programs for dog-strangling vine (pale swallowwort) in forest plantations and rights-of-way. Nancy P. Cain, Cain Vegetation Inc. and Michael Irvine, Ontario Ministry of Natural Resources.

The history of 2,4,5-T/agent orange debates in Canada. G.R. Stephenson. School of Environmental Sciences, University of Guelph.

Controversy over the use of 2,4,5-T and 2,4-D as a herbicide for weed and brush control in forestry and on roadside and utility rights of way became a world-wide issue with the extensive use of a special formulation of these two herbicides, known as 'Agent Orange', as a military defoliant in Viet Nam during the 1960's. Reports of birth defects in Viet Namese children gained credibility when toxicology studies with mice showed birth defects following maternal exposure of mice to the 'Agent Orange' product,. As a result, the uses of 2,4-D/2,4,5-T mixtures were banned in Canada and a number of other countries. Subsequent studies showed that the teratogenic effects in mice were clearly related to 2,3,7,8-TCDD, a dioxin contaminant rather than to 2,4,5-T or 2,4-D and the use of 'dioxin free' mixtures of these herbicides were reinstated. Then, during the late 1970's another report, The Alsea Oregon Study, indicated a higher number of miscarriages or spontaneous abortions among women in Oregon who might have been exposed to 2,4,5-T sprays for conifer release in that region. The use of 2,4,5-T was again banned in Ontario and other areas until that study could be evaluated. Even though that study was fully discredited, 2,4-5-T use remained banned in Ontario and other areas. Even though the federal government in Canada maintained that 'dioxin free' 2,4,5-T had a wide margin of safety if used appropriately, the companies decided to withdraw 2,4,5-T in the 1980's. Dioxin controversies erupted again during the 1980's when chemists at Agriculture Canada reported that some formulations of 2,4-D could also contain dioxin contaminants. Further studies indicated that the highly tertatogenic contaminant, 2,3,7,8-TCDD was not a possible contaminant of 2,4-D and that there were synthetic procedures for 2,4-D that could prevent contamination with dioxins. The situation today is that phenoxy herbicides and pesticides in general are insignificant sources of dioxins in our environment and that the major sources are municipal incineration and forest fires.

Program Session Agenda
Weed Control in Cereals, Oilseeds & Pulses Section - 2011 Oral Presentations

Wednesday, November 24th

10:00 – 12:00 in the Hennepin South Room

Contributed papers and discussion

Chair, Robert (Bob) Blackshaw, AAFC, Lethbridge, AB

Time	Presenter	Author(s)	Title
10:00 AM	Neil Harker	K. N. Harker, T. K. Turkington, J. T. O'Donovan, H. R. Kutcher, and E. N. Johnson	Barley Herbicide and Fungicide Tank-Mixtures?
10:15 AM	John O'Donovan	O'Donovan, J.T, Harker, K.N., and Blackshaw, R.E.	Implications of sub-economic threshold wild oat densities in a cereal/field pea rotation under no-till.
10:30 AM	Hugh Beckie	Beckie, H.J., Warwick, S.I., Sauder, C.A., Kelln, G.M., and Lozinski, C.	Acetolactate synthase (ALS) inhibitor-resistant false cleavers (*Galium spurium*) in western Canada.
10:45 AM	Tom Wolf	Wolf, T.M., Caldwell, B.C, and Hewitt, A.	Movement of pesticide on dust – quantification and implication for buffer zone calculations.
11:00 AM	Ken Sapsford	Sapsford, K.*, Johnson, E., Vandenberg, A.	Searching for improved lentil tolerance to PPO Inhibitor (Group 14) herbicides.
11:15 AM	Eric Johnson	E. N. Johnson, H. J. Beckie, L. M. Hall, J. J. Schoenau, C. J. Willenborg, and K. L. Sapsford	Progress in Managing Herbicide Resistant Weeds in Pulse Crops.

Abstracts for Weed Control in Cereals, Oilseeds & Pulses Section

Barley Herbicide and Fungicide Tank-Mixtures? K. N. Harker[1], T. K. Turkington, J. T. O'Donovan, H. R. Kutcher, and E. N. Johnson. [1]Agriculture & Agri-Food Canada, Lacombe AB.

Herbicides and fungicides are common inputs in barley production. Generally, herbicides are applied earlier than fungicides given differing pest life cycles and critical protection periods. Some "bundling" promotions suggest that herbicides and fungicides can be effectively tank-mixed. Direct-seeded barley experiments were conducted in 2010 at Lacombe, AB; Melfort, SK; and Scott, SK to determine propiconazole efficacy on barley leaf diseases and impacts on barley yield when applied relatively early with herbicides versus at the flag leaf stage. Barley was seeded into barley stubble. Pre- and post-spray weed densities were not sufficient to reduce barley yield. Furthermore, weed control levels were not generally antagonized in mixtures with propiconazole. Propiconazole was much more effective on scald (*Rhynchosporium secalis*), net form net blotch (*Pyrenophora teres* f. *teres*) and other barley leaf diseases [Spot form net blotch (*Pyrenophora teres* f. *maculate*) and spot blotch – (*Cochliobolus sativus*)] when applied at the flag leaf stage versus earlier stages coinciding with typical herbicide application stages (2-3 & 5-6 leaf). Barley yields were significantly greater when a full rate of propiconazole was applied at the flag leaf stage than at earlier stages. Barley 1000 seed weights, % plump kernels, % thin kernels, and bushel weights were usually optimized when propiconazole was applied at the flag leaf stage versus earlier stages. However, under some conditions, slight reductions in disease levels and improvements in barley yield and quality were evident when half rates of propiconazole were applied with herbicides; further research is warranted.

Implications of sub-economic threshold wild oat densities in a cereal/field pea rotation under no-till. O'Donovan, J.T[1], Harker, K.N.[1], and Blackshaw, R.E..[2]. [1]Agriculture & Agri-Food Canada, Lacombe AB; [2]Agriculture & Agri-Food Canada, Lethbridge, AB.

Wild oat can cause significant yield losses in field crops but control with herbicides can sometimes be uneconomical e.g. low-value feed barley or wheat. Basing decisions on single-season thresholds may result in unacceptable increases in wild oat populations, and reduced yields in subsequent poorly competitive crops such as field pea. The objective of this study was to assess the impact of sub-economic threshold wild oat densities on wild oat population dynamics, and on yield of rotational crops. Field experiments were conducted at Beaverlodge, Lethbridge and Lacombe, Alberta over four years. Barley (year 1) and wheat (year 3) were seeded at 200 and 400 seeds/m^2 and tralkoxydim was applied at 0, 0.5 and 1 x recommended label rate. In years 2 and 4, field pea was seeded at 100 seeds m^{-2} and imazamox+imazethapyr at the recommended rate was applied across the entire trial. In year 1, initial wild oat densities were 3 (Beaverlodge), 25 (Lethbridge) and 33 (Lacombe) plants m^{-2}. Over the 4-year course of the experiment, wild oat populations increased as herbicide rate and seeding rate decreased but data varied considerably among sites. For example, in year 4, average numbers of wild oat

seed in the soil seed bank were 36 (Beaverlodge), 130 (Lethbridge) and 4366 (Lacombe) m^{-2}. At Beaverlodge and Lethbridge in years 2 and 4, and at Lacombe in year 2, field pea yield was unaffected by the treatments; but at Lacombe in year 4, field pea yield was reduced by 26% when no graminicide was applied in previous cereal crops. The results suggest that omitting wild oat control in low-value cereal crops can be risky in terms of contributing unacceptable amounts of wild oat seed to the soil seed bank. However, the impact on rotational crops would appear to be less risky unless wild oat populations are exceptionally high.

Acetolactate synthase (ALS) inhibitor-resistant false cleavers (*Galium spurium*) in western Canada. Beckie, H.J.[1], Warwick, S.I.[2], Sauder, C.A.[2], Kelln, G.M.[3], and Lozinski, C.[1] Agriculture and Agri-Food Canada [1]Saskatoon, SK, [2]Ottawa, ON, [3]Dept. Plant Sciences, University of Saskatchewan, Saskatoon

Cleavers species (*G. spurium* and *G. aparine*) are among the top 10 most abundant weeds across the Prairie region of western Canada, and are increasing in relative abundance at the fastest rate since the 1970s. In 2008, two false cleavers populations from Tisdale and Choiceland, Saskatchewan were suspected of ALS-inhibitor resistance. Dose-response experiments were conducted using imazethapyr and florasulam, both acetolactate synthase (ALS) inhibitors, as well as fluroxypyr, a synthetic auxin. Additionally, a 1,954-bp region of the *ALS* gene including sites known to confer *ALS* resistance were sequenced. Both populations were highly resistant to imazethapyr (resistance factors greater than 100), one population (Tisdale) was highly resistant to florasulam (Choiceland population susceptible, although a second larger screening of 200 individuals indicated low frequency (2%) florasulam resistance), and both populations were susceptible to fluroxypyr. All sequenced Tisdale individuals screened with imazethapyr possessed the Trp_{574}Leu mutation. In contrast, three point mutations were found for Choiceland individuals sequenced: Ser_{653}Asn, Trp_{574}Leu, and Asp_{376}Glu. These *ALS* target-site mutations have not been documented previously in this species.

Movement of pesticide on dust – quantification and implication for buffer zone calculations. Wolf, T.M.[1], Caldwell, B.C[1], and Hewitt, A.[2,3] [1]Agriculture and Agri-Food Canada, Saskatoon, SK; [2]Lincoln Ventures Ltd., Lincoln University, Christchurch, New Zealand; [3]University of Queensland, Gatton, Australia.

Buffer zones are increasingly common regulatory tools for protection of sensitive areas from pesticide spray drift. Their accurate calculation requires models that represent current agricultural practices. Drift studies were conducted near Saskatoon, SK during July and August 2011 to generate deposition data up to 120 m downwind from single- and multiple-swath spray applications. The sprayer was a self-propelled high clearance sprayer with 18 m boom width using two boom heights (60 and 90 cm above ground) and four ASABE spray qualities (Fine, Medium, Coarse, and Extremely Coarse). Spray deposits were determined with 15-cm diameter petri plates placed 1, 2, 5, 10, 20, 40, 80, and 120 m downwind. Background levels of tracer dye (Rhodamine WT) were assessed after each set of trials by exposing clean petri plates with either a non-spraying pass of the sprayer unit, or through simple exposure to ambient conditions, for 5 minutes. Plates were washed with 50 mL 95% ethanol and quantified by fluorescence spectrophotometry. Limits of quantification by the instrument were conservatively 0.1 ppb, or about 0.0016% of the applied amount. Results showed that spray deposit amounts at 40, 80, and 120 m downwind approached the limits of quantification for some trials. For the same distances, the background amounts of dye were as high as 0.4 to 0.6 ppb, depending on soil moisture and the amount of dye sprayed in the preceding trials. These results suggests that dye which moved on dust from the treated area may have contributed to the measured spray drift deposit. Therefore, at larger distances where overall deposits are very low, careful analysis will be required to attribute the deposit to the correct source. This has implications for multiple pass spray trials where the accumulation of low deposit values over several spray passes can determine the buffer zone distance for pesticides with high non-target toxicities.

Searching for improved lentil tolerance to PPO Inhibitor (Group 14) herbicides.
Sapsford, K.[1]*, Johnson, E.[2], Vandenberg A.[3], [1]Dept of Plant Sciences, University of Saskatchewan, Saskatoon, Sk., [2]Agriculture and AgriFood Canada, Scott, Sk., [3]Crop Development Centre, Saskatoon, Sk. *Presenter (k.sapsford@usask.ca)

Sulfentrazone, a soil applied, Group 14 (PPO inhibitor) herbicide registered in Canada in 2010, is very effective for control of kochia in pea, flax, chickpea and sunflower. Lentil is sensitive to sulfentrazone but we hypothesize that it may be possible to identify and develop Group 14 resistant lentil germplasm since tolerance exists in other grain legume genera. In 2008 we evaluated 4 lentil lines to 4 sulfentrazone rates and found wide variability in tolerance; from 0 to 68% visual injury and 31% to 82% yield reductions compared to the untreated check. In 2009 we screened 32 lentil lines for sulfentrazone tolerance and selected 7 of the most tolerant lines for replicated trials in 2010-11 at two Saskatchewan locations. Our most and least tolerant lines have been CDC Improve and CDC Impala, respectively.

Progress in Managing Herbicide Resistant Weeds in Pulse Crops.
E. N. Johnson[1], H. J. Beckie[2], L. M. Hall[3], J. J. Schoenau[4], C. J. Willenborg[5], and K. L. Sapsford[5]. [1]Agriculture and Agri-Food Canada (AAFC), Box 10, Scott, SK. S0K 4A0; [2]AAFC, Saskatoon Research Center, Saskatoon, SK; [3]Faculty of Agicultural, Food, and Nutritional Science, University of Alberta, Edmonton, AB; [4]Dept. of Soil Science, College of Agriculture and Bioresources, University of Saskatchewan, Saskatoon, SK.; [5]Dept. of Plant Sciences, College of Agriculture and Bioresources, University of Saskatchewan, Saskatoon, SK.

Pulse crops have limited weed control options and are highly reliant on ALS /AHAS inhibitor herbicides. Broadleaf weeds such as ALS resistant kochia [*Kochia scoparia* (L.) Schrad], wild mustard (*Sinapis arvensis* L.) and cleavers (*Galium spurium* L. and *Galium aparine* L.) are particularly problematic. In addition, alternative modes of action are required for controlling grass weeds such as wild oat (*Avena fatua* L.). Screening trials of alternative chemistries were conducted in Saskatchewan and Alberta in 2010-11 which have identified some potential solutions. Screening has focused on Group 14 (ppo inhibitors) and Group 15 (mitosis inhibitors) herbicides. Sulfentrazone has provided good control of cleavers in field pea at rates of 105 to 140 g ai ha^{-1} on soils with organic matter contents of less than 5%. Additional research is required to determine lowest effective rates required for higher organic matter soils. Preliminary results indicate that fall applied flumioxazin may provide suppression to control of kochia and wild mustard in lentil. Fluthiacet-methyl, a post-emergence ppo inhibitor, has provided suppression to control of kochia and wild mustard in lentil; however, more research is required to determine rates that maximize selectivity. Pyroxasulfone, a Group 15 herbicide, has activity on both broadleaf and grass weeds. Studies indicate that both lentil and field pea are extremely tolerant to pyroxasulfone. Pyroxasulfone is a soil active herbicide, and its performance has been inconsistent and dependent on soil moisture. Current and future work will focus on assessing rates and timing to reduce inconsistent weed control. Although pyroxasulfone has activity on both grass and broadleaf weeds, research will focus on optimizing control of wild oat in pulses.

Weed Control in Horticulture & Special Crops Section - 2011 Oral Presentations

Wednesday, November 24th
10:00 – 12:00 in the Auditorium
Chair, Rob Nurse, AAFC, Harrow, ON

Time	Presenter	Author(s)	Title
10:00 AM	Kate Hyatt	Kate Hyatt	Alion Herbicide: New chemistry for season-long weed control in orchards
10:15 AM	Nathan Boyd	Nathan Boyd	Impact and management of red sorrel (*Rumex acetosella*) in wild blueberry
10:30 AM	Gavin Graham	Gavin Graham	NBDAAF Horticulture Update
10:45 AM	Darren Robinson	Robinson, D.E. and Nurse, R.E.	Antagonism of acetyl-CoA carboxylase inhibitors by strobilurin fungicides in tomato
11:00AM	Kristen Callow	K. Callow, B. Visser and B. Annett	Herbicide Resistant Pigweed in Ontario
11:15AM	Clarence Swanton	Swanton C.J., Chandler K., Callow K.	New solutions for the control of herbicide resistant redroot pigweed (*Amaranthus retroflexus* L.) in carrot

Abstracts for Weed Control in Horticulture & Special Crops Section

Alion Herbicide: New chemistry for season-long weed control in orchards. Kate Hyatt, Bayer CropScience, Guelph ON

Alion Herbicide is a new pre-emerge option for season-long weed control in orchards. The active ingredient, indaziflam, helps provide broad-spectrum weed control in pome fruit, stone fruit, and tree nuts using a very low rate. As a new herbicide Group (29), Alion controls all labelled weeds that show resistance to other chemistries such as glyphosate, triazine, and ALS. Alion is active on seedlings as they germinate, and requires a burndown tank-mix partner to control emerged weeds. Application flexibility not only allows growers to select their preferred burndown tank-mix partner, but also their preference for a spring or fall application that best suits their management needs.

The impact and management of red sorrel (*Rumex acetosella* L.) in wild blueberry (*Vaccinium* spp.) Boyd, N.S. and Hughes, A. Department of Environmental Sciences, Nova Scotia Agricultural College, Truro, NS

Red sorrel (*Rumex acetosella* L.) is a troublesome weed in commercial wild blueberry fields. It competes with the blueberry and interferes with harvest operations. Experiments were conducted in controlled environments and commercial fields throughout Nova Scotia to: (1) determine if the presence of sorrel increases botrytis incidence, (2) determine if sorrel impacts pollinator activity, and (3) to evaluate a range of management options. Red sorrel and wild blueberry plants flower at similar time's and sheep sorrel pollen grains were found on blueberry flowers at all sites. Red sorrel pollen grains increased botrytis germination in controlled conditions and results suggest that pollen grains on blueberry flowers may enhance botrytis infection in the field. Honey bees were found foraging on male red sorrel flowers for pollen. The overall impact of sorrel flowers on honeybees is unclear. Red sorrel management options will be discussed.

Evaluation of Foramsulfuron in New Brunswick Wild Blueberry Production. Graham, G.L. New Brunswick Department of Agriculture, Aquaculture and Fisheries (NBDAAF), Fredericton, NB

Foramsulfuron is a post-emergent, sulfonylurea (Group 2) herbicide registered by Bayer CropScience in Canada. There are two formulations of the product available, Option for use in corn in Canada and the United States which contains a safener Revolver for use in turf in the United States which does not contain a safener. Foramsulfuron controls grass species with limited control of broadleaf species. Nine trials were conducted by NBDAAF and these trials indicate an excellent level of blueberry tolerance was obtained at 35 g ai/ha. Limited crop stunting was noted at higher use rates, but this injury would be commercially acceptable. Yield data, while limited, is promising. No consistent significant difference has been shown between formulations. For effective grass control, both formulations should be applied with

Urea Ammonium Nitrate (UAN). In trial evaluations, ticklegrass (agrostide scabre, *Agrostis scabra*) and witchgrass (Panic capillaire, *Panicum capillare*) were controlled (80%) while poverty oatgrass (danthonie à épi, *Danthonia spicata*) and Canada bluegrass (pâturin comprimé, *Poa compressa*) were suppressed (60%). Fescue control was more variable, with improved control of fine-leaf sheep fescue (Fétuque chevelue, *Festuca filiformis*) when foramsulfuron was applied following a spring burning as compared to a spring mowing. Foramsulfuron activity for red fescue (Fétuque rouge, *F. rubra* subsp. *fallax*) was lower than fine-leaf sheep fescue although this trial followed an early fall mowing and application was made before blueberry emergence. Future fescue evaluations should examine layering foramsulfuron with other herbicide treatments. Foramsulfuron has potential for use within commercial wild blueberry production, although future trial evaluation for best use practices (pruning timing, pruning method, application timing and weed control spectrum) is warranted. Foramsulfuron was selected as a regional upgrade at the 2011 Minor Use Priority Setting Meeting. AAFC-PMC staff is gathering data for a submission this winter.

Antagonism of acetyl-CoA carboxylase inhibitors by strobilurin fungicides in tomato.
Robinson, D.E.[1] and Nurse, R.E.[2] [1]University of Guelph, Ridgetown, ON, [2]Agriculture and Agri-Food Canada, Harrow, ON.

Trials were established in 2010 and 2011 at Ridgetown Campus of the University of Guelph, and at the AAFC Research Station in Harrow, Ontario to determine tomato tolerance and annual grass control by combinations of strobilurin fungicides and three registered postemergence graminicides. For comparison, additional treatments of each fungicide and herbicide on their own, a hand-weeded check and a weedy check were included. In all cases, broadleaf weeds were removed by hand to eliminate potential confounding effects of broadleaf weed competition. The fungicides were azoxystrobin – 125 g ai ha^{-1}, and pyraclostrobin – 168 g ai ha^{-1}. The herbicides were fenoxaprop-p-ethyl – 54 g ai ha^{-1}, fluazifop-p-butyl – 250 g ai ha^{-1}, and sethoxydim – 500 g ai ha^{-1}. In three of four study years, none of the combinations caused injury to tomato, nor did they reduce weed control or marketable tomato yield, compared with the treatments where the herbicides were applied alone. However, we observed a 21% reduction in control of large crabgrass (*Digitaria sanguinalis* (L.) Scop.) when fenoxaprop-p-ethyl was applied in combination with pyraclostrobin at Ridgetown in 2011. The reduction in weed control corresponded to an 8 T ha^{-1} reduction in marketable yield. We hypothesize the difference among site-years was a result of very high density of crabgrass at the Ridgetown location in 2011 (31 plants m^{-2}), relative to the other site-years where crabgrass density was never greater than 11 plants m^{-2}. Strobilurin fungicides may antagonize postemergence acetyl-CoA carboxylase inhibitors in tomato, depending on weed species and density.

Herbicide Resistant Pigweed in Ontario. K. Callow[1], B. Visser[2] and B. Annett[1], [1]OMAFRA, 120 Main St. East, Ridgetown, Ontario N0P 2C0, [2]University of Guelph, Department of Plant Agriculture, Guelph, Ontario N1G 2W1

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.

Until herbicides with new modes of action are registered, growers need to find alternative methods to control resistant pigweed species. As a result, 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.

New solutions for the control of herbicide resistant redroot pigweed (*Amaranthus retroflexus* L.) in carrot. Swanton C.J. [1], Chandler K.[1], Callow K [2]. [1] Department of Plant Agriculture, University of Guelph, Guelph, ON; [2] Ontario Ministry of Agriculture, Food and Rural Affairs, Ridgetown, Ontario.

Pigweed populations resistant to linuron have become a significant threat to carrot producers. Alternative herbicides were evaluated for control of linuron resistant redroot pigweed and crop tolerance in carrots grown on muck soil. PRE treatments of pendimethalin (ME formulation), thiobencarb, pyroxasulfone, and flufenacet, were applied at: 3000, 1680, 89, and 450 g ai ha^{-1}, respectively. Pyroxasulfone and flufenacet gave >75% control at 3 WAT (weeks after treatment). Control at 6 WAT was poor with all treatments. Carrots exhibited excellent tolerance to 2X of the proposed label rates of pendimethalin, thiobencarb, and flufenacet. Pyroxasulfone reduced canopy growth but not yield. In a separate trial, ethofumesate applied PRE at rates of 2160 to 8640 g ai ha^{-1} gave >80% control of redroot pigweed at 3 WAT but later control was maintained only with 8640 g ai ha^{-1}. Sequential treatments of ethofumesate at 2160 and 4320 g ai ha^{-1} applied PRE and POST at the 2-3 leaf stage of carrots gave >80% control. Carrots exhibited excellent tolerance to ethofumesate applied PRE at rates up to 8640 g ai ha^{-1} but injury resulted with POST treatments. Below label treatments of oxyfluorfen (SC and EC formulations), acifluorfen, sulfentrazone, fluthiacet-methyl, and fomesafen, at doses of 70, 60, 18.75, 15, 1.5, and 3.75 g ai ha^{-1}, respectively, applied POST demonstrated potential for the control of redroot pigweed. Carrot tolerance to 2X rates of these herbicides applied when carrots were at the 2-3 and 4-5 leaf stage was commercially acceptable. The EC formulation of oxyfluorfen, and sulfentrazone applied POST resulted in yield loss.

Weed Biology and Ecology Section - 2011 Oral Presentations

Wednesday, November 24th
10:00 – 12:00 in Hennipen North
Chair, Stephen Murphy, University of Waterloo
(Session moderator is Darby McGrath, University of Waterloo)

Time	Presenter	Author(s)	Title
10:00 AM	Eric Page	Eric Page and Clarence Swanton	In search of uniformity: how weed interference influences crop population dynamics.
10:20 AM	David Clements	David R. Clements and Christine L. Gile	Management of Japanese knotweed: getting to the root of the problem

Abstracts for Weed Biology and Ecology Section

In search of uniformity: how weed interference influences crop population dynamics. Eric Page and Clarence Swanton[2], [1 2]Department of Plant Agriculture, University of Guelph, Guelph, ON

Management of Japanese knotweed: getting to the root of the problem. David R. Clements and Christine Gile, Trinity Western University, Langley, BC

Japanese knotweed (*Fallopia japonica* Houtt. or *Polygonum cuspidatum*) is an invasive weed that originated from Japan, Korea, Taiwan and northern China. Current methods used to control Japanese knotweed, including cutting off the stems, cutting of the stems and applying glyphosate, and glyphosate injection, do not fully eradicate the knotweed, as it can cause the plant to go dormant in its rhizomes. Part of the reason for the lack of efficacy is due to the rhizomes being targeted in the fall, which limits the effect of glyphosate. Since the root system of Japanese is extensive, most experiments are done in the field rather than growing the plant in the lab. The hypothesis is that injecting copper sulfate or sodium methyldithiocarbamate will be more effective in eradicating Japanese rhizomes than injecting glyphosate, cutting the stems and applying glyphosate. Copper sulfate and sodium methyldithiocarbamate were chosen as they are capable of killing tree roots in sewer lines as well having herbicidal effects when above ground plants are sprayed. This will be observed by growing the plants by using a hydroponics system, so that the rhizomes can be observed after the treatments are applied. Since killing the rhizomes is key to the reducing plant populations effectively, looking at the effects of different methods of control of the rhizomes may give insight into how to fully eradicate this invasive weed.

Poster Presentations

Polymer-coated urea compared with urea reduces N uptake by weeds	Blackshaw, Robert
Ragweed pollen concentrations following a 3 year control program in two municipalities in Quebec	Benoit, Diane Lyse and Marie-Josée Simard
Common ragweed densities in two municipalities in Quebec with and without coordinated control program	Benoit, Diane Lyse and Marie-Josée Simard
SR&ED Grower Scale Herbicide Resistant Pigweed Trial	Callow, K. and B. Annett, OMAFRA, Ridgetown, Ontario
Herbicide Resistant Pigweed in Ontario	Callow, K., B. Visser and B. Annett
Canola pod drop and seed shatter	Cavalieri A & Gulden RH
Mechanisms of yield loss in maize caused by weed competition	Cerrudo, Diego, E.R. Page. M. Tollenaar, G. Stewart and C.J. Swanton
Gene flow between canola and mustard in Saskatchewan, Canada	G. Seguin-Swartz, H. Beckie, S. Warwick, E. Johnson, K. Falk
Acetolactate synthase (ALS) inhibitor-resistant false cleavers (*Galium spurium*) in western Canada	H. Beckie, S. Warwick, C. Sauder, G. Kelln, C. Lozinski
Late vs. early season weed communities in organic and conventional corn-soybean: the big picture changes vary according to tillage system	Légère, Anne, F. Craig Stevenson, and Anne Vanasse
Late vs. early season weed communities in organic and conventional corn-soybean: the species driving the changes	Légère, Anne, F. Craig Stevenson, and Anne Vanasse
Title: Invasive Weed Control with Aminocyclopyrachlor	Livingston, Pamela and Nigel Buffone
The Prevention and Control Options for Glyphosate Resistant Kochia	Low, Ryan
The tolerance of niger to sulfentrazone	May, William
The rate and timing of flucarbazone on niger	May, William
Soil moisture stress influences feeding preference of grasshoppers for hound's-tongue leaves	Momayyezi, M., M. B. Isman, and M. K. Upadhyaya
Soil moisture stress influences feeding preference of grasshoppers for hound's-tongue leaves.	Momayyezi, M., M. B. Isman, and M. K. Upadhyaya, University of British Columbia, Canada.

Evaluation of stem injection for hogweed control	Smith, Peter and François Tardif
Weed control and sensitivity of oats (*Avena sativa*) with various doses of saflufenacil	Soltani, Nader *; Shropshire, Christy; Sikkema, Peter H.
Dry bean tolerance to halosulfuron applied postemergence	Soltani, Nader *; Shropshire, Christy; Sikkema, Peter H.
Co-existence of genetically engineered and conventional camelina; an investigation on seed-mediated gene flow	Walsh, Kimberly D., Melissa J. Hills, Keith C. Topinka, and Linda M. Hall

Abstracts for Posters

Validating demographic analysis as a method for predicting the invasive potential of plant species. Brendan Alexander, Department of Agricultural, Food and Nutritional Science, University of Alberta

Demographic analysis using field based experiments as a method of quantifying the relative invasiveness potential of crops and weeds has not been evaluated. Common garden sites have been established in 5 ecological regions of Canada in disturbed, ruderal and natural areas, comparing 6 species at 2 densities. Experiments are initiated twice a year, fall to assess seed viability and emergence, spring to measure plant survival, growth and fecundity. Data collection includes weekly survival counts, height and staging, and fecundity measure in the fall. In Edmonton, preliminary emergence data show little to no differences between the 2 densities. Emergence and survival were highest for wheat, intermediate wheatgrass, camelina and alfalfa in the disturbed area but were only highest for wheat and intermediate wheatgrass in the ruderal and natural areas. The ability of demographic analysis to accurately determine the relative invasiveness potential of crops and weeds will be examined further upon acquiring the seed viability, germination and fecundity data.

Gene flow between canola and mustard in Saskatchewan, Canada. Séguin-Swartz, G.[1], Beckie, H.J.[1], Warwick, S.I.[2], Johnson, E.N.[1], and Falk, K.C.[1] Agriculture and Agri-Food Canada, [1]Saskatoon, SK, [2]Ottawa, ON

The objective of the research was to investigate pollen-mediated gene flow between transgenic glyphosate-resistant canola (*Brassica napus*) and mustards (condiment mustard, *B. juncea* and Ethiopian mustard, *B. carinata*) under large-scale field conditions. Canola and mustard crops were grown adjacent or 5 m apart at two sites in the semiarid Grassland region of the Prairies. In trials with condiment mustard, pollen donor and recipient fields were 16 ha each. In trials with Ethiopian mustard, pollen donor and recipient fields were 6.5 ha and 2.4 ha, respectively, at site 1 (5 m apart), and 12 ha and 4 ha, respectively, at site 2 (adjacent). Flowering of the crops overlapped. Seed samples were collected in mustard crops at maturity on a 10 × 10 m grid pattern. F1 interspecific hybrids were identified in seed samples using a seed germination assay designed to detect glyphosate-resistant seedlings. Herbicide-resistant seedlings were further confirmed using commercial test strips and AFLP analysis. In condiment mustard, 393 F1 interspecific hybrids were identified among 2,944,391 seedlings. Overall field hybridization frequencies were 0.017% for adjacent crops and 0.008% for crops grown 5 m apart. Hybrid plants were detected at the furthest edge of the field for adjacent crops (400 m) and at 350 m for crops grown 5 m apart. In Ethiopian mustard, 20 interspecific hybrids were identified among 647,665 seedlings. Overall field hybridization frequencies were 0.005% for adjacent crops, and 0.002% for crops grown 5 m apart. One hybrid plant was detected at 130 m from the common border at site 2. It is concluded that gene flow between

B. napus canola and mustard crops can occur but that hybridization frequency is low. A 5 m isolation distance contributed to reducing hybridization frequency by more than 40% in both mustard species.

Acetolactate synthase (ALS) inhibitor-resistant false cleavers (*Galium spurium*) in western Canada. Beckie, H.J.[1], Warwick, S.I.[2], Sauder, C.A.[2], Kelln, G.M.[3], and Lozinski, C.[1] Agriculture and Agri-Food Canada [1]Saskatoon, SK, [2]Ottawa, ON, [3]Dept. Plant Sciences, University of Saskatchewan, Saskatoon

Cleavers species (*G. spurium* and *G. aparine*) are among the top 10 most abundant weeds across the Prairie region of western Canada, and are increasing in relative abundance at the fastest rate since the 1970s. In 2008, two false cleavers populations from Tisdale and Choiceland, Saskatchewan were suspected of ALS-inhibitor resistance. Dose-response experiments were conducted using imazethapyr and florasulam, both acetolactate synthase (ALS) inhibitors, as well as fluroxypyr, a synthetic auxin. Additionally, a 1,954-bp region of the *ALS* gene including sites known to confer *ALS* resistance were sequenced. Both populations were highly resistant to imazethapyr (resistance factors greater than 100), one population (Tisdale) was highly resistant to florasulam (Choiceland population susceptible, although a second larger screening of 200 individuals indicated low frequency (2%) florasulam resistance), and both populations were susceptible to fluroxypyr. All sequenced Tisdale individuals screened with imazethapyr posessed the $Trp_{574}Leu$ mutation. In contrast, three point mutations were found for Choiceland individuals sequenced: $Ser_{653}Asn$, $Trp_{574}Leu$, and $Asp_{376}Glu$. These *ALS* target-site mutations have not been documented previously in this species.

Ragweed pollen concentrations following a three year control program in two municipalities in southwestern Quebec. Benoit, D. L.[1]and Simard, M.-J.[2]. [1]Agriculture and Agri-Food Canada (AAFC), St-Jean-sur-Richelieu, QC; [2]AAFC-Québec, QC.

Throughout August and September, common ragweed (*Ambrosia artemisiifolia* L.) pollen is the primary causal allergen of seasonal rhinoconjunctivitis (“hay fever”). A project was initiated in Quebec to demonstrate that coordinated efforts at the local scale over several years (2007-2010) to manage ragweed can result in reduced allergenic rhinitis within a population living in a medium size municipality. Two municipalities - Salaberry-de-Valleyfield (SdV) chosen as the model area for mobilization and Saint-Jean-sur-Richelieu (SJsR) serving as a control area with no specific ragweed management - participated in the study. In both municipalities, assessments of aerial pollen concentrations were done yearly from 2007 to 2010 and pollen emissions were monitored for 12 consecutive days at the end of August. Four habitat types were identified within each municipality: residential, industrial, landscaped and disturbed. Pollen concentrations were measured at 1.5 m height using 13 rotorod type samplers in each city. Three samplers were distributed per habitat and one rotorod was placed over a 15 m high building to measure pollen concentration from regional sources. At the onset of the project in 2007, both cities had similar ragweed pollen loads (105 ± 14 to 304 ± 41 pollen grains/m³ in STsR ; 40 ± 13 to 835 ± 114 pollen grains/m³ in SdV) but significant differences between habitats were observed ($P<0.05$). Pollen concentrations were significantly higher in disturbed habitats in both cities. In the mobilized city, a significant reduction in ragweed pollen concentrations occurred in residential (-58%) and landscaped (-16%) habitats from 2007 to 1010 while concentrations increased in the control city. Significant increases in pollen concentrations were measured in disturbed habitats such as snow deposits in SJsR (304 ± 41 in 2007 to 1355 ± 156 pollen grains/m³ in 2010). Disturbed habitats must be carefully monitored and managed if allergenic airborne pollen concentrations are to be lowered.

Common ragweed densities in two municipalities in Quebec with and without control programs. Benoit, D. L.[1]and Simard, M.-J.[2]. [1]Agriculture and Agri-Food Canada (AAFC), St-Jean-sur-Richelieu, QC; [2]AAFC-Québec, QC.

A provincial working group on common ragweed (*Ambrosia artemisiifolia* L.) in Québec (Table Québécoise sur l'Herbe à Poux -TQHP) initiated a project whose objective was to demonstrate that coordinated efforts at the local scale over several years (2007-2010) to manage ragweed can result in reduced ragweed densities and allergenic rhinitis within a population living in a medium size municipality. Two municipalities, located south of Montréal participated in the study. Salaberry-de-Valleyfield (SdV) was chosen as the model area for mobilization while Saint-Jean-sur-Richelieu (SJsR) served as a control area where no specific ragweed management was done. In both municipalities, assessments of ragweed density and distribution were done in July from 2007 (before the onset of control efforts) to 2010 (after three years of mobilization). Each municipal territory was divided into sectors of 1.5 km². Four habitat types were identified within each municipality: residential, industrial, landscaped and disturbed. Ragweed plants were counted in quadrats (50 X 50 cm) randomly positioned in each habitat per sector (for a total of 312 to 432 quadrats per municipality). A mixed model ANOVA was carried out on transformed ($\ln(\sqrt{(x+0.5)} + 1)$ values. At the onset of the project in 2007, both cities had similar ragweed populations (48 ± 143 plants/m² in SJsR and 38 ± 84 plants/m² in SdV). Ragweed density was lower in residential areas than in any other habitat (landscaped, industrial or disturbed) in both cities throughout the study. By 2010, ragweed management through mobilization resulted in reduced ragweed densities in residential, landscaped and disturbed habitats, but increases were observed in industrial habitats. Densities remained statistically unchanged or increased in the control municipality (SJsR). Industrial and disturbed habitats were identified as important but problematic habitats for ragweed management through collective efforts.

Polymer-coated urea compared with urea reduces N uptake by weeds. Blackshaw, R.E.[1], Harker, K.N.[2] and O'Donovan, J.T[2]. [1]Agriculture and Agri-Food Canada, Lethbridge, AB; [2]Agriculture and Agri-Food Canada, Lacombe, AB.

Previous research has documented that weeds, as well as crops, respond positively to nitrogen fertilizer. Multi-year field experiments were conducted at Lethbridge, Lacombe and Beaverlodge in Alberta to determine whether N uptake by weeds would be affected by nitrogen fertilizer formulation. Urea was compared with polymer-coated urea [Environmentally Smart Nitrogen (ESN), Agrium Inc.] in a no-till canola production system. Both urea fertilizer forms were side-banded 3 cm away and 4 cm below the canola seed row during the planting operation. Weed shoot N concentration was determined 4 and 8 weeks after emergence (WAE) by randomly collecting 5 to 10 plants of each species per plot and analyzing for N using an automated combustion analyzer coupled with a mass spectrometer. Results indicated that N concentration of wild oat (*Avena fatua*) was lower with ESN compared with urea in 4 of 9 and 9 of 9 site-years at 4 and 8 WAE, respectively. Similarly, wild buckwheat (*Polygonum convolvulus*) N concentration was lower with ESN than with urea in 3 of 7 and 6 of 7 site-years at 4 and 8 WAE, respectively. These positive results attained with the slower N release form of urea (ESN) compared with urea could potentially reduce weed competitiveness and increase soil N availability to the crop.

Herbicide Resistant Pigweed in Ontario. K. Callow[1], B. Visser[2] and B. Annett[1], [1]OMAFRA, Ridgetown, Ontario and [2]University of Guelph, Department of Plant Agriculture, Guelph, Ontario

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.

SR&ED Grower Scale Herbicide Resistant Pigweed Trial. K. Callow and B. Annett, OMAFRA, Ridgetown, Ontario

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
Lorox + Prowl H_2O PRE, Goal Tender POST

Canola pod drop and seed shatter. Cavalieri, A. and Gulden, R.H. University of Manitoba, Winnipeg, MB

Pod drop and seed shatter can result in substantial harvest losses in canola. This represents an economic issue for growers due to the yield loss before and during harvest and is the source of future volunteer canola populations. The agronomic improvement and the adoption of canola hybrids characterized by increased seed size compared to open pollinated verities is suspected to have resulted in a relative increase in pod drop. Rapid pod drop and seed shatter estimation is not simple in the field and there is no universally accepted method at this time. In 2010, experiments were initiated to compare and evaluate different methods for estimating pod drop and seed shatter among a group of open pollinated and a group of hybrid canola cultivars. Visual methods including rating are being compared to seed collection in catch trays and on the ground to determine the most efficient and accurate method for estimating pod drop and seed shatter. In addition, the strength required to break attached pods off the rachis at various plant positions is being evaluated.

Mechanism of yield loss in maize by weed competition. Cerrudo, Diego, E.R. Page. M. Tollenaar, G. Stewart and C.J. Swanton.

Cover crops as an integrated approach to weed management in vegetable production in Canada. B. Ball Coelho[1], D.L. Benoit[2], R. Nurse[3], K. Callow[4], D. Bernier[5], [1]AAFC, Southern Crop Protection and Food Research Centre, London, ON, [2] AAFC, Saint-Jean-sur-Richelieu QC**;** [3]AAFC, Harrow ON ; [4]OMAFRA, Ridgetown ON; [5]MAPAQ Québec QC

Cover crops (CC) could be used for integrated weed management in field vegetable production to reduce reliance on herbicides, but information has not been sufficiently integrated to define suitable approaches for Canada. Therefore a literature review on using CC for weed control in temperate climates was conducted. A general consensus is that full season weed control is not usually achieved, but intensity of other weed control approaches can be reduced. For example, CC may allow reduced number of cultivations, or switching from PRE broadcast to band, or from PRE to POST as needed applications. Savings on weed control costs do not usually compensate for the CC cost, but other on- and off-site values are usually added. Mechanisms of control are physical and chemical (allelopathy). Physical control of weeds can be provided by a thick mulch layer from a killed CC. Length of growing season generally limits potential to produce the necessary amounts of mulch to utilize this approach in Canada, so control by allelopathy is more promising. Based on economics, allelopathy, and successes in other temperate regions, four systems recommended for Canada were: fall-seeded rye + vetch mixture before no-till tomato; fall-seeded rye before zone-till cucurbits; overseeded rye into late harvested vegetable; and sorghum or sudangrass before a late-planted, or after an early-harvested vegetable. Two approaches recommended for study based on promising results in the US and uncertainty of success in Canada were brassicas before soil-borne disease sensitive crops such as potato, and mechanical kill of the CC. Other research avenues were optimizing cultural practices and CC cultivar selection and developments to improve weed suppression.

Soil moisture stress influences feeding preference of grasshoppers for hound's-tongue (*Cynoglossum officinale*) leaves. Momayyezi, M., Isman, M.B., and Upadhyaya, M.K., University of British Columbia, Vancouver, B.C.

Hound's-tongue, a rangeland weed of British Columbia, hosts several phytophagous insects. Little information on effects of environmental stressors on its interaction with these insects is available. We studied the effect of soil moisture stress (SMS) during hound's-tongue growth on the feeding preference and growth of 5th instar grasshoppers (*Melanoplus sanguinipes*). Hound's-tongue plants were grown under four SMS levels [100, 80, 60, and 40% field capacity (FC)] in a glasshouse. In one study, grasshoppers were released on intact plants grown under 40 or 100% FC in an enclosed system. The insects displayed no leaf age preference for plants grown under 100% FC, but consumed more mid-aged leaves from plants at 40% FC. Three bioassays comparing feeding preference for discs excised from young (Expt. 1) or old (Expt. 2) leaves developed at 100% FC versus 40, 60 or 80% FC as well as from young and old leaves from plants at the same SMS level (Expt. 3) were conducted. In bioassays employing discs from young leaves, grasshoppers chose discs from plants grown under 40% FC over those under 100% FC. Grasshoppers showed no statistically significant preference for old leaves in individual bioassays, but when pooled results of three experiments were analyzed they preferred discs from old leaves of 40 and 60% FC treatments compared to 100% FC. In bioassays involving young versus old leaves from plants at the same SMS, the insects preferred young over old leaves for 40% FC. In a separate study, grasshoppers feeding on discs from young leaves of plants at 40% FC had higher fresh weights compared to those feeding on discs from old leaves developed at the same SMS, or on discs from the young or old leaves developed at 100% FC. A greater preference for, as well as better grasshopper growth, on young leaves from stressed (40% FC) hound's-tongue plants could have significant implications for grasshopper herbivory when this weed is distributed on microsites with varying SMS.

Response of dry beans to halosulfuron applied postemergence. Soltani, N., Shropshire, C. and Sikkema, P. H. University of Guelph Ridgetown Campus, Ridgetown, ON

Four field trials were conducted over a two-year period (2009 and 2010) at Exeter and Ridgetown, Ontario to evaluate the tolerance of adzuki ('Erimo'), black ('Black Velvet'), cranberry ('Etna'), kidney ('Red Hawk'), otebo ('Hime'), pinto ('Wind Breaker'), Small Red Mexican ('Merlot') and white ('T9905') beans to halosulfuron applied postemergence (POST) at 35 and 70 g ai ha^{-1}. All treatments including the non-treated control were maintained weed free during the growing season. Halosulfuron applied POST caused as much as 73, 7, 13, 12, 12, 11, 11 and 9% injury in adzuki, black, cranberry, kidney, otebo, pinto, Small Red Mexican (SRM) and white beans, respectively. Halosulfuron applied POST reduced adzuki bean height as much as 52 and 70% at Exeter and Ridgetown, respectively. Plant height was not affected in the other market classes of dry bean evaluated. Halosulfuron POST reduced shoot dry weight of adzuki bean 68% at both rates evaluated. Otebo and SRM bean shoot dry weight were not affected when halosulfuron was applied POST at 35 g ai ha^{-1} but otebo bean shoot dry weight was reduced 12% and SRM bean shoot dry weight was reduced 14% at 70 g ai ha^{-1}. Shoot dry weight of black, cranberry, kidney, pinto and white bean was not affected with either rate of halosulfuron. Halosulfuron applied POST resulted in a delay in maturity of adzuki, cranberry and kidney bean but the maturity of the other market classes was not affected. Seed yield of adzuki bean was decreased 58% at 35 g ai ha^{-1} and 68% at 70 g ai ha^{-1} with halosulfuron. White bean yield was not affected with halosulfuron applied POST at 35 g ai ha^{-1} but was reduced 9% at 70 g ai ha^{-1}. Seed yield of black, cranberry, kidney, otebo, pinto and SRM bean was not reduced with either rate of halosulfuron.

Key words: Adzuki bean, black bean, cranberry bean, kidney bean, otebo bean, pinto bean, Small Red Mexican bean and white bean, *Phaseolus vulgaris* L.

Weed control and sensitivity of oats (*Avena sativa*) with various doses of saflufenacil·
Soltani, N., Shropshire C., Sikkema, P.H. University of Guelph Ridgetown Campus, Ridgetown, Ontario,

Saflufenacil is a new herbicide being developed by BASF for broadleaved weed control in maize, soybean and other crops prior to crop emergence. Six field studies were conducted in Ontario, Canada over a three year period (2008 to 2010) to evaluate the potential of saflufenacil applied pre-emergence (PRE) at various doses for broadleaved weed control in oats. Saflufenacil applied PRE caused minimal visible injury at 1, 2 and 4 weeks after emergence (WAE) in oats. At 4 WAE, the dose of saflufenacil required to provide 95% control of *Ambrosia artemisiifolia* (common ragweed), *Chenopodium album* (common lambsquarters), *Polygonum convolvulus* (wild buckwheat), *Polygonum scabrum* (green smartweed) and *Sinapsis arvensis* (wild mustard) was 72 to >100, >100, 74, 58 and >100 g ai ha^{-1}, respectively. Generally, similar saflufenacil dose response trends were seen at 8 WAE. The doses of saflufenacil required to provide 95% reduction in density and dry weight ranged from 95 to >100 and 42 to >100 g ai ha^{-1} respectively for *A. artemisiifolia*, *C. album*, *P. convolvulus*, *P. scabrum* and *S. arvensis.* Oat yield showed no sensitivity to saflufenacil at the doses evaluated. Based on this study, saflufenacil applied PRE can be safely used in spring planted oats for the control of some troublesome annual broadleaved weeds.

Keywords: Density; dry weight; dose response; herbicide sensitivity; oats (*Avena sativa* L.); tolerance; yield

Methods to Control Herbicide Resistant Pigweed (*Amarathus retroflexus* L., *A. powellii,* S. Watson *and A. hybridus* L.). B. Visser[1] and K. Callow[2], [1]University of Guelph, Department of Plant Agriculture, Guelph, Ontario and [2]OMAFRA, Ridgetown, Ontario

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.

Co-existence of genetically engineered and conventional camelina; an investigation on seed-mediated gene flow. Kimberly D. Walsh[1], Melissa J. Hills[2], Keith C. Topinka[1], and Linda M. Hall[1], [1]Department of Agricultural, Food, and Nutritional Science, University of Alberta, Edmonton, Alberta; and [2]Department of Biological Sciences, Grant MacEwan University. Edmonton, Alberta

Camelina [*Camelina sativa* (L.) Crantz] is a small seeded oilseed crop being considered for production of bioproducts, including modified oils and bioplastics. Seed-mediated gene flow may influence the ability of transgenic camelina to co-exist with conventional crops within the cropping systems of western Canada. A study was conducted to quantify seed inputs at harvest, seed bank persistence and volunteer populations. Seed loss at harvest, appraised for seven camelina fields for years 2008 to 2010 in central and southern Alberta, averaged 49 kg ha^{-1} (≈3 500 seeds m^{-2}). Large losses are attributed, in part, to small seed size. Seed persistence was measured in artificial seed banks at three seeding depths (surface, 3 cm and 10 cm). Camelina seeds did not persist beyond 9 months after autumn dispersal. Surveys of fields in central and southern Alberta and central Saskatchewan over two years (2010 and 2011) following camelina production recorded average volunteer populations of 1 200 plants m^{-2} prior to seeding. Volunteer populations sharply declined with the administration of herbicide indicating these populations can be effectively controlled. There was a slight increase in volunteers for the pre-seed 2011 survey; however, it comprised a small proportion of the original population suggesting that camelina is not invasive in an agricultural setting. While camelina populations are unlikely to persist in conventional cropping systems, coexistence with conventional crops in the year following camelina production will require stewardship. In conclusion, large seed bank additions are balanced by low population persistence and there is a low to moderate risk of seed-mediated gene flow.

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