Canadian Weed Science Society

Société canadienne de malherbologie

68st Annual Meeting
November 17th-20th, 2014

68^{e} Réunion annuelle
17 au 20 novembre 2014

Fairmont - The Queen Elizabeth
Montréal, Québec

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TABLE OF CONTENTS

CWSS-SCM 2014 Annual Meeting Agenda

Date	Time	Topic
Sunday November 16th	12:00 – 13:00	Board Lunch
	13:00 – 17:00	Strategic Planning Board Meeting
Monday November 17th	9:00 – 17:00	Board of Directors Meeting. Lunch served at noon
	13:00 – 17:00	Pre-Conference Tour – Meet in Hotel Lobby @ 13:15
	16:00 – 19:00	Registration
	18:00 – 21:00	Board members & Graduate Students Meet and Greet
		FREE NiGHT – for Attendees
Tuesday November 18th	7:00 – 8:00	Continental Breakfast
	7:00 – 18:00	Registration
	8:30 – 10:00	Poster and Commercial Display **set-up**
	10:00 – 17:00	Poster and Commercial Display Viewing
	8:00 – 10:15	**Plenary Session - Symposium**
	10:15 – 10:45	Health Break
	10:45 – 11:55	**Plenary Session - Symposium** (continued)
	12:00 – 13:00	Lunch
	13:00 – 15:15	**Graduate student presentations**
	15:15 – 15:30	Health Break
	15:30 – 17:15	**Graduate student presentations** (continued)
	18:30 – 21:30	FREE NiGHT – optional networking supper in downtown Montréal
		If interested, meet in Hotel Lobby @ 18:30
Wednesday November 19th	7:00 – 8:00	Breakfast Meeting for 2015 Program Committee
	7:00 – 8:00	Continental Breakfast
	8:00 – 18:00	Registration
	8:00 – 9:30	**Poster and Commercial Display Viewing (authors in attendance for judging)**
	9:30 – 10:00	Special Sugar Shack Health Break
	8:00 – 17:00	Poster and Commercial Display Viewing
	10:00 – 12:00	**Professional Development workshops – Concurrent**
	10:00 – 12:00	Introduction to R using RStudio
	10:00 – 11:00	Professional use of social media
	11 :00 – 12 :00	How to review a manuscript for a scientific journal
	12:00 – 14:00	Awards Banquet
	14:00 – 15:40	**Concurrent Program Sessions** – Weed Control in corn, soybean & edible beans
	14:00 – 16:00	**Concurrent Program Sessions** – PMRA,CFIA regulatory issues and provincial weed reports
	15:00 - 16:00	**Concurrent Program Sessions** – Weed control in horticulture & specialty crops
	18:00 – 21:00	Industry Reception
Thursday November 20th	7:00 – 8:00	Poster and Commercial Display – **take down**
	7:30 – 9:30	CWSS-SCM Annual Business Meeting Breakfast
	8:30 – 10:30	**CWSS-SCM Annual Business Meeting**
	10:30 – 12:00	**Concurrent Program Sessions** – Weed control in cereals, oilseeds & pulses
	10:30 – 11:45	**Concurrent Program Sessions** – Weed biology & ecology
	12:00 – 13:00	CWSS-SCM Board lunch
	12:00 – 15:00	CWSS-SCM Board Member Meeting

AUDIT ON INTEGRATED WEED MANAGEMENT / AUDIT DE LA LUTTE INTÉGRÉE AUX MAUVAISES HERBES

Plenary Session - Agenda
Tuesday, November 18, 2014

Time	Topic	Speaker	Affiliation
8:00 – 8:10	Welcome and Announcements	**Hugh Beckie**	President, CWSS
8:10 – 8:20	Local Arrangement Chair - Announcements	**Diane Lyse Benoit**	Saint-Jean-sur-Richelieu, Québec
8:20 – 8:30	Plenary Session Chair - Introduction	**Danielle Bernier / Marie-Édith Cuerrier**	MAPAQ, Québec, Québec CEROM, Saint-Mathieu-de-Beloeil, Québec
Simultaneous translation will be available all day **La traduction simultanée sera disponible pour les participants.**			
8:30 – 9:05	L'indicateur intégrée de gestion des cultures / **Integrated indicator for crop management**	**Pierre-Antoine Thériault**	MAPAQ, Québec, Québec
9:05 – 9:40	Nouvelles biotechniques et lutte intégrée / **New technologies and IWM**	François Tardif	Guelph University - Guelph, Ontario
9:40 – 10:15	Les bioherbicides et la lutte intégrée / **Bioherbicides and IWM**	**Alan Watson**	McGill University -, Sainte-Anne-de-Bellevue, Québec
10:15–10:45	**Health Break**		
10:45–11:20	La confiance des producteurs québécois par rapport aux pratiques de la lutte intégrée pour contrôler les mauvaises herbes **Québec producer confidence in IPM practices for weed control**	**Gale West**	Université Laval, Québec, Québec
11:20–11:55	Comment trouver l'équilibre en régie bio, quand les plantes ont toujours le dernier mot! **Finding the right equilibrium the organic way when plants always have the last say!**	**Sébastien Angers**	Saint-Monique, Québec
11:55–13:00	**Lunch**		

Professional Development Workshops

(Concurrent sessions)

Agenda
Wednesday, November 19, 2014

Time	Topic	Speaker	Affiliation
10:00 – 12:00	**Introduction to R using RStudio**	**Daniel Cloutier**	**Institut de malherbologie, Sainte-Anne-de-Bellevue, Québec**
	Concurrent sessions		
10:00 – 11:00	**Professional use of social media**	**Émmanuelle Arès**	**Émmanuelle Arès Communications**
11:00 – 12:00	**How to review a manuscript for a scientific journal**	**Robert Nurse**	**AAFC, Harrow Ontario & editor in chief for Canadian Journal of Plant Science**

November 18, 2014 – Tuesday	
Time	**Topic/Event**
08:00 – 08:30	Welcome to 68th Annual Meeting for the CWSS-SCM Hugh Beckie, President, CWSS-SCM Diane Lyse Benoit, Local Arrangements Chair Danielle Bernier & Marie-Edith Cuerrier, Symposium chairs
08:30-11:55	**Plenary Session**

1)	8:30	Pierre-Antoine Thériault , MAPAQ	L'indicateur intégré de gestion des cultures
2)	9:05	François Tardif, Univ. Guelph	Nouvelles biotechnologies et lutte intégrée
3)	9:40	Alan Watson, McGill Univ.	Bioherbicides and IWM
	10:45	Gale West, Université Laval	La confiance des producteurs québécois par rapport aux pratiques de la lutte intégrée pour contrôler les mauvaises herbes
5)	11:20	Sébastien Angers, Sainte-Monique	Comment trouver l'équilibre en régie bio, quand les plantes ont toujours le dernier mot!

13:00 – 15:30	**Grad Student Presentations**

6) 13:00 **Sonhita Chakraborty -** Assessing the cultivation potential of oilseed crops *Euphorbia lagascae* and *Centrapalus pauciflorus* in Southern Ontario
7) 13:15 **Ali Moussavi -** Studying the practical field establishment of *Taraxacum Kok-saghyz* (TKS) from seed
8) 13:30 **Breanne Tidemann -** Potential for Harvest Weed Seed Control as Evidenced by Weed Seed Rain
9) 13:45 **Andrew G. McKenzie-Gopsill -** Light, weeds and carbon partitioning – how does a neighbour do it?
10) 14:00 **Reece Lawrence -** Exergy, a candidate for precision agriculture
11) 14:15 **HaeWon Kim -** Thiamethoxam enhances soybean competitive ability with weeds
12) 14:30 **Katherine Stanley -** The potential for inter-row cultivation in organic pulse production
13) 14:45 **Scott Ditschun -** Control of Glyphosate-resistant *Conyza canadensis* [L.] Cronq. with isoxaflutole and metribuzin
14) 15:00 **Charles M. Geddes -** To Till, or Not to Till: Soil disturbance after canola harvest
15) 15:30 **Ian G. Epp -** Evaluating the response of *Galium* species and populations to herbicides
16) 15:45 **Andrea C. De Roo -** Molecular discrimination of Catchweed Bedstraw (Galium aparine L.) and False Cleavers (*Galium spurium* L.) in Western Canada
17) 16:00 **Amy R. Mangin -** Optimizing Efficacy of Pyroxasulfone on Wild Oat
18) 16:15 **David Miville -** Evaluation of Hairy Vetch (*Vicia villosa* Roth.) and Winter Rye (*Secale cereale* L.) Mulch as Cover Crops to Control Weeds in Cucurbits
19) 16:30 **Jessica Weber -** Improving kochia control in Oats (*Avena sativa* L.)
20) 16:45 **Annemarie C. Van Wely -** Control and Distribution of Glyphosate Resistant Common Ragweed (*Ambrosia artemisiifolia* L.) in Ontario
21) 17:00 **Ethan Bertholet -** Evaluation of new and existing desiccants in lentil

17:15 Adjourn

November 19, 2014 – Wednesday		
Time	**Topic/Event**	**Room**

Continuing Education Sessions (Concurrent)		
10:00-12:00	Concurrent Session - Introduction to R using RStudio. Daniel Cloutier	Harricana/Chaudière
OR		
10:00 – 11:00	Concurrent Session – Professional use of social media –Émmanuelle Arès	Matapedia
11:00 – 12:00	Concurrent Session – How to review a manuscript for a journal – Robert Nurse	Saint-Charles
14:00 – 17:00	Concurrent Program Sessions – Contributed Papers	
14:00 – 15:40	1. **Weed Control in Corn, Soybean and Edible Beans**. Chair: François Tardif	Harricana/Chaudière

22) 14:00	Joe Vink	Glyphosate-resistant weed control with the Roundup Ready Xtend Crop System in Canada
23) 14:20	Andrew W. MacRae	Evaluation of the Enlist Weed Control System in Western Canada field corn and soybean.
24) 14:40	Peter H. Sikkema	Control of volunteer Enlist corn in soybean
25) 15:00	Clarence J. Swanton	Early season weed control-getting to the root of the problem
15:20		General discussion

OR		
14:00-16:00	2. **PMRA, CFIA Regulatory Issues and Provincial Weed Reports** Chair: Mike Cowbrough	Matapedia

26) 14:00	Mike Cowbrough	How the Monarch Butterfly, Genesis and giant hogweed changed the noxious weed list in Ontario
27) 14:20	Gavin Graham	New Brunswick IPM Image Pending Database
28) 14:40	David Ralph	Pesticide Use in the Urban Environment, an ounce of education goes a long way
29) 15:00	Chris Neeser	Current status and challenges of surveying regulated weeds in Alberta and first impressions on the use of Unmanned Aerial Vehicles for field scouting

30) 15:20	Wendy Asbil	CFIA update
31) 15:40	Mike Cowbrough	Opportunities for collaboration across provinces
15:00-16:00	3. **Weed Control in Horticulture & Speciality Crops** Chair: Darren Robinson	Saint-Charles
32) 15:00	Gavin L. Graham	Evaluation of Ignite (glufosinate-ammonium) in Wild Blueberries
33) 15:15	Diane L. Benoit	Rye cover crop as an economic weed management option in spaghetti squash production
34) 15:30	Scott N. White	Pre- and post-vernalization ramet removal reduces flowering of red sorrel (*Rumex acetosella* L.) in wild blueberry (*Vaccinium angustifolium* Ait.).
35) 15:45	Nathan S. Boyd	Integrated approaches to purple nutsedge (*Cyperus rotundus*) management in Florida tomato production

November 20, 2014 – Thursday		
Time	**Topic/Event**	**Room**
10:30 - 12:00	Concurrent Program Sessions – Contributed Papers	
10:30 – 12:00	**1. Weed Control in Cereals, Oilseeds & Pulses** Chair: Robert Blackshaw	Harricana/Chaudière

36) 10:30	Ken L. Sapsford	*Galium aparine*, Cleavers, Control in Peas in Soils with Greater than 6% Organic Matter
37) 10:45	Hugh J. Beckie	Glyphosate-resistant kochia in Saskatchewan and Manitoba
38) 11:00	Robert E. Blackshaw	Glyphosate-resistant kochia (*Kochia scoparia* (L.) Schrad.) management
39) 11:15	Rory Degenhardt	Halauxifen-methyl plus Florasulam for Preplant Weed Control in Western Canadian Cereal Crops
40) 11:30	Eric Tozzi	Late glyphosate applications alter yield and yield components in glyphosate-resistant canola (*Brassica napus* L.).
41) 11:45	Bryce Geisel	Heat LQ-spring burndown and fall harvest aid

10:30 – 11:45	**2. Weed Biology and Ecology** Chair: Eric Page	Saint-Charles

42) 10:30	Sara L. Martin	Camelina: Canadian distribution and Hybridization -An Update
43) 11:00	David R. Clements	Fire may spark weed invasion instead of restoration
44) 11:15	K. Neil Harker	Crop Canopy Effects on Light Quality and Weeds
45) 11:30	Eric R. Page	Cropping systems and the prevalence of giant ragweed (*Ambrosia trifida* L): from the 1950's to present

ABSTRACTS

Plenary Session Abstracts

1) L'indicateur de la gestion intégrée des ennemis des cultures – Résultats 2012. Direction de l'Agroenvironnement et du développement durable. Ministère de l'Agriculture, des Pêcheries et de l'Alimentation du Québec (MAPAQ), Québec, QC

La Stratégie phytosanitaire québécoise en agriculture 2011-2021 vise à accroître l'adoption de la gestion intégrée des ennemis des cultures (GIEC). En 2013, le ministère de l'Agriculture, des Pêcheries et de l'Alimentation (MAPAQ) a conçu un indicateur d'adoption de la GIEC et a réalisé un sondage auprès de 1 400 producteurs de différents secteurs de production : canneberge, productions maraîchères, grandes cultures, petits fruits, pomme, pomme de terre, serres ornementales et pépinières ornementales. L'objectif était de dresser le portrait de l'adoption la gestion intégrée des fermes du Québec. Les pratiques retenues pour l'indicateur ont été sélectionnées par des experts québécois des secteurs de production et ont été pondérées selon leur importance. Ces pratiques couvrent différentes étapes de la GIEC : la connaissance, les pratiques préventives, le dépistage et le suivi des champs, les méthodes de lutte, l'évaluation des interventions phytosanitaires et la gestion des pesticides. Les répondants devaient identifier la fréquence à laquelle ils avaient recours aux pratiques de GIEC. Leurs résultats étaient ensuite classés selon quatre niveau d'adoption de la GIEC : en transition, de base, intermédiaire et avancé. Le niveau d'adoption des pratiques de GIEC des exploitations agricoles ayant participé au sondage se situe, en majorité, à un niveau intermédiaire. Le secteur montrant un niveau d'adoption le plus élevé est la canneberge, où 64 % des répondants se classent à un niveau avancé. Les secteurs de la pomme et de la pomme de terre montrent un niveau d'adoption élevé, respectivement 41 et 40 % des producteurs étant au niveau avancé. Ces résultats permettront de cibler les actions les plus pertinentes afin d'améliorer l'adoption de la GIEC chez les entreprises agricoles du Québec. Le sondage sera répété en 2017 et 2021 afin de déterminer l'évolution de l'adoption de la GIEC.

2) **Nouvelles biotechnologies et lutte intégrée / New Technologies and Integrated Weed Management. François Tardif, University of Guelph.**

Integrated Weed Management (IWM) has been defined in different ways, but a common theme revolves around the use of various approaches to manage weeds. This is done in order to reduce the environmental impact of a single weed control measure and to prevent management issues such as resistance or population shifts. In modern agriculture this means reducing reliance on herbicides as the sole weed control method. In order to be adopted by practitioners, IWM approaches need to be efficient and also not compromise on short-term advantages. One proposed benefit of the adoption of IWM is the reduction in the development of herbicide resistance. As such the appearance rate of resistance cases could serve as one indicator of the adoption of IWM. New technologies such as herbicide resistant crops (HRC) have had a significant impact on weed management. Some authors have posited on the fit of these HRC within IWM systems. While not contradictory, the use of HRC presents so many immediate benefits to growers that they make adopting IWM less appealing. The phenomenal increase in the number of glyphosate resistant weeds in the last decade and a half is testament to the lack of adoption of IWM.

3) Why the limited success with mycoherbicides. Alan K. Watson, McGill University

There was great anticipation generated from the early successes of Luboa, COLLEGO and DeVine in the earlier 1980's. This was followed by extensive, relatively well funded research in many countries. Hundreds of weeds were targeted with fungi, bacteria, and viruses. Scientists in government and university laboratories often conducted basic screening and testing of "potential biocontrol agent" under laboratory, greenhouse or small plot field trials anticipating that multinational companies would take active roles in developing "like an herbicide" biopesticide products. That did not occur. Success has not been great; only 10 mycoherbicide products have being made available in the marketplace and likely only one will be available in 2015. Earlier products are no longer produced, some product registrations are cancelled, and others have delayed or prevented product development due to mass production, formulation and application technology difficulties. There are two current examples of successful mycoherbicides in Canada: Chontrol® (*Chondrostereum purpureum*), registered as in 2002 for control of deciduous shrubs and trees in rights-of-ways, and Sarritor® (*Sclerotinia minor*), registered in 2007 for control of dandelions and broadleaf weeds in turfgrass. Both of these products were developed by university spin-off companies, with product user assistance. Sarritor benefited tremendously from the provincial bans of conventional herbicide that left few effective weed management options to the commercial and domestic users. Similar increasing public pressure against chemical herbicides left few alternatives for forest vegetation management. Future success with mycoherbicides will require overcoming biological, environmental, technological and commercial limitations with molecular and other technologies to make the mycoherbicide better than the competition. Favourable public opinion and government action against chemical pesticides will help.

4) **La confiance des producteurs québécois par rapport aux pratiques de la lutte intégrée pour contrôler les mauvaises herbes. Gale West, Université Laval.**

5) **Comment trouver l'équilibre en régie bio, quand les plantes ont toujours le dernier mot! Sébastien Angers, Sainte-Monique.**

Graduate Student Abstracts

6) ASSESSING THE CULTIVATION POTENTIAL OF OILSEED CROPS EUPHORBIA LAGASCAE AND CENTRAPALUS PAUCIFLORUS IN SOUTHERN ONTARIO Chakraborty, S.[1], Van Acker, R.[1], Todd, J.[2], Grohs, R.[2], Deen, B.[1] and Robinson, D.[3] [1]Department of Plant Agriculture, University of Guelph, Guelph, ON; [2]Ontario Ministry of Agriculture and Food and Rural Affairs, Simcoe Resource Centre, Simcoe, ON; [3]University of Guelph Ridgetown Campus, Ridgetown, ON.

Interest continues to grow within the plasticizer industry to adopt cleaner and more sustainable oils derived from renewable sources. Both *Euphorbia lagascae* and *Centrapalus pauciflorus* produce high amounts of already epoxidized vernolic acid, which is less likely to release volatiles into the atmosphere and cause pollution. The purpose of this study is to investigate the potential for farming these species in Ontario. This research will provide data on the performance of *E. lagascae* and *C. pauciflorus* in Ontario conditions, data to guide production approaches and data to help assess the potential weediness of these species. If both crops are to be grown on a commercial scale, agronomic practices that maximize oil yield will have to be established. Field trials were conducted in the summer of 2014 at Simcoe and Guelph, Ontario, to better understand the phenology and compare agronomic practices (such as seeding date, cultivar, irrigation rate, and soil type) required to produce early germinating and flowering varieties suited for Canadian cultivation. Indoor germination rates for *C. pauciflorus* far exceeded field emergence rates. In field trials, irrigation or late seeding did not significantly improve germination rates for either species. Little is known about the potential weediness of either of these species. We have established studies to explore their ability to establish over a range of habitats, persist through the winter and leave seedbanks, and to compete with other crops. Preliminary results from a spring 2014 study show that, as a volunteer, *C. pauciflorus* established at significantly higher rates in seedbeds than *E. lagascae*. However, there was no significant difference in recruitment between these species when seeds were spread onto non-cultivated plots (mowed or unmowed swards of grass). These results suggest that both species may have some potential as volunteer weeds. Data on yield will help explain their potential as crops.

7) **STUDYING THE PRACTICAL FIELD ESTABLISHMENT OF *TARAXACUM KOK-SAGHYZ* (TKS) FROM SEED**. Ali Moussavi*[1], C. Loucks[1], Rene van Acker[2]; [1]Department of Plant Agriculture, Guelph, ON, [2]University of Guelph, Guelph, ON

The price and pollution potential of oil make it vital to have an alternative natural source of rubber. *Taraxacum k-saghyz* (TKS), also called Russia dandelion, is a potential source of natural rubber. TKS's original habitats are the high mountain regions of Central Asia and south Russia, but it can be grown in North America. TKS can contain up to 20% (w/w) of high quality rubber in its roots making it a potentially key global source of natural rubber. One key challenge for the commercial production of TKS is establishing it from seed in the field. This is difficult because of small seed size and sensitivity to inconsistent soil moisture. TKS germinates well under controlled conditions; however, transplanting greenhouse seedlings to the field is not a viable commercial production option because 1) transplanting is expensive 2) the majority of transplants do not survive. The purpose of this study was to explore over two seasons (2013 and 2014) and at two sites (Simcoe and Guelph, Ontario) techniques for achieving greater success rates for the establishment of TKS from seed in the field including watering regimes, seeding depth and the use of mulches. In 2013 field establishment of TKS from seed was very low regardless of mitigating treatments. Percent recruitment ranged from 2.2% to 11.4% over two sites and three seeding dates. Location and seeding date both significantly affected percent recruitment. The best recruitment was at Simcoe in spring, followed by Simcoe in fall and Guelph in spring. The use of a starch based polymer significantly inhibited recruitment in 2013 at Simcoe. Watering regime had no significant effect on recruitment. The first year results confirm that TKS field establishment from seed is very challenging. Experiments were modified for 2014 with the inclusion of horticultural cloth mulches, results have yet to be analyzed.

8) THE POTENTIAL FOR HARVEST WEED SEED CONTROL AS EVIDENCED BY WEED SEED RAIN. Breanne Tidemann*; Department of Agricultural, Food and Nutritional Science, University of Alberta, Edmonton, Alberta.

As the incidence of herbicide resistance increases, and with no new herbicide modes of action released in over 20 years, new weed management methods are required. Harvest Weed Seed Control (HWSC) has been widely adopted in Australia and has proven effective at controlling problematic weeds. For HWSC to be effective, weed seeds must be produced at a collectible height, and must be retained on the plant at crop maturity. Cleavers (*Galium spurium* L.), canola (*Brassica napus* L.), and wild oat (*Avena fatua* L.) were cross-seeded with 1x and 2x seeding rates of wheat and faba bean to determine seed retention and height of seed production. Seed loss was quantified using shatter trays collected twice a week, and number of seeds retained determined at wheat swath timing, wheat direct harvest timing and faba bean direct harvest timing. During plant harvests, weeds were sectioned into four heights (0-15cm, 15-30cm, 30-45cm, and 45+cm) to determine the height of seed production.

Preliminary results indicate retention of 99% of canola seeds at wheat swathing and direct harvest timing, with 93% retained at faba bean harvest. Cleavers seed was also well retained at swath timing with 99% retention, but dropped to 78% and 58% for wheat and faba bean direct harvest, respectively. Wild oat had the lowest retention values with 57% of seeds retained at swathing, 28% at wheat harvest and 22% at faba bean harvest. Wild oat and canola produce the majority of their seed (>97%) in the highest fraction of 45+cm. Cleavers produce a minimum of 83% of its seed in the collectible height fraction (>15cm).

Based on a single location (Lacombe, AB) and year (2014), these results indicate that canola and cleavers are compatible with HWSC methods. High wild oat seed loss indicates far less potential for control with HWSC methods.

9) **LIGHT, WEEDS AND CARBON PARTITIONING "HOW DOES A NEIGHBOUR DO IT?"** Andrew G. McKenzie-Gopsill*, Sasan Amirsadeghi, Elizabeth Lee, Lewis Lukens, Clarence J. Swanton; University of Guelph, Guelph, ON

Plants have the ability to detect the presence of neighbouring plants through changes in the red: far-red ratio of light reflected or transmitted off vegetation. This triggers the shade avoidance response before direct shading occurs and has been shown to be important in understanding yield loss especially when it occurs during the critical period for weed control. Previous work in our lab has shown that this response is triggered upon emergence and can have long lasting negative effects on plant yield. While the morphological and hormonal changes associated with this response are well documented, investigations into how carbon and nitrogen assimilation may be impacted are lacking. Through a growth chamber study, we hypothesized that soybean seedlings exposed to weedy conditions and non-limiting resources would have reduced rates of carbon assimilation and in turn direct consequences on the sugar and starch pools, compared to weed-free plants. Through direct measurements of photosynthesis, chlorophyll content and soluble and insoluble sugars, we identified key changes to carbon partitioning in plants exposed to early season neighbouring weeds. While we found significant effects on the carbon cycle, nitrogen assimilation did not seem to be impacted. A better understanding of carbon partitioning during plant-weed interactions, will shed light on the mechanisms of yield loss in soybean. This work can help improve our understanding of yield loss in soybeans and can be applied to management and breeding programs to improve plant health.

10) **EXERGY, A CANDIDATE FOR PRECISION AGRICULTURE**. Reece Lawrence*[1], Roydon Fraser[2], Clarence J. Swanton[3]; [1]University of Waterloo, Waterloo, ON, [2]University of Waterloo, waterloo, ON, [3]University of Guelph, Guelph, ON

Exergy has long been proposed as a potential tool to gain information about the health of an ecosystem. By utilizing predictions from exergy theory, we propose a new and novel approach to detecting plant stress. It is hypothesized that when a plant becomes stressed it hampers the plants ability to degrade the incoming exergy, which should have a measurable effect on the plants surface temperature. In particular, a stressed plant's surface temperature should be warmer than an unstressed plant. In this study crops stressors are applied and the resultant crop surface temperature measured. Two experiments physiologically stressed wheat and corn through a range of nitrogen application restrictions. A third experiment introduced weed competition as the physiological stressor using cultivated wheat as a surrogate weed. The results from these studies provide preliminary support for the exergy-based temperature metric for crop health hypothesis; specifically, the crops under stress experienced an increased surface temperature compared to that of an unstressed crop. Further, the application of the theory of exergy may allow for more accurate and proactive crop monitoring, thus enabling the detection of stress in crops well before there is any visual indication. Further research is required to develop this theory into a potential technology that will improve the ability of precision agriculture to reduce the environmental "foot print"of agriculture.

11) **THIAMETHOXAM ENHANCES SOYBEAN COMPETITIVE ABILITY WITH WEEDS.** HaeWon Kim*, Maha Afifi, Gale Bozzo, Elizabeth Lee, Lewis Lukens, Clarence J. Swanton; University of Guelph, Guelph, ON

In the absence of direct resource competition, neighbouring weeds can trigger physiological changes in soybean seedlings that may ultimately result in yield loss. These changes can occur in soybean seedlings grown under conditions of non-limiting resources in response primarily to the detection of the R:FR signal reflected from above ground neighbouring weeds. Recently, research has shown that maize seedlings arising from seeds treated with thiamethoxam did not experience these same physiological changes. In this experiment, we hypothesized that in the presence of above ground weeds, soybean seedlings emerging from seed treated with thiamethoxam would not express differences in root morphology or isoflavonoid content. A detailed morphological and physiological analysis of soybean roots was conducted. The data confirmed soybean seedlings emerging from seeds treated with thiamethoxam maintained root structure and isoflavonoid content in the presence of above ground weeds. This study suggests that the role of seed treatments be expanded beyond crop protection to explore the potential of new chemistries which may enhance the tolerance of soybeans to early weed competition.

12) **THE POTENTIAL FOR INTER-ROW CULTIVATION IN ORGANIC PULSE PRODUCTION**. Katherine Stanley*[1], Steven J. Shirtliffe[2]; [1]University of Saskatchewan, Saskatoon, SK, [2]University of Saskatchewan, Saskatoon, SK

Field pea (*Pisum sativum*) and lentil (*Lens culinaris* L.) are important crops in the Canadian Prairies due to their desirable agronomic characteristics, high economic return and significant role in the global export market. The non-competitive nature of these crops in the presence of weeds poses a challenge to producers to achieve economic yields in both organic and conventional cropping systems. As a result of this, alternative weed control methods need to be developed. The objective of this study is to examine the tolerance of peas and lentils to inter-row cultivation at different crop stages. This study was conducted for one year (2014) at two locations at Saskatoon and Vonda, Saskatchewan. Crop tolerance to single cultivation treatments and multiple cultivation treatments at different crop growth stages were examined. Multiple cultivation treatments consisted of two cultivation timings and three cultivation timings. The pea crop exhibited tolerance to single cultivation treatments during the early growth stages, however yield loss was observed at the latest cultivation timing. In the multiple cultivation treatments, peas showed no yield losses when cultivated twice, however yield losses were evident in the treatments cultivated three times. Similar trends were observed in lentil. Lentil exhibited tolerance to early single cultivation treatments, with yield losses at later growth stages. However, in contrast to peas, there was reduced tolerance to all of the multiple cultivation treatments. The result of this study indicate that there will be no significant loss in yield potential for field pea and lentil from inter-row cultivation at earlier stages of crop growth; however, these results were variable in lentil. Late cultivation and multiple cultivation timings pose a risk for yield loss in both crop types.

13) **CONTROL OF GLYPHOSATE-RESISTANT *CONYZA CANADENSIS* [L.] CRONQ. WITH ISOXAFLUTOLE AND METRIBUZIN.** Scott Ditschun*; University of Guelph, Guelph, ON

New weed control strategies are needed to control glyphosate-resistant Canada fleabane (*Conyza canadensis* [L.] Cronq.) in soybean (*Glycine max* [L.] Merr.) fields. With the pending release of new isoxaflutole resistant soybeans cultivars such as 'Balance GT', a control strategy for glyphosate resistant Canada fleabane can be developed using a combination of isoxaflutole (IFT), metribuzin (MTZ) and glyphosate (GLY). Experimental field trials conducted in 2013 and 2014 included rates of MTZ and IFT in a 4 to 1 ratio, which are then mixed with a standard 900 g ae/ha rate of glyphosate. 63, 74 and 85% control of Canada fleabane was achieved at MTZ and IFT rates of 210+52.5, 316+79, and 420+105 gai/ha respectively. Synergism was observed in IFT and MTZ tank mixed while each product applied alone with GLY provided poor control of glyphosate resistant Canada fleabane. Factorial experiments were conducted in greenhouse and growthroom to assess the effect of IFT and GLY tank mixes and determine the effect of MTZ addition to the tank mix. Antagonism was observed in IFT and GLY tank mix while the addition of MTZ synergizes the mix.

14) **TO TILL, OR NOT TO TILL: SOIL DISTURBANCE AFTER CANOLA HARVEST.**
Charles M. Geddes*[1], Robert H. Gulden[2]; [1]University of Manitoba, Winnipeg, MB, [2]University of Manitoba, Winnipeg, MB

Canola is the most abundant oilseed crop produced in western Canada. Volunteer canola, derived mainly from canola harvest losses, has become a significant agricultural weed in many fields throughout western Canada. Seedbank persistence and seed return of volunteer canola, along with genetically-engineered herbicide-resistance, create difficulties for weed management. In 2013/2014, the impact of type (zero tillage, tandem disc, tine harrow, and seeding winter wheat) and timing of soil disturbance following canola harvest (immediately or one month after) on the volunteer canola seedbank was evaluated at three sites throughout Manitoba. Tillage immediately following canola harvest or seeding winter wheat resulted in the least amount of viable seed in the spring seedbank (316 and 325 viable seeds m^{-2}, respectively), whereas zero tillage resulted in the greatest spring seedbank populations (814 viable seeds m^{-2}). The quantity of viable volunteer canola seed in the spring seedbank correlated with spring seedling emergence. Soil disturbance following canola production has been identified as a valuable tool for managing the volunteer canola seedbank immediately after harvest and seedling emergence in subsequent years.

15) **EVALUATING THE RESPONSE OF *GALIUM* SPECIES AND POPULATIONS TO HERBICIDES**. Ian G. Epp[1]*; Willenborg C.[1], JohnsonE.[2], Department of Plant Sciences, University of Saskatchewan, Saskatoon, Sk., [2] Agriculture and Agri-Food Canada, Scott, Sk., [3]

Galium species are prolific seed producers that compete with crops and can cause crop lodging and harvest difficulties. According to the latest Prairie weed survey, cleavers was ranked 9th among weeds for the 2000's, up from 30th in the 1980's. The proliferation of cleavers can be partially attributed to the increasing land base on which canola is grown across the prairies and the development of group 2 resistant biotypes. Although cleavers are competitive weeds in most annual crops, they can be especially problematic in canola crops where their similar size and shape to canola makes them difficult to eliminate as a seed contaminant. The efficacy of current in-crop (glufosinate-ammonium, glyphosate and imazamox + imazapyr) and potential new (quinclorac, clomazone) herbicides was evaluated on *Galium* species during the summers of 2013 and 2014. Treatments sprayed with quinclorac and clomazone reduced cleaver biomass by 81% and 42% respectively compared to the unsprayed check. The reduction in cleaver biomass also corresponded with higher canola yields. Cleaver biomass was further reduced when quinclorac and clomazone were used in conjunction with current in-crop herbicides. The addition of quinclorac to each of the current in-crop herbicides sprayed on canola (glufosinate-ammonium, glyphosate and imazamox + imazapyr) reduced cleaver biomass by 41%, 14% and 38% respectively. A preseeding application of clomazone followed by and in crop application of glufosinate-ammonium, glyphosate or imazamox + imazapyr reduced cleaver biomass by an average of 31% compared to the herbicide standard applied without clomazone. The results from this study suggest that canola production in Western Canada could be substantially benefited by the use of quinclorac and clomazone to improve control of *Galium* species.

16) MOLECULAR DISCRIMINATION OF CATCHWEED BEDSTRAW (*GALIUM APARINE* L.) AND FALSE CLEAVERS (*GALIUM SPURIUM* L.) IN WESTERN CANADA .
Andrea C. De Roo[1]*, Eckstein P.E.[1], Beattie A.D.[1] and Willenborg C.J[1]. [1] Department of Plant Sciences, University of Saskatchewan, Saskatoon, SK.

Three species of *Galium*, collectively known as cleavers, are commonly believed to thrive in Western Canada; *Galium aparine* L., *Galium spurium* L. and *Galium boreale* L. *G. boreale* is commonly found in forested environments and does not compete with crops, but both *G. aparine* and *G. spurium* are strong competitors in numerous types of field crops grown in Canada. The ability to identify and distinguish between species is important to understand their ability to outcross, thus passing traits such as herbicide resistance (*G. spurium*, Group 2 herbicides) between species. Cleavers are difficult to distinguish morphologically and current literature focuses on chromosome counts to differentiate species, a technique that may be challenging and prone to interpretation. DNA based analysis techniques may greatly reduce these inefficiencies and further our understanding of the species complex in Western Canada. We have sequenced the internal transcribed spacer (ITS) 1, 5.8S gene and ITS2 of the large sub-unit ribosomal RNA locus from reference populations of *G. aparine* and *G. spurium.* Some sequence variation has been identified that consistently differentiates these two *Galium* species. In addition to several variable nucleotides in ITS2, two variable loci were identified within the highly conserved 5.8S gene. Sequence analysis of the ITS1-5.8S-ITS2 complex of *Galium* field collections from Western Canada indicates that all samples belong to *G. spurium*. Additional DNA variation exists that may be used to differentiate between geographically isolated populations. The species-specific DNA sequences of the 5.8S gene may be used to develop diagnostic molecular markers to quickly, reliably, and cost-effectively distinguish between *Galium* species.

17) OPTIMIZING EFFICACY OF PYROXASULFONE ON WILD OAT *(AVENA FATUA L.)*. Amy R. Mangin*; Department of Agriculture, Food and Nutritional Science, University of Alberta, Edmonton, Alberta.

Wild oat *(Avena fatua L.)* is a significant weed in many cropping systems in Western Canada and with increased herbicide resistance, effective control is being eroded. Pyroxasulfone is a new soil-applied herbicide that has potential to become a useful tool in wild oat control, but its efficacy has been questioned in conventional tillage systems. We quantified pyroxasulfone control on wild oat precision planted at two depths (0.5 cm or 6 cm) in both the greenhouse and in small plot experiments where plots were either direct seeded or had spring tillage. Pyroxasulfone was applied at 0, 150 or 300 g ai ha^{-1} and triallate at 1672 g ai ha^{-1} was used as a known soil-applied herbicide comparison. Survival, plant morphology and biomass were quantified for both the greenhouse and small plot trials. In the greenhouse wild oat survival was reduced by 59% when shallow seeded but only 13% when deep seeded. In small plot trials deep seeded wild oats were more vigorous than shallow seeded in the absence of tillage. Pyroxasulfone controlled 90% of seeded wild oat without tillage compared to 50% of the wild oats that received a tillage treatment. Results indicated pyroxasulfone control of wild oat is dependent on vertical seed position in the soil; however, more research is required on the interaction between seed position, and tillage systems on pyroxasulfone efficacy. In addition the effect of seedling morphology on pyroxasulfone efficacy must be determined.

18) **EVALUATION OF HAIRY VETCH (*VICIA VILLOSA* ROTH.) AND WINTER RYE (*SECALE CEREALE* L.) MULCH AS COVER CROPS TO CONTROL WEEDS IN CUCURBITS.** David Miville*, Gilles D. Leroux; Département de Phytologie, Université Laval, Québec, QC

Soil degradation of winter rye used as cover crop leads to an immobilization of soil nitrogen. Combining winter rye to nitrogen fixing legumes such as hairy vetch is an interesting and innovative option to solve this problem. Weed control and effects on pumpkin and spaghetti squash of each mulch combination were studied during the 2013 and 2014 growing seasons at the Laval University Agronomy Station in Saint-Augustin-de-Desmaures, Quebec. Adding hairy vetch to winter rye mulch provided no benefits because of severe winter kill. The two most important factors were respectively the use of glyphosate (potassium salt) at 0.45 kg ae ha^{-1} and the mulch growth stage at time of using the roller crimper. Using glyphosate was necessary to guarantee adequate cucurbits growth and yield comparable to the no mulch hand-weeded control. Without glyphosate, rye resumed growth after rolling and competed with main crops. However, this was less observed when the rye was more mature. Two growth stages of rye were studied (Zadok 51 (early heading) and Zadok 69 (flowering)). Mulches formed at flowering provided about 2,000 kg ha^{-1} more biomass than at early heading. Excellent weed control was achieved without glyphosate, regardless of growth stages. Weed ground cover and dry biomass were reduced significantly. Using glyphosate greatly reduced early heading rye mulches effectiveness over time. Mulch from flowering rye maintained an excellent efficiency at low weed pressure and a good efficiency at high weed pressure. These findings suggest that: 1) glyphosate is required to get adequate cucurbits yields and 2) it is essential to obtain the greatest mulch biomass possible prior to rolling in order to maintain an excellent weed control throughout the growing season.

19) **IMPROVING KOCHIA CONTROL IN OATS (*AVENA SATIVA* L.)** . Jessica Weber*[1], Christian Willenborg[1], Eric N. Johnson[2]; [1]University of Saskatchewan, Saskatoon, SK, [2]Agriculture and Agrifood Canada, Scott, SK (Corresponding author- jdw510@mail.usask.ca)

Tame oat (*Avena sativa* L.) is an economically important crop, ranking sixth in world cereal production. Oat yield reductions and poor grain seed quality have become more prevalent with increased resistant weed populations, particularly in the cases of herbicide-resistant (HR) kochia (*Kochia scoparia* L.). Increased populations of HR kochia along with a general lack of herbicide registration for domesticated oats has lead to reduced weed control efficacy. Based on this, the objectives of this study were to apply various pre- and post emergent herbicides to determine herbicide efficacy on kochia and to ensure herbicide tolerance in oats. Oat yield data indicated significant losses of 25%, 28%, 35%; 43% in applications of acifluorfen, flumioxazin, tembotrione and topramezone at a 2x application rate compared to the untreated check. Similarly, oat biomass, thousand kernel weights, and test weights indicated significant reductions in treatments of acifluorfen, flumioxazin, tembotrione and topramezone at their respective 2x application rates. Kochia control was highly variable between treatments, with control ranging from 98% to minimal control. Post-applications of fluthiacet-methyl, pyrasulfotole with bromoxynil, and florasulam with bromoxynil resulted in excellent kochia control with a 96-98% reduction in kochia biomass. Applications of bentazon with 2,4-D, and aciflourfen resulted in kochia suppression, with an approximate 60-70% reduction in kochia biomass. To conclude, overall weed control efficacy and crop tolerance using treatments of fluthiacet-methyl, pyrasulfotole with bromoxynil, bentazon added with 2,4-D, and florasulam with bromoxynil are potential herbicide products to be used in oat production systems.

20) **CONTROL AND DISTRIBUTION OF GLYPHOSATE RESISTANT COMMON RAGWEED (*AMBROSIA ARTEMISIIFOLIA* L.) IN ONTARIO**. Annemarie C. Van Wely*[1], Peter H. Sikkema[1], Darren E. Robinson[1], David Hooker[1], Mark B. Lawton[2]; [1]University of Guelph, Ridgetown, ON, [2]Mosanto Canada, Guelph, ON

Glyphosate resistant (GR) weeds have started to appear in Ontario over the last decade following the repeated use of glyphosate in GR crops. A population of common ragweed was confirmed to be resistant to glyphosate in Ontario in 2011. Field surveys were conducted in 2012 and 2013 to determine the spread of glyphosate resistance in Ontario, where four addition sites with resistance were found in Essex county. Twenty-eight field experiments were evaluated to determine alternative control methods in Roundup Ready (glyphosate resistant) and Roundup Ready 2 Extend (glyphosate plus dicamba resistant) soybean (*Glycine max* L. Merr.). The three objectives of the research were to determine 1) the biologically effective rate of glyphosate on a resistant and susceptible biotype, 2) the level of control of glyphosate tank mixes applied prior to and following crop emergence, 3) the efficacy of glyphosate and dicamba tankmixes in Roundup Ready 2 Xtend soybean applied at various timings. Linuron and metribuzin applied prior to planting, provided >80% control of GR common ragweed 4 and 8 weeks after application. None of the postemergence herbicides provided commercially acceptable control. Sequential applications of dicamba provided 64 to 100% control throughout the season.

21) **EVALUATING NEW AND EXISTING HERBICIDES AS HARVEST AID TOOLS IN LENTIL (*LENS CULINARIS* MEDIK)**. Ethan Bertholet*[1], Eric N. Johnson[2], Christian Willenborg[3]; [1]University of Saskatchewan, Grandora, SK, [2]Agriculture and Agrifood Canada, Scott, SK, [3]University of Saskatchewan, Saskatoon, SK (Corresponding author – ejb417@mail.usask.ca **)**

Globally, herbicide resistance has become a major challenge for many producers. In Western Canada, many lentil (*Lens culinaris* L.) producers have great difficulty controlling Group 2 resistant weed biotypes. Two of these problematic weeds, wild mustard (*Sinapis arvensis L*.) and kochia (*Kochia scoparia*), are particularly challenging for lentil growers and can cause extensive yield loss when not adequately controlled. Desiccation is primarily used to dry down lentil for harvest ease and efficiency. Desiccation or harvest aid products may also have potential to provide late season control of actively growing weeds. Within the lentil crop, late season weeds can impact the quality and efficiency of the harvest. Green weeds can reduce the speed of harvest, while mature weeds will shed their offspring to replenish the seed bank. The objective of this project is to evaluate the response of wild mustard and kochia to several different herbicides, tank-mixed with two different rates of glyphosate (450 g a.e. ha^{-1} and 900 g a.e. ha^{-1}) at Saskatoon and Scott, Saskatchewan over a 3 year period. Desiccation occurred when the lentil seed moisture content was approximately 30%. The results indicate that weed control is highly dependent on weed stage. Treatments tank mixed with glyphosate provided greater dry-down than treatments without glyphosate. Glufosinate treatments tended to provide the greatest reduction in kochia seed yield as well as the greatest reductions in seed and straw moisture of both the lentil and weeds.

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22) **GLYPHOSATE-RESISTANT WEED CONTROL WITH THE ROUNDUP READY XTEND CROP SYSTEM IN CANADA**. Joe Vink*; Monsanto Canada, Winnipeg, MB

Since 2008, glyphosate-resistant (GR) weeds have been confirmed in Ontario, Manitoba, Saskatchewan and Alberta. Giant ragweed (*Ambrosia trifida*) was the first confirmed GR weed, followed by Canada fleabane (*Conyza canadensis*), common ragweed (*Ambrosia artemisiifoli*a) and kochia (*Kochia scoparia* L. Schrad.). Glyphosate-resistant weeds have shown to be troublesome and competitive in soybean. For example, GR giant ragweed interference may reduce soybean yields by greater than 90% in Ontario. In Canada, growers will soon have access to new herbicide-tolerant technologies in soybean. Roundup Ready 2 Xtend™ soybeans are tolerant to both glyphosate and dicamba herbicides and will provide growers with a new weed management tool for the control of glyphosate-resistant and other tough to control weeds. Since 2010, Monsanto Canada in collaboration with the University of Guelph has conducted five field trials in GR giant ragweed, six field trials in GR Canada fleabane and two field trials in GR common ragweed. In Western Canada, six field trials evaluated dicamba activity on kochia in Roundup Ready 2 Xtend™ soybeans. Dicamba provided excellent control of all GR weeds in the studies conducted. The use of dicamba in Roundup Ready 2 Xtend soybean will be a new weed management tool, and should be integrated into a total weed management system that includes crop diversity, herbicide rotations and sequences and other residual herbicide treatments to maintain stewardship of the technology.

23) EVALUATION OF THE ENLIST WEED CONTROL SYSTEM IN WESTERN CANADA FIELD CORN AND SOYBEAN. Andrew W. MacRae*[1], Laura Ford[2], Rory Degenhardt[3]; [1]Dow Agrosciences Canada Inc., Winnipeg, MB, [2]Dow AgroSciences Canada Inc., Winnipeg, MB, [3]Dow AgroSciences Canada Inc., Edmonton, AB

24) **CONTROL OF VOLUNTEER ENLIST CORN IN SOYBEAN.** Peter H. Sikkema*, Nader Soltani; University of Guelph, Ridgetown, ON

Volunteer Enlist corn can become a problem when glyphosate-resistant soybean follows Enlist corn in a rotation. A total of four field trials were conducted at Ridgetown, Ontario over a two-year period (2013 and 2014) to evaluate the control of volunteer Enlist corn in glyphosate-resistant soybean. Treatments consisted of postemergence (POST) glyphosate at 900 g ae/ha alone (weedy control) and in tank-mix with clethodim (30 and 60 g ai/ha), fenoxaprop-p-ethyl (54 and 108 g ai/ha), fluazifop-p-butyl (75 and 150 g ai/ha), quizalofop-p-ethyl (36 and 72 g ai/ha) and sethoxydim (150 and 300 g ai/ha). Clethodim at 30 g ai/ha provided 75-92% control of volunteer Enlist corn at 1, 2, 4 and 8 weeks after treatment application (WAA) and reduced volunteer Enlist corn density and dry weight 95-97%. Clethodim at 60 g ai/ha provided 84-98% control of volunteer Enlist corn at 1, 2, 4 and 8 WAA and reduced volunteer Enlist corn density and dry weight 97-99%. Sethoxydim at 150 g ai/ha provided 66-86% control of volunteer Enlist corn at 1, 2, 4 and 8 WAA and reduced volunteer Enlist corn density and dry weight 91-97%. Sethoxydim at 300 g ai/ha provided 84-96% control of volunteer Enlist corn at 1, 2, 4 and 8 WAA and reduced volunteer Enlist corn density and dry weight 96-98%. Fenoxaprop-p-ethyl (54 and 108 g ai/ha), fluazifop-p-butyl (75 and 150 g ai/ha) and quizalofop-p-ethyl (36 and 72 g ai/ha) provided 0-9% control of volunteer Enlist corn at 1, 2, 4 and 8 WAA and reduced volunteer Enlist corn density and dry weight 21-44% and 18-41%, respectively. Soybean yields closely reflected the level of volunteer Enlist corn control. Based on these results, clethodim and sethoxydim at rates evaluated provide adequate control of volunteer Enlist corn in glyphosate-resistant soybean. However, fenoxaprop-p-ethyl, fluazifop-p-butyl and quizalofop-p-ethyl at rates evaluated do not provide adequate control of volunteer Enlist corn in glyphosate resistant-soybean.

25) **EARLY SEASON WEED CONTROL-GETTING TO THE ROOT OF THE PROBLEM.** Jessica Gal, Maha Afifi, Elizabeth Lee, Lewis Lukens, Clarence J. Swanton*; University of Guelph, Guelph, ON

Plant competition studies rarely explore how plant to plant interactions can affect roots. In this study, we explored how the presence of neighbouring weed seedlings could alter soybean root structure and physiology. We hypothesized that in the presence of above ground weed seedlings, soybean root biomass and nodulation would be reduced and that the reduction in nodulation would be caused by a loss in total flavonoid root content. University of Guelph soybean variety, OAC Wallace was selected to be used in this experiment as it was known to exhibit the classic shade avoidance response in the presence of weeds. Ryegrass was used as the model weed species. The potting arrangement isolated the roots of soybean seedlings from those of the perennial ryegrass, thereby, eliminating the effects of direct root competition for water, nutrients or allelopathy. The results from this study supported our hypothesis. In the presence of above ground weeds, soybean root biomass and nodulation were reduced, an accumulation of hydrogen peroxide and an increase in lipid peroxidation were also observed. In addition, total flavonoid content was reduced. These physiological changes occurred in soybean seedlings grown under conditions of non-limiting resources in response primarily to the detection of the R:FR signal reflected from above ground neighbouring weeds. The response to and the recovery from the presence of above ground weed seedlings may contribute to our understanding of how a soybean plant loses yield.

26) **HOW THE MONARCH BUTTERFLY, GENESIS AND GIANT HOGWEED CHANGED THE NOXIOUS WEED LIST IN ONTARIO.** Mike Cowbrough*; Ontario Ministry of Agriculture Food and Rural Affairs, Guelph, ON

27) **NEW BRUNSWICK IPM IMAGES DATABASE** . Gavin L. Graham*; NBDAAF, Fredericton, NB

The New Brunswick Department of Agriculture, Aquaculture and Fisheries maintains an integrated pest management (IPM) image bank on the www.gnb.ca/agriculture website, or available directly at this location: http://daafmaapextweb.gnb.ca/010-002/Default.aspx?Culture=en-CA. This site contains images of diseases, insects, weeds and other disorders affecting New Brunswick's crops and plants. This site helps producers and specialists properly diagnose plant pests, making the correct management strategy possible. Images are available in both low and high resolutions and the site is completely bilingual. There are over 350 disorders with nearly 2000 images in the image bank. The site can be accessed in three different methods: 1) the Browse feature where a pest category and/or crop can be selected to find the appropriate images, 2) the Search feature using a key word search or 3) the Complete Listing showing all images in the bank. The tool was developed in collaboration with IPM and Information Technology staff within the department, with the ultimate goal to create a user-friendly, low text solution for pest identification. Development continued over two years, although database creation was focused within an eight month period and image collection is on-going. In the end, a very flexible and easily to maintain tool was created and is currently used in multiple extension materials within the department. With any tool, there are lessons learned over the development and it has been modified for other web-based content delivery for clients.

28) **PESTICIDE USE IN THE URBAN ENVIRONMENT - AN OUNCE OF EDUCATION GOES A LONG WAY**. David Ralph, Invasive Plant Program, Ministry of Forests, Lands and Natural Resource Operations

Awareness of invasive plant impacts has increased in urban areas as a result of their recognized impact on natural urban environments with unique habitats', sensitive ecosystems or endangered species. This concern has raised specific questions, by residents, about the problem and how the problem is being addressed. Outreach programs using printed factsheets or brochures are quickly becoming passé as they can be cumbersome, quickly become outdated and not easily accessible to the inquiring public. Today, folks expect information now, if not 5 minutes ago, with immediate access to further facts. Many management tools are available but often use of herbicides in urban locations are met with concerns and opposition. There are significant risks to not fulfilling this need for immediate information and social media can be a good tool for overcoming this hurdle. Media tools utilized, by Invasive Species Council of Metro Vancouver, to communicate with the public such as; IPhone apps, YouTube video, social networking and branding will be outlined.

29) **CURRENT STATUS AND CHALLENGES OF SURVEYING REGULATED WEEDS IN ALBERTA AND FIRST IMPRESSIONS ON THE USE OF UNMANNED AERIAL VEHICLES FOR FIELD SCOUTING.** Chris Neeser*; Alberta Agriculture and Rural Development,, Brooks, AB.

Following the proclamation of the Alberta Weed Control Act in 2010, the Pest Surveillance Branch began a survey to gather information on the distribution and prevalence of regulated weeds. The intent was to request a subjective rating for each township within the jurisdiction of a particular municipal authority. Contrary to expectations, the level of participation tended to stagnate by the third year. Informal conversations with managers responsible for the enforcement of this act suggested that the main obstacles are the shortage of human resources, the low priority of the issue and the lack of a clear benefit from sharing this information with the provincial government. Possible strategies to overcome these obstacles will be discussed. In the second part of this presentation, the potential of Unmanned Aerial Vehicles (UAVs) for the purpose of field scouting will be briefly examined.

30) **CFIA UPDATE**. 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. (See CFIA poster in the CFIA and Regulatory Reports Section.)

31) **OPPORTUNITIES FOR COLLABORATION ACROSS PROVINCES**. Mike Cowbrough*; Ontario Ministry of Agriculture Food and Rural Affairs, Guelph, ON

32) **EVALUATION OF IGNITE (GLUFOSINATE-AMMONIUM) IN WILD BLUEBERRIES.** Gavin L. Graham*; NBDAAF, Fredericton, NB

Typically, wild blueberry plants are pruned every two years to renew plants and increase yield potential. Historically, pruning was completed through a controlled burning of the field. Now, most growers use flail mowing to remove above-ground biomass. With this change in practice, a change in weed spectrum to more mowing resistant weeds is occurring. Sheep sorrel (petite oseille, *Rumex acetosella*), hawkweeds (epervière, *Hieracium* spp.), fine-leaf sheep fescue (fétuque chevelue, *Festuca filiformis*) and red fescue (fétuque rouge, *F. rubra* subsp. *fallax*) are weed species better adopted to resist flail mowing either through growth habit or quick regrowth. In addition, there is a real or suspected shift in these weed populations toward biotypes resistant to the typical pre-emergent herbicide, hexazinone. One potential solution is to apply a burn down herbicide, like Ignite (glufosinate), before blueberry emergence in the spring of the sprout year. This use pattern is registered in other tree, fruit and vegetable crops. Nine trials were conducted by NBDAAF and indicate an excellent level of blueberry tolerance for glufosinate applied at 750 g ai/ha, even when application was delayed until after blueberry emergence. Excellent early season weed control was shown for multiple weed species, although weed re-growth was noted for the perennial species evaluated. When used in combination with other registered herbicides, glufosinate provides additional weed control for difficult weed species and improves the level of control for following herbicide treatments. A User-Requested Minor Use Label Expansion for this use pattern is planned.

33) **RYE COVER CROP AS AN ECONOMIC WEED MANAGEMENT OPTION IN SPAGHETTI SQUASH PRODUCTION.** Diane L. Benoit*[1], Chanelle Bouladier Laprade[2,] Gilles D. Leroux[2]; [1]Agriculture and Agri-Food Canada, Saint-Jean-sur-Richelieu, QC, [2]Université Laval, Québec, QC

34) **PRE- AND POST-VERNALIZATION RAMET REMOVAL REDUCES FLOWERING OF RED SORREL (RUMEX ACETOSELLA L.) IN WILD BLUEBERRY (*VACCINIUM ANGUSTIFOLIUM* AIT.).** White S.N[1], Boyd N.S.[2], Van Acker R.C.[3], Swanton C.J.[3] 1Dalhousie University Faculty of Agriculture, Truro, NS; [2]Gulf Coast Research and Education Center, University of Florida, Wimauma, FL; [3]Department of Plant Agriculture, University of Guelph, Guelph, ON.

Red sorrel is a common, ramet producing herbaceous creeping perennial species in wild blueberry fields. Flowering and seed production occurs primarily in overwintering ramets in Nova Scotia and growers may therefore be able to adopt fairly simple management strategies to reduce or prevent flowering and seed production in this species. The objective of this research was to determine the effect of pre- and post-vernalization ramet removal on red sorrel flowering ramet density under field conditions and using a pot experiment in a growth facility. Under field conditions, pre- and post-vernalization ramet removal was achieved using postemergence applications of paraquat applied at a rate of 1100 g a.i. ha-1 in autumn following field pruning or in spring prior to blueberry emergence. In the pot experiment, established ramet populations were subject to pre- and post-vernalization clipping treatments to simulate autumn and spring ramet removal. Autumn and spring applications of paraquat under field conditions significantly reduced the density of overwintering ramets, resulting in a significant reduction in the density of flowering ramets. Pre- and post-vernalization ramet clipping in the pot experiment reduced the density of flowering ramets by >95 % and significantly reduced the frequency of pots with flowering ramets. Pre- and post-vernalization ramet removal has the potential to be a component of an integrated weed management strategy for red sorrel in wild blueberry.

35) **INTEGRATED APPROACHES TO PURPLE NUTSEDGE (*CYPERUS ROTUNDUS*) MANAGEMENT IN FLORIDA TOMATO PRODUCTION.** Nathan S. Boyd*; University of Florida, Wimauma, FL

Experiments were conducted in the fall of 2013 and spring of 2014 at the Gulf Coast Research and Education Center in Florida to evaluate the impact of a glyphosate application during the fallow period, fumigation (none versus 131 kg/ha 1,3-dichloropropene plus 200 kg/ha chloropicrin, or 250 kg/ha 1,3-dichloropropene plus 51 kg/ha chloropicrin), preemergence herbicide (none versus EPTC at 2943 g ai/ha) and post emergence herbicides (none versus halosulfuron at 52.5 g ai/ha) on purple nutsedge control and tomato growth and yield. In both years, plants were shorter and yields were lower where fumigants were not applied. Herbicide applications had no impact on yield. In the fall, fallow treatments ($p=0.0026$), fumigation ($p<0.0001$), preemergence (PRE) herbicides ($p<0.0001$), and post emergence (POST) herbicides ($p<0.0001$) all reduced nutsedge density in the crop. The same trend was observed in the spring but fallow treatments had no effect. In the fall, there were fewer nutsedge where EPTC was applied regardless of fallow treatment. There was also a significant fallow by fumigation by PRE herbicide interaction ($p=0.0018$) with a glyphosate application during the fallow period followed by fumigation providing levels of control equivalent to fumigation followed by EPTC. In the spring, fumigation reduced nutsedge with or without EPTC. Halosulfuron reduced nutsedge density regardless of the fallow treatment both seasons. Nutsedge density always decreased with herbicide applications regardless of fallow treatment. Combined our results suggest that fumigation is required in Central Florida to achieve maximum tomato yield and a combination of fumigation and halosulfuron is needed to maximize nutsedge control.

36) ***GALIUM APARINE*, CLEAVERS, CONTROL IN PEAS IN SOILS WITH GREATER THAN 6% ORGANIC MATTER**. Ken L. Sapsford*[1], Christian Willenborg[1], Eric N. Johnson[2], Hugh Beckie[3], M. Long[4]; [1]University of Saskatchewan, Saskatoon, SK, [2]Agriculture and Agrifood Canada, Scott, SK, [3]Agriculture and Agri-Food Canada, Saskatoon, Sk., [4]FMC Canada, Saskatoon, Sk.

There are a limited number of herbicides that are registered for cleavers (*Galium* sp.) control in peas. There is an increase in Group-2 (ALS) resistant cleavers across the prairies and there are no products that are registered to control Group-2 resistant cleavers in peas, only products that that have suppression of Group-2 resistant cleavers on their label. These are bentazon (Basagran®) Group 6, ethalfluralin (Edge®) Group 3 and Imazamox+bentazon (Viper®) Groups 2+6. Other products that are known to have residual activity on cleavers, but are not registered for cleavers control in a pea crop at this time, are sulfentrazone (Authority®) Group 14, Clomazone (Command®) Group 13 and saflufenacil (Heat®) Group 14. Edge®, Authority®, Command® and Heat® are all soil applied and have reduced weed control activity on high organic matter soils. The objective of the study was to apply 2 or more products, with different modes of action, that independently suppress cleavers, in sequence, to provide control of Group-2 resistant cleavers in peas in soils with greater than 6% organic matter. The results showed there was over 90% control of cleavers in soils with greater than 6% organic matter when the following herbicides were applied in sequence: Edge® followed by (fb) Heat® , Edge® fb Authority® , Edge® fb Viper®, Edge® fb Basagran®, Authority® fb Viper®, Authority® fb Basagran®, Heat® fb Viper®, Heat® fb Basagran®, Command® fb Viper®, and Command® fb Basagran®.

37) **GLYPHOSATE-RESISTANT KOCHIA IN SASKATCHEWAN AND MANITOBA**. Hugh J. Beckie*[1], Robert Gulden[2], Nasir Shaikh[3], Eric N. Johnson[4], Christian Willenborg[5], Clark Brenzil[6], Nikki Burton[5], Scott Shirriff[1], Chris Lozinski[1], Greg Ford[7]; [1]Agriculture and Agri-Food Canada, Saskatoon, SK, [2]University of Manitoba, Winnipeg, MB, [3]Manitoba Agriculture, Food and Rural Development, Carman, MB, [4]Agriculture and Agrifood Canada, Scott, SK, [5]University of Saskatchewan, Saskatoon, SK, [6]Saskatchewan Ministry of Agriculture, Regina, SK, [7]Agriculture and Agri-Food Canada, Scott, SK

Previous surveys have documented the occurrence of glyphosate-resistant (GR) kochia (*Kochia scoparia* L. Schrad.) in Alberta in 2011 and 2012. To determine the incidence of GR kochia in Saskatchewan and Manitoba, a stratified-randomized survey of 342 sites (one population per site) in southern and central regions of Saskatchewan and a similar survey of 283 sites in southern Manitoba was conducted in the fall of 2013. Mature plants were collected, seed threshed, and progeny screened by spraying with a discriminating glyphosate dose of 900 g ae ha-1 under greenhouse conditions. Screening confirmed 17 GR kochia populations in nine municipalities in west-central or central Saskatchewan, but only two GR populations from different municipalities in the Red River Valley of Manitoba. While the majority of GR kochia populations in Saskatchewan originated in chemical-fallow fields, some populations were found in cropped fields (wheat, lentil, GR canola) and non-cropped areas (oil well, roadside ditch). In Manitoba, the two populations occurred in fields cropped to GR corn and soybean. Agronomic and economic impact of this GR weed biotype is compounded because of consistent multiple resistance to acetolactate synthase (ALS)-inhibiting herbicides. However, all GR plus ALS inhibitor-resistant kochia populations were susceptible to dicamba at 280 g ai ha-1. Additionally, a greenhouse study found no difference in control of GR and non-GR kochia in response to five postemergence herbicide treatments commonly used in chemical fallow, cereals, or oilseed crops: dicamba, dicamba/fluroxypyr, dicamba/diflufenzopyr, MCPA/bromoxynil, and glufosinate. MCPA/bromoxynil was the most effective treatment in reducing shoot biomass 3 wk after application (99%) , followed by glufosinate (91%) then the dicamba mixtures (82%). Dicamba alone (140 g ai ha-1) only suppressed kochia biomass (76% reduction).

38) **GLYPHOSATE-RESISTANT KOCHIA (*KOCHIA SCOPARIA* (L.) SCHRAD.) MANAGEMENT.**
Robert E. Blackshaw*[1], Alysha Torbiak2, Linda Hall[2], Hugh Beckie[3]; [1]Agriculture and Agri-Food Canada, Lethbridge, AB, [2]University of Alberta, Edmonton, AB, [3]Agriculture and Agri-Food Canada, Saskatoon, SK

Glyphosate-resistant (GR) kochia was identified in Alberta in 2011, Saskatchewan in 2012, and Manitoba in 2013. GR kochia is spreading rapidly with well over 60 populations being confirmed in western Canada. The majority of these resistant populations appear to have been selected by repeated glyphosate use on chemfallow fields; not glyphosate use in Roundup Ready crops. Greenhouse and field dose-response experiments found that these kochia populations have a resistance factor ranging from 4 to 7, similar to what was previously reported for GR kochia in Kansas. Field experiments were conducted at two locations in Alberta in 2014 to identify alternative herbicides to manage glyphosate-resistant kochia. Dicamba/diflufenzopyr, carfentrazone/sulfentrazone, flumioxazin, and saflufenacil provided the most consistent GR kochia control in fallow. Dicamba was only effective at a relatively high rate of 590 g ai ha-1. In wheat, several commonly used herbicides such as dicamba/2,4-D amine, bromoxynil/2,4-D ester, MCPA/mecoprop-p/dicamba, and dichlorprop/2,4-D did not provide adequate control. However, fluroxypyr and prasulfotole/bromoxynil controlled GR kochia well. Although sulfentrazone is not registered in wheat it provided >95% GR kochia control with adequate crop tolerance. Sulfentrazone was the only herbicide providing consistent GR kochia control in field peas; imazamox/bentazon was effective at one site but not the other. The unregistered herbicide fluciacet gave 80-90% control and merits further evaluation in field peas. In Liberty Link canola, glufosinate applied once or twice was the only herbicide giving >90% control of GR kochia. Low sulfentrazone rates (27 or 53 g ai ha-1) exhibited potential to control GR kochia with minimal canola injury. These findings will be utilized to provide growers on the Canadian prairies with advice on GR kochia management.

39) **HALAUXIFEN-METHYL PLUS FLORASULAM FOR PREPLANT WEED CONTROL IN WESTERN CANADIAN CEREAL CROPS**. Rory Degenhardt*[1], Len Juras[2], Andrew MacRae[3], Donald Hare[1], Laura Ford[3], Jamshid Ashigh[4]; [1]Dow AgroSciences Canada Inc., Edmonton, AB, [2]Dow AgroSciences Canada Inc., Saskatoon, SK, [3]Dow AgroSciences Canada Inc., Winnipeg, MB, [4]Dow AgroSciences Canada Inc., London, ON

Arylex™ Active (halauxifen-methyl) is a new Group 4 herbicide active ingredient (arylpicolinate family) from Dow AgroSciences Canada currently registered as pre-formulated mixtures with florasulam (Paradigm™ herbicide) and fluroxypyr (Pixxaro™ herbicide) for post-emergence broadleaf weed control in Canadian cereal crops. Between 2012 and 2014, halauxifen-methyl plus florasulam was evaluated in small plot field research trials for use as a preplant herbicide in cereal crops. Fall or spring application of halauxifen-methyl plus florasulam (5 + 5 g ae/ha), with or without glyphosate (450 g ae/ha) was safe to spring seeded wheat, durum wheat, oats, and spring barley. In addition to providing excellent control of a wide range of winter annual, over-wintered and summer annual broadleaf weeds, halauxifen-methyl plus florasulam also controlled key perennial weeds such as dandelion (*Taraxacum officinale*), and Group 2 resistant weeds such as cleavers (*Galium aparine*) and chickweed (*Stellaria media*). In fields without resistant weed biotypes, the mixture of halauxifen-methyl and florasulam plus glyphosate will offer three distinct modes of action with overlapping activity on many hard-to-kill weeds for robust multi-mode of action resistance management. Other attributes of halauxifen-methyl plus florasulam include low use rate, short rainfast interval, compatibility with all glyphosate formulations, residual control of emerging Group 2-susceptible weeds, flexibility to use on large and small weeds, and excellent performance under cool and adverse environmental conditions.

40) **LATE GLYPHOSATE APPLICATIONS ALTER YIELD AND YIELD COMPONENTS IN GLYPHOSATE-RESISTANT CANOLA (*BRASSICA NAPUS* L.)**. Eric Tozzi*[1], Christian Willenborg[2], Robert E. Blackshaw[3], K. Neil Harker[4], John T. O'Donovan[5], Stephen Strelkov[6]; [1]University of Saskatchewan, SASKATOON, SK, [2]University of Saskatchewan, Saskatoon, SK, [3]Agriculture and Agri-Food Canada, Lethbridge, AB, [4]Agriculture & Agri-Food Canada, Lacombe, AB, [5]Agriculture and Agri-Food Canada, Lacombe, AB, [6]University of Alberta, Edmonton, AB

The development of glyphosate-resistant canola (*Brassica napus* L.) has provided more weed management options for growers. In this study, glyphosate-resistant canola 45H28 (RR) was used to determine the effects of glyphosate application timing on yield and yield components at several sites in western Canada. Canola application stages involved 2-leaf, 6-leaf, bolting and early bloom as well as 2-leaf+6-leaf, 2-leaf+bolting, and 2-leaf+early bloom sequential applications. Contrasts were made between early vs. late, single vs. double, and on-label vs. off-label applications to determine further potential effects. In general, significant differences between application timing were seen in yield and yield components in 3 of 8 site-years Off-label applications of glyphosate (beyond the 6-leaf stage) was seen to significantly decreased yield, seeds pod-1, and increase thousand-seed weight and aborted pods in canola at the Lethbridge and St. Albert locations. Excessive moisture due to local weather may have been the likely cause of such a reduction in yield in the 2012 season. Increased glyphosate translocation to new growth may have suppressed new seed formation and encouraged pod abortion at the time of application in the 2010 and 2011 seasons. Results from this experiment show the importance of proper application timing of glyphosate on canola and can help better predict impacts of late application.

41) **HEAT LQ-SPRING BURNDOWN AND FALL HARVEST AID.** Bryce Geisel, Herbicides, BASF

42) **CAMELINA: CANADIAN DISTRIBUTION AND HYBRIDIZATION -AN UPDATE**. Sara L. Martin*; Agriculture and Agri-Food Canada, Ottawa, ON

In order to proactively manage risks to the sustainability of the agricultural system prior to the release of new transgenic crops, it is essential to evaluate the potential for transgenes to escape into populations of weedy relatives. Camelina (*Camelina sativa* (L.) Crantz; Brassicaceae) is a promising oilseed with potential applications ranging from feed to biofuel. Cultivars carrying transgenes for modified oil or protein characteristics and herbicide resistance are currently in development indicating a need for evaluation of the potential for transgene escape. Several Canadian weedy species have been identified as priorities for this assessment. These include members of the same tribe (Camelineae): shepherd's purse (*Capsella bursa-pastoris* (L.) Medik) and ball mustard (*Neslia paniculata* (L.) Desv.), as well as members of the same genus such as little-podded false flax (*Camelina microcarpa* Andrz. ex DC). However, there are major gaps in our knowledge about these species, making any science-based risk assessments impossible. We have undertaken work to rectify this situation. This has included determining the current range of these species in Canada, beginning work to understand the evolutionary relationships of species included in the tribe Camelineae, and testing the reproductive compatibility of Camelina and these wild species using hand pollinations. Specifically, we have estimated the hybridization rate between shepherd's purse (♀) and Camelina (♂) as 1.5 hybrids per 10,000 ovules pollinated. We have determined that naturalized populations of Camelina still occur in Canada and that little-podded false flax is comprised of three cytotypes - two of which occur throughout the Canadian Prairies. Furthermore, we have estimated the hybridization rate between hexaploid little-podded false flax (♀) and Camelina(♂) is nearly perfect at 96% and although these hybrids have reduced fitness compared to their parents in the greenhouse, they produce viable offspring. Future work will primarily focus on completing hand crosses between the species with Camelina as the maternal parent.

43) **FIRE MAY SPARK WEED INVASION INSTEAD OF RESTORATION.** David R. Clements*, Rebecca Prins; Trinity Western University, Langley, BC

Garry oak ecosystems flourished for many centuries in the Pacific Northwest through intentional disturbance by First Nations people via fire and other means. This ecological disturbance regime was lost with the colonization of Europeans in the 1800s, which also lead to deer overpopulation due to loss of predators. Prescribed fire is seen as a potentially useful tool in restoring the system. An accidental fire in a Garry Oak meadow on Mount Maxwell, Salt Spring Island in 2009 provided an opportunity to study the restoration potential of fire. Twelve 4x4 meter plots were set up within the burned area and twelve control plots were placed outside the burned area; half of the plots in each area were fenced to prevent herbivory by ungulates. Species composition analysis over four years revealed that disturbance of meadows by fire resulted in an initial decrease in the average percent cover of invasive species. However, after four years the percent cover of invasive species remained nearly the same as the first year. By contrast the unburned plots experienced a 12% decrease in percent cover of invasive species on average. This lack of increase in native dominance in the burned area suggests that disturbance by fire makes Garry Oak meadows more susceptible to invasion. Thus measures other than burning alone are necessary for effective restoration of invaded Garry Oak meadows.

44) **CROP CANOPY EFFECTS ON LIGHT QUALITY AND WEEDS.** K. Neil Harker*[1], John T. O'Donovan[2]; [1]Agriculture & Agri-Food Canada, Lacombe, AB, [2]Agriculture and Agri-Food Canada, Lacombe, AB

Light quality can influence weed emergence and growth as well as weed-crop competition outcomes. A direct-seeded experiment to determine crop canopy effects on light quality and weed germination and growth was conducted at Lacombe, Alberta from 2012 to 2014. Barley, canola, field peas and wheat were seeded at two rates. No in-crop herbicides were applied. Weed emergence and crop biomass were determined weekly until canola canopy closure. Light quality near the soil surface was determined at the same weekly intervals using a spectroradiometer. Green foxtail (*Setaria viridis*) (2013-14 only), henbit (*Lamium amplexicaule*) and shepherd's-purse (*Capsella bursa-pastoris*) populations were sufficient for data collection. Barley usually produced the greatest crop biomass. However, at canopy closure, the crops leading to the least red light and the most far red light near the soil surface were: canola > barley > wheat > field pea. In terms of causing the lowest weed biomass, crops were also ranked in the same order. Weed emergence results were much more variable and did not always align with light quality and weed biomass data. Our hypothesis that barley would be the most competitive crop and produce a crop canopy environment least favourable for weed growth was rejected. Given the relatively cool, high moisture conditions that often prevail at Lacombe, similar studies at other locations in different environments would likely prove interesting.

45) **CROPPING SYSTEMS AND THE PREVALENCE OF GIANT RAGWEED (AMBROSIA TRIFIDA L): FROM THE 1950s TO PRESENT**. Eric R. Page*1, Robert E. Nurse[2]; [1]Agriculture and Agri-Food Canada, Harrow, ON, [2]Agriculture Canada, Harrow, ON

Giant ragweed has become an increasingly important weed of arable land in many parts of North America. Although it has historically been considered a weed of roadsides, fence rows and ditches, the prevalence of giant ragweed in Ontario agriculture has steadily increased over the past half-decade. While the development of resistance to Group 2 and 9 herbicides has certainly contributed to recent difficulties in controlling giant ragweed populations, it is unclear what other factors may have impacted the preceding increase in the prevalence of this species in arable lands. The objective of this research was to examine the effect of changes in cropping systems practices over the past 50yrs on the fecundity of giant ragweed in maize and soybean. Three eras of cropping systems practices (i.e., the 1950s, 1980s and 2000s) were established using historic soybean varieties and maize hybrids that were seeded and fertilized at the plant population densities (PPD) and rates recommended for their respective time periods. Giant ragweed seedlings were transplanted into these eras at a density of 2 plant m^{-2} at crop emergence and 14 days after. The fecundity of giant ragweed in maize declined by 54% from the 1950s to the 2000s. In contrast, giant ragweed fecundity in soybean remained the same across eras. Results of this study suggest that, while increases in the plant population density of maize has decreased the in-crop fecundity of giant ragweed over the past half -decade, the combination of soybeans' poor competitiveness with giant ragweed and the increase in soybeans acreage from the 1950s to present has likely contributed to the increased frequency with which giant ragweed is observed in present day cropping systems.

Abstracts for Posters

46) **GROUND COVER SPECIES SELECTION TO MANAGE COMMON RAGWEED (AMBROSIA ARTEMISIIFOLIA L.) IN ROADSIDE EDGE OF HIGHWAY.** Jichul Bae*[1], Chaeho Byun[1], Alan K. Watson[1], Diane L. Benoit[2]; [1]McGill University, Ste. Anne de Bellevue, QC, [2]Agriculture and Agri-Food Canada, Saint-Jean-sur Richelieu, QC

In southern Québec, Canada, *Trifolium* species are commonly used as supplement ground cover along roadside of major roads to assist turf recruitment. They often fail to establish particularly near roadside edges. The noxious weed, *Ambrosia artemisiifolia*, exploits the empty niches. Based on an assumption that heavy metal stress mainly drives plant species shift, we conducted a field experiment to test the emergence of four species near roadside edges along a metal gradient. The test species included a clover ground cover (*Trifolium arvense*), two candidate ground covers (*Lotus corniculatus* and *Coronilla varia*), and the weed (*A. artemisiifolia*). Two hundred wet-cold stratified seeds of each species were sown in plots (20 × 30 cm), assigned separately for one of four species treatments, replicated three times. We measured final emergence percentage and soil metal contents and analyzed their correlations. *Trifolium arvense* emergence was negatively correlated with Zn, Pb, and Cu. In contrast, *A. artemisiifolia* emergence was positively correlated with Zn, Pb, and Cu. The experiment supports the hypothesis that *A. artemisiifolia* colonization along roadside edges may be attributing to its greater tolerance for Zn, Pb, and Cu than *T. arvense*. In evaluating the two legume candidates, *L. corniculatus* was positively correlated with Zn, Pb, and Cu like *A. artemisiifolia*, while *C. varia* emergence did not have significant relationship with Pb and Cu. The current finding implies *L. corniculatus* can be a good candidate because of its emergence performance and its tolerance to heavy metal, similarly to that of *A. artemisiifolia*.

47) **QUICK TESTS: GLYPHOSATE-RESISTANT KOCHIA AND PINOXADEN-RESISTANT GRASS WEEDS.** Jessica Pratchler[1], Scott Shirriff[2], Hugh Beckie[*2]; [1]University of Saskatchewan, Saskatoon, SK, [2]Agriculture and Agri-Food Canada, Saskatoon, SK
Rapid herbicide-resistant weed bioassays can facilitate timely and economical screening of suspected populations as a first step in their management. Growth chamber studies were conducted to determine the feasibility of developing a quick, yet reliable bioassay to detect glyphosate-resistant (GR) kochia (*Kochia scoparia* L. Schrad.) and pinoxaden (ACC inhibitor, Group 1)-resistant wild oat (*Avena fatua* L.) and green foxtail (*Setaria viridis* L. Beauv.). Seeds of six kochia populations, three GR and three non-GR (susceptible), were placed on filter paper in petri dishes treated with varying doses of glyphosate. After 7-d incubation, seedlings with a true leaf (i.e., not cotyledons) at 25 mg L^{-1} glyphosate accurately distinguished GR from susceptible kochia populations. Shoot length inhibition and presence of seedlings with shoot tips exhibiting chlorophyll (with or without emerged first leaf) at 16 µM pinoxaden reliably identified herbicide-resistant and -susceptible wild oat and green foxtail populations in a 7-d agar dish bioassay. These bioassays can facilitate more timely identification of GR kochia and the pinoxaden-resistant grass weed populations, thereby aiding resistant weed management.

48) **DEVELOPING A METHOD TO ESTIMATE POD DROP IN CANOLA**. Andrea Cavalieri*[1], Angelena Syrovy[2], Steven J. Shirtliffe[3], Robert H. Gulden[4]; [1]University of Manitoba, Winnipeg, MB, [2]University of Saskatchewan, Saskatoon, SK, [3]University of Saskatchewan, Saskatoon, SK, [4]University of Manitoba, Winnipeg, MB

Canola, one of the main cash crops for producer in western Canada, is a crop associated with large seed losses at harvest which poses agronomic and economic concerns. Pod shatter and pod drop are the two different processes that result in harvest losses in canola. Pod shatter and pod drop are largely independent and influenced by a genetic and an environmental components, respectively. To date, much of the research on canola harvest losses has been dedicated to reducing pod shatter, but little information is available on pod drop. This research evaluates a method (pod retention resistance) to determine pod drop in canola. The method is fast, specific and quantitative and has been tested across a select number of genotypes over a number of environments. Pod retention resistance is currently being refined by determining the number of measurements and plant position from which to collect these measurements to facilitate efficiency in taking the data. This method is a promising tool for breeders and private industry to rapidly estimate pod drop in the field. The development of canola cultivars that are resistant to pod drop would greatly benefit canola producers and the industry.

49) SYMBIOTIC ASSOCIATION WITH NEORHIZOBIUM GALEGAE LIMITS THE DISPERSAL OF *GALEGA OFFICINALIS* (GOAT'S RUE) IN CANADA. Stephen Darbyshire[1], Eden Bromfield[1], Sylvie Cloutier[1] and Catherine Robidas[1,2], [1]Agriculture and Agri-Food Canada, ECORC, Ottawa, Ontario, K1A 0C6, [2]La Cité, Baccalauréat en technologie appliquée-Biotechnologie

The legume plant, *Galega officinalis* (Goat's rue) is native to eastern Europe. Its establishment in Canada may have resulted from ornamental planting and/or forage trials. In its native range a symbiotic relationship with the host-specific nitrogen-fixing bacterium *Neorhizobium galegae* is required for normal growth. Four populations of *G. officinalis* established in the Ottawa area were studied. All sites showed evidence of disturbance and importation of soil materials. Plants from all sites possessed pinkish coloured root nodules indicating the presence of leghaemoglobin. About 150 bacterial isolates from effective nitrogen fixing nodules were found to be closely related to *N. galegae symbiovar officinalis*, based on sequence analysis of 16S rRNA and glnII loci. Axenic plant tests indicated that soils at sites without a history of agriculture or *G. officinalis* presence, did not contain bacteria capable of eliciting nodule formation. This preliminary study suggests that the successful establishment of G. officinalis at new Canadian locations requires the co-introduction of the plant host and its highly specific bacterial symbiont, which is most likely accomplished through transport of soil materials containing both *G. officinalis* seeds and *N. galegae.*

50) WEED MANAGEMENT AND SOIL FUNCTION - WHAT'S THE CONNECTION? Robert H. Gulden*[1], Tenuta Mario[2], Susan Mitchell[3], Adrian Langarica Fuentes[3], Tim J. Daniell[3]; [1]University of Manitoba, Winnipeg, MB, [2]University of Manitoba, Winnipeg, MB, [3]James Hutton Institute, Invergowrie, Scotland

The impact of weeds, particularly with respect to below-ground function, is not well understood. In this study, we used a mesocosm approach with soils collected from a long-term rotation study to compare legacy effects of previous flax (*Linum usitatissimum* L.) or canola (*Brassica napus* L.) and different levels of weediness established over a decade by different herbicide-use patterns. The impact of level of weediness superseded that of the preceding crop and altered the temporal dynamics of denitrification and the *nirK* denitrifier communities. The impact of the presence of durum plants in the mesocosm experiment was relatively small, however, the presence of durum plants did modify the legacy effects of preceding crop and weediness on the denitrifier community. To our knowledge, this is the first study to investigate the effects of long-term weed management strategies on denitrification. Our results indicate that weediness contributes to priming effects and unexplained variation associated with these soil processes and that weed management history should be taken into consideration when determining soil function and soil microbial community dynamics in agricultural systems.

51) **WEED COMMUNITY DYNAMICS IN COVER CROP-BASED, ORGANIC ROTATIONAL NO-TILL SOYBEAN.** Caroline Halde*[1], Steven B. Mirsky[2], Matthew R. Ryan[1]; [1]Cornell University, Ithaca, NY, [2]Agricultural Research Station - Beltsville, MD, Beltsville, MD

Cover crops can be used to overcome tradeoffs between soil health and weed management goals in organic cropping systems. Cover crops can facilitate reductions in tillage, and recent research has shown that no-till planting of organic soybean into rolled-crimped cereal rye can result in weed suppression and soybean yields that are equivalent to tillage-based management. As in conventional no-till systems, reductions in tillage in organic systems can result in weed community shifts toward perennial species. In this research, a range of cover crop mulch rates and soybean seeding rates were created to assess their weed suppressive ability and their effect on weed community composition and structure. The study was conducted in 2008 and 2009 in Maryland and Pennsylvania, using five levels of cereal rye residue representing 0, 0.5, 1, 1.5, and 2 times the ambient level, and five soybean seeding rates ranging from 0 to 74 seeds m-2. A cereal rye cover crop was planted in the fall, then clipped and removed from the plots the following spring. Soybeans were seeded at five rates, before the clipped rye biomass was returned to the plots. Weed biomass decreased with increasing rye residue and decreased with increasing soybean density. Smooth pigweed (*Amaranthus hybridus* L.), wild buckwheat (*Polygonum convolvulus* L.), and four summer annual grasses were associated with the absence of soybeans. The effect of site-year was apparent in the NMDS ordination, indicating that weed community composition varied across site-years. Weed biomass ranged from 0 to 967 g m-2 across all site-years. Soybean yields were optimized with 100-1200 g m-2 of rye mulch and soybean seeding rates of 50-60 seeds m-2 in an organic no-till system. Anticipating and managing for weed community shifts is important for farmers, and even more critical in organic systems because of the reduced options for weed control.

52) **INVESTIGATION IN THE ULTRASTRUTURE OF GLYPHOSATE RESISTANT GIANT RAGWEED USING ELECRTON MICROSCOPY.** Mackenzie Lesperance*[1], Mihai Costea[2], Peter H. Sikkema[3], François J. Tardif[1]; [1]University of Guelph, Guelph, ON, [2]Wilfrid Laurier University, Waterloo, ON, [3]University of Guelph, Ridgetown, ON

53) **WILD SEX – THE CASE OF ETHIOPIAN AND WILD MUSTARD.** Kyle W. Cheung, Fakhira M. Razeq, Connie A. Sauder, Tracey James, Sara L. Martin*; Agriculture and Agri-Food Canada, Ottawa, ON

When transgenic crops are being developed it is important to evaluate the potential for transgenes to escape into populations of wild, weedy relatives. Ethiopian mustard (*Brassica carinata*, BBCC) is easily transformed and is being investigated for uses ranging from biodiesel fuels to biopharmaceuticals. However, little work has been done evaluating its ability to cross with relatives such as wild mustard (*Sinapsis arvensis*, SrSr), an abundant, cosmopolitan weedy relative. We conducted bidirectional crosses with Ethiopian mustard as a maternal parent in 997 crosses and paternal parent in 1,109 crosses. Hybrids were confirmed using flow cytometry and species-specific ITS molecular markers and indicate a high hybridization rate of 6.4% between Ethiopian mustard (â™€) and wild mustard (â™‚) and a lower, but not insignificant, hybridization rate of 0.01% in the reverse direction. The majority of the hybrids were homoploid (BCSr) with low fertility. The accession used in the cross had a significant effect on hybrid seed production with different accessions of Ethiopian mustard varying in hybrid offspring production from 2.7% to 16.3% and one accession of wild mustard siring almost twice as many hybrid offspring as the other. One pentaploid (BBCCSr) and one hexaploid (BBCCSrSr) hybrid were produced and had higher pollen viability, though no and low seed production, respectively. This result suggests a high rate of unreduced gamete formation, increasing the potential for hybrid lineage establishment. As wild mustard is self-incompatible and the outcrossing rate of Ethiopian mustard has been estimated as 30% potential for hybrid production in the wild appears to be high and needs to be directly evaluated, as does the propensity of Ethiopian mustard to volunteer.

54) **"IS THERE A COST TO GLYPHOSATE RESISTANCE IN KOCHIA?"** Leshawn Benedict, Connie A. Sauder, Tracey James, Hugh J. Beckie, and Sara L. Martin; Agriculture and Agri-Food Canada, Ottawa, ON

Glyphosate resistant (GR) weeds are a significant threat to Canadian agriculture. In 2011, the first Canadian reports were made of GR *Kochia scoparia* L. Schrad. (kochia; Chenopodiaceae) - a species that is already recognized as one of the top ten most abundant agricultural weeds in the Canadian Prairies. The management strategies for GR kochia will depend on whether GR comes at a cost to fitness, as this will determine whether or not the frequency of GR will decline in kochia populations in the absence of glyphosate selection. Glyphosate targets an enzyme that is a part of the shikimate pathway, 5-enolpyruvylshikimate-3-phosphate synthase (EPSPS) and, in kochia, amplification and increased expression of the EPSPS gene has conferred resistance. Here we have undertaken a competitive fitness experiment in the glasshouse using individuals from five segregating F2 populations to evaluate the costs of increased EPSPS copy number and expression. Specifically, seed collected from GR kochia populations was grown in the greenhouse and EPSPS gene copy number was determined using quantitative PCR. Individuals with low and high EPSPS copy number were selected from each population and manually, reciprocally crossed. Seeds from these parents were then grown in the greenhouse, bagged and allowed to self-pollinate. The progeny of these F1s are expected to segregate for EPSPS copy number following a single locus model and will be assessed for EPSPS copy number, and then placed into a competitive fitness experiment. This work will provide a robust evaluation of the fitness consequences of GR in kochia while controlling for genetic background and maternal effects.

55) POLLEN, SEED, OR EVOLUTION? UNDERSTANDING THE SPREAD OF GLYPHOSATE RESISTANT KOCHIA. Ryan H. Tobalt[1], Connie A. Sauder[1], Tracey James[1], Hugh J. Beckie[2], Sara L. Martin*[1]; [1]Agriculture and Agri-Food Canada, Ottawa, ON, [2]Agriculture and Agri-Food Canada, Saskatoon, SK

The spread of glyphosate resistant (GR) *Kochia scoparia* L. Schrad. (kochia; Chenopodiaceae) poses a significant threat to Canadian agriculture. Kochia populations with GR were first reported in Kansas in 2007, with reports following for South Dakota in 2009 and Nebraska in 2011. The first Canadian reports were from Alberta in 2011. The management strategies for GR kochia will be influenced by how GR spreads through kochia populations. There are three potential routes: 1) kochia is highly outcrossing and wind pollinated, suggesting that pollen-mediated gene flow could play a role at short to medium distances; 2) in addition to potential human-mediated seed dispersal, kochia is a tumbleweed suggesting that seed-mediated gene flow may play a strong role – potentially over larger distances; 3) continued selection by glyphosate may result in the emergence of new GR ecotypes. To untangle the relative contributions of these three mechanisms we plan to combine information on EPSPS copy number (nuclear), chloroplast haplotype (maternal), and microsatellites for historical and current Canadian population and current American populations. We expect that if seed-mediated gene flow is the dominant method for dispersal of GR Kochia that we may see an association between 5-enolpyruvylshikimate-3-phosphate synthase (EPSPS) gene copy number and chloroplast haplotype. Furthermore, the dominant chloroplast haplotypes may have shifted with the invasion of the GR ecotypes. Conversely, if pollen mediated-gene flow or evolution predominates we would expect there to be little association between chloroplast haplotype and EPSPS gene copy number.

56) **THE CRITICAL WEED-FREE PERIOD IN GRAIN AMARANTH AND QUINOA.** Robert E. Nurse*[1], Eric R. Page[2], Kristen Obeid3; [1]Agriculture Canada, Harrow, ON, [2]Agriculture and Agri-Food Canada, Harrow, ON, [3]OMAFRA, Harrow, ON

Quinoa (*Chenopodium quinoa*) and grain amaranth (*Amaranthus hypochondriacus*) are generating interest among growers and industry for production as crops in Southwestern and Southern Ontario. Two field trials were established at Harrow, ON in 2013 and 2014 to evaluate the duration of the weed-free period in quinoa and grain amaranth. Brightest Brilliance and Burgundy were the varieties seeded for each crop, respectively. Each trial consisted of five treatments; 3 treatments in which the crop was kept weed-free for a specified duration after crop emergence (7, 14, and 28 DAE), and season-long weedy and weed-free treatments. Weed height and biomass was recorded in each treatment at 56 DAE and grain yield was measured at maturity. There was equal exposure to both dicots and annual grasses at densities as high as 120 plants m-2. The most common weed species were *Digitaria sanguinalis, Echinochloa crus-galli, Amaranthus retroflexus*, and *Chenopodium album*. The critical weed-free period in both quinoa and grain amaranth was approximately 14 days after crop emergence. Weeds emerging after the initial 14 day period did not cause yield reductions when compared to yields in the season long weed-free control.

57) **GIANT RAGWEED (AMBROSIA TRIFIDA L.) FECUNDITY AND REPRODUCTIVE ALLOMETRY IN MAIZE (*ZEA MAYS* L.) AND SOYBEAN (*GLYCINE MAX* (L.) MERR.).** Eric R. Page*[1], Robert E. Nurse[2]; [1]Agriculture and Agri-Food Canada, Harrow, ON, [2]Agriculture Canada, Harrow, ON

Over the past 15-20 years, giant ragweed has become an economically important weed of arable land in SW Ontario and many parts of North America; a fact that may be attributable to changes in cropping systems practices and the development of resistance to Group 2 and 9 herbicides. The objective of this research was to 1) examine giant ragweed fecundity in maize and soybean crops representing over 50 years of cropping systems practices and 2) to develop a relationship to estimate giant ragweed fecundity based on non-destructive, easily measured physiological parameters. Overall, ragweed fecundity was 50% lower in maize than in soybean; when only the most recent cropping system is considered, this disparity between crops increases to 77%. A relationship was developed to describe giant ragweed fecundity by calculating cylindrical plant volume based on measurements of plant height and stem diameter. The slope of this relationship was influenced by crop type as giant ragweed plants growing in soybean produced 19% less seed per unit volume than did those growing in maize. Similarly, the slope of the relationship between giant ragweed vegetative and reproductive biomass was decrease for plants grown in soybeans. This shift in the reproductive allometry of giant ragweed was indicative of the increase in branching and support tissue that characterized giant ragweed plants grown in soybeans.

58) EFFICIENCY OF TWO TYPES OF VEGETATEDÂ BUFFER ZONES TO LIMIT THE TRANSFER OF GLYPHOSATE AND AMPA BY RUNOFF TOWARDS SURFACE WATER. Pierre Lafrance[1], Marie-Josee Simard*[2], Genevieve Begin[3], Georges Theriault[3], Eric van Bochove[3]; [1] Université INRS-Centre Eau, Terre et Environnement (ETE), Québec, QC, [2]Agriculture and Agri-Food Canada, Saint-Jean-sur-Richelieu, QC, [3]Agriculture and Agri-Food Canada, Quebec, QC

The presence of pesticides in the surface water of watersheds is frequently observed in Canada and Quebec. Mitigation procedures are needed to limit such contamination. The adoption of best managements practices (BMPs) in agriculture includes the use of vegetated buffer zones to attenuate the exportation of herbicides. Main types of buffer zones currently used include: 1) riparian buffer strips (BS) and 2) grassed waterways (GW) located downslope of cultivated fields. This study aimed at quantifying, at commercial field scale (corn and soybean), the efficiency of these zones to reduce glyphosate and AMPA (degradation product) losses by runoff. This study was part of the WEBs project initiated by AAFC (2004-2012). The study area is located in a sub watershed section (2.4 km2) of the Bras d'Henri River watershed near Quebec city. The vegetated section of BS was 5 to 7 m wide. Two sampling sites were chosen along this strip (BC and B). The vegetated section of GW was 18 m wide and sampled at a site GWC. Glyphosate was applied at a rate close to 1 kg a.i./ha. Water samples were collected in 2011 after glyphosate application DURING the 3 consecutive rainfall events that generated surface runoff. Surface water in the drainage ditch was also sampled. Results showed that glyphosate and AMPA concentrations in runoff water decreased after each rain event. Reduction in herbicide concentrations were very high for site BC (66% to 100%), low for B (-7% to 31%) and high to moderate for GWC (30% to 90%). The low efficiency of site B was attributable to some water infiltration and possible subsurface lateral flow under the root zone. Results for GWC were very promising. Glyphosate concentrations in ditch water were very low. Both types of herbaceous buffer zones appeared to be efficient mitigation procedures at a realistic/commercial field scale.

59) **HERBICIDE RESISTANCE IN QUÉBEC: MORE SUSPECTS, MORE CASES.** Marie-Josee Simard*[1], Danielle Bernier[2]; [1]Agriculture and Agri-Food Canada, Saint-Jean-sur-Richelieu, QC, [2]MAPAQ, Quebec, QC

Reported cases of herbicide resistance are increasing worldwide. In Québec, few cases of suspected resistance used to be reported annually (<10) and few cases of resistance were on the international list (3) or documented (17). However, a recent inquiry suggested more cases of putative resistance are observed and growers were encouraged to send seed from suspicious populations. Our goal was to evaluate the herbicide resistance of samples sent by Québec growers in 2012 and 2013. A total of 70 samples were sent. All samples were treated to overcome seed dormancy and planted in trays in the greenhouse until seedlings had 2-3 leaves. Four herbicide doses (0, 1/2, 1 and 2X the recommended rate) were applied to four replicates of 20 plants from the tested samples and from known susceptible populations. Visual injury was noted one, two and four weeks after treatment. 41% (2012) to 47% (2013) of the samples could not be tested (seed not viable) and others could only be partially tested. Resistance was clearly detected in about half of the fully tested samples (52.4%:2012, 52%:2013) for a total of 22 resistant cases. Two additional small samples of common ragweed (*Ambrosia artemisiifolia*) had some level of group 2 (ALS) resistance. Six populations of wild oats (*Avena fatua*) were resistant to fenoxaprop-P-ethyl (Group 1, ACCase). All other cases were resistant to group 2 herbicides: Ten common ragweed, two redroot pigweed (*Amaranthus retroflexus*), two lamb's-quarters (*Chenopodium album*) and one giant foxtail (*Setaria faberi*) population. All group 2 resistant samples originated from plants growing in soybean while group 1 resistant samples were collected in wheat. This is the first report of Group 1 resistance in wild oats and of group 2 resistance in giant foxtail in Québec. Our results suggest herbicide resistance cases are increasing and/or were clearly underreported in Québec.

60) **VOLUNTEER GLYPHOSATE AND GLUFOSINATE RESISTANT CORN COMPETITIVENESS AND CONTROL IN GLYPHOSATE AND GLUFOSINATE RESISTANT CORN.**
Nader Soltani*, Christy Shropshire, Peter H. Sikkema; University of Guelph, Ridgetown, ON

Glyphosate and glufosinate resistant (RR/LL) volunteer corn has become a problem when hybrid RR/LL corn follows hybrid RR/LL corn in the rotation. A total of six field trials were conducted over a three year period (2008 to 2010) in southwestern Ontario to a) evaluate the competitiveness of volunteer RR/LL corn in hybrid RR/LL corn, and b) determine how to control volunteer RR/LL corn in hybrid RR/LL corn. The predicted volunteer RR/LL corn density to reduce hybrid RR/LL corn yield by 5% was 1.7 volunteer RR/LL corn plants m-2. There was no crop injury in hybrid RR/LL corn with herbicides evaluated at 1 and 2 WAA except for rimsulfuron (15 g ai ha-1) and foramsulfuron (35 g ai ha-1) which caused as much as 5 and 11% injury in hybrid RR/LL corn, respectively. Glyphosate (1800 g ae ha-1), glufosinate (500 g ae ha-1) and glyphosate + glufosinate (1800 + 500 g ae ha-1) provided up to 18, 10 and 21% control of volunteer RR/LL corn, respectively. The POST application of rimsulfuron (15 g ai ha-1), nicosulfuron (25 g ai ha-1), nicosulfuron/rimsulfuron (25 g ai ha-1), foramsulfuron (35 g ai ha-1), and primisulfuron/dicamba (166 g ai ha-1) did not provided any control of volunteer RR/LL corn. Glyphosate and glyphosate + glufosinate reduced volunteer corn density 26 and 30%, respectively. The other herbicides evaluated did not reduce volunteer RR/LL corn density compared to the weedy control. None of the herbicides evaluated reduced volunteer RR/LL corn cob numbers compared to the weedy control. Glyphosate + glufosinate applied POST reduced volunteer RR/LL corn yield 35% compared to the weedy control but other herbicides evaluated caused no reduction in volunteer RR/LL corn yield compared to the weedy control. Glyphosate applied POST resulted in hybrid RR/LL corn yield equivalent to the weed free control but all other herbicide treatments resulted hybrid RR/LL corn yield equivalent to the weedy control. This research concludes that volunteer RR/LL corn can be very competitive with RR/LL hybrid corn. None of the herbicides evaluated provided adequate control of volunteer RR/LL corn in hybrid RR/LL corn.

61) **WEED MANAGEMENT WITH TANKMIXES OF S-METOLACHLOR, IMAZETHAPYR AND LINURON IN DRY BEAN.** Nader Soltani*[1], Robert E. Nurse[2], Peter H. Sikkema[1]; [1]University of Guelph, Ridgetown, ON, [2]Agriculture Canada, Harrow, ON

Field studies were conducted in various locations in Ontario during 2011 to 2013 to evaluate s-metolachlor, imazethapyr and linuron applied preemergence (PRE) alone and in tankmix combination for the control of troublesome weeds in kidney bean. S-metolachlor, imazethapyr, linuron, s-metolachlor + imazethapyr, s-metolachlor + linuron and s-metolachlor + imazethapyr + linuron applied PRE at rates evaluated caused 3% or less injury in kidney bean. S-metolachlor provided 87-91% control of redroot pigweed, 46-55% control of common lambsquarters, and 96-97% control of green foxtail. Imazethapyr provided 93-96% control of redroot pigweed, 96-99% control of lambsquarters and 86-93% control of green foxtail. Linuron provided 82-98% control of lambsquarters, 82-99% control of redroot pigweed and 55-85% control of green foxtail. The tankmixes of s-metolachlor plus imazethapyr, s-metolachlor plus linuron, and s-metholachlor plus imazethapyr plus linuron provided 92-100% control of lambsquarters, redroot pigweed and green foxtail. Generally, kidney bean yields reflected the level of weed control. Based on these results, tankmixes of s-metolachlor plus imazethapyr, s-metolachlor plus linuron, and s-metholachlor plus imazethapyr plus linuron all provided an adequate margin of crop safety and excellent control of redroot pigweed, common lambsquarters and green foxtail in kidney bean.

CFIA Regulatory Issues and Provincial Weed Reports

Agence canadienne d'inspection des aliments / Canadian Food Inspection Agency

Révision de *l'Arrêté sur les graines de mauvaises herbes*

Catégorie 1 - Proposée

Aegilops cylindrica	Égilope cylindrique
Alopecurus myosuroides	Vulpin des champs
Bothriochloa ischaemum	Chiendent à balai
Bothriochloa laguroides	Barbon faux-saccharumis
Centaurea diffusa	Centaurée diffuse
Centaurea iberica	Centaurea iberica
Centaurea solstitialis	Centaurée du solstice
Centaurea stoebe	Centaurée maculée
Centaurea virgata	Centaurea virgata
Crupina vulgaris	Crupine
Cuscuta spp. (sauf *C. cephalanthi, C. coryli, C. gronovii, C. umbrosa, C. pentagona, C. polygonorum* et *C. salina*)	Cuscutes
Echium plantagineum	Vipérine à feuilles de plantain
Eriochloa villosa	Ériochloé velue
Halogeton glomeratus	Halogeton
Inula britannica	Inule des fleuves
Milium vernale	Millet de printemps
Nassella trichotoma	Stipe à feuilles dentées
Paspalum dilatetum	Herbe de Dallis
Peganum harmala	Rue de Syrie
Persicaria perfoliata	Renouée perfoliée
Pueraria montana	Kudzu
Senecio inaequidens	Séneçon du Cap
Senecio madagascariensis	Séneçon de Madagascar
Solanum elaeagnifolium	Morelle jaune
Taeniatherum caput-medusae	Tête-de-méduse
Zygophyllum fabago	Fabagelle


K. Allison, CFIA
Euphorbe ésule


Vipérine à feuilles de plantain

Catégorie 2 - Proposée

Abutilon theophrasti	Abutilon
Amaranthus tuberculatus	Acnide tuberculé
Ambrosia trifida	Grande herbe à poux
Anthriscus sylvestris	Anthrisque des bois
Berteroa incana	Bertéroa blanc
Carduus acanthoides	Chardon épineux
Carduus nutans	Chardon penché
Cenchrus longispinus	Cenchrus à épines longues
Chondrilla juncea	Chondrille
Cirsium arvense	Chardon des champs (chardon du Canada)
Conium maculatum	Ciguë maculée
Convolvulus arvensis	Liseron des champs
Datura stramonium	Stramoine commune
Elymus repens	Chiendent
Euphorbia esula	Euphorbe ésule
Galega officinalis	Galéga officinal
Heracleum mantegazzianum	Berce du Caucase
Heracleum sosnowskyi	Berce de Sosnowskyi
Jacobaea vulgaris	Séneçon jacobée
Lepidium appelianum	Cranson velu
Lepidium chalapense	Cranson rampant
Lepidium draba subsp. *draba*	Cranson dravier
Linaria dalmatica.	Linaire à feuilles larges
Linaria genistifolia	Linaire à feuilles de genêt
Linaria repens	Linaire striée
Linaria vulgaris	Linaire vulgaire
Lythrum salicaria	Salicaire commune
Nicandra physalodes	Nicandre faux-coqueret
Odontites vernus subsp. *serotinus*	Odontite rouge
Raphanus raphanistrum	Radis sauvage
Rhaponticum repens	Centaurée de Russie
Setaria faberi	Sétaire géante
Solanum carolinense	Morelle de la Caroline
Sonchus arvensis	Laiteron des champs
Sorghum halepense	Sorgho d'Alep
Tribulus terrestris	Croix-de-Malte


Crupine

Catégorie 3 - Proposée

Ambrosia artemisiifolia	Petite herbe à poux
Anthemis cotula	Camomille des chiens
Avena fatua	Folle avoine
Avena sterilis	Avoine stérile
Barbarea spp.	Barbarée vulgaire ou cresson de terre
Bromus arvensis	Brome des champs
Bromus japonicus	Renouée japonaise
Bromus secalinus	Brome faux-seigle
Bromus tectorum	Brome des toits
Daucus carota subsp. *carota*	Carotte sauvage
Erucastrum gallicum	Moutarde des chiens
Galium aparine	Gaillet gratteron
Galium mollugo	Gaillet mollugine
Galium spurium	Gaillet bâtard
Galium verrucosum	Gaillet à verrues
Lepidium campestre	Lépidie des champs
Leucanthemum vulgare	Marguerite blanche
Lolium persicum	Ivraie de Perse
Pastinaca sativa	Panais sauvage
Plantago lanceolata	Plantain lancéolé
All *Rumex* species (except *R. maritimus* & *R. acetosella*)	Patience
Silene latifolia subsp. *alba*	Lychnide blanche
Silene noctiflora	Silène noctiflore
Silene vulgaris	Silène enflé
Sinapis arvensis	Moutarde des champs
Sisymbrium loeselii	Sisymbre élevé de Loesel
Thlaspi arvense	Tabouret des champs
Tripleurospermum inodorum	Matricaire inodore (matricaire camomille)
Vaccaria hispanica	Saponaire de vaches

Catégorie 4 - Proposée

Cerastium spp.	Céraiste
Digitaria spp.	Digitaire
Panicum spp.	Panic
Prunella vulgaris	Prunelle vulgaire
Stellaria media	Mouron des oiseaux ou stellaire moyenne

Catégorie 5 - Proposée

Les espèces énumérées dans la catégorie 2 ainsi que les suivantes:

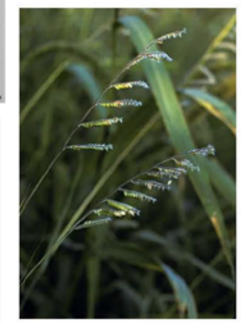
Cerastium spp.	Céraiste
Digitaria spp.	Digitaire
Leucanthemum vulgare	Marguerite blanche
Panicum spp.	Panic
Prunella vulgaris	Prunelle vulgaire
Stellaria media	Mouron des oiseaux ou stellaire moyenne
Tripleurospermum inodorum	Matricaire inodore (matricaire camomille)

État actuel

- Les résultats des consultations seront intégrés au Résumé de l'étude d'impact de la réglementation, en vue de la prépublication dans la *Gazette du Canada* (GC) Partie I, pour une période de commentaires de 75 jours.
- Les modifications à l'AGMH entreraient en vigueur à la suite de la publication dans la GC, Partie II, ou à une date d'entrée en vigueur publiée dans la GC, Partie II.


Grande herbe à poux


Égilope cylindrique


Ériochloé velue

S'il vous plaît soumettre des commentaires à SeedSemence@inspection.gc.ca

www.inspection.gc.ca juillet 2014

Canada

New Brunswick Report to the CWSS/SMC

Gavin Graham
New Brunswick Department of Agriculture, Aquaculture and Fisheries gavin.graham@gnb.ca
October 2014

Legislation

Plant Health Act - http://laws.gnb.ca/en/ShowPdf/cs/2011-C.204.pdf
No pests named and no plans for naming any weeds as pests at this time.

Invasive Plants

Operating using volunteer time, the New Brunswick Invasive Species Council (www.nbisc.ca) was mostly inactive in 2014. Increased public and media awareness of giant hogweed, wild parnsip and angelica driving this file. Stable funding is needed to move the Council forward.

Weather/Crop Reports

A cool and wet pattern presented for most of May, which made early planting and pest control difficult. The early season weather variability made pest control operations difficult to time and apply. Weather improved in June, with near ideal pollination conditions for many crops. Post tropical storm Arthur that passed through July 5-6 caused direct crop damage and losses associated with lack of power for an extended period of time. Normal conditions for the remainder of the season and average to above average yields expected but varies between regions and crops. An early frost in September will limit yield and quality potential for some late harvested crops.

Wild blueberry: New land coming into production, with 2,300 ha expected in next 24 months and goal of 8,000 ha in order to keep pace with demand. Concern with increasing populations of hawkweed, spreading dogbane and fescue species. Tank mixing becoming more popular, with more questions on safety of non-labelled tank mixes. In need of crop year weed management tools. Sector identified as a key area for economic expansion with a 2013-2018 Sector Strategy document announced:
http://www2.gnb.ca/content/dam/gnb/Departments/10/pdf/Agriculture/WildBlueberries-BleuetsSauvages/WildBlueberryStrategy.pdf

Cranberry: Dewberry, burnweed and common reed are reported issues. Growers are rapidly adopting mesotrione as base weed control treatment, with favourable overall performance, although interest in having US mesotrione registration in Canada. Need for alternative weed control products for resistance management.

Strawberries: Groundsel and toadflax remain largest concerns. Need for new herbicide options, especially for the planting year. Handweeding labour becoming harder to access.

Vegetables: Vegetable production static, in need of new herbicide options especially with uncertainty surrounding the future of linuron. Increased interest in CSA programs and more diverse crop varieties.

Hops: Herbicide options needed in this new crop for the region. Poast Ultra 180 day PHI excludes its use in production.

Potatoes: Sow thistle, lamb's quarters, pigweeds, chickweed, mugwort, cleavers and marsh hedge-nettle reported issues. In need of new chemistry as industry relies on metribuzin and linuron for weed control. One-pass hilling is becoming more common, putting more pressure on PRE herbicide effectiveness. Control of volunteer plants within rotation and potential for herbicide resistance are grower concerns.

Field Corn: Acreage increasing. Most RR growers using a residual tank mix or second application for improved control. Application timings remain problematic for some growers.

Soybean: Acreage increasing, growers still learning best practices for this crop. Commercial interest for non-GM types but there are weed control challenges. Vetch is a common issue for conventional producers

Cereals: Sow thistle, volunteer potato, cleavers and marsh hedgenettle reported as issues. Options for weed management in underseeded crops required, both post-emergence in spring to control a larger spectrum of weeds and at pre-harvest to control the underseeded red-clover if needed.

Pastures/hay: Smooth bedstraw largest issue, although triclopyr use can help with control. White cockle becoming more prevalent in some areas.

Minor Use

NBDAAF conducted 20 herbicide trials in 2014, mostly in support of Minor Use crops. Specific needs addressed included fescue control in wild blueberry, hawkweed control in wild blueberry, tank mixes in wild blueberry, cleavers control in barley and herbicides for marsh hedgenettle control in potato.

Current minor use gaps include crop year herbicides for wild blueberry production, broadleaf control in cranberry and alternative herbicides for potato production.

New URMULE for Ignite in lowbush blueberry planned.

Branch/Department and Personnel Updates

Provincial election in fall resulted in a change in government. A new direction is forth-coming, but expect slight adjustments to priority areas. Out of province travel may become more difficult to obtain.

Update for website complete, more focus on images and improved visibility of content.

Active Extension program, including field visits, presentations and factsheets.

Challenges/Research Needs

Reduction in weed science expertise within Atlantic region remains a great concern. Increased collaboration with other regions is a necessity in the future.

Status update for linuron needed, extremely vital tool for many industries.

Additional herbicide screening required in wild blueberry industry, with weed control in the crop year a major need. New herbicide tools are helping weed control within sprout year, but the gap for management tools in the crop year is increasing. Concerns over ticklegrass canopy causing other production issues like increased insect injury and reduced fungicide performance.

Additional weed control tools are required within cranberry industry, especially for broadleaf weeds.

Additional weed control tools for potato production required. Industry is rapidly adopting one-pass hilling system, which places additional pressure on late season weed control with reduced mechanical weed control.

Plenary Session Topic – Audit of Integrated Weed Management

Integrated Pest Management still seen as the cornerstone to production recommendations for clients. Its full use is limited for weed control recommendations in some crops, which are very reliant on herbicides. Low level of research within the region hampers extension of new approaches, although we try to adapt information from other crops/regions. Monetary cost and expected efficacy of the treatment are the major considerations for most weed control choices by growers.

CWSS Links List

Updated list of links for the provincial links section of the CWSS website:

Integrated Pest Management Images
New Brunswick Department of Agriculture, Aquaculture and Fisheries
New Brunswick Invasive Species Council
Potato Topkilling
Potato Weed Control
Strawberry Weed Management Guide
Wild Blueberry Weed Management Guide

Ontario Report to the CWSS/SMC

Amanda Green (Horticultural Crops), amanda.green@ontario.ca
Mike Cowbrough (Field Crops), mike.cowbrough@ontario.ca
October/2014

Legislation

The following changes were made to the Weed Control Act during 2014:

- Milkweed species were removed and dog-strangling vine was added

http://www.ebr.gov.on.ca/ERS-WEB-External/displaynoticecontent.do?noticeId=MTIxNzQz&statusId=MTgyNDQy

A proposal to remove 13 species and add 9 species was recently posted on the EBR for comment. The feedback from stakeholders resulted in this final proposal:

Proposed species for removal:

1. Johnson grass (*Sorghum halepense* (L.) Persoon)
2. Black-seeded proso millet (*Panicum miliaceum* L. (black-seeded biotype))
3. Yellow rocket (*Barbarea* spp.)
4. Russian thistle (*Salsola pestifer* Aven Nelson)
5. Tuberous vetchling *(Lathyrus tuberosus* L.)
6. Goat's-beard spp. (Tragopogon spp.)
7. Nodding thistle spp. (Carduus spp.)
8. Scotch thistle (Onopordum acanthium L.)
9. Wild carrot (Daucus carota L.)

Proposed species to add:

1. Smooth bedstraw (*Gallium mollugo* (L.))
2. Wild chervil (*Anthriscus sylvestris*)
3. Common crupina (*Crupina vulgaris* Cass.)
4. Jointed goatgrass (*Aegilops cylindrical* Host)
5. Kudzu (*Pueraria lobata*)
6. Wild parsnip (*Pastinaca sativa*)
7. Serrated tussock (*Nassella trichotoma*)
8. Tansy ragwort (*Senecio jacobeae*)
9. Wolly cup grass (*Eriochloa villosa* (Thunb.) Kunth)

The proposed list is expected to go to cabinet shortly and, if approved, will be in place for the 2015 season. Contact Mike Cowbrough for more information.

Invasive Plants

The Ontario Invasive Plant Council (OIPC) www.ontarioinvasiveplants.ca/ has conducted a series of webinars and workshops around invasive plant management that are posted on their website.

Phragmites (common reed) has been receiving a lot of attention with the formation of the Ontario Phragmites Woriking group http://www.opwg.ca and support from the Ontario Federation of Agriculture http://ofa.on.ca/media/news/ofa-wants-to-rid-ontario-of-canada's-most-invasive-plant

Requests to add it to the noxious weed list have been made. OMAFRA has had discussion with the Ontario Federation of Agriculture about the possibility of adding it as a locally noxious weed in a municipality that wishes to actively pursue management so as to evaluate the effectiveness of a provincially noxious weed designation.

Minor Use Update – Jim Chaput, OMAFRA Provincial Minor Use Coordinator
URMULE registrations 2014 to date – weed management

- Prism – highbush blueberries
- Puma Advance – perennial ryegrass for seed
- Prowl - carrots
- Centurion – caraway
- Eptam – dry beans
- Sandea, Permit – numerous crops [via registrant submission]
- Etho – sod turf
- Royal MH30 – sucker control on black tobacco
- Goal – highbush blueberries
- Casoran – blueberries, caneberries
- Express – forage grasses
- Centurion – carrots, radish, beets, parsnips
- Frontier Max - grapes

For a link to Ontario's minor use program visit:
http://www.omafra.gov.on.ca/english/crops/minoruse/aboutminoruse.html

For a listing of Active URMULE projects in weed management contact Jim Chaput at jim.chaput@ontario.ca

Branch/Department and Personnel Updates

Personnel Updates: The agriculture development branch will see a number of retirees in the next 6-12 months. At this time it is uncertain how many positions will be rehiring or if all the retiring positions will be filled. Job postings for positions within OMAFRA can be found by going to www.gojobs.gov.on.ca

Challenges/Research Needs

Herbicide Resistant Weeds:

- Glyphosate resistant Canada fleabane now occurs in 12 counties.
- Glyphosate resistant giant ragweed now occurs in 7 counties.
- Glyphosate resistant common ragweed still only occurs in 1 county.
- Group II resistant species, particularly common ragweed, pigweed species and eastern black nightshade are being confirmed, with an increase being seen in eastern Ontario
- The latest in herbicide resistance can be found at: http://fieldcropnews.com/category/pests/weed-resistance/

CWSS Links List

http://fieldcropnews.com/category/pests/weed-resistance/

RAPPORT DU QUÉBEC À LA SOCIÉTÉ CANADIENNE DE MALHERBOLOGIE

Danielle Bernier, MAPAQ, Danielle.Bernier@mapaq.gouv.qc.ca
Montréal, Québec
Novembre 2014

Règlementation (Loi sur la protection sanitaire des cultures [L.R.Q., c. P-42.1])
Aucune modification ou réglementation n'a été apportée ou développée au niveau des mauvaises herbes depuis l'adoption de la nouvelle loi.

Il est important de souligner le départ à la retraite du coordonnateur des mesures législatives au ministère de l'Agriculture, des Pêcheries et de l'Alimentation du Québec (MAPAQ), M. Alain Garneau. Il quittera son poste le 21 novembre 2014. Mme Sophia Boivin assumera dorénavant les tâches en lien avec la réglementation sur la phytoprotection au MAPAQ.

Espèces exotiques envahissantes (ériochloé velue)
Réglementation

Nous sommes toujours dans l'attente de la décision de l'Agence canadienne d'inspection des aliments.

Dans le but d'aider les producteurs agricoles aux prises avec l'ériochloé velue, le MAPAQ a inclus dans sa liste des actions du Plan d'accompagnement agroenvironnemental admissibles à un financement pour la saison 2014-2015 dans le contexte du Programme services-conseils, l'action de prévention de la propagation des espèces exotiques envahissantes.
Cette action vise à identifier les espèces exotiques envahissantes, informer les intervenants concernés en tenant compte de l'ampleur de la problématique cernée, donner des conseils pour réprimer ou contrôler ces espèces, vérifier l'efficacité des pratiques ou techniques effectuées, etc. Les interventions sont admissibles à l'aide financière du Programme services-conseils pour seulement 6 espèces, dont l'ériochloé velue.

Un avertissement du Réseau d'avertissements phytosanitaires a également été publié le 11 août 2014 pour inviter les intervenants à dépister l'ériochloé velue (avertissement No 38).

Une fiche d'information sur l'ériochloé velue a également été développée par le CÉROM
Le CÉROM, sous la coordination de Mme Marie-Édith Cuerrier, a poursuivi le projet « *Évaluation de différents moyens de désherbage contre l'ériochloé velue* ». Financé dans le cadre du programme Innov'Action, le projet d'une durée de trois ans a réalisé sa dernière saison d'essai plein champ en 2014. Les résultats devraient être disponibles d'ici le printemps prochain. - 2 -

Un nouveau projet de recherche sur l'ériochloé velue a également reçu le financement du programme Innov'Action cette année. Le projet prévu pour deux ans est intitulé « *Étude sur les facteurs influençant la viabilité des semences d'ériochloé velue* ». Il est également réalisé par le CÉROM sous la coordination de Mme Catherine Thibaut, en collaboration avec Mme Marie-Édith Cuerrier.

Température / récolte

(Tiré de l'état des cultures au Québec, La Financière agricole, rapport 1 à 10)

En raison de l'arrivée tardive du printemps, les semis ont débuté pendant la deuxième semaine de mai pour l'ensemble des régions.

- Quelques régions ont eu des périodes de pluie abondante, ce qui a nécessité la prorogation des dates de fin des semis pour quelques cultures et rendu les travaux d'arrosage difficiles pour cette période.
- De façon générale, la levée et la croissance des cultures ont été bonnes.

Juin a été marqué par des températures variables et des précipitations au-dessus de la normale pour certaines régions.

- Les températures chaudes et les précipitations occasionnelles de juillet ont favorisé la croissance et le développement des cultures en général.
- Malgré une certaine récupération, le stade de développement de la plupart des cultures annuelles demeure en retard.

Les conditions climatiques du 14 juillet au 3 août ont été variables avec alternance de températures chaudes et humides, puis fraîches, le tout accompagné de précipitations sous forme d'averses et d'orages violents à l'occasion.

- Malgré un climat généralement favorable en juillet, on observe toujours un retard dans le développement des cultures et le déroulement des récoltes.

Le climat, depuis le début de la saison, a été généralement favorable au développement des cultures, mais le manque de chaleur et les pluies abondantes des derniers jours ont ralenti leur mûrissement ainsi que l'avancement des récoltes.

Du 19 août au 8 septembre, les températures ont été généralement chaudes et la pluviométrie a été inférieure à la normale dans plusieurs régions.

Pour la période du 8 au 21 septembre, les températures ont été sous les normales saisonnières : le gel généralisé de la nuit du 18 au 19 septembre a touché l'ensemble du territoire.

- Les températures fraîches ont ralenti le mûrissement des cultures.

- 3 -

Emplois mineurs

Il n'y a eu aucun projet en lien avec les mauvaises herbes dans le cadre du dernier appel du volet ADLAI du programme Prime-Vert – 4 du MAPAQ. Aucune homologation d'urgence n'a été demandée non plus.

En 2014, une extension d'homologation du GOAL 2XL a été déposée pour le contrôle des mauvaises herbes prévues à l'étiquette pour l'échalote sèche.

Le vinaigre blanc concentré à 12 % technique a obtenu l'homologation pour utilisation dans les canneberges. La demande provenait des producteurs de canneberges du Québec. C'est assez nouveau, car il n'y a pas de compagnie associée, mais comme il s'agit du grade technique, les producteurs peuvent se le procurer où ils veulent.

Stratégie phytosanitaire québécoise en agriculture (SPQA)

La Stratégie phytosanitaire québécoise en agriculture 2011-2021 comporte des actions en lien avec la santé des travailleurs et de la population, l'environnement, ainsi que l'agronomie et l'économie. L'enjeu principal du volet agronomie/économie est d'accroître l'adoption de la gestion intégrée des ennemis des cultures au Québec. En ce sens, quelques activités en lien avec la gestion des mauvaises herbes et les herbicides ont été réalisées. Par exemple, des actions du plan d'action 2011-2014 visaient à :

- Réduire les risques de développement et de dissémination d'ennemis des cultures en renforçant notamment les activités du Réseau d'avertissements phytosanitaires (RAP).
- Réduire le risque de développement d'ennemis des cultures résistant aux pesticides. À cet effet, un état de situation a été réalisé au regard des ennemis des cultures présents au Québec qui ont développé une résistance aux pesticides. Aussi, un service de détection de résistance des mauvaises herbes aux pesticides est maintenant disponible.
- Encourager les producteurs agricoles à adopter une gestion intégrée des ennemis des cultures en donnant des aides financières pour l'accompagnement individuel[1] des producteurs afin d'encourager ces derniers à :

☐ Utiliser le contrôle mécanique pour une culture donnée.
☐ Pratiquer un mode de production certifié pour une culture donnée (ex. : agriculture raisonnée, production fruitière intégrée).
☐ Appliquer des pesticides en bandes ou de manière localisée pour une culture donnée.
☐ Introduire ou pratiquer la production biologique pour l'entreprise.
☐ Améliorer la gestion intégrée des ennemis des cultures.

[1] Manuel du conseiller en agroenvironnement (Annexe 6.4i : Explications des actions du PAA pouvant être financées par l'entremise du Programme services-conseils)

En 2014, un projet en lien avec le désherbage mécanique a été financé via le programme Prime-Vert : « *Étude des aspects opérationnels, économiques et agroenvironnementaux du travail réduit des sols d'une herse offset, d'une déchaumeuse et d'un semoir combiné à une herse rotative* ». - 4 -

Mauvaises herbes résistantes

Le projet de détection de la résistance réalisé conjointement par le MAPAQ, Agriculture Canada et la compagnie Dow Agrosciences a pris fin cette année. Le projet a mis au jour la présence de deux nouvelles espèces de mauvaises herbes résistantes, soit la folle avoine (*Avena fatua*) dans la région du Saguenay–Lac-Saint-Jean, et la sétaire géante (*Setaria faberii*) en Montérégie-Ouest. De plus, 16 nouveaux sites infestés par de mauvaises herbes résistantes déjà présentes au Québec ont également été répertoriés.
Le service de détection de la résistance des mauvaises herbes aux herbicides sera de nouveau offert en 2014. Il est rendu possible grâce à une entente entre le CÉROM et le MAPAQ, et grâce à la participation financière de la compagnie Monsanto. Le service est offert gratuitement.
Un projet pour rendre la détection des mauvaises herbes résistantes aux herbicides a été entrepris entre le CÉROM et le MAPAQ pour assurer la pérennité du service dans les prochaines années. Le banc d'essai du MAPAQ sera déménagé au CÉROM.
La problématique de la résistance a été introduite dans les thèmes de recherche du programme Innov'Action du MAPAQ. Grâce à cette nouvelle thématique de recherche, un projet intitulé « *Détection et répartition de la folle avoine et de la petite herbe à poux résistantes à des herbicides dans les régions du Saguenay-Lac-Saint-Jean et de la Montérégie* » a été accepté. Mme Marie-Édith Cuerrier du CÉROM est coordonnatrice de ce projet d'une durée de trois ans.
Un comité sur la résistance a également été mis en place pour discuter des priorités à mettre en place dans le secteur. Il s'est réuni pour une première fois le 11 mars 2014. Un plan de travail a été initié.

Direction de la phytoprotection (DP)

La Direction de la phytoprotection a poursuivi, au cours de la dernière année, ses interventions dans le cadre de la Stratégie phytosanitaire québécoise en agriculture 2011-2021 (SPQA) en collaboration avec ses partenaires. Des efforts ont été investis afin de connaître les herbicides homologués les plus utilisés pour les cultures suivantes : crucifères-feuilles, crucifères-racines, oignon sec, pomme, fraise, framboise, soya et maïs de grandes cultures. Une consultation a été menée auprès d'une dizaine de conseillers experts de chacune des cultures et a permis de dresser la liste des matières actives et des produits commerciaux les plus utilisés. Ce travail constitue une première étape permettant d'établir des priorités de travail en vue de diminuer les risques pour la santé et l'environnement des pesticides identifiés. La SPQA poursuit deux grands objectifs, qui sont d'accroître l'adoption de la gestion intégrée des ennemis des cultures et de réduire les risques des pesticides pour la santé et l'environnement en assurant la viabilité économique des productions agricoles.
Le laboratoire de diagnostic en phytoprotection du MAPAQ reçoit de plus en plus de cas de dérive par le glyphosate. De nombreuses cultures sont affectées, tant les grandes cultures que les cultures fruitières, maraîchères et ornementales. - 5 -

Pour ajouter la section « mauvaises herbes » à IRIIS phytoprotection, le CRAAQ a engagé pour trois ans M. Sam Chauvette, agronome, pour travailler à la réalisation de cette nouvelle section. M Chauvette travaille en étroite collaboration avec M. Romain Néron, agronome-botaniste à la Direction de la phytoprotection.
Toutes les plantes de l'Herbier Campagna-Dubé de l'Institut de technologie agroalimentaire de La Pocatière ont été déménagées à l'Herbier du Québec, au complexe scientifique.

Danielle Bernier
Agronome-malherbologiste
Direction de la phytoprotection, MAPAQ
20 octobre 2014

British Columbia Report to the CWSS/SMC
Respectfully Submitted by
David Ralph, Invasive Plant Program,
Ministry of Forests, Lands and Natural Resource Operations,
David.Ralph@gov.bc.ca
Nov 1, 2014

Overview for 2014

In BC, no major changes, new programs or initiatives occurred relative to Invasive Plant in 2014. Projects, programs or initiatives were existing and ongoing from those developed in 2013 or prior. The following is generally updates on those programs and projects.

Legislation

The **BC *Weed Control Act*** has not undergone any revisions for many years and there are no immediate plans for such.
http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/00_96487_01

The **BC *Weed Control Act* Regulations** was revised July 21, 2011 with the addition of 18 species to Schedule A, Part I, Provincial Weeds. http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/10_66_85
Since 2010, a Policy review has been underway to develop new updated weed lists proposing four noxious categories. The current Regulation has two categories, Provincial and Regional, while the new revisions propose three categories: Prohibited; Restricted A – Provincial; Restricted- B Regional; and Restricted C – Nuisance. The Regulation amendments will also address; Definitions, Designations, Notice to Control and Transportation restrictions. Additions to the Regulations under consideration are prohibition of sale and ticketing for non-land infractions, such as transport, of listed noxious species.
Regulation revisions are nearing completion and are expected to be distributed to government and non-government stakeholders for discussion and comment in early 2015. Upon expected agreement of the proposed amendments it will be submitted to Cabinet.
Other provincial legislation pertaining to weed or invasive plant legislation currently exists in BC are:
The Forest and Range Practices Act, Sec 47:
http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/00_02069_01
The Forest and Range Practices Act, Invasive Plants Regulation:
http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/18_18_2004
The Community Charter, Spheres of Concurrent Jurisdiction, Environmental and Wildlife Regulation:
http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/41_144_2004

Invasive Plants and Programs

Invasive Plant Program, Ministry Forests, Lands & Natural Resource Operations (FLNRO): is responsible for the *Weed Control Act* and *Forest and Range Practices Act* and invasive plant operations on crown owned lands in BC.

Early Detection Rapid Response Program (EDRR)

FLNRO operates under and administers an established EDRR Program. Current reports of listed EDRR species on Crown or private lands in BC are acted on to verify species and site reports. Verification of historical sites is ongoing. Follow-up on confirmation of species and sites triggers action of the EDRR system process where control actions (chemical, mechanical) are led and implemented by FLNRO, the land owner/occupier, and with assistance from local IP committees. These EDRR species and sites are of the highest priority in BC with a goal of eradication.

Invasive Alien Plant Program (IAPP) *Database*

A primary responsibility of the FLNRO IP Program is administration of the web-based IAPP database which now contains nearly half a million records (IP surveys, treatments, and activity plans) for the entire province.. This comprehensive data is entered by a wide variety of user groups (ministries, regional districts, weed committees, forest licensees, utilities, conservation groups, federal departments, and others) on an on-going basis. Access to the data in IAPP is password-restricted to authorized users.

BC Ministry of Forests, Lands and Natural Resource Operations recognize users want a system that is current and innovative. Expansion and re-designs for all these applications is on-going. Innovations include: Invasive Species Reporting smartphone app, plus a smartphone app specifically geared to the BC Ranching and Agricultural sector. This last app will allow the reporting of invasive plants as well as offer information and management options.

Complete and in-depth user guide for the current IAPP database component, view or download the Reference Guide part II at:
http://www.for.gov.bc.ca/hra/Publications/invasive_plants/Part_2-IAPP_Data_Entry.pdf
The Reference Guide part III, which explains how to optimize use of the Map Display component, is available at:
http://www.for.gov.bc.ca/hra/Publications/invasive_plants/Part_3-IAPP_Map_Display.pdf

Approximately 95% of lands in BC are Crown lands with 80% of this being the responsibility of FLNRO. Crown land IP management by FLNRO is accomplished through several approaches: staff; contracted services; partnership delivery through Regional Weed Committees and local government weed programs (hereafter referred to as Regional Weed Programs (RWC)). The ministry supports the partnership delivery with Regional Weed Committees and local governments through disbursement of grant funding to cover operational Crown land treatments and coordination and education components provided by the partners. In 2014, FLNRO distributed approximately $1.7 million in Invasive Plant Grants to invasive plant management partners. This does not include the cost of other contracts for crown land management.

BC Inter-Ministry Invasive Species Working Group (IMISWG)
The IMISWG responsibilities are to develop a strategic and collaborative approach to invasive species management among government agencies and other partners in BC.
http://www.for.gov.bc.ca/hra/invasive-species/index.htm
Member Ministries include: Agriculture, FLNRO, Transportation and Infrastructure, Energy and Mines, Environment, Community, Sport and Cultural Development, Aboriginal Relations and Reconciliation, and other Provincial Authorities.

Regional Weed Programs
http://bcinvasives.ca/about/partners/bc-stakeholders/regional-committee-map
Twenty eight regional committees or local government programs – Regional Weed Programs – provide multi-stakeholder invasive plant management coverage of the entire province. Regional Weed Programs carry out a variety of functions from education and awareness to partnership delivery which can encompass education, coordination, inventory, mapping, addressing complaints, on-ground management of public lands. Many Regional Weed Programs have begun diversifying their focus to invasive species This is a trend that seems to be increasing in BC.

Invasive Species Council of BC (ISCBC)

http://www.bcinvasives.ca/

ISCBC is involved in province wide programs that are predominately rolled out through Regional Weed Programs or industry in a collaborative approach. There are numerous programs and initiatives in development and publication of Best Management Practices underway, or just completed by the ISCBC. A list of materials can be found at http://bcinvasives.ca/resources

Some specific programs are described below.

Take Action Program

http://www.bcinvasives.ca/programs/take-action

The Take Action Program is a multi-year social behavioural change program that will apply the principles of social marketing to encourage behaviour change related to invasive species in BC.

"CLEAN-DRAIN-DRY" Take Action Program

http://bcinvasives.ca/news-events/recent-highlights/clean-drain-dry

Program team members worked with boaters and outdoor recreationists to present information on best practises to prevent the spread of aquatic invasive species in BC and acquire commitments for ongoing clean, drain, dry activities when moving watercraft and equipment. The "CLEAN-DRAIN-DRY" program continued in 2014 in selected regions where recreational boat traffic and risk of *Dreissenid* mussel incursion was highest.

Plant-Wise Project

http://bcinvasives.ca/resources/programs/plant-wise

The program focuses on the already available "Grow Me Instead' brochure produced by the ISCBC. This project combines industry initiatives with consumer purchasing tools and resources that support the horticulture industry's transition to becoming invasive-free, and to build consumer demand for non-invasive plants. This program focuses on industry and consumer client groups in the Fraser Valley and Central Okanagan regions. Seasonal staff met with industry retailers to explain the concern of invasive plants and outlined alternate species to current invasive species being sold. Seasonal staff engaged with consumers at farmers markets and community events to encourage the purchase of non-invasive plants and assist gardeners in making responsible plant choices

Weather/Crop Reports
Regional Weather/Crop Production Reports

South Coastal Region

Some wet and cool periods occurred in spring with summer provided good growing conditions resulting in good yields. Some rains in fall caused some challenges harvesting root crops. *Drosophila* fly is an increasing problem on fruit crops.

Vancouver Island

Spring months saw average temperatures with July, August and September temperatures above average for the region. Due to a warm season overall, a decrease in plant pathogens was evident. Non-native, invasive horticultural species escapes (deliberate and accidental) are a concern in Vancouver Islands' natural areas. Knotweed species, along with yellow flag Iris, are concerns in riparian areas,

Cariboo Chilcotin Region

Weather in 2014 provided good growing conditions. Spring was cool but fall was long. The top three weeds having the greatest impact forage production are orange hawkweed (*Hieracium aurantiacum*), oxeye-eye (*Chrysanthemum leucanthemum*), and Canada thistle (*Cirsium arvense*). Weed species having the greatest impact on grassland and grazing areas, as well as sensitive environmental ecosystems, are marsh plume thistle (*Cirsium palustre*), sulphur cinquefoil (*Potentilla recta*), and spotted knapweed (*Centaurea stoebe*).

Central/Bulkley/Mid-Coast Region
Spring temperatures and precipitation were average with summer months hot and dry and fall being warmer than normal and relatively dry. Crop yields were average. Weather was accommodating this year for weed growth. Hoary alyssum (*Berteroa incana*) and Marsh plume thistle remains dominant in the Central, West Central and North Cariboo regions. Orange and yellow hawkweed species continues to spread across the Central/Bulkley and Cariboo regions with the prevailing winds transporting wind-blown seed.

Thompson Okanagan Region
March and April were average months for temperature and precipitation benefiting the tree fruit industry/viticulture sector. Forage crop production was above average for the region. Above average temperatures in July/August and September made crop harvest of cherries through to apples successful and the grape crop came off well.

Kootenay Region
Normal temperatures and moisture patterns occurred in spring with summer months thru to the end of August being hot and dry. September was very wet, but temperatures were average. Forage production was average throughout the season with reduced final cut come fall.

Peace Region
Average weather in spring progressed into a hot summer season with precipitation being average. Fall weather was good for harvest, but overall crop yields were slightly below average. The Peace region is actively working to prevent establishment of hawkweed and ox-eye daisy, but as survey's increase, new sites are identified. Scentless chamomile and Canada thistle are of concern and actively managed in cropping and pasture production. Common tansy is increasing and has become a priority species in private and community pasture areas.

Minor Use
Imazapyr for Spartina
This is a collaborative project with FLNRO, Ducks Unlimited, MoE and the Spartina Working Group. In early March 2014 an 2nd emergency registration (ER) was granted from PMRA to B.C. Ministry of Environment (MoE) for the herbicide Habitat (imazapyr) for controlling and eradicating the invasive Spartina (cordgrass) located in tidal areas along the B.C. Coast. Rodeo (glyphosate) was not included in the 2014 ER application.The provincial Pesticide Use Permit (PUP) for this use is current until Dec 31, 2015.

Spray treatments using Habitat continue for the second year in the Roberts Bank area and continued until late mid-September. Approximately 2 hectares of Spartina newly infested area and follow-up treatment, combined, was treated with Habitat + Ag Surf II. A blue dye was added to enhance visual recognition of treated.

A research trial, established in 2013, to evaluate efficacy of spray treatments using glyphosate and imazapyr at various rates alone and in combination, plus one treatment in combination applied as a wipe-on application will conclude this fall. Efficacy evaluation of 2013 treatments was very good. The 2014 Spartina Project was considered very successful achieving treatment of 85% of known plants. Application for a 2015 ER for Habitat will be submitted to PMRA in January 2015.

Branch/Department and Personnel Updates
The FLNRO Invasive Plant Program staff remained the same for 2014 consisting of a Program Manager, 4 IP Specialists (1 vacant), an EDRR Coordinator, GIS/Mapping Technician, Inter-Ministry Coordinator, Biological Control Specialist and 2 Bio control Technicians.
http://www.for.gov.bc.ca/hra/Plants/index.htm

Extension
This function is primarily carried out by Regional Weed Committees and the ISCBC in the form of Best Management Practices, Factsheets and Weed Alerts and can be obtained through web downloads. Hard

publications are still being published, however use of social media and web-based applications are increasing. This nature evolution of extension to our audiences is a result of the demand for immediate information that is easily accessible.

Provincial IP Specialists develop hard and web based information and assist in the development of ISCBC and RWC and other partner material through technical advice and editing of publications and information applications. The FLNRO IP Program also provides extension support to ministry client groups (forest industry and ranchers).

Challenges, Needs
Stable, consistent funding for invasive plant and species programs is an ongoing challenge in all of BC's IP Programs. Needless to say, increased funding would be beneficial.

Many priority species sites in BC are found in very remote locations, difficult to access and expensive to carry out the initial treatments as well as the required follow-up treatments each year.

Increased survey and inventory by land managers, as well as the better informed public, has resulted in increased IP reporting with an expectation for action.

Regional Weed Programs and the ISCBC are challenged each year to seek out funding to continue carrying out the functions that their programs offer.

Permitting is required to control IP species to water edge and is expensive and lengthy. Increased communications and pre-permit planning with regulatory agencies to have self-ready permits in place is occurring to speed process when emergency incursions occur in BC.

Research Needs
-For the majority of invasive plant species in BC, research needs are typically in the form of new or improved methods of control. Long term management methods are a necessity for successful IP management in BC.
-Biological control agent screening is needed for plant species such as: marsh plume thistle, ox-eye daisy, sulphur cinquefoil, knotweeds. These species have infested large areas and continue to spread. Restoration of these infested lands is expensive and could be temporary remediation without continued input of expensive resources. Bio-control seems the best economic and environmental sustainable approach for the long term provided suitable, target specific agents can be found for the targeted weeds.

Plenary Session Topic
IWM is widely used in BC root, berry and cole crop production systems, especially in the organic production. Many small production operations are located in semi-urban areas and IPM/IWM systems are being practiced. Local producer associations are eager to refine the integrated systems in place or to initiate integrated systems if currently not using that approach.

IP programs in BC are required to use an IPM/IWM approach as part of the deliverables and performance based results of Pesticide Management Plans for BC

Ministry of Environment, Environmental Protection Division, Integrated Pest Management Act and Regulations mandate IPM instituted in their legislation.

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