Western Applied Research Corporation

2010 Summary of Research Results and Events

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Table of Contents

Western Applied Research Corporation

The Western Applied Research Corporation (WARC) was incorporated in 2003 and is directed by a seven member Board of Directors. The seven directors are local producers that represent both livestock and grain producers from each of the seven Agriculture Development and Diversification (ADD) districts in NW Saskatchewan.

WARC is a producer based organization that facilitates practical field research and demonstration. It also ensures the transfer of technology from research to farm level for the benefit of producers in NW Saskatchewan and the province. In addition to the field trial analysis the economic implication for the technology is evaluated.

WARC is affiliated with Agriculture and AgriFood Canada (AAFC) at Scott. The Scott Research Farm acts as the main site for research and demonstration as well as coordination of the projects. Another location accessible to WARC through AAFC at Scott is Glaslyn. In addition to Glaslyn, there are seven other sites that are accessible through the AgriARM program: Indian Head, Redvers, Canora, Rosthern, Swift Current, Prince Albert, and Melfort.

Board of Directors

Don Karstens	Wilkie, SK
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Leonard Lundberg	Turtleford, SK
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Scott Research Farm

The Scott Research Farm was established in 1910 by the Federal Department of Agriculture's Experimental Farm Service. In the 1970's organizational restructuring within Agriculture and Agrifood Canada Research Branch resulted in Scott Research Farm becoming a sub-station of Saskatoon Research Centre.

The farm consists of approximately 340 hectares (840 acres) of dark brown loam soil (pH ranging from 5.0-6.5). In addition to this land base there were two Project Farms operated on leased land in North Western Saskatchewan. One located near Lashburn (Black climatic zone) and the other near Loon Lake (Grey climatic zone). These project farms were closed at the end of 2006. In 2007, a new Project Farm near Glaslyn (Grey climatic zone) was started.

In the early years, there were research programs in livestock, horticulture and field crop production. Along with specialization in the agriculture industry, Research Centres also specialized. As a result, the livestock and horticulture programs have been transferred to other AAFC Research Centres. Scott Research Farm now specializes in crop production systems**.**

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Statistics

Statistics are very important for agricultural research. They allow a person to understand how different treatments relate to one another. Statistics is a mathematical way to determine if the differences between treatments are a real effect or random effect. For agricultural research a significance level of $\alpha=0.05$ is used. This means that if there is a significant difference, the difference is expected to occur 95 percent of the time. For example if the yield of variety A is larger and statistically different from variety B, variety A is higher yielding 95% under the environmental conditions of the experiment. Least significant difference (LSD) will be used in the WARC annual report to show differences among treatments like varieties and herbicides. To compare treatment averages you subtract one treatment average from another. If the difference is greater than the LSD the treatments are statistically different. Table 1 shows an example of three different treatments.

Table 1 A statistical example of using LSD to determine significant differences between treatements.

Treatment	Average
A	10
B	8
C	5
LSD(0.05)	2.5

treatment A (10) – treatment B (8) = difference (2)
2 is less than LSD of 2.5 so treatment A is not statistically different than treatment B

treatment A (10) – treatment C (5) = difference (5)
5 is greater than LSD of 2.5 so treatment A is statistically higher than treatment C

treatment B (8) – treatment C (5) = difference (3)
3 is greater than LSD of 2.5 so treatment B is statistically higher than treatment C

Statistical differences can also be presented by letters next to the average. Treatment averages with the same letter are not different but treatment averages with different letters are significantly different (Table 2). Treatments A and B are not significantly different but they are both significantly different from treatment C.

Table 2 A statistical example using letters on treatment averages to denote significant differences.

Treatment	Average
A	10^a
B	8^a
C	5^b
LSD(0.05)	2.5

Statistical significance is usually shown as error bars on graphs. If the error bar reaches as high as another average the treatments are not statistically different. If the error bar does not reach as high as another average they are significantly different. Treatment A and B are not significantly different but both are different from treatment C.

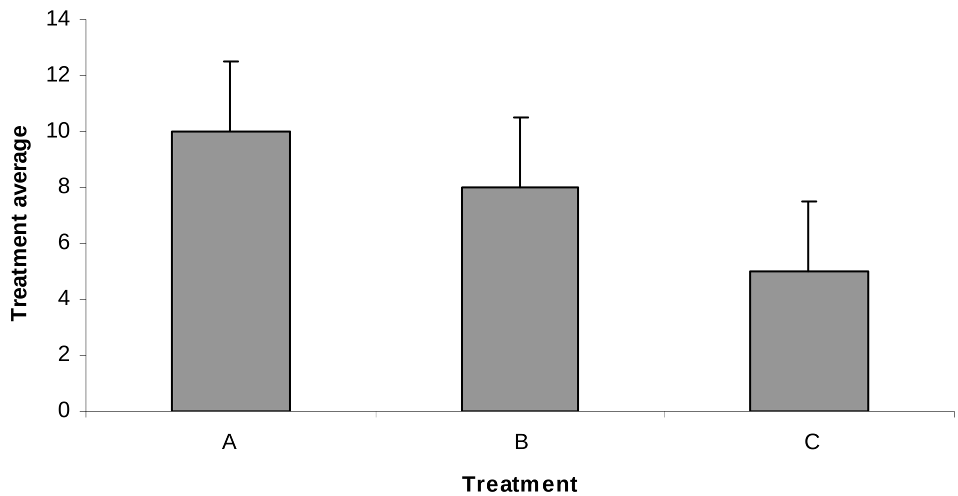

Figure 1 A statistical example using error bars on treatment averages to denote significant differences.

If treatment averages are not significantly different under the conditions of the experiment it is assumed that the environment of the experiment explains more of the treatment differences than do the treatments themselves. When there is no significant difference it is difficult to predict which treatment will perform better. The environment is the years and locations that the experiment takes place.

Two important factors that influence how precise an experiment are the number of locations used and the number of years the experiment occurred in. The more site years (multiply number of sites by the number of years) an experiment occurs in the more precise the results. Experiments with few sites and few years do not have many different environments to compare. More conclusive results are obtained by experiments with more site years of data.

Weather Report for Scott, Saskatchewan 2010

Soil Information:
Dark Brown Chernozemic (Typic Boroll)
Association: Scott
Texture: Loam

sand: 31%
silt: 42%
clay: 27%

Organic Matter: 4%
Soil pH: 6.0

Table 1 Air temperature, growing degree days, and precipitation at Scott for 2010.

Year		April	May	June	July	August	September	October	Season Total
Air Temperature (°C)									
	2010 mean	5	9	15	16	15	9	6	
	99 year mean	3	10	15	17	16	10	4	
Growing Degree Days									
	2010 mean	58	131	298	354	318	140	85	1384
	99 year mean	42	170	285	381	346	174	48	1446
Precipitation (mm)									
	2010 mean	45	121	146	122	62	44	17	557
	99 year mean	23	37	62	61	45	31	16	275

Last spring frost: May 24 (-0.1 °C)
First fall frost: September 17 (-3.4 °C)
Rainfall event greater than 10 mm (April-October):
April 14 (15 mm)
May 4 (11 mm)
May 23 (42 mm)
May 28 (17 mm)
May 29 (21 mm)
June 10 (39 mm)
June 17 (17 mm)
June 21 (28 mm)
June 22 (21 mm)
June 26 (18 mm)
July 5 (15 mm)
July 16 (23 mm)
July 23 (38 mm)
July 26 (11 mm)
August 1 (22 mm)
September 6 (15 mm)
September 19 (12 mm)
October 24 (12 mm)

Extension Activities

Every year WARC in involved with several extension activities. They are used to transfer new and relevant information about varying topics from agronomy to market outlooks to producers, agronomists, and business advisors.

Extension Activities Include:

	# attendees
Crop Opportunity	250
Scott Field Day	400
Viterra Agronmist Tour (Aug 17)	25
Leafy Spurge Tour (Aug)	15
Unstructured Tours	20

Other forms of extension:
Radio interviews & radio spots
Newspaper articles
Website – reports
Results in Stay Connected

Scott Field Day

The Scott field day was held July 16, 2010. 2010 was the 100th anniversary of the Agriculture and Agri-Food site at Scott. The field day was a celebration of the anniversary highlighting many advances in agriculture that were pioneered at Scott. Many dignitaries were in attendance like Federal Agriculture Minister Gerry Ritz. Around 400 people were in attendance at the field day. Demonstrations included crop rooting depth, history of dandelion control and wild oat control, plot seeding demonstration, and horse pulled seeder demonstration. Other highlights were the pesticide minor use program demonstration, the long term rotation study, and history of variety development in wheat and canola.

Crop Opportunities and Scott Research Update

The Crop Opportunities and Scott Research Update was held March 2, 2010 at the Gold Ridge Centre. Attendance was approximately 250 producers and agronomists from northwest Saskatchewan. The event featured seven speakers that spoke on a wide range of topics. Topics included plant diseases, lentil production, herbicide rotations, ADOPT projects, calculating land rental costs, and market outlook for pulses, oilseeds, and cereals.

ADOPT Projects

Agricultural Demonstration of Practices and Technologies (ADOPT) is a program funded by the Saskatchewan Ministry of Agriculture. The goal of the program is to demonstrate new research findings around the province to show the effectiveness of the new research finding. WARC has funding for several of these projects. They included control of dandelion, comparing spray coverage by high clearance and air plane fungicide application, malt barley seeding rates, intercropping, and camelina seeding dates and depths.

Dandelion Control – Changes in Control Methods

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Dandelion is a significant pest in Saskatchewan as it is a perennial with a large tap root and it is also a very prolific seed producers in that one plant can produce up to 20,000 seeds. The amount of dandelion present in a particular year is dependent on environmental conditions and control levels from previous years. An ADOPT (Agricultural Demonstration of Practices and Technologies) project was started in the fall of 2009 to demonstrate the changes that have taken place in the control methods for dandelion. The project occurred at Scott, Saskatchewan in 2010. The project was grown in a RCBD with two blocks. Table 1 shows the 14 different dandelion control treatments used. They included an untreated check, tillage, different chemical options, and biological control. Most of the treatments were applied both fall and spring to show the differences in control based on application timing. The fall treatment was applied October 22, 2009 while the spring treatment was applied May 11, 2010.

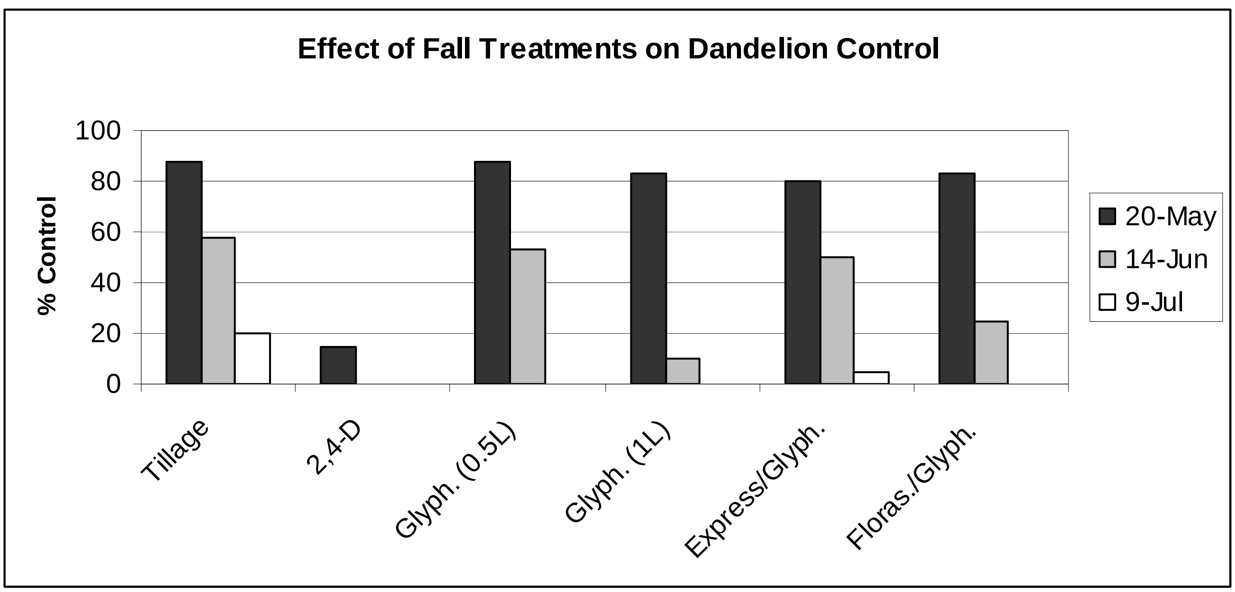
Table 1 Rate, timing, and treatment applied to demonstrate dandelion control at Scott, Saskatchewan.

Number	History	Treatment	Timing	Application Rate (g ai ha^{-1})
1	control	N/A	N/A	N/A
2	Oldest method	Tillage	Fall	single pass rototill
3	Oldest method	Tillage	Spring	single pass rototill
4	1st broadleaf herbicide	2,4-D Ester	Fall	900
5	1st broadleaf herbicide	2,4-D Ester	Spring	900
6	Most popular	Glyphosate	Fall	450
7	Most popular	Glyphosate	Spring	450
8	Most popular	Glyphosate	Fall	900
9	Most popular	Glyphosate	Spring	900
10	Newer	Express	Fall	7.4
		Glyphosate		450
11	Newer	Express	Spring	7.4
		Glyphosate		450
12	Newer	Florasulam	Fall	5
		Glyphosate		450
13	Newest	Aim	Spring	8.8
		Glyphosate		450
14	Future	Biological Control	Summer	2 apps of 60 g m^{-2}

The results from this demonstration were gathered from one site over one year and are presented in Figure 1. Tillage produced good initial control of dandelion but decreased over time as new dandelion and other seedlings emerged with time. The spring tillage operation gave longer control than the fall tillage but by July control was greatly reduced. With fall herbicide treatments all gave good initial control except for 2,4-D. Fall applications with 2,4-D usually produce acceptable control of dandelion however in this case control was reduced compared to other treatments. Glyphosate produced acceptable control of dandelion at both 450 and 900 g ai ha^{-1}. All fall treatments showed reduced control by second rating date in June.

Spring treatments were applied on May 11th and rated on May 20th. The reduced initial control is due to the slow action of some of the herbicides used and the cool spring conditions. However, CleanStart did show good much quicker burndown of the dandelion with control obtained by the 9 day rating date. However, with CleanStart the control was lost by July as the dandelions regrew as shown by the July rating date. With glyphosate there was better control with the higher rate and control was still obtained in July with the spring applications. Express plus glyphosate gave similar control to the high rate of glyphosate in the spring.

With the biological treatment control was slower and was not equal to herbicide options. There were bleaching symptoms on the larger dandelion plants but no control. However, the biological product did control the newly emerging dandelion seedlings as the season progressed which is promising.



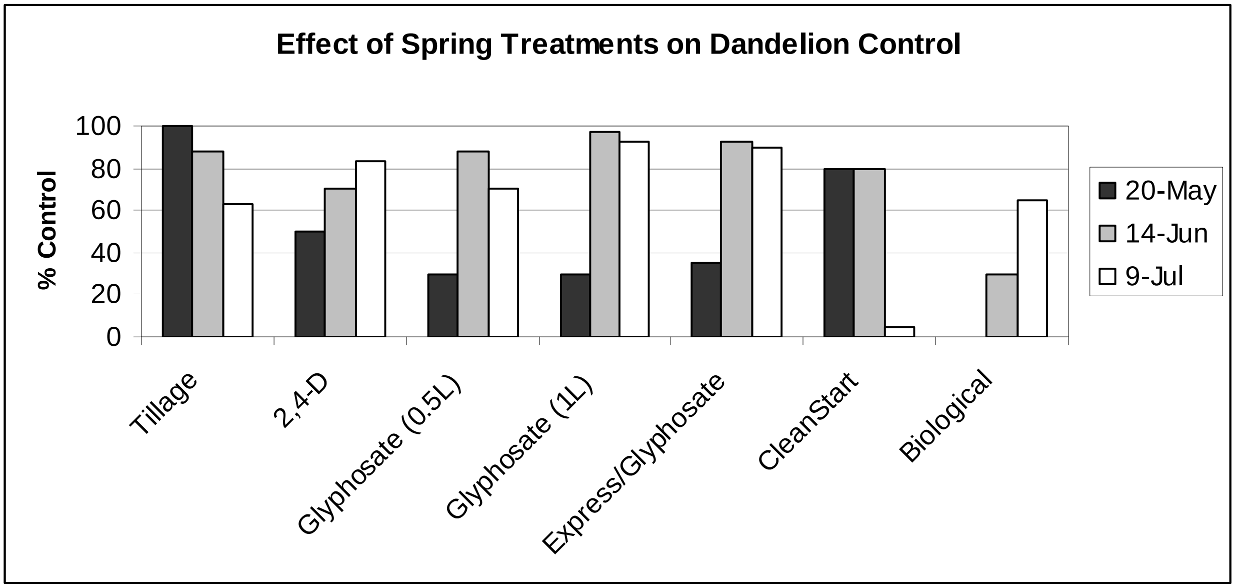


Figure 1 Effect of treatments on dandelion control for spring and fall application.

Due to cool and wet weather conditions in the fall of 2009 and spring of 2010 some of the treatments did not display the level of expected control. The fall applications were applied later than intended due to wet weather and therefore the dandelions were quite large and may have already started shutting down for winter. In general, fall applications do provide good dandelion control as long as the plants are still active.

Understanding the weaknesses of dandelion also helps to improve the control. Dandelion requires light for germination, and produces seedlings that are poor competitors. Ensuring good control prior to crop emergence and then quick crop establishment is important to provide competition to the young dandelion seedlings. Controlling the larger plants prior to seeding also allows more options in crop as the young seedlings are easier to control. As dandelions grow the growing point moves from the soil surface to 2-3cm below the soil surface and they become more anchored in the soil. Obtaining good control of the roots is important to controlling the larger dandelions.

In summary, advancements in control of dandelion have provided producers with more control options. Tillage was the only option available until the advent of herbicides and can still be very effective if done deep enough to control the roots. The first herbicide developed that provided control of dandelion was 2,4-D. Advancements in herbicide technology brought glyphosate to the market which gave producers a product that moves to the roots and kills the larger plants. More recently, tank mixes of glyphosate with more residual products can provide longer season control of germinating seedlings. Cleanstart is one of the newest herbicides that target very fast dry down for quicker preseed burnoffs. As technology advances the future of biological controls control methods may be promising.

Effect of Water Volumes on Spray Coverage with Aerial and Ground Applications

S. Phelps[1], T. Wolf[2], B. Caldwell[2], R. Turpin[3] and B. Davey[4]

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Introduction

Water volume is one of the best management practises (bmp) with pesticide application. Higher water volumes provide better penetration and should be used for fungicides where the crop is more advanced and canopies are more dense. Higher water volumes are recommended with fungicides applications as the pesticide needs to move into a denser canopy and the pathogen is often found within the lower portion of the canopy.

With typical pesticide applications the top of the canopy receives more spray coverage than in the middle of the canopy and the bottom of the canopy receives even less. The spray distribution decreases linearly from the top of the canopy to the middle and bottom of the canopy as crop density and height increase (Zhu et al, 2002). One of the factors that impacts the penetration of fungicide into a crop canopy is water volume (Derksen, et al, 2001).

Spray volume has been shown to be important especially under high disease pressure and dense canopies. Armstong-Cho et al (2007) showed that the disease severity of aschochyta blight in chickpeas was reduced as water volumes were increased from 100 to 300 l/ha using ground applications. They also showed that higher carrier volumes (>100 l/ha) was more beneficial for canopy penetration of the fern versus unifoliate leaved cultivars. Under low disease pressure spray volume did not have an impact.

Fungicide application is important for disease management strategy for many prairie crops and there are two application methods available. Ground sprayers can utilize higher water volumes to allow good coverage but leave tracks in the field that can lower yield and spread disease. Aerial applications can cover more area than ground sprayers in the same timeframe without damaging the crop. The drawback to aerial application is the limited water that can be carrier which limits the spray volumes that can be used. With aerial application the common volume for herbicide and fungicide applications is 2 and 4 gpa, respectively. For high clearance applications water volumes vary by the applicator but typically 8 gpa is commonly recommended for herbicide applications and 12 gpa is commonly recommended for fungicides.

In 2003 and 2004 Dr. Tom Wolf and colleagues compared the effectiveness of ground and aerial application of fungicides on controlling ascochyta blight in chickpeas. They found that fungicide applications increased chickpea yield to 33 bu/acre compared to the untreated control which averaged 13 bu/acre. There was no significant difference between the aerial application and ground applications. Their results showed that even though ground application had higher spray volume of 100 l/ha there was no difference in yield compared to the aerial application using lower spray volumes of 37 l/ha.

The basic relationship between water volume, droplet size, and coverage is the same whether spray is released from an aircraft or a ground sprayer. At any given droplet size, less water results in fewer droplet per unit area or less coverage, and more water volume increases coverage (Tom Wolf, 2006). This project will demonstrate the effect of water volume on spray coverage throughout the canopy with aerial and ground applications.

Materials and Methods
The aircraft (Piper Pawnee model PA25) and high clearance sprayer (John Deere 4720) was owned and operated by the cooperator (Robert Turpin, Battleford, SK).

Figure 1. John Deere 4720 high clearance sprayer and Piper Pawnee air plane model PA25.

Table 1. Treatments used with targeted and actual water volumes applied.

Method	Nozzle	Travel Speed (mph)	Pressure (psi)	Targeted (US gpa)	Actual (US gpa)	Targeted (L/ha)	Actual (L/ha)
Aerial	2510			4.0	4.3	37	40
Aerial	2520			2.0	2.2	19	21
Aerial	2506			1.2	1.4	11	13
Ground	ABJ 8005	17	70	12.0	12.0	112	112
Ground	ABJ 8004	11	42	12.0	10.9	112	102
Ground	ABJ 8004	17	59	8.5	7.0	79	65
Ground	ABJ 8002	17	40	6.9	3.1	65	29
Ground	Twin ABJ 8001	16	60	4.4	4.9	41	46

In both the airplane and the high clearance ground sprayer a mixture of water, 0.1% AgSurf and 2 ml/L Rhodamine WT dye was used to determine spray distribution through the canopy. Late flowering, well podded pea crop with heavy canopy (Figure 2) was used for applications on morning of July 27, 2010. Wind speed ranged from 4 to 12 km/hr with some gusting.

The Rhodamine WT dye allowed quantification of coverage in different canopy locations. Three methods were used to quantify the results: Petri dishes at top of canopy to calibrate amount reaching canopy; straws inserted at the top, middle and bottom of canopy to provide measurement within canopy; and water sensitive paper to see distribution at the top of the canopy. Deposits were expressed as L/ha of spray mixture based on the area of the collecting surface. Deposits on the water-sensitive paper were quantified by image analysis. The estimated water volume deposited, as well as the percent card coverage by droplets, was calculated.

Figure 2. Heavy canopy of peas at Battleford on July 27, 2010.

Figure 3. Petri dish and straw in the top of the canopy.

Results

Although the sprayers were calibrated prior to application, the sprayer malfunctioned for 65 L/ha ground application and the target amount could not be applied. For the remaining treatments, the actual amount of spray deposited on the Petri plates differed from the target amount by an average of 3%, and as much as 18%. Petri dish and straw samples used to measure spray reaching top of canopy were highly correlated.

The treatments were not replicated so data reflects information from a single pass and should be used with caution. There was no significant difference between the treatments but general trends were observed.

As water volumes increased the amount of spray reaching the canopy (top) and within the canopy (mid and bottom) was increased in both the air and ground sprayer applications, as expected (Figure 4 and 5). However, the rate of increase was highest in the top of the canopy followed by middle of the canopy and lowest with the bottom of the canopy. This means that as water volumes increase the amount reaching the top of the canopy increases more than that reaching the bottom of the canopy and this was consistent with both methods of application. Increasing water volumes was therefore still is an effective way to increase the penetration into the canopy.

Comparing the distribution within the canopy, the aerial application had 30 to 50% of the spray reach the middle section of the canopy and 11 to 15% reach the bottom of the canopy. The highest water volume with the highest spray pressure in the high clearance spray gave similar distribution of spray as the air plane.

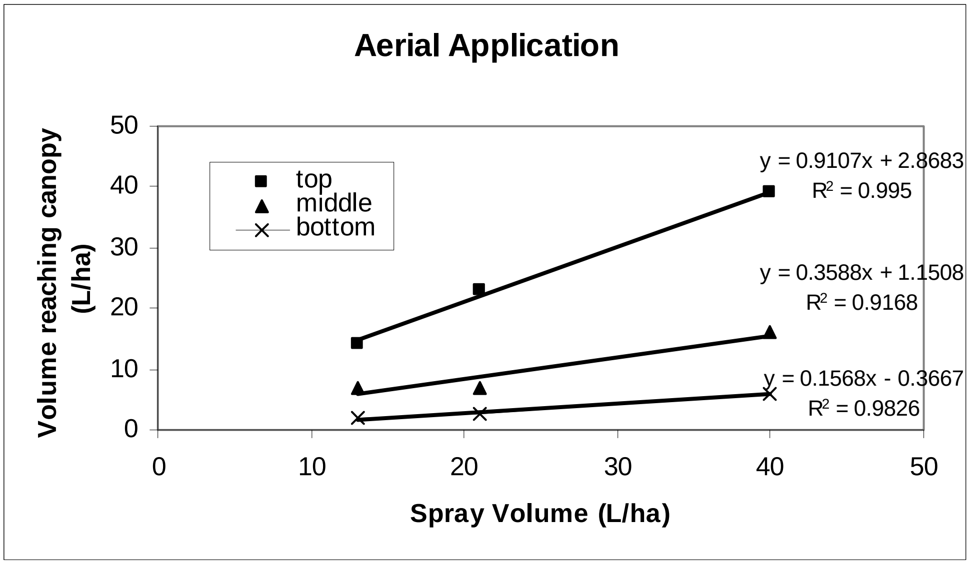

Figure 4 Spray distribution for the different water volumes using aerial application.

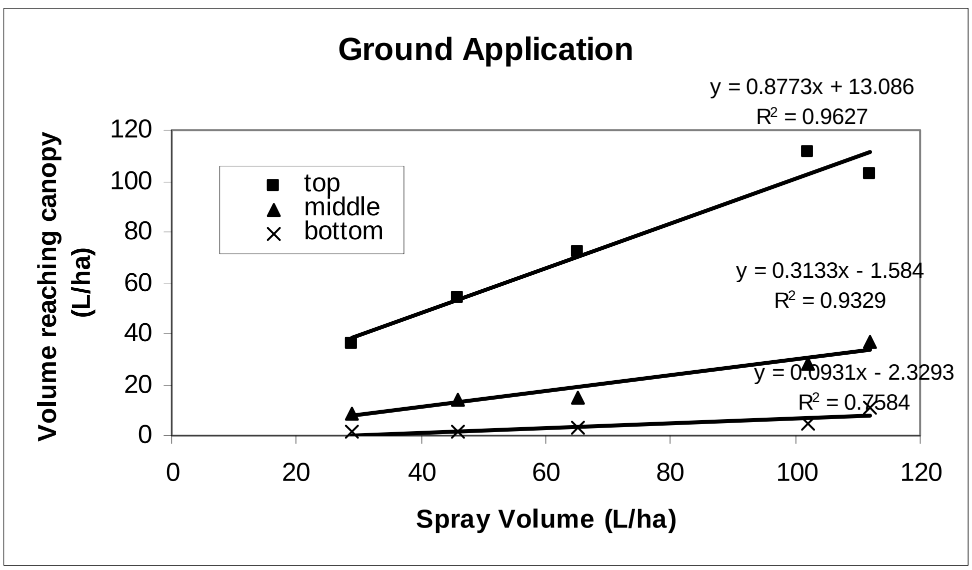

Figure 4 Spray distribution for the different water volumes using ground application.

Single vs Double nozzles – due to sprayer malfunction, the single nozzle was applied at a lower water volume than intended. As a result, no direct comparisons are possible. However, based on a percent deposition within the lower canopy, both of these application systems appear similar.

Speed – it is recommended for dense canopies (such as when fungicide application occurs) to reduce ground speed. The slower speed in this demo utilized a lower spray pressure, which complicates comparisons. However, there appeared to be no benefit to the slower travel speed in this demonstration. The faster travel speed had higher overall deposits within the canopy, although differences were not statistically significant.

Conclusion

Demonstration trials were not replicated it is therefore difficult to draw statistically sound conclusions. However, this demonstration showed the trend that as water volume increased the amount distributed into the canopy also increased for both ground and aerial applications. When percent of spray reaching the top of the canopy was compared the ground and aerial applications at the recommended fungicides rates of 112 and 40 L/ha, respectively, were comparable. In conclusion this demonstration showed the importance of water volume on spray distribution and that both aerial and ground applications at recommended water volumes are comparable.

Acknowledgements

A big thank you to all those involved in the project: Robert and Joanne Turpin who were amazing cooperators for this project; Dr. Tom Wolf and Brian Caldwell for all this assistance and advice in carrying out the project; summer students and others that helped during the day.

Robert and Joanne Turpin, Battleford, SK

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Malt Barley: Effect of Seeding Rates

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There are significant financial rewards for producing malt barley. However, certain agronomic practices can affect yield, plumpness, chit, germination and protein levels. Dr. John O'Donovan's research projects have indicated an improvement in malt barley characteristics with higher than traditional seeding rates. Better uniformity, higher extract amounts, lower protein and beta glucan levels have been identified as benefits of higher seeding rates up to 2.5 bushels per acre. The ADOPT project was established in NW Saskatchewan on producers fields using strip plots of seeding rates across the field. Two seeding rates were targeted and include 1.5 bu/acre (175 to 200 seeds m^{-2}) and 2 to 2.5 bu/acre (250-275 200 seeds m^{-2}).

Fields were seeded in May at normal seeding times for barley in their area. Malt barley varieties were seeded according to the recommended seeding rates calculated based on actual seed size and are show in Table 1. Strips were marked with flags after seeding and emergence counts were completed prior to the tiller stage. Harvest involved either swathing or straight cutting. Where swathed, the swath was made with the full width of the swather after the headlands had been cut. For straight cutting the full header width was taken. Cut length was measured using GPS or a metering wheel and grain yield was measured using weigh wagon, grain cart with scale, or yield monitor. Samples were then sent to Prairie Malt Ltd. at Biggar, SK where malt quality was analyzed.

Table 1. Details of the 2010 Malt Barley ADOPT Project: location, cooperator, seeding rates, harvest method, harvest date, and sample quality.

		Targeted Rates lbs/acre (bu/acre)			Date	Quality of
Co-operator	**Location**	**Low**	**High**	**Harvest**	**harvested**	**Sample**
Blaine Davey	Wilkie	70 (1.5) 175 seeds/m^2	106 (2.2) 262 seeds/m^2	Straight cut	1-Oct	malt
Terrill Hill	Medstead	72 (1.5) 162 seeds/m^2	110 (2.3) 247 seeds/m^2	swathed	29-Sep	feed
Jim Metherall	Lashburn	72 (1.5)	112 (2.3)	swathed	6-Oct	feed
Dan Ornawka	Battleford	92 (2)	120 (2.5)	Straight cut	Oct 3	malt

Seeding rates were grouped together based on the actual seeding rate and the plant counts taken after emergence (Table 2). Seeding rates of 1.5 to 2 bu/acre were considered the low rates and 2.2 to 2.5 were considered the high rates.

Table 2 Seeding rates and plant counts used to categorize the seeding rates into high and low.

	Plant Counts (# per metre^2)		Category
Seeding Rate (bu/acre)	Min	Max	Seed rate
1.5	108	156	low
2	144	144	low
2.2	208	208	high
2.3	180	180	high
2.5	184	184	high

There were two sites that were lost during the course of the year. A site at Shell Lake was late seeded and when it came to harvest the marking flag was unable to be found so no data is shown from that site. At Medstead the plots were harvested and visual differences were noted. The higher seeding rate was more uniform and matured quicker than the lower seeding rate.

However, there were problems with volunteer wheat and the high seeding rate also had more wheat present so the results from that site are not included in this report.

Of the three remaining sites, higher yields were produced with the higher seeding rates 66% (2 out of 3) of the time (Figure 1). The site at Battleford had seeding rates that were a bit higher than the other locations with the low seeding rate of 2 and high of 2.5 bu/acre.

In terms of protein the differences were not as prominent (Figure 2). The largest difference was 0.3% difference between the high and low seeding rate at Lashburn. Other locations were within 0.1% of each other. With chit there was only a difference at Lashburn where the higher seeding rate had a much greater percent chatted (Figure 2). This could possibly be explained by the higher seeding rate being more uniform and maturing earlier, allowing more time for chitting to occur. Germination level seemed to be related to chitting where higher chit had lower germination.

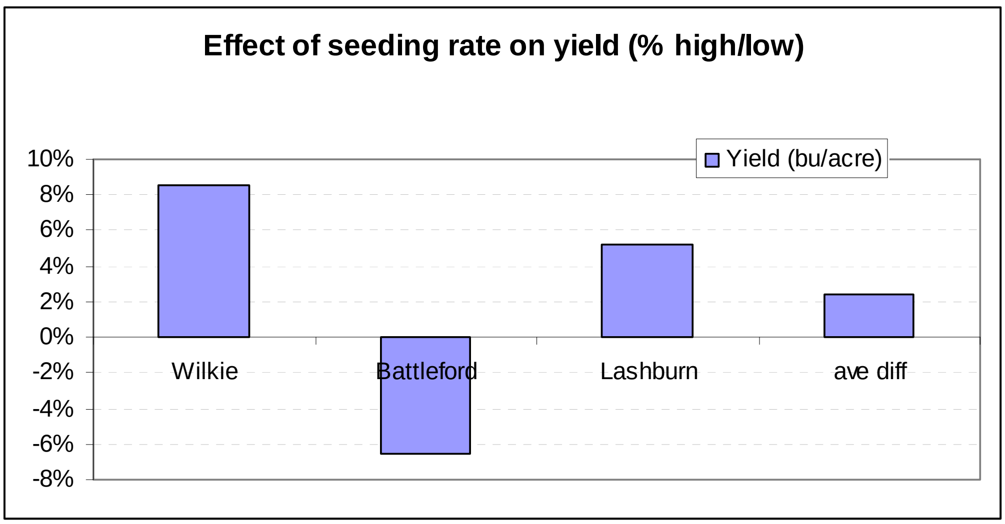

Figure 1 Effect of seeding rate on barley yield at Wilkie, Battleford, and Lashburn in2010.

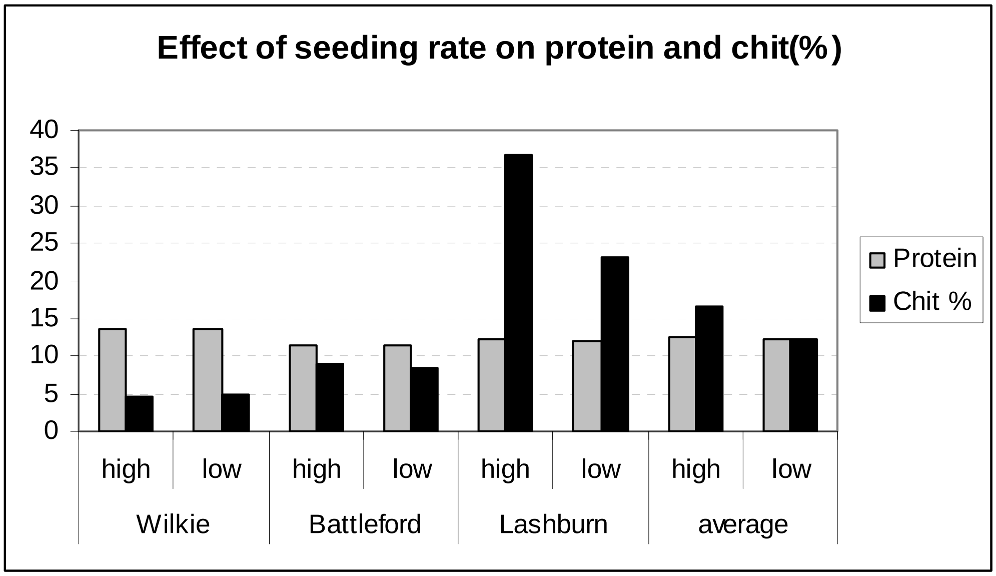

Figure 2 Effect of seeding rate on protein and chit in barley from Wilkie, Battleford, and Lashburn in 2010.

Conclusion

There is an indication that higher seeding rates up to 2.5 bushels per acre or plant counts up to 208 plants m^{-2} can produce higher yields. There was little effect of seeding rates on the quality of the grain samples but the environment played a large role. Samples that remained in the field longer at harvest maturity had higher chit which reduced their germination and overall malt quality.

Acknowledgements

Thank you to those co-operators that participated in the trial and to Erin Tollefson with Cavalier Agrow at Medstead for her assistance with the project at Medstead.

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Optimum Camelina Seeding Dates

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Abstract

Camelina is a new crop to Saskatchewan with little known about its crop husbandry. Seeding date is one of the agronomic factors that effects crop establishment and yield potential of

camelina. As camelina is a small seeded crop with poor weed competition early in its lifecycle, seeding date plays a large role in producing a competitive crop early in the season. Fall seeding and very early spring seeding may produce a healthy competitive crop that may increase yields and enhance maturity. In 2009 camelina was seeded at three locations (Scott, Indian Head, and Swift Current) on five dates in the fall and then three dates in the spring of 2010. Fall seeding dates ranged weekly from Oct 1 to November 15. Early fall dates did germinate but were not early enough to produce rosette stage. Late fall seeding was more consistent with spring seeding dates in terms of plant counts and yield. More data is needed to really demonstrate the suitability of camelina to different seeding date options in different areas of the province. Project is continuing for one more year.

Objective

This project evaluated fall and spring seeding dates for their effect on camelina overwinter survival, establishment, maturity and yield.

Rationale:

Camelina is a new crop to Saskatchewan with little known about its crop husbandry. Seeding date is one of the agronomic factors that effects crop establishment and yield potential of camelina. As camelina is a small seeded crop with poor weed competition early in its lifecycle, seeding date plays a large role in producing a competitive crop early in the season. Fall seeding and very early spring seeding may produce a healthy competitive crop.

Materials and Methods:

The project began in fall of 2009 at three locations (Scott, Indian Head and Swift Current). It included eight seeding dates in large plot demos: five seeding dates in the fall, and three seeding dates in the spring. Measurements taken include germination, emergence counts, flowering and maturity dates, height, grain yield, and kernel weight. Data from an initial project started in 2008 at Indian Head is also included.

Seeding rate targeted for camelina was 400 seeds per metre square (5 lbs/acre). Demonstration was replicated in completely randomized design to ensure results were consistent between the treatments.

Results:

With the bad weather in October there were some limitations to fall seeding dates. Seeding dates for the demonstration projects at each location and data collected are in Tables 1 to 4.

At Scott germination and plant establishment occurred in the fall of 2009 for the first fall seeding date. For the remaining seeding dates there was no plant emergence and the ground froze after November 5 preventing germination counts to be completed.

At Indian head in both 2008 and 2009 all seeds planted in the fall germinated. In 2008, the October 2 seeded camelina fully emerged and partial emergence was observed for the October 8 seeding date. In 2009,just the October 14 seeding date emerged. For Indian Head in 2009 wet conditions delayed the start of the experiment until Oct 14 instead of Oct 1. Therefore on November 2 an extra treatment was added which used a Valmar® applicator instead of a seed drill to distribute the seed onto the plot.

At Indian Head the project harvested in 2009 (Table1) showed the fall seeding dates produced lower yields and lower plant populations than the spring seeding dates. The highest yields were obtained with the April and early May seeding dates and these dates also had the highest plant densities.

Table 1 The effect of seeding date on camelina at Indian Head (2008-2009)

	Plant density	Grain Yield	
Treatment	Plant/m2	kg/ha	bu/ac
Oct 02/08	77.1	1536.3	27.4
Oct 08/08	92.7	1504.9	26.8
Oct 15/08	36.3	1401.1	24.9
Oct 22/08	51.1	1622.8	28.9
Oct 29/08	63.4	1638.3	29.2
Apr 29/09	142.5	1939.0	34.5
May 06/09	193.8	1935.6	34.5
May 13/09	188.9	1580.0	28.1
LSD (P=.05)	*58.6*	*165.8*	
CV	*38*	*6.5*	

With the 2010 harvested plots at Indian Head (Table 2) there were reduced yields compared to 2009 which is likely due to wet conditions experienced during the 2010 growing season. The 2010 yield data demonstrated that there was no yield advantage of spring seeding over fall seeding. There was however a difference in the fall seeding dates in terms of yield as the latest fall seeding of Nov 9 did produce higher yields than the earlier fall seeding dates of Oct 14 and 21. Although there were yield differences with the fall seeding dates there was no difference in plant density.

With the spring seeded plots, plant counts improved as seeding was delayed with the best emergence occurring with the June 2 seeding date. Flowering date was also affected by seeding date as the earliest seeding date in spring of April 16 flowered 24 days sooner than the latest seeding date on June 2.

Table 2 The effect of seeding date on camelina at Indian Head(2009- 2010)

	Plant Density	10% first bloom	Length of Flowering	Height	Grain Yield	
Treatment	plant/m2	Julian date	Days	cm	kg/ha	bu/ac
Oct14	130.8 c	158.0 e	26.0 a	59.0 a	672.3 b	12.0 b
Oct 21	93.5 c	159.0 e	25.0 a	57.5 a	760.5 b	13.5 b
Nov 2	86.9 c	165.0 d	20.0 b	57.0 a	868.8 ab	15.5 ab

Nov 9	109.9	c	165.0	d	19.5	b	69.5	a	1085.2	a	19.3	a
Nov 2	83.7	c	166.3	d	18.5	b	63.0	a	700.5	b	12.5	b
velmar												
April 16th	188.2	c	169.5	c	18.0	b	64.5	a	731.5	b	13.0	b
May 12th	310.0	b	183.1	b	25.5	a	55.5	a	894.1	ab	15.9	ab
June 2nd	408.1	a	193.5	a	26.0	a	55.0	a	660.5	b	11.8	b
LSD (P=.05)	*90.1*		*2.0*		*3.0*				*213.3*		*3.8*	
CV	*34.74*		*0.77*		*5.73*		*12.88*		*11.32*		*11.32*	

At Scott in 2010 (Table 3) the yields were impacted by seeding dates in the fall and in the spring. The Oct 2 seeded treatment had the best emergence in the fall but lowest plant density in the spring and lowest yields suggesting loss of plants overwinter. Fall seeded treatments increased in yield and plant density as seeding was delayed. The latest fall seeded plots did not emerge in the fall and produced the highest plant density and the highest yields.

Spring seeding was also impacted be delaying seeding. The last seeding date of June 3 had reduced plant counts and grain yield.

Height was also affected by seeding date with the shortest plants being the fall seeded, and increasing in height to the dormant seeded and again increasing in height to the spring seeded. Seeding date did have an effect on leaf number or plant staging as the fall seeded plots were much further advanced than the spring seeded plants (leaf number on June 5). Maturity data is not presented but the fall seeding dates did mature sooner than the spring seeded plots and as seeding date was delayed in the spring so was maturity.

Table 3. The effect of seeding date on camelina at Scott in 2009-2010.

Seeding date	Grain yield kg/ha	Plant density plant/m2	Leaf number (June 5)	Flowering Days	Height cm
Oct 02	292.5	59.5	9.0	26.5	65.5
Oct 9	437.5	50.5	8.0	26.3	65.6
Oct 20	734.0	64.8	7.4	28.5	74.4
Oct 27	1106.5	124.0	7.7	28.3	79.4
Nov 5	1112.5	162.5	7.1	25.8	72.9
April 21	1220.8	163.0	2.8	25.0	81.4
May 12	1315.3	230.0	1.0	25.0	83.9
June 3	722.8	138.3	0.0	25.0	86.5
LSD	*248.0*	*59.0*	*1.1*	*2.3*	*11.1*

At Swift Current (Table 4) plant density was dramatically affected by seeding date with the spring seeded plots showing much higher plant populations. Yields were also affected by seeding date and the highest yields were obtained with the April 6th seeding date. Even though there were lower plant densities in the fall the yields of the later fall seeding dates of Nov 7 and 17th were comparable to the spring seeding dates of May 12 and June 1.

Table 4. The effect of seeding date on camelina at Swift Current in 2009-2010

Seeding date	Grain yield		Plant density
	kg/ha	bu/ac	plant/m2
Oct 26	797.9	14.2	21.1
Nov 3	999.6	17.8	47.8
Nov 7	1278.1	22.8	52.5
Nov 17	1279.2	22.8	89.0
Nov 23	1073.5	19.1	35.5
April 6	1755.0	31.3	162.0
May 12	1297.1	23.1	224.8
June 1	1229.1	21.9	179.0
LSD	*341*	*6.1*	*71*

The project was supposed to have involved fall seeding dates of camelina on producers fields but with the extended harvest in 2009 there were no producers interested in doing this part of the project. This portion will be attempted again in fall of 2010.

Conclusion

Fall seeding camelina does show some promise in terms of early maturity but yield response was variable across the province. Delayed seeding in the fall appeared to be more consistent in terms of higher plant count and better yields compared to earlier fall seeding. Early and mid spring seeding was more consistent at producing higher plant counts and higher yields than fall seeding dates. As seeding was delayed in the spring to June the plant counts were good but yields dropped off likely due to delayed maturity. Another year of data at more locations is needed to really demonstrate the suitability of camelina to different seeding date.

Acknowledgement

We would like to express our gratitude to the Ministry of Agriculture for the funding support and inkind support with this project. To recognize the ADOPT program and the Ministry we had signage at the sites.

Regional Testing of Cereal, Oilseed and Pulse Cultivars 2011

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Cultivars are tested regionally to determine their adaptation to the wide range of soil and climatic conditions in Saskatchewan. These tests are conducted at approximately 12 locations each year including two by Scott Research Farm staff (Scott and Glaslyn) and one at the Melfort Research Farm. Results form the basis of cultivar recommendations – yield data can help producers assess the performance of varieties in their area. However, data from a single location can be limited, particularly for new varieties. More comprehensive information is contained in the Saskatchewan Ministry of Agriculture publication, *Varieties of Grain Crops 2011*. Seed quantities for new varieties listed herein may be limited for 2011.

Table 1 Average Yield of Crop Species on Fallow expressed as a % of hard red spring wheat (AC Barrie) at Scott, Glaslyn and Melfort. For most crops, data presented is based on yields averaged over the past 15-20 years. Only 3 years data are averaged at Glaslyn.

	Cultivar	**Scott**		**Glaslyn**		**Melfort**	
		Yield as % of bread wheat (kg/ha)					
Bread Wheat	Katepwa, AC Barrie	100 (2990)		100 (4040)		100 (3540)	
Utility Wheat	AC Karma, AC Crystal, AC Andrew	119		128	*	133	
Extra Strong Wheat	Glenlea, AC Glenavon, Burnside	105		106	*	100	
Durum Wheat	Kyle, AC Avonlea	103		---		111	
Triticale	Frank, AC Certa	125		---		137	
Barley	Harrington, AC Metcalfe	140		136	*	122	
Oat	Calibre CDC Dancer	144		130	*	130	
Canola	2663, 5020	75		---		88	
Flax	Vimy, CDC Bethune	55		53	*	54	
Mustard (Oriental)	Cutlass	77		---		----	
Mustard (Brown)	Commercial Brown	67		---		---	
Mustard (Yellow)	Ochre	51		---		---	
Field Pea	Grande, Alfetta Cutlass	106		101	*	93	
Lentil	CDC Milestone	72		---		52	

* Less than 4 years of data

Table 2. Yield of Spring Wheat Cultivars at Scott, Glaslyn and Melfort 2010

	2010 Yield (kg/ha)			Long Term Average Yield (% of AC Barrie)		
Cultivar	**Scott**	**Glaslyn**	**Melfort**	**Scott**	**Glaslyn**	**Melfort**
Bread Wheat						
AC Barrie	4220	5390	4190	100	100	100
Carberry	4700	5860	3820	111 *	109 *	91 *
Fieldstar VB	4550	5750	5080	102	107	103
Glenn	4220	5830	4200	100 *	108 *	97 *
Goodeve VB	4510	5760	4880	101	111	105
Muchmore	4540	5750	3740	108 *	107 *	91 *
Shaw	4470	5860	5530	106 *	109 *	116 *
Settler	4940	6070	4310	113 *	113 *	106
Unity VB	4620	6120	5220	109	113	113
Waskada	4590	5540	4180	107	109	104
Utmost	4360	5450	5000	119 *	105 *	119 *
Stanley	4440	5580	4540	108	111 *	108 *
Kernan	4750	5210	4490	107 *	97 *	107 *
Thrive			4580			109 *
Utility Wheat						
AC Andrew	6440	6150	6090	133	123	133
Burnside	5550	5410	4690	109 *	103 *	101
Glencross VB	5330	5600	5230	101	111	110
Minnedosa	5140	5730	5080	101 *	112 *	107 *
Sadash	6970	6910	6080	137 *	135 *	126 *
CDN Bison	6180	5890	5020	125 *	112 *	109 *
5702PR	5940	6010	5260	121	119	114

* Less than 3

Table 3 Yield of Durum Cultivars at Scott and Melfort 2010

	2010 Yield (kg/ha)		Long Term Average Yield (% of Strongfield)			
Cultivar	Scott	Melfort	Scott		Melfort	
Strongfield	4270	4590	100		100	
DT 801	---	4400	97		96	*
Brigade	4420	5120	101	*	115	
Enterprise	4350	4400	102	*	99	*
Eurostar	4170	4590	97	*	99	
CDC Verona	4160	5050	99	*	101	

* Less than 3 years of data

Table 4 Yield of Oat Cultivars at Scott, Glaslyn and Melfort 2010

	2010 Yield (kg/ha)			Long Term Average Yield (% of CDC Dancer)					
Cultivar	Scott	Glaslyn	Melfort	Scott		Glaslyn		Melfort	
CDC Dancer	4650	6100	6480	100		100		100	
Souris	4450	5780	7650	107		102		118	*
CDC Seabiscuit	4120	5460	7100	97		95		110	*
Gloria	4620	5540	5370	108		101		83	*
CDC Minstrel	4300	6300	6820	102		101		104	
Bradley	3880	5670	7590	88		85		109	*
Stainless	3830	5530	6670	98	*	85	*	101	
Summit	4340	5960	7590	93	*	98	*	111	*
Triactor	4830	6630	8700	112		111		130	

* Less than 3 years of data

Table 5 Yield of Barley Cultivars at Scott, Glaslyn and Melfort 2010

	2010 Yield (kg/ha)			Long Term Average Yield (% of AC Metcalfe)					
Cultivar	**Scott**	**Glaslyn**	**Melfort**	**Scott**		**Glaslyn**		**Melfort**	
TWO ROW									
AC Metcalfe	4760	7030	5030	100		100		100	
Bentley	5120	8100	6200	110	*	111	*	115	
Busby	5050	7470	5640	106	*	106		108	*
Champion	6040	8390	6730	130		115		120	
CDC Austenson	5770	8950	6720	116	*	118	*	121	
CDC Carter	4740	6760	5650	100	*	96	*	108	*
CDC ExPlus	5810	8050	6220	118		113		109	*
Cerveza	4720	7610	6210	99		99		123	*
CDC Landis	5300	8000	6790	108	*	111	*	116	
CDC Meredith	5960	8190	5850	122	*	113	*	110	
CDC Mindon	4530	7660	6090	106		102		104	
CDC Reserve	5340	7770	6630	111	*	108	*	115	
Major	5730	8200	6670	120	*	117	*	124	*
Gadsby	5240	7810	5880	109	*	107	*	117	*
Merit 57	5530	7990	6140	115	*	109	*	110	
Norman	4920	7530	6070	102	*	103	*	108	
SIX ROW									
Celebration	4540	7910	4460	107		106		87	
CDC Kamsack	4380	7610	6350	98	*	105	*	101	
*CDC Mayfair	4460	7950	6050	103	*	106	*	111	
*Chigwell	5110	8600	6340	110	*	113	*	119	
*Stellar	---	---	6380	120	*	113	*	127	*

* Less than 3 years of data

Table 6 Yield of Flax Cultivars at Scott, Glaslyn and Melfort 2010

Cultivar	2010 Yield (kg/ha)			Long Term Average Yield (% of CDC Bethune)			
	Scott	Glaslyn	Melfort	Scott	Glaslyn	Melfort	
CDC Bethune	2860	2450	2320	100	100	100	
CDC Sanctuary	2360	2590	2000	90	92	86	
FP2214	2520	2690	2190	93	96	95	*
CDC Sorrel	2700	2430	------	97	97	93	*

* Less than 3 years of data

Table 7 Yield of Lentil Cultivars at Scott and Melfort 2010

Cultivar	2010 Yield (kg/ha) Scott	2010 Yield (kg/ha) Melfort	Long Term Average Yield (% of CDC Milestone) Scott		Long Term Average Yield (% of CDC Milestone) Melfort	
Small Green						
CDC Milestone	3230	1229	100		100	
CDC Imvincible	3400	1880	95	*	125	
Eston	2930	750	87		96	
Medium Green						
CDC Impress CL	3070	1230	100		96	
CDC Imigreen CL	2460	1080	68	*	92	
CDC Richlea	2980	480	97		94	
QG		870			71	*
Large Green						
Laird	2880	990	83		78	
CDC Greenland	3160	1260	90		98	
CDC Impower CL	3150	790	98	*	69	*
CDC Improve CL	2620	1110	86		95	
CDC Plato	3390	1150	99		100	
Extra Small Red						
CDC Imperial CL	2810	1200	85		90	
CDC Redbow	3250	2020	105	*	156	
CDC Robin	2980	1170	87		99	
CDC Rosebud	3170	2250	98	*	165	
CDC Rosetown	3170	1010	105		122	
Small Red						
CDC Imax CL	2840	910	103	*	80	
CDC Impact CL	2080	950	81		92	
CDC Maxim CL	3060	1850	103		136	
CDC Redberry	3120	1740	103		119	
Redcoat	1060	1600	107	*	95	
Large Red						
CDC KR-1	3590	1580	111	*	113	

* Less than 3 years of data

Table 8 Yield of Pea Cultivars at Scott, Glaslyn and Melfort 2010

	2010 Yield (kg/ha)			Long Term Average Yield (% of Cutlass)		
Cultivar	**Scott**	**Glaslyn**	**Melfort**	**Scott**	**Glaslyn**	**Melfort**
Yellow						
Cutlass	2370	5340	4430	100	100 *	100
Agassiz	2670	5950	4860	108 *	102 *	105
CDC Bronco	1730	4500	4690	84	84 *	93
CDC Golden	2570	5000	4190	109 *	94 *	102
CDC Meadow	2190	5600	4450	96 *	99 *	110
CDC Prosper	2160	5470	3740	91 *	95	99
CDC Treasure	2370	5570	4810	100 *	101	105
Eclipse	1770	2850	4030	90	76	95
Polstead	2840	5460	3570	108 *	96	103
Sorento	1660	3680	4150	70 *	82 *	89
Thunderbird	2010	4980	4690	87 *	94	99
Hornet			4510			102 *
Argus			5470			123 *
Hugo			4750			107 *
Stella			4490			101 *
Green						
CDC Patrick	2540	4470	6580	97 *	89	87
CDC Striker	2010	3790	7470	95	85	94
Cooper	2120	5140	8140	99	94	94
Tetris			4540			102 *
Pluto			4590			103 *
Mendel			3200			72 *

* Less than 3 years of data

Control of Leafy Spurge (Euphorbia esulaesula L.) with Aminocyclopyachlor in Grassland

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Introduction

Leafy spurge (Euphorbia esula L.) is a perennial noxious weed that is problematic in forages and rangeland in the Northern Great Plains. Leafy spurge is not palatable to most grazing animals; therefore, they selectively overgraze the interspersed forage. This selection pressure leads to leafy spurge dominance in the ecosystem. The weed also invades sensitive riparian areas.

Aminocyclopyrachlor, a new pryimidine carboxylic acid herbicide under development by E.I. DuPont Canada Company, has exhibited activity on a wide range of non- cropland broadleaf weed species. Its attributes include low use rates, low animal toxicity, and low environmental impact. It is formulated as a methyl-ester (DPX- KJM44) or free-acid (DPX-MAT28).

Objectives

1. To determine the optimum rate of aminocyclopyrachlor required for long-term control of leafy spurge in non-cropland;
2. To determine if the DPX-MAT28 and the DPX-KJM44 formulations provide equivalent control of leafy spurge.

Materials and Methods

Three field studies were conducted near Battleford, Saskatchewan in 2007, 2009 and 2010. The 2007 site was a loamy sand soil while the 2009 and 2010 studies were located on a sandy loam alluvial soil. The sites were a mix of native northern tallgrass and Bromus sp. Leafy spurge populations at all sites were high (> 40 shoots m-2) and uniform across the entire test. At application the leafy spurge plants were 30 to 60 cm tall with 50 to 80 percent of the plants flowering.

2007 treatments:
• Untreated check;
• DPX-KJM44 @ 15, 30, 60, 120, and 240 g ai ha-1;
• DPX-KJM44 @ 30 g ai ha-1 & metsulfuron-methyl @ 15 g ai ha-1;
• Industry standard: Grazon™ (picloram @ 65 g/l & 2,4-D @ 240 g/l) @ 2135 g ai ha-1;
™Grazon is a registered trademark of Dow AgroSciences LLC.

2009 & 2010 Treatments:

- Untreated check;
- DPX-MAT28 @ 30 and 60 g ai ha-1;
- DPX-MAT28 @ 30 g ai ha-1 & metsulfuron-methyl @ 15 g ai ha-1;
- DPX-MAT28 @ 60 g ai ha-1 & metsulfuron-methyl @ 30 g ai ha-1;
- DPX-MAT-28 @ 70 g ai ha-1 & chlorsulfuron @ 30 g ai ha-1;
- DPX-KJM44 @ 30 g ai ha-1;
- Industry standard: Grazon™ @ 2135 g ai ha-1

Experimental design was RCBD with 4 replicates. Herbicides were applied in a carrier volume of 220 L ha-1. Herbicide treatments were applied in late June to early July when the majority of leafy spurge plants were flowering and 20 to 65 cm tall.

Data collection included visual control ratings at 2-3 and 4-8 weeks after application (WAA). Long-term control was assessed at 58 WAA and 108 WAA in the 2007 study, and 58 WAA in the 2009 study. The 2009 and 2010 study will be assessed for long-term control in future years.

Results

The 2007 project showed DPX-KJM44 to be slower acting than Grazon™(Figure 1) but was less injurious to grass (data not shown). Control was comparable to Grazon™ at rates of ≥ 30 g ai/ha 6 WAA. DPX-KJM44 applied at rates ≥ 60 g ai ha-1 provided greater than 80% control 58 to 110 WAA whereas Grazon™ provided only suppression (Figure 1). Tank-mixing with metsulfuron-methyl did not improve control.

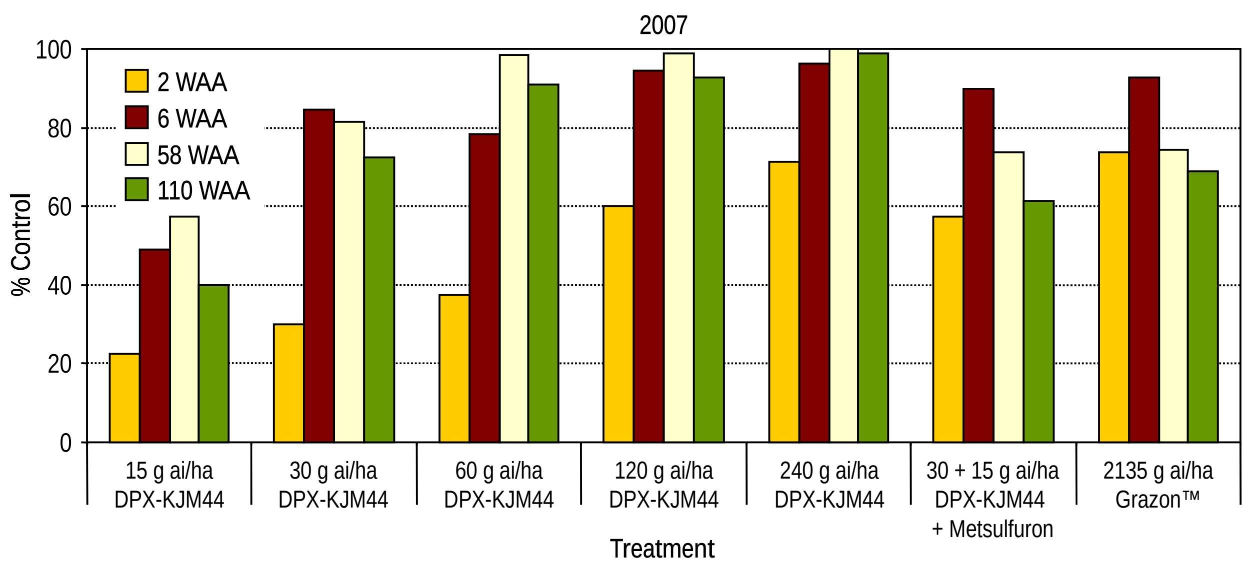

Figure 1. Control of Leafy Spurge with DPX-KJM44 and Tank-Mixes. Battleford, SK 2007

The 2009 and 2010 projects show DPX-MAT28 provided similar results as DPX-KJM44 in 2007 and was slower acting than Grazon™ (Figures 2 & 3). DPX-MAT28 and DPX-KJM44 applied at the same rate resulted in similar levels of leafy spurge control. The 60 g ai ha-1 rate of DPX-MAT28 was required to provide greater than 80% control and was statistically similar to Grazon™ 58WAA (2009 study). Rates below 60 g ai ha-1 only provided suppression of leafy spurge 58 WAA. The addition of metsulfuron-methyl or chlorosulfuron to DPX-MAT28 did not statistically improve control. Injury to mixed grassland with DPX-MAT28 was evident but acceptable (data not shown). Early injury ratings to the grassland was severe with Grazon™. In all cases the grass recovered by next season.

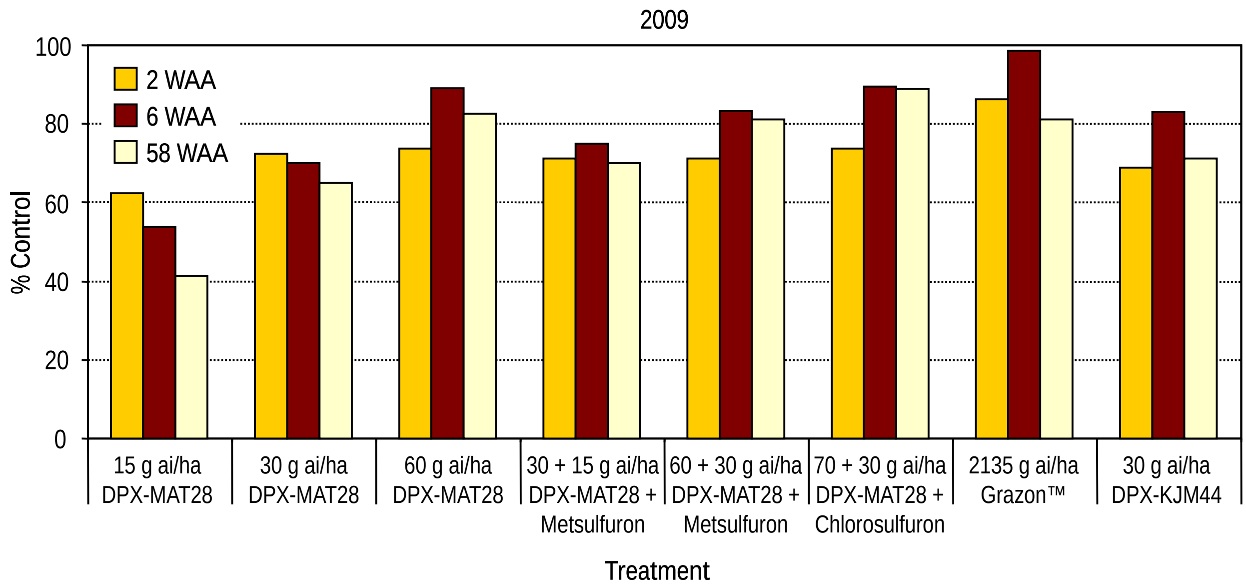

Figure 2. Control of Leafy Spurge with DPX-MAT28 and Tank-Mixes. Battleford, SK 2009

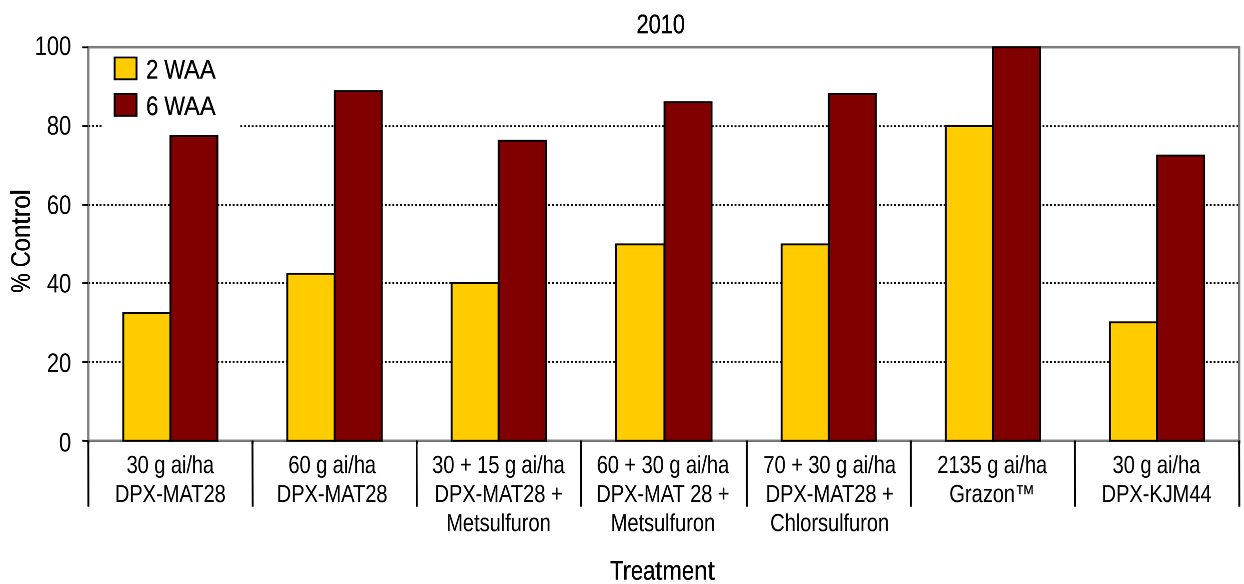

Figure 3. Control of Leafy Spurge with DPX-MAT28 and Tank-Mixes. Battleford, SK 2010

Conclusions

The 60 g ai ha^{-1} rate of both formulations of aminocyclopyachlor is required for long-term control of leafy spurge in mixed grassland. The effect of application parameters (carrier volume, spray quality) on the efficacy of DPX-MAT28 is currently under investigation. Efficacious control and the favourable environmental profile of aminocylopyrachlor should provide producers and vegetation managers with an excellent option for controlling leafy spurge in the future.

Acknowledgements

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Effect of Podsealants on Canola Yield

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Producer interest in straight combining canola is increasing in western Canada. For some canola growers the traditional method of swathing is not appealing because of the increase in their cost of production. Some producers have extra equipment, swathers, and require extra labor to swath canola. Previous research has shown that straight combining canola can produce larger seeds, higher seed oil content, and lower green seed in the sample. Podsealants were first available in western Canada in 2008. They have been previously available in other areas of the world like Europe. Podsealants are designed to prevent pod shatter prior to harvest in shatter prone crops like field pea, lentil, and canola. The objectives of this study were to determine the effect of variety and podsealant on straight combined canola yield.

Materials and Methods

This study took place in 2009 and 2010 at Indian Head, Melfort, Scott, and Swift Current. It was grown in a randomized complete block design with four replications. Five varieties of canola were grown, 5440LL, 5020LL, 45H26RR, 4362RR, and 8571CL. 8571CL is a canola quality juncea that is positioned as straight combinable canola. Four treatments were applied to each variety at each site, swathed, straight combined, Pod-Stik then straight combined, and Pod Ceal then straight combined. Trays were placed in the standing plot before harvest maturity to catch seed lost from pod drop and pod shatter. Seed loss was measured at harvest and again at least two weeks after harvest. At harvest only half of the plot was harvested and the other half was left to deteriorate in the environment.

Results

All of the figures shown are for all four sites and two years combined. The highest yielding variety was 5440LL, it was significantly higher than the other four varieties. The lowest yielding variety was 8571CL, it was significantly lower yielding than the other four varieties. When comparing yield for the different harvest treatments, no statistical differences were seen. Swathing, straight combining, Pod-Stik then straight combining, and Pod Ceal then straight combining all produced similar yields (Figure 1). All three of the treatments that used straight combining produced similar sized seeds which were significantly larger than the seeds from the swathing treatments.

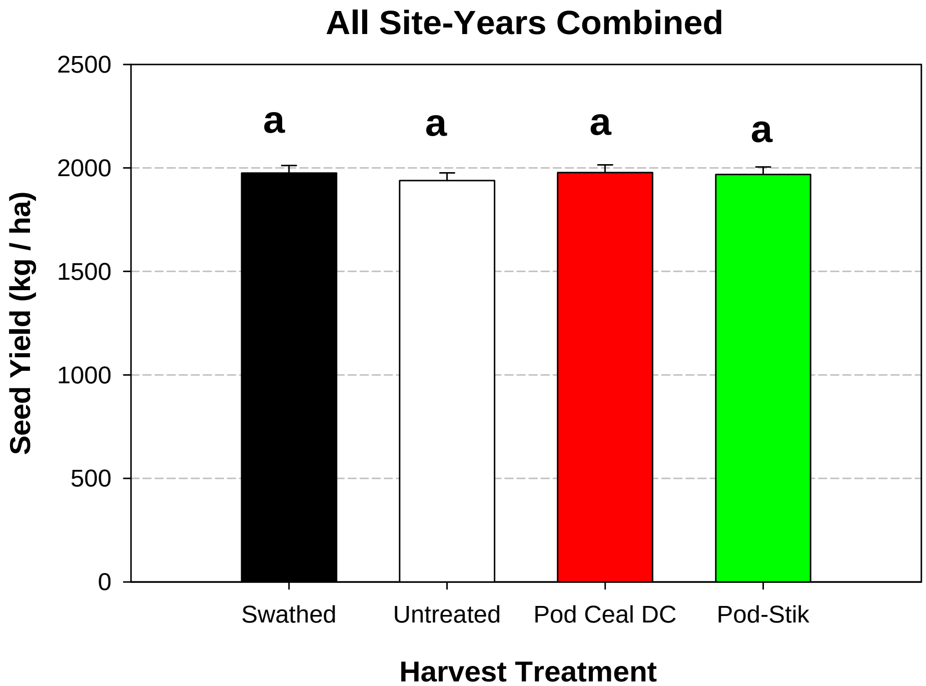

Figure 1 Canola seed yield for all four treatments combined for all sites in 2009 and 2010.

The amount of seed loss was not measured for the swathing treatment, but was measured for straight combining, Pod-Stik then straight combining, and Pod Ceal and straight combining (Figure 2 and 3). The amount of seed loss was similar for all straight combining treatments. The pod sealants did not produce, across all siteyears, less seed loss compared to the untreated straight combined treatment, at either the early (harvest) or late (at least two weeks after harvest) measurements. There was also no difference between the straight combined treatments for pod drop or pod shatter. Large differences were noted for seed loss across varieties. For both the early seed loss measurement (at harvest) and late seed loss measurement (at least two weeks after harvest) 5440LL produced significantly less seed loss than the other four varieties. This was consistent for both the early and late measurements (Figures 4 and 5). 8571CL had seed loss similar to three of the napus varieties and more than 5440LL. The amount of seed loss through pod drop and pod shatter was dependent on variety. 5440LL and 8571CL had the least amount of drop pods at the early and late seed loss measurements while 5440LL and 45H26RR had the least amount of pod shatter.

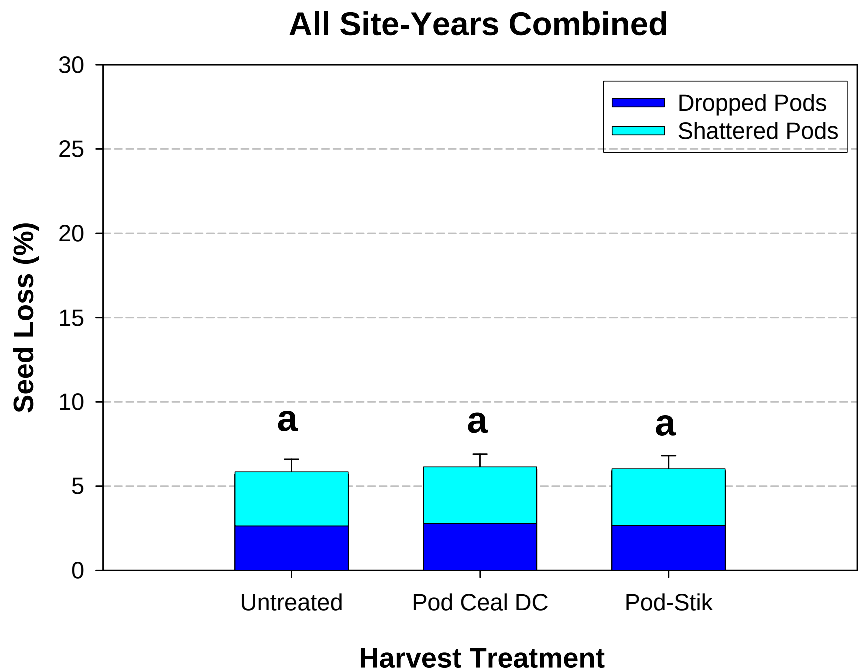

Figure 2 Amount of seed loss as a percent of yield for the straight combined treatments at the early (harvest) measurement for all sites in 2009 and 2010.

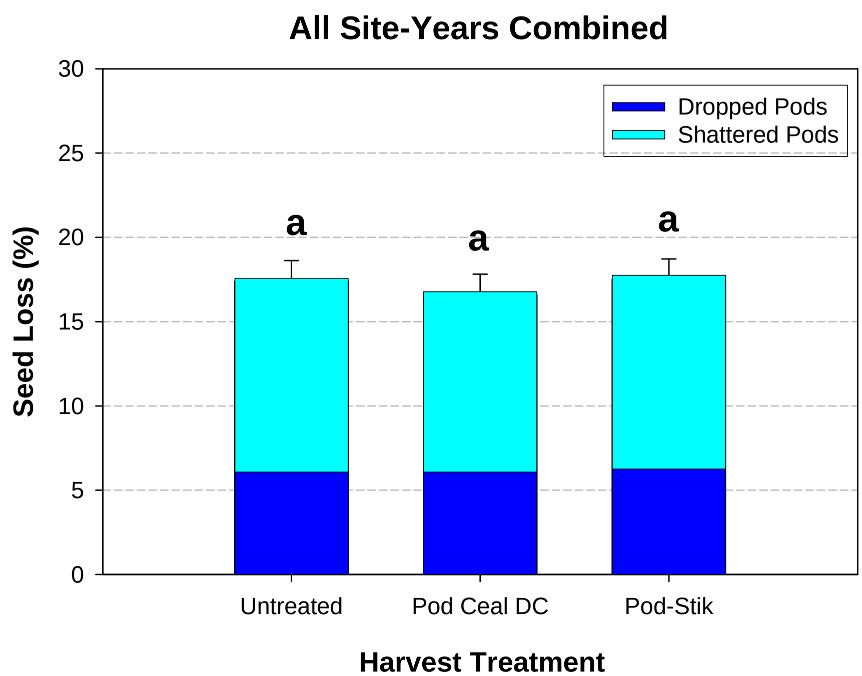

Figure 3 Amount of seed loss as a percent of yield for the straight combined treatments at the late (at least two weeks after harvest) measurement for all sites in 2009 and 2010.

Figure 4 Amount of seed loss as a percent of yield for the different varieties at the early(harvest) measurement for all sites in 2009 and 2010.

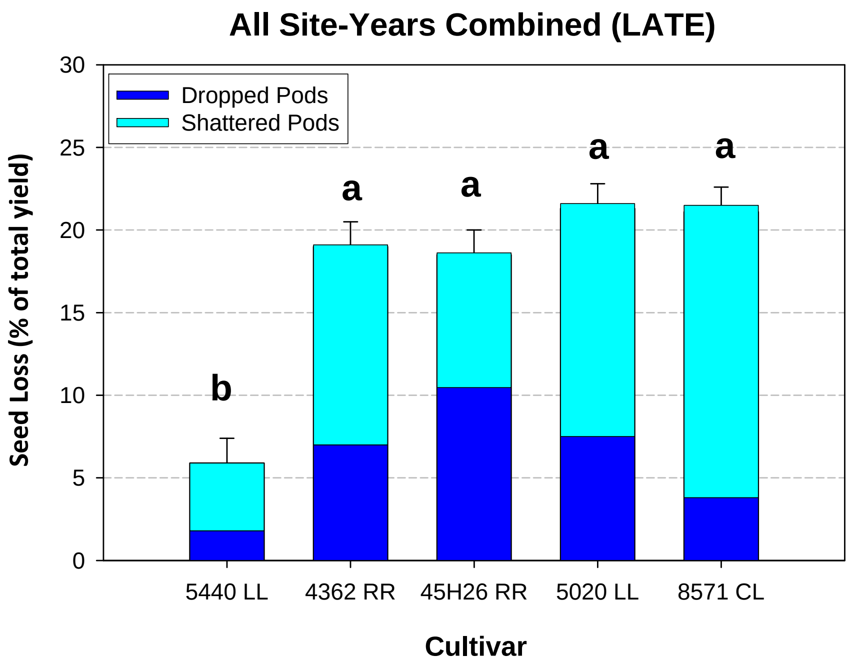

Figure 5 Amount of seed loss as a percent of yield for the different varieties at the late (at least two weeks after harvest)measurement for all sites in 2009 and 2010.

Conclusion

Straight combining canola was successful. The yield of straight combined canola was similar to swathing when combining all sites and years. To increase the chance of successful straight combining choosing a variety with less pod drop and shatter will reduce seed loss and increase harvested yield. Another important factor was beginning harvest as soon as possible. Seed loss from weathering was large negatively affecting yield. In this study podsealants did not decrease pod shatter compared to straight combining and did not have an increase in yield compared to any treatment.

Acknowledgement

Funding for this project was from the Saskatchewan Canola Development Commission and the ADOPT program.

Micronutrient Seed Primers

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Producers in Saskatchewan have many products available for use to try and increase crop yield. Many of the products do not have to undergo registration similar to pesticides and do not have independently verified research results. Indian Head Agricultural Research Foundation heads a test called Yield Busters to determine the effectiveness of different products available to producers. Miconutrient seed primers were tested in 2010.

Materials and Methods

This project began in 2010. Lentil, canola, wheat, and pea were seeded at Canora, Scott, and Swift Current and lentil, canola, and wheat at Indian Head. The wheat and canola was treated with the commercially available Omex zinc primer. At Indian Head the wheat and canola was also had a second generation zinc primer that is not commercially available included. The lentil and pea was treated with the commercially available Omex calcium primer. Indian Head also treated the lentil with the second generation zinc primer not commercially available. Plant density, maturity, and yield were measured.

Results

The results presented are combined for all sites. There was no difference in plant density was noted comparing the micronutrient treated canola, lentil, and pea and the untreated seed. Maturity also was unaffected when comparing micronutrient treated and untreated seed for lentil, pea, canola, and wheat. Figure 1 shows the yield combined for all sites. There was no significant difference in yield for any of the crops when comparing yields of micronutrient treated and untreated.

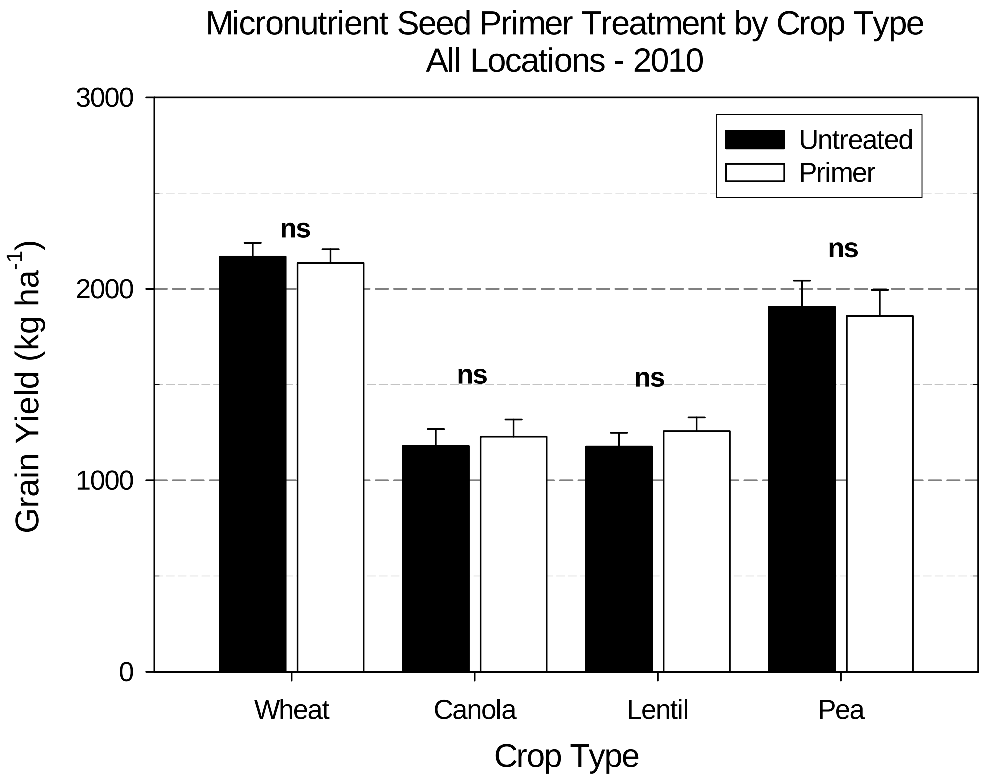

Figure 1 Yield comparison of micronutrient treated and untreated seed for wheat, canola, lentil, and pea at all four sites combined.

Conclusion

In 2010 the use of the micronutrient seed primer did not seem to have any effect on plant density, maturity, or yield. This study will continue in 2011 to verify the 2010 results.

Acknowledgement

Funding was through the Saskatchewan Ministry of Agriculture Agri-ARM program.

Fababean Nitrogen Replacement

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Fababean is a pulse crop that Saskatchewan producers are becoming more interested in growing. Little is known about the effect of crops grown on fababean stubble the following year. Pulse crops form symbiotic relationships with bacteria which produce nitrogen for the pulse crop. As the stubble and root mass decays following the crop some of the nitrogen is released into the soil solution and can be used by following crops.

Materials and Methods

A study was set up to determine if wheat crops planted on fababean stubble produced higher yields compared to canola stubble. The data presented is from Scott, Saskatchewan for 2008, 2009, and 2010. Fababeans and canola were seeded in 2007, 2008, and 2009 with the wheat plots seeded into the fababean or canola stubble in 2008, 2009, and 2010. Three N fertilizer rates were used 0, 45, and 90 kg ha^{-1}, all of the nitrogen fertilizer was placed in mid row bands. The wheat variety used AC Lillian was seeded at 100 kg ha^{-1} with 29 kg ha^{-1} of P placed below the seed. It was seeded on May 20, 2008 and May 10, 2009. Harvest occurred September 8, 2008 and September 21, 2009.

Results

Wheat yield increased when grown on fababean stubble compared to canola stubble. The increase was greatest (526 kg ha^{-1}), and statistically significant, when N fertilizer was not used. An increase in wheat yield was noted for both 45 and 90 kg ha^{-1} of N fertilizer when grown on fababean stubble compared to canola stubble but the increase in yield was not statistically significant. As the N fertilizer rate increased the yield benefit of fababean stubble decreased. The extra wheat yield benefit from fababean stubble compared to canola stubble at 90 kg ha^{-1} of N was 237 kg ha^{-1}. For both fababean and canola stubble the addition of N increased wheat yield, but only significantly from 0 to 45 kg ha^{-1} of N in both cases. For both canola and fababean stubble the mean plant density decreased as fertilizer rate increased. The highest wheat plant density was from canola stubble with 0 kg ha^{-1} of N with 173 plants m^{-2}. It was significantly higher than both 90 kg ha^{-1} of N treatments. All other plant densities were not significantly different.

Table 1 Wheat yield and plant density for three different N fertilizer rates grown on fababean or canola stubble in 2008, 2009, and 2010 at Scott.

Stubble	N rate	Wheat yield	Wheat density
	(kg ha^{-1})	(kg ha^{-1})	(plants m^{-2})
Fababean	0	2415	165
Fababean	45	3195	162
Fababean	90	3399	145
Canola	0	1889	173
Canola	45	2839	158
Canola	90	3162	146
	LSD (α=0.05)	362.5	22.4

Conclusion

Fababean stubble had advantages over canola stubble for seeding wheat. Wheat grown on fababean stubble statistically out yielded wheat grown on canola stubble when no fertilizer was applied. With the addition of fertilizer the wheat grown on fababean stubble had slightly higher yields than wheat grown on canola stubble at the same nitrogen rates, however the difference was not statistically significant. Fababean is a legume crop that fixes its own nitrogen. Therefore, we expect some level of plant available N left from the fababean crop that can be used by the preceeding crop to produce higher yields when no fertilizer is used. However we also expect that by adding nitrogen to the canola stubble we should be able to obtain similar yields as that grown on fababean stubble. At all rates of nitrogen the yields on fababeans are still higher than that on canola stubble. As N rates increased the yields between canola and fababean stubble was no longer significant but the mean yield of fababean stubble was higher than canola stubble. This means one of two things: either we haven't used high enough nitrogen rates to equate the benefit from the fababeans or fababeans provide more than just a N benefit. A larger study is required with several sites across years to determine the amount of N available from fababean stubble to wheat crops and if another factor is helping produce higher yields on fababean stubble.

Acknowledgements

This project was funded through the Saskatchewan Ministry of Agriculture AgriARM program.

Validation of the mustard root bioassay for detection of pyroxsulam and thiencarbazone in the soil

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This study showed that the mustard root length inhibition bioassay previously reported for flucarbazone detection in soil is suitable for determination of pyroxsulam and thiencarbazone residues and that it can be used for investigation of behavior of these herbicides in soil. Phytotoxicity in soils was reduced as soil organic carbon increased due to herbicide adsorption to soil organic matter. Phytotoxicity of pyroxsulam and thiencarbazone was high at concentrations equivalent to field application rates. Dissipation of pyroxsulam was very fast and the half-lives estimated from the dissipation curves ranged from 2.3 to 4.2 days. Dissipation of thiencarbazone was slower than that of pyroxsulam; the half-lives for thiencarbazone ranged from 5.0 to 31.6 days and generally increased as the soil organic matter content increased. Dissipation rates of pyroxsulam and thiencarbazone are quite rapid and decrease with the increase of soil organic matter content due to higher herbicide adsorption resulting in less herbicide available for degradation. Unusually wet conditions in 2010 created considerable variability in field evaluations of recropping to lentil and mustard. There were no significant effects of the herbicides applied in 2009 on lentil and mustard yield in 2010 at three sites in Saskatchewan.

Evaluating the response of hybrid canola to low plant populations

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Hybrid canola has become widely grown by producers and information on minimum plant stands required for establishment is important for producers when it comes to reseeding decisions. In terms of minimum plant stands, much of the previous research conducted has used open pollinated canola and indications are that hybrid canola may be able to compensate more at lower plant densities and thereby lower minimum plant densities may be acceptable. The purpose of this project was to identify the minimum plant stand required by hybrid canola to achieve 90% of the yield under optimum densities and at what plant density is maximum yield achieved. Hybrid canola in this experiment was seeded at 5, 10, 20, 40, 80, 150, and 300 seeds m^{-2} at Scott, Melfort, Indian Head, Saskatoon, and Swift Current. Melfort and Scott both had large amounts of volunteer canola grow in the plots. 90 percent of maximum yield was achieved at 23 plants m^{-2} when combining all of the sites. Generally as plant density decreased flower duration, days to maturity, green seed content, and number of pods per plant all increased. This study will continue in 2011.

Acknowledgement

Funding and support is greatly appreciated for this project and was provided by Saskatchewan Canola Development Commission and Saskatchewan Crop Insurance Corporation.

Canola Reseeding Options

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A canola reseeding experiment was undertaken in 2010. The experiment was designed to mimic a direct seeding situation in a producer's field whereby low populations justify reseeding. For this project low plant populations (20 seeds per m^{-2}) were seeded early May. The plots were then terminated with glyphosate prior to reseeding to canola at two different dates (late May and early June). Reseeded plots consisted of glyphosate tolerant hybrids (early and late maturity) and a polish synthetic variety. Reseeding produced similar yields to the original thin stand for the later reseeding in mid-June. The reseeding in early June produced significantly higher yields than the original thin stand. Later reseeding caused a yield reduction, lower thousand seed weights, and higher green seed contents. The data from 2010 showed that Polish canola produced lower canola seed yields when compared to hybrid argentine canola seeded the same time. Under the earlier reseed timing the Polish yield reduction was significant. More research must be conducted before recommendations on canola reseeding can be made to canola producers. This trial will continue in 2011.

Acknowledgement

Funding and support is greatly appreciated for this project and was provided by Saskatchewan Canola Development Commission and Saskatchewan Crop Insurance Corporation.

Broadleaf Weed Control in Chickpea

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Chickpea growers in Saskatchewan face a large challenge when growing the crop. Few options are available for weed control that allow good weed control and crop safety.

Materials and Methods

This study occurred at Scott in 2010. The weed control portion was the same as previous research at Scott, Saskatoon, and Lethbridge. All of the chemical weed control treatments were applied May 11 (Table 1). The next significant rainfall event was May 23 with 42 mm of precipitation. Anna chickpea was seeded in a randomized complete block design with four blocks on May 12 at 150 kg ha^{-1} at Scott. The plot size was 2 x 5 meters. The weed populations were seeded May 12 with wild mustard at 3.4 kg ha^{-1}, kochia at 7.8 kg ha^{-1}, and wild buckwheat at 16.8 kg ha^{-1}. Headline was applied at 593 mL ha^{-1} on June 29 and July 8. Lance was applied at 420 g ha^{-1} on July 8. Chickpea injury and weed control was measured June 17, July 12, and August 25. Chickpea density and biomass were also measured. Chickpea yield was not taken because disease prevented seed set.

Table 1 Treatment number with corresponding herbicide and surfactant rate and tank mix.

Treatment number	Herbicide	Herbicide Rate (g ai ha^{-1})	Surfactant	Sufactant Rate (% v/v)
1	untreated check (no herbicide)	N/A	N/A	N/A
2	Authority + glyphosate	70 + 450	ammonium sulphate	2
3	Authority + glyphosate	140 + 450	ammonium sulphate	2
4	Heat + glyphosate	18 + 450	Merge	0.5
5	Heat + glyphosate	36 + 450	Merge	0.5
6	Heat + glyphosate	50 + 450	Merge	0.5
7	Heat + glyphosate	100 + 450	Merge	0.5
8	Authority + Heat + glyphosate	70 + 18 + 450	Merge	0.5
9	Authority + Heat + glyphosate	70 + 36 + 450	Merge	0.5
10	Authority + Heat + glyphosate	70 + 50 + 450	Merge	0.5
11	Authority + Heat + glyphosate	140 + 18 + 450	Merge	0.5
12	Authority + Heat + glyphosate	140 + 36 + 450	Merge	0.5
13	Authority + Heat + glyphosate	140 + 50 + 450	Merge	0.5
14	Authority + Converge + glyphosate	140 + 80 + 450	N/A	N/A

In 2010 lentil, CDC Imperial, was seeded on the treated area of 2009 (Table 1) to measure some of the recrop restrictions of Authority and Heat. Lentil is known to be sensitive to both Authority and Heat residue in the soil. The lentil crop was seeded May 15 at 80 kg ha^{-1}. Harvest occurred on September 25. Solo was applied for weed control at 20 g ha^{-1} on June 15. Headline was applied on June 29 at 593 mL ha^{-1}. Crop injury ratings were made June 16, July 7, and August 12. Lentil yield and density were also measured.

Results

The best control for the weeds tested was treatment 14 (Authority + Converge at 140 + 80 g ai ha^{-1}). Authority and Heat provided control of wild mustard, wild buckwheat, and shepherds purse (Table 2). The best level of control for wild mustard was provided by Heat at 100 g ai ha^{-1} (treatment 7) with 95 percent control 37 DAA. The control level remained high for the two subsequent ratings. Authority alone did not provide sufficient control of wild mustard at either rate (treatment 2 and 3). Treatment 12 (Authority + Heat at 140 + 36 g ai ha^{-1}) provided good initial control of wild mustard (91 percent) with control at 74 percent 106 DAA.

Wild buckwheat control was good with Authority alone (Table 2). The 140 g ai ha^{-1} rate of Authority compared to 70 g ai ha^{-1} (treatment 3 and 4) provided slightly better control at all three ratings but was statistically better only at 106 DAA. Heat alone did not provide sufficient control of wild buckwheat at any rate or timing. When Authority and Heat (treatments 8 through 13) were applied together the level of control was good at one of the three ratings. The best control for wild buckwheat occurred at the second rating (62 DAA) when Authority and Heat were combined. Control was less at the earlier and later rating.

Control of shepherds purse was not sufficient for Heat or Authority alone (treatments 2 through 7). Only Authority at 140 g ai ha^{-1} at 62 DAA had control greater than 80 percent (86). When Heat and Authority were combined (treatments 8 through 13) control levels increased (Table 2). The best control for the combined treatments was treatment 13 (Authority +Heat at 140 and 50 g ai ha^{-1}) which provided control greater than 80 percent for both ratings (89% 37 DAA and 86% 62 DAA). Treatment 12 (Authority + Heat at 140 + 36 g ai ha^{-1}) had slightly less control of shepherds purse (87% 37 DAA and 76% 62 DAA) than treatment 13 (Authority +Heat at 140 and 50 g ai ha^{-1}) but statistically the control was the same at both 37 and 62 DAA.

Table 3 Visual injury ratings of wild mustard, wild buckwheat, and shepherds purse for all 14 chemical weed control treatments.

Treatment	Wild mustard injury (%)			Wild buckwheat injury (%)			Shepherds purse injury (%)	
	37 DAA	62 DAA	106 DAA	37 DAA	62 DAA	106 DAA	37 DAA	62 DAA
1	0	0	0	0	0	0	0	0
2	23	5	0	83	94	20	39	23
3	61	59	19	91	99	83	78	86
4	65	59	33	5	13	0	8	13
5	69	70	41	25	20	10	54	28
6	54	57	44	15	29	13	63	43
7	95	98	95	61	69	13	72	45
8	70	70	38	68	86	30	69	50
9	84	83	59	76	89	13	79	69
10	79	81	59	83	87	38	71	66
11	48	39	34	74	94	66	69	63
12	91	89	74	86	94	45	87	76
13	79	78	51	91	98	85	89	86
14	100	100	100	99	100	97	96	100
LSD (α=0.05)	25.4	26.3	38.2	23.4	17.6	25.1	26	29.7

There were some visual differences in the lentil injury, when grown on the 2009 treated area. Treatment 14 (Authority + Converge at 140 + 80 g ai ha^{-1}) had the most injury at each rating. At the initial injury rating on June 16 injury levels were relatively low (Table 3). There appeared to be a synergistic effect injury effect when Authority and Heat were combined. Authority at 140 g ai ha^{-1} had 3 percent injury and Heat at 18 g ai ha^{-1} had no injury. Yet when combined the lentil injury level was significantly higher at 8 percent injury. This happened for all of the combined treatments with Authority at 140 g ai ha^{-1}. A similar effect was seen for Authority at 70 g ai ha^{-1} when combined with Heat, but not as much injury was visible and the injury rating was not statistically significant from either Heat or Authority alone at the respective rates at the first rating.

More injury was noted at the second rating on July 7. The treatments that contained Authority at 140 g ai ha^{-1} (treatments 3, 11, 12, 13, and 14) had significantly more injury than all other treatments except treatment 8 (Authority + Heat at 70 + 18 g ai ha^{-1}). Treatment 8 did not have significantly more injury than any of the other treatments (1, 2, 4, 5, 6, 7, 9, and 10) at the second rating. Injury levels decreased for the final rating. Treatment 11 and 14 had significantly more injury than treatment 1 (untreated check).

None of the lentil plant densities were significantly different than the untreated check (treatment 1). Treatment 14 (Authority + Converge at 140 + 80 g ai ha^{-1}) produced the lowest density at 88 plants m^{-2} while treatment 5 (Heat at 36 g ai ha^{-1}) produced the highest at 113 plants m^{-2}. The lowest lentil biomass was produced by treatment 8 (Authority + Heat at 70 + 18 g ai ha^{-1}) with 91 g m^{-2}. The second lowest lentil biomass was from the untreated check (treatment 1) with 96 g m^{-2}). All of the treatments biomass means were similar to the untreated check except treatment 7 (Heat 100 g ai ha^{-1}) which was significantly higher than the untreated check at 146 g m^{-2}.

Table 3 Visual injury, plant density, and biomass of lentil in a recrop situation for different treatments of Authority and Heat.

Treatment	Lentil visual injury			Lentil density	Lentil biomass
	Jun-16	Jul-07	Aug-12	(plants m^{-2})	(g m^{-2})
1	0	0	0	107	96
2	3	3	0	104	111
3	3	13	7	95	104
4	0	3	0	107	109
5	1	1	0	113	114
6	2	0	0	109	127
7	0	1	0	112	146
8	5	6	0	111	91
9	5	3	0	106	112
10	5	4	0	108	103
11	8	15	10	102	136
12	13	20	4	112	110
13	7	16	3	92	109
14	14	35	15	88	108
LSD (α=0.05)	6.8	10.4	9.3	21.3	33.3

Conclusion

Authority and Heat can be used together to provide control for wild mustard, wild buckwheat, and shepherds purse. The combination of Authority at 140 g ai ha^{-1} and Heat at 36 g ai ha^{-1} (treatment 12) worked well. It provided good control of the weeds studied but did not have major injury issues the following year, the injury level decreased after July. More research is needed for the recrop restrictions of Authority (140 g ai ha^{-1}) and Heat (36 g ai ha^{-1}), especially because of the uncharacteristic growing season at Scott in 2010. It is unknown the effect of the extremely wet growing season on the chemical residues in the soil.

Acknowledgement

Funding for this project was through the Saskatchewan Pulse Growers.

2010 Pesticide Minor Use Program

Dan Ulrich[1], Eric Johnson[1], Greg Ford[1]

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The federal Minor Use Pesticide program assists in the registration of crop protection products where returns on investment are insufficient for a private chemical company to recoup costs. AAFC Scott is one of 9 sites in Canada where federal minor use pesticide field trials are conducted Since 2003 the minor use team at Scott has conducted approximately 250 trials to support 95 MU projects resulting in 42 submissions and 35 registrations. Nationally 776 MU projects have been developed with 271 submissions and 204 registrations as of Nov, 2010. Crops evaluated at Scott include grasses for forage and hay production, legumes, herb and spices, oil seeds, vegetables and small fruits. Field trials are required to show the intended crop will tolerate the pesticide, control the target pest, and generate a harvested sample that when analysed shows pesticide residue levels are below a maximum allowable residue level before a pesticide can be registered in Canada.

In 2010, 25 minor use field trials were conducted at Scott with 7 trials evaluating crop tolerance, 13 evaluating pest control and crop tolerance, and 4 trials generating samples to characterize pesticide residue levels. Based on preliminary screening results for kochia control products in mustard in 2010, trial work in 2011 will investigate spring and fall soil applied Authority (ai sulfentrazone) alone and in combination with either ethaflralin or trifluralin, and the product Cadet (ai fluthiacet-methyl). A broadleaf weed control tolerance trial in tame buckwheat revealed acceptable crop injury for the herbicides Command and Accord. However due to their limited spectrum of broadleaf weed control, a 2011 tame buckwheat trial will evaluate tolerance to Muster Toss and Go, Muster + low rate of Ally and Cadet. Mutagenesis of mustard and tame buckwheat seed which results in altered genetics via chemical or radiation means will also be screened for herbicide resistance in 2011. In insecticide trials partial suppression of cabbage maggots with DPX-HGW86 (ai cyantraniliprole) on radish and rutabaga was achieved. In fungicide trials disease control with the fungicide Quash on sunflower and Lance WDG on caraway achieved partial suppression. Herbicide mixes that included the active ingredient florasulam on fall dormant alfalfa or alfalfa just breaking dormancy in the spring showed promising crop safety and dandelion control in established alfalfa. A new active pyroxasulfone was evaluated. Under above normal moisture conditions pyroxasulfone provided excellent control of cleavers, red root pigweed, green foxtail and wild oats.

A major development in late 2010 was the announcement that Authority (ai sulfentrazone) would be registered on chickpea, field pea, flax, and sunflower. This registration provides growers with a much needed option for controlling both herbicide resistant and susceptible kochia in crop. Work is currently underway to determine sulfentrazone’s efficacy for controlling cleavers in field pea

The table below summarizes minor use crop-pesticide trial evaluation results for 2010. Readers should be aware that these results are from a single growing season at one location and may not reflect findings under different growing conditions or other locations.

Results from 2010 field trials **<u>AAFC Scott - 2010 Pesticide Minor Use Program Results</u>**

Eric Johnson, Dan Ulrich, Greg Ford

25 field trials (15 for registration, 10 screening)

7 crop tolerance, 13 efficacy (8 weed, 3 pathology, 2 insect), 1 desiccation, 4 residue

Crop *application crop stage*	**Product(s)**	**Crop Tolerance** * =acceptable	**Pest(s)**	**Pest Control** *=acceptable
Creeping Red Fescue *established seedlings*	Infinity Barricade+fluroxypyr Assert	* * stunting, yield loss		
Yellow Mustard *soil applied May 2009*	Chateau (53-840 g ai/ha)	plant loss, stunting		
Lentil *soil applied May 2009*	Chateau (53-840 g ai/ha)	* (up to 107 g ai/ha)		
Tame Buckwheat *pre emerge:* ………… *4 leaf:*	 Command KIH-485 Callisto <u>Dual II</u> Accord Lorox L Sencor Ally Toss-N-Go	 * plant loss, stunting stunting <u>plant loss, stunting</u> * plant loss, stunting plant loss, stunting stunting		
Alfalfa *fall: dormant*, *spring: breaking dorm.*	Fall or spring applied: Pardner MCPA ester Vantage Plus ai florasulam (flr) Pardner+flr MCPA+flr [Frntln xl] Vantage Plus+flr ai fluroxypyr+flr	 * * spring app: stunting * * * * *	dandelion	 unacceptable * * * * * * *
Radish *seed treatment,* *in furrow drench*	DPX-HGW86 (ai cyantraniliprole)	*	cabbage maggot (late season pressure)	partial suppression
Rutabaga *4 leaf + 6 leaf*	DPX-HGW86 (ai cyantraniliprole)	*	cabbage maggot (high pressure)	partial suppression
Caraway *Flower*	Lance	*	blossom blight (low pressure)	partial suppression
Sunflower *Flower*	Quash (ai metconazole)	*	alternaria sclerotinia (low-moderate pressure)	unacceptable partial suppression
Yellow Mustard *pre-emerge:* pre-seed/ pre-emerge pre-seed/ pre-emerge *2 leaf:*	 Authority Treflan + Authority Edge + Authority Aim II	 * @ 105 g ai/ha *@ 70g +rec. Tref. chlorosis, stunting *	kochia (low density)	* @105 g ai/ha * @52 g ai/ha *@52 g ai/ha unacceptable
Oriental Mustard *post emerge*	ALS7HPPS (ai propis.) Muster+ALS7HPPS Cadet (ai fluth.-meth.)	* chlorosis, stunting *@4 g ai/ha	kochia (low density)	*@2880 g ai/ha suppression *early season
Desi-chickpea *80% pod turn*	Heat (ai saflufenacil)		desiccation	killing frost 4 days after application, no treatment diff.
No crop *soil applied May 2010*	KIH-485 (ai pyroxasulfone @ 41-512 g ai/ha)		wild oat+green foxtail+redroot pigweed+cleavers wild mustard lamb's quar,prostrate pw	* 60 g ai/ha *200 g ai/ha *300-400 g ai/ha

Mechanical Weed Control

E. Johnson[1] and L. Nielson[1]

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This project evaluated the effectiveness of the precision shallow cultivation tool (PSCT) developed in 2008 under controlled small plot research. Initial look at the PSCT showed tremendous promise for pre-emergence weed control under stubble and fallow conditions. The PSCT was developed to provide very shallow cultivation to allow removal of weeds prior to crop emergence with deep seeded crops such as pea or spring wheat but it was not known how well it would work in a zero-till situation. The PSCT is basically a heavy harrow equipped with 3" shovels.

2009 was a set-up year for the study. An area was seeded to wild oat and wild mustard, and then over-seeded to spring wheat. Natural populations of lambs-quarters and cow cockle were also present in the field. Seed produced by the weeds were allowed to shatter naturally in the field prior to harvesting the wheat. This provided a uniform, naturalized weed population although weed densities were extremely high in 2010.

The study was a 3 X 3 X 2 factorial. Factor 1 was Seeding system. It consisted of Pre-seed tillage, High Disturbance Seeding, and Zero Tillage treatments. Factor 2 was Pre-emergence Tillage. Treatments included No Pre-emergence tillage, Pre-emergence PSCT, and Pre-emergence rotary hoe. Factor 3 was Post-emergence Tillage and treatments were none and Post-emergence rotary hoeing. A herbicide check was also included in the treatments.

Due to inclement weather and high weed densities, weed density and biomass data could not be collected. Therefore, a weed density / biomass rating system was used. The rating system was a 0-4 scale with 0 = no weeds present; 1 = low weed density / biomass;
2 = moderate weed density / biomass; 3 = high weed density / biomass; and 4 = very high weed density / biomass. The herbicide checks were assigned a rating of 1 and other treatments were assessed against this treatment. Field pea seed yield was also taken in the fall.

The weed density / biomass ratings produced similar trends as field pea yield (Table 1). The only factor that had an impact on weed rating and yield was seeding system. Zero-till field pea had the lowest weed rating and the highest seed yield. Lowest field pea seed yield was achieved with the Pre-seeding Tillage system. There was a trend for higher yields with pre-emergence PCST and rotary hoeing; however, differences were not statistically significant. Also, there were trends for lower weed density / biomass ratings and higher seed yields with post-emergence harrowing but the differences were not statistically different.

The PCST tool had trouble with straw plugging with the wet soils and high crop residue. The rotary hoe did not plug and weed ratings and yields were similar to the PCST. In past evaluations, the PCST appeared to be more effective in reducing wild oat densities than the rotary hoe. In this trial, it appears that the rotary hoe is as effective as the PCST and considering its ability to work in the presence of crop residues, it would be the tool of choice in an organic zero-till system. The PCST works well in an organic conventional tillage system or when crop residues are low.

It is also interesting to note that when treatments are ranked for yield, the 2nd and 3rd highest yielding treatments (herbicide was number 1) were Zero Till Seeding followed by Pre-Emergence Rotary Hoeing, and Zero-Till Seeded Seeding, followed by Pre-Emergence PCST, and Post-Emergence Rotary Hoeing, respectively (data not shown).

The good performance of the Zero-Till system without the use of herbicides was unexpected.

Table 1: Effect of seeding system, pre-emergence tillage, and post-emergence tillage on weed density / biomass rating (0-4 scale) and seed yield of field pea. Scott. 2010.

	Weed Rating (0-4)	Seed Yield kg/ha
Seeding System		
Pre-Seed Tillage	3.55 b	663 c
High Disturbance Seeding	3.49 b	834 b
Zero-Till Seeding	2.8 a	939 a
Pre-Emergence Tillage		
None	3.17	780
PCST	3.43	803
Rotary Hoe	3.25	853
	NS*	NS
Post-Emergence Tillage		
None	3.31	799
Rotary Hoe	3.25	825
	NS	NS
Herbicide	1.00	1446
* NS = Not significant		

Control and Recropping Restrictions with Authority (sulfentrazone)

E. Johnson, Agriculture and AgriFood Canada, Scott, SK.

Research conducted in 2010 focused on Authority (sulfentrazone) weed control efficacy and re-cropping. Authority received full registration in 2010 based largely on field trials conducted by the Scott Research Farm and the University of Saskatchewan. Authority is registered in chickpea, flax, field pea and sunflower. It is a Group 14 herbicide so it has a unique mode of action for Western Canada. Authority is a pre-emergent herbicide that can tank-mixed with glyphosate and applied at burn-down. It requires some moisture for residual control. It is very effective on kochia, wild buckwheat, lambs-quarters, and redroot pigweed. Although it is not labeled for cleavers control, Authority has been quite effective in controlling cleavers on soils at Scott. Further work is needed to see if Authority is effective on cleavers in soils with higher clay content and organic matter. Authority has a 24 month re-cropping interval to canola and a 36 month re-cropping interval to lentil. Research work is underway to try and reduce the canola re-cropping interval.

Another FMC herbicide evaluated at Scott in 2010 was fluthiacet-methyl. It is a post-emergence Group 14 herbicide. It exhibited some promise for broadleaf weed control in cereals, flax, and pulse crops. Sunflower was not tolerant to fluthiacet-methyl. Work with this product will be expanded in 2011 under the Pulse Cluster Project.

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Developing sulfentrazone tolerance in lentil

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As mentioned previously, the registered re-cropping interval for lentil after Authority (sulfentrazone) application is 36 months. Initial screening work at the University of Saskatchewan identified significant genetic variation between lentil lines in their tolerance to Authority. Follow-up work at the Scott Research Farm and the University of Saskatchewan in 2010 confirmed that some lines of lentils were more tolerant to Authority than other lines. The studies have not been repeated enough to make recommendations to producers at this time. It is hoped in the near future that lentil lines will be identified that can be safely re-cropped on soils that have received a sulfentrazone application 12 months prior.

Acknowledgement

This project is funded by the Saskatchewan Pulse Growers and will be continued under the Pulse Cluster Project.

Persistence of cow cockle in the soil

E. Johnson, Agriculture and AgriFood Canada, Scott, SK.

Cow cockle has been investigated as a potential crop for the Prairies. Since it can also be a weed, research is required to understand its biology. It is unknown how long the seed can persist in the soil so a study was initiated in the fall of 2008 to answer the following questions:

How persistent is the seed in the soil?
Is there a difference in persistence between semi-domesticated seed (known as Prairie Carnation) and wild cow cockle seed?
Does tillage system have an impact on persistence?

Semi-domesticated Prairie Carnation and wild cow-cockle seed were broadcast in the fall of 2008 at rates of 1200 seeds m^{-2}. These rates were based on estimates of harvest losses from field scale plots grown at Scott. The study is a 2 X 2 factorial with seed source (semi-domesticated and wild cow cockle seed) as one factor and tillage system (spring pre-seed tillage and zero tillage) as the second factor. Treatments were replicated 6 times. The site was seeded to spring wheat and Roundup ready canola in 2009 and 2010, respectively. The zero-till treatments received a pre-seed glyphosate application while the spring pre-seed tillage plots received one cultivator pass prior to seeding. In-crop weed control consisted of registered rates of Refine SG and Roundup in the wheat and canola, respectively.

Cow cockle and Prairie Carnation plants were counted in the treatments four times during the growing season. Plants were counted just prior to spring tillage or glyphosate burnoff; in-crop prior to post-emergence spraying; 3 weeks after herbicide application; and post-harvest. Plants surviving the post-emergence application are removed after counting so they don't produce seed and return fresh seed to the seedbank.

Results from Scott are shown in Table 1 and Table 2. In 2009, plant numbers were very low prior to pre-seeding tillage or pre-seed glyphosate application (less than 1 plant per m^2) and there was no difference between seed source or tillage system (Table 1). At the second counting date (prior to in-crop herbicide), the spring tillage plots had much higher numbers than the zero-till plots. Plant counts were similar between seed sources. Post in-crop spraying counts were low, with respective counts of 4 and 2 plants m^{-2} in spring tilled and zero till plots, respectively. There were no surviving plants post-harvest in any of the plots indicating that late season germination and emergence of plants did not occur.

In 2010, there were no plants emerged prior to spring tillage or pre-seed burnoff (Table 2). As in 2009, the highest numbers of plants were present just prior to in-crop herbicide application. Both seed source and tillage system had an effect on plant counts at this time. The density of wild cow-cockle plants was nearly 4 times as high as the density of the semi-domesticated Prairie Carnation plants. Tillage system had a reverse effect in 2010 compared to 2009 with the zero-till plots having slightly higher numbers of plants compared to spring-tilled plots. Post in-crop spraying counts were low with the zero-till plots having slightly higher densities than the spring-tilled plots. As in 2009, no plants were present post-harvest.

Conclusions

This experiment is also being conducted at AAFC, Lethbridge and the University of Saskatchewan. This study is part of a project for a PhD candidate at the University of Saskatchewan. Only the Scott results are presented in this report. In both years of the study, highest emergence of both cow-cockle and Prairie Carnation occurred just prior to in-crop spraying. This indicates the importance of post-emergence herbicide application for controlling volunteers and minimizing the number of live plants contributing new seed to the seedbank.

The study will be repeated at all locations in 2011. Barley will be seeded and soil samples will be taken in the fall of 2011 to determine the amount of viable seeds remaining in the seedbank.

Table 1: Effect of seed source and tillage system on number of cow cockle plants in spring wheat. Scott, 2009.

2009 Results	Plants m^{-2} Pre-spring tillage or Pre- burndown	Plants m^{-2} Pre- In-crop herbicide	Plants m^{-2} Post In-crop herbicide	Plants m^{-2} Post Harvest
SEED SOURCE				
Semi-domesticated Prairie Carnation	<1	54	4	0
Wild Cow Cockle	<1	65	4	0
TILLAGE SYSTEM				
Spring pre-seed tillage	<1	110	5	0
Zero tillage	<1	8	2	0
P values				
Seed Source	NS*	0.0001	NS	NS
Tillage System	NS	NS	0.0069	NS
Seed Source X Tillage System	NS	NS	NS	NS

Table 2: Effect of seed source and tillage system on number of cow cockle plants in Roundup ready canola. Scott, 2010.

2010 Results	Plants m^{-2} Pre-spring tillage or Pre- burndown	Plants m^{-2} Pre- In-crop herbicide	Plants m^{-2} Post In-crop herbicide	Plants m^{-2} Post Harvest
SEED SOURCE				
Semi-domesticated Prairie Carnation	0	28	3	0
Wild Cow Cockle	0	83	3	0
TILLAGE SYSTEM				
Spring pre-seed tillage	0	44	2	0
Zero tillage	0	66	4	0
P values				
Seed Source	NS*	0.0001	NS	NS
Tillage System	NS	0.03	0.0007	NS
Seed Source X Tillage System	NS	NS	NS	NS

Acknowledgement

This project was funded by Saskatchewan Ministry of Agriculture through the AgriARM program.

Hemp Variety Trial

The hemp variety trial was seeded in May, 2010. Due to subsequent wet weather poor plant establishment occurred and disease caused increased plant mortality. The test was discarded in the summer because of the poor establishment and variety yield would not have been reliable.

Intercropping of pea and canola

The intercropping of pea and canola was an ADOPT funded project. It was not completed in 2010 because of adverse weather. It was to be seeded at a field scale on producer's fields. The first crop, peas, were planted but the second crop, canola, was not seeded because the fields were too wet to allow seeding. This trial will take place in 2011.

Hybrid poplar and willow demo

Little was done to the hybrid poplar and willow demonstrations in 2010. The only activities were maintenance activities of the demonstrations, like weeding.

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