WADO

Westman Agricultural Diversification Organization

2010 Annual Report

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Manitoba

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2010 Industry Partners

(Alphabetical Order)

Industry Partners:

Agriculture and Agri-Food Canada
BASF
Barker's Agri-Centre - Melita
Calendula Oil Ltd.
Canada Manitoba Crop Diversification Centre- Carberry
Canadian Wheat Board
Cargill
DB Murray Ltd. (John Deere, Melita)
Ducks Unlimited Canada
Farm Genesis Group - Waskada
Great Plains Oil & Exploration / The Camelina Company – Cincinnati, OH
Hamiota Feed Lot
Local GO Team Offices
Manitoba Agriculture Food and Rural Initiatives
Manitoba Corn Growers Association
Manitoba Crop Variety Evaluation Team
Manitoba Forage Council
Manitoba Forage Seed Association
Manitoba Pulse Growers Association
National Sunflower Association of Canada
Ontario Hemp Alliance
Parkland Crop Diversification Foundation - Roblin
Parkland Industrial Hemp Growers
Prairies East Sustainable Agriculture Initiative - Arborg
Prairie Agricultural Machinery Institute - Portage
Saskatchewan Ministry of Agriculture
Seed Manitoba
Shape Foods - Brandon
Sustainable Oils LLC. – Bozeman, Montana
Terramax – Seedtec – Qu'Appelle Sk.
University of Manitoba
University of Saskatchewan (CDC)
Western Feed Grains Development Cooperative - Minto
Winter Cereals Canada

Farmer Co-operators - Trial Locations:

Barker Farms - Melita	Blake Nestibo - Goodlands	Ellis Seeds - Wawanesa
Gary Serruys - Melita	Dave Stewart - Goodlands	Kendall Heise - Crandall
Greig Farms - Melita	Jack Edwards - Goodlands	Kevin Beernaert - Hartney
Wayne White - Melita	Armstrong Seeds - Boissevain	Mark McDonald - Virden
Elliott Bros. - Reston	Chalmers Farm - Carroll	Soutar Farms - Hamiota

Introduction

The Westman Agricultural Diversification Organization Inc. (WADO) manages a wide range of value-added and diversification ag research and demonstration projects that are summarized in this report. WADO operates in the Southwest Region of Manitoba and works in conjunction whenever possible with the other Diversification Centres in Roblin (PCDF), Arborg (PESAI) and the Fed/Prov. Canada/Manitoba Diversification Centres (CMCDC) based in Carberry, Portage & Winkler. WADO owes its success to the excellent cooperation and participation we receive from the WADO Board of Directors, cooperating land owners, local producers, industry partners and cooperating research institutes. WADO acts as a facilitator and sponsor/banker for many of the Ag Extension events held across the province in conjunction with other MAFRI staff and Industry Personnel. This is all part of WADO's goal of helping farmers and our rural communities do better.

WADO receives the majority of its operating funds from the Agricultural Sustainability Initiative (ASI) and other Growing Forward (GF) programs. Smaller amounts of additional funding come from the MCVET committee and other Industry Partners for the contract work that WADO is able to provide to these organizations.

WADO Staff

Scott Day P.Ag. (far left), is the Diversification Specialist for MAFRI in Melita and is responsible for all activities associated with WADO such as project development, extension, and communications.

Scott Chalmers P.Ag. (far right), is the Diversification Technician for MAFRI in Southwest Manitoba. Scott is responsible for summer staff coordination, plot management, data collection and analysis.

WADO had excellent Summer Staff for 2010, they were an important reason we were able to successfully handle almost 2000 plots throughout the SW region. A full salute goes out to the two main summer staff: Anita Fewings (left) from Pierson, & Sarah Jane Speers (right) from Alexander. We also had Ben Weidenhamer & Alex Day from Deloraine and Andy Sterling from Tilston work for WADO at certain times during 2010.

Got An Idea?

The Westman Agricultural Diversification Organization continually looks for project ideas, value-added ideas, and producer production concerns. If you have any ideas, please forward them to:

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All WADO annual reports are posted at our new website: http://www.gov.mb.ca/agriculture/diversification/wado

WADO Directors

WADO functions with a board of directors that assists in communications, activities and project development. The directors are from all across southwest Manitoba and they have a direct connection to farming and agriculture. The directors listed below are those that participated with WADO operations for 2010. For 2011 Terry Wilkinson is stepping down and Brooks White from Lyleton will be joining the WADO board. Terry's interest and commitment to WADO was greatly appreciated.

Gary Barker	Melita - Chairman	John Finnie	Kenton
Terry Wilkinson	Melita	Allan McKenzie	Nesbitt
Ryan Martens	Boissevain	Patrick Johnson	Killarney
Kevin Beernaert	Hartney	Neil Galbraith	Minnedosa
Kevin Routledge	Hamiota		

MAFRI staff members located in Southwest Manitoba are also part of the WADO board: Elmer Kaskiw – Shoal Lake, Lionel Kaskiw – Souris, Murray Frank – Brandon, Kristen Phillips – Virden, Amir Farooq – Hamiota, as well as Scott Day & Scott Chalmers – Melita

2010 Weather Report and Data – Melita Area

Weather for the Melita Region in the spring of 2010 was rather interesting. Generally optimal seeding conditions were present for April and a good part of May. Then at the end of May the rain started to fall! Many acres that were seeded in low areas were lost due to flooding. June & August experienced higher than normal rainfalls as well. Temperatures remained normal during most of the summer despite only 7 days reaching above 30°C. Most crops were harvested in late August and September with a few corn and sunflower fields left to stand the winter months, but were generally in good condition. Most, if not all, crops were able to mature in time before the first fall frost on September 18 reaching -1.7°C then October 2 at -1.6°C. Since May 15 until the first fall frost, the Melita region received approximately 2414 CHU (Corn Heat Units) for the entire growing season.

Season Summary May 1 - September 1			
	Actual	Normal[1]	% of Normal
Number of Days	124		
Growing Degree Days	1410	1436	98
Corn Heat Units	2288	2338	98
Total Precipitation	365.9	303	121

You will see that the rainfall in Melita for the growing season was only 121% of normal – and this has been confirmed from two different weather stations. However, only a few miles outside of town in virtually every direction; Tilston, Pierson, Medora, Reston, Deloraine etc. there was near record rainfall for the growing season. Many of these other communities in the SW Corner saw 180 – 200% of normal rainfall (see precipitation map summary on the next page).

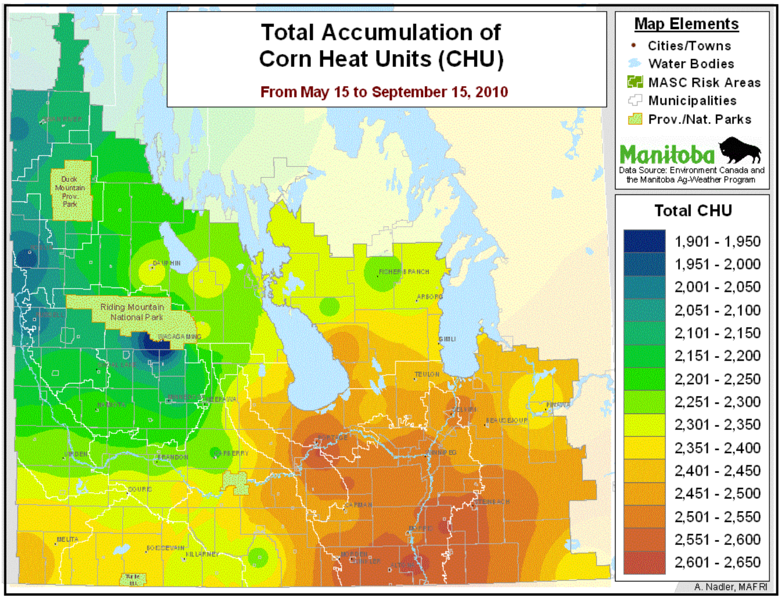
To calculate growing degree days (GDD), first determine the mean temperature for the day. This is usually done by taking the maximum and minimum temperatures for the day, adding them together and dividing by 2. The base temperature (0°C for cereals, 5°C for both alfalfa and canola) is then subtracted from the mean temperature to give a daily GDD. If the daily GDD calculates to a negative number it is made equal to zero. Each daily GDD is then added up (accumulated) over the growing season.

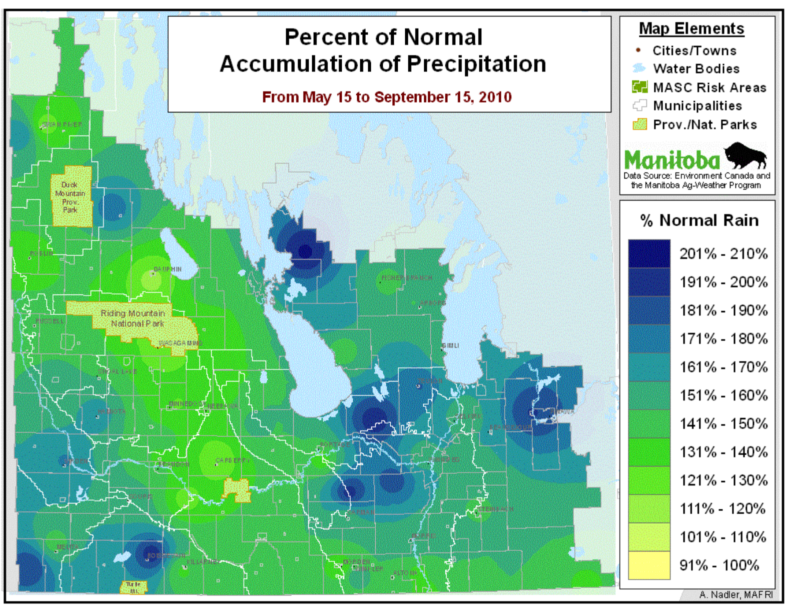
Corn heat units (CHU) are based on a similar principle to growing degree days. CHUs are calculated on a daily basis, using the maximum and minimum temperatures; however, the equation that is used is quite different. The CHU model uses separate calculations for maximum and minimum temperatures. The maximum or daytime relationship uses 10°C as the base temperature and 30°C as the ceiling, because warm-season crops do not develop at all when daytime temperatures fall below 10°C, and develop fastest at about 30°C. The minimum or nighttime relationship uses 4.4°C as the base temperature and does not specify an optimum temperature, because nighttime minimum temperatures very seldom exceed 25°C in Canada. The nighttime relationship is considered a linear relationship, while the daytime relationship is considered non-linear because crop development peaks at 30°C and begins to decline at higher temperatures. CHU's is a more accurate crop prediction tool for crops like corn and beans that require heat for proper growth.

In 2010, WADO purchased two new weather stations to collect trial site weather data at Melita and Hamiota. Continuous real time data recorded every 15 minutes and this can be viewed publicly at the following locations:

http://tgs.gov.mb.ca/climate/DisplayImage.aspx?StationID=melitaWADO
http://tgs.gov.mb.ca/climate/DisplayImage.aspx?StationID=hamiotaWADO

2010 Corn Heat Unit Maps





Melita - WADO 2010 Season Report by Month							
Month	May	June	July	August	September	October	Total
Precip (mm)	98	109	68	90	35	37	436
Norm. Precip.[1]	55	77	68	52	47	32	330
Temp Ave°C	11	17	19	19	12	8	
Norm. Temp[1]	12	17	19	19	13	5	
CHU	322	579	706	650	351	248	2855
GDD	193	350	439	419	203	124	1728

[1]Normals are based on 30-yr averages, Manitoba Ag-Weather Program

WADO Tours and Special Events

Ag Days was the largest event WADO was involved in for 2010 (picture left). WADO attended the show with the rest of Manitoba's Diversification Centres featuring a booth showcasing new farming opportunities and possibilities in Innovation Corner. Ag Days attracted 35,000 people in 2010. Other tradeshows WADO participated in were: the Farm Focus Event in Boissevain, Crop Meetings in: Rivers, Souris, Hamiota, Wawanesa, Binscarth & Oak Lake. WADO also presented at a Hemp Growers Meeting in Waskada in collaboration with the Farm Genesis Group. WADO was also a guest speaker at the OPAM Annual General Meeting and the Man-Dak 0-till Conference in Minot ND. Scott Day also talked about WADO activities at Ag Conferences in London and Rome this past spring and fall.

WADO offered several special group tours during the growing season of 2010 including hosting guests from North Dakota, China, Iceland, Russia, and Australia.

Summer tours included the major on site tour in Melita (picture right) on July 21st where over 160 people attended, and a tour at Hamiota on August 12th. All plots at each site were showcased with a wide range of content on old and new crops, varieties, and agronomy.

WADO also helped organize the Sunflower Tour (picture left) in cooperation with the National Sunflower Association on August 4th at our site near Goodlands.

Understanding Plot Statistics

There are two types of plots at WADO. The first type is replicated research plots and the other is demonstration plots. Demonstration plots are not used to determine statistical differences between data, they are typically used only for show and tell, and observation.

Replicated plots are scientific experiments in which various treatments (ex. varieties, rates, seed treatments, etc.) are subject to a replicated assessment to determine if there are differences or similarities between them. Many designs of replicated trials include randomized complete block designs (most common), split plot design, split-split plot design and lattice designs. Since these types of trials are replicated, statistical differences can be derived from the data using statistical analysis tools.

The analysis of variance (ANOVA) is the most common of these calculations. From those calculations, we can determine several important numbers such as coefficient of variation (CV), least significant difference (LSD) and R-squared. CV indicates how well we performed the trial in the field which is a value of trial variation; variability of the treatment average as a whole of the trial. Typically CV's greater than 15% are an indication of poor data in which a trial is usually rejected from further use. LSD is a measure of allowable significant differences between any two treatments. Ex: Consider two treatments; 1 and 2. The first treatment has a mean yield of 24 bu/ac. The second treatment has a yield of 39 bu/ac. The LSD was found to be 8 bu/ac. The difference between the treatments is 15. Since the difference was greater than the LSD value 8, these treatments are significantly different from each other. In other words, you can expect the one treatment (variety or fertilizer amount, etc.) to consistently produce yields higher than the other treatment in field conditions. If "means" (averages) do not fall within this minimal difference, they are considered not significantly different from each other. Sometimes letters of the alphabet are used to distinguish similarity (same letter in common) between varieties or differences between them (when letters are different representing them).

R-squared is a value of how "sound" the data really is. It is determined by a value that approaches the value of 1, which represents perfect data in a straight line. In most plot research, R-squared varies between 0.80 and 0.99 indicating good data.

Grand mean is the average of the entire data set. Quite often, it helps gauge the overall yield of a site or trial location.

Sometimes ‘checks’ are used to reference a familiar variety to new varieties and may be highlighted in grey or simply referred to as ‘check’ in the results table or summary for the readers convenience.

Data in all replicated trials at WADO has been analyzed by statistical software from either Agrobase Gen II version 16.2.1 software, or Analyze-it version 2.03 software. Coefficient of variation and least significant difference at the 0.05 level of significance was used to determine trial variation and mean differences respectively. At this level of significance, there is less than 5% chance that this data is a fluke when considered significant. For differences among treatments to be significant, the p-value must be less than 0.05. A p-value of 0.001 would be considered highly significant.

MCVET Variety Evaluation Trials

The Westman Agricultural Diversification Organization is one of many sites that are part of the Manitoba Crop Variety Evaluation Team (MCVET) which facilitates variety evaluations of many different crop types in this province.

The purpose of the MCVET variety evaluation trials is to grow both familiar (checks or reference) and new varieties side by side in a replicated manner in order to compare and contrast various variety characteristics such as yield, maturity, protein content, disease tolerance, and many others. From each MCVET site across the province, yearly data is created, combined, and summarized in the ‘Seed Manitoba 2011’ guide. Hard copies can be found at most MAFRI and Ag Industry Offices. A digital version is available online at www.seedmb.ca

Winter Wheat

Locations:

Boissevain, MB
Cooperator: Armstrong Seeds Location: SE 6-3-19 W1
Previous Crop: Mustard Soil Texture: Clay Loam

Crandall, MB
Cooperator: Kendall Heise Location: SW 33-13-25 W1
Previous Crop: Canola Soil Texture: Clay Loam

Reston, MB (plot lost due to establishment issues)
Cooperator: Elliott Bros. Location: NE 1-7-28 W1
Previous Crop: Canola Soil Texture: Clay Loam

Soil Tests:

Depth	0-6"				6-24"		pH
Nutrient	N	P	K	S	N	S	
Location	lbs/ac	olsen ppm	ppm	lbs/ac	lbs/ac	lbs/ac	
Boissevain	21	14	379	24	33	42	7.5
Crandall	30	8	169	64	51	90	7.5

Objectives

- To evaluate yield and qualities of different varieties of winter wheat for use in food, fuel and feed markets.
- To expand the current industry for value-added processing opportunities
- To grow winter wheat in several locations across SW Manitoba to assess climate and soil type differences among variety yields.

Methods

This trial consisted of 12 varieties of winter wheat in plots that were 1.44 m wide by 9 m long. Varieties were organized in a randomized complete block design. Variety plots were replicated three times. Plots were direct seeded September 28 at a depth of ¾". Total fertilizer applied was 50 lbs. nitrogen, and 30 lbs phosphorus in the form of granular 11-52-0 and liquid 28-0-0 as well as granular 46-0-0 (67 lbs N as spring broadcast, April 20). Plots were maintained for weeds with a broadleaf and grassy herbicide product at recommended timing and rates. Plots were harvested at full maturity in mid August. Grain yield was recorded by the HarvestMaster GrainGauge for total plot weight, moisture and test weight.

Results

There were significant differences at both Crandall and Boissevain locations. Low coefficients of variation (CV%) indicate good data. Yields were generally consistent at both sites in terms of percent of Falcon (Check). Large variation specifically with CDC Raptor, CDC Buteo, McClintock, between sites with these varieties yielding much lower compared to the check in Crandall than Boissevain. Ptarmigan, Sunrise, Accipiter and DH99W19H*16 were generally high yielding at both sites.

Variety	Crandall Yield kg/ha	Crandall % of check	Crandall bu/ac	Crandall Protein %	Boissevain Yield kg/ha	Boissevain % of check	Boissevain bu/ac	Boissevain Protein %	Average Yield kg/ha
Canada Western Red Winter									
CDC Falcon (CHECK)	5847	100	87	11.0	4640	100	69	9.9	5244
CDC Raptor	5903	76	66	11.2	5271	114	79	10.4	5587
CDC Buteo	5689	79	69	11.1	4962	107	74	10.6	5325
McClintock	5449	69	60	10.6	5158	111	77	10.6	5303
Canada Western General Purpose									
Accipiter	6013	103	90	10.9	5488	118	81	9.7	5750
Broadview	5741	98	85	10.6	5346	115	79	9.8	5544
Sunrise	6608	113	98	10.1	5433	117	81	9.1	6020
CDC Ptarmigan	7013	120	104	9.7	6112	132	91	9.0	6562
Peregrine	5787	99	86	10.7	5372	116	80	10.0	5579
Varieties proposed or tested for registration (GP)									
DH99W19H*16	6456	110	96	11.0	5446	117	81	10.0	5951
DH99W18I*45	5651	97	84	11.1	5355	115	79	9.5	5503
DH00W31N*34	5633	96	84	10.8	5718	123	85	9.8	5675
CV%		7.0				7.5			
Grand Mean	5983		89		5358		89		
LSD (p<0.05)	712	12	10		680	13	9		
P value		0.0055				0.036			
R-Square		0.76				0.72			

Comments

Varieties in table proposed or tested for registration are derived from the Department of Plant Sciences at the University of Manitoba.

Sunrise is a soft red kernel type. CDC Ptarmigan, Accipiter and CDC Ptarmigan have soft white kernels typically high in starch and lower in protein than other winter wheats. Broadview, Accipiter and Peregrine are hard red kernel types. CDC Kestrel, CDC Clair, CDC Harrier, CDC Raptor and CDC Falcon all will be moved from the Canada Western Red Winter (CWRW) class to the Canada Western General Purpose (CWGP) class August 1, 2013. CDC Buteo, McClintock and Radiant are eligible varieties for the CWB's 2010-2011 CWRW select wheat contracting program. It is important to keep in mind the marketing limitations with some of these Winter Wheat varieties.

Spring Wheat

Partners:
Westman Agricultural Diversification Organization
Seed Manitoba

Location:

Melita, MB
Cooperator: Wayne White — Location: NE 36-3-27 W1
Previous Crop: Canola — Soil Texture: Loamy

Soil Test	N	P	K	S	pH
Depth	lbs/ac	ppm (olsen)	ppm	lbs/ac	
0-6"	15	11	373	18	7.8
6-24"	39			48	
0-24"	54			66	

Objective

To evaluate and demonstrate different varieties of Canada Western Red Spring, Canada Prairie Spring Red, Canada Western Extra Strong, and Canada Western Hard White wheats to support the high quality food demand, feed wheat, ethanol and other industries for yield potential and protein content. This variety data is used to support the province wide data set published in Manitoba's Seed Guide for 2010.

Methods

The trial consisted of 22 varieties in plots that were 1.44 m wide x 8.5 m long. Varieties were organized in a randomized complete block design. Varieties were replicated three times. Plots were direct seeded May 17th at a depth of 1". Fertilizer was applied at 80 lbs/ac nitrogen in the form of liquid 28-0-0, and 30 lbs/ac phosphorous in the form of granular 11-52-0. Plots were maintained weed free using herbicides Buctril M and Axial at rates of 0.4 L/ac and 0.243 L/ac. Plots were desiccated with glyphosate at a rate of 1 L/ac on August 27. Plots were harvested at full maturity on September 3. Protein samples were analyzed from composite samples of each variety. Data collected includes vigor, height, leaf disease, maturity, lodging, yield and test weight. Leaf disease was assessed July 28th, visually as a single plot observation using the McFadden Scale (1-11) where 1 is disease free and 11 where the leaves are completely covered in lesions. Yield and leaf disease will be summarized.

Results

There were significant yield and leaf disease differences among varieties. Greatest yield was from Minnedosa and NRG010. Keep in mind, these are general purpose "feed" wheats and as such have limited market opportunities. Smallest yields were from AC Barrie, CDC Abound, and Stettler. Leaf disease pressure was high in 2010 and may have contributed to the large differences among yields. Low yielding varieties generally had high leaf disease incidence while high yielding varieties had low leaf disease incidences. Protein content varied normally with classes of wheat. General purpose wheats were low in protein. Settler was the highest protein wheat however was the lowest in yield.

		Mean Yield				Leaf	
Variety	Class	kg/ha		bu/ac	% of Check	Disease	Protein %
Minnedosa	CWGP	4810	a	71	199	9.0	12.8
NRG010	CWGP	4236	ab	63	175	9.7	12.8
Glenn	CWRS	4001	bc	59	166	7.7	14.3
BW878	Proposed CWRS	3964	bc	59	164	9.7	14.4
5603HR	CWRS	3961	bc	59	164	6.7	14.5
Unity VB	CWRS	3952	bc	59	164	8.7	14.0
Kane	CWRS	3809	bcd	57	158	8.3	14.6
WR859 CL	CWRS	3795	bcd	56	157	9.7	14.3
Carberry	CWRS	3695	bcd	55	153	9.3	14.4
Fieldstar VB	CWRS	3597	bcd	53	149	8.3	14.8
Muchmore	CWRS	3541	cde	53	147	10.0	14.7
Goodeve VB	CWRS	3429	cdef	51	142	10.3	14.3
Glencross VB	CWES	3409	cdef	51	141	9.3	14.2
5602HR	CWRS	3223	def	48	133	9.0	14.4
CDN Bison	CWES	3218	def	48	133	9.7	13.7
Shaw VB	CWRS	2884	efg	43	119	11.0	13.7
Sadash	CWSW	2803	fgh	42	116	10.0	10.6
AC Barrie	CWRS	2416	ghi	36	100	10.7	14.2
CDC Abound	CWRS	2202	hi	33	91	11.0	14.7
Stettler	CWRS	1831	i	27	76	11.0	15.4
	CV%	11.9				9.9	
	LSD (p<0.05)	669		10	20	1.6	
	P value	<0.00001				0.001	
	GRAND MEAN	3404		51		9.5	

CWGP – Canada Western General Purpose
CWRS – Canada Western Red Spring
CPSR – Canada Prairie Spring Red
CWSW – Canada Western Soft White
CWES – Canada Western Extra Strong

Pictures: Plot of AC Barrie (left) showing significant leaf disease compared to Glenn (right) that is much greener, with less disease. Plots were not sprayed with a fungicide in accordance with MCVET protocols.

Oats

Partners:
Westman Agricultural Diversification Organization
Seed Manitoba

Site Location:

Melita, MB
Cooperator: Wayne White   Location: NE 36-3-27 W1
Previous Crop: Canola   Soil Texture: Loamy

Soil Test Depth	N lbs/ac	P ppm (olsen)	K ppm	S lbs/ac	pH
0-6"	9	16	287	14	7.9
6-24"	24			48	
0-24"	33			62	

Objective

To evaluate and demonstrate varieties of oats for yield and protein for milling, food processing and expand the current industry for value-added processing opportunities.

Methods

This trial consisted of 7 varieties of hulled oats in plots that were 1.44 m wide by 8.5 m long. Varieties were organized in a randomized complete block design and replicated three times. Plots were direct seeded May 26 at a depth of 5/8". Fertilizer was applied at 80 lbs/ac nitrogen in the form of liquid 28-0-0, and 30 lbs/ac phosphorous in the form of granular 11-52-0. Plots were maintained weed free using Buctril M at rates of 0.4 L/ac applied June 9. Plots were desiccated with an application of Roundup Transorb on August 23 at a rate of 1 L/ac. Plots were harvested at full maturity September 4. Protein samples were analyzed from composite samples of each variety. Data collected includes vigor, height, leaf disease, maturity, lodging, yield and test weight. Leaf disease was assessed visually as a single plot observation using the McFadden Scale (1-11) where 1 is disease free and 11 indicates the leaves are completely covered in lesions. Lodging data can be made available upon request. Yield and leaf disease will be summarized.

Results

Oat yields were exceptionally high in Melita. Yields were also exceptionally high across the province in these MCVET trials. There were significant yield, bushel weight and leaf disease differences among oat varieties.

	Mean Yield						
Variety	kg/ha		bu/ac	% of Check	Protein (%)	BuWt lbs/bu	Leaf Disease
Souris	6218	a	162.9	105.0	11.8	39.1	10.3
Triactor	6201	ab	162.4	105.0	11.3	36.1	10.0
Leggett	5920	abc	155.1	100.0	12.6	37.9	10.0
Stainless	5791	abc	151.7	98.0	12.0	36.2	10.0
Summit	5762	abc	150.9	97.0	12.0	36.7	11.0
Bradley	5361	cd	140.4	91.0	12.0	35.6	8.7
CDC Minstrel	5052	d	132.3	85.0	10.3	33.7	11.0
CV%	5.6					3.0	4.1
LSD (p<0.05)	560		14.7	10.0		1.9	0.7
P value	0.0052					0.0016	0.0001
Grand Mean	5716					36.5	10.0

Variety ‘Souris’ was the highest grain yielding variety but was not significantly different from Triactor, Leggett, Stainless, and Summit. Lowest yielding varieties were CDC Minstrel and Bradley. Bushel weight was greatest also with Souris and Leggett. Lowest bushel weight was in CDC Minstrel at 33.7 lbs/bu. Leaf diseases were highly significant, however they did not appear to affect yield. Protein content was highest for Leggett in Melita. After 77 site years of MCVET Oat testing across Manitoba, Leggett has shown to have the highest protein content overall.

Barley

Partners:
Westman Agricultural Diversification Organization
Seed Manitoba

Site Location:

Melita, MB
Cooperator: Wayne White — Location: NE 36-3-27
Previous Crop: Canola — Soil Texture: Loamy

Soil Test	N	P	K	S	pH
Depth	lbs/ac	ppm (olsen)	ppm	lbs/ac	
0-6"	17	9	301	26	7.9
6-24"	27			72	
0-24"	44			98	

Objective

To evaluate varieties of barley for feed and malting processing and to expand the current industry for value-added processing opportunities.

Methods

This trial consisted of 22 varieties in plots that were 1.44 m wide x 8.5 m long. Varieties were organized in a randomized complete block design. Variety plots were replicated three times. Plots were direct seeded May 17 at a depth of 1”. Fertilizer was applied at 80 lbs/ac nitrogen in the form of liquid 28-0-0, and 30 lbs/ac phosphorous in the form of granular 11-52-0. Plots were maintained weed free using herbicides Buctril M and Achieve applied June 9 and June 16, respectively. Plots were desiccated with glyphosate at a rate of 1 L/ac on August 16. Plots were harvested at full maturity August 27. Data collected includes vigor, height, leaf disease, maturity, lodging, yield and test weight.

Results

Unfortunately the Melita Barley data was not included into Seed Manitoba’s 2011 Seed Guide due to several reasons including:

1. Unusually, there were no significant yield differences among the barley varieties at Melita.
2. There were some missing harvest data points.
3. The R-squared statistic was low indicating that data was not very sound.
4. The Melita “means” appear to not follow the provincial averages.

That being said the CV% for the plot was very acceptable and the plot itself looked okay so the data can be used as a guide but should be used with caution.

		Mean Yield			Provincial*	
Variety	Market	kg/ha	bu/ac	% of Check	% of Check	*Protein%
Desperado	F	6870	122	108	113	12.8
CDC Mindon	F	6743	120	106	105	13
CDC Clyde	MF	6727	120	106	114	12.5
CDC Kamsack	MF	6551	117	103	106	12.5
Norman	MF	6469	115	102	105	13.1
Bentley	MF	6431	115	101	110	12.5
CDC Meredith	MF	6376	114	100	105	12.4
Major	MF	6368	113	100	114	12.6
AC Metcalfe	MF	6350	113	100	100	12.9
CDC ExPlus	Hulless	6336	113	100	88	12.6
Tradition	MF	6222	111	98	111	13.1
Stellar-ND	MF	6222	111	98	107	12.9
TR07728	F	6208	111	98	111	12.3
Cerveza	MF	6196	110	98	115	12.5
CDC Austenson	F	6107	109	96	122	12.2
CDC Mayfair	MF	6045	108	95	114	12.8
Celebration	MF	5785	103	91	111	13.4
Chigwell	F	5756	103	91	108	12.3
Merit 57	MF	5690	101	90	106	12.5
CDC Reserve	MF	5684	101	90	108	12.2
CDC Carter	Hulless	5307	95	84	96	13.5
HB705	Hulless	5274	94	83	88	12.6
CV%		11.6				
LSD (p<0.05)		N/S	N/S	N/S		
P value		0.38				
Grand Mean		6169	110			
R-square		0.36				

* 2010 Provincial average

Durum

Partners:
Westman Agricultural Diversification Organization
Seed Manitoba

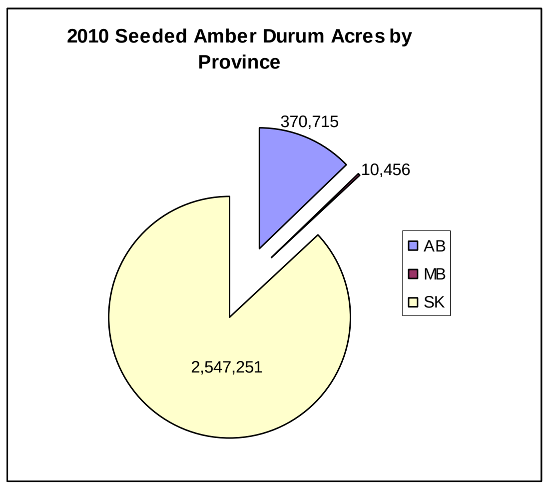
Site Location:

Melita, MB
Cooperator: Wayne White — Location: NE 36-3-27
Previous Crop: Canola — Soil Texture: Loamy

Soil Test Depth	N lbs/ac	P ppm (olsen)	K ppm	S lbs/ac	pH
0-6"	15	11	373	18	7.9
6-24"	39			48	
0-24"	54			66	

Background

Manitoba Durum production has been minimal as of late due to its poor price and higher susceptibility to Fusarium head blight (FHB) and leaf diseases linked to southern Manitoba's unique climate. FHB not only affects final yield potential by shriveling kernels, it also produces deoxynivalenol (DON) toxins. Durum is also easily downgraded because of other fungal diseases so this has limited its acreage in Manitoba as well. Durum wheat regained popularity in 2007 and 2008, so there was a revival of the MCVET Durum wheat trials and they were brought back into the spotlight. Producer interest in durum remains concentrated in the SW corner of Manitoba. Another new variety developed by AAFC in Swift Current named DT801 was tested in the 2010 trials. In 2010, according to the CWB Seeded Acreage Report there were only 10,000 acres of Durum planted divided among 23 permit books, in Manitoba. Compare this to Saskatchewan whom had over 2.5 million acres declared in 6440 permit books.



Methods

This trial consisted of 6 varieties in plots that were 1.44 m wide x 8.5 m long. Varieties were organized in a randomized complete block design. Variety plots were replicated three times. Plots were direct seeded May 17 at a depth of 1". Fertilizer was applied at 80 lbs/ac nitrogen in the form of liquid 28-0-0 and 30 lbs/ac phosphorous in the form of granular 11-52-0. Buctril M and Achieve applied June 9 and June 16, respectively. Plots were harvested at full maturity August 27. Data collected includes vigor, height, leaf disease, maturity, lodging, yield and test weight. A composite sample of each variety was analyzed for protein content.

Results

There were no significant yield differences among varieties. This is the third consecutive year where there have been no significant differences among durum varieties at WADO's Melita research site.

	Yield				
Variety	kg/ha	lbs/ac	bu/ac	% of Check	Protein %
Eurostar	4903	4367	73	120	13.4
Brigade	4709	4194	71	116	13.0
DT801	4357	3881	65	107	13.6
Enterprise	4273	3806	64	105	13.9
Strongfield	4074	3629	61	100	14.0
CDC Verona	4056	3613	61	100	13.8
CV%	7.8				
LSD (p<0.05)	NS	NS	NS	NS	
P value	0.066				
Grand Mean	4395		65	107	
R-Square	0.75				

Discussion

Durum is highly susceptible to FHB and other cereal diseases. If grown in Manitoba, strict production management practices should be exercised. These measures may include crop rotation cycles and field stubble selection, timely use of fungicides, seed treatments, and attention to weather patterns, humidity and temperature. Varieties used in this trial and others found in the Manitoba Seed Guide are rated as poor or very poorly resistant to FHB, therefore, these management practices are a must to follow. However, it goes without saying that these practices must also make economic sense.

Annual Forage Trials

Cooperators:
Manitoba Forage Council
Seed Manitoba
Westman Agricultural Diversification Organization

Site Location:

Melita, MB

Cooperator: Wayne White — Location: NE 36-3-27 W1

Previous Crop: Canola — Soil Texture: Loamy

Soil Test	N	P	K	S	pH
Depth	lbs/ac	ppm (olsen)	ppm	lbs/ac	
0-6"	10	9	186	24	8
6-24"	33			114	
0-24"	43			138	

Background

Annual forages provide a short term solution with maximum production potential for livestock without having to establish perennial forages more suited for long term feedstocks or that may be in short supply.

There are many annual crops and options available to producers provided they make their plans early in the growing season. When planting annuals early in the spring, producers can take advantage of spring moisture, cooler conditions, less evaporation and larger selection of crops which can be used.

Manitoba operates the Forage Cultivar Evaluation Program. This program has several testing sites including Arborg, Rosebank, Roblin, Hamiota, Minnedosa, Boissevain and Melita. The objective of the evaluation program is to provide information to Manitoba producers and industry partners in the performance of annual and perennial forage cultivars under regional Manitoba conditions. The program measures dry matter yields of annuals under a one-cut per year system combined with feed tests to estimate feed quality. These results are available in this report (from Melita) and in the Manitoba Seed Guide (from all sites).

Crops types tested in Melita include barley, oats, triticale, foxtail and proso millet.

Methods

This trial consisted of 28 entries in plots that were 1.44 m wide x 8.5 m long. Each crop type was organized in a randomized complete block design. Variety plots were replicated four times. Plots were direct seeded May 20 at a depth of 5/8”. Fertilizer was applied at 90 lbs/ac nitrogen in the form of liquid 28-0-0, and 30 lbs/ac phosphorous in the form of granular 11-52-0. On May 28, just prior to emergence plots were sprayed with Roundup and Liberty, both at a rate of 1 L/ac. Barley & triticale plots were maintained weed free using Buctril M and Achieve at rates of 0.4 L/ac and 0.2 L/ac applied June 9 and June 16, respectively. In crop herbicides were not used in Oats and Millets (very few weeds to deal with). Plots were harvested at early dough stage with a Swift Current plot forage harvester. Wet weights were taken at the plot sites; samples were dried to determine moisture content in order to determine total dry matter from original harvest weights. Samples varieties were combined into composite form and used to determine forage quality using the 2FF forage test (Central Testing Labs, Winnipeg, MB). Forage quality values reported are from the Melita composite samples representing on a dry matter (DM) basis.

Table: Annual Forage Trial Yield and Feed Quality parameters from the Melita site.

		Mean Yield DM		Feed Quality Parameters* (%)							Net Energy
Crop	Variety	kg/ha	lbs/ac	RFV	ADF	NDF	TDN	CP	Ca	P	Gain (mCal/kg)
Barley	Desperado	11348	10108	75	47.0	64.9	54.7	5.1	0.29	0.16	0.57
	CDC Austenson	11005	9802	95	35.9	59.7	60.2	8.4	0.26	0.19	0.74
	AC Ranger (Check)	10892	9702	79	43.8	64.9	56.3	5.4	0.43	0.17	0.62
	Vivar	10705	9535	87	39.3	62.4	58.5	6.8	0.45	0.18	0.69
	Chigwell	10544	9391	85	40.8	62.8	57.8	7.0	0.36	0.15	0.66
	Xena	10272	9149	91	38.7	60.2	58.8	7.4	0.35	0.20	0.70
	Champion	10222	9104	86	41.6	61.1	57.4	5.8	0.28	0.17	0.65
	CDC Mindon	9986	8894	93	38.0	59.6	59.2	6.7	0.34	0.17	0.71
	CDC Cowboy	9936	8849	91	38.3	60.4	59.0	6.5	0.38	0.24	0.70
	Trochu	9812	8739	126	29.1	48.7	63.6	8.0	0.29	0.21	0.84
	CV%	12									
	Grand Mean	10472	9327								
	LSD (p<0.05)	1877	1672								
Oat	Triactor	12337	10988	85	40.4	63.0	58.0	6.5	0.21	0.22	0.67
	Triple Crown	11763	10477	70	48.5	67.8	54.0	5.6	0.32	0.18	0.54
	AC Ranger (Barley)	10655	9491	71	47.6	67.9	54.4	5.1	0.54	0.14	0.56
	AC Mustang	10063	8963	81	41.3	64.9	57.6	6.8	0.22	0.22	0.66
	CDC Baler	10028	8932	75	44.7	67.0	55.8	6.4	0.30	0.22	0.60
	AC Assiniboia	9512	8472	88	40.8	60.5	57.8	10.0	0.19	0.24	0.66
	CV%	13									
	Grand Mean	10841	9656								
	LSD (p<0.05)	2045	1821								
Triticale	Tyndal	9067	8075	86	40.4	61.9	58.0	8.3	0.14	0.22	0.67
	Bunker	9512	8472	87	40.4	61.8	58.0	8.7	0.15	0.23	0.67
	Bumper	8812	7848	86	40.2	62.5	58.1	8.7	0.20	0.21	0.67
	Banjo	10170	9059	90	37.9	61.4	59.2	9.4	0.17	0.27	0.71
	AC Ranger (Barley)	9933	8847	102	35.5	55.6	60.4	6.2	0.28	0.20	0.75
	CV%	11									
	Grand Mean	9499	8460								
	LSD (p<0.05)	1592	1418								
Proso Millet	Yellow Proso	6074	5410	81	40.2	66.1	58.1	9.6	0.22	0.21	0.67
	Red Proso Cerise	5875	5233	79	43.0	65.1	56.7	9.7	0.32	0.22	0.63
Foxtail Millet	Green Proso Crown	5573	4964	82	39.2	65.9	58.6	10.0	0.18	0.23	0.69
	Golden German	5341	4757	90	37.9	61.3	59.2	9.6	0.20	0.23	0.71
	Siberian Red	4988	4443	87	39.4	62.2	58.5	6.5	0.20	0.24	0.69
	CV%	10									
	Grand Mean	5570	4961								
	LSD (p<0.05)	861	767								

*Acronyms: RFV - Relative Feed Value, ADF - Acid Detergent Fiber
NDF - Neutral Detergent Fiber, TDN - Total Digestible Nutrients,
CP - Crude Protein, Ca - Calcium, P - Phosphorous

Western Manitoba Soybean Adaptation Trial

Partners:
Manitoba Pulse Growers Association
Seed Manitoba
Westman Agricultural Diversification Organization

Site Location:
Melita, MB

Cooperator: Gary Serruys | Location: NE 36-3-27 W1
Previous Crop: Spring Wheat | Soil Texture: Loamy-Clay

Soil Test Depth	N lbs/ac	P ppm (olsen)	K ppm	S lbs/ac	pH
0-6"	23	9	328	24	7.7
6-24"	33			72	
0-24"	56			96	

Wawanesa, MB

Cooperator: Ellis Seeds | Location: NW 35-7-17
Previous Crop: Summer fallow | Soil Texture: Clay Loam

Soil Test Depth	N lbs/ac	P ppm (olsen)	K ppm	S lbs/ac	pH
0-6"	16	14	408	14	6.8
6-24"	39			46	
0-24"	55			60	

Background

Recent research from Manitoba Agriculture, Food and Rural Initiatives has found that when moisture becomes limited, soybean plants shut down growth and force themselves into early maturity. Bean development is still finished but yields are lowered (unpublished data). In other words when soil moisture becomes limited in late summer soybean plants will hurry up maturity but reduce yields. This can be looked at two ways: the first point is if late summers become dry soybean yields can be reduced – probably more than many other crops we grow. However, the second point is that soybeans will still produce mature seeds in dry conditions and quality will be maintained.

The season of 2009 saw the first expansion of the soybean insurable acres into the more western part of the province. For more information about the areas of the province able to insure soybeans please visit the MASC website at: http://www.masc.mb.ca/

Objective

To evaluate and demonstrate soybean varieties in Southwest Manitoba.

Methods

Trials consisted of 10 varieties of glyphosate tolerant varieties arranged in a randomized complete block design. Varieties were replicated three times. Agronomic parameters for establishment and growing season are summarized in the table below. Seed was inoculated with Rhizobia just prior to planting.

Site	Seeding Date	Plot Size m^2	Depth	Fertilizer Applied	Herbicides	Harvest Date
Melita	18-May	12.96	1.5"	30 lbs/ac P (11-52-0)	Treflan, Credit, Select	05-Oct
Wawanesa	07-Jun	12.96	5/8"	30 lbs/ac P (11-52-0)	Treflan, Credit	08-Oct

Data collected included height, and test weight. Plots were harvested with a Hege plot combine at full maturity and yield was determined with the combine yield monitor system (Harvest Master Classic GrainGauge). Composite samples were used to determine seed size and oil content (results available in 2011).

Results

There were no significant yield differences among varieties at each site. The Melita site yielded over 1172 kg/ha more than Wawanesa. The Melita site had standing water throughout the plot at least 4 times during the growing season. At times we thought the plot was lost because of this water but in the end the yields were amazing. The soybean plants at Melita appeared stunted from all the moisture but by harvest they were mostly pods and seeds. In Melita, overall yields were higher likely because of the earlier seeding date compared to Wawanesa. However, despite the June 7th seeding date at Wawanesa we still achieved excellent yields there as well. There were significant differences among days to maturity (>95% Brown Pods) between varieties. Days to maturity did not correlate ($p = 0.45$, $r = 0.27$) in any shape or form to the company rated heat unit value.

Variety	Company Heat Units	Days to Maturity	DTM of Rosco	Melita kg/ha	Melita bu/ac	Melita % of Check	Wawanesa kg/ha	Wawanesa bu/ac	Wawanesa % of Check
RR Rosco	2450	125.3	0	4982	74	113	4120	61	119
IsisRR	2400	122.7	-3	4585	68	104	4045	60	117
LS 0036RR	2425	128.3	3	4919	73	111	3692	55	107
900Y71	2400	128.0	3	5225	78	118	3321	49	96
NSC Warren RR	2350	121.3	-4	5057	75	114	3403	51	99
PS 0027 RR	2425	124.0	-1	4564	68	103	3827	57	111
LS 0028RR	2375	128.3	3	4787	71	108	3523	52	102
S00-W3	2450	121.7	-4	4474	66	101	3418	51	99
24-60RY	2475	130.0	5	4425	66	100	3455	51	100
NSC Argyle RR	2450	125.0	0	4419	66	100	2910	43	84
	CV%	2.3		7.9			12.4		
	LSD (p<0.05)	5.0		NS			NS		
	Grand Mean	125		4743.5			3571.4		
	P value	0.014		0.15			0.10		

Comments

The Wawanesa site suffered deer getting into the northwest few plots late in season and this may have contributed to slightly higher than normal variation within the trial. In Melita, the site was underwater several times during the growing season. Yield was obviously not affected by this flooding as this has been WADO's best soybean yields since our trials began over 10 years ago.

Growers should pay close attention to maturity data evaluated from local research trials and compare to the heat ratings claimed by the appropriate seed companies.

Picture: Soybean variety trial at Melita. Excellent yields were observed despite being flooded several times (note: standing water in the trial).

Peas

Partners:
Manitoba Pulse Growers Association
Seed Manitoba
Westman Agricultural Diversification Organization

Site Location:

Melita, MB
Cooperator: Gary Serruys — Location: NW 35-7-17
Previous Crop: Spring Wheat — Soil Texture: Clay Loam

Soil Test Depth	N lbs/ac	P ppm (olsen)	K ppm	S lbs/ac	pH
0-6"	11	15	388	16	7.8
6-24"	12			78	
0-24"	23			94	

Objective

To assess varieties of peas including green, yellow, maple, silage types for yield potential in the Southwest region of Manitoba.

Methods

The trial consisted of 29 varieties (+1 fill) in plots that were 1.44 m wide x 8.5 m long. Varieties were organized in a 5x6 Rectangular Lattice and blocks were replicated three times. A pre-seed burn-off was applied day of seeding with glyphosate and a pre-emergent herbicide Rival. Plots were direct seeded in wheat stubble at a depth of 1.5” on May 10. Seed was inoculated with Rhizobia and phosphate was applied at 30 lbs/ac from 11-52-0. Plots were maintained weed-free with Select and Odyssey applied at a rate of 120 mL/ac and 17 g/ac, applied June 14 and June 24, respectively. Plots were desiccated August 16 with Reglone at a rate of 0.9 L/ac. Plots were harvested August 20. Data collected included plant emergence, leaf disease rating, height, and days to maturity. Plots were harvested for grain yield with a Hege plot combine. Test weight, sample moisture, and total plot weight were collected.

Results

There were significant differences among pea varieties (Table).

Table: Varieties of peas are grouped by market type (yellow, green, maple, forage, Dun) then by descending yield for that type.

Market Class	Variety	Yield			
		kg/ha	lbs/ac	bu/ac	% of Check
Yellow	CDC Meadow	4916	4379	73	125
	CDC 2093-22	4585	4084	68	117
	CDC 1897-14	4420	3936	66	113
	Thunderbird	4325	3852	64	110
	Eclipse	4306	3836	64	110
	CDC Hornet	4281	3813	64	109
	CDC Prosper	4234	3771	63	108
	Hugo	4181	3724	62	107
	CDC Golden	4172	3716	62	106
	Polstead	3984	3548	59	102
	Sorento	3955	3523	59	101
	Argus	3949	3517	59	101
	Agassiz	3717	3311	55	95
	Cutlass	3386	3016	50	86
	CDC Bronco	3264	2907	48	83
	CDC Treasure	3063	2729	45	78
Green	CDC 1932-201	4626	4120	69	118
	CDC Striker	4418	3935	66	113
	CDC 2235-4	4194	3736	62	107
	Cooper	4102	3654	61	105
	CDC Tetris	4002	3564	59	102
	CDC Pluto	3922	3493	58	100
	CDC Patrick	3587	3195	53	91
	Mendel	3136	2793	47	80
Maple	JSC43001	3927	3498	58	100
	CDC 1816-4	2493	2221	37	64
Forage	CDC 1681-11	3663	3263	54	93
	Stella	3370	3001	50	86
Dun	CDC 2098-20	5069	4515	75	129
	CV%	13.2			
	LSD ($p<0.05$)	852	759	13	22
	P value	0.00002			
	Grand Mean	3960	3527		
	R-Square	0.63			

Sunflower Variety Trials

Partners:
Westman Agricultural Diversification Organization
Seed Manitoba
National Sunflower Association of Canada

Site Location:

Goodlands, MB
Cooperator: Jack Edwards — Location: NW 30-1-23
Previous Crop: Spring Wheat — Soil Texture: Loamy

Soil Test Depth	N lbs/ac	P ppm (olsen)	K ppm	S lbs/ac	pH
0-6"	48	6	285	12	7.8
6-24"	81			30	
0-24"	129			42	

Background

As part of WADO's support for special crops, WADO partnered up with the National Sunflower Association to test Sunflower varieties in Western Manitoba. A site was established 5 miles north of the Goodlands Customs in a producer's sunflower field on the east side of highway #21. The plot was set up to determine the various aspects of weight, oil content, screen seed size distribution, and final yield.

Methods

Test design:	Randomized complete block design for each type
Treatments:	8 confectionary and 11 oil types
Replications:	Four
Plot size:	1.524 m x 9 m
Row Spacing:	29.5" x 4 rows/plot
Plant Spacing:	Seeded heavy rate with air seeder then thinned out stand at 8" (oilseed) and 10" (confectionary) between plants in row
Seeding date:	June 2, 2010
Fertilizer applied:	Sideband: 10 lbs/ac N. from 28-0-0 and 30 lbs/ac P. from 11-52-0. Producer applied 80 lbs/ac N in early spring
Herbicide applied:	Treflan, Liberty, Authority (115 ml/ac), Assert (0.35 mL/ac), and Select.
Insecticide:	Not Applied
Harvest date:	October 19, 2010
Product handling:	Each plot was harvested with only the two middle rows of the four being used. Plot samples were weighed and moisture was determined

Data Collected: Height, disease rating, lodging, maturity (R9), Oil content, seed size, screen seed size distribution, test weight, final yield

Results

Confectionary

There were significant differences between varieties among mean yield, days to maturity (DTM), height, and bushel weight. In terms of yield, variety 'Panther' was significantly greater compared to all other varieties. Low yield in variety 'RH3126 RT' may be due to the small head diameter coupled with the difficulty in threshing observed in this variety compared to the other varieties. This variety also is distinctly a long seeded type and was the tallest variety in the trial. RH3126 RT is a Royal Hybrid® from CHS Sunflower Inc.

Variety	Yield lbs/ac		DTM days	Height cm	Bushel Wt lbs/bu
Panther DMR	1846	a	116	179	22.7
Jaguar	1627	b	117	154	21.3
6946 DMR	1605	b	116	177	21.4
X9151	1548	b	116	175	24.0
6946	1523	b	116	166	22.8
RH400 CL	1476	b	117	179	21.2
179	1187	c	121	186	20.2
RH3126 RT	813	d	121	195	20.9
CV%	9.8		1.0	6.8	5.2
LSD (p<0.05)	211		2	18	1.7
P value	0.0001		<0.0001	0.0042	0.0025
Grand Mean	1453		117	176	22

Note: DMR – Downy Mildew Resistant
CL – Clearfield™ Tolerant

Oilseed

There were significant yield and bushel weight differences between varieties. Variety 'X9828' was the highest yielding variety but was not significantly different from others like Cobra, Defender Plus, 63M80, and 63N82. The lowest yielding variety was 803 DMR NS with a yield of only 427 lbs/ac. According to observations at harvest, this variety appeared to be plagued by *Sclerotinia* with an incidence of at least 80% infection, and as a result lodged severely.

Variety	Yield lbs/ac		DTM days	Height cm	Bushel Wt lbs/bu
X 9828	1843	a	118	167	25.3
Cobra	1795	ab	117	168	23.9
Defender Plus	1744	ab	117	165	27.0
63M80	1729	ab	119	177	23.7
63N82	1717	ab	118	177	26.5
2930 NS DM	1354	c	117	171	27.2
3433 DM	1328	c	119	166	27.0
3480 NS CL DM	1311	c	118	173	23.3
306 DMR NS	1275	c	118	171	24.7
3080 DMR NS	1254	c	119	169	24.2
803 DMR NS	427	d	117	160	25.2
CV%	15.3		1.3	4.8	3.9
LSD (p<0.05)	319		NS	NS	0.5
P value	<0.0001		0.17	0.17	<0.0001
Grand Mean	1434		118	169	25

Discussion

In general the entire trial had lower overall yields compared to other sites in Manitoba. Reasons for lower yield may be due to poor seed fill development in the centers of the heads. Cool & wet weather during flowering may have diminished effective pollination activity. The plot did have some hail damage early in the season and also there was some localized flooding within the plot at certain times over the growing season.

Photo (left): Long seeded variety 'RH3126 RT'.

Photo (right): Middle two rows of the four row plot were harvested. Fallen heads cut by combine header are picked up after the combine and put back into the combine. Every head is important for final yield.

Corn Variety Trials:

Partners:
Westman Agricultural Diversification Organization
Seed Manitoba
Manitoba Corn Growers Association

Site Location:
Melita, MB
Cooperator: Brian Greig   Location: NE 4-4-26 W1
Previous Crop: Grazed Corn   Soil Texture: Sandy Loam, stony

Soil Test Depth	N lbs/ac	P ppm (olsen)	K ppm	S lbs/ac	pH
0-6"	26	19	358	12	7.4
6-24"	120			24	
0-24"	146			36	

Background

Growing grain corn comes with a high risk investment and a significant gamble on the weather. In 2009, this risk was clearly expressed with much of the Province's Corn crop destroyed before harvest. Later planted corn was especially unfortunate with greater issues in mold, poor dry down, and poor forage quality. Manitoba's grain corn crop was substantially better in 2010, however there are still a few corn fields waiting to be harvested in spring 2011.

Planting date, corn heat unit rating, and new performing hybrids can offer some sort of resilience to grain corn production risks.

This was the second year WADO has joined forced with the Manitoba Corn Growers Association to conduct a grain corn variety trial for the southwest region of Manitoba.

Objective

To assess various hybrid corn varieties for grain production entering into the feed, food, and ethanol markets.

Methods

Trial consisted of 18 RR Corn varieties grown in a randomized complete block design replicated three times. Plot size was 3 m wide by 9 m long. Four rows were planted at 29.5" spacing and seeded at a heavy rate at 1.5" depth. Plots were fertilized with 100 lbs/ac N (28-0-0) and 30 lbs/ac P (11-52-0). Plants were thinned at the three leaf stage to accommodate 8" between plants. Plots were kept weed free with the use of Roundup Transorb applied at 0.75 L/ac on June

24. Plots were harvested for yield October 21. Samples were bagged and weighed, moisture and bushel weight recorded.

Results

There were no significant yield or moisture differences among corn varieties. There were significant differences in bushel weight among varieties.

				2010 Results			2-Year Average (2009 - 2010)	
Hybrid	**CHU**	**Traits***	**Distributor**	**Yield (bu/ac)**	**Moisture (%)**	**Density (lbs/bu)**	**Yield (bu/ac)**	**Moisture (%)**
P7213R	2050	RR2	Pioneer Hi-Bred	73	23.8	47.9	87	26.7
N04A-3000GT	2050	CB, LL, RW, GT	Syngenta Seeds	79	28.7	45.7	-	-
N05C-GT	2050	GT	Syngenta Seeds	86	21.7	51.8	-	-
P7535R	2100	RR2	Pioneer Hi-Bred	80	24.4	44.6	87	29.8
39B61	2100	RR2	Pioneer Hi-Bred	83	28.0	44.5	82	31.7
P7443R	2100	RR2	Pioneer Hi-Bred	90	21.1	47.1	-	-
LR 9975RR	2150	RR2	Delmar Commodities	69	25.9	41.9	76	33.7
LR 9074RB	2150	YGCB, RR2	Delmar Commodities	77	25.2	45.0	79	32.3
DKC26-79	2150	YGCB, RR	Monsanto Canada	76	25.8	45.2	85	32.9
P7535HR	2150	HX1, LL, RR2	Pioneer Hi-Bred	89	22.9	45.0	-	-
39D95	2175	RR2	Pioneer Hi-Bred	91	23.6	45.0	94	27.1
DKC27-33	2200	YGCB, RR	Monsanto Canada	93	22.2	49.1	95	29.6
A4240RR	2200	RR2	PRIDE Seeds	87	23.5	45.4	-	-
HL R208	2225	RR	Hyland Seeds	79	27.4	45.1	87	30.2
HL B18R	2250	BT, RR	Hyland Seeds	88	25.5	48.0	-	-
39B94	2250	HX1, LL, RR2	Pioneer Hi-Bred	84	26.1	45.2	93	29.5
			Site Average	83	24.7	46.0		
			CV%	11.0	12.7	4.6		
			Sign Diff	No	No	Yes		
			LSD (p<0.05)	-	-	4		

Traits – BT, HX1, CB, YGCB – are resistant to European Corn Borer; RR, RR2 – are Roundup herbicide tolerant; GT – glyphosate herbicide tolerant; LL – Liberty herbicide tolerant; RW – resistant to rootworm

Final yields were adjusted to 15% moisture in the table that is listed here. However, moisture values are included as insight into harvest conditions applicable to those varieties.

Discussion

For more information about corn production, market development, research and education please visit the Manitoba Corn Growers Website at: http://www.manitobacorn.ca and MAFRI: www.gov.mb.ca/agriculture

Industrial Hemp Fibre and Grain Trial – Manitoba

Locations: WADO - Melita, MB PESAI - Arborg, MB
CMCDC - Carberry, MB PCDF - Roblin, MB

The actual location of the WADO hemp site was one mile NW of the Goodlands Port in a field of hemp belonging to Dave Stewart on the SE 11-1-24 W1. The site is labeled as "Melita" in this report for continuity with previous year's reports.

Cooperator: MCVET

Background

Fibre – Around the world, hemp has traditionally been grown for the fibre. Canada is really the main country that has created a hemp economy around hemp grain and hemp grain processing.

Hemp plants are composed of bast fibre and hurd. The bast fibre is the long, strong fibres around the outside of the plant (often compared to "bark" of a tree) and comprise about 30 – 35% of the total plant make up. Hurd is the short fibre that is found in the middle of the plant and is the other component of the stem.

To date, Canada has a very small fibre processing industry with small plants in Manitoba and Ontario. A large decortication plant is currently under construction in Gilbert Plains. There are 3 or 4 initiatives across Canada that are looking at the feasibility and financing of hemp decorticating plants, however, at time of publishing none have been announced or started building.

This project is to evaluate hemp varieties that may produce high biomass with a high fibre yield. This will give processors a baseline of production that can be expected from growing various varieties for fibre production.

This project is part of a national "characterization" trial with locations in other provinces. Data from other locations is not available at this time and will be reported on later.

Grain - Amino acids are the building blocks of protein, and hemp seed contains the complete spectrum, including all eight essential proteins. As well, hemp seed contains a healthy oil content rich in polyunsaturated fats, as well as Essential Fatty Acids (EFAs), notably Omega 3 and Omega 6. EFAs are not made by the human body and must be acquired through ones diet. Hemp is also one of the few plants like Borage and Evening Primrose that have Gamma Linolenic Acid (GLA) in their fatty acid profile. GLA helps regulate such common conditions as: cardiac function, insulin balance, mood stability, skin and joint health.

Hemp seed can be eaten in many forms. The seed is crushed to produce hemp oil; the seed cake leftover from the crush is processed into flour. The whole seed can be enjoyed toasted, and for other uses, processors remove the seed shell to create hulled seed that can be an added ingredient in many recipes.

Hemp grain processed this way can be used to make a number of healthy food products including: bread, pasta, chips, dips, cheese substitutes, salad dressings, spreads, ice cream and lactose-free milk.

The industrial hemp grain trials located in Manitoba were in Dauphin, Melita, Carberry and Arborg. These trials were also included in the national "characterization" trial that was coordinated by Gordon Scheifele, Tavistock, Ontario. A total of 16 sites were chosen in Alberta, Saskatchewan, Manitoba, Ontario, and Quebec. This is the second year of these trials. Data from the rest of the Canada trials is not available at this time.

Presently there are 5 grain contractors located in Manitoba that are helping to process, market and increase the demand for grain production. They are located in Winnipeg, Ste. Agathe, McGregor, Rossendale, and Waskada.

Objective
To evaluate industrial hemp varieties in terms of fibre and grain yield.

Design, Materials & Operation
Plots were established in Dauphin, Melita (Goodlands), Carberry and Arborg. Due to extremely wet conditions the plots in Dauphin and Arborg had to be abandoned.

Table 1. 2010 Industrial Hemp Fibre and Grain Trial (Manitoba)

	Melita	**Carberry**
Treatments	11 varieties (Table 1)	11 varieties (Table 1)
Replication	4	4
Plot size	1.44m x 11.44m	1.2m x 7m
Test design	Randomized complete block design	Randomized complete block design
Seeding date	June 1	May 19
Seeding rate	250 seeds/m^2	250 seeds/m^2
Fertilizer applied	80 lbs. actual N, 30 lbs. actual P	100 lbs. actual N
Harvest date	Fibre – August 11 & 20 Grain - September 14	Fibre – September 17 Grain - September 17

For the fibre portion of this trial, a $1m^2$ sample from each plot was cut and bound individually using a Mitsubishi Rice Harvester. Each sample was then dried, stripped of leaves and stems, weighed and recorded. The grain yield from the remaining $4m^2$ of each plot was harvested with a Hege plot combine, individually bagged and weight recorded.

Table 2. 2010 Industrial Hemp Fibre and Grain Trial (Manitoba) Varieties – Melita, MB and Carberry, MB

Petera	Alyssa	Jutta
Carmen	Anka	Canda
Delores	Joey	CRS-1
CFX-1	CFX-2	

Table 3. 2010 Spring Soil Nutrient Analysis (AgVise Laboratories) from 0-24" Depth.

	Melita		Carberry	
	Soil Test (lbs/ac)	**Fertilizer Applied (actual lbs/ac)**	**Soil Test (lbs/ac)**	**Fertilizer Applied (actual lbs/ac)**
N*	48	87 lbs/acre	40	100 lbs/acre
P	8	30 lbs/acre	13	
K	436		240	
S*	42		30	

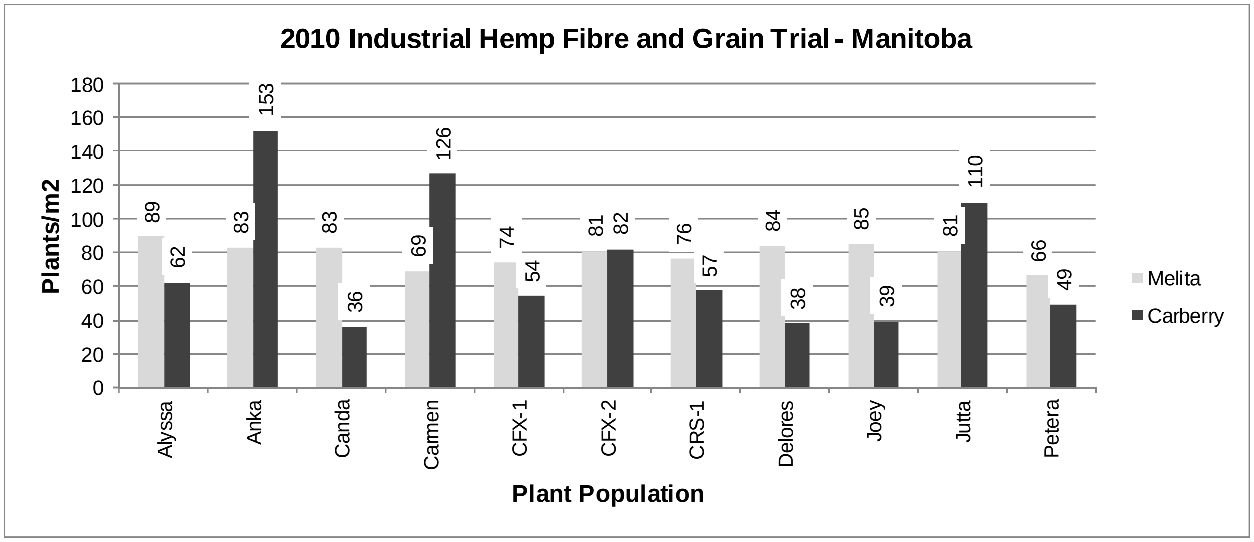
* Nitrate – N * Sulphate – S

Results

Plant Population

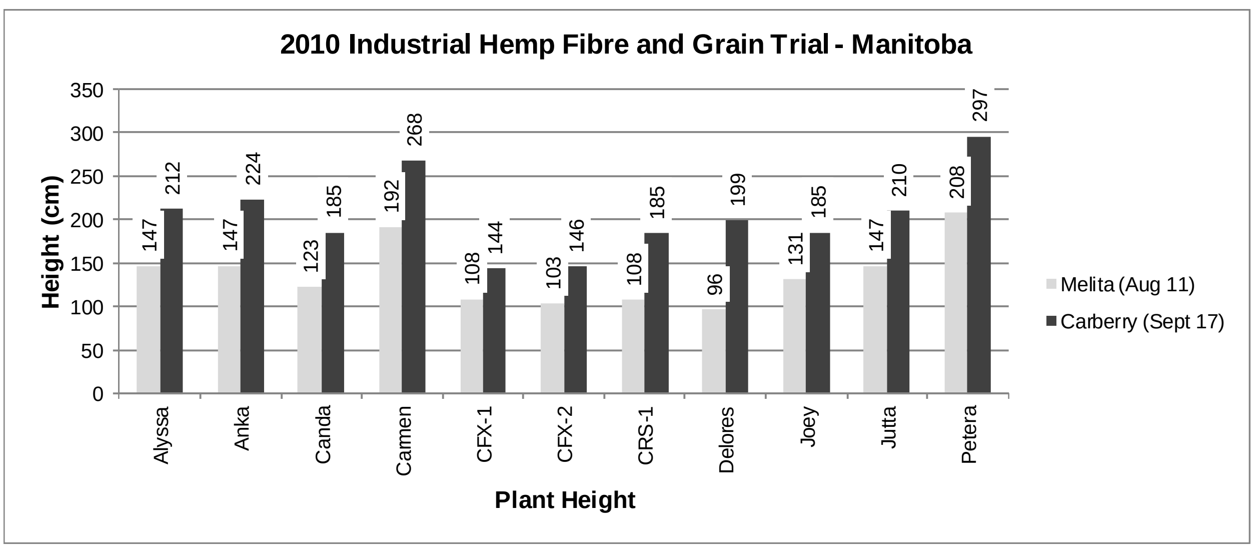
To produce high yielding, high quality hemp, hemp stalks need to be the equivalent diameter of a pencil. To achieve this, a high plant population is desired. Target seeding rates in the plots were 250 plants per square metre. To achieve that target, the plots were seeded at a rate of 30 pounds per acre. Typical emergence rates for the plots are expressed in the table below. At this population, the maximum yield potential was expressed. Also it is important to maintain a high population to ensure there are smaller stem diameters.

Chart 1. 2010 Industrial Hemp Fibre and Grain Trial (Manitoba) – Average Plant Population (plants/m^2) – Melita, MB and Carberry, MB



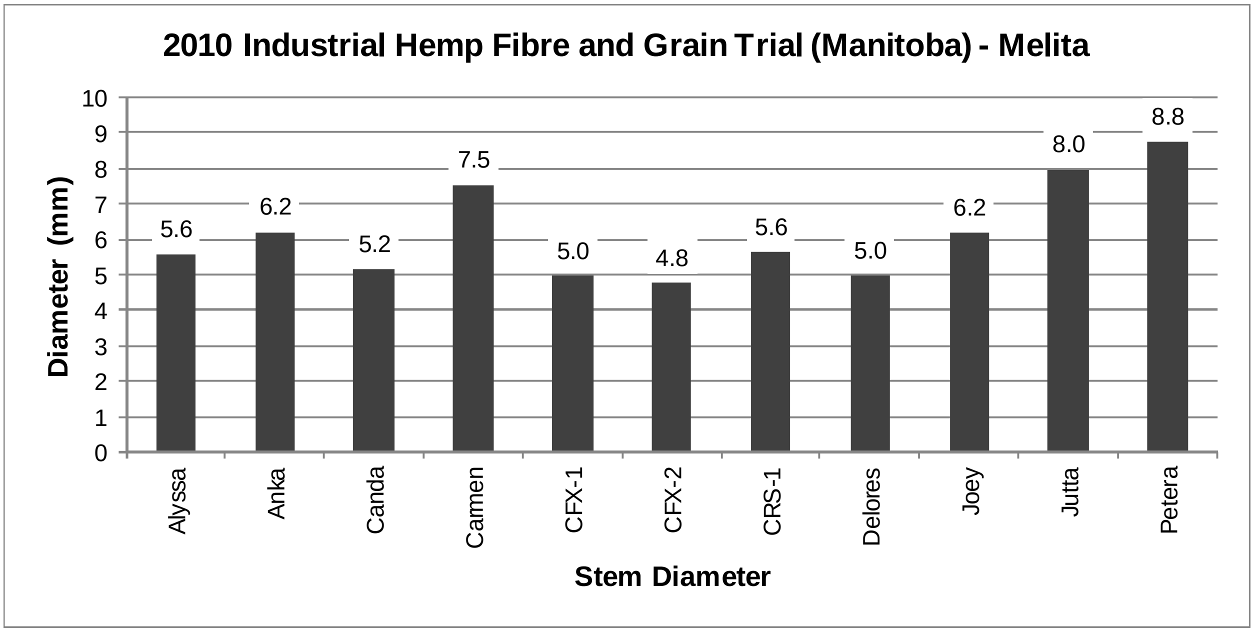
Plant Height - Height of the hemp crop is one factor that contributes to the fibre yield of hemp. There are both variety and geographical differences to be aware of when the crop is harvested for fibre.

Chart 2. 2010 Industrial Hemp Fibre and Grain Trial (Manitoba) – Average Plant Height (cm) – Melita, MB and Carberry, MB



Stem Diameter – The desirable hemp stem diameter for fibre processing is 10mm or less. This size of stem is easy to decorticate and will yield higher bast fibre than hurd. The bast fibre has a higher economic value as it is used in more applications than hurd.

Chart 3. 2010 Industrial Hemp Fibre and Grain Trial (Manitoba) – Average Stem Diameter (mm) – Melita, MB*



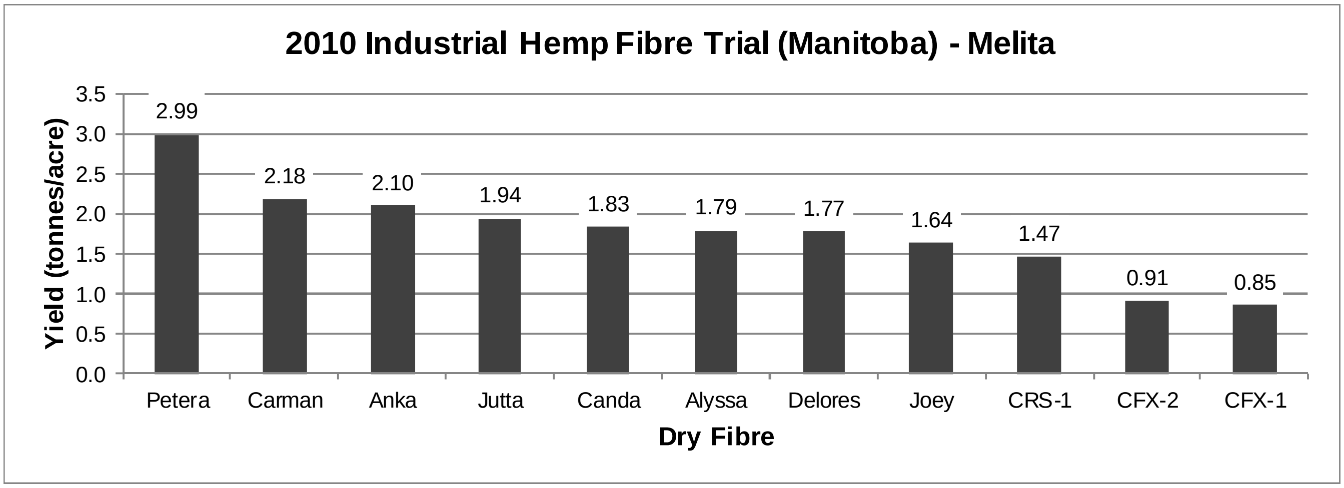
* Carberry site had a higher than acceptable CV%.

Table 4. 2010 Industrial Hemp Fibre and Grain Trial (Manitoba) – Dry Fibre Yield (kg/ha)* - Melita, MB**

Variety	Melita Fibre Yield (kg/ha)
Petera	7391
Carman	5387
Anka	5180
Jutta	4800
Canda	4524
Alyssa	4421
Delores	4386
Joey	4041
CRS-1	3626
CFX-2	2245
CFX-1	2107
CV = 15.30%	
LSD = 977.27	

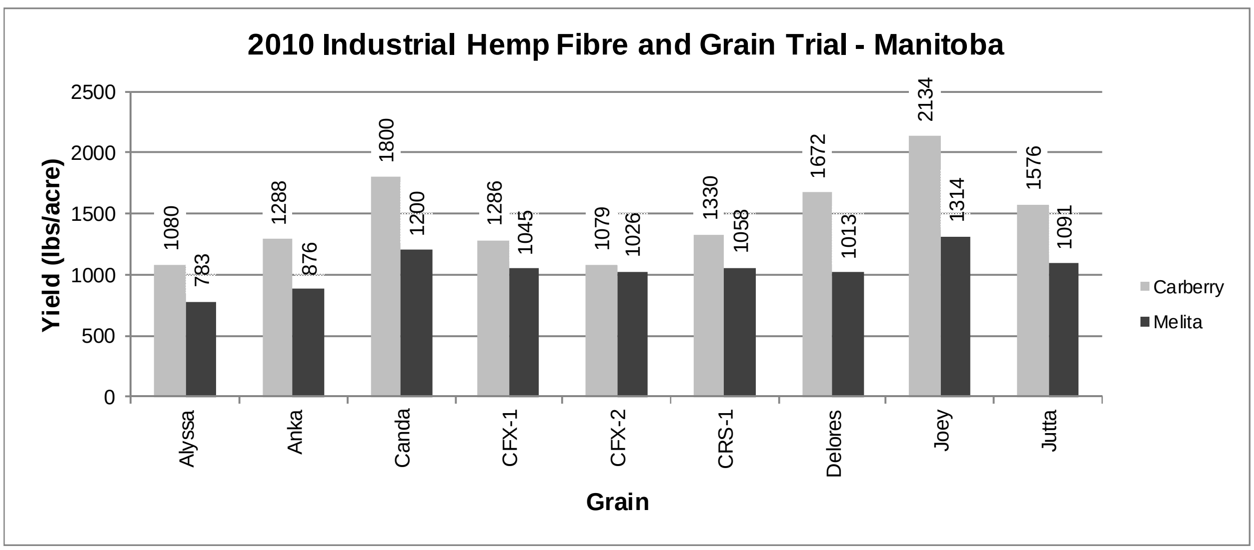
* Stalks only – all short stems and leaves removed
****** Carberry site had a higher than acceptable CV%.

Chart 4. 2010 Industrial Hemp Fibre and Grain Trial (Manitoba) – Dry Fibre Yield (tonnes/acre) – Melita, MB**



** Carberry site had a higher than acceptable CV%.

Chart 5. 2010 Industrial Hemp Fibre and Grain Trial (Manitoba) – Grain Yield (lbs/acre) – Melita, MB and Carberry, MB



Long Term Data

Always use caution when using a single site year of data. Varieties are tested over a number of years and are entered into the MCVET database for inclusion in the 2011 Seed Manitoba guide. Environmental conditions vary so performance will be variable. The more site years, the more dependable the data.

Table 5. 2010 Industrial Hemp Fibre and Grain Trial (Manitoba) – Seed Manitoba 2011 Grain Yield Summary – Melita, MB and Carberry, MB

INDUSTRIAL HEMP

Comments:

A licence from Health Canada is required to grow Industrial Hemp.

THC testing for some varieties is required.

Please check Health Canada's List of Approved Cultivars (www.hc-sc.gc.ca) to determine status of varieties.

Variety Descriptions

Variety	Yield % Check	Site Years Tested	2010 Yield	2010 Yield: % of Alyssa Carberry	2010 Yield: % of Alyssa Melita
Alyssa	100		100	100	100
Anka	104	5	112	-	112
Carmen	57	1	57	-	57
CFX-1	114	6	125	119	133
CFX -2	113	2	113	100	131
Crag	89	3	-	-	-
CRS-1	121	6	128	123	135
Delores	112	15	144	155	129
Finola~	64	10	-	-	-
Petera	33	1	33	-	33
USO 14	75	13	-	-	-
Varieties that are being tested or proposed for registration					
Canda	133	3	161	167	153
Heidrun	85	4	-	-	-
Joey	185	2	185	198	168
Jutta	123	6	143	146	139
Yvonne	90	4	-	-	-
CHECK CHARACTERISTICS			Alyssa (lb/acre)	1080	783
Alyssa	1267	15	CV%	14.1	9.0
	lb/acre	site years	LSD%	7	13
			Sign Diff	Yes	Yes

Use single site year data with caution.

The more site years indcate performance over a number of locations and years. 20 site years is a target

CV% = Coefficient of Variation. A measure of random variation in a trial. A low CV is desirable.

LSD% = Least Significant Difference. Varieties must differ by the LSD% to be considered significantly different.

Further Information refer to Seed Manitoba www.seedmb.ca

Multi-year data for Manitoba is summarized as a percentage in Table 6 below.

Table 6. 2010 Industrial Hemp Fibre and Grain Trial (Manitoba) – Multi-year Fibre Summary – Melita, MB

Industrial Hemp Fibre

				% of Alyssa
Variety	**Yield % of Check**	**Site Years Tested**	**2010 Yield**	**Melita**
Alyssa	100	15	Alyssa	100
Anka	115	6	Anka	117
Carmen	116	6	Carmen	122
Petera	139	8	Petera	167
USO 14	91	12	USO 14	-
Delores	103	5	Delores	99
Jutta	109	1	Jutta	109
Canda	102	1	Canda	102
Joey	91	1	Joey	91
CRS-1	82	1	CRS-1	82
CFX-2	51	1	CFX-2	51
CFX-1	48	1	CFX-1	48
CHECK CHARACTERISTICS			Alyssa (t/ac)	1.8
Alyssa	4.3	15	CV %	15.3
	t/acre	site years	LSD %Alyssa	9
			Sign Diff	Yes

Important Considerations and Recommendations

Fibre - The yield summary above represent the yield of stalks only. The small stems and leaves are stripped off.

No allowances were made for machine and harvesting losses that would be experienced in commercial production.

Industrial hemp has the potential for producing high biomass and fibre yield per acre. Good fibre yield requires a higher seeding rate than for grain to ensure good plant population resulting in maximum, high quality yield.

The optimum time for fibre only harvest is after pollen set and at the early formation of seed, but prior to any viable seed being formed. At this stage, the fibre content of the plant is mature. Depending on the variety and the year, this will take place between the middle to the end of August. Traditionally, this gives a good window of favorable weather to cut, ret, dry down, and bale the crop before winter.

Grain - The industrial hemp industry as a whole is growing by about 20% per year. There were 8990 acres (MASC seeded acreage reports) grown in Manitoba on 46 farms in 2010.

A number of Canadian varieties are showing significantly higher grain yields than the varieties that were originally introduced at the beginning of the hemp industry in Canada.

Farmers should use long-term, multi-site data as a management tool to select the best, yield-stable varieties. The more site years, especially if they are over more than one season, the more dependable the data will be.

Industrial hemp is a crop that requires a license for possession and production from Health Canada. All varieties must have every field tested for THC each year by the grower unless the variety is specifically exempt by Health Canada. Growers need to check the exemption list.

Early and late varieties will give farmers an opportunity to grow acres and spread out their harvesting due to different harvest maturities.

Conclusions

Fibre - Hemp can produce a relatively high biomass and fibre yield in Manitoba.

More research is needed to identify hemp fibre quality characteristics to capture the crops full potential. As the processing industry develops, quality parameters will be established.

Grain - New hemp varieties adapted to Canadian growing conditions are now established and show good promise of improved grain yields and harvest ease.

Preliminary Food Barley Trial

Lead Scientist:
Agriculture and Agri-Food Canada – Dr. Mario Therrien

Site Location:

Melita, MB — Cooperator: Wayne White
Previous Crop: Canola — Soil Texture: Loamy

Soil Test

Legal Land Location	Nutrient Depth	N lbs/ac	P ppm (olsen)	K ppm	S lbs/ac	pH
NW 31-3-26 W1	0-6"	13	11	222	18	7.8
	6-24"	36			48	
	0-24"	49			66	

Background

Barley is grown for many purposes, but the majority of all barley is used for animal feed, human consumption, or malting. High protein barleys are generally valued for food and feeding, and starchy barley for malting.

Most barley used for food is either pearled barley or barley flour. Prior to the 1500's barley flour was the main ingredient for breads. Only a minor amount of barley is actually used in the production of foods for human consumption, though the ranges of uses for barley within this context are diverse. In some regions of the world, barley is grown for human consumption where other grains do not grow well. When consumed as grain, hulless barley is generally used because the absence of the hull makes the product more palatable and easier to process. Barley can be pearled, which removes the outer layers of the seed and the embryo, followed by processing to produce small rounded pieces of the endosperm. Covered barley can also be de-hulled, milled, and polished to remove the bran layers, to produce a rice like product. Pearled and polished barley are used in porridges and soups and as rice substitutes. Other food uses include barley flakes, flour for baking purposes (either alone or in mixtures with wheat flour) to produce breads and crackers, grits, breakfast cereals, pilaf, noodles, and baby foods. Lastly, some barley is used for the production of distilled spirits such as whiskey, vodka, and gin, and for making vinegar and malted beverages.

Barley is an excellent food choice for those concerned about type 2 diabetes or pre-diabetes because the grain contains essential vitamins and minerals and is an excellent source of dietary fiber, particularly beta-glucan soluble fiber.

Research shows that barley beta-glucan soluble fiber promotes healthy blood sugar by slowing glucose absorption. For example, findings from a clinical trial published in the December 2006 edition of Nutrition Research showed that mildly insulin-resistant men who ate muffins containing barley beta-glucan soluble fiber experienced significant reductions in glucose and insulin responses, compared to responses after eating muffins made with corn starch. In a clinical study reported in the August 2006 edition of the Journal of the American College of Nutrition, data showed that subjects who ate cookies and crackers made with barley flour enriched with beta-glucan soluble fiber also experienced significant reductions in glucose and insulin responses compared to responses after eating the same products made with whole wheat flour. A long-term study published in the August 2007 edition of the Diabetes Research and Clinical Practice journal reported a 30-percent decrease in HbA1c (average blood glucose level) in type 2 diabetics who consumed a healthy diet including pearl barley that supplied 18 grams of soluble fiber a day.

Regardless of the form of the grain, there is always a ready source of beta-glucan soluble fiber in barley. Unlike many grains which contain fiber only in the outer bran layer, barley contains fiber throughout the entire kernel. So whether it's whole grain or processed barley products, dietary fiber, including beta-glucan soluble fiber, is available in amounts that have a positive impact on improving blood glucose levels (National Barley Foods Council n.d.).

Objective

- To evaluate yield and quality, early lines barley suitable for human consumption.

Methods

Plot area was burnoff with Credit and Spike-up applied at a rate of 1 L/ac and 4 g/ac, respectively. Varieties were seeded on May 17 in a randomized complete block design replicated three times. Seed depth was 1" deep and fertilizer was sideband at a rate of 80 lbs/ac N (liquid 28-0-0) and 30 lbs/ac P (granular 11-52-0). Plots were kept weed free using Buctril M herbicide at a rate of 0.4 L/ac applied June 9 and Achieve applied at a rate of 0.2 L/ac on June 16. Plots were harvested August 17 at maturity.

Results

There were significant differences among variety yields (Figure 1). Coefficient of variation was low indicating a good data set. In Melita, generally the milling barleys were highest yielding and yielded similar. The waxy barleys like 'Fibar' and 'H255-22' were lower yielding than the milling types. There were also differences among heading date, crop height, visual plant rating (vigor), disease incidence, lodging, maturity and overall yield among combined site data (Table 1).

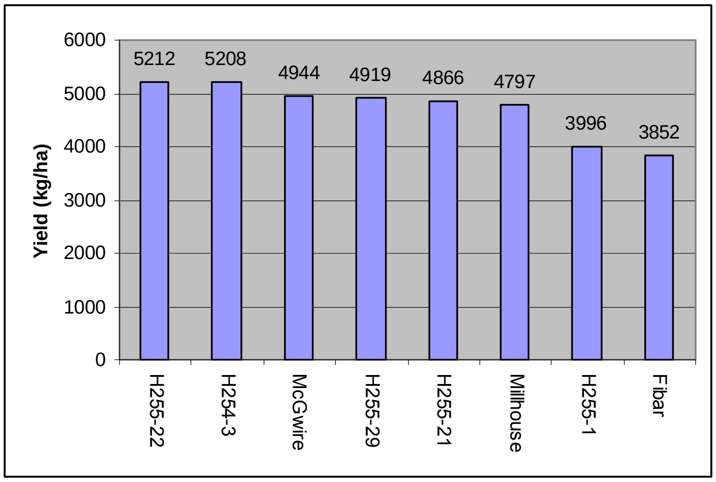


Figure 1: Yield values for preliminary food barley varieties at Melita, 2010. CV%= 8.7, LSD (p<0.05) 717 kg/ha.

Table 1: 2010 Preliminary Food Barley Trial – Manitoba Multi-site Summary of Results at Brandon, Hamiota, Roblin and Melita

Entries	Type	Head[1]	Hght[2]	Lodg[3]	Rate[4]	DisLoad[5]	Mat[6]	Yield[7]	%McGw
Millhouse	millck	63.5	83.7	4.0	7.3	5.4	85.8	4535.0	100
McGwire	yldck	65.0	78.0	2.3	4.8	4.9	89.6	4556.1	100
Fibar	waxck	62.8	83.7	5.0	6.8	4.9	84.1	3666.2	80
H254-3	mill	64.7	80.6	4.7	7.0	5.3	88.1	4526.8	99
H255-1	mill	64.0	80.2	3.7	6.8	5.4	86.0	3911.4	86
H255-21	mill	64.0	82.3	5.3	7.3	5.0	85.6	4527.8	99
H255-22	waxy	58.0	80.5	5.0	8.0	5.6	83.7	4840.8	106
H255-29	mill	64.5	80.1	2.3	7.3	5.4	85.9	4404.5	97
Grand Mean		63.3	81.1	4.0	6.9	5.2	86.1	4371.1	
LSD (p<0.05)		2.8	9.6	1.7	0.5	0.9	4.6	446.9	
CV%		4.4	11.9	40.9	7.2	16.3	5.3	10.5	

[1] Head = Days from seeding to 50% heading
[2] Hght = Height in cm
[3] Lodg = Lodging: Scale 1 = fully erect; 9 = fully flat
[4] Rate = Overall visual score: Scale 1 to 10; 1= very poor; 10 = excellent
[5] DisLd = Disease load: Scale 1 = no disease; 9 = heavy disease,
[6] Mat = Days from seeding to 50% maturity
[7] Yield = Grain yield in kg/ha

Conclusion

Food barley is a small, niche market that is handled by a few companies with specific interests in food barley products. Producers should first secure a grower contract prior to growing food barley, as food barley is rarely sold as an open market commodity.

Reference

National Barley Foods Council. "Health and Nutrition." Barley Foods. n.d. Available Online: http://www.barleyfoods.org/nutrition.html

Advanced Food Barley Trail

Lead Scientist:
Agriculture and Agri-Food Canada – Dr. Mario Therrien

Site Location:
Melita, MB — Cooperator: Wayne White
Previous Crop: Canola — Soil Texture: Loamy

Soil Test

Legal Land Location	Nutrient Depth	N lbs/ac	P ppm (olsen)	K ppm	S lbs/ac	pH
NW 31-3-26 W1	0-6"	13	11	222	18	7.8
	6-24"	36			48	
	0-24"	49			66	

Background

Hulless barley is used as both human food and animal feed, and this distinction is reflected in the grading system. Grain destined for human consumption should be:

- free of hulls (5 per cent or less) 60 lb/bu
- free of cracked and broken kernels (4 per cent or less)
- fully mature
- appear bright, clean and free of diseased, frosted, sprouted or stained kernels (Government of Alberta, 1999)

WADO had 7 entries in the Advanced Food Barley trial this season. Three of these entries were check varieties.

Objective

Evaluate and demonstrate hulless barley as an alternative crop for the food industry.

Methods

Plot area was burnoff with Credit and Spike-up applied at a rate of 1 L/ac and 4 g/ac, respectively. Varieties were seeded on May 17th in a randomized complete block design replicated three times. Seed depth was 1" deep and fertilizer was sideband at a rate of 80 lbs/ac N (liquid 28-0-0) and 30 lbs/ac P (granular 11-52-0). Plots were kept weed free using Buctril M herbicide at a rate of 0.4 L/ac applied June 9 and Achieve applied at a rate of 0.2 L/ac on June 16. Plots were harvested August 17 at maturity.

Results

There were significant differences among variety yields (Figure 1). Coefficient of variation was low indicating a good data set. In Melita, generally the milling barleys were highest yielding and yielded similar. The waxy barleys like ‘Fibar’ and ‘H255-22’ were lower yielding than the milling types, except H243-26 which had an exceptional yield, and is a waxy barley. There were also differences among heading date, crop height, visual plant rating (vigor), disease incidence, lodging, maturity and overall yield among combined site data (Table 1).

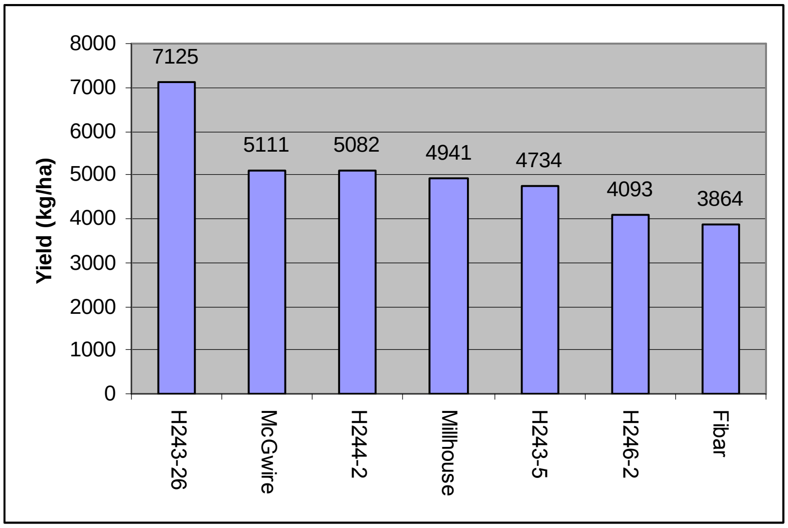


Figure 1: Yield values for advanced food barley varieties at Melita, 2010. CV%= 4.5, LSD (p<0.05) 392 kg/ha.

Table 1: 2010 Advanced Food Barley Trial – Manitoba Multi-site Summary of Results at Brandon, Hamiota, Roblin and Melita

Entry	Type	Head[1]	Hght[2]	Lodg[3]	Rate[4]	DisLoad[5]	Mat[6]	Yield[7]	%McGw
Millhouse	millck	64.5	80.2	4.7	6.3	5.3	84.2	3864.0	101.0
McGwire	yldck	63.5	77.1	2.0	6.0	5.1	90.2	3818.6	100.0
Fibar	waxck	62.2	83.6	6.3	6.5	5.3	86.7	3410.4	89.0
H243-26	waxy	62.8	84.6	6.3	7.3	6.1	86.4	4212.8	110.0
H243-5	mill	61.0	75.4	2.7	6.3	5.5	83.1	3647.7	96.0
H244-2	feed	64.2	76.9	4.0	6.5	5.5	84.8	3871.6	101.0
H246-2	mill	64.8	81.0	3.3	6.0	5.6	87.1	3389.9	89.0
Mean		63.3	79.8	4.2	6.4	5.5	86.1	3745.0	
LSD		3.0	7.6	2.1	0.9	1.3	4.4	319.0	
CV		4.7	9.5	49.3	14.3	24.0	5.1	9.0	

[1] Head = Days from seeding to 50% heading
[2] Hght = Height in cm
[3] Lodg = Lodging: Scale 1 = fully erect; 9 = fully flat
[4] Rate = Overall visual score: Scale 1 to 10; 1= very poor; 10 = excellent
[5] DisLd = Disease load: Scale 1 = no disease; 9 = heavy disease,
[6] Mat = Days from seeding to 50% maturity
[7] Yield = Grain yield in kg/ha

Conclusions

Results show that there are three promising two-row hulless lines that may become varieties in 3 to 5 years. H243-26 is a waxy-endosperm food barley with outstanding yields, but has a lodging problem in high-production environments. It may be better suited to low-production environments where disease pressure is less and quality can be maintained. H243-5 is a flour-producing food two-row hulless line that is similar in yield to the checks, but offers better lodging resistance and improved quality (data not shown). H244-2 is actually a feed two-row hulless with very low hull retention (data not shown).

Hulless food barley is a small, niche market and has remained so for about the last decade. Growing this type of barley is advisable only if the producer can secure a contract directly with a mill that utilizes food barley in its operations.

Reference

Government of Alberta. "Information, Harvesting Hulless Barley." Government of Alberta, Agriculture and Rural Development. November 1, 1999. Available Online: http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex99

Alternative Use Barley Demonstration

Lead Scientist: Dr. Mario Therrien - Agriculture and Agri-Food Canada

Location: WADO River site at Melita – Wayne Whites

Background

This demonstration has a total of 15 barley varieties grown to demonstrate to producers new non-malting barleys. Not all areas in Manitoba are suited to growing high quality and malt barley. The varieties showcased in this demonstration give producers options to utilize barley on their farms.

Objective

A demonstration of the newest barley varieties from AAFC including 2 and 6 row hulless, forage, malt and grazing varieties.

Methods

Plot area was burnoff with Credit and Spike-up applied at a rate of 1 L/ac and 4 g/ac, respectively. Varieties were seeded on May 17th in three blocks and were not replicated Seed depth was 1” deep and fertilizer was sideband at a rate of 80 lbs/ac N (liquid 28-0-0) and 30 lbs/ac P (granular 11-52-0). Plots were kept weed free using Buctril M herbicide at a rate of 0.4 L/ac applied June 9 and Achieve applied at a rate of 0.2 L/ac on June 16. Plots were harvested August 17 at maturity.

Results

This test is designed only for demonstration to highlight some of the new, and potentially new, barley varieties that may become available to producers in the near future. Although yields were recorded they will not be included in this report as this was not a replicated trial. The table below describes the varieties demonstrated in more detail.

Variety	Description
Alston	New six-row feed cultivar from Viterra
SR309	New six-row feed developed jointly between AAFC Brandon and ECORC Ottawa
Champion	New two-row feed cultivar from Viterra
AC Ranger	Established six-row forage barley from AAFC Brandon - most widely grown
Desperado	Newest six-row forage cultivar from AAFC Brandon
CDC Cowboy	New two-row forage cultivar from the CDC in Saskatoon
Binscarth	New specialized forage-grazing barley cultivar from AAFC Brandon
FB015	Unique extended grazing barley from AAFC Brandon in Co-op testing
Millhouse	Canada's first milling food barley; no longer commercially available
HB 122	Newest two-row hulless food cultivar; replacement for Millhouse
CDC McGwire	Established two-row hulless feed cultivar - mainly for use in poultry
CDC Lophy-I	Specialized low phytate two-row hulless feed barley from CDC
Major	New two-row malting cultivar from AAFC Brandon
Celebration	Newest six-row malting cultivar from Anheuser-InBev
SR310	New six-row malting variety from AAFC Brandon

Western Feed Grains Development Cooperative - Variety Trial

Partners:
Westman Agricultural Diversification Organization – Melita MB
Prairies East Sustainable Agriculture Initiative – Arborg MB
Parkland Crop Diversification Foundation – Roblin, MB
Ag-Quest Inc. – Minto MB - Carol Evenson, Dana Rourke

WADO Site Locations: Wayne White's – Melita, Soutar Farms - Hamiota

Introduction - partially taken from the WFGDC website: http://www.wfgd.ca

The formation of this cooperative was initiated as an alternative approach to filling a void that existed in feed wheat varieties. For over forty years there have been attempts by both public and private groups to develop and license a feed wheat variety which, until recently, were unsuccessful. These failed attempts were largely due to the traditional approach taken by breeders that has stringent KVD requirements for variety licensing. Some of the cultivars developed by the cooperative will be exempt from licensing and KVD requirements, as seed will be supplied to members only. Grain will be sold only to members and will be used exclusively for livestock feed or ethanol production within a closed loop. Other cultivars developed by the Cooperative have been submitted for registration under the new Canada Western General Purpose wheat class.

Wheat as a feed grain has historically been supplied by default. Poor weather conditions and disease determine the availability of supply. By developing feed wheat cultivars, livestock producers will have a continuous, predictable supply of grain without compromising high value grain for feed. New high yielding cultivars with low FHB and low protein will increase feed value and farm gate revenues, lower feed costs, and reduce the reliance on imported feed grains, both provincially and internationally.

Development of these new cultivars will also create a better feedstock for the production of ethanol. This value-added opportunity will help satisfy the Provincial and Federal Government's objectives to increase the supply of ethanol-blended gasoline in Canada.

This WFGDC cooperative is currently offering memberships (through their website) to both grain producers and end users of the grain. Membership fees collected will finance the research necessary for such development. Feed wheat cultivar releases are anticipated in approximately five to seven years from the time the first crosses are made, and some varieties developed by the Co-op are very close to public release at this time.

Since some of the feed wheat varieties will not be registered, it is imperative that all members enter contracts which state clearly that any grain produced will not enter the export market, they will only sell to recognized members of the Co-op, and the grain will only be used for livestock feed and ethanol production.

Feed grain development is not limited only to feed wheat, as many feed grain varieties could be developed in the future through this cooperative.

In 2010, yield trials featuring the best lines currently being developed by the Co-op were evaluated against some of the current standards. Field plot trials were conducted in Melita, Roblin, Hamiota, and Arborg. In addition to straight yield per acre they were also tested for higher than normal starch content. Some of the WFGDC varieties are being bred to fulfill this specific need for higher starch in addition to higher yields.

Methods

A variety trial was located at four sites in Manitoba: Melita, Roblin, Hamiota, and Arborg. Plots were arranged in a randomized complete block design replicated three times. The Melita site was slightly different than other sites in that the trial replications were split in half so that one side would be sprayed with fungicide and the other not. Hamiota, Arborg and Roblin did not have fungicide applications. Melita site was planted into a loamy soil on Souris River bottom located on NE 36-3-27 W1, while the Hamiota site was planted on a Newdale Clay loam soil at NW 7-15-23 W1. Soils in Arborg and Roblin are clay and loamy textures, respectively. Seeding dates, seeding fertility, weed control, and harvest dates varied among sites (Table 1). Unfortunately, plots were lost in Arborg due to extreme seasonal flooding, and those plots will not be included in this report.

Table 1: Seeding date, fertility regime, weed control and harvest information for Hamiota, Roblin, and Melita sites.

Site	Seed Date	Fertilizer Applied	Weed Control	Date of Application	Harvest Date
Melita	26-May-10	80 lbs/ac N & 30 lbs/ac P	Buctril M & Axial	June 9 & 16	21-Sep-10
Hamiota	03-Jun-10	80 lbs/ac N & 30 lbs/ac P	Axial & Everest	June 23 & 30	07-Oct-10
Roblin	19-May-10	47 lbs/ac N & 33 lbs/ac P	Axial and Fronline	June 9.	27-Sep-10

* Applied at recommended rates

Soil tests were taken prior to seeding at each site (Table 2). Considerable nitrate values were available at the Hamiota and Roblin sites compared to the Melita and Arborg sites.

Table 2: Soil nutrient profiles of Melita, Hamiota, Roblin sites at 0-6" and 6-24" depths.

	0-6"				6-24"	
Site/Depth	N	P	K	S	N	S
Nurient	lbs/ac	ppm (olsen)	ppm	lbs/ac	lbs/ac	lbs/ac
Melita	17	15	395	22	30	48
Hamiota	16	19	385	28	66	90
Roblin	67	12	249	64	138	132

In Melita, Tilt 250E, a propiconazaole formulation, was used as the fungicide to control leaf diseases at recommended rates. The fungicide was split into two applications. The first application was on July 7, and the second was on July 15, at the booting and flag leaf emergence stages, respectively.

Data collected included height, leaf disease severity, test weight and final yield. Disease ratings were taken in Melita before application of the fungicide. Final yields were adjusted for 14.5% moisture content. In Melita, disease was rated as one rating per plot based on the McFadden Scale (AAFC, McLaren, Brandon, MB). All site data was analyzed with a two-way analysis of variance (Analyze-it version 2.03 statistical software, Microsoft) to test data means for significance according to each location. A paired t-test was also performed to compare variety response yield means to fungicide application versus without fungicide application.

Results

There were significant yield differences at both harvestable sites at the 0.05 level of significance according to the analysis of variance (Table 3). Coefficient of variation was relatively low at all sites indicating a good data set except for Melita sprayed plots with a CV of 19%. Grand mean for each site was as follows: 4169 kg/ha in Roblin, 4482 kg/ha in Melita (without fungicide), and 3837 kg/ha in Hamiota. There was no yield data developed at the Arborg site because of extensive flooding in that region once again in 2010. Keep in mind the seeding date at Hamiota was quite late on June 3rd but this provided useable results if you were seeding these varieties late in the future.

Table 3: Shows the mean yields of the Hamiota, Roblin, and Melita wheat yields. Melita compares sprayed versus unsprayed yield means and its corresponding mean spray advantage as a percentage of yields. Both sites' means do not include the sprayed Melita values for yield, only unsprayed.

	Average Yield*	Roblin	Hamiota	Melita (kg/ha)		% Spray
Variety	kg/ha	kg/ha	kg/ha	Unsprayed	Sprayed	Advantage
WFT 601	5090	5360	4657	5253	6089	19
5702 PR	4838	4446	4449	5618	5459	1
WFT 623	4802	4749	4472	5187	4447	-3
WFT 624	4675	5315	4463	4246	5131	23
WFT 603	4544	4765	4886	3982	5186	33
Unity VB	4526	4404	4739	4436	4940	11
WFT 602	4418	5082	4843	3329	5312	23
WFT 618	4344	5254	3993	3783	4539	24
WFT 517	4332	3903	3704	5390	6018	12
WFT 622	4275	4750	4182	3894	4689	21
WFT 514	4071	3843	4199	4171	5726	38
AC Sadash	4043	4734	3869	3526	4857	36
WFT 607	3985	4473	3765	3716	4151	12
WFT 621	3962	4190	3735	3960	4521	16
WFT 613	3892	4348	4098	3229	4150	31
WFT 411	3851	3659	3654	4239	5076	21
WFT 609	3836	4301	3893	3314	3976	21
WFT 617	3788	4262	3540	3563	3793	14
WFT 614	3778	4172	3863	3299	4279	32
AC Andrew	3774	4304	3424	3595	5308	27
WFT 611	3753	3280	3934	4045	4346	11
WFT 409	3692	3495	3448	4133	4839	17
WFT 608	3510	2918	3999	3614	4764	36
WFT 619	3484	4105	4041	2306	3138	37
WFT 620	3464	4146	3514	2732	4159	51
WFT 616	3454	3807	3460	3095	3466	12
WFT 610	3445	3138	3678	3518	3502	2
WFT 612	3341	3530	3043	3451	4537	39
WFT 606	3235	3877	2379	3450	3077	-9
WFT 604	3230	3393	3425	2871	4074	39
WFT 615	3042	3899	2807	2418	2743	14
WFT 605	2827	3505	2625	2350	3132	33
	CV%	9.9	10.8	19.4	15.7	Sign. Adv.
	LSD (p<0.05)	675	677	1184	1151	P<0.0001
	Grand Mean	4169	3837	3741	4482	22
	R-squared	0.78	0.77	0.68	0.72	

* Average yield between Roblin, Hamiota and Melita unsprayed

In Hamiota, yields were significantly different among varieties and generally followed the provincial average in rank. Hamiota being planted on June 3rd is an interesting test for late seeding of these wheats.

In Roblin, yields were significantly different among varieties and generally followed the provincial average in rank.

In Melita, plot replications were split in half with one side being sprayed with fungicide and the other not. Fungicide application significantly ($p<0.0001$) increased yield overall by 22% on average according to grand means. The majority of varieties responded positively to a fungicide application ranging from 3% to 44% yield response. Some of the WFT varieties such as WFT 602 and, to a lesser extent, 622 had much greater yield stability in that the fungicide had little impact in increasing the already respectable yield. These "stable" varieties could be an option for keeping costs down by reducing fungicide use.

2010 was a year for high disease pressure. Application of fungicide pays especially with susceptible varieties. However, the Melita site may have had higher than normal disease pressure because of the seeding of susceptible winter wheat varieties in an adjacent area to help "seed" disease on some other Wheat and Oat varieties for a different trial.

Representative samples of each plot were bagged and sent to AgQuest for further analysis of protein and *Fusarium* infection levels. For further information on data such as disease, height and test weight values, please contact the WFGDC / AgQuest at Minto or through their website http://www.wfgd.ca

Camelina Variety Trial

Partners:
Great Plain Oil and Exploration Company, LLC. (Great Plains-The Camelina Company) Cincinnati, OH
Sustainable Oils LLC – Bozeman, MT
Seed Tec / Terramax – Qu'Appelle, SK
WADO

Diversification Centre Locations:
Westman Agricultural Diversification Organization – Melita, MB –WW's River Site
Prairies East Sustainable Agriculture Initiative – Arborg, MB
Parkland Crop Diversification Foundation – Roblin, MB
Canada Manitoba Crop Diversification Centre – Carberry, MB

Introduction

Camelina, also known as "false flax" or "gold of pleasure" is a member of the Brassica family originating in the Mediterranean to Central Asia. It can be grown both as a spring or winter annual and is adapted to cool northern climates. The plant grows 30-60 cm tall and branches with smooth or hairy stems that become woody at maturity. Smooth-edged leaves are narrow shaped and 5-8 cm long. Small greenish flowers are prolific with seed pods resembling flax bolls 6-14 mm long. Camelina matures 85-100 days, producing small pale yellow-brown seeds (>500,000/lb). Camelina has been touted as a low input, frost tolerant, drought tolerant, shatter resistant crop. (Putnam et al. 1993)

Camelina can be drilled or broadcast into soil late in the fall or early spring on stubble without seedbed preparation. However seed to soil contact is essential. Seeding rate is typically 5 lbs/ac. It is early emerging, usually before other weeds are present, and can seedlings can survive mild frosts. No herbicides are registered in Manitoba (pre-plant, or incrop), however in Saskatchewan, Assure II herbicide (Quizalofop-P ethyl) has a minor use registration in camelina (Saskatchewan Ministry of Agriculture). Fertility requirements have been conflicting, ranging from applications of 60 lbs/ac N to 120 lbs/ac N. Additional research on this matter is pending from AAFC in Saskatchewan. Camelina is black leg, and Altenaria tolerant. Most insect pests avoid camelina and have not been found to cause an agricultural production problem, except cutworms, and then grasshoppers when in extreme numbers. It is known to be tolerant to shattering, making straight cut harvest possible. Typical yields range from 20-30 bu/ac on the prairies.

Camelina has 30-40% oil content with 12% saturated, 54% polyunsaturated, and 34% mono-unsaturated fatty acids. It is high in both linoleic (omega 3, 30-42%) and linolenic acid (omega 6, 16-25%). Camelina meal is comparable to soybean meal with 45-47% crude protein, and 10-11% fibre. (Putnam et al. 1993) Camelina can be used for edible or industrial oil, animal and bird feed, cosmetics, biofuels, and lubricants.

As the camelina industry starts to grow it is important to test varieties available from companies for growers. Varieties of most crops can vary in performance from year to year and location to location, so understanding the regional adaptability of camelina is an important step towards making sound variety recommendations and build confidence towards this crop. These trials are also important for showcasing and understanding performance improvements being made with next generation varieties.

In 2010, the four Manitoba Diversification Centres collaborated with three camelina companies to assess various growth parameters of varieties available from these companies. Companies involved in the project were the Great Plains Oil and Exploration Company, Sustainable Oils LLC, and Terramax. Seventeen varieties in total were assessed.

Methods

Four camelina variety trial sites were established at each of the Diversification Centres including Roblin, Melita, Carberry, and Arborg. Due to flooding in Arborg and disease issues in Melita, these sites did not produce plot data. Only Carberry and Roblin reported data, which will be discussed in this report. Sites were managed by their respective managers.

At each site, plot varieties were arranged in a randomized complete block design and replicated four times. Varieties used in this experiment are listed in the following with their affiliates.

Treatment No.	Designation	Company
1	GP07	Great Plains
2	GP10	Great Plains
3	GP11	Great Plains
4	GP12	Great Plains
5	GP42	Great Plains
6	GP68	Great Plains
7	GP73	Great Plains
8	GP201	Great Plains
9	GP202	Great Plains
10	GP203	Great Plains
11	Blaine Creek	Great Plains
12	Columbia	Great Plains
13	SO-30	Sustainable Oils
14	SO-40	Sustainable Oils
15	SO-5 0	Sustainable Oils
16	SO-60	Sustainable Oils
17	Ter-92	Terramax

Soil fertility recommendations were estimated from current soil tests in order to optimize yield potential. Each site sampled fertility levels prior to seeding to determine residual soil fertility levels (Table 1). Soil type and stubbles varied as well.

Table 1: Residual soil fertility levels for two depths of soil profile, including stubble and soil texture for each site.

Site/Depth	0-6"				6-24"			
Nutrient (lbs/ac)	N	P	K	S	N	S	Stubble	Soil Texture
Roblin	67	24	249	60	138	132	wheat	loamy
Carberry	23	26	480	12	12	18	wheat	clay loam
Melita	9	32	287	14	24	48	canola	sandy loam
Arborg	32	38	411	44	36	118	wheat	clay loam

Plots were seeded, fertilized and custom maintained for each site (Table 2). Fungicides were not used at all Manitoba sites. Target seeding rate was 5 lbs/ac (400-500 plants/m^2) in Roblin, Arborg, and Melita. In Carberry, seeding rate was adjusted based on thousand kernel weights to achieve a final stand of 500 plants/m^2. Seed was not treated with fungicide. Harvest at Carberry was lather later than desired due to logistical reasons.

Table 2: Agronomic specifications of each location.

Location	Preseed Burnoff		Seeding	Plot Size	Fertilizer (lbs/ac)		Herbicides		Dessication	Harvest
	Burnoff	Date Applied	Date	m2	N	P	Product	Date Applied	Date	Date
Roblin	Glyphosate	07-May	17-May	5	20	25	Centurion	9-Jun	19-Aug	03-Sep
Carberry	Tilled, Harrow	May	20-May	8.4	50	0	Centurion	25-Jun	-	17-Sep
Melita	Liberty + Rival	16-Jun	16-Jun	12.96	90	30	Axial	15-Jul	-	-
Arborg	Glyphosate	15-Jun	15-Jun	8.4	50	27	-	-	-	-

Weather conditions were recorded at each site with on-site weather stations (Table 3) and are summarizing precipitation and Growing Degree Days (GDD) after planting but before desiccation.

Table 3: Precipitation (mm) and heat unit values (GDD) were derived from the Manitoba-Ag Weather Program.

Month	May		June		July		August		TOTAL		% Normal	
Site	mm	GDD	mm	GDD	mm	GDD	mm	GDD	mm	GDD	precip	GDD
Roblin	70	96	116	298	46	372	57	224	290	990	143	93
Carberry	92	92	72	318	67	414	63	267	294	1091	146	97
Melita	-	-	84	205	68	439	90	419	241	1064	119	101
Arborg	-	-	61	193	106	453	86	403	253	1050	141	103

Data parameters are from seeding date to dessication date, inclusive. May not reflect the entire month.
GDD is based on a base temperature of 5*C

At Carberry, plot data included plant emergence, plot stand (percent of gaps in plot), vigor (1-10, 10 is most vigorous), days to flower, days to maturity, height, lodging (scale 1-5, 5 flat) and seed yield. Vigor ratings were taken just prior to or when the most vigorous plots had started to close their canopies but not influenced by stand - if a patchy plot was encountered that area of the plot was ignored for this rating. At Roblin, height, days to flower, day to maturity, disease rating (scale 1-5, 5 is infested with Downy Mildew, *Peronospora parasitica*), and seed yield were taken. Seed moisture was determined with a Labtronics Model 919 moisture meter based on canola charts and final plot yields were adjusted to 8% moisture content.

Data values were analyzed with a nearest neighbors analysis of variance and covariance using Agrobase Gen II® statistical software. Mean yields were determined as well as coefficient of variation (CV%), least significant difference LSD at the 0.05 level of significance, P values, and R-squared values. Plot yields by location were applied to an analysis of variance to determine if there was significant differences overall between varieties and if there was interaction between variety and location. Pearson correlation coefficient was determined between mean yield and disease or maturity observations.

Results

There were significant yield differences among treatments at both the Carberry and Roblin sites (Table 4). Treatment means between sites were significantly different (P=0.014) and treatment means interacted significantly (P=0.019) within locations indicating that varieties may have responded differently in one location compared to another. Generally varieties yielded similar at each site respective to their grand means, relative to the overall grand mean. At Carberry, the highest yielding variety was SO-40, but not significantly different from SO-60. In Roblin, the highest yielding variety was GP10; however this was not significantly different from several other varieties including SO-40, SO-60, GP10, GP11, GP201, and Columbia. Both sites shared GP07 and GP73 as their lowest yielding variety.

Table 4: Yield and relative yield values at Carberry and Roblin. Sorted from greatest to least by overall yield average. Levels of significance illustrated by letters after means.

Trt No.	Variety	Mean Yield (kg/ha)				Overall Yield Average	
		Carberry	% of GM	Roblin	% of GM	Trt x Location	% of GM
14	SO-40	2054.1 a	123.6	3120.9 abcd	109	2587.5 a	114.7
2	GP10	1604.4 cde	96.5	3549.8 a	125	2577.1 a	114.2
16	SO-60	1880.7 ab	113.2	3151.8 abc	111	2516.2 ab	111.5
3	GP11	1664.2 bcd	100.1	3253.4 ab	114	2458.8 ab	109.0
8	GP201	1757.4 bcd	105.7	3123.7 abc	110	2440.5 ab	108.2
12	Columbia	1790.6 bcd	107.7	3073.3 abcdef	108	2431.9 ab	107.8
11	Blaine Creek	1814.0 bc	109.1	2813.0 bcdef	99	2313.5 abc	102.5
13	SO-30	1642.5 cde	98.8	2922.4 bcdef	103	2282.5 abc	101.2
17	Ter-92	1725.7 bcd	103.8	2820.5 bcdef	99	2273.1 abc	100.7
15	SO-5 0	1678.0 bcd	101.0	2816.5 bcdef	99	2247.3 abc	99.6
4	GP12	1430.4 ef	86.1	3021.0 abcdef	106	2225.7 abc	98.6
9	GP202	1804.3 bc	108.6	2539.3 efg	89	2171.8 abc	96.3
5	GP42	1690.9 bcd	101.7	2601.1 cdef	91	2146.0 abc	95.1
10	GP203	1599.9 cde	96.3	2613.1 cdef	92	2106.5 bc	93.4
6	GP68	1579.6 de	95.0	2548.3 defg	89	2063.9 bc	91.5
7	GP73	1360.5 fg	81.9	2460.7 fg	86	1910.6 cd	84.7
1	GP07	1178.9 g	70.9	2025.6 g	71	1602.2 d	71.0
	CV%	9.2		14.1		13.5	
	Grand Mean	1662.1	100.0	2850.2	100	2256.2	100.0
	LSD (p<0.05)	218.0	13.1	572.9	20	458.9	20.3
	Prob. Entry	<0.0001		0.0007		0.0191	
	R-Square	0.77		0.53		0.87	

There were significant difference among all agronomic evaluations except in stand at Carberry and days to flower (DTF) in Roblin (Table 5).

Table 5: Other characteristics related to variety at Carberry and Roblin sites. DTM, Days to Maturity; DTF, Days to Flower.

Trt No.	Variety	Carberry - CMCDC							Roblin - PCDF				
		Emergence p/m2	Height cm	Lodging 1-5, 5 flat	DTF	Stand (%) (gaps in plot)	DTM	Vigor 1-10,10 most	Emergence* p/m2	Height cm	DTF	DTM	Disease 1-5, 5 infested
1	GP07	122	66.9	2	44	100	85	5	128	60.6	46	90	0
2	GP10	143	82.5	2	46	100	88	6	134	78.5	43	95	2
3	GP11	164	81.9	2	45	96	87	6	196	78.9	45	97	1
4	GP12	188	79.4	2	45	90	86	7	176	69.9	46	94	2
5	GP42	92	81.9	1	46	96	89	6	145	77.4	46	98	4
6	GP68	127	78.8	1	46	100	88	6	173	73.5	44	94	2
7	GP73	89	71.9	3	44	93	85	6	198	67	44	92	1
8	GP201	93	79.4	1	47	98	88	6	110	74.1	45	97	4
9	GP202	103	85.6	1	46	94	90	6	90	82.6	45	101	3
10	GP203	131	88.8	2	47	93	89	7	178	83.8	44	97	5
11	Blaine Creek	118	83.1	1	46	95	89	7	131	76.9	45	98	4
12	Columbia	148	83.1	1	46	98	89	7	160	77.9	44	96	2
13	SO-30	78	81.9	1	47	95	90	6	160	77.3	44	99	3
14	SO-40	152	91.9	2	46	95	90	7	191	83.9	45	97	1
15	SO-5 0	133	85.6	1	47	98	89	6	219	76	45	100	4
16	SO-60	188	86.9	1	46	90	89	7	216	81.5	44	96	5
17	Ter-92	187	84.4	2	44	95	87	6	205	72	45	97	1
	CV%	33.0	4.8	37.0	1.9	7.3	0.8	11.5	17.0	6.4	4.7	2.1	28.6
	Grand Mean	132.5	82.0	1.5	45.6	95.5	88.1	6.2	165.2	76.0	44.6	96.3	2.4
	LSD (p<0.05)	62.2	5.6	0.8	1.2	9.9	1.0	1.0	59.4	7.0	3.0	2.9	1.0
	Prob. Entry	0.005	<0.0001	<0.0001	<0.0001	0.668	<0.0001	0.007	0.007	<0.0001	0.797	<0.0001	<0.0001
	R-Square	0.67	0.78	0.66	0.67	0.31	0.88	0.70	0.78	0.75	0.24	0.69	0.87

*Based on two replications of data

Emergence was quite variable among varieties at both sites. In Carberry, thousand seed weight was used in calculating seeding rates, indicating that other factors may be at work causing variations. Variation in plant emergence may be due to seed viability or seed borne disease issues. In Melita, Arborg and Roblin only a flat seeding rate was used. Moreover, seed weight may have affected final plant emergence at these sites.

There was a significant positive correlation between days to maturity and overall yield at Carberry ($p<0.0001$, $r=0.81$) but not Roblin ($p=0.25$, $r=0.29$). Generally this suggests those that were later maturing were higher yielding; however further study is needed to confirm this trend in the Carberry region.

In Roblin there were significant disease observations among varieties related to the infection of downy mildew, caused by *Peronospora parasitica*. Despite pressure on these varieties, there was no correlation ($p=0.59$, $r=0.14$) between disease incidence and percentage yield.

Conclusions

Reasons for total yield being much higher in Roblin than in Carberry may be due to Roblin having high 6-24" NO3- content compared to Carberry. In the past, other crop types have typically had higher yields in Roblin; it is a unique site in which the local town irrigates effluent to the nearby field near the camelina trial. High nitrate values have likely been contributed through ground water percolations to the trial area, creating excess nutrients for growth. Other reasons for over yielding in Roblin may include GGD differences among sites in June, July, and August, which were much higher in Carberry than in Roblin, possibly inferring that camelina may prefer cooler environments, giving it more days to mature translating into greater yield potential

Future breeding programs may have to consider lengthening days to maturity for camelina in order to boost yield performance in the southern prairies. This may become less important in areas further north.

In Carberry, there was no incidence of downy mildew disease in the plots. Intense infestations of downy mildew where observed in Melita which may have been related to the canola stubble the trial was seeded into. Reasons for infection may have been a combination of volunteer canola acting as an initial host, as well as continuous wet weather experienced during flower. Roblin also experienced cool and wet conditions that can perpetuate downy mildew infestation. Carberry experienced warmer weather which may have prevented possible downy mildew infections.

Future variety trials will have to take thousand kernel weight and germination into account when determining seeding rates for each variety. This will help gauge insight into additional variability in plant emergence between varieties that may be caused by soil or seed borne pathogens. In addition, little work has been done with the efficacy seed treatments with fungicide

Pictures: (Left) shows downy mildew infection on the camelina inflorescence. (Right) shows how downy mildew overtook the entire Melita camelina trial.

Further variety testing in 2011 is being planned at the Diversification Centres to help build a larger data set for camelina production in Manitoba. Other tests on camelina being conducted at the Manitoba Diversification Centres for 2011 include a fall dormant versus spring seeded trial. Fall treatments have already been established with spring dormant and mid spring plantings planned in 2011.

Picture: Flooding damage to another camelina trial in Melita. Camelina does not fair well in saturated growing conditions. In this photo an entire replication and half of the plots were lost to overland flooding (within circled area).

References

1. Putnam, D.H., J.T. Budin, L.A. Field, and W.M. Breene. 1993. Camelina: A promising low-input oilseed. p. 314-322. In: J. Janick and J.E. Simon (eds.), New crops. Wiley, New York.

2. Saskatchewan Ministry of Agriculture. August 2010. Crop Production News Vol. 32, No 7. ,. Canada. Available Online: http://www.agriculture.gov.sk.ca/cpn100805

Calendula Variety Trial and Steam Distillation

Diversification Centre Locations:
Westman Agricultural Diversification Organization – Melita, MB –WW's River Site
Prairies East Sustainable Agriculture Initiative – Arborg, MB
Parkland Crop Diversification Foundation – Roblin, MB
Canada Manitoba Crop Diversification Centre – Carberry, MB

Background

Calendula officinalis L., or calendula, is a member of the *Asteraceae* family, which includes other oilseed crops such as sunflower, safflower, niger seed and vernonia. This plant, with its large yellow to orange flowers, is commonly known as orange marigold, or English marigold. It is an annual flower that originated in the eastern Mediterranean and southern European areas. *Calendula officinalis* has been used mainly as an ornamental garden plant and in medicinal and cosmetic preparations, but has also been used for coloring, garnishes and flavoring.

There is now growing interest in calendula's seed oil for industrial use. Government directives in Europe to eliminate the use of harmful Volatile Organic Compounds in paints have resulted in investigations of the calendula seed as an alternative source of the "oil" for oil based paints. Besides paint this oil can be used in a number of valuable non-food use products including Tung oil replacement, as well coatings and some industrial nylon products. Calendula oil, which makes up 40-46% of the seed, contains 50-55% highly conjugated calendic acid and 28-30% non-conjugated linoenic acid (Kathryn Homa 2009). Making it truly unique and a very suitable plant oil for these purposes.

Objectives

- Evaluate yield stability of three Calendula varieties across Manitoba.
- Explore additional market options for calendula such as steam distillation.

Methods

Variety Evaluation:

Three varieties of calendula, including Carola, 99276-3 and Hi 1557-3, were seeded in a randomized complete block design and replicated six times. Plots were direct seeded into canola stubble May 26, 2010, with a Seedhawk dual knife single sideband system in six rows 9.5" in spacing at a seed depth of 5/8". Plot dimensions were 1.44 m wide by 8 meters long. Plot area received an application of Liberty and Roundup Transorb herbicide at rates of 1 L/ac and 0.75

L/ac, respectively, prior to emergence to aid in weed control. Fertilizer was applied during seeding at a rate of 80 lbs/ac N (liquid 28-0-0) and 30 lbs/ac P (granular 11-52-0). Plots were maintained relatively weed free using separate applications of Assert (with pH adjuster) and Select (with adjuvant) herbicide at rates of 0.54 L/ac and 120 mL/ac applied June 15 and July 7, respectively. Plots were desiccated with Reglone on September 19, at a rate of 0.91 L/ac. Plots were harvested for seed yield October 12, 2010.

Melita Location Soil Test:

Legal Land Location	Nutrient Depth	N lbs/ac	P ppm (olsen)	K ppm	S lbs/ac	pH
NW 31-3-26 W1	0-6"	11	15	388	16	7.8
	6-24"	12			78	
	0-24"	23			94	

Steam and Hydro Distillation*:*

Over 2 kg of calendula flower heads were collected by WADO on September 2 from guard rows of the variety trial. Flowers were frozen then sent the Manitoba Agri-Health Research Network (MARHN) in Winnipeg where hydro distillation took place on September 10. The flowers were submerged in water and were hydro distilled for three hours. In addition to WADO's contribution to this project approximately 800 grams of flower heads were also provided by Craig Linde (Carberry CMCDC) and were subject to steam distillation (different from hydro distillation in that it uses a higher temperature). Distillate samples and observations were taken from both processes.

Results

Variety Trial

There were significant differences among variety yield (Figure 1). A low coefficient of variation of 12% indicates good acceptable data. The 99276-3 variety was the highest seed yielding variety in Melita.

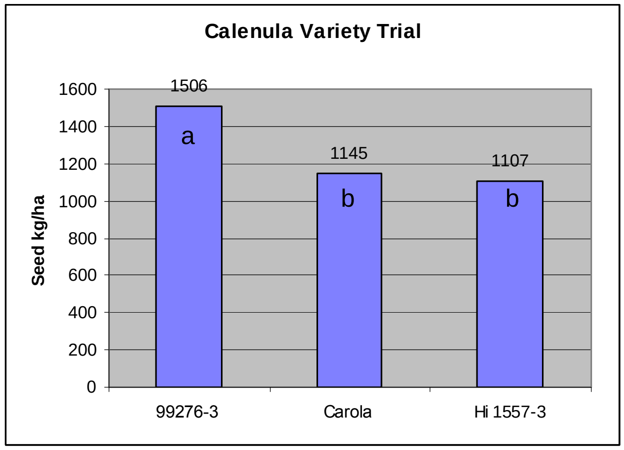


Figure 1: Seed Yield of three calendula varieties in Melita, MB in 2010. Letters indicate level of significance

Hydro & Steam Distillation:

After **hydro** distilling 2 kg of calendula flowers from WADO at 98°C, a yellow, clear, pleasant smelling, viscous liquid accumulated on top of the hydrosol (density of oil less than water). Since the temperature was below the boiling point of water, this is an indication that the distillation process was not complete.

The 800 grams of flower heads provided by Craig Linde were **steam** distilled for < 2 hrs. A small volume of waxy oil (a mixture of wax and oil) accumulated. This mixture, which was less dense than water, was difficult to collect because of the waxy character and small volume. Nevertheless, a small sample was collected into a vial and given to Craig Linde. The flower heads were inspected and it was noted that they still retained some of their characteristic scent; also, the maximum stillhead temperature read 98.5°C, therefore it was concluded that the distillation process was incomplete.

Interestingly, the two different types of distillation may be used to distill off different volatile components from the calendula flower. This finding is not entirely unique—clove buds will give off different types of oil depending on which distillation technique is used; steam or hydro distillation. Both the steam and hydro distillations on the calendula required a longer time, however this wasn't possible under the circumstances. Typically oil accumulation increases towards the end of the process where the more hydrophobic compounds come out towards the end. These distillations should be allowed to carry on throughout the entire day in order to properly evaluate the potential of calendula as a source of oil and/or wax.

The wax may be composed of a large organic molecule such as a large fatty alcohol or acid. If it is a fatty acid, proper considerations should be accommodated such as: acidification of the hydro distillation water and the incorporation of a vacuum pump to reduce the pressure, thus inhibiting decomposition.

To maximize oil/wax production from calendula it may be necessary to do a steam distillation. When completed, move the organic material to the boiler to do a follow up hydro distillation.

Collection into a small vial was difficult because of the small volume so some water would have been collected with the oil. In any case, the yellow oil should be enough for analytical procedures such as NMR, MS, HPLC/MS. The oil sample, along with the hydrosol, was left with Keith Murphy at the Manitoba Agri-Health Research Network, Winnipeg, Manitoba.

Participatory Wheat Breeding Project

Partners: U of M – Anne Kirk – Technician, Department of Plant Science
WADO
Location: WADO's river site with Wayne White – Melita

Background:

The participatory wheat breeding program began in 2010 with the goal to involve farmers in the breeding process and to develop varieties specifically suited to farmers with specific needs. Participatory plant breeding (PPB) can involve scientists, farmers, extension agents, consumers and processors. PPB programs have been successful in developing countries where farmers may not have access to improved varieties or inputs. PPB is also thought to be beneficial to organic producers since there are currently no wheat cultivars specifically tailored to this specific environment.

Some of the goals of the participatory breeding program include:

- Selecting wheat varieties for high stress, heterogeneous (differing) environments
- Developing varieties that are specifically suited to a particular farmer's preferences – farmers and participants set the breeding goals
- Increase genetic diversity

2010 Summary:

In the first year of the University of Manitoba's participatory plant breeding program populations of wheat were planted at five locations across Manitoba and Saskatchewan. Locations included certified organic farms at Notre Dame de

Lourdes, MB and Oxbow, SK, as well as three research farms located at Melita, Glenlea, and Carman, MB.

The four populations planted at each location were fourth generation wheat lines from Agriculture and Agri-Food Canada and the University of Manitoba's organic wheat breeding program. In 2008, 29 populations of wheat were grown as F2's in the University of Manitoba's organic wheat breeding nursery, located at Glenlea, MB. These lines were bulked, selected for sprouting resistance in the winter of 2009 then planted as F3 hills in the spring of 2009 at Glenlea, MB. Five populations of F3 hills were harvested in 2009; four of those populations had enough seed to be planted into plots as F4 populations in 2010. In the spring of 2010, the four populations were planted into $16m^2$ plots in these five locations.

It was the responsibility of the individual farmer or employees of the various research stations to remove undesirable plants from the plots throughout the growing season then harvest each population as a bulk. This was met with various degrees of success, since it was hard for individuals to find the time to make selections throughout the growing season. Natural selection also took place throughout the growing season, most obviously at the organic locations where the populations were generally grown in areas with high weed pressure. The harvested seed from all locations was brought to the University of Manitoba where it was cleaned and will be prepared for planting at some of the same locations in 2011.

The PPB locations were visited at least once during the growing season so that observations could be made concerning average height, level of leaf disease, plant architecture and leaf size, as well as other characteristics of each population. These observations, along with the amount and quality of the seed harvested, will be considered when deciding which of the four populations should be planted at each location in 2011.

Photo: WADO Summer students selecting undesirable plants from the participatory wheat breeding plot at Melita.

Predicting Drop Development with Accumulated Thermal and Meteorological Relationships

Partners:
Canadian Wheat Board – Mike Grenier
University of Manitoba - Dr. Paul Bullock

Locations:
AAFC – Swift Current, Regina, Melfort (Saskatchewan)
University of Saskatchewan – Crop Development Centre
Westman Agricultural Diversification Organization – Melita (River Site), Hamiota
University of Manitoba – Carman, MB

Background

As part of the weather network initiative and launch of weatherfarm.ca, the CWB has undertaken a number of projects in support of application development for weather based decision support systems. The CWB is coordinating the growth stage work and in collaboration with Dr. Paul Bullock from University of Manitoba will be conducting the final data analysis. Cooperators are anticipating at least two years of field work before the start of any information release.

The CWB, through its weather network is looking at opportunity to provide daily growth stage predictions in real time based on meteorological parameters or thermal time. Various growing degree day and photo thermal models are being evaluated. To help guide model development, in field plant development staging is required to evaluate model predictions.

The broad spectrum of locations provides good coverage of brown, dark brown and black soil zones as well as good range of day length with the varying location latitudes and meteorological conditions.

Objectives

- To validate phenological development models for use in predicting growth stage development through CWB weather network project.
- To observe phenological growth stage under field grown conditions in order to compare predicted versus observed data over the growing season.

Field setup

Trial design to include at least 8 varieties by two replicates in a randomized block design. Plot size to be determined by local site co-operator and based on standard layout given available equipment.

Varieties:

CWRS:	Early:	AC Splendor and Intrepid
	Medium	AC Barrie (neutral) and Kane
	Late	Superb and BW874
Barley:	Malting	AC Metcalfe
	Feed	Conlon

Phenological Development Measurements

At each location, phenological observations were recorded weekly from seeding using the Haun scale (Haun 1973) followed by the Zadok scale during the vegetative, reproductive (anthesis) and final maturity phases of crop development. A total of 10 plants per plot were designated for observation at Melita, Hamiota, and Wawanesa. Data was collected and sent to the Canadian Wheat Board for computation and analysis.

Data is to be correlated with climatic parameters to help forecast various agronomic considerations in terms of crops stage and real time crop scouting issues.

What does this mean for Producers?

This data will help farmers by improving pest risk forecast in terms of synchronizing risk with the crop development stage. For example; synchronizing pest development risk with host crop staging such as anthesis stage for Fusarium Head Blight would be very useful. Earlier growth stage information will be important for farmers in planning their crop scouting and assessing where crop development is relative to potential pest risks.

Significance to CWB

From the CWB perspective, having improved crop growth staging information will be incorporated into internal crop yield and quality forecasts. This will allow better assessment of any heat or moisture stress impacts during critical periods for yield determination as well as end use quality functionality. It should also contribute to better management timing for producers leading to better overall yields and quality for the Western Canadian Cereal Crop.

Reference:

Haun, J. R. 1973. Visual Quantification of Wheat Development. Agron. J.65:116-119.

Cereal disease and quality evaluation contributing to enhanced regional variety testing in Manitoba

Manitoba Trial Locations: Melita, Portage la Prairie, Rosebank, St. Adolphe, Stonewall
Cooperators: WADO, CMCDC, Viterra/Syngenta Seeds, JRI Kelburn Farms, SICTC

Background

MCVET serves as an independent third party crop variety testing program for producers in Manitoba. MCVET strives to provide producers with the most recent agronomic data available not only in their own growing region, but throughout the whole province. MCVET collects data on an average of 23 major/minor crops types over a minimum of 13 locations annually. MCVET and Seed Manitoba are well known in North America for their reputable data produced as a result of the variety testing program in Manitoba.

In order to provide the most recent data to producers to ensure they are competitive domestically and in the export market, it is necessary for them to have all the knowledge necessary to make important cropping decisions. Agronomic, disease and some of the quality data presented in Seed Manitoba is not collected annually as part of the MCVET program. This data is from the official registration trials across western Canada and is included in Seed Manitoba to complete the data package for each variety. From the time a variety is registered until it is commercialized, there is a seed multiplication period of 3 to 4 years. During the seed multiplication period, new races/isolates of disease may develop and have the ability to overcome current disease resistant genes. As a result the rating that was originally assigned to the variety when it was registered may vary slightly over a period of time.

Disease can significantly decrease yields and quality (grade and protein) affecting producers in Manitoba. It is of great importance to track new races of disease which overcome current disease resistance genes in varieties to ensure breeders and pathologists are able to identify the virulence spectrum in the pathogen and then search for new specific resistance gene(s). The information is also very valuable to producers as they become aware that the varieties they are growing that were at one time resistant to certain disease are no longer and they will have to manage the disease differently than relying solely on genetics or can plan to purchase certified seed of a new resistant variety.

Breeders and researchers have indicated there is very little current information available to producers on the effect of disease on yield and quality as well as the effect of fungicides and their interactions with different cultivars. As part of this project, MCVET will focus on assessing wheat and oat crop types. Rusts and

Fusarium head blight are two of the most severe diseases affecting wheat and oats in Manitoba and can cause yield losses on average of 10%.

Objectives & Materials/Methods

1) To initiate disease evaluation for wheat and oat varieties over a period of three years and multiple locations (5). Disease evaluation will be conducted by pathologists. The MCVET trials will serve as sites for the annual disease survey that is conducted annually by Drs. B. McCallum and T. Fetch. These trials are to AAFC pathologists as all commercial varieties are located in one trial and can be assessed together to be part of the Provincial disease survey to monitor race evolution.

- Wheat – leaf, stem and stripe rust; FHB
- Oats – leaf and stem rust

2) To determine the effect of disease on yield and quality parameters. Trials will be duplicated at five locations and one of the two trials will be sprayed with a fungicide and the other will be unsprayed. Seed will be harvested from both trials and assessed for test weight, thousand kernel weight, falling number, protein and plumpness/thins. This will allow for direct comparison of the effect of disease on yield and quality parameter of wheat and oat varieties.

Design was two trials side by side, both a randomized complete block design. One trial was sprayed and the other unsprayed.

Sprayed trial received two split applications of Tilt 250E (propiconazole). Timing of first was when the first variety when to flag, then the second was 7 to 10 days after the first.

Wheat Treatment List

TRT	NAME	Leaf Rust
1	AC Barrie	MR
2	5602HR	R
3	Hoffman	MR
4	AC Andrew	S
5	AC Domain	I
6	Alvena	I
7	Fieldstar	R
8	5603HR	R
9	Glenn	R
10	WR859CL	R
11	Stettler	MS
12	CDC Abound	MS
13	CDC Teal	MR
14	CDN Bison	MR
15	Glencross	MR
16	Goodeve VB	MR
17	Harvest	MR
18	5702PR	MR
19	Infinity	MR
20	KANE	R
21	Lillian	R
22	McKenzie	R
23	Snowbird	I
24	Snowstar	MR
25	Superb	S
26	Unity VB	R
27	Waskada	I
28	Burnside	R

Oat Treatment List

TRT	NAME	Crown Rust
1	Furlong	S
2	Leggett	R
3	AC Morgan	S
4	Triple Crown	S
5	AC Assiniboia	S
6	CDC Dancer	MS
7	CDC Minstrel	MS
8	CDC Pro-Fi	S
9	HiFi	R
10	Jordan	I
11	OT2046	R
12	Souris	R
13	SW Triactor	MR
14	Ronald	S

Key:

R – Resistant
MR – Moderately resistant
I - intermediate
MS – Moderately susceptible
S - Susceptible

Preliminary Results

Data analysis and grading is ongoing. A final report to come out in the months to follow.

WHEAT

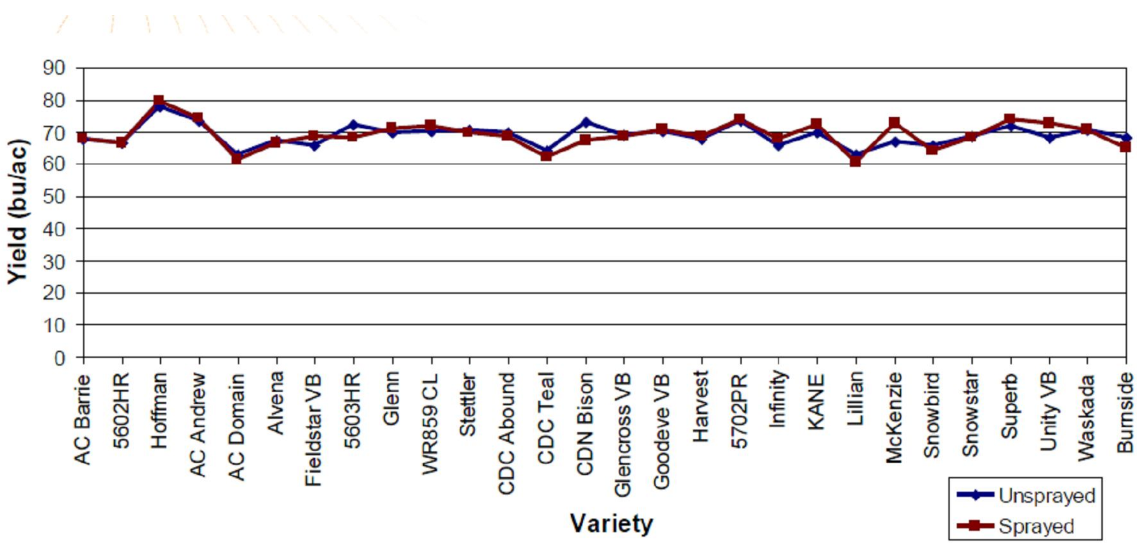
2008 Wheat Yields

Year	Site	Yield (bu/ac) Unsprayed	Sprayed	+ / -
2008	Portage	73	54	- 19
	Rosebank	87	89	+ 2
	Stonewall	42	51	+ 9
	Average	**67**	**65**	**- 2**

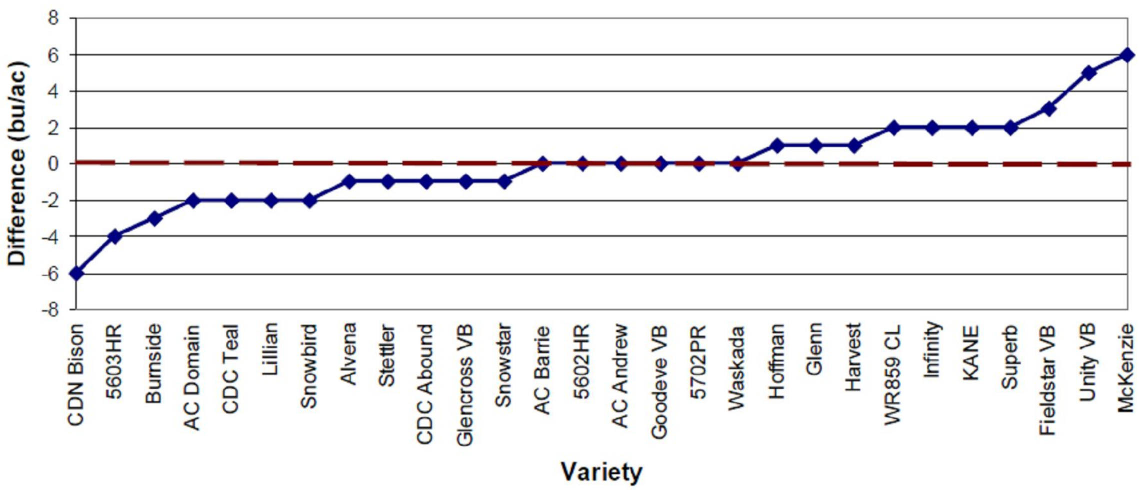
Average 2009 Wheat Yields

Year	Site	Yield (bu/ac) Unsprayed	Sprayed	+ / -
2009	Melita	73	79	+ 6
	Rosebank	91	83	- 8
	Portage	57	61	+ 4
	St.Adolphe	54	54	=
	Average	**69**	**69**	**=**

Individual 2009 Wheat Yields



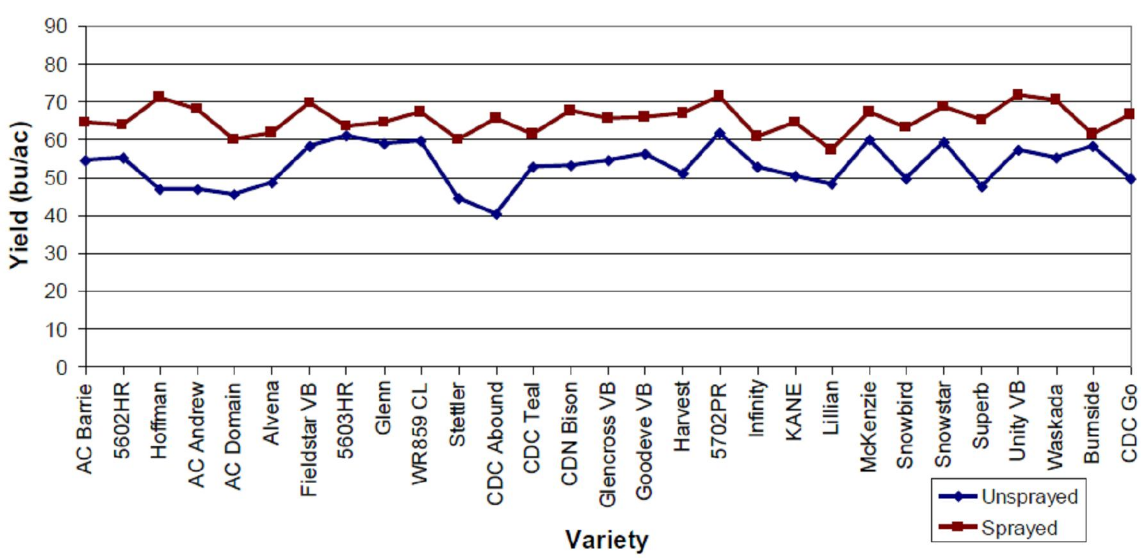
Individual 2009 Wheat Responses to Fungicide



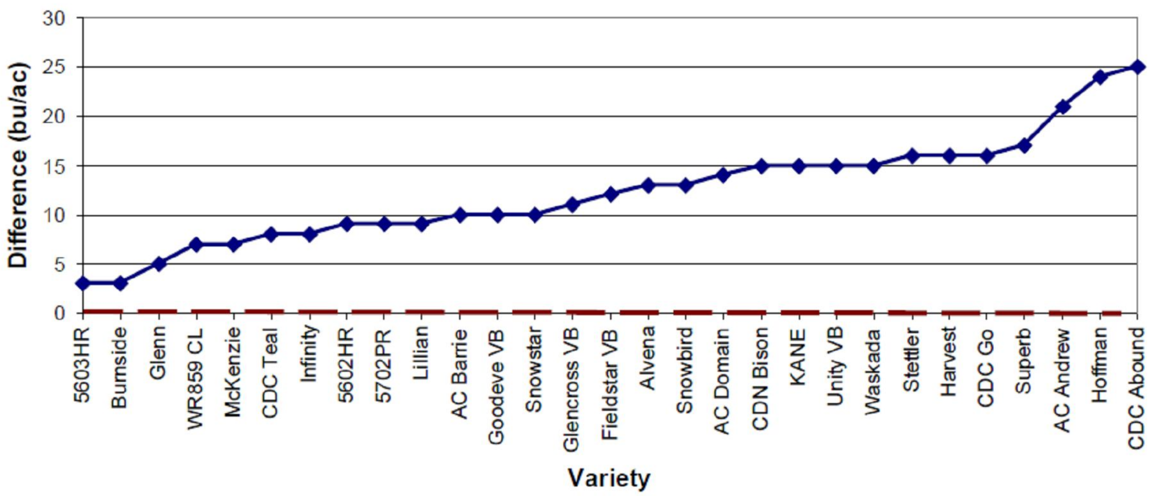
2010 Wheat Yields

Year	Site	Yield (bu/ac) Unsprayed	Sprayed	+ / -
2010	Melita	53	77	+ 24
	Rosebank	64	73	+ 9
	St.Adolphe	42	47	+ 5
	Average	**53**	**66**	**+ 13**

Individual 2010 Wheat Yields



Individual 2010 Wheat Responses to Fungicide



Wheat Summary
In 2008 and 2009 there was little or no rust. Rust was more prevalent in 2010. All years received high levels and pressure of FHB. In the majority of trials, FDKs was the major downgrading factor. Other factors included midge, ergot, and mildew.

OATS

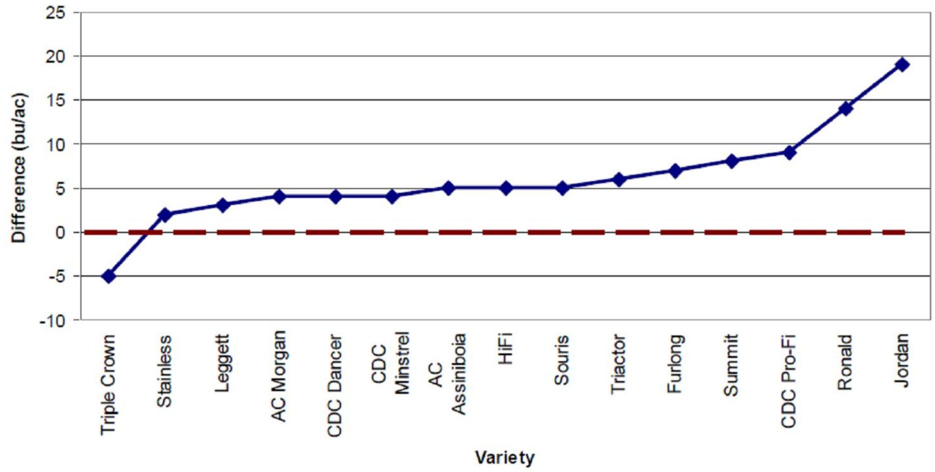
2008 Oat Yields

Year	Site	Yield (bu/ac) Unsprayed	Sprayed	+ / -
2008	Melita	151	163	+ 12
	St.Adolphe	182	185	+ 3
	Stonewall	139	145	+ 4
	Average	**157**	**164**	**+ 7**

2009 Average Oat Yields

Year	Site	Yield (bu/ac) Unsprayed	Sprayed	+ / -
2009	Melita	163	171	+ 8
	Rosebank	161	161	=
	St.Adolphe	120	126	+ 6
	Stonewall	143	153	+ 10
	Average	**147**	**153**	**+ 6**

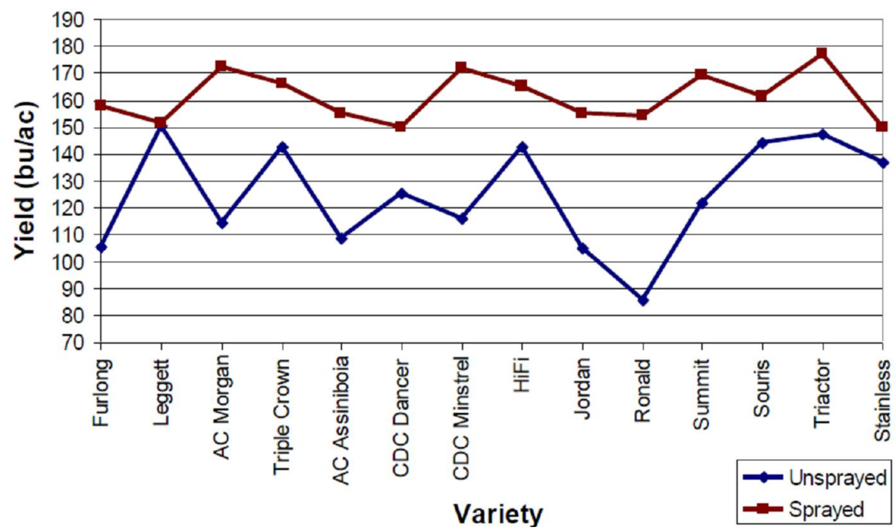
2009 Oat Yield Response to Fungicide



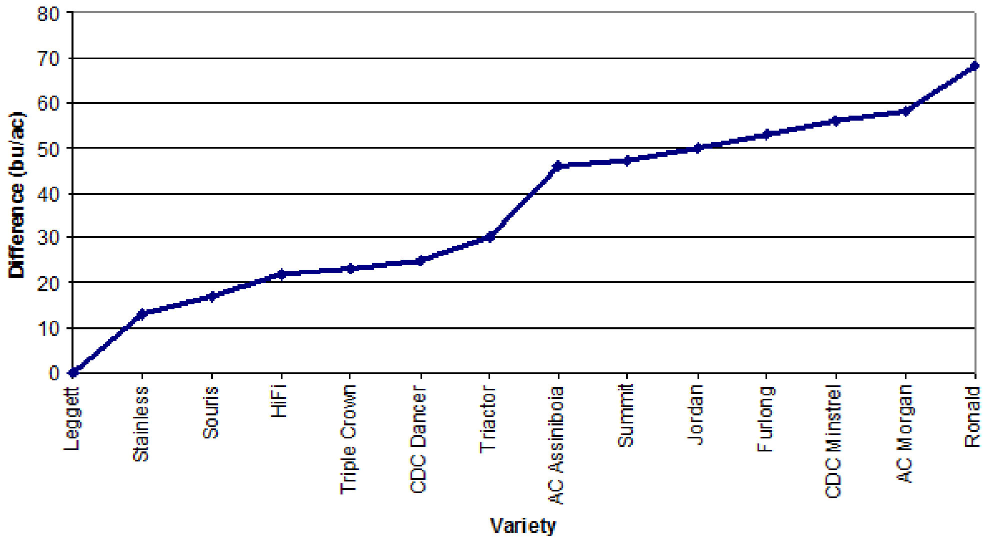
2010 Average Oat Yield

Year	Site	Yield (bu/ac) Unsprayed	Sprayed	+ / -
2010	Melita	128	182	+ 54
	St.Adolphe	124	141	+ 17
	Average	**126**	**162**	**+ 36**

Individual 2010 Average Oat Variety Yields



2010 Oat Yield Response to Fungicide



2010 Average Oat Test Weights

	Test Weight (g/0.5L)			Grade Impact
Variety	Unsprayed	Sprayed	+ / -	+ / -
AC Morgan	183	227	44	+
Ronald	190	224	34	+
Jordan	167	197	30	
CDC Minstrel	194	220	26	+
Summit	212	235	23	+
Triple Crown	207	226	19	+
AC Assiniboia	206	213	7	
CDC Dancer	230	237	7	+
Triactor	210	217	7	
Leggett	227	231	4	
Stainless	224	225	1	
HiFi	235	234	-1	-
Souris	236	229	-7	-
Average	**209**	**224**	**15**	**+**

General Summary

		Yield (bu/ac)		
Crop	**Year**	**Unsprayed**	**Sprayed**	**+ / -**
Wheat	**2008**	67	65	- 2
	2009	69	69	=
	2010	53	66	+ 13
Oat	**2008**	157	164	+ 7
	2009	147	153	+ 6
	2010	126	162	+ 36

Yield – Wheat & Oats

- Under higher levels of disease pressure, trend towards lower yield response to fungicide application on varieties with improved disease resistance
- In oat, main downgrading factor was light test weight.
- Variable response of test weight to fungicide application (oats)
- More analysis required to determine:
    - if there is an interaction between genetics & fungicides on yield & quality
    - the effect of genetics, fungicide use and their interaction on other agronomic factors – height, lodging, maturity.

Quality

- In wheat, main downgrading factor was FDK.
- In oat, main downgrading factor was light test weight.
    - Variable response of test weight to fungicide application
- More analysis required to determine:
    - the effect of both variety & fungicide on quality & grades in both crops
    - the effect of variety on FDK

Acknowledgments

The MCVET committee gratefully acknowledges the financial support of ARDI, researchers Drs B. McCallum and T. Fetch at the Cereal Research Centre-AAFC, and the trial cooperators.

Flax Fibre Trial

Site Cooperators:
Westman Agricultural Diversification Organization – WADO, River Site – Serruys
Parkland Crop Diversification Foundation - PCDF
Prairies East Sustainable Agriculture Initiative – PESAI
Canada Manitoba Crop Diversification Centre – CMCDC
Lead Scientist – Eric Lui - MAFRI

Background

A linen flax processing company from Europe has recently become interested in a collaborative project with Manitoba. This European company processes flax straw from fibre varieties into high quality textiles. It is interested in diversifying into composite materials using their textile-quality flax fibre and also examining industrial or food opportunities for grain from the fibre varieties. With our transportation and machinery manufacturing base and biocomposites research and development capacities, Manitoba would be a great fit to this opportunity. In 2010, a variety and seeding rate trial was conducted in 4 locations to determine performance in terms of fibre quality and yield in Manitoba's climate and soil.

There is a growing demand for products made from renewable and environmentally friendly biomass. The bast fibre produced can be used for paper and flax shives (the non-fibre parts of the stem) for livestock bedding, soil erosion control and biofuels. Flax fibre can also be used in place of fiberglass and other petroleum-based products. Western Canada's flax acres harvested for grain, typically range between 1 million to 1.5 million acres (Rance, 2010).

In this trial, CDC Bethune, a commonly grown oilseed variety in Canada, is used as a check and the remaining 4 varieties are European linen varieties.

Objective

Evaluate new flax varieties for fiber and grain yield in Manitoba's environment.

Methods

Treatments: 5 varieties at 3 seeding rates (Table 1)
Replication: 3
Plot size: 1.44 m x 9 m
Test design: Randomized complete block design
Seeding date: May 13
Fertilizer applied: 30 lbs. actual P (11-52-0) and 70 lbs. actual N (28-0-0)
Pesticide applied: June 9 – Centurion; June 9 – Buctril M; September 7 - Reglone
Harvest date: Fibre – August 11(pulled), August 3 (cut); Grain – September 27
Product handling: Fibre – 0.965 m^2 of each treatment dried, stripped of seed pods, individually weighed and recorded; Grain – remaining area of each treatment individually bagged and recorded

The bundles of cut and pulled flax were left in the field to ret and dry. Once the retting process was complete and the plants were dry, the seed pods and remaining leaves were stripped, the fibre weighed and recorded. Prior to harvesting the grain with a small plot combine, an herbicide application of Reglone was applied. Each treatment was individually bagged and weight recorded. The entire fibre yield was shipped to Prairie Agricultural Machinery Institute (PAMI) for quality analysis. Samples were then shipped to Europe for the company's quality evaluation.

Results

Grain

There were significant yield differences among varieties but not among seeding rates. There was no grain yield interaction between variety used and seeding rate.

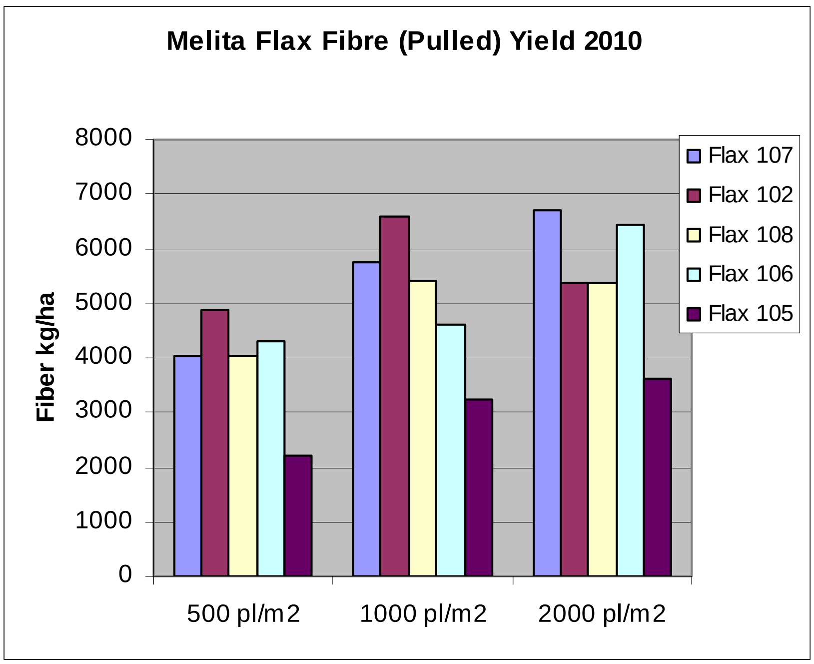
Grain (kg/ha)			
Variety	500 p/m^2	1000 p/m^2	2000 p/m^2
Flax 107	543	614	509
Flax 102	466	471	463
Flax 108	342	457	517
Flax 108	372	398	339
Flax 105	334	382	432
CV%	13.6		
LSD (p<0.05)	57.9		

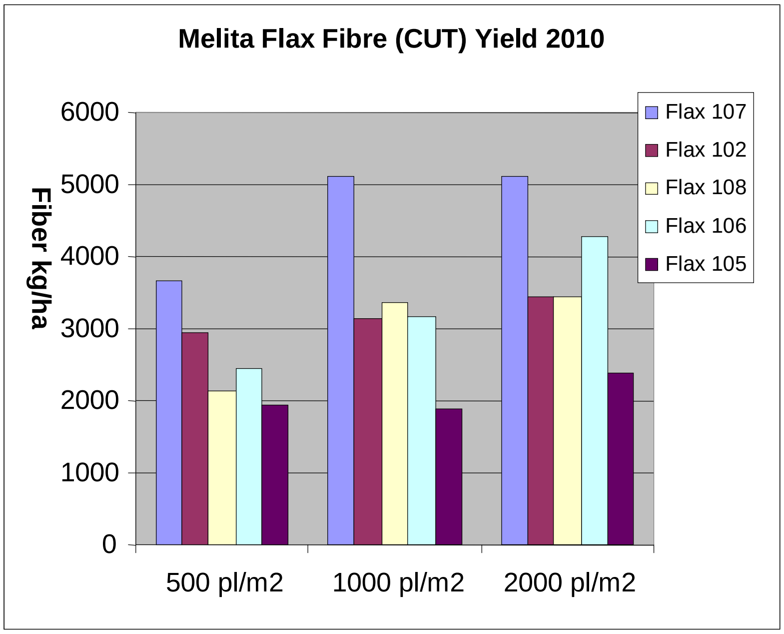
Fibre

There were significant fiber yield differences among varieties and seeding rates but there was no interaction between these characteristics with both pulled and cut flax samples.

Fibre Pulled (kg/ha)			
Variety	500 p/m^2	1000 p/m^2	2000 p/m^2
Flax 107	4041	5767	6700
Flax 102	4869	6596	5387
Flax 108	4041	5422	5388
Flax 108	4317	4593	6424
Flax 105	2210	3246	3626
CV%	21.6		
LSD (p<0.05)	1009.2		

Fibre Cut (kg/ha)			
Variety	500 p/m^2	1000 p/m^2	2000 p/m^2
Flax 107	3661	5111	5111
Flax 102	2936	3143	3454
Flax 108	2141	3350	3454
Flax 108	2452	3177	4282
Flax 105	1934	1899	2383
CV%	23.7		
LSD (p<0.05)	740.0		



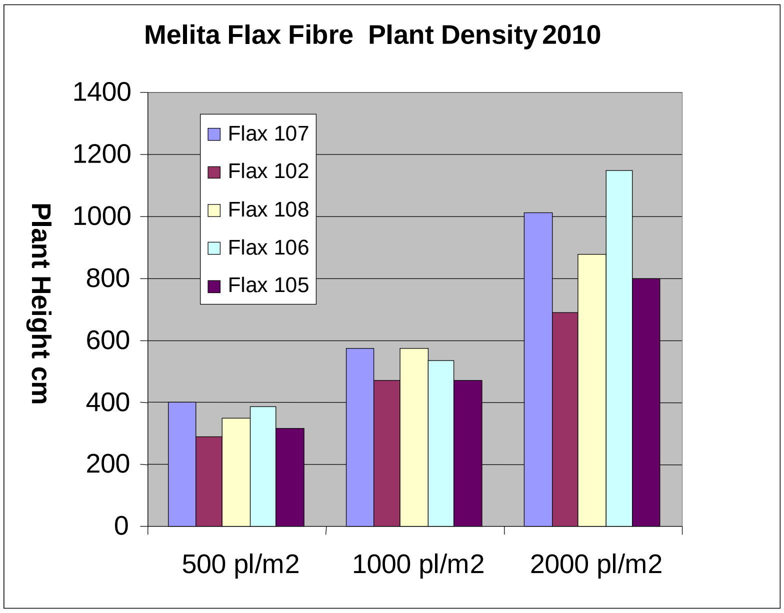


There were significant crop height differences among varieties and seeding rates but there was no interaction between these characteristics.

Height (cm) Variety	500 p/m^2	1000 p/m^2	2000 p/m^2
Flax 107	104	105	97.50
Flax 102	111	110	106
Flax 108	92.33	98.67	91.33
Flax 108	97.67	95.50	89.33
Flax 105	67.67	67.83	65.17
CV%	4.4		
LSD (p<0.05)	3.9		

There were significant emergence differences among varieties and seeding rates but there was no interaction between these characteristics.

Emergence (p/m^2) Variety	500 p/m^2	1000 p/m^2	2000 p/m^2
Flax 107	304	384	352
Flax 102	290	304	325
Flax 108	262	339	366
Flax 108	311	357	363
Flax 105	262	332	366
CV%	23.0		
LSD (p<0.05)	131.7		



Flax plants are traditionally pulled at harvest time for fibre only production. Keeping the entire stalk is important to maintain the fullest possible length of the flax fiber. Fiber flax is typically harvested when only the lower third of the plant is turning yellow and the lower leaves are falling off.

The research showed a significant yield increase of fibre from plants that were pulled vs. the ones that were cut 3-5 cm above ground.

This limited data shows the trend that the target of 1000 seed/m2 maximized the yield for most varieties. This is only one trial. More site years are required to confirm this observation.

Fibre & Shive Content in Flax Varieties

Prepared by: Eric Nickel, Composites Innovation Centre, Winnipeg, MB

Sampling Notes

- Raw flax was ground twice using a Retsch ZM 200 centrifugal mill, first using a 1.00 mm ring sieve and again using a 0.20 mm ring sieve.
- Roughly 10 g of each flax variety was ground and tested “as received”. No steps were taken to dry or otherwise standardize the condition of the mats.
- 3 samples of each flax variety were scanned 11 times with the Polychromix Phazir, yielding 33 total scans for each variety. Outlier scans were removed if and the total number of scans for each variety was brought down to 30.
- The “Flax Shive 09R” PLS model was used to predict shive content from the NIR spectrum of each scan. Fibre content was predicted with the “Flax Fibre 09R” PLS model. Predictions were consolidated and averaged for this report.

- Fibre and shive content were predicted independently using the two PLS models listed above. The independently predicted fibre and shive mass fractions added up to between 99.6% and 99.8% for all 5 flax varieties, which is close to the assume true value of 100%. This is evidence of accurate model performance for the flax varieties tested.

Results

The averaged mass fractions of shive and fibre for each variety are shown in Figure 1 and Figure 2 and are tabulated in Table 1.

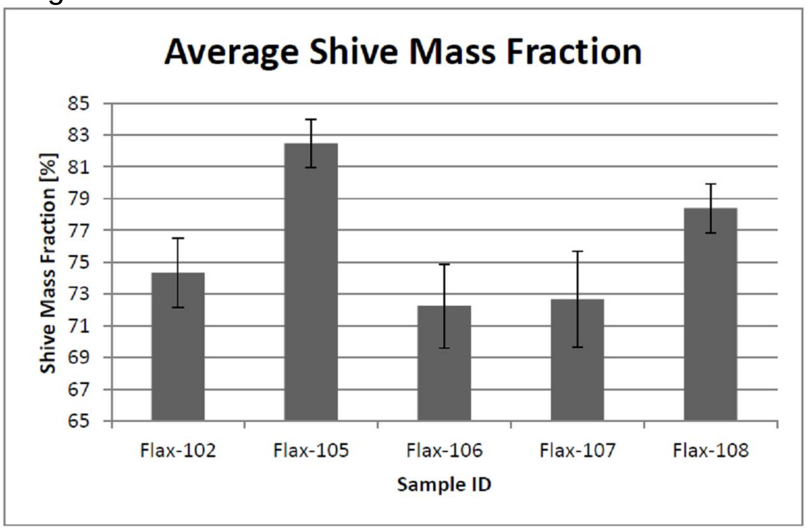


Figure 1: Average mass fraction of shive in flax varieties. Error bars show the sample standard deviation for each variation.

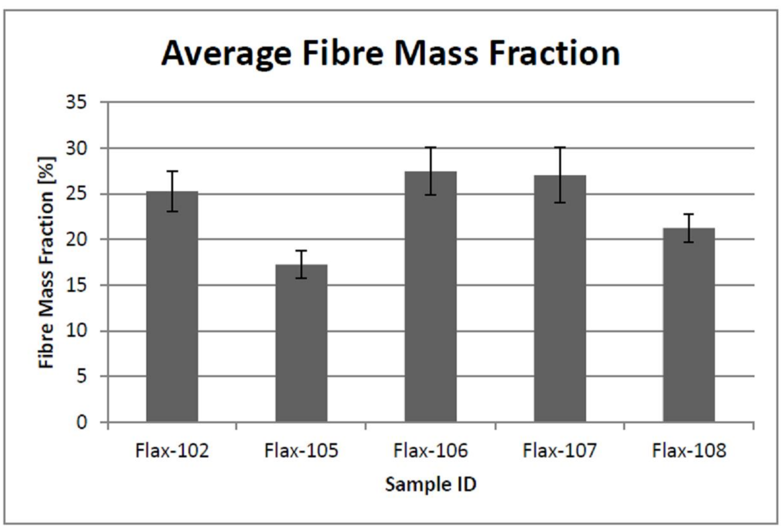


Figure 2: Average mass fraction of fibre in flax varieties. Error bars show the sample standard deviation for each variety.

Table 1: Averaged mass fraction of shive and fibre for each flax variety.

Name	# of Scans	Shive Mass Frac.	Std. Dev.	Fibre Mass Frac.	Std. Dev.
Flax-102	27*	74.3	2.16	25.3	2.18
Flax-108	30	82.5	1.51	17.3	1.52
Flax-105	30	72.2	2.63	27.5	2.62
Flax-106	30	72.7	3.02	27.1	3.00
Flax-107	30	78.4	1.55	21.3	1.54

*Flax-102 has only 27 samples because 3 of the scans contained bad data. Standard deviation calculations are corrected for sample size, so this slight difference in the number of scans will not significantly alter the data.

Discussion

At present there is not a flax fibre industry that is growing fibre only flax in Western Canada. Present flax decortication is being done using the straw that is left over from the grain producing varieties.

More research and economic analysis is required to evaluate the potential of growing specialized flax varieties for fibre only.

Machinery and management systems have to be defined and or developed to harvest the flax fibre so it can ret and be suitable for the decortication industry.

Yield data will be available from other sites from the 2010 growing season. Samples have been sent to the cooperating company in Europe for evaluation. This information will be available at a later date.

Conclusions

Flax grown for fibre only is not new but is a new concept for Western Canada. Varieties, yield, quality and economics need to be evaluated for the potential production opportunity that may exist. An industry partner is an important part of this investigation but our initial results from 2010 are very promising.

References

Rance, Laura. "Spinning Straw into Fibre." Manitoba Co-operator, Vol. 68, No. 21, May 27, 2010: 1,3.

Picture: Scott Chalmers in the WADO plot showing: grain flax (left) and fibre flax (right) with obvious height and flower date differences

Industrial Hemp Plant Population Trial

Location: Melita, Manitoba Carberry, Manitoba

Partner: PCDF WADO CMCDC

Like WADO's other hemp trial the exact location of this trial was in Dave Stewart's commercial field of Hemp one mile NW of the **Goodlands**' Border Port – on the SE of 11-1- 24 W1. Through the rest of the report the hemp site will be referred to as **"Melita"** just to provide continuity to previous year's data.

Background

Plant population for any crop needs to be optimized to ensure producers realize the highest returns. To date, the hemp industry has recommended a 20-25 pounds per acre seeding rate for the grain industry. It has been proven that higher seeding rates are required to maximize fibre yield and quality. The grain industry is well established in Manitoba, but as fibre processing comes on line, the question is how can producers maximize their grain and fibre yields for dual purpose production. The correct seeding rate and plant population recommendations need to be established so producers can optimize returns.

Objective

Evaluate the effect of seeding rate on plant population and grain and fibre yield.

Methods

This trial was planted in 4 locations, Roblin, Arborg, Melita and Carberry. Due to excessive moisture, the plots in Roblin and Arborg were destroyed early in the season. Plots in Melita and Carberry were established with seeding rates from 50 seeds per m^2 increments to 350 plants per m^2. The variety Alyssa was used.

Table 1. 2010 Industrial Hemp Plant Population Trial – Melita, MB and Carberry, MB

	Melita	**Carberry**
Treatments	7 seeding rates (Table 2)	7 seeding rates (Table 2)
Replication	4	4
Plot size	1.44m x 11.44m	1.2m x 7m
Test design	Randomized complete block design	Randomized complete block design
Seeding date	June 1	May 19 & June 7
Fertilizer applied	80 lbs. actual N, 30 lbs. actual P	100 lbs. actual N
Harvest date	Fibre – August 11 & 20 Grain - September 14	Fibre – September 17 Grain - September 17

Table 2. 2010 Industrial Hemp Plant Population Study Treatments – Melita, MB and Carberry, MB

50 plants/m^2	100 plants/m^2	150 plants/m^2
200 plants/m^2	250 plants/m^2	300 plants/m^2
350 plants/m^2		

Table 3. 2010 Spring Soil Nutrient Analysis from 0-24" Depth** - Melita, MB and Carberry, MB

	Melita		**Carberry**	
	Estimated Available Nutrients	**Fertilizer Applied (actual lbs/ac)**	**Estimated Available Nutrients (lbs/ac)**	**Fertilizer Applied (actual lbs/ac)**
N*	48 lbs/acre	87	40	100
P	4 ppm	30	13	
K	218 ppm		240	
S*	42 lbs/acre		30	
pH	7.9			

* Nitrate – N * Sulphate – S

** Analysis by AgVise Laboratories

Results

Table 4. 2010 Industrial Hemp Plant Population Trial – Melita, MB

Seeding Rate	Plant Count[1]	Height (cm)[2]	Stem Diameter (mm)[3]	Grain Yield (lbs/acre)	Fibre Yield (tonnes/acre)
50 pl/m^2	72	183.3	8.5	917	2.013
100 pl/m^2	113	177.5	7.3	931	2.446
150 pl/m^2	132	149.8	6.1	892	2.293
200 pl/m^2	203	151	5.5	929	2.279
250 pl/m^2	202	156	5.4	914	2.419
300 pl/m^2	295	140.8	4.6	785	2.265
350 pl/m^2	255	144.8	4.8	825	2.391
CV%	41.2	11.8	13.3	13.3	11.800
LSD ($p<0.05$)	111.2	27.6	1.2	175.4	0.402

[1] Plant counts June 25th
[2] Heights measured at fibre harvest, August 11th
[3] Average stem diameter at harvest, August 11th

Table 5. 2010 Industrial Hemp Plant Population Trial – Carberry, MB

	Seeded May 19		Seeded June 7		
Seeding Rate	**Plant Count[1]**	**Grain Yield (lbs/acre)**	**Plant Count[1]**	**Height (cm)[2]**	**Grain Yield (lbs/acre)**
50 pl/m^2	107	1313			
100 pl/m^2	199	1249	116	168	1131
150 pl/m^2	249	1089	202	168	1124
200 pl/m^2	374	1127	202	168	1089
250 pl/m^2	338	1176	280	177	1116
300 pl/m^2	436	1225	321	167	1088
350 pl/m^2	454	1171	343	173	1071
CV%	37	16.7	34	5.3	10.9
LSD	296	169.6	13.6	125	181

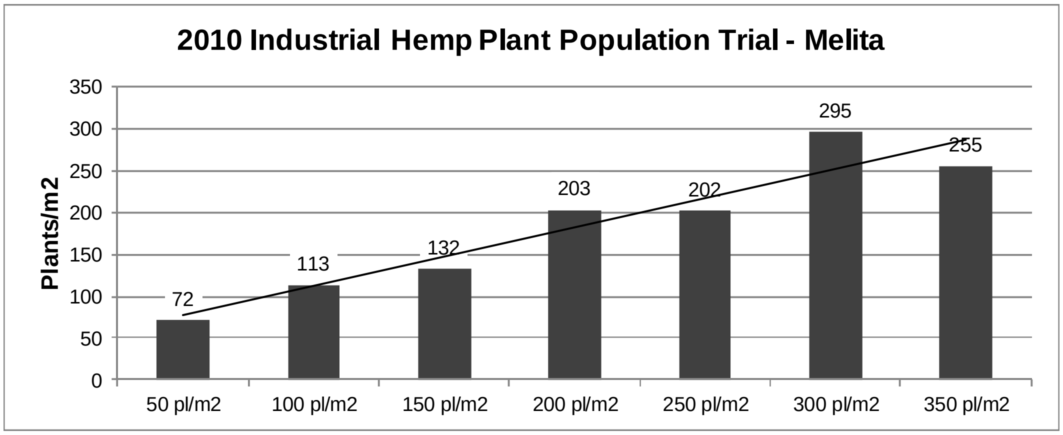
1 Plant counts were done - June 25th
2 Heights measured at Grain Harvest – September 17th

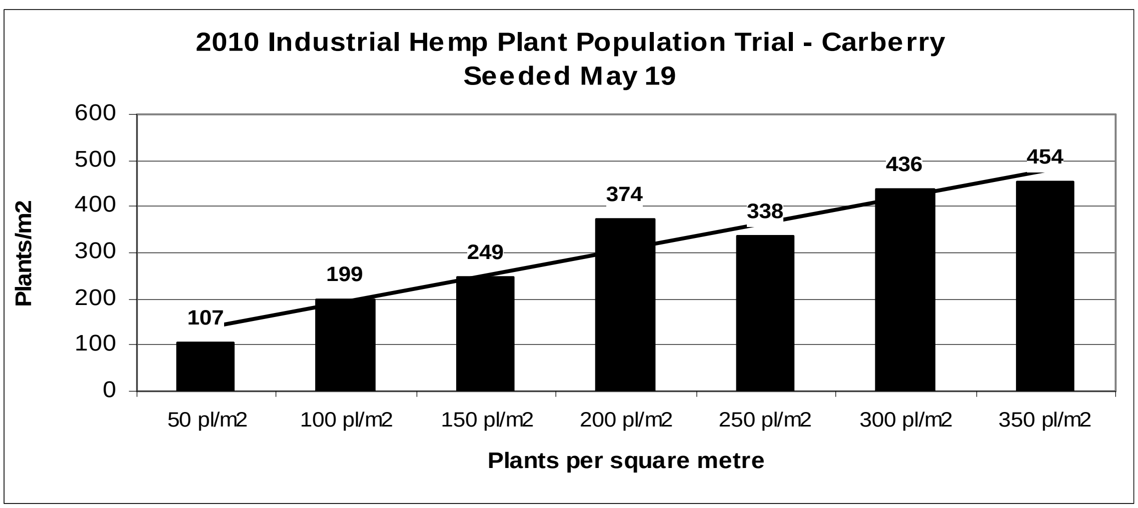
Plant Counts

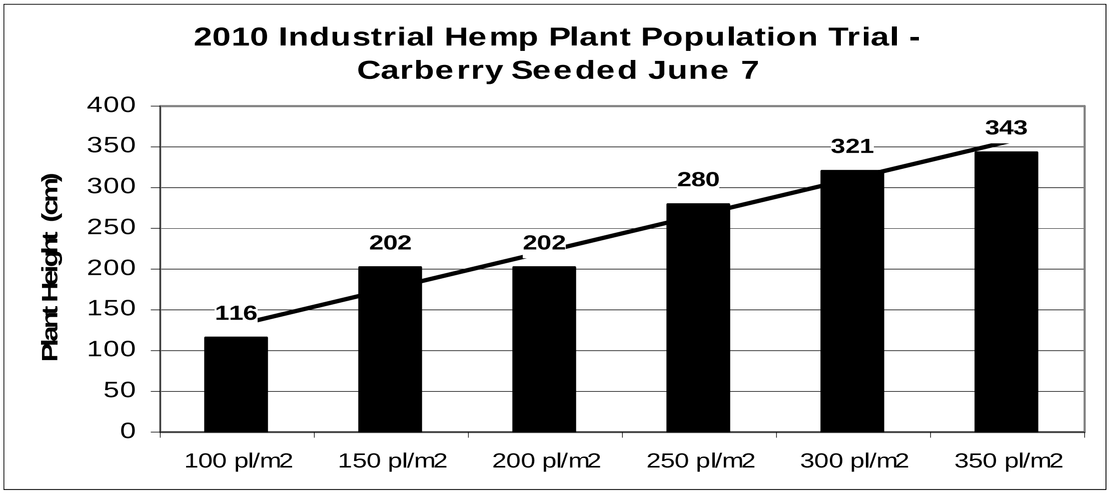
The Melita and Carberry sites show an increasing plant population with increased target seeding rate, as expected. There is a high variability in the emergence as indicated by the Coefficient of Variation (CV=37 to 41.2%). Hemp is a crop that has a high variability in the plant stand when it emerges, due to seed mortality and poor plant vigour. Factors such as weather and seeding depth affect mortality, leading to increased variability.

Plant counts do show an increase as expected in the plant population. The Carberry sites are higher than the target seeding rate indicating a smaller area was seeded than the seed was calculated for.

Figure 1. 2010 Industrial Hemp Plant Population Trial – Plant Counts – Melita



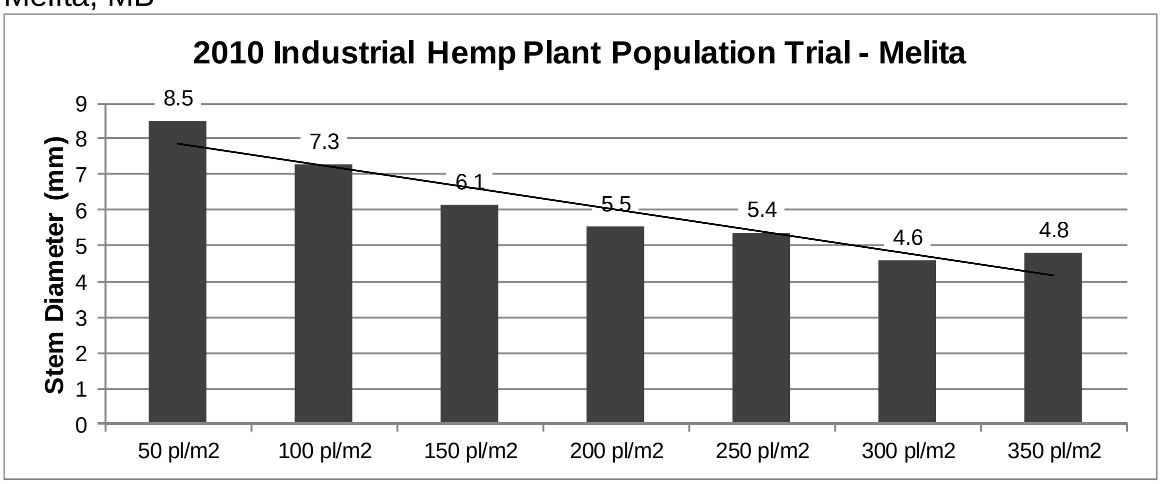




Stem Diameter

As plant population increased, stem diameter decreased due to more plants competing for sunlight and nutrients. The stem diameter decreased in a linear fashion by about 57% from the low to the high target seeding rates. The smaller stems will give a higher bast fibre yield and less hurd, which is desirable. The stem diameter does not seem to change after the 300 target seeding rate.

Figure 2. 2010 Industrial Hemp Plant Population Trial – Stem Diameter (mm) – Melita, MB

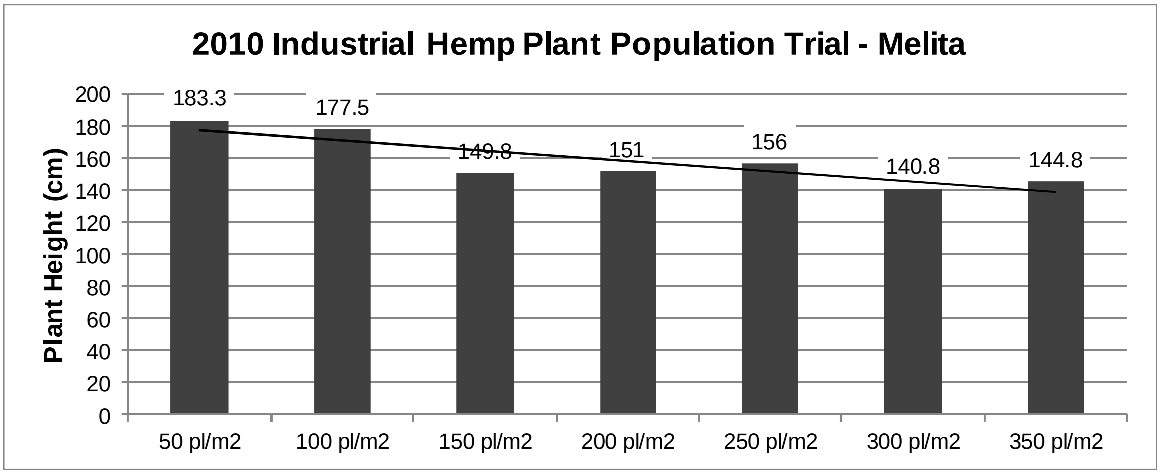


Height

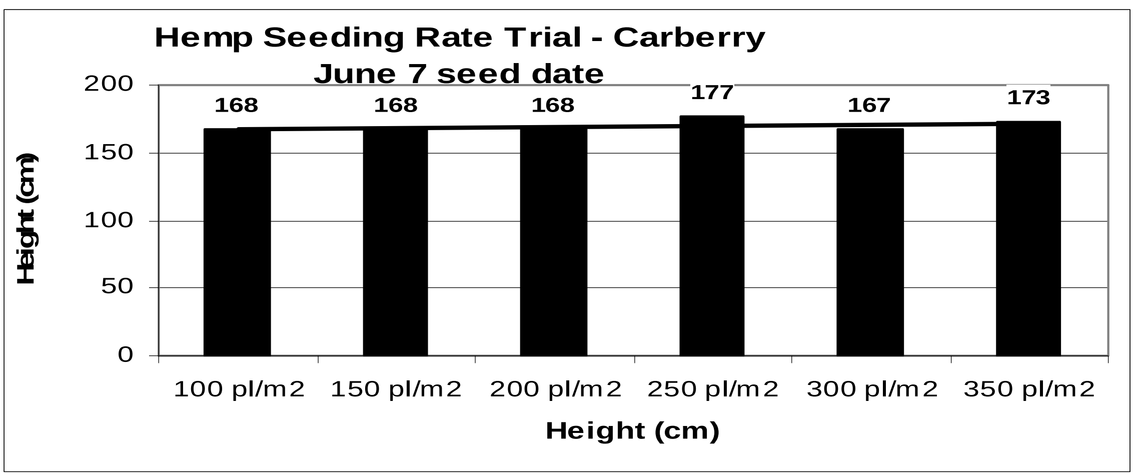
Increased plant population trends towards decreasing the overall height of the crop canopy. At the Melita site from 150 to 250 plants/m^2, there is no significant difference. Plant height seems to level out after the 250 plant rate. There was a 25% drop in crop height from the lowest seeing rate to the highest seeding rate.

The LSD is 27 cm for the plot heights so there is a significant drop in height from the low to high plant seeding populations.

Figure 3. 2010 Industrial Hemp Plant Population Trial – Plant Height (cm) at August 11th Harvest – Melita



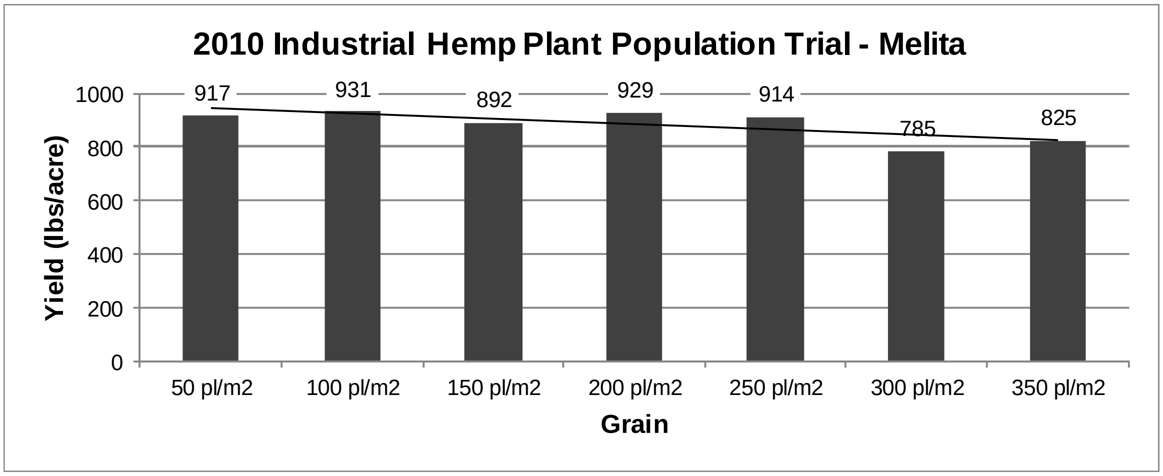
The Carberry site (late seeding) showed no significant height difference with higher plant populations.



Grain Yields

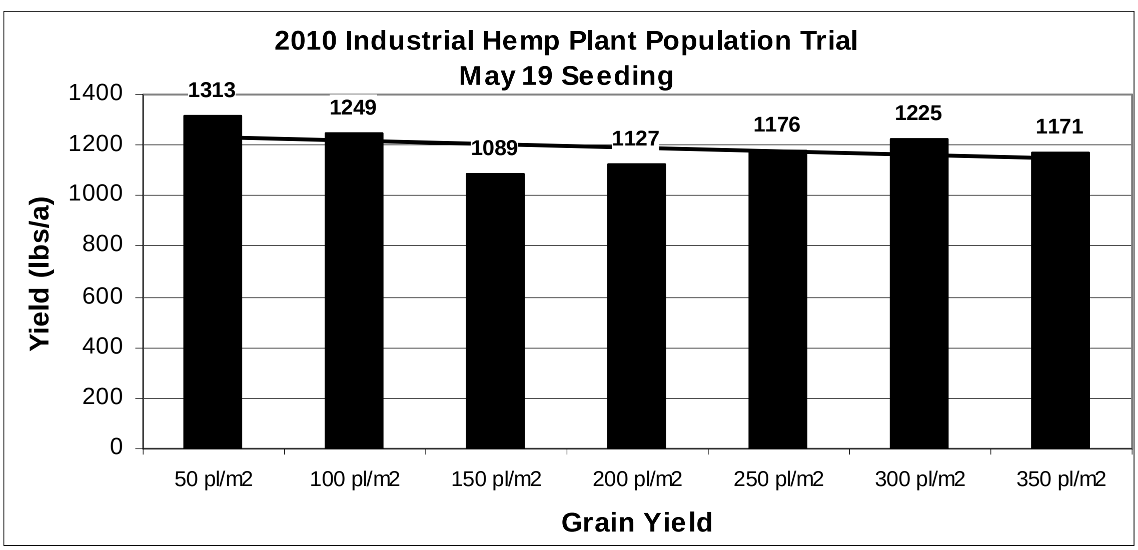
Mean grain yields for the Melita trial was 844 lbs per acre. LSD was 175 lbs per acre. Although there appears to be a downward trend in grain yield with increasing plant population, there is no significant yield decrease. From 50 to 250 seeds per m^2, the grain yield is essentially the same. At the 300 and 350 target rates there is a decrease that may indicate the plant competition is starting to affect yield.

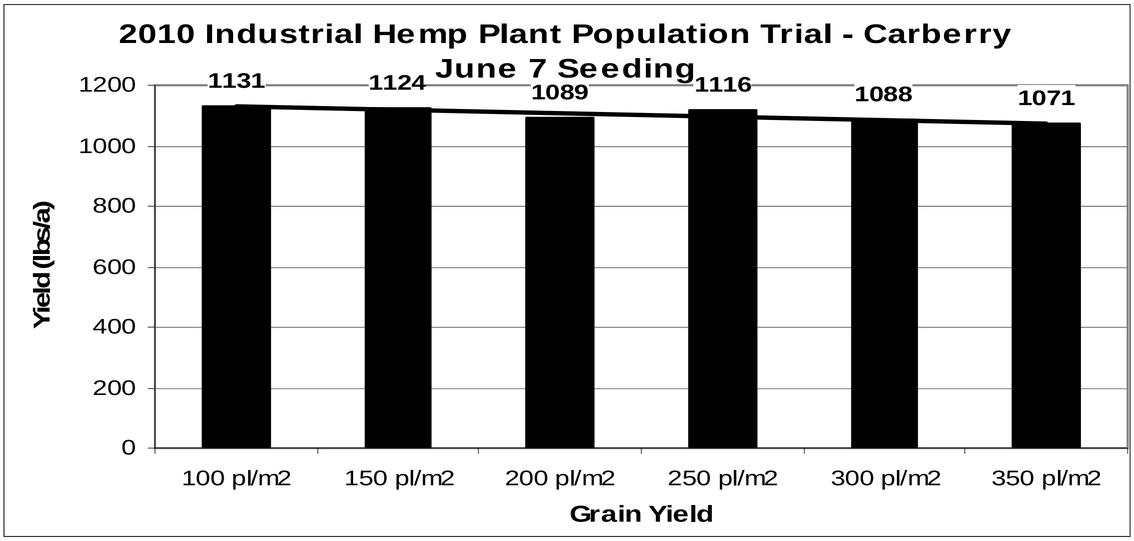
Figure 4. 2010 Industrial Hemp Plant Population Trial – Grain Yield (lbs/acre) – Melita



Carberry site had an early and late seeded plot. The mean yield for the early seeding (May 19) was 1192 pounds per acre. The late seeding (June 7) was 1103. There is not a significant yield difference in the grain yield from the early and late seeding.

At the Carberry site there is no significant yield difference as the seeding rate and plant population increased. The LSD for the early seeding was 169 pounds per acre and 181 for the late seeding. This indicates no significant difference from the increased seeding rate on the grain yield from increasing plant populations.

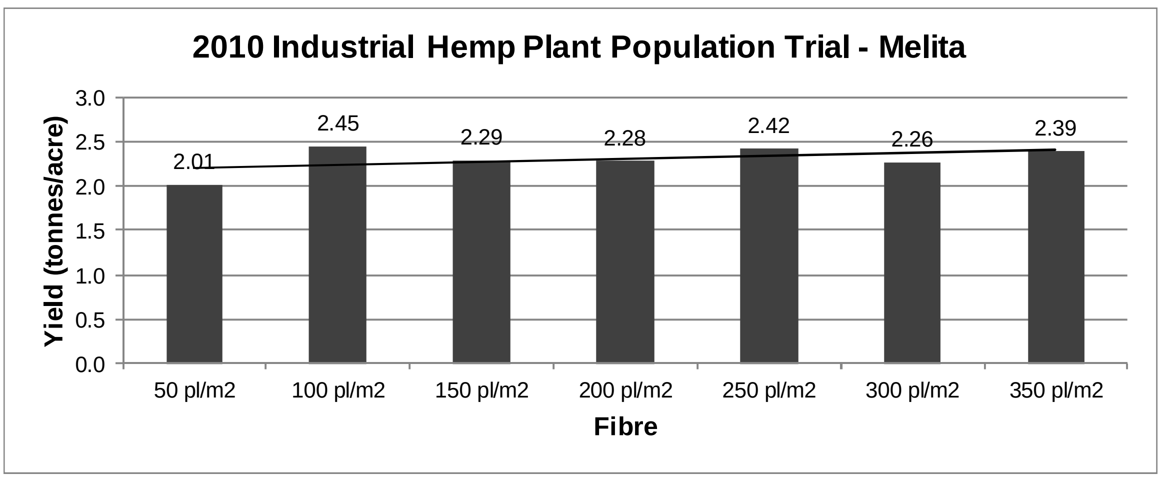




Fibre Yields

The fibre yield (Melita) shows a slight increase with an increase in plant population. The biggest response was going from the 50 to 100 plant target rate but with a LSD of .402 tonnes per acre, this would not be considered a significant difference.

Figure 5. 2010 Industrial Hemp Plant Population Trial – Fibre Yield (tonnes/acre) – Melita



Conclusions

Hemp seed mortality and plant vigour differs greatly resulting in plant population variation.

As the seeding rate increases, stem diameter decreases. This may be a benefit for fibre quality for some markets and applications.

Higher seeding rates seem to show a reduction in plant height. This could be a result of a more uniform plant stand. A sparser stand would allow more vigorous plants to grow taller. It appears that the 50 plant/m2 rate is the highest. This would suggest that there is low competition and the plants will then grow tall. After the 150 target rate, the seeding rate does not seem to affect the height of the stand.

Hemp grain yield is fairly uniform as the seeding rate increases. There is no significant grain yield increase with increasing seeding rate.

The target of 50 seeds/m^2 appears to be too low for a potential maximum yield of fibre. In this trial, the 100 seeds/m^2 showed a significant yield increase over the 50 seeds/m^2. The treatments remaining showed no significant yield increase or decrease. Further evaluation is needed to establish a target plant population for fibre production that will give small stalks but also the highest fibre yield.

This data should be viewed with caution as it is limited data. Further site years need to be evaluated to confirm the trends.

Photo: Aerial photo of the WADO hemp plot near Goodlands, MB. Hemp trials in producer hemp fields help reduce wildlife damage compared to isolated hemp plots on their own.

<u>"Buckwheat" Inc.</u>

Location: WADO's River site – Wayne White – Melita.

Partners: An unnamed, for-profit private company formed between the Manitoba Agri-Health Research Network Inc (MAHRN) and the Manitoba Buckwheat Growers Association. WADO

Project goal

To determine functional food, food ingredient and nutraceutical opportunities from Manitoba grown and processed buckwheat seed and biomass. Consultations between the growers and MAHRN members in 2009 resulted in a work plan that would take advantage of expertise and facilities at the Food Development Centre, Canadian Centre for Agri-Food Research in Health and Medicine (CCARM) and the Richardson Centre for Functional Foods and

Nutraceuticals to help explore the opportunities for extracting more value from buckwheat.

2010 Milestones

- Biomass trials established at Fort Whyte and Melita. Six varieties and advanced lines were selected for study: ManCan, Springfield, Manisoba, DK1, Koma and a tartary buckwheat line. Whole plant samples of each variety were harvested at full flowering and maturity. The plant samples from each variety-location combination were separated into leaf only, stem only and whole plant samples and frozen for analysis.
- Sprouting trials using the same varieties were also established. Seed was sprouted for between 1 and 14 days, then dried and the ground material analyzed for health properties.
- Stone-milled seed of the different varieties will be assessed for food and food ingredient properties including suitability as a gluten-free ingredient.

Outcomes

Interest is growing in the health promoting properties of buckwheat. Its nutritional profile and 'fit' with gluten free diets has lead the food industry to take another look at this traditional crop. In order to determine the market opportunity, however, the food and nutraceutical specifications of Manitoba grown and processed buckwheat need to be assessed. Based on the results, test market quantities of sprouted buckwheat; dried biomass; stone-milled flour and its components (protein, starch) will be produced and marketed by Buckwheat Inc. Having this type of potential for Buckwheat could be very interesting especially when a very short growing season is required. This could be a new option for seeding into July (because of flooding or whatever) or for early harvest to better set up a fall seeding option.

Sunflower Input Management Trial – 2010

Location: Four miles north of the Goodlands' Port, on Blake Nestibo's farm.

Partners: National Sunflower Association of Canada
WADO

Objective: To determine if there is one single or a combination of crop protection inputs that contribute increased confection sunflower yield and quality.

Background:
Sunflower production can be very profitable when yields and quality are achieved. To obtain the best returns per acre, producers may need to spend large upfront dollars on inputs, sometimes without knowing if it is the single input or combination that is giving the returns.

Crop protection products used in sunflowers are herbicides for broadleaf and cereal control; insecticides for management of seed head insects which reduce quality and yield and fungicide for control of rust, sclerotinia that can also reduce quality and yield potential.

Trial Specification and Design:

- Plot size 4 rows on 30 inch spacing, 8 meters length
- Trial design random complete block design, 15 treatments and 4 replicates.
- Sunflower confection variety was 6946, the most popular variety in Manitoba.
- Seeding rate to target 400,000 plants/acre and thin rows to one plant per 10 inches on our 30 inch row spacing.
- Pre-emergent herbicide application to be applied prior to seeding or up to 3 days after seeding. Needs rainfall to activate, so timing is important.
- Late herbicide application to occur when plants V4-V6 or up to 4-6 inches tall
- Entire trial to be over-sprayed with grassy herbicide control product at V4-V6, over-spray to be completed 3-5 days prior to or after broadleaf herbicide application

Treatment list and timings:

1. No inputs (untreated check)
2. Early herbicide application – pre-emergent
3. Late herbicide application
4. Late herbicide + fungicide at R5.1
5. Late herbicide + fungicide R5.1 + insecticide at R5.1
6. Late herbicide + fungicide + insecticide at R5.1 + desiccant at R8
7. Late herbicide + fungicide at R5.1 and R7
8. Late herbicide + fungicide at R5.1 and R7 + insecticide at R5.1

9. Late herbicide + fungicide at R5.1 and R7 + insecticide at R5.1 + desiccant at R8

Ratings:

1. Days to V4-V6 (late herbicide application timing)
2. Weed Density and species at V4-V6, record density in plants/m2 (3 counts) just prior to herbicide application
3. Weed density and species and R5.1, record density in plants/m2 (3 counts)
4. Days to R5.1 (timing of 1st fungicide application and insecticide application)
5. Height (recorded as cm) at R7
6. Days to R7 (timing of 2nd fungicide application)
7. Weed density and species at R7, record density in plants/m2 (3 counts)
8. Days to R8, back of head yellow, bracts starting to brown (timing of desiccation)
9. Days to R9 (maturity)
10. Yield – 2 middle rows, record yield in kg/plot, seed moisture at harvest
11. Seed subsample for quality analysis and insect damage – 500 grams cleaned seed

Results

The summer of 2010 experienced challenging weather. Due to prolonged periods of wet and somewhat excessive rainfall events, only the trial at Melita was successfully planted (Beausejour was abandoned).

At the trial in Melita, only one treatment was sprayed with the pre-seed sulfentrazone. Comparisons presented and discussed will then look at the differences between untreated, early application and normal time application of herbicide on yield. Then look at the additions of fungicide, insecticide and desiccation on yields.

Herbicide Timing application

Herbicide application treatments were made for the control of broadleaf weeds in sunflowers which can be a problem. Pre-emergent application of Authority was made June 6th, "late" application of herbicide consisted of the tank-mix Muster, Assert, Centurion on June 28th. The entire trial was over-sprayed with Select in-crop on June 25th to control grassy weeds.

Table 1: Impact of Herbicide Type on Sunflower Performance

Treatment	Yield (lb/ac)	Harvest Moisture	Days to R7 (DAP)*	Height (in)*	Weed Density (/m2)*
Untreated Check	1451.9	8.8	91	63.6	9.3
Early herbicide	1783.7	9.3	91	62	5.6
Late herbicide application	1551.7	9.1	93	61.6	8.9
GRAND MEAN	1597.4	9.2	91.4	63.1	7.7
CV	9.4	3.9	1.5	4.1	30.3
LSD	214.7	0.5	1.9	9.3	3.3
Significant	NS	NS	NS	NS	NS

*measurements taken at R7 sunflower development stage (back of head turning yellow)

Analysis of Variance was completed for the measurements were differences occurred. There were no differences in days to reach V6 (22 DAP), R5.1 (54 DAP), R8 (113 DAP) or R9 (128 DAP). Yield differences were not significant, but the use of the pre-emergent herbicide had the best yield results. The in-crop broadleaf herbicide treatment also showed better yields compared to the plots only receiving a graminicide. Harvest moisture again was not significantly different between the herbicide treatments and within 0.5%. The pre-emergent treatment had the highest moisture which might be explained by the fact it had the least density of weeds at R7 which would mean less competition. Measurement of Height showed no statistical differences, but the treatments were broadleaf herbicides were applied were slightly shorter than the untreated (graminicide only) check plot.

Multi-Input Impact on Sunflower Yield and Development

In addition to herbicide, other inputs such as fungicide for rust control and insecticides to contract seed feeding insects are applied to ensure highest possible yield and seed quality.

Table 2: Impact of Additive Pesticide Treatments to Performance of Sunflowers

Treatment	Yield (lb/ac)	Harvest Moisture	Days to R7 (DAP)*	Height (in)*	Weed Density (/m2)*
Untreated Check	1451.9	8.8	91	63.6	9.3
Early herbicide	1783.7	9.3	91	62	5.6
Late herbicide application	1551.7	9.1	93	61.6	8.9
Fungicide (R5.1)	1646.5	9.1	91.5	61.4	8.4
Fungicide + insecticide (R5.1)	1597.1	9.2	90.5	65.2	7.2
Fungicide + insecticide (R5.1) + dessicant (R9)	1633.1	9.4	91.5	64.4	7.5
Fungicide (R5.1, R7)	1624.5	9.1	91.5	61.6	7.5
Fungicide (R5.1, R7)+ insecticide (R5.1)	1530.8	9	91.5	64.6	6.9
Fungicide (R5.1, R7)+ insecticide (R5.1)+ dessicant (R9)	1555.1	9.2	92	63	8.4
GRAND MEAN	1597.4	9.2	91.4	63.1	7.7
CV	9.39	3.94	1.47	4.12	30.28
LSD	214.7	0.5	1.9	9.3	3.3
Prob. Entry	NS	NS	NS	NS	NS

*measurements taken at R7 sunflower development stage (back of head turning yellow)

The differences in yield are the main component that producers are interested in. The differences between all of the agronomic traits were not significantly different but they do provide an indication of trends seen in producer's fields. For this discussion though only yield will be focused on.

In general, the pre-emergent herbicide treatment yielded the most and the untreated check (graminicide only) yielded the least. The single fungicide treatment in addition to the post emergent herbicide application yielded more than the post emergent herbicide application alone and greater than the two fungicide applications. The addition of insecticide to post emergent herbicide and fungicide again yielded more than post emergent herbicide alone, but less than fungicide at the single timing. Desiccant in combination with the single fungicide and insecticide treatment yielded the third highest and again the addition of the second fungicide application did not increase yield.

Photos: Crew investigates area of plot within the trial found to have been struck by lightning! Lightning caused the pith of the plant to literally explode.

Crop Tolerance Evaluation of Potential Herbicides for Control of Japanese and Downy Brome in Established Perennial Ryegrass

Partners: WADO
Manitoba Forage Seed Association

Location: Mark McDonald's PRG field NW of Virden, MB.

Objectives

Determine the efficacy of various herbicides registered for control of Japanese and Downy Brome on established perennial ryegrass (PRG) produced for seed; Measure crop tolerance and relate to yield; and work towards Minor Use Registration for products that show sufficient tolerance and have been shown to have sufficient efficacy.

Methods

Trial Location and Design

In 2010, an herbicide trial was established northwest of Virden MB on the legal land location of NW 5-11-26 W1 in an established PRG field, near mid-eastern side of quarter 40 m west of grid road and approximately 200 m north of bluff area. Plot treatments were setup in a randomized complete block design and replicated four times. Plots were 2 meters wide and 6 meters long. A two meter pathway separated the blocks from each other.

Herbicide Application

A hand held sprayer pressurized by CO_2 was used to spray each herbicide. Additional sprayer details can be viewed in the spray report (Appendix I, available by request at WADO). Treatments were applied June 14. Weather conditions can be viewed in the weather data (Appendix II, available by request at WADO). The following foliar applied treatments were sprayed in addition to the untreated check.

Treatment	Notation	Description
1	Check	No herbicide Applied
2	Frontline 1x	40 mL/ac (A) florasulam 50 g a.i./L SC, 0.4L/ac (B) 564 g/L 2,4-D LV ester EC
3	Frontline 2x	80 mL/ac (A) florasulam 50 g a.i./L SC, 0.8 L/ac (B) 564 g/L 2,4-D LV ester EC
4	Sencor 1x	111 g/ac with 75% a.i. metribuzin DG
5	Sencor 2x	222 g/ac with 75% a.i. metribuzin DG

Crop Tolerance Assessments

Plots were rated visually for percent of crop injury of each treatment relative to the untreated control at 7, 14, 21 and 28 days after treatment (DAT). Actual assessment dates were June 23 (9 DAT), June 30 (16 DAT), July 8 (24 DAT), and July 15 (31 DAT), respectively. Pictures were taken of each plot during the crop tolerance assessment. Crop injury included, but is not limited to, spotting or speckling of leaf surfaces, yellowing, stunting, leaf curl, and plant death. Pictures relative to their rating on a specific day are attached in a digital appendix (CD) to this report.

Harvest

Plots were desiccated with Reglone herbicide at a rate of 0.91 L/ac containing surfactant Agral 90 (0.1L/100 L) with a hand powered backpack sprayer on August 17. Prior to harvest, crop height was measured. Plots were harvested August 26 with a Hege plot combine (harvest was delayed because of excessive rain during this period). Harvested plot size was 1.5 m x 6 m. Plot combine was set to 1200 rpm cylinder speed and 800 rpm wind speed. The cylinder to concave gap was tight. Seed was bagged and eventually cleaned with a fan mill cleaner using a narrow slotted screen normally used to screen barley seed.

Additional sample cleaning was warranted with a canola screen if green foxtail populations were high in the sample. Seed samples were weighed and stored. Moisture was not taken because in most cases, the sample was insufficient to complete this variable.

Data Analysis

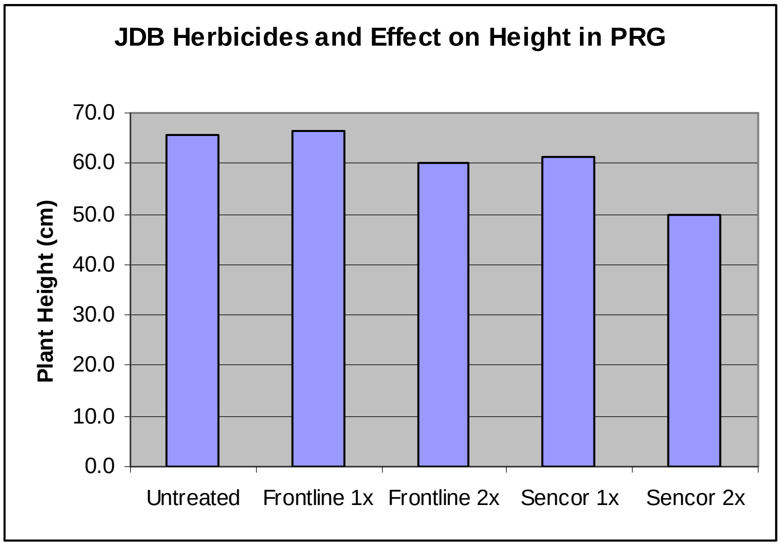
Height and yield data was subject to a two-way analysis of variance (ANOVA) using Analyze-it version 2.03 statistical software. Coefficient of variation (CV%) was determined and Fishers unprotected Least Significant Difference (LSD) at the 0.05 level of significance was calculated if the ANOVA was significant. R-squared and P values were also included to determine both data "soundness" and significance, respectively.

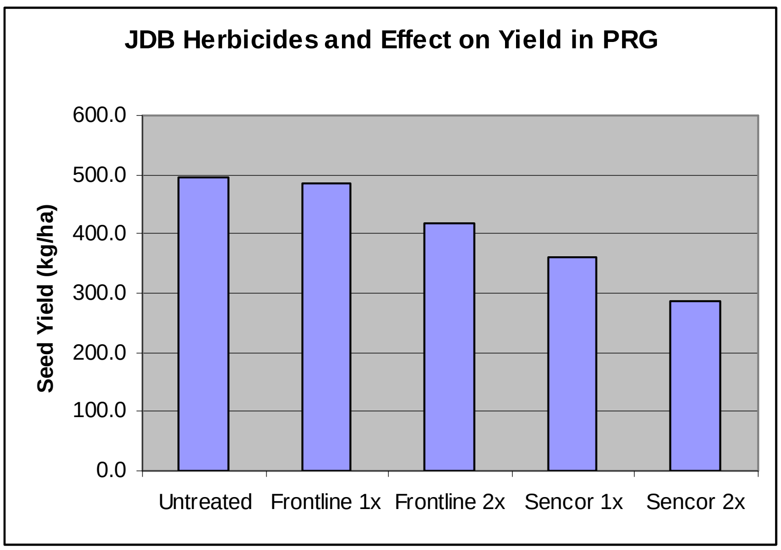
Results

There were significant differences in plant height prior to harvest but not in yield. Sencor 2x significantly reduced plant height compared to all other treatments combined, but had no significant effect on final yield despite trends suggesting otherwise in both height data and tolerance ratings. High CV%, low R-squared value, and data variation (not shown) in treatments 3 & 5 indicate there is some level of yield discrepancy among treatments, however this may be indicative of working with small quantities relative to large quantities in a data set such as this. In other words, small means tend to translate into greater than normal variation, naturally.

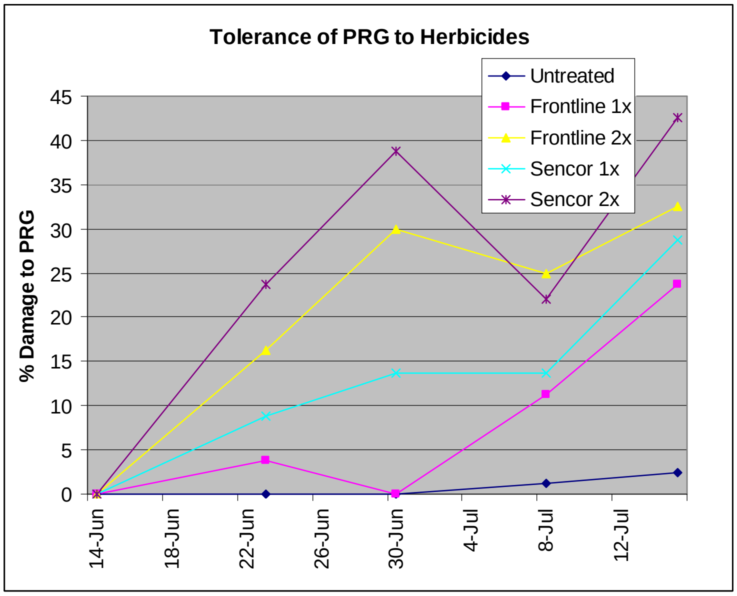
						Tolerance Rating (% Damage)				
Treatment	Description	Height (cm)		Yield kg/ha		14-Jun	23-Jun	30-Jun	8-Jul	15-Jul
1	Untreated	65.5	a	494.4	a	0	0	0	1	3
2	Frontline 1x	66.3	a	486.1	a	0	4	0	11	24
3	Frontline 2x	60.0	a	416.7	a	0	16	30	25	33
4	Sencor 1x	61.3	a	361.1	a	0	9	14	14	29
5	Sencor 2x	50.0	b	286.1	a	0	24	39	22	43
	CV%	7.0		26.9						
	LSD (p<0.05)	6.6		N/S						
	R-squared	0.76		0.49						
	P value	1.14E-03		9.45E-02						

JDB Herbicides = Japanese & Downy Brome Herbicides





Crop Tolerance ratings indicate that there was some degree of injury in any case where herbicide was used. Sencor used at a 2x rate resulted in the greatest response in injury followed by that of the 2x rate of Frontline, the 1x rate of Sencor and finally the 1 x rate of Frontline. The rate of injury was also faster for the double rates (2x) as compared to the single rate (1x) applications compared to the untreated check. Some drift may have occurred in the untreated check illustrated by the slight response in the tolerance rating late in the season.



Conclusions

Frontline 1x appears to be the safest herbicide (in terms of crop tolerance) to use in the control of JDB compared to its 2x rate and any rate of Sencor. Despite the insignificance in yield loss, supporting data such as tolerance rating and height suggest that Frontline 2x, and Sencor would be inferior to PRG production in controlling JDB. This data is only one site year and should be regarded as tends until further data can be recorded and compiled.

Evaluation of Potential Herbicides for Control of Perennial Rye Grass (PRG)

Partners: WADO
Manitoba Forage Seed Association

Location: Mark McDonald's Farm NW of Virden, MB.

Objective

Determine the potential of various herbicides to be used for controlling Perennial Rye Grass (PRG) in subsequent Cereal Crops; in addition to measuring control we also measured crop tolerance and relationship to yield. This work is moving towards a Minor Use Registration for products that show sufficient tolerance and have been shown to have sufficient efficacy of controlling volunteer PRG.

Methods

Trial Location and Design

In 2010, an herbicide trial was established northwest of Virden MB on the legal land location of NW 5-11-26 W1 in an established PRG field, near mid-eastern side of quarter 40 m west of grid road and approximately 200 m north of bluff area. Plot treatments were setup in a randomized complete block design and replicated four times. Plots were 2 metres wide and 6 metres long. A two metre pathway separated the blocks from each other.

Herbicide Application

A hand held sprayer pressurized by CO_2 was used to spray each herbicide. Additional sprayer details can be viewed in the spray report (Appendix I, available by request at WADO). Treatments were applied June 14. Weather conditions can be viewed in the weather data (Appendix II, available by request at WADO). The following foliar applied treatments were sprayed in addition to the untreated check.

Treatment	Notation	Description
1	Axial 1x	243 mL/ac Pinoxaden 100 a.i. g/L EC, Adigor adjuvant 280 mL/ac
2	Axial 1.5x	364.5 mL/ac Pinoxaden 100 a.i. g/L EC, Adigor adjuvant 420 mL/ac
3	Horizon BTM	0.32 L/ac clodinafop-propargyl 240 g a.i./L, Score Adjuvant
		0.51 L/ac bromoxynil 225 g a.i./L + MCPA ester 225 g a.i./L
4	Velocity	0.2 L/acthiencarbazone-methyl 10 g a.i./L
5	Untreated	No Herbicide Applied (Check)

Crop Tolerance Assessments:

Plots were rated visually for percent of crop injury of each treatment relative to the untreated control at 7, 14, 21 and 28 days after treatment (DAT). Actual assessment dates were June 23 (9 DAT), June 30 (16 DAT), July 8 (24 DAT), and July 15 (31 DAT), respectively. Pictures were taken of each plot during the crop tolerance assessment. Crop injury included, but is not limited to, spotting or speckling of leaf surfaces, yellowing, stunting, leaf curl, and plant death. Pictures relative to their rating on a specific day are attached in a digital appendix (CD) to this report.

Harvest

Plots were desiccated with Reglone herbicide at a rate of 0.91 L/ac containing surfactant Agral 90 (0.1L/100 L) with a hand powered backpack sprayer on August 17. Prior to harvest, crop height was measured. Plots were harvested August 26 with a Hege plot combine (harvest was delayed after desiccation because of excessive rain during this period). Harvested plot size was 1.5 m x 6 m. Plot combine was set to 1200 rpm cylinder speed and 800 rpm wind speed. The cylinder to concave gap was tight. Seed was bagged and eventually cleaned with a fan mill cleaner using a narrow slotted screen normally used to screen barley seed. Additional sample cleaning was warranted with a canola screen if green foxtail populations were high in the sample. Seed samples were weighed and stored. Moisture was not taken because in most cases the sample was insufficient to complete this measurement.

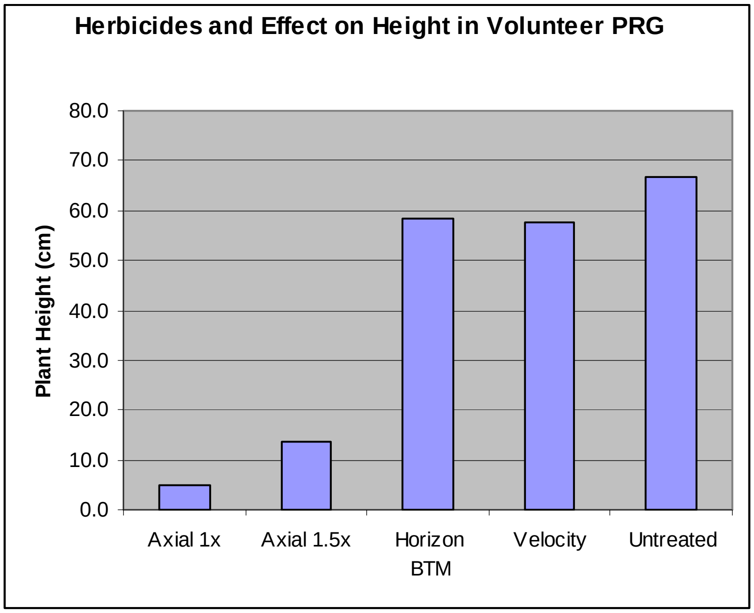
Data Analysis

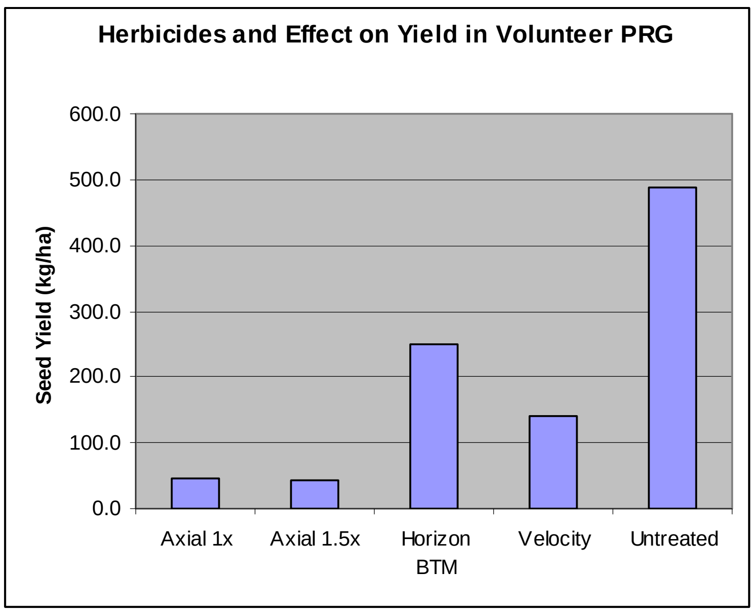
Height and yield data was subject to a two-way analysis of variance (ANOVA) using Analyze-it version 2.03 statistical software. Coefficient of variation (CV%) was determined and Fishers unprotected Least Significant Difference (LSD) at the 0.05 level of significance was calculated if the ANOVA was significant. R-squared and P values were also included to determine both data "soundness" and significance, respectively.

Results

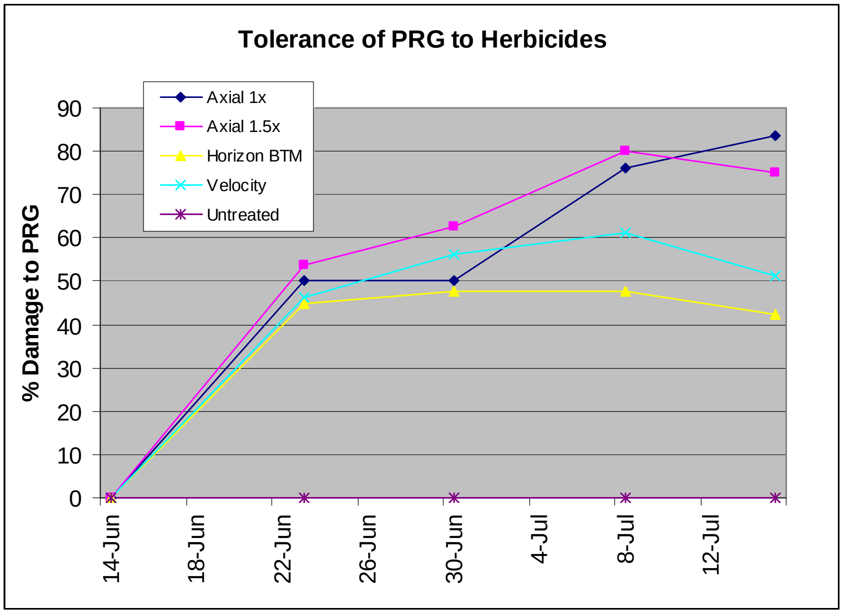
There were significant differences in both height and yield. In terms of yield, use of Axial resulted in the greatest control of PRG. Horizon BTM offered the least level of control compared to the untreated check, while the use of Velocity was somewhat effective for controlling PRG and was intermediate to that of Axial or Horizon BTM. Similar conclusions in terms of height were found, Axial appeared to stunt the PRG more than Velocity or Horizon BTM compared to the untreated check. A high CV% and large data variation between treatments (not shown) indicate there is some level of yield discrepancy among treatments. However, this may be indicative of working with small quantities relative to large quantities in a data set such as this. In other words, small "means" tend to translate into greater than normal variation, naturally.

						Tolerance Rating (% Damage)				
Treatment	Description	Height (cm)		Yield kg/ha		14-Jun	23-Jun	30-Jun	8-Jul	15-Jul
1	Axial 1x	5.0	b	47.2	d	0	50	50	76	84
2	Axial 1.5x	13.8	b	41.7	d	0	54	63	80	75
3	Horizon BTM	58.3	a	250.0	b	0	45	48	48	43
4	Velocity	57.5	a	141.7	c	0	46	56	61	51
5	Untreated	66.8	a	488.9	a	0	0	0	0	0
	CV%	23.4		26.9						
	LSD (p<0.05)	14.5		80.4						
	R-squared	0.93		0.95						
	P value	1.18E-06		2.07E-07						





Tolerance ratings indicated that greatest injury was the result of using Axial and was nearly undistinguishable for all ratings. Velocity appeared to be intermediate in injury compared to Axial and Horizon caused the least amount of injury. Both Velocity and Horizon BTM appeared to lack the ability to sustain injury as plants appeared to recover from their applications later in the season.



Conclusions

Use of Axial at the 1x or 1.5x rate resulted in the best control of PRG. However, economically, 1x rate would likely be sufficient according to this data. Products like Velocity and to a lesser extent; Horizon BTM offer intermediate control. This data is only one site year and should be regarded as tends until further data can be recorded and compiled.

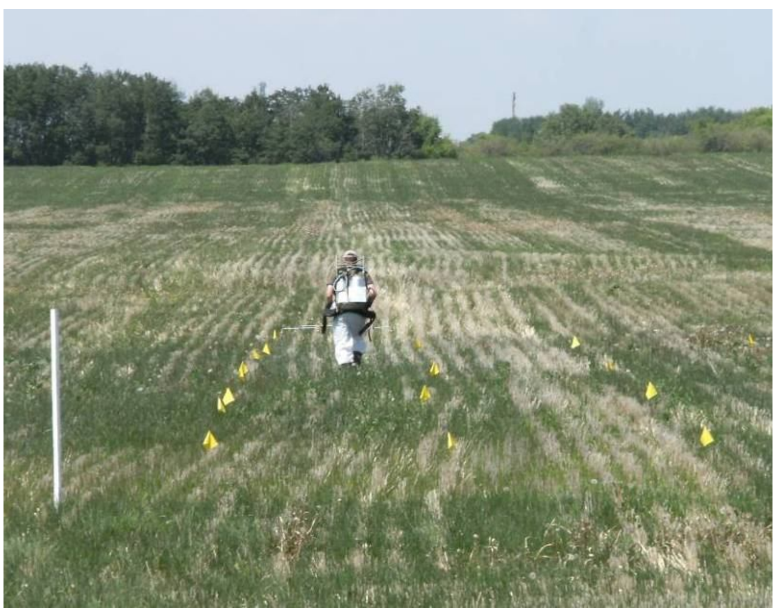


Photo: Scott Chalmers applying herbicide treatments in the PRG trial at Virden

Developing yield loss relationships and economic thresholds for kochia and biennial wormwood in sunflowers in Manitoba

Researchers:

- Derek Lewis, Graduate Student, Department of Plant Science, University of Manitoba
- Dr. Rob Gulden, Assistant Professor, Department of Plant Science, University of Manitoba

Funding: National Sunflower Association of Canada
WADO

Location: WADO's Sunflower Agronomy Site – 4 miles north of the Goodlands Custom Port, west side of highway #21 on Blake Nestibo's farm.

Objective

Previous research has shown that sunflowers are a crop that has a high susceptibility to yield losses caused by weed interference. Kochia and biennial wormwood are two weeds that producers often have difficulty controlling in sunflower crops in Manitoba. Sunflower producers use combinations of herbicides and in-crop tillage to control weeds after crop emergence however, there is movement towards zero-tillage production systems in many areas and with the removal of tillage, herbicides remain the only option for weed control in sunflowers under zero-tillage. There has been no local research to date examining the potential yield losses in sunflowers caused by weed interference under zero-tillage production systems. The goal of this research is to determine yield and quality losses caused by kochia and biennial wormwood in sunflowers and provide the information necessary to calculate economic thresholds for control of these weeds in sunflowers in Manitoba. In 2010, the experiments were located near Deloraine, Winnipeg and Carman in 2010.

Preliminary Results for Goodlands site:

Measurements in sunflower in response to weed interference included crop density, plant height, number of leaves, stem diameter, time of flowering, head diameter, yield and weed density.

Kochia

In 2010, kochia that emerged at the same time as the crop and after the 4 leaf sunflower stage did not appear to affect sunflower growth parameters, or yield at densities as high as 27 kochia plants per square meter according to our preliminary results. In 2009 yield losses as great as 30% at a density of about 44 kochia plants per square meter were observed when kochia emerged at the same time as the sunflower crop. Kochia thrives under hot, dry conditions. In many areas of Manitoba, 2010 had above average precipitation with cooler temperatures which could have reduced the competitive ability of kochia.

Biennial wormwood

In 2010, we observed yield losses up to 38% when biennial wormwood densities reached 723 plants per square meter and the weeds emerged at the same time as the sunflower crop. When biennial wormwood emerged when the sunflowers were past the 4 leaf stage, preliminary results show minimal yield loss.

The kochia and biennial wormwood experiments will be repeated in 2011 in Melita, Carman and Winnipeg.

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Intercropping Pea & Canola by Row Arrangement and N rates

Investigators:
Scott Chalmers, P. Ag. & Scott Day, P. Ag
Westman Agricultural Diversification Organization (WADO)

Location: WADO's River Site – Gary Serruys – Melita
Soutar Farms – 8 miles NW of Hamiota

Intercropping is the agricultural practice of cultivating two different crops in the same place at the same time (Andrews & Kassam 1976). Benefits of intercropping can lead to greater than expected yields compared to the sole crop. Reasons for additional yield may be the result of greater efficiency in the use of nutrients, light and water (Szumigalski & Van Acker 2008). Intercropping may improve pest control and provide structural support advantages when compared to each being grown as a sole crop. Intercropping is not a new concept and has been used by farmers for generations. However, recent improvements in farm machinery and individual variety characteristics and herbicide tolerance have once again tweaked producer's interests in intercropping.

Often, intercropping is not only measured by total yield of products, but as a total economical value (total $/acre) by combining each crop value, or by Land Equivalent Ratio (LER). The LER is a measure of how much land would be required to achieve intercrop yields with crops grown separately as pure stands. When the LER is greater than 1.0, over-yielding is occurring and the intercrop is more productive than the component crops grown as sole crops. When the LER is less than 1.0, no over-yielding is occurring and the sole crops are more productive than the intercrop. For example; a LER rating of 1.20 from an intercrop of pea-canola means it would take 20% more land to equal that final yield if each crop was planted as separate components.

This is the second year of pea-canola intercropping trial at the Westman Agricultural Diversification Organization. This year is different from 2009. In 2009, mixed plots of pea and canola were tested against seeding rates of the component crops. Achievements in over-yielding occurred in 2009, but obvious improvements on the idea were needed in dealing with applied nitrogen and the interaction with pea production, and a closer look at the behavior of pea and canola crops in row proximity. The idea was to improve pea and canola growth conditions based on nitrogen need but still attempt to preserve and better understand over-yielding in intercropping behavior.

Objectives

1. Monitor effect of row arrangement in a canola-pea system including mixed, single and double crop rows on yield, disease incidence, canola shatter, soil fertility, plant density, flower and maturity dates.
2. Monitor effect of row placed nitrogen and the effect it has on both canola and pea yield and its relationship to row arrangement (neighbor effect)
3. Examine causes to inflated LER in the pea-canola cropping system compared to their monocrop counterparts

Architectural design of intercrop fields to improve nutrient and light and production efficiency were investigated in this trial based on nitrogen rate and nitrogen-to-row placement. Row-to-crop arrangement was modified to observe crop responses. Nutrient efficiency focused on applied nitrogen within only the canola rows, while row arrangement of the individual crops (single, double, or mixed in the rows) was modified to determine the effect of row arrangement and crop-nitrogen responses. It is speculated that if inoculated peas can be starved of applied nitrogen by dividing to specific individual crop rows, the crop will be less likely to become in-efficient in its "fixing" of nitrogen. Therefore, improving the efficiency of the pea-canola system as a whole by having dedicated rows of each individual crop; compared to mixing everything together should provide even better economic results. In addition, dividing rows into individual crops will partition applied nitrogen to exclusively the canola rows where it will be better used economically. For example: a field of alternating rows of pea and canola, with canola rows only fertilized with nitrogen, could possibly result in a positive LER and yet use only half the nitrogen fertilizer compared to what is used in a monocrop or fully mixed field of canola or peas. The concept may even improve further by moving to double sets of alternating rows.

Methods

Previous crop established in 2009 was Columbus wheat. Plot stubble area was maintained with a spring harrow to deal with excess straw. On May 10, plot area was then sprayed with Roundup Transorb (glyphosate 500 g a.i./L) tank mixed with Rival (trifluralin 500g a.i./L EC) at a rate of 1.0 L/ac and 0.69 L/ac, respectively. Plots were seeded with a SeedHawk dual knife single side band plot seeder May 18, 2010 near Melita, MB on a loamy sand soil (East River Site). Six rows at 9.5" spacing were planted twice to result in a single plot. Final plot dimension was 2.88 m x 9 m. Plots were rolled after seeding. Seed was placed 1" below the soil. Fertilizer was side band 1" below and beside the seed. Seeding rate for canola was 6 lbs/ac in the monocrop treatments. Variety 71-30 CL (Monsanto) was used.

Crop Treatments are as outlined in Table 1. Initial intensions were to fertilize (with nitrogen) individual rows of canola and not individual pea rows in order to promote proper N fixation in pea rows. Ball values were placed on the liquid fertilizer distribution lines (Pattison Liquid Fertilizer Distribution Kit) in order to be able to turn off and on applications of nitrogen. It was assumed that the system would self regulate each line to be the same rate per row due to the orifice insert. For example, single alternate rows of canola would have the exact rate of liquid fertilizer per unit of row as a full rate monocrop row (resulting in half rate N applied overall in intercropping situations compared to monocrop situations). However, post trial measurements indicated that lines that were left on actually applied the additional fertilizer to which rows were turned off, thus separating rows into individual crops increases nitrogen rates within the rows of canola. Initial protocol did not intend for this to happen, but observing the plot as a whole, rates were still within the intended range, and results where still somewhat useful in providing more clues in intercropping behavior of pea-canola.

Table 1: Trial treatment descriptions with their corresponding row orientation (C – canola, P – pea, and underscore symbol dividing the individual rows) and nitrogen (N,n) fertility level applied both when considering in row of canola and overall within tested area (including pea area). N= 76 lbs/ac in row equivalent, n= 33 lbs/ac in row equivalent.

Trt. No.	Description	Crop Row and Nitrogen Placement Arrangement	Applied Nitrogen (lbs/ac Actual) In Canola Row	Applied Nitrogen (lbs/ac Actual) Total Plot**
1	Canola Full Rate	CN_CN_CN_CN_CN_CN	76	76
2	Peas Inoculated	P_P_P_P_P_P	-	-
3	Double Rows Full Rate	CNn_CNn_P_P_CNn_CNn_P_P_CNN_CNN_P_P	109*	76
4	Single Rows Full Rate	CNN_P_CNN_P_CNN_P	152	76
5	Mixed Rows Full Rate	CNP_CNP_CNP_ CNP_CNP_CNP	76	76
6	Mixed Rows Half Rate	CnP_CnP_CnP_CnP_CnP_CnP	33	33
7	Canola Half Rate	Cn_Cn_Cn_Cn_Cn_Cn	33	33

* weighted average of 101#/ac (4/6 rows canola) and 126#/ac(2/6 rowscanola)
**Combined pea and canola row area of entire plot

In single and double row treatments similar plant densities within the row were maintained as in the monocrop system. Likewise for peas, seeding rate was set for 153 lbs/ac (75 plants/m2) in the monocrop, and in single and double row treatments, similar plant densities were preserved within those rows. However, in the mixed row treatments, seeding rates for each crop were cut in half, but seeded in the same row. Variety 'CDC Golden', a semi-leafless yellow medium height type pea was used. 71-30 DeKalb Clearfield was used for the canola variety

All plots received 58 lbs/ac of 11-52-0 (MAP). Addition nitrogen was supplied by 28-0-0 (UAN liquid solution). Only canola monocrop treatments and canola rows received additional nitrogen. Peas were inoculated with proper Rhizobium (granular Nodulator) and were not fertilized with N (28-0-0) unless canola was in the same row at the time depending on the treatment. Nitrogen sourced from 28-0-0 fertilizer was denied in rows of peas and only applied to canola rows. Individual ball valves were inserted into each liquid fertilizer line to restrict or permit flow. As a factor of this restriction, closing valves caused open lines to compensate equally, essentially fertilizing those rows in proportion. For example, when monocropped, canola received 76 lbs/ac N, however when in alternate single rows, canola received 152 lbs/ac (within that canola row equivalent) but overall plot area still received 76 lbs/ac total (when peas are included into the land area). In the double row treatments, canola received 109 lbs/ac row equivalent, yet overall still received 76 lbs/ac N. In half rate plots only 33 lbs/ac N was applied to the canola. This treatment was incorporated to gauge the canola N response as well as monitor the N response in pea yield. Plots were kept weed free using herbicides. Odyssey (35% imazamox & 35% imazethapyr DG), was applied at a 17 g/ac, with a water spray volume of 10 gal/ac, applied June 14.

Data collected included flower dates, crop height, plant density, leaf diseases, seed diseases (Hamiota demo site); days to maturity, lodging, seed shatter (canola), grain moisture, seed yield, and a post harvest soil test. Pod shatter was a visual observation of the percent of pods that had shattered prior to harvest. Soil tests were taken November 4th using a 24" hydraulic soil probe with a wet tip. Plots were samples 5-6 times to achieve enough soil volume. All plots were sampled between the rows, while intercrop plots were sampled between those rows in which only pea-canola bordered each other. The purpose of this was to attempt to capture the plot average nutrient rather than in the over-fertilized canola row, or the under-fertilized pea row.

Plots were desiccated at maturity on Aug 16, 2010 with Reglone herbicide at a rate of 0.91L/ac. Plots were let stand to dry for several days. Plots were harvested August 25, 2010 with a Hege plot combine set at 800 rpm wind speed and 850 rpm cylinder speed with a flat sieve setting. Seed samples were separated using a grain cleaner and both crops corrected for yield at 10% moisture.

Harvest yields were converted to partial land equivalent ratios (PLER) for peas and/or canola, which were combined into a total land equivalent ratio using the following equation:

$$\text{Total LER} = la/Sa + lb/Sb = \text{Partial LER Peas} + \text{Partial LER Canola}$$

Where total LER is the total Land Equivalent Ratio, I is the intercrop yield (in the rep), S is the sole crop yield (of the rep), and a and b refer to the crop components.

Data was analyzed with a two-way Analysis of Variance (ANOVA) using Analyze-it Statistical software version 2.03 (Microsoft). Coefficient of variation (CV%) was determined and Fishers unprotected Least Significant Difference (LSD) at the 0.05 level of significance was calculated if the ANOVA was significant. P values were also included to illustrate the degree statistical significance.

Cost of Production specific for each treatment was applied to Gross Revenues to realize net revenues. Cost of Production indicative of the 2010 year is summarized in appendix A. Gross and Net revenues of each treatment were determined using low and high market prices indicative of the 2010 year. A two-way ANOVA was applied to Gross Revenues.

Results

Grain Yield

There were significant differences among treatments between total yield, individual pea yield and canola shatter losses (Table 2). Intercropping improved total yield in all cases compared to monocrop canola, but was similar to monocrop pea yield (Figure 1). Individual canola yield did not vary among intercrop yields as compared to monocrop yields despite being grown on half the area (as in single or double rows) or as half the plant density (as in the mixed row treatments). Individual pea yields varied considerably, in which yields was cut in half in any intercropping situation, suggesting peas are considerably affected by canola plant competition or reduced pea plant density. Pea yield may indirectly be affected by N fertility within the canola row in which canola tends to grow more aggressively. For example in single row, canola rows received the equivalent of 152 lbs/ac N within the row causing the canola to grow aggressively and in turn causing the peas to be out-competed compared to the mixed row half rate fertility treatment which appeared to favor peas yields and demote canola yields. Elevated coefficients of variation especially in pea yield suggest the continuous flooding pressure over the year may have caused considerable variation among pea plots.

Table 2: Individual and total crop yields of pea and canola in both monocrop and intercrop systems. Canola yield values are corrected to include losses from shattering.

			Yield (kg/ha)			
Trt No.	Decription	Row-Crop Orientation	Pea	Canola (Shatter Corr.)	% Shatter	Total
1	Canola Full Fert	C_C_C_C_C_C	-	1704.9 a	7.09 de	1583.0 ab
2	Pea (inoculated)	P_P_P_P_P_P	2639.2 e	-	-	2639.2 c
3	Double Rows (Full Fert Canola)	C_C_P_P_C_C_P_P	1390.4 abc	1582.0 a	4.76 abcd	2897.1 c
4	Single Rows (Full Fert Canola)	C_P_C_P_C_P	1018.9 a	1632.6 a	3.83 abc	2589.2 c
5	Mixed Rows Full Fert	CP_CP_CP_CP_CP_CP	1360.3 ab	1254.1 a	3.52 ab	2571.1 c
6	Mixed Rows Half Fert	CP_CP_CP_CP_CP_CP	1844.6 bcd	1272.8 a	1.95 a	3094.1 c
7	Canola Check Half Fert	C_C_C_C_C_C	-	1485.1 a	6.49 cde	1392.9 a
		CV%	20.0	17.9	33.8	16.4
		LSD p<0.05	620.2	ns	2.83	700.5
		p=values	0.0026	0.27	0.020	0.0011

Noticeable canola shatter differences were observed among canola treatments intercropped with peas compared to monocrop canola. Winds gusting up to 53 km/hr on August 24 would have contributed significantly to shatter damage (wind data Appendix B). Shatter risk was greatest in both canola monocrop treatments, while significant reduction in shatter was observed in both mixed row treatments. A trend appears when canola rows deviate from pea rows. Therefore shatter risk appears to be directly related to degree of crop row closeness.

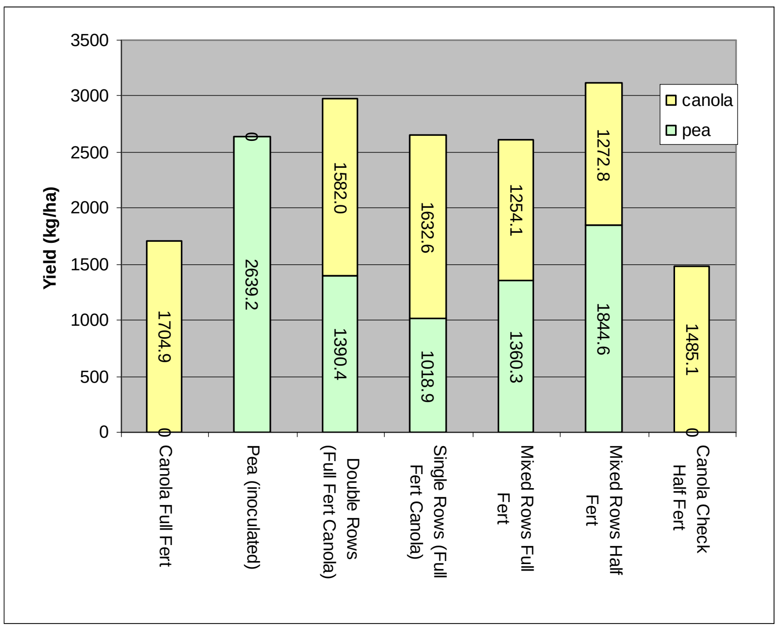


Figure 1: Combined yields of monocrop and intercrop yields of pea and canola. Canola yield values are corrected to include losses from shattering.

There we significant differences in total Land Equivalent Ratios (LER) as well as in pea partial LERs but not in canola (Table 3). Total LERs for intercropping peas and canola ranged from 1.23 using a mixed row full fertilizer system to 1.49 using the double row full fertilizer system, however, no intercropping system was significantly different from another (Figure 2). Single row system was similar to that of monocrop canola fully fertilized but still retained the benefit advantage of the other intercropping systems. It should be noted that in treatment 6 there would have been half the fertilizer used compared to the intercropping treatments, yet the yield was no different, resulting in an economic savings (see revenues table). All intercrop pea PLERs were significantly less than that of the monocrop. Peas in a mixed row half fertilizer rate treatment resulted in the best intercrop PLER but were only significantly different from the single row full fertilizer treatment.

Table 3: Individual and total Land Equivalent Ratios (LER) of pea and canola in both monocrop and intercrop systems. Canola partial LER (PLER) values are corrected to include losses from shattering.

			Land Equivalent Ratio w/ shat corr.					
Trt No.	**Decription**	**Row-Crop Orientation**	**PLERpea**		**PLERcanola**		**Total LER**	
1	Canola Full Fert	C_C_C_C_C_C	-		1.00	a	1.00	ab
2	Pea (inoculated)	P_P_P_P_P_P	1.00	d	-		1.00	a
3	Double Rows (Full Fert Canola)	C_C_P_P_C_C_P_P	0.56	abc	0.93	a	1.49	c
4	Single Rows (Full Fert Canola)	C_P_C_P_C_P	0.41	a	0.97	a	1.38	c
5	Mixed Rows Full Fert	CP_CP_CP_CP_CP_CP	0.50	ab	0.73	a	1.23	bc
6	Mixed Rows Half Fert	CP_CP_CP_CP_CP_CP	0.73	bc	0.74	a	1.48	c
7	Canola Check Half Fert	C_C_C_C_C_C	-		0.87	a	0.87	a
		CV%	19.0		18.1		16.3	
		LSD p<0.05	0.23		ns		0.35	
		p=values	0.0023		0.2497		0.0094	

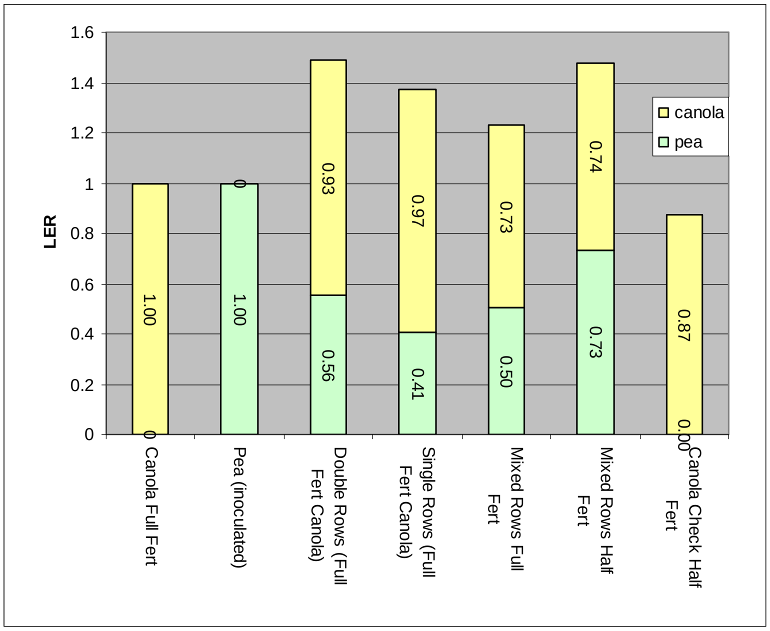


Figure 2: Combined LERs of monocrop and intercrop yields of pea and canola.

Separate from this experiment in Melita (which had less disease issues), was a demonstration plot of each treatment near Hamiota, MB. During harvest of the plot, samples noticeably had differences in the pea seed incidence of Mycosphaerella Blight. Samples were then divided by treatment. Four hundred pea seeds from each sample were counted and tabulated in terms of diseased (diseased) or free of disease (good). Severity of individual seeds was not accounted for, as diseased seed may have been marginally or wholly affected in severity, yet still was tabulated as a diseased seed. Percent diseased was calculated against plot treatments and is summarized in Figure 3. An exceptionally higher percent of disease seed occurred in the monocrop peas

(16.5%) as in the intercrop pea samples (1.75-5.0%). This data suggests that intercropping may assist in reducing pea disease risk to Mycosphaerella Blight of the seed. In relation to the Hamiota disease issues, lodging also occurred. Greatest lodging was in monocrop pea, which fell flat to the ground, while monocrop canola was upright. Intercropping resulted in an intermediate lodging of both crops; this difference in the stature of the peas amongst treatments could have been the main reason for the differences in disease severity as well. In order of increasing severity due to lodging among intercrop treatments was double rows followed by single then followed by mixed rows, respectively.

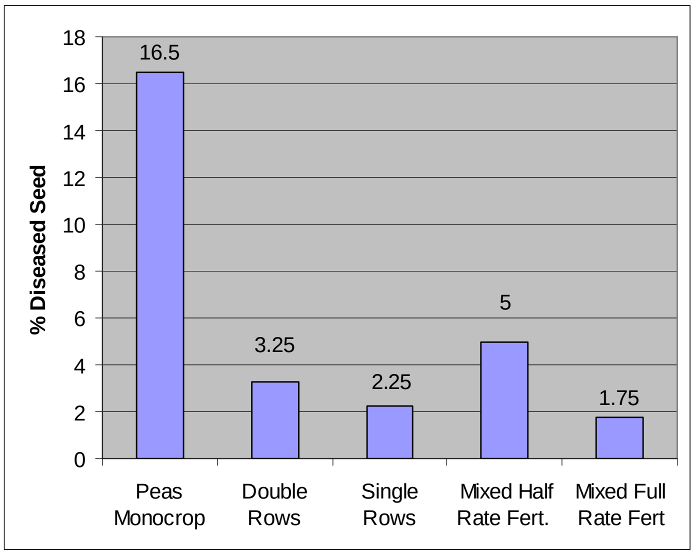


Figure 3: Incidence of seed Mycosphaerella blight on pea seed as affected by intercrop row arrangement and/or fertility regime (n = 400 pea seeds).

At the Melita; Monocrop pea resulted in a significantly higher residual soil nitrate test compared to all other treatments in both the lower depth (6-24") as well as the total soil profile (0-24") [Table 4]. Differences were not apparent in the upper soil profile (0-6"). Intercropping did not provide an increased residual nitrate value compared to canola monocropping. Observations during harvest indicated greater crop residues occurring in intercrop treatments over the monocrop treatments. Although no measurements on crop residues were taken directly, once allowed to decompose those higher residues would possibly contribute to higher residual soil nitrate.

Table 4: Separate and total fall soil nitrate values for two depths (0-6", 6-24") in both monocrop and intercrop treatments.

Trt No.	Decription	Row-Crop Orientation	Fall Soil Nitrate 0-6" N	6-24" N		Total (0-24")	
1	Canola Full Fert	C_C_C_C_C_C	6	10	a	16	a
2	Pea (inoculated)	P_P_P_P_P_P	11	14	b	25	b
3	Double Rows (Full Fert Canola)	C_C_P_P_C_C_P_P	6	10	a	16	a
4	Single Rows (Full Fert Canola)	C_P_C_P_C_P	7	9	a	16	a
5	Mixed Rows Full Fert	CP_CP_CP_CP_CP_CP	6	9	a	15	a
6	Mixed Rows Half Fert	CP_CP_CP_CP_CP_CP	5	8	a	13	a
7	Canola Check Half Fert	C_C_C_C_C_C	7	9	a	16	a
		CV%	41.9	19.0		20.5	
		LSD p<0.05	ns	3		6	
		p=values	0.27	0.038		0.023	

Revenue Analysis

Low and high market values were applied to crop component yields to determine gross revenue on each plot. Treatment gross revenues were determined (Table 5). Costs of production summarized in Appendix A were applied to those gross revenues to generate net revenues for each treatment. Market value per bushel for a low priced market was $5.75 peas and $9.25 canola and high market values were $7 pea and $12.50 canola. This was to reflect the variation in prices experienced in 2010.

Table 5: Gross revenues and cost of production (COP) and realized net revenues for low and height market crop values applied to yields of monocrop and intercrop treatments. Red or bracket values indicate net revenue losses.

Trt No.	Decription	Gross Revenue $/ac Low Market		High Market		COP $/ac	Net Revenue $/ac Low Market	High Market
1	Canola Full Fert	$ 280.92	bcd	$ 379.63	abcd	$268.66	$ 12.26	$ 110.97
2	Pea (inoculated)	$ 225.28	d	$ 274.25	d	$226.95	$ (1.67)	$ 47.30
3	Double Rows (Full Fert Canola)	$ 379.36	a	$ 496.75	a	$268.29	$ 111.08	$ 228.47
4	Single Rows (Full Fert Canola)	$ 355.98	ab	$ 469.41	ab	$268.29	$ 87.70	$ 201.12
5	Mixed Rows Full Fert	$ 322.76	abc	$ 420.61	abc	$268.29	$ 54.47	$ 152.32
6	Mixed Rows Half Fert	$ 367.17	ab	$ 475.09	ab	$248.51	$ 118.67	$ 226.58
7	Canola Check Half Fert	$ 244.71	cd	$ 330.68	cd	$248.88	$ (4.17)	$ 81.80
	CV%	16.4		16.5				
	LSD (p<0.05)	$ 90.46		$ 119.10				
	P values	0.014		0.012				

There were significant differences in gross revenues in both low and high market prices among treatments. The greatest gross revenue in low market prices was from the intercropping treatment of double rows compared to all monocrop treatments but was not significantly different from all other intercropping treatments. Lowest gross revenues were generated from monocrop peas, but this was not significantly different from growing canola in both half rate and full rate nitrogen fertilizer systems. In high market prices, gross revenues did not vary widely from low market prices, however in monocrop canola under full fertilizer rates resulted in revenues statistically similar to the double row system, likely favoring the canola in all systems.

After costs of production were applied to gross revenues, net market values were generated. During low market values, monocrop peas and canola at half rate systems resulted in negative profit margins and monocrop canola in a full rate nitrogen system barely generated over $12/ac. During low market values greatest margins were realized in the intercropping systems with the greatest in the mixed row half rate nitrogen system at over $118/ac, followed by the double row system at over $111 /ac. During high market values, net revenues were favored in systems with high yielding canola, and no system had a negative profit margin. Lowest revenues were still generated by monocrop systems compared to intercrop systems. Greatest revenues were generated nearly identically with the double row and mixed row half rate systems at $228/ac and $226 /ac, respectively. Single row revenues were not far behind, however, the mixed row full fertilizer rate was less profitable likely due to the in-efficiencies of pea possibly taking up applied nitrogen from canola.

Conclusions

As in 2009, the 2010 year proved to illustrate a positive intercropping effect compared to monocrop peas or canola. Canola appears to have responded to additional nitrogen in row, later possibly translating into a competitive edge over peas. Conversely, peas may upload applied nitrogen from canola rows making the overall system less efficient such as in a mixed row situation. However, in double row situations, peas appear to be physically removed enough from the applied nitrogen that they need to fix nitrogen. Regardless of row arrangement or fertility practice, there still seems to be a row separation benefit with intercropping compared to monocrop treatments. This benefit may be discovered as simply coming from a more efficient use of light and/or water. These concepts should be researched more to be better understood.

Further field research is needed to explore the true interactions between pea and canola rows when separated individually compared to their mixed row systems.
Intercropping peas with canola appears to assist in reducing the risk of canola shatter. Peas appear to act as an anchor for canola against high wind events, binding branches and pods of canola that would have otherwise waved in the winds. Intercropping could offer lower risk to canola growers attempting to straight cut canola. Further study on this concept is needed to confirm its real advantages in risk prevention and gain real time data values on its benefits during delayed harvest seasons.

Based on observations in Hamiota, intercropping may reduce the risk of Mycosphaerella blight on pea. Reason for reduced risk may be lower pea plant density or upright pea growth allowing for greater plant ventilation and less pea to pea plant contact. Intercropping may offer the difference between a marketable food pea and a low valued feed pea. Additional intercropping benefits remain unexplored by research for peas such as seed bleaching (in green peas), dimpling effects, seed size, seed coat breakage, and other pea prone diseases like Fusarium Wilt, Sclerotinia, and Powdery Mildew.

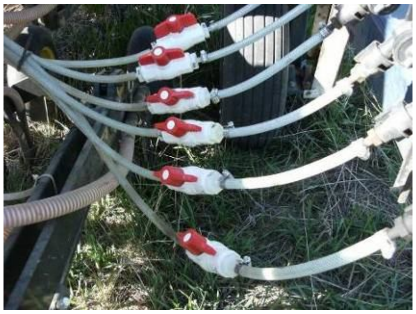
Although no lodging appeared in the plots at Melita, the Hamiota demo site did lodge. Several producers across Manitoba and Saskatchewan in the 2010 growing season also mentioned lodging in their pea-canola systems. Lodging may pose risks with greater mechanical harvest losses, and seed quality for both crops, but may compensate growers on lower risk of pre-harvest canola shatter losses due to wind. Considerations may have to be made when choosing varieties for intercropping. Perhaps a tall canola and a short pea would be desirable in an intercropping situation. According to one producer tall feed peas were inferior to the shorter food pea types in a canola/pea intercrop.

When looking at economics, both mixed half rate or double row full rate had the same net revenue. This could offer some buffer when prices are high or low. Intercropping peas and canola appears to be a viable option economically.

Reference:

1. Szumigalski, A., Van Acker, R. C., 2008. Land Equivalent Ratios, Light Interception, and Water Use in Annual Intercrops in the Presence or Absence of In-Crop Herbicides. Agronomy Journal. Vol 100, Issue 4, pg. 1145-1154

Photos of the 2010 Intercropping Trial



Seeder modification of the liquid fertilizer (34-0-0) distribution system. Each row was equipped with a ball valve that allowed for specific nitrogen to row placement. In some treatments containing rows of peas were turn off in theory to improve pea fixation efficiency.

Diverting canola seed into a pail when seeding intercrop treatments of single or double alternate rows.

Beginning the Harvest of plots at Melita. Left plot (canola monocrop full rate N) and right plot mixed row with full rate N. Note the shading (crop density) difference. This may shed light on clues related to the light use efficiency between systems.

Photos taken June 25 and July 5.

Trt. 1 Canola Full N note: possible flooding damage

Trt 2 Peas Inoculated

Trt 3 Double Rows Full N

Trt 4 Single Rows Full N

Trt 5 Mixed Row Full N


Trt 6 Mixed Row Half N


Trt. 7 Canola Half N


Demo plot at Hamiota. Left Plot is Canola monocrop with half rate N, Right Plot is mixed row half rate N. Note the lodging difference.

Demo plot at Hamiota. Double row full rate system illustrating less lodging.

Appendix A: Cost of Production Spreadsheet (Pea-Canola)

Treatment No.	1	2	3	4	5	6	7
Operating Cost	Canola	Pea	Double Row	Single Row	Mixed Full	Mixed Half	Canola Half
Seed and Treament	$ 38.00	$ 31.25	$ 34.63	$ 34.63	$ 34.63	$ 34.63	$ 38.00
Fertilizer	$ 46.06	$ 11.10	$ 46.06	$ 46.06	$ 46.06	$ 26.28	$ 26.28
Herbicide*	$ 25.00	$ 25.00	$ 25.00	$ 25.00	$ 25.00	$ 25.00	$ 25.00
Fuel	$ 16.25	$ 16.25	$ 16.25	$ 16.25	$ 16.25	$ 16.25	$ 16.25
Machinery Operating	$ 30.00	$ 30.00	$ 30.00	$ 30.00	$ 30.00	$ 30.00	$ 30.00
Crop Insurance	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Other**	$ 8.00	$ 8.00	$ 10.00	$ 10.00	$ 10.00	$ 10.00	$ 8.00
Land Taxes	$ 4.35	$ 4.35	$ 4.35	$ 4.35	$ 4.35	$ 4.35	$ 4.35
Drying Cost	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Interest	$ 4.98	$ 4.98	$ 4.98	$ 4.98	$ 4.98	$ 4.98	$ 4.98
Total Operating	**$ 172.64**	**$ 130.93**	**$ 170.27**	**$ 170.27**	**$ 170.27**	**$ 150.49**	**$ 152.86**
Fixed Cost							
Land Investment	$ 32.00	$ 32.00	$ 32.00	$ 32.00	$ 32.00	$ 32.00	$ 32.00
Machinery Depreciation	$ 30.00	$ 30.00	$ 30.00	$ 30.00	$ 30.00	$ 30.00	$ 30.00
Machinery Investment	$ 12.00	$ 12.00	$ 12.00	$ 12.00	$ 12.00	$ 12.00	$ 12.00
Storage Cost***	$ 4.02	$ 4.02	$ 8.04	$ 8.04	$ 8.04	$ 8.04	$ 4.02
Total Fixed	**$ 78.02**	**$ 78.02**	**$ 78.02**	**$ 78.02**	**$ 78.02**	**$ 78.02**	**$ 78.02**
Labour Cost^	$ 18.00	$ 18.00	$ 20.00	$ 20.00	$ 20.00	$ 20.00	$ 18.00
TOTAL	**$ 268.66**	**$ 226.95**	**$ 268.29**	**$ 268.29**	**$ 268.29**	**$ 248.51**	**$ 248.88**

* based on one application of Odyssey herbicide (17 g/ac)
**based on an extra cost of $1/ac to use a rotary seed cleaner, $1/ac for an extra auger
***based on needing double the storage for two separate crops
^Labour cost inflated for intercropping due to the extra labour needed to ship, clean and harvest intercrops

Appendix B: Wind Gust Data.

Conditions contributing to high canola risk during post desiccation (Aug 16) and pre-harvest (Aug 25). Measured with local weather station in Melita (weatherbug.com).

Observation Date	Max Temp	Rain	Wind Gust	Min Humid	Max Humid
	°C	mm	km/h	%	%
14-Aug	19	0	43.0	66	94
15-Aug	22	0	41.3	45	93
16-Aug	22	0	32.1	38	93
17-Aug	22	0	32.1	58	94
18-Aug	21	0	19.1	45	100
19-Aug	25	0	36.3	44	94
20-Aug	30	0	27.2	51	99
21-Aug	29	0	36.3	45	96
22-Aug	34	0	43.0	43	92
23-Aug	23	0	44.8	69	98
24-Aug	21	0	52.6	43	89
25-Aug	24	0	21.9	42	96

Effect of Legume Relay Crops in Barley Silage Production

Investigators:
Scott Chalmers P. Ag. & Scott Day P. Ag.
Westman Agricultural Diversification Organization (WADO), Melita MB

Location: WADO river site – Wayne White's – Melita.

Background

Relay Cropping (a specific type of cover cropping) is the practice of seeding a separate crop into/with a main crop in order to maximize the resources of the entire growing season. Generally the goal is to take advantage of any extra growing season that may occur after the main harvest. With our short cropping season in Manitoba relay crops are sometimes "harvested" as forage or grazing in late fall, but there are opportunities where a second "crop" could be produced as well. However, Relay Crops most often are used to provide ground cover and fix nitrogen in the fall after the main crop is harvested. As such they are often not harvested and are left to grow until winter shuts them down. Relay crops can offer benefits to conventional cropping systems such as adding soil N, improved light, moisture and nutrient efficiency, reducing soil erosion, improving soil quality, boosting yield, and suppressing weeds. However, Relay Crops can also act like a "weed" themselves and very careful planning and suitable conditions need to be present for the technique to be effective.

Black medic (*Medicago lupulina* L.) is an annual, winter annual, biennial, or short lived perennial legume able regenerate itself from seed every year. It has a tap root, and spreads low to the ground, but it does not root from nodes on the stems. Research conducted by the University of Manitoba has show black medic to produce up to 38 kg/ha soil N when cropped with flax (Naguleswaran & Entz, 2007). Black Medic is not generally integrated intentionally into most farms and is considered a noxious weed in many jurisdictions. Black Medic can be a significant problem in forage seed production, with other pulse crops, and can be difficult to clean out of flax.

Red clover (*Trifolium pratense* L.) is a short lived perennial legume generally grown for fodder and its inherent ability to fix nitrogen during the growing season (similar to black medic). It is typically under-seeded within a cereal crop and later used for late season grazing.   It seems to do well in higher rainfall situations.

Hairy vetch (*Vicia villosa* Roth) is grown as an annual or winter annual and able to produce prolific stands with 3-10 spindly vines up to 6 ft long. Its popularity has increased recently as a cover/relay crop and in organic systems as both a quality forage and significant N-fixer. (Undersander et al. 1990)

Fenugreek **(***Trigonella foenum-graecum* L.) is a single cut annual legume that has been found to have similar production quantity as alfalfa however has the ability to maintain a high quality protein profile throughout the growing season allowing for greater flexibility in silage harvest timing.   Quality of forage can be sufficient for lactating dairy cows

Purpose: To evaluate the performance of spring triticale in both grain and silage systems when seeded with the relay cover crops: black medic, red clover, or hairy vetch. Then to evaluate the late season re-growth of the legumes in these systems.

Methods

The trial, located at Melita, consisted of four seeding combinations with barley and one check replicated three times in a randomized complete block design (RCBD). Treatments were as follows:

1. Barley (Check) - variety 'CDC Cowboy' (100 lbs/ac)
2. Barley + Black Medic cv. 'George' (10 lbs/ac)
3. Barley + Red Clover cv. 'Altaswede' (10 lbs/ac)
4. Barley + Hairy Vetch (35 lbs/ac)
5. Barley + Fenugreek (35 lbs/ac)

Six rows per plot were direct seeded May 26 into wheat stubble at a depth of 5/8" using Seedhawk™ dual knife openers with 9.5" spacing. Soil test was taken prior to seeding (Table 1). Fertilizer was side banded using 28-0-0 (liquid) and 11-52-0 (granular) for a final rate of 80 lbs/ac N and 30 lbs/ac P.

Table 1: Soil nutrient profile of site prior to seeding at Melita, MB.

Legal Land Location	Nutrient Depth	N lbs/ac	P ppm (olsen)	K ppm	S lbs/ac	pH
NW 31-3-26 W1	0-6"	17	15	395	22	7.7
	6-24"	30			48	
	0-24"	47			70	

Weeds were controlled with Achieve (400g/L tralkoxydim) at a rate of 0.2 L/ac (+ Turbocharge adjuvant) at tiller stage. Plots were harvested for silage on August 6 at the soft dough stage with a flail mower. Wet silage was weighed and sampled for moisture.

Data was analyzed with a two-way ANOVA and coefficient of variation (CV%) was calculated. If ANOVA was significant and unprotected least significant difference (LSD) was calculated at the 0.05 level of significance. Data collected included wet and dry silage values and feed quality tests (Central Testing Laboratories, Winnipeg, MB).

Results

There were no significant differences among treatments with the dry matter silage harvest (p=0.24), despite the acceptable 5.5% coefficient of variation. Feed test indicated a spike in crude protein content of near 10% with the use of hairy vetch intercropped with barley compared to all other treatments around 6 to 7% crude protein.

Figure 1: Dry matter silage and corresponding protein content in barley and barley relay crops. (B – Barley, BM – black medic, RC – red clover, HV – hairy vetch, F – fenugreek)

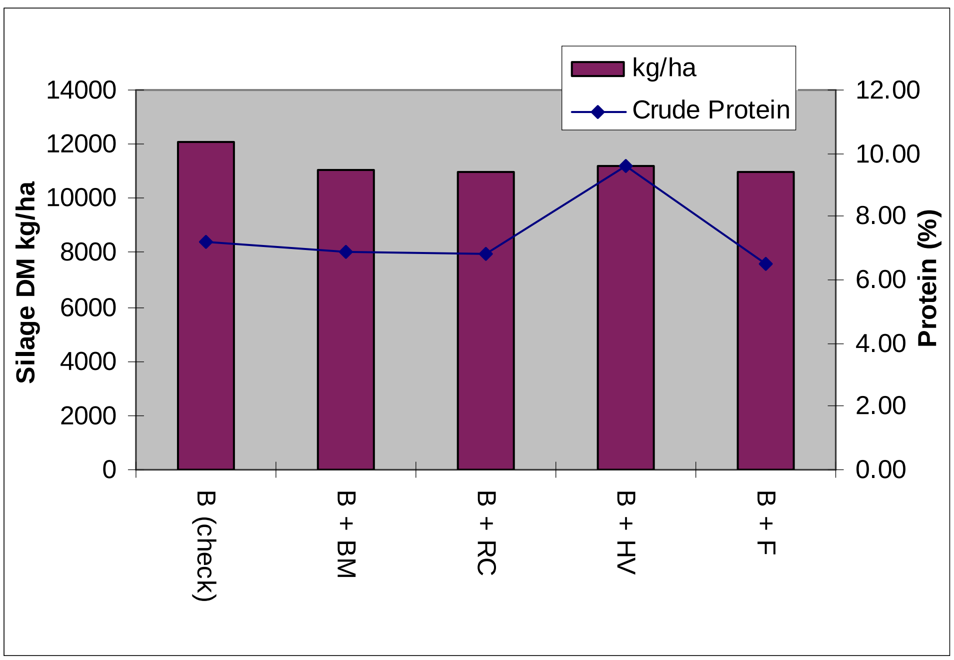


Table 1: Feed Test values in a dry mater basis.

Treatment	CP	Ca	P	Mg	K	Na	ADF	NDF	NFCarbs	TDN	NetEGain	RFV
	%										Mcal/kg	
Barley (check)	7.20	0.32	0.27	0.17	1.33	0.06	35.57	55.13	26.87	60.40	0.74	103
Barley + Black Medic	6.87	0.40	0.26	0.18	1.62	0.09	40.00	59.67	22.66	58.18	0.68	90
Barley + Red Clover	6.81	0.35	0.25	0.17	1.49	0.07	41.88	64.27	18.12	57.24	0.65	81
Barley + Hairy Vetch	9.63	0.34	0.28	0.18	1.60	0.07	34.96	56.35	23.21	60.70	0.75	102
Barley + Fenugreek	6.48	0.35	0.24	0.18	1.45	0.10	41.37	61.30	21.42	57.50	0.66	86

No measurable data was taken into account when considering solely the legume portion of the biomass. However by observation, hairy vetch was by far the most prolific within the barley followed by black medic, then red clover, and fenugreek.

Re-growth of legumes resumed post silage harvest. Although no measurable data was taken, photos were taken on August 16, 2010. In order of most vigorous to least vigorous re-growth post silage harvest was hairy vetch, red clover, black medic, then fenugreek. Fenugreek virtually had no re-growth.

Photos: Extent of re-growth of legumes after silage harvest.

Barley + Hairy Vetch

Barley + Red Clover

Barley + Black Medic


Barley + Fenugreek

Incorporating legumes into cereal stands may help boost depleted soil nitrogen values, assist in soil biota health, and provide some late season grazing. Little effort would be needed to seed these legumes, and in many cases there was no detectable yield loss. In 2009 Melita research plots, grain yield losses were observed when intercropping hairy vetch in summer triticale as the Hairy Vetch virtually took over the entire treatment.

No-Till Green Manure Mulches for Wheat Production

Partners:
University of Manitoba – Dr. Martin Entz
Westman Agricultural Diversification Organization

Location: WADO River Site – Wayne White's - Melita

Background

While green manure mulch crops are not currently used by most conventional farmers, the high price of fertilizer may make "growing your own N" more popular in the future. While farmers are familiar with the nutrient benefits of green manure crops, the weed control benefits of green manures are also significant. This study will test the weed control benefits of different legume-based green manure mulches over a 2-year period.

Methods

The experiment was conducted at Carman and Melita, MB. Eight species combinations will include grass, legume, brassica and composite plants. Treatments were arranged in a randomized complete block design replicated 4 times. The treatments and their respective seeding rate were:

Trt	Description	Component Partial Seeding Rate (kg/ha)			
		1	2	3	4
1	Barley (Check) CDC Cowboy	152			
2	Barley + Hairy Vetch	76	26		
3	Barley + Pea	76	108		
4	Barley + Oilseed Radish	76	6.5		
5	Barley + Sunola	76	4.75		
6	Barley + Oilseed Radish + Pea	51	13	72	
7	Barley + Sunola + Pea	51	3	72	
8	Barley + Oilseed Radish + Sunola + Pea	38	3	2	54
9	Chemfallow (Check)	-			
10	Pea (Forage Type '40-10') [Check]	216			
11	Hairy Vetch (Check)	52			

All seeded treatments were seeded May 26. Seeding rates were adjusted to ensure that plant populations reflect the % of each species. For example, target plant population density for the barley/sunflower/pea intercrop was 100 barley plants/m-2, 100 pea plants/m-2, and 6 sunflower plants m-2. At the flowering stage of barley (August 6), all crops were terminated using the blade roller. Crops may be rolled several times for the remainder of the season based on crop and weed regrowth. Spring wheat will be seeded in year 2 of the study into these specific mulch treatments.

Measurements included above-ground plant biomass assessment immediately prior to green manure crop termination. Plant material was sorted into individual species before determining plant dry mass. After rolling, the plants dried naturally in the field. Mulch characteristics were assessed: mulch density, mulch C:N ratio, and mulch fibre. These measurements were taken after initial termination, in late fall, and will be at wheat seeding the following year and again after wheat harvest. In selected treatments, soil temperature will be measured using portable Tidbit sensors and soil surface water content will be measured periodically. Measurements of the physical soil environment may help explain any differences in weed communities.

Wheat will be seeded into the plots in year 2 of the study using a low-disturbance no-till disc drill. Wheat establishment, biomass production and N uptake at soft dough stage will be assessed.

The long-term effects of the mulch treatments on weeds will be assessed by measuring weed growth in the treatments over the 2 years. Weed density will be measured after emergence of green manure crops in year 1, in late fall after termination, at time of wheat seeding the following spring and at wheat harvest. Weed biomass will be measured in late fall after termination and at time of wheat harvest in the second year.

Picture (left): Even 350 lbs of extra dead weight was not able to flatten the monocropped barley (ha ha). Below: comparison barley+sunola plot (left) and hairy vetch+barley (right), where hairy vetch aided in flattening the mulch.

Results:

Results of the spring wheat yields will be available in the 2011 WADO Annual Report.

Nitrogen Rate Calculator Validation Trial

Locations: PCDF Roblin
WADO's River Site – Wayne White's – Melita

Partners: John Heard, Soil Fertility Specialist, MAFRI
WADO & PCDF

Background:

This trial was introduced to validate the MAFRI N rate calculator for wheat. It was to address one of the requirements from the Soil Fertility Advisory Committee to assure that the calculator is appropriate for current and new varieties. An additional component to the study was added to investigate the probability of yield responses to applied K on high K testing soils.

The Nitrogen (N) Rate Calculator for spring wheat, barley and canola is a spreadsheet that can be used to evaluate different net return per acre scenarios involving N source and cost, the expected crop price and soil nitrogen (nitrate-N in lb/ac to 24"). The user must select appropriate soil moisture supply categories for wheat and barley, which in turn represent yield potential and yield responses based on numerous research trials. The user has the option of changing fertilizer source; cost, crop price, N rate and soil nitrogen (Government of Manitoba). A copy of the N rate Calculator can be found at the MAFRI website:
http://www.gov.mb.ca/agriculture/financial/farm/nitrogencalc.html

Objective:

Validate MAFRI's N rate calculator for wheat and investigate K rate responses on high K testing soils.

Methods

Table 5. 2010 Nitrogen Rate Calculator Validation Trial

Location:	**Roblin**	**Melita**
Previous crop	Fallow	Canola
Initial soil N 0-24" lb nitrate-N/ac	97	54
Soil P ppm	7	11
Soil K ppm	174	373
Seeding date	May 17	May 26
Variety	Kane	Kane
Starter fertilizer lb P2O5/ac	33	30
Herbicides – Pre Plant Burndown	Glyphosate	Spikeup & Glyphosate
Herbicides – Incrop	Frontline & Axial June 9	Buctril M June 9 & Axial June 16

Herbicides – Dessicant	-	Glyphosate Sept 3
Harvest date	September 8	2nd week September

Treatments: 9 varying rates of N, using Kane wheat (Table 1)
Replication: 3
Plot size: 1m x 5m
Test design: Randomized complete block design

Prior to seeding, six soil plugs were taken from each replicate and made into one composite soil sample (Results in Table 1). At Roblin nitrogen was preplant banded as urea followed by seeding. At Melita nitrogen was applied as UAN liquid (28-0-0) in a sideband during seeding.

Measures of N sufficiency (plant height, SPAD chlorophyll levels and flag leaf nutrient analysis) were done at heading. These tools generally consider the nitrogen supply to be adequate (within 5% of maximum yield) when:

- Height is 95% of maximum crop height
- SPAD chlorophyll levels are > 95% of maximum SPAD reading
- Flag leaf N is > 3.5%

All plots were harvested with a small plot combine and individually bagged and weight recorded. All yields were analyzed for protein.

Based on the N Rate Calculator and the soil test N, wheat at $6.25 per bu and N at 53 cents/Lb N, the most economic rates of N (MERN) is recorded in Table 2. The wheat price and N costs are estimates from the MAFRI 2011 Cost of Production bulletins.

Table 2. Most economic rate of N (lb/ac) based on the Soil Fertility Guide (pre 1992 recommendations) and the MB N Rate Calculator (2009) for moist and dry environments.

Site	Soil N	Soil Fertility Guide (pre 1992 recommendations)		MB N Rate Calculator	
	lbs/ac	Dry	Moist	Dry	Moist
Roblin	97	0 lb N/ac	0 lb N/ac	30 lb N/ac	40 lb N/ac
Melita	54	20 lb N/ac	25 lb N/ac	70 lb N/ac	80 lb N/ac

Results

Results are shown in Table 3 for Roblin and Table 4 for Melita.

Table 3. 2010 Nitrogen Rate Calculator Validation Trial - Nitrogen (N) Study - Roblin, MB

N rate Lb/ac	Height cm	SPAD	SPAD Index	Flagleaf N%	Flagleaf K%	Flagleaf Cl%	Protein %	Yield bu/ac	Soil nitrate-N lb/ac 0-24"	Soil nitrate-N lb/ac 0-48"	Grain N Uptake lb/ac
0	93.4	43.5	92.5	4.6	1.5	0.07	15.1	76.4	24.0	84.0	121.4
30	96.5	44.8	94.1	5.2	1.6	0.09	15.2	77.5	28.0	80.0	123.6
60	96.1	45.7	96.0	5.2	1.7	0.12	15.1	80.4	50.0	108.0	127.9
90	96.3	44.4	93.3	5.2	1.6	0.10	15.2	80.0	54.0	130.0	127.6
120	93.0	44.9	94.5	5.3	1.8	0.11	15.3	84.9	70.0	152.0	136.0
150	97.6	46.7	98.2	5.2	1.5	0.12	15.0	85.4	112.0	192.0	134.7
180	98.3	47.6	100.0	5.5	1.7	0.10	15.3	86.8	88.0	168.0	139.9
LSD	8.0	2.5	5.5	-	-	-	0.5	7.7	48.0	63.6	
C.V.%	3.6	2.4	2.3				1.3	6.3	32.2	19.9	

Observations:

- Yield increased slightly, but linearly at this site owing to the high background levels of N. Based on these yields, and assumed wheat price and N cost, the yield increase was insufficient to justify any nitrogen application.
- The high protein values even at low N rates are a reflection of the high soil N levels.
- Additional applied N did not result in higher yields or protein but accumulated as increased soil N levels.
- The nitrate in the 2 foot level would be available to following crops. Residual nitrate in the 2-4 foot depth would be below the rooting depth of some crops.
- N sufficiency tools estimated N sufficiency at 0, 60 and 0 lb N/ac based on plant height, SPAD chlorophyll reading and flagleaf N, respectively.

Table 4. 2010 Nitrogen Rate Calculator Validation Trial - Nitrogen (N) Study - Melita, MB

N rate Lb/ac	**Height cm**	**SPAD**	**SPAD Index**	**Flagleaf N%**	**Flagleaf K%**	**Flagleaf Cl%**	**Protein %**	**Yield bu/ac**	**Soil nitrate-N lb/ac 0-24"**	**Soil nitrate-N lb/ac 0-48"**	**Grain N Uptake lb/ac**
0	82.0	33.1	80.5	3.8	1.6	0.06	13.7	29.1	34.7	44.0	42.0
30	87.7	34.7	84.5	3.9	1.4	-	14.0	41.5	28.0	42.7	61.0
60	93.9	38.5	93.8	4.3	1.5	0.06	14.4	50.3	29.3	40.0	76.1
90	94.8	38.5	93.7	5.3	1.9	0.45	14.7	52.6	32.0	52.0	81.5
120	96.1	38.6	93.9	4.8	1.4	0.04	14.7	51.2	29.0	46.3	79.4
150	97.0	39.1	95.2	4.6	1.4	0.03	15.0	53.6	30.7	52.0	84.4
180	98.2	41.1	100.0	4.9	1.6	0.03	15.1	55.3	64.0	88.0	88.2
LSD	3.7	1.6	3.9	-	-	-	0.4	4.7	12.5	16.6	6.7
C.V.%	2.3	2.4	2.4				1.4	5.5	21.6	17.9	5.2

Observations:

- Yield response to applied N was strong and based on the yields achieved and assumed wheat price and N cost, the MERN was about 110 lb N/ac.
- Wheat protein levels increased with N rates
- Additional applied N did not result in higher yields or protein but accumulated as increased soil N levels.
- Residual nitrate-N in the 2 foot level did not increase until the highest rate of 180 lb N/ac. Little additional nitrate was in the 2-4 foot depth.
- N sufficiency tools estimated N sufficiency at 90, 150 and 0 lb N/ac based on plant height, SPAD chlorophyll reading and flagleaf N, respectively.

Table 5. Seedrow potash study at 90 lb N/acre - Roblin, MB

K2O rate Lb/ac	Height cm	SPAD	SPAD Index	Flagleaf N%	Flagleaf K%	Flagleaf Cl%	Protein %	Yield bu/ac	Grain N Uptake lb/ac
0	96.3	44.4	93.3	5.2	1.6	0.10	15.2	80.0	127.6
15	96.6	45.0	94.7	5.0	1.5	0.09	15.0	82.1	129.6
40	96.3	44.0	92.4	5.1	1.7	0.75	15.3	81.6	131.3
LSD	8.0	2.5	5.5	-	-	-	0.5	7.7	
C.V.%	3.6	2.4	2.3				1.3	6.3	

Table 6. Seedrow potash study at 90 lb N/acre - Melita, MB

K2O rate Lb/ac	Height cm	SPAD	SPAD Index	Flagleaf N%	Flagleaf K%	Flagleaf Cl%	Protein %	Yield bu/ac	Soil nitrate-N lb/ac 0-24”	Soil K ppm	Soil Cl lb/ac 0-24”	Grain N Uptake lb/ac
0	94.8	38.5	93.7	5.3	1.9	0.45	14.7	52.6	32.0	359	6.7	81.5
15	94.5	37.5	91.2	4.2	2	0.33	13.9	56.5	26.3	361	8.0	82.8
40	96.2	38.6	94.1	4.6	1.9	0.37	14.1	55.5	25.3	361	10.7	82.2
LSD	3.7	1.6	3.8	-	-	-	0.4	4.7	12.5	115.7	14.7	
C.V.%	2.3	2.4	2.4				1.4	5.5	21.6	14.2	76.5	

Yield response to applied potash was not significant at either site; however there was a trend of slightly greater yield (2.1-3.9 bu/ac) with the seed-placed rate of 15 lb K2O/ac. Additional potash did not offer any improvement over this low base rate. The potash applications did not create any consistent improvements in measured observations.

Important Considerations and Recommendations

The N Rate calculator indicated higher N requirements than actually was required at Roblin and slightly less than that required at Melita. In both cases rainfall was adequate to excessive so the “moist environment “conditions would be most appropriate.

Such studies remain important in validating production practices for high yield production in Manitoba.

Reference

Government of Manitoba. "Nitrogen Rate Calculator for Wheat, Barley and Canola." *Manitoba Agriculture Food and Rural Initiatives, Financial.* n.d. http://www.gov.mb.ca/agriculture/financial/farm/nitrogencalc.html (accessed November 22, 2010).

Acknowledgement

Special Thanks to Cargill providing wheat protein analysis.

Photo: MAFRI's John Heard speaking at WADO's summer field day on the N rate calculator at the N rate validation trial.

Effect of Fall and Spring Application of Compost Manure with Fall Banded Fertilizer in Winter Wheat

Locations: Barker Farms – just east of Melita; Armstrong Seeds – SE of Boissevain.

Partners:
Westman Agricultural Diversification Organization
AAFC
MAFRI
Hamiota Feed Lot

Introduction:

Compost manure can have several advantages[1] on farm including:

- An efficient recycling method for crop residues, livestock manure management and livestock moralities;
- Reduced moisture, weight, and volume of stored manure;
- Reduced fly, weed, and odor problems in manures and other ag-byproducts;
- A more stable form of nitrogen that is less likely to leach into water supplies; and
- Slower release of more concentrated plant available nutrients such as nitrogen, phosphorous and potassium.

1. Dougherty, M. 1999. Field Guide to on-farm composting. Natural Resource, Agriculture, and Engineering Service. NRAES (Series); 114. Ithaca, NY.

Phosphorous can be a limiting nutrient on Manitoba crop soils. Application of man-made phosphorous fertilizers can be costly and tends to be a crop input cost that is cut back quite often. Local manure compost from livestock producers may offer an economical alternative to crop phosphorus needs.

Phosphorous is an essential nutrient in winter wheat production and is attributed to healthy growth of plant tillers and roots linked to winter survivability. Little research has been done with compost manure and winter wheat production. A trial was established in the fall of 2009 to explore this concept.

Objective:

1. To evaluate rates of compost manure application and the effect on yield in winter wheat.
2. To determine the effect of application timing (fall vs. spring) of compost manure on yield in winter wheat production.
3. To evaluate interaction between applied fertilizer and applied compost manure in winter wheat production in terms of phosphorous use.

Methods

Trials were set up a two locations including Boissevain and Melita on the legal land locations of NW 6-3-19 W1 and SE 6-4-26 W1, respectively. Soil tests prior to seeding were taken to determine nutrient parameters and, most importantly, phosphorus levels (Table 1).

Table 1: Soil Test parameters

Depth	0-6"				6-24"		Sample
Nutrient (lbs/ac)	N	P	K	S	N	S	Date
Melita	14	16	127	8	15	24	30-Sep-09
Boissevain	21	30	379	24	33	42	02-Oct-09

Plots were arranged in a Split-Plot-Split-Block Design where manure treatments and fertilizer treatments were split plots and timing of application was a split block. Plots were direct seeded using a SeedHawk dual knife system. Specific establishment, maintenance and harvest dates are summarized in Table 2. Treatments (table 3) were replicated three times.

Table 2: Trial establishment, maintenance and harvest information.

Location	Seed Date	Seed Rate	Depth	Plot Area	Fungicide	Herbicide	App. Date	Harvest Date
Melita	30-Sep-09	108 lbs/ac	5/8"	12.96	Cadabra	Attain	30-Jun-10	9-Aug-10
Boissevain	28-Sep-09	108 lbs/ac	5/8"	12.96	Cadabra	Attain, Buctril M, Axial	26-May-10	17-Aug-10

Note: the Boissevain site received additional phosphorous fertilizer applications compared to the Melita site that received no phosphorous fertilizer what so ever.

Table 3: Treatments Include the Following:

	Manure Rate	Fertilizer Rate (lbs/ac N or P)		
Trt. No	1x = 30 lbs/ac P	Melita	Boissevain	Manure Timing
1	0x	0N 0P	0 N 0 P	Fall
2	1x	0N 0P	0 N 0 P	Fall
3	3x	0N 0P	0 N 0 P	Fall
4	0x	50 N 0P	50 N 15 P	Fall
5	1x	50 N 0P	50 N 15 P	Fall
6	3x	50 N 0P	50 N 15 P	Fall
7	0x	100 N 0P	100 N 30 P	Fall
8	1x	100 N 0P	100 N 30 P	Fall
9	3x	100 N 0P	100 N 30 P	Fall
10	0x	0N 0P	0 N 0 P	Spring
11	1x	0N 0P	0 N 0 P	Spring
12	3x	0N 0P	0 N 0 P	Spring
13	0x	50 N 0P	50 N 15 P	Spring
14	1x	50 N 0P	50 N 15 P	Spring
15	3x	50 N 0P	50 N 15 P	Spring
16	0x	100 N 0P	100 N 30 P	Spring
17	1x	100 N 0P	100 N 30 P	Spring
18	3x	100 N 0P	100 N 30 P	Spring

Fertilizer depending on the treatment was sideband using granular 11-52-0 or liquid 28-0-0. Plots were harvested with a Hege plot combine. Grain yield was determined using a HarvestMaster GrainGauge (Juniper Systems Inc.) system for total yield, moisture, and test weight. Plant height was taken at maturity. Data was analyzed with a Split-Split Plot ANOVA using Agrobase software.

Compost manure samples were obtained from the Hamiota Beef Feed Lot, near Hamiota, MB. Compost rows were maintained by a Rotary Drum Turner during the season resulting in a relatively decomposed product with particles less than an inch in length. (see picture) Samples were sent to Central Testing Labs (Winnipeg, MB) for nutrient testing under a 5CO Compost Manure analysis. Results of those analyses are in Table 4.

Table 4: Compost Manure nutrient analysis, corresponding application date, compost row from the Hamiota feed lot, and application dates pertaining to the specific site involved.

			Moisture	Dry Matter	Total N	S	P2O5	P	K2O	K	Application Date	
Application	Row	Sample	%								Boissevain	Melita
Fall 2009	5	Wet	37.96		0.94	0.29	1.12	0.47	1.20	1.00	27-Oct-09	26-Oct-09
		Dry		62.04	1.51	0.47	1.80	0.75	1.94	1.61		
Spring 2010	22	Wet	32.56		1.24	0.34	1.39	0.58	2.11	1.75	20-Apr-10	21-Apr-10
		Dry		67.44	1.83	0.51	2.06	0.86	3.12	2.60		

Manure was hand broadcast on plots soon after lab analysis testing was complete. Application rates were calculated based on lab analysis of sample moisture and phosphorus content. Target phosphorous rates were 30 lbs/ac for the 1x rate and 90 lbs/ac for the 3x rate. Application rates of compost manure were calculated as follows (Table 5).

Table 5: Calculated application rates of compost manure based on fall and spring laboratory nutrient analysis and a target application rate of phosphorous.

Compost Treatment	Application Rate (t/ac wet)		Equivalent
	Spring	Fall	Actual P lbs/ac
1x	1.5	2.9	30
3x	4.5	8.7	90

Results

There were significant differences among fertilizer rates (F) but not among manure (M) application rates (Table 6) at Boissevain and Melita. There was no interaction among timing, manure rate or fertilizer rate and although there was a significant difference among timing (T) of compost application. The latter part of this report will dismiss this statistic based on a design flaw of the experiment.

Table 6: Effect of Timing (T), compost manure rate (M), and Fertilizer rate (F) used at both Boissevain and Melita winter wheat sites and the corresponding P values.

	Boissevain	Melita
Effect	*P value*	
Timing (T)	<0.0001	0.0051
Manure (M) Rate	0.91	0.42
Fertilizer (F) Rate	<0.0001	<0.0001
T x M	0.95	0.95
T x F	0.83	0.83
M x F	0.98	0.98
T x M x F	0.93	0.93
CV%	8.7	26.1
R-squared	0.94	0.67

<u>Boissevain:</u>

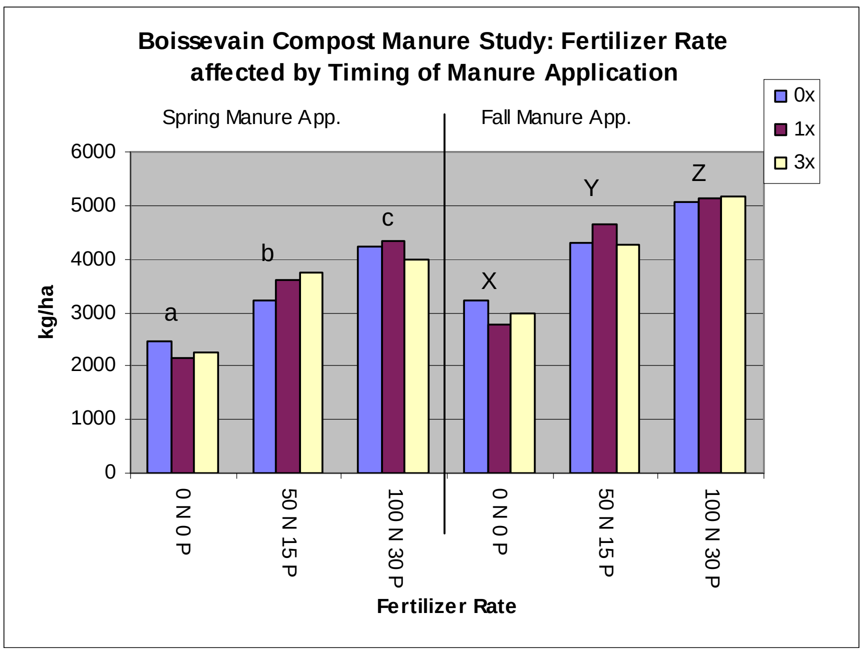


Figure 1: At the Boissevain site, obvious fertilizer responses were observed with increases in fertilizer rate.

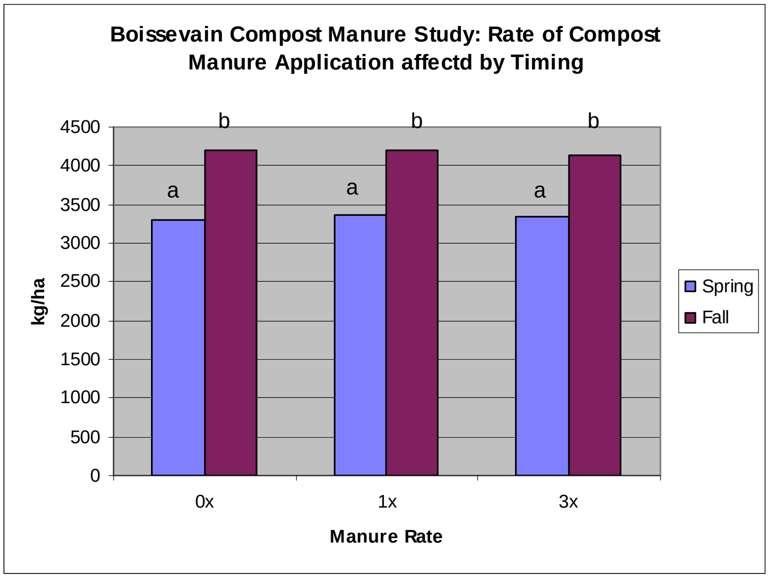


Figure 2: There was a distinct significant difference among timing of manure application but no difference among rate used at the Boissevain site. Important Note: There was a significant difference among the 0X rate between timing of application, indicating a large variation in spatial arrangement of the plots.

Melita:

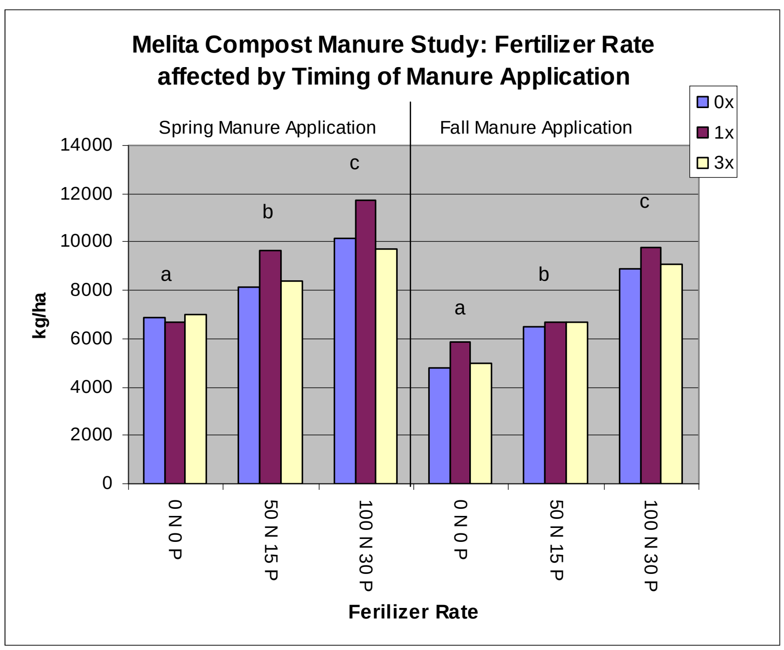


Figure 3: At the Melita site, obvious fertilizer responses were observed with increases in fertilizer rate.

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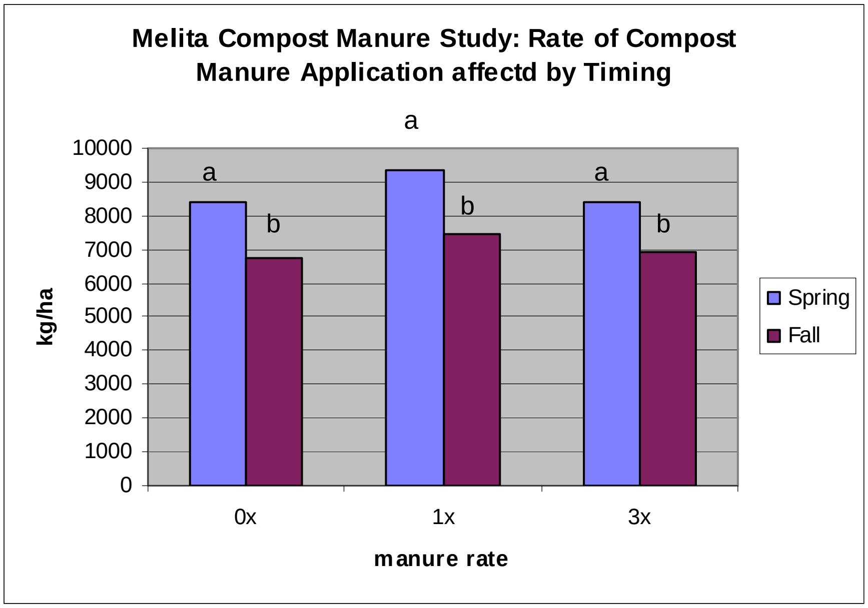


Figure 4: There was a distinct significant difference among timing of manure application but no difference among rate used at the Melita site. Important Note: There was a significant difference among the 0X rate between timing of application, indicating a large variation in spatial arrangement of the plots

Design of the trial was possibly flawed due to it improper design with fall and spring application randomization. Both sites were designed in such a way that one half of the site was spring applied treatments, while the other half were fall applied treatments. This lead to a spatial error that could have caused the statistical analysis to favor yields on the “spring” side of the trial in Melita and the “fall” side of the trial in Boissevain. Examples of this error are illustrated in both locations, where there was a significant difference between 0x spring and fall applications of compost manure applications (Figure 2 and 4). This point combined with the flaw of design leads us to reject that statistical difference in timing. To help support this, there was no real response to manure applications overall despite even the 3x rate compared to the 0x rate. Even if the trial was designed properly (in which manure timing was randomized) it would have been unlikely that a response even would have occurred. Failure of manure rate responses may also be due to a factor of top dressing the product rather than incorporating the compost. Going back directly into these sites in the future will probably give a better indication on the benefits of the compost.

Earlier timing of a fall application, perhaps just after seeding of winter wheat, may have provided an additional response to application. Phosphorous release by compost may have aided in healthier growth of plant tillers and root systems therefore leading to greater yields than spring applied.

Discussion

Proper design by randomization of timing of compost application may have improved odds of achieving a true timing conclusion. Moreover, incorporation of the compost may have also achieved an actual phosphorous response and possibly an interaction with timing of application and/or fertilizer applications of nitrogen.

Unfortunately in Boissevain, a granular application of phosphorous fertilizer was also applied which may have distorted actual phosphorous responses in compost manure. Relatively high residual soil phosphorus levels may have also contributed to the lack of any phosphorous response at Boissevain. In Melita, where residual soil phosphorous was relatively low, no response to the rate of compost occurred indicating that top-dressing of compost may not be a viable option for initial crop responses. Incorporation may have improved chances of a response in the initial growing season. Phosphorous is typically an immobile nutrient unlike nitrogen, and should be situated close to the root zone of the crop.

Further research with compost manure would need to ensure proper randomization of trial, incorporation of compost manures prior to seeding, and an improved choice of a low phosphorous soil test location.

Surface application of compost manure in zero-tillage systems elevates the risk of nutrient loss from surface run-off.

An excellent reference called the ‘Tri-Provincial Manure Application and Use Guidelines” can be found on Manitoba Agriculture Food and Rural Initiatives website at: http://www.gov.mb.ca/agriculture/livestock/beef/pdf/baa08s01a.pdf

Manure storage and use is regulated by law in Manitoba. It is governed by several aspects such as size of operation, closeness to water sources, handling of product, and rate and timing of application. For more information regarding the legislations of manure application and composting manure please visit:
http://www.manure.mb.ca/
http://web2.gov.mb.ca/laws/regs/pdf/e125-042.98.pdf

Pictures: (Left) A handful of manure compost for fall application. (Right) Surface application of manure compost on established winter wheat. Note: 1x rate on left plot and 3x rate being applied on right plot, in contrast, 0 x rates on far left and far right plots adjacent.

Dryland Rice

Locations:	PCDF	Roblin, MB
	WADO	Melita, MB – River Site – Wayne White's
	PESAI	Arborg, MB
	CMCDC	Carberry, MB

Objective:

To demonstrate and evaluate dryland rice for Manitoba conditions.

Background:

"Dryland" rice is also known as "upland" or "pluvial" rice. It is cultivated on level or sloping lands in fields that do not have dykes to retain surface water. Flooding is rare in this ecosystem and dryland rice depends solely on rainfall. This type of rice does work well if the field has a high water table. Upland rice represents approximately 13 percent of area planted to rice in the world and 4 percent of global rice production. So obviously it does not yield as much as the "flooded" rice.

Rice can be grown within a wide range of environmental conditions and by utilizing a broad spectrum of different agronomic techniques. Differences in cultivation practices largely hinge on the amount of water required and the way in which it is harnessed and used.

Generally speaking, rice is best known as a lowland crop grown in flooded fields or paddies. This covers all types of rice cultivation in which the soil is covered with water to a variable depth, and over a lengthy period of time that may encompass the complete rice production cycle. The amount of water supplied may range from several meters (deep water or floating rice) to just few inches. In many parts of the world this water flooding of the rice fields is simply a form of weed control and isn't completely necessary for the rice itself to produce seed.

Among the most modern methods of wet paddy cultivation, irrigation is the most expensive means of rice production. In areas of restricted water supplies, farmers have developed the 'age-old' art of 'upland' rice farming. For upland cultivation of rice, the crop is grown with limited irrigation over specific short periods, dictated by water availability and stage of crop development (e.g. grain filling).

'Dryland' rice farming does not use irrigation and the crop relies solely on rainfall for its growth and development. 'Dryland' rice farming takes place on well-drained soils above the flood line, where seasonal rainfall and the ability of the soil to retain water are the sole determinants of crop growth and development. Stand establishment is the first step to a successful rice crop. Factors that influence stand establishment include variety, seedling vigor, seeding method, seeding date, soil properties, seeding rate, density and uniformity. The goal in stand establishment is to obtain a uniform stand of healthy rice seedlings.

Methods

Seeding rates vary depending on the variety due to differences in seed size or weight. Under most conditions where rice is drill seeded, 40 per square foot are adequate to obtain the optimum stand density of 15 to 25 plants per square foot. Most varieties compensate for low seedling population by increasing the number of grains per panicle and by tillering.

Rice should be seeded in a seedbed that is conducive to good seed-to-soil contact when the daily average soil temperature at the 4-inch depth is above 15°C. Assuming adequate moisture for germination, rice emergence should occur within approximately 8, 14 and 20 days after seeding when 4-inch soil temperatures average 21°, 18° and 15°C respectively.

Three varieties of "Dryland Rice" were seeded in a 3 replicate plot. This trial was also duplicated at the other 3 diversification centers in Manitoba.

Results

The rice was very slow to emerge and establish. Weed control was an issue as there was very little competition from the rice plants. None of the varieties reached maturity. The plants reached the flag leaf stage but none of the plots had any visible observations of panicles (heads) of the rice starting to show. The heat units for the Roblin plots were about normal and rainfall was well above normal. The WADO rice plots were hand weeded at least twice during the summer. Dryland rice appears to be too late a maturing crop for the Melita area. Weed control is also a problem as there are not yet any registered control options.

Conclusions

Dryland Rice did not mature at any of the demonstration sites in Manitoba in 2010. Despite the excessive rainfall and the near normal heat units and long growing season we were unable to produce rice seed anywhere. If we couldn't produce rice this year then it is unlikely we will produce rice anytime soon.

<u>WADO trials that did not turn out well in 2010:</u>

0-tannin Fababean Variety Trial:

WADO planted a substantial multi variety 0-tannin Fababean trial at their Serruys river site in early May 2010. We were excited to finally get this trial as the zero-tannin Fababeans present a very interesting and exciting cropping option for Manitoba Farmers. Unlike traditional fababeans whose tannin content severely limits their level in most livestock rations, 0-tannin Fababeans have no such limit and can be the sole protein source in many rations. This allows 0-tannin fababeans to essentially replace soymeal in much of our livestock rations. These fababeans also "fix" a tremendous amount of nitrogen and make an excellent rotation crop in any annual cropping system. However, our Fababean plot this past year in Melita had a complete failure of the inoculant. The Fabas came up well and everything looked fine except they seemed to just stop growing after about 3 or 4 weeks and that is where they stayed. We sent plant samples away but there didn't seem to be any serious root rot or plant diseases. There were a couple of areas in the plot, only a few square metres in size, where the fababeans continued to grow as expected. When we dug up roots in these good areas and compared them to the roots in the rest of the plot that was poor you could see a very distinct difference in root nodulation. The poor areas there were virtually no nodulation and in the good areas the roots were covered in nodules. There wasn't any point in taking the plot to harvest so the site was destroyed but it did provide us with a stark example of what can happen if you don't have good nodulation. We were provided the inoculant as part of our protocol and we have no idea when it became "none viable". When seeding any pulse crop be extra careful when you are applying the inoculate and possibly look at applying two different sources at once. See the photo page at the back for some examples.

Dry Bean Variety Trial:

WADO established a dry bean variety trial at the Serruys River site in 2010. Once again the site came up well and the plot looked like it was going to be successful. Then the excessive summer rains caused some local flooding to the plot which was impossible to manage. The beans did recover but results would have been jeopardized because of this flooding. However, the main problem that emerged in this plot was an absolute carpet of group 1 resistant green foxtail. We sprayed the plot 5 times with every possible form of group 1 grass killer and each time the green foxtail simply got thicker. In the end it was like a golf green. However, like the Fababean trial failure there was still a lesson to learn. If you have repeated use of any type of herbicide as this particular field did, then you will experience resistance issues. Also we have learned that you can have a resistance problem explode very quickly as this site showed no resistant issues in 2008. As a result the plot was sprayed with Glyphosate to try and at least reduce the seed bank. See the photo page on the back showing the thick weed population.

Lentil Variety Trial:

We have had had excellent yields with lentils over the past few years in our WADO variety trials. The yields in 2009 were unbelievable. In 2010 once again we had high hopes for our lentils as the plot established well and things were progressing nicely. However, the heavy summer rains proved just too much for the lentils as flooding stunted and killed parts of the plot and then disease came in and finished off some of what was remaining. It is standard protocol with MCVET trials to not apply a fungicide to a variety yield trial so that each variety is properly evaluated on its specific merits. In extreme cases fungicides are allowed and this year might have been that scenario but we felt with the flood damage already it wasn't worth the effort. So the lentil trial was destroyed prior to harvest. We are hoping to have a return to our Lentil success in 2011.

Chickpea Variety Trials:

WADO in Melita is the only place in Manitoba where chickpea variety trials are being conducted. Our somewhat drier climate is the only possible location for this crop to grow in this province. However, as we all know, that somewhat drier climate did not materialize in 2010 and the WADO chickpeas were not spared the flooding that overcame our lentil and other pulse trials as well. Although in the end it was probably the group 1 resistant green foxtail that also impacted the adjacent dry bean trial that affected the chickpea trial the most. Despite the excessive rain the chickpea trial did grow very well and disease was not a terrible problem but the carpet of green foxtail was certainly the most troublesome issue. As a result the trial was harvested but the yields were not useful for any conclusions. Chickpeas in general have grown very well in our trials in the past; it is just the disease susceptibility that has made them a very risky crop in our region. New fungicide options and research in North Dakota has shown tremendous Chickpea yields and responses to these new products. This means their region of suitable production may soon expand to a much greater area beyond that fairly confined region of South Central and South Western Saskatchewan. With this in mind WADO hopes to continue our Chickpea work in 2011.

Ancient Grains Demonstration Site:

In 2009 WADO established an ancient grains demonstration plot at our Wayne White River site. The seed was provided by Viterra/Proven. This plot was very interesting and garnered a lot of attention for WADO. 2009 was an excellent production year for just about everything and these ancient grains were no exception. In 2010 we established the same demonstration plot in a similar location and once again everything grew well and provided an interesting observation as to the ancient genetics that have now become our common wheats. However, the ancient grains did not handle the rust, leaf diseases and other problems that infected our adjacent wheat trials this past year and there was virtually no production of grain despite lots of vegetative growth. As with our other failures there was still a lesson to learn here, it is obvious that much of the improvement we have made in plant breeding become extremely important when conditions are less than perfect.

ARDI funded fungicide on Wheat and Oat Trial:

In 2008-2009 and 2010 WADO was part of a province wide project coordinated by MCVET and funded by ARDI looking at fungicide interactions with all the old and current varieties of wheat and oats grown in Manitoba. As you can imagine there was a tremendous amount of data generated and some very interesting results. However the final report has not been completed so we have nothing specific to report in this our annual report. While 2009 showed very little response to fungicides across the board in this trial, 2010 was a different story. At Melita we showed winter wheat in amongst the ally ways of this trial to try and "seed" rust on the rest of the plots. This worked very well in 2010 and there were very significant infection levels in both the wheat and the oats. We observed tremendous differences in how each variety responded to the disease pressure but more importantly we saw tremendous differences in how each variety responded to the fungicide as well. Some of the varieties that had a good genetic disease package handled the disease pressure very well and also did not respond to a fungicide. Other varieties had severe disease but did respond tremendously to the fungicide while still others were poor with disease and poor with the fungicide response. Like I said the preliminary data is very interesting and could be very useful in deciding how and where to apply fungicides in the future but until the data is fully compiled you will simply have to contact us directly at the MAFRI/WADO office for any specific observations.

Using the post-harvest nitrate-nitrogen soil test as a yield sufficiency tool

John Heard, CCA, MAFRI Crops Branch.

Background

•Nitrogen sufficiency tools may be useful to crop advisers to indicate whether crops have been adequately fertilized, under-fertilized or excessively fertilized. The fall soil nitrate test is widely used but primarily for planning nitrogen rates for the following crop

•some suggest residual nitrate levels consistently less than 30 lb N/ac indicate a crop may have been under-fertilized. However no research is cited to support this "rule of thumb".

•A data set of N response studies on corn, canola and spring wheat were collected to see if such rules of thumb could be derived.

Method

- Three N rate studies determined the residual or post-harvest nitrate-N levels to 48" as follows (Figure 1) :

1. Corn – 4 site years of corn response data from 5 N rates (0, 50, 100, 150 and 200 lb N/ac) (Heard, 2008)
2. Canola – 3 site years of hybrid canola response data from 4 N rates (0, 30, 60 and 90 lb N/ac) (Day et al, 2008).
3. Red spring wheat – 2 site years of Kane wheat response data from 7 N rates (0, 30, 60, 90, 120, 150 and 180 lb N/ac) (PCDF, 2010).

- Most Economic Rate of N (MERN) for each crop and site was determined using a quadratic response curve, crop and fertilizer prices used in the MAFRI 2011 Cost of Production Guide and an MERN Calculator (Table 1).

Figure 1. Post harvest nitrate-N sampling to 48" following corn (2006-7), canola (2007) and wheat (2010).

Table 1. Pre-plant soil nitrate-N levels and resulting MERN from N rate studies.

CROP	Initial nitrate-N (lb/ac)		MERN Most Economic Rate of N	
Site-Yr	0-24"	24-48"	Lb N/ac	N cost, crop value
CANOLA				$053/lbN, $10.50/bu
Arborg-2007	48	nd	58	
Melita-2007	24	nd	51	
Roblin-2007*	159	nd	43	
CORN				$053/lbN, $5.00/bu
Reinland-2006	30	nd	139	
Reinland-2007	74	104	165	
Carman-2006*	87	80	0	
Carman-2007	65	5	157	
WHEAT				$053/lbN, $6.25/bu
Melita-2010	54	nd	108	
Roblin-2010*	97	nd	0	

* Research station sites tended to have VH starting and residual N levels.

Crop Yield Response, MERN and Residual Soil Nitrate

Yield and resulting soil nitrate levels at the 0-24" and 0-48" depths (Fig 2-10). The MERN is the black vertical line and initial soil nitrate level in 0-24" is represented by a green circle.

Fig. 2 Canola – Arborg -2007

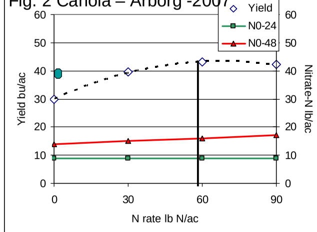


Fig 3. Canola – Melita -2007

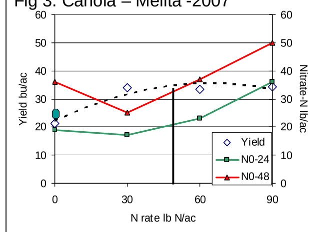


Fig 4. Canola – Roblin -2007

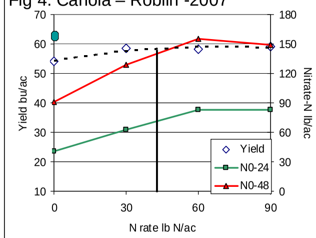


Fig. 5 Corn – Reinland -2006

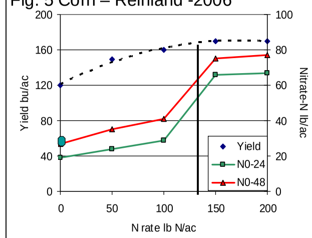


Fig. 6 Corn-Reinland -2007

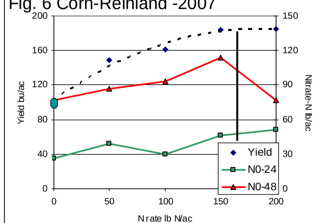


Fig. 7 Corn-Carman -2006

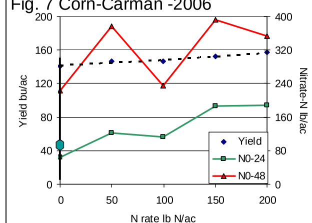


Fig. 8 Corn-Carman -2007

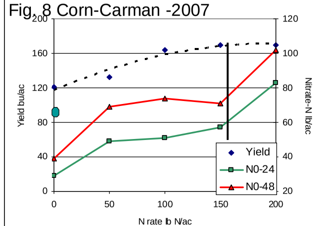


Fig. 9 Wheat -Melita -2010

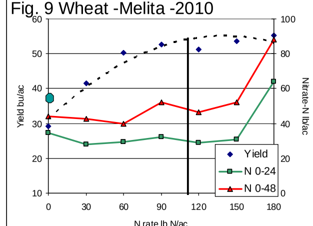
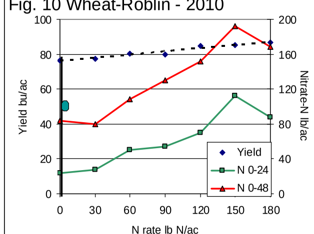


Fig. 10 Wheat-Roblin - 2010



•Residual soil N was relatively stable until the MERN rate was surpassed.

•Sites on research stations (Roblin 2007, Carman 2006 and Roblin 2010) had the highest initial soil N, MERN rate = 0, increased residual soil N with each N rate and high nitrate-N in the deep subsoil (0-48")

The residual nitrate-N levels of the 9 studies were sorted into ranges according to deviation from the MERN (Figures 11).

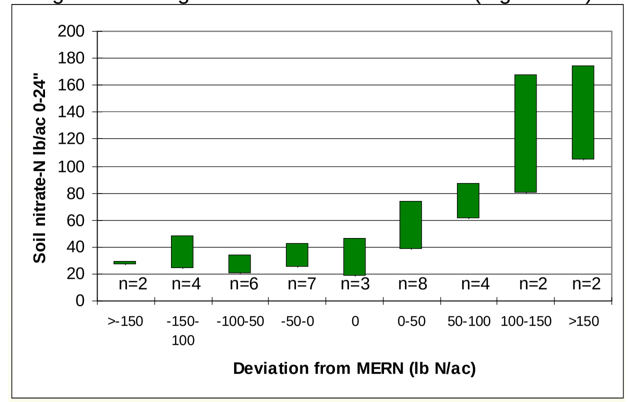


Figure 11. Residual nitrate-N in 0-24" relative to the deviation of applied N from the MERN rate (bars represent 1 std dev around the mean)

It appears that:

- when fertilized with N exceeding the MERN, soil N levels increased substantially with increasing variability. These values are derived from those sites with high initial soil nitrate levels.
- when adequately fertilized for most economic yield (MERN), the residual nitrate levels were between 20-50 lb N/ac in 0-24".
- when under-fertilized for MERN, residual nitrate levels did not continue to decline, but were similar to those adequately fertilized, ranging between 20-50 lb N/ac. Variability in soil N was less than when crops were excessively fertilized.

Despite this intriguing trend, it may be premature to set rules of thumb for assessing nitrogen fertility programs since:

- adequately and under-fertilized crops have similar residual nitrate-N levels
- over-fertilized crops will have greater residual soil N, but the range of values is wide
- these relationships are only observed here by using a rather coarse range of 50 lb N/ac increments.

More on-farm studies would be required to increase the confidence in using this concept .

Acknowledgements

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Potential yields from Intercropping Field Pea and Canola

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Introduction

Intercropping is the agricultural practice of cultivating two different crops in the same place at the same time (Andrews & Kassam 1976). Benefits of intercropping can lead to greater than expected yields compared to the sole crop. Reasons for additional yield may be the result of greater efficiency in the use of nutrients, light and water (Szumigalski & Van Acker 2008). Intercropping may improve pest control and provide structural support advantages when compared to each being grown as a sole crop. Intercropping is not a new concept and has been used by farmers for several generations. However, recent improvements in farm machinery and individual variety characteristics have once again tweaked producer's interests in intercropping.

Often, intercropping is not only measured by total yield of products, but as a total economical value (total $/acre) by combining each crop value, or by Land Equivalent Ratio (LER). The LER is a measure of how much land would be required to achieve intercrop yields with crops grown separately as pure stands. When the LER is greater than 1.0, over-yielding is occurring and the intercrop is more productive than the component crops grown as sole crops. When the LER is less than 1.0, no over-yielding is occurring and the sole crops are more productive than the intercrop. For example; a LER rating of 1.20 from an intercrop of pea-canola means it would take 20% more land to equal that final yield if each crop was planted as separate components.

The purpose of this trial was to examine the effect of seeding rate combinations of pea-canola intercropping in regards to total yield, separate crop yield components, Land Equivalent Ratio (LER), and final stand characteristics compared to that of the sole crop characteristics.

Picture:
WADO's Pea-Canola Intercropping Trial at Melita, July 2009 late flowering stage

Methods

Plots were direct seeded with a dual knife system on May 14, 2009 at Melita, MB. Seeding depth was 1" into a loam type soil that was previously spring wheat. Six rows per plot were spaced at 9.5". Fertilizer was placed in a side band at a rate of 50 lbs/ac N and 30 lbs/ac P. All pea treatments were inoculated with proper granular based *Rhizobium leguminosarum* bv. *Viciae*. Residual soil fertility was relatively low (Table 1). Treatments were arranged in a Randomized Complete Block Design (RCBD) and replicated three times. Seeding rate treatments were as follows:

1. Canola Full rate (6 lbs/ac) - variety 71-30 CL
2. Peas Full (120 lbs/ac) - variety CDC Striker
3. Canola 2/3 + Peas Full
4. Canola 1/2 + Peas Full
5. Canola Full + Peas Full
6. Canola 2/3 + Peas 1/2
7. Canola 1/2 + Peas 1/2
8. Canola Full + Peas 1/2
9. Canola 2/3 + Peas 2/3
10. Canola 1/2 + Peas 2/3
11. Canola Full + Peas 2/3

Methods cont.

Table 1: Soil fertility of site prior to seeding.

Depth	N lbs/ac	P ppm (olsen)	K ppm	S lbs/ac	pH
0-6"	12	14	420	18	8.2
6-24"	21			36	
0-24"	33			54	

Weeds were controlled using Odyssey™ (35% imazamox + 35% imazethapyr) at a rate of 17g/ac+adjuvant merge applied July 15. Plots were desiccated with Reglone™ (0.91 L/ac) prior to harvest and left standing. Emergence counts were taken June 12 on a single 1 m row. Plots were harvested with a Hege plot combine set at a cylinder speed of 910 rpm, with about 1" cylinder-concave gap. Wind was adjusted for canola. Plot samples were separated using a fanning-mill, then they were weighed and moisture determined. Weights were re-calculated to a constant moisture of 10%.

Harvest values were converted to partial and total LER using the following equation:

$$\text{Total LER} = Ia/Sa + Ib/Sb = \text{Partial LER Peas} + \text{Partial LER Canola}$$

Where total LER is the total Land Equivalent ratio, I is the intercrop yield, S is the sole crop yield, and a and b refer to the crop components.

All data (Total Yield, LER's and Emergence) was analyzed with a two-way analysis of variance (ANOVA) and coefficient of variation and Fisher's unprotected Least Significant Difference (LSD) at the 0.05 level of significance was calculated if the ANOVA was significant.

Results

There were significant differences in total yield, both crop's partial LER, total LER, and final stand germination (canola only). (Table 2).

Table 2: Final Yield, LER, and stand germination values for each intercrop combination and sole crop treatments.

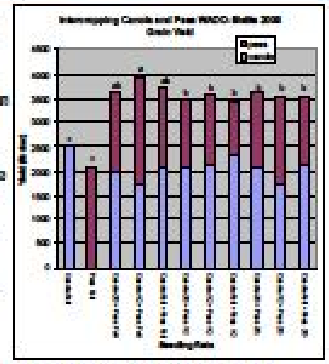
Treatment	Seeding Rate Combination	Mean Yield (lbs/ac): Canola	Pea	Total	Land Equivalent Ratio: Canola	Pea	Total	Germination (%)*: Pea	Canola
1	Canola Full	[illegible]	-	[illegible]	1.00	-	1.00	-	[illegible]
2	Peas Full	-	[illegible]	[illegible]	-	1.00	1.00	100.0	-
3	Canola 2/3 + Peas Full	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4	Canola 1/2 + Peas Full	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.77	[illegible]	[illegible]
5	Canola Full + Peas Full	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6	Canola 2/3 + Peas 1/2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7	Canola 1/2 + Peas 1/2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8	Canola Full + Peas 1/2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9	Canola 2/3 + Peas 2/3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10	Canola 1/2 + Peas 2/3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11	Canola Full + Peas 2/3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	CV%			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	LSD (p=0.05)			[illegible]	[illegible]	[illegible]	[illegible]	ns	[illegible]
	Pr > F			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

*Germination based on sole crop emergence values and not actual seed quality

Total grain yield was significantly higher (p<0.001) for all intercropped treatments compared to their sole crop derivatives (Graph 1). Treatments 4, 5 and 3 (in order of highest to lowest) were the highest yielding treatments. Treatments 5 and 3 were statistically similar to all other intercrop treatments.

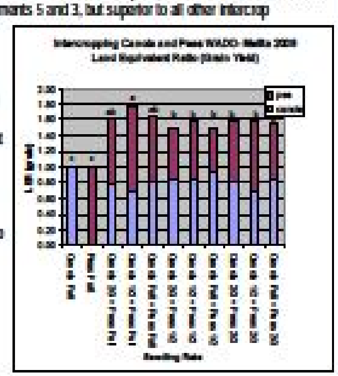
Results cont.

Graph 1 (Right): All crop grain components in intercrops were lower yielding than their sole crop derivatives indicating some sort of competitive effects between each crop co-existing together. Treatment No. would be ascending left to right.



Total LER generally followed the same conclusions as total yield. Treatment 4 (1/2 rate canola, full rate peas) with a total LER of 1.77 was similar to treatments 5 and 3, but superior to all other intercrop combinations.

Graph 2 (Right): Total LER composed of each partial LER component for all treatments. Treatment No. would be ascending left to right.



Despite a low coefficient of variation value in both total yield and LER components, error still may have been caused by wildlife browsing during the bolting and early flower stages of crop development. Scare-crows and moth balls were used as deterrents and appeared to be successful.

Interestingly, the plant counts show that canola emergence was possibly inhibited when intercropped with peas. Although there was considerable variation in the data it appears that significant reductions in the canola stand occurred in all intercrop combinations (Table 2, far right). We do not know if this reduction in the canola stand occurred during germination or emergence, or both. The reductions in pea germination were determined to be statistically insignificant. The Coefficient of Variation (CV) in the plant counts was very high in both crops (35% & 38%) and this casts doubt on our observations; regardless, something unique was occurring. This large variability may have been caused from a single count per plot or spatial bias within the plot during counts. Multiple counts per plot may have helped improve this error. However, there may have just been considerable plant stand variation between the plots, as well.

Conclusions

According to this evidence, significant yield increases are achievable by intercropping canola and peas compared to their sole crop derivatives. Despite stand reductions in canola when intercropped with any pea combination, total yield accumulations with both crops were more than sole crop values. Their component grain yields were less when intercropped compared to sole crop yields but when they were combined the intercrop yields were always superior.

Total LER maintained similar results to that of total grain yield. The combination that resulted in maximum production, whether in total grain yield or LER, was when peas were seeded at their full rate and canola at 1/2, 2/3 or the full rate. Canola maintained a rather large partial LER despite the high population of pea plants in those intercrop plots.

We observed that the emergence of canola was negatively affected by pea intercropping. However, the very high CV's in the plant counts detracts from the certainty of this observation. Possibly there was an unforeseen variable in the seeding operation or maybe there were allelopathic pea exudates of root or seed chemicals inhibiting the growth of canola, or some sort of root or seedling disease issue. Similar topics have been discussed by Marles et al. (2008) when weathered pea extracts are used to suppress canola germination in both the lab and greenhouse setting. A similar bioassay would assist in answering this question.

Harvest samples indicated that peas were higher moisture content compared to canola (14.5% moisture vs. 9.8%, respectively). On-farm adoption would need to stress grain separation prior to storage.

Future research considerations should be focused on the effects of pod shatter in this system, possible allelopathic relationships, nutrient, water and light dynamics and economic gain. Further site years of work are needed to confirm these results.

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Scott Chalmers applying beef compost to the Melita Winter Wheat/compost site

Hairy Vetch roots already nodulating in April at Beernaert Farms

Close to 160 people attended the Field Day in Melita on July 21st – 2010

Calendula(left), Niger (right) in the Hamiota site demo plots

The Future Home of WADO: the RM of Arthur Maintenance Shed along #3 highway at Melita

Poor fababeans on the left are from no nodulation (inoculant failure)
Good plants in the right had excellent nodulation.

The WADO crew: Scott D, Anita F, SJ S, & Scott C obviously ready for any action

Scott C over spraying plots with Glyphosate in between rain storms

The two Scotts getting ready to seed the intercrop trials with the new land roller

A field of Peas being overtaken with Root Rot in June, a big concern for the future.

The Western Feed Grain Screening trial at Hamiota – despite late seeding we still saw good results

One of the many group tours at the WADO sites this year – this is a group from Western China looking at our rice

Scott Chalmers working hard at harvesting and weighing the annual forage trial

Cultivated on the left and 0-till on the right with Strip Till on the upper left: Barkers Strip Till site east of Melita

WADO's new to us row crop planter to be modified and used for 2011

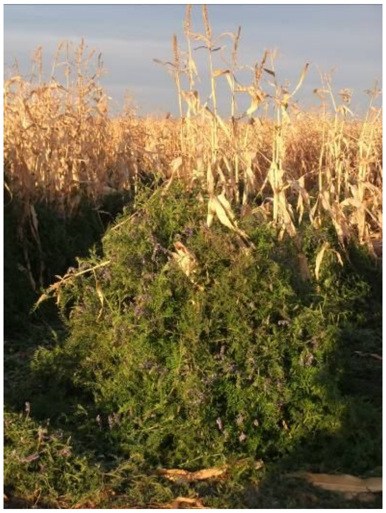
Starting to seed the Sunflower Variety trial North of the Goodlands Port.

One of WADO's two new auto weather stations Their website address can be found on page 6

WADO's new truck and hyd soil probe, this helped greatly with our activities in 2010

Just getting started at harvesting the Pea and Canola intercrop trial at WADO's river site	**WADO's Melita soybean site that was under water several times but still yielded excellent**

Canola and Peas being evaluated together as an intercrop – notice seed production is occurring throughout the crop canopy	**Anita F showcasing the pea/canola intercrop trial in the treatment featuring the double rows of each crop**



Hairy Vetch overtaking the grazing corn in WADO's companion crop trials	**Dryland Rice growing well, but it didn't grow beyond this point, so no seed**

An aerial photo of the lightning strike in the middle of WADO's sunflower trial - Goodlands	**Photo of Hemp plant showing the perfect stage for harvesting – Goodlands site**

S J and Anita obviously enjoying WADO	**Bethune flax on left – Fibre Flax on right**

WADO's Dry Bean site at Melita became over run with Group 1 resistant Green Foxtail in 2010. The previous history of the field showed a high usage of one particular group 1 grass killer in wheat over many years.

The green foxtail plants would just not die so the site was eventually sprayed 4 different times with every combination of Group 1 formulation currently available. Each time the green foxtail plants became stunted but then eventually thicker, very few of them were actually killed. These photos show the plot after the 4 applications of Group 1 herbicides had been applied.

Participatory Wheat Breeding Program

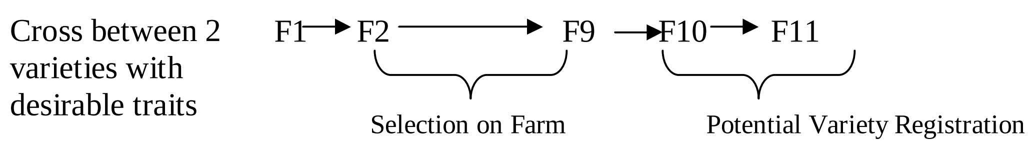
Last year a participatory wheat breeding program was created as a collaborative project between researchers of the University of Manitoba, Agriculture and Agri-Food Canada, and farmers.

What is a participatory plant breeding program (PPB)?

A PPB is a dynamic collaboration between breeding institutions and farmers which benefits from their comparative advantages. The principal aim of PPB is to ensure that the research undertaken is relevant to the farmer's needs, and to create more relevant technology. The objectives are to select varieties for high stress, heterogeneous environments, to increase genetic diversity, and to develop varieties that are specifically suited to farmers' preferences.

How does the participatory wheat breeding program work?

Principle of the Participatory wheat breeding program:



Farmers receive populations of wheat to grow on their farm using their management practices. During the growing season, farmers make selections by doing a "negative selection" (i.e. remove unwanted plants). The wheat is harvested and reseeded the following year on the farm, and once again farmers remove unwanted plants from the wheat population. The process is repeated through several growing seasons. The goal is to have a final population that is well adapted to the local area, homogeneous, and stable. The amount of land required will vary from generation to generation, but in the early generations you would need approximately 10 m by 10 m.

If you are interested in participating or learning more about the program, call:
Marion (204) 474 6236
or Gary at (204) 474 6097
marion.dewaele@etu.ensat.fr
gary_martens@umanitoba.ca
If you would like to participate this summer, please call by April 10.