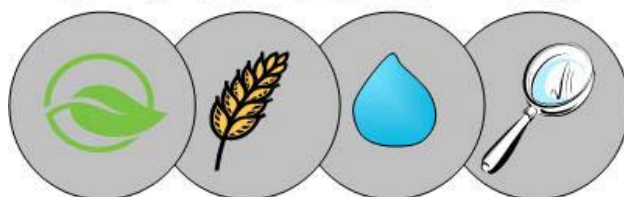


WADO



Westman Agricultural Diversification Organization

2012 Annual Report

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2012 Industry Partners

(Alphabetical Order)

Agriculture and Agri-Food Canada
Agrisoma Biosciences
ARDI – Agri-Food Research Development Initiative
Arye Seeds – Minto, MB
Barker’s Agri-Centre - Melita
BASF
Boissevain Select Seeds
Canada Manitoba Crop Diversification Centre- Carberry
Canadian Hemp Trade Alliance
DB Murray Ltd. (John Deere, Melita)
Ducks Unlimited Canada
Indian Head Agricultural Research Foundation
Local GO Team Offices
Manitoba Agriculture Food and Rural Initiatives
Manitoba Beef Producers
Manitoba Corn Growers Association
Manitoba Crop Variety Evaluation Team
Manitoba Food Development Centre
Manitoba Pulse Growers Association
Melita Rink Committee
National Sunflower Association of Canada
Nestibo Agra
Northstar Seeds
Parkland Crop Diversification Foundation - Roblin
Parkland Industrial Hemp Growers
Paterson Grain
Plains Industrial Hemp Processing
Prairie Agricultural Machinery Institute - Portage
Prairies East Sustainable Agriculture Initiative – Arborg
Rural Municipality of Arthur
Secan-Quaker-Fritolay-Pepsico
Seed Manitoba
Shape Foods - Brandon
Soya UK Ltd. – Southhampton, UK
Town of Melita
University of Manitoba
University of Saskatchewan (CDC)
VBine Energy – Moosomin, SK
Viterra
West Souris River Conservation District
Western Feed Grains Development Cooperative – Minto, MB
Winter Cereals Canada

Farmer Co-operators – 2011-2012 Trial Locations

Glenn Vercaigne - Waskada
Jim Anderson - Melita
Greig Farms – Melita
Wayne White – Melita
Bruce Cowling – Hamiota

Elliott Bros. - Reston
Kendall Heise - Isabella
Boissevain Select Seeds - Boissevain
Mike Fisher – Wawanesa
Ellis Seeds – Wawanesa

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 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 right), 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 left), 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 2012, they were an important reason we were able to successfully handle more than 2200 plots throughout the SW region. A full salute goes out to the three main summer staff (middle left to right): Aly Turnbull from Pipestone, Jaclyn Rampton from Morden and Liam Bambridge from Melita, MB. We

also had retired physics teacher Dale McKinnon return again from Deloraine, MB to work for WADO early in the spring and later in the fall of 2012. Thanks to all for their hard work!

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:

Westman Agricultural Diversification Organization (WADO)

c/o Scott Chalmers MAFRI

Box 519, 139 Main Street

Melita, MB R0M 1L0

204-522-3256 (office)

204-522-5415 (cell)

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scott.chalmers@gov.mb.ca

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 2012.

Gary Barker	Melita - President	John Finnie	Kenton
Brooks White	Pierson	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, Amir Farooq – Hamiota, as well as Scott Day & Scott Chalmers – Melita

2012 Weather Report and Data – Melita Area

It was an early spring for Melita with the last spring frost occurring in late April rather than mid May. Seeding conditions were nearly perfect and with few breaks in the weather between May 7 and 27. Most crops were seeded mid-May into summerfallow, chemfallow and weed stubbles left over from the 2011 floods. On May 31 minimum air temperature fell to 0.4°C however early morning sun quickly

recovered temperatures. Last spring frost occurred April 27 at -3.7°C and last fall frost was on September 15 at -2.6°C. Next fall frost after that did not occur until September 23 at -6.8°C.

Season Summary May 1 - September 1			
	Actual	Normal ¹	% of Normal
Number of Days	124		
Growing Degree Days	1536	1436	107
Corn Heat Units	2373	2338	101
Total Precipitation (mm)	197	303	65

1. Based on Environment Canada 30 yr averages

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.

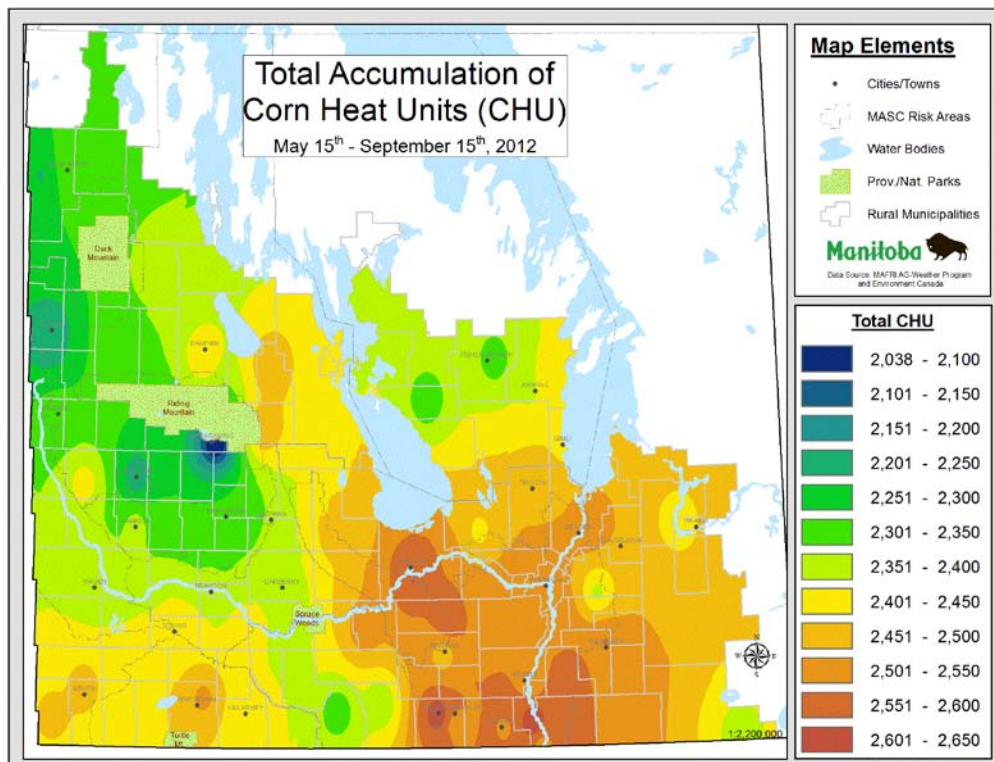
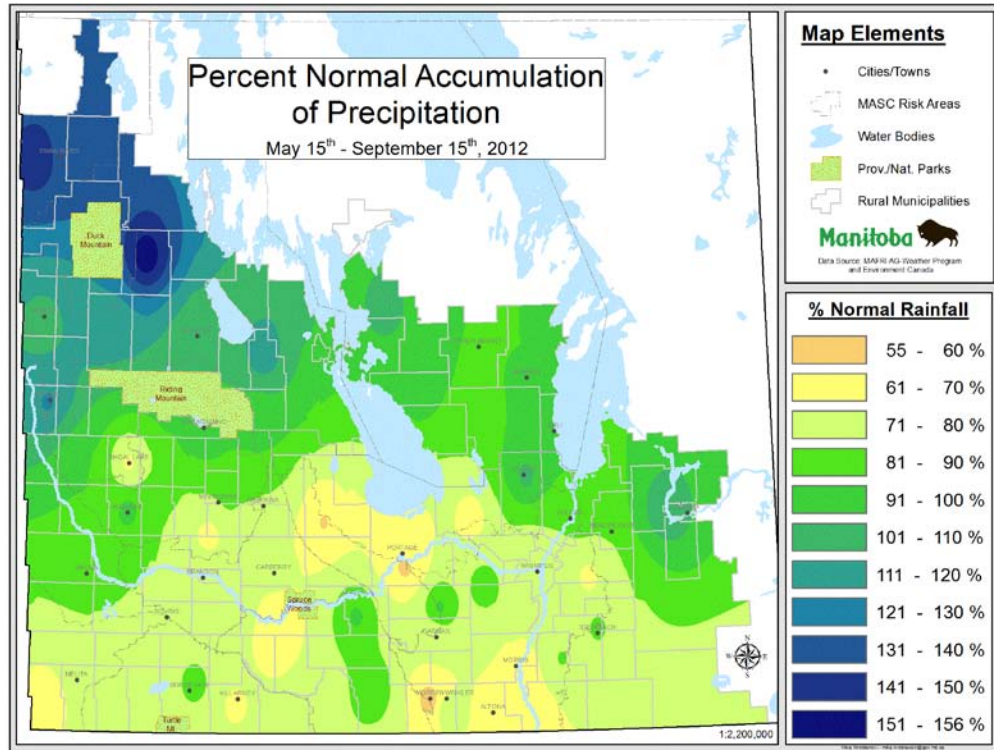
Corn heat units (CHU) are based on a similar principle to growing degree days. CHUs are calculated on a daily basis, using the maximum and minimum temperatures; however, the equation that is used is quite different. The CHU model uses separate calculations for maximum and minimum temperatures. The maximum 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 (SW 8-4-26 W1) and Hamiota (NE-18-14-23 W1). These stations continued to run in 2012. During the winter months, of 2011 and 2012, these stations were taken down for maintenance and were reinstalled April of 2012. 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>

2012 Precipitation & Corn Heat Unit Maps



Melita - WADO 2012 Season Report by Month								
Month	April	May	June	July	August	September	October	Total
Precip (mm)	62	32	68	76	32	6	19	295
Norm Precip. ¹	34	55	77	68	52	47	32	365
Temp Ave °C	6	12	17	22	19	13	3	
Norm. Temp ¹	5	12	17	19	19	13	5	
CHU	155	314	596	776	645	452	97	2783
GDD	77	201	372	511	424	253	38	1761

Normals based on 30-yr averages, Environment Canada

WADO Tours and Special Events



Ag Days was the largest event WADO was involved in for 2012 (picture left). WADO attended the show with the rest of Manitoba's Diversification Centres featuring a booth showcasing new farming opportunities and possibilities.

Other tradeshow WADO participated in were: the Farm Focus Event in Boissevain, MANDAK Zero Till Workshop, Souris Crop Day and Hamiota Crop Day.

WADO main summer in Melita (picture below right) on July 20 saw over 160 people attended, including the Minister of Agriculture for Manitoba, Honorable Ron Kostyshyn. All plots at each site were showcased with a wide range of content on old and new crops, varieties and demonstrations. WADO also held a corn, soybean and sunflower tour (picture below left) on October 3, which toured over 60 people. In addition, a small winter wheat school was held near Isabella on July 26 touring about 24 people.



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 the coefficient of determination and is a value of how "sound" the data really is. In regression models such as ANOVA 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 Agrobases Gen II version 16.2.1, or Analyze-it version 2.03 software. Coefficient of variation and least significant difference at the 0.05 level of significance is 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 2013' guide. Hard copies can be found at most MAFRI and Ag Industry Offices. The suite of Seed Manitoba products — the Seed Manitoba guide and the websites www.seedinteractive.ca and www.seedmb.ca — provides valuable variety performance information for Manitoba farmers.

Winter Wheat Variety Trials

Cooperators:

Ducks Unlimited Canada & Bayer Crop Science
Winter Cereals Canada
MCVET & Seed Manitoba

Introduction (by Pam de Rocquigny- MAFRI Cereals Specialist)

Farmers select winter wheat varieties based on yield potential, disease resistance, height, standability and maturity. But what is becoming increasingly important is selecting varieties on planned end-use or marketing considerations.

Is the harvested product for milling? For ethanol production? As an ingredient in feed rations? Knowing the answers to these questions will help farmers select not only a variety that will perform on their farm but be suitable for the planned end-use.

CDC Falcon transition delayed

The Canadian Grain Commission plans to move CDC Falcon, Manitoba's most popular variety, from the Canada Western Red Winter (CWRW) class to the Canada Western General Purpose (CWGP) class as of August 1, 2014. This one-year delay will allow farmers more time to evaluate possible replacement varieties if their planned end-use markets need a milling type wheat.

Please note that CDC Kestrel, CDC Clair, CDC Harrier and CDC Raptor (varieties not commonly grown in Manitoba) will be moved from the CWRW class to the CWGP class as of August 1, 2013, a year earlier than CDC Falcon.

Updated Long-Term Data

To assist with variety decisions, MCVET (Manitoba Crop Variety Evaluation Team) is publishing performance data collected in 2012 and updated variety descriptions.

Farmers should look at long-term data and select those varieties which perform well not only in their area but across locations and years. Long-term data can be found in the 2012 Winter Wheat Variety Descriptions Table. The "Yield % Check" column provides an indication of how the listed varieties performed compared to the check CDC Falcon. Remember that only direct comparisons can be made between CDC Falcon and the variety chosen to compare it to. The more site-years, the more dependable the data. If farmers want to choose their own check, the website www.seedinteractive.ca gives them that ability.

Flourish and Moats, possible CWRW replacements for CDC Falcon, have now been tested for a second year so additional data is available. New CWGP entries in 2012 are 1603-137-1 and DH01-25-135*R. More caution must be exercised when evaluating the performance of these two varieties as the data only represents one year of data.

Multi-site Data for 2012

Multi-site data can be found in the Yield Comparisons Table. Although yields are expressed as per cent of CDC Falcon, comparisons are not restricted to only CDC Falcon. Comparisons can be made between other varieties.

For example, you may want to compare the performance of Flourish and Moats at Carman. The first step will be to look at the "Sign Diff" value — a "yes" or "no" will indicate if a real difference exists between varieties. At Carman, there is a significant difference between the varieties tested.

You then need to look at the "LSD %" value. LSD stands for Least Significant Difference and it shows the percentage that individual varieties must differ by to be considered significantly different. At the Carman location, varieties must differ by seven per cent. Since yields of Flourish and Moats differs by 11 per cent, statistically Moats yielded more than Flourish at Carman.

The next step would be to determine if that yield potential is consistent across all sites. Out of the 10 locations, Moats yielded significantly more than Flourish at two locations, but at the remaining locations the performance of Flourish and Moats is similar at six sites while Flourish yielded significantly more than Moats at two locations. Therefore by looking only at the 2012 data, farmers can see that yield potential of Flourish and Moats is pretty similar.

Keep in mind that data accumulated over several sites in a single year must always be viewed with caution. Varieties that excel under one set of environmental conditions may not perform as well under the next year's conditions. Farmers can do the same exercise with past guides, available online at www.seedmb.ca, to see how consistent yield is between sites and locations (in Seed Manitoba 2012, at the six locations the performance of Flourish and Moats were statistically the same at five).

Farmers can also go to www.seedinteractive.ca where they can select multiple varieties, locations and years that best compare with their farm, while still offering the ability to choose their own check variety.

Fusarium Head Blight ratings

A concerted effort to improve fusarium head blight (FHB) resistance in winter wheat varieties is being undertaken by breeders. In past editions of the seed guide, there has been limited data available to publish ratings for many varieties. However, official FHB evaluations have started for winter wheat

entries tested in both the Central and Western winter wheat co-operative registration trials. Combined with previous testing, also done by Dr. Anita Brulé-Babel at the University of Manitoba, enough data exists to assign and in one case change, ratings to some of the varieties.

The rating for CDC Buteo has been changed to moderately resistant or MR from the previous intermediate (I) rating. Data for CDC Ptarmigan and Peregrine shows both at an intermediate (I) rating. All other varieties are either susceptible (S) or moderately susceptible (MS), or not enough data exists yet to give a rating.

It is important to note with future testing, more changes to the ratings may occur in order to provide the most accurate information to farmers. But it is a great first step and subsequently great news for farmers as FHB can be an issue in winter wheat production. In 2012/13, MCVET is evaluating the variety W454 which has improved resistance to FHB.

Trial 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

The trials consisted of 13 winter wheat varieties in plots that were 1.44 m wide by 9 m long. Varieties were organized in a randomized complete block design and replicated three times. Soil tests were taken prior to seeding (Table 1). Plots were established at various locations in southwest Manitoba by WADO with accordance to their agronomic specifications (Table 2). A plot air seeder equipped with SeedHawk dual knife openers was used to seed plots. Herbicides were applied at 10 gal/ac water volume at recommended application rates. Plots were sprayed only in Isabella with a fungicide, all other sites were not. Plots were combined with a Hege 140 plot combine. Samples were measured for moisture and test weight. Composite subsamples taken and protein was determined.

Table 1: Site locations, previous crop type, and the corresponding soil tests.

Site	Legal Land Location	Previous Crop	Depth	N	P	K	S	pH
				lbs/ac	ppm Olsen	ppm	lbs/ac	
Melita	NW 1-4-27W	Canola	0-6"	14	11	130	14	7.8
			6-24"	18			36	
Boissevain	SE 19-7-27W	Canola	0-6"	73	11	501	32	7.7
			6-24"	81			84	
Reston	SW 19-7-27W	Canola	0-6"	23	10	366	120	7.6
			6-24"	24			360	
Isabella	SW 29-14-25W	Canola	0-6"	62	16	321	16	6.5
			6-24"	90			90	

Table 2: Specific site location seeding dates, fertilizer applications, herbicide applications and harvest dates.

Site	Seed Date	Seeding Fertilizer	Top Dressing	Herbicides	App. Date	Harvest
		App. (lbs/ac)	40 lbs/ac N			
Melita	15-Sep	60-30-0-0	04-Apr	Achieve + Mextrol	08-May	30-Jul
Boissevain	14-Sep	70-30-0-0	12-Apr	Achieve + Mextrol	08-May	03-Aug
Reston	14-Sep	70-30-0-0	12-Apr	Achieve + Mextrol	08-May	01-Aug
Isabella	14-Sep	70-30-0-0	12-Apr	Achieve + Mextrol	08-May	10-Aug

Results

2012 WINTER WHEAT VARIETY DESCRIPTIONS

Variety	Yield % Check	Site Years Tested	% Protein +/- Check	Height +/- Check	Days to Maturity +/- Check	Resistance Level:				Relative Winter Hardiness	Distributor
						Lodging	Stem Rust	Leaf Rust	Fusarium Head Blight		
Canada Western Red Winter											
CDC Buteo	100	73	-0.1	4	4	G	I	I	MR	VG	SeCan
CDC Falcon	100	85	0	0	0	VG	MR	MR	S	F	SeCan
Flourish~	102	16	0.2	2	0	VG	I	I	S	F	SeCan
McClintock~	98	69	0.2	7	5	VG	R	MR	S	F	CANTERRA SEEDS
Moats~	103	16	0.4	6	0	G	R	R	S	G	SeCan
Canada Western General Purpose											
Accipiter~	104	31	-0.4	3	3	VG	R	MR	MS	G	SeCan
Broadview~	104	25	-0.4	2	1	VG	R	R	S	G	CANTERRA SEEDS
CDC Ptarmigan	104	36	-1.7	8	3	F	S	S	I	G	Western Ag
Peregrine~	106	31	-0.5	10	2	G	I	MR	I	VG	SeCan
Sunrise	107	25	-1.0	6	4	G	MR	MR	-	G	Western Ag
Varieties that have been supported for registration											
Canada Western Red Winter											
DH00W31N*34	105	25	-0.1	7	2	G	R	R	S	F	-
Canada Western General Purpose											
1603-137-1	101	10	-	4	2	G	R	R	MS	G	-
DH01-25-135*R	108	10	-	8	3	F	R	R	-	F	-
DH99W18H*45	107	31	-0.1	6	2	VG	MR	R	-	F	-
DH99W19H*16	104	25	0.1	1	1	VG	R	R	MS	VG	-
CHECK CHARACTERISTICS											
CDC Falcon	81 bu/acre	85 site years	11.1% protein	26 inches							

~ Indicates a variety that is protected by Plant Breeder's Rights or a variety where protection has been applied for but not yet granted at time of printing.
Protein data for 2012 was not available at time of publication. Please reference Seed Manitoba 2013 in December for 2012 data.

2012 Yield Comparisons Table

Variety	2012 Average Yield	2012 Yield: % of CDC Falcon									
		Carberry	Carman	Reston	Melita	Isabella	Roblin	Rosebank	Stonewall	Boissevain	Winnipeg
Canada Western Red Winter											
CDC Buteo	97	109	95	92	94	84	86	104	108	94	107
CDC Falcon	100	100	100	100	100	100	100	100	100	100	100
Flourish~	104	149	102	96	104	104	119	91	109	102	94
Moats~	103	109	113	103	99	88	124	104	106	95	103
Canada Western General Purpose											
Accipiter~	103	107	111	103	110	100	68	113	95	100	108
Broadview~	103	112	103	99	103	104	103	101	100	92	114
Peregrine~	104	111	113	97	113	90	115	106	101	100	103
Sunrise	104	125	117	94	116	96	98	118	91	81	111
Varieties that have been supported for registration											
Canada Western Red Winter											
DH00W31N*34	104	104	110	99	105	100	139	94	109	97	101
Canada Western General Purpose											
1603-137-1	101	121	117	94	105	85	100	108	88	90	107
DH01-25-135*R	108	122	110	98	110	102	139	111	102	102	101
DH99W18H*45	105	109	111	98	114	102	122	103	100	94	106
DH99W19H*16	104	90	113	94	111	101	102	106	102	105	114
CHECK YIELD											
CDC Falcon (bu/ac)		52	95	96	58	101	52	99	74	92	86
CV %		7.6	3.6	6.5	4.4	3.4	8.3	6.5	7.2	5.1	6.0
LSD %		15	7	-	8	6	16	12	12	8	11
Sign Diff		Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes

~ Indicates a variety that is protected by Plant Breeder's Rights or a variety where protection has been applied for but not yet granted at time of printing.

2012 Winter Wheat Protein Table

Class/Variety	2012 Average Protein (%)	2012 Protein (%)									
		Carberry	Carman	Reston	Melita	Isabella	Roblin	Rosebank	Stonewall	Boissevain	Winnipeg
Canada Western Red Winter											
CDC Buteo	11.9	13.1	13.2	9.6	11.5	12.8	11.4	10.8	13.1	12.9	10.1
CDC Falcon	11.8	13.3	12.3	10.4	12.2	12.2	12.0	10.2	13.7	12.0	9.5
Flourish🌾	12.1	13.9	12.9	10.2	11.5	12.2	11.9	12.0	13.7	12.4	10.0
Moats🌾	12.0	13.7	13.1	10.1	11.6	13.6	11.8	10.3	13.6	12.5	9.7
Canada Western General Purpose											
Accipiter🌾	11.5	13.3	12.2	9.4	12.5	11.9	11.9	9.6	13.4	11.9	9.0
Broadview🌾	11.6	13.0	11.7	9.6	12.1	12.0	11.6	10.1	13.9	12.3	9.2
Peregrine🌾	11.4	13.0	12.2	9.4	11.0	12.8	11.2	9.7	13.1	12.8	8.4
Sunrise	11.3	12.7	11.1	8.9	11.1	12.1	11.2	9.0	13.4	12.0	—
Varieties that have been supported for registration											
Canada Western Red Winter											
DH00W31N*34	11.4	13.2	12.3	9.7	12.9	12.5	11.1	9.2	—	13.3	8.0
Canada Western General Purpose											
1603-137-1	11.8	13.1	12.1	9.9	12.4	12.7	11.8	11.4	13.5	12.3	9.1
DH01-25-135*R	11.5	12.9	12.1	9.7	11.7	12.4	10.8	9.4	13.5	12.3	10.1
DH99W18I*45	12.0	13.8	11.9	10.0	12.5	12.6	12.1	10.2	14.1	13.0	9.8
DH99W19H*16	11.6	13.6	—	10.1	12.6	12.5	12.2	9.8	13.6	11.8	8.4
SITE GRAND MEAN (%)		13.3	12.3	9.8	12.0	12.5	11.6	10.1	13.6	12.4	9.3

Spring Wheat

Cooperators:

MCVET & Seed Manitoba

Site Information

Melita, MB

Location: NE 36-3-27 W1

Soil Texture: Liege Sandy Loam

Previous Crop: Summer Fallow

Soil Test:

Site	Depth	pH	N lbs/ac	P ppm Olsen	K ppm	S lbs/ac
Melita	0-6"	8	11	9	216	34
	6-24"		21			42
	0-24"		32			76

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 wheat 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 2013.

Methods

The trial consisted of 18 varieties in plots that were 1.44 m wide x 8.5 m long. Varieties were organized in a 3x6 rectangular lattice design. Varieties were replicated three times. Plots were direct seeded May 9th at a depth of 1" using a dual knife Seedhawk air seeder. Fertilizer was sideband at 80 lbs/ac nitrogen and 30 lbs/ac phosphorous using liquid 28-0-0 UAN and granular 11-52-0 MAP. Plots were maintained weed free using Tundra Herbicide at a rate of 0.8 L/a. Plots were desiccated with Maverick glyphosate and Heat herbicides at a rates of 1 L/ac and 10 g/ac, respectively, on August 6. Plots were harvested at full maturity on August 17. 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 Aug 2nd visually as a single plot observation using the McFadden Scale (1-11) where 1 is disease free and 11 where the flag leaf is completely covered in lesions. Yield and protein data will be summarized.

Results

In Melita there were significant differences in yield among varieties.

		2012 Yield (bu/acre)										
	2012 Average Yield (bu/acre)	Beausejour	Boisevain	Dauphin	Hamiota	Melita	Neepawa	Rosebank	Souris	St. Adolphe	Stonewall	Thornhill
Canada Western Red Spring												
5603HR	51	42	59	40	56	43	42	65	62	40	43	67
5604HR CL	53	44	58	44	51	50	43	72	70	38	43	66
AAC Bailey	47	—	49	36	46	—	—	—	—	—	—	56
AAC Redwater	56	—	54	47	54	—	—	—	—	—	—	69
AC Barrie	53	47	63	47	48	48	49	72	61	36	48	67
Carberry	57	45	55	42	54	48	54	74	62	56	60	82
Cardale	57	—	58	41	55	—	—	—	—	—	—	76
CDC Kernen	52	48	58	32	56	48	41	67	62	45	55	64
CDC Plentiful	53	—	51	41	51	—	—	—	—	—	—	68
CDC Stanley	52	45	58	43	53	47	45	68	58	40	43	68
CDC Thrive	48	43	53	36	56	45	39	66	54	33	42	56
CDC Ulmost VB	54	—	56	44	54	—	—	—	—	—	—	64
CDC VR Morris	58	—	58	41	58	—	—	—	—	—	—	75
KANE	51	39	49	38	56	48	43	67	66	35	50	70
Muchmore	57	48	57	45	52	48	48	81	71	50	56	75
Shaw VB	55	47	60	47	61	49	44	72	65	35	52	70
SY433	53	45	62	44	51	51	41	69	70	44	48	60
Vesper VB	54	48	61	48	61	50	52	71	69	27	41	70
Canada Prairie Spring Red												
Conquer VB	59	51	56	48	58	50	41	75	64	66	60	76
Enchant VB	61	—	57	53	60	—	—	—	—	—	—	72
SY985	58	42	58	49	47	52	50	78	64	66	59	78
Canada Western Hard White Spring												
Whitehawk	45	41	47	34	52	42	37	62	62	25	32	57
Canada Western General Purpose												
CDC NRG003	61	41	55	55	55	50	53	87	72	61	56	84
NRG010	60	46	58	48	60	53	47	85	68	59	60	81
Pasteur	59	44	56	45	64	51	46	77	73	59	51	84
Varieties that have been supported for registration												
Canada Western Red Spring												
BW931	61	—	58	45	59	—	—	—	—	—	—	81
BW932	63	—	61	48	60	—	—	—	—	—	—	84
Canada Prairie Spring Red												
HY1312	58	—	56	50	57	—	—	—	—	—	—	68
HY1603	61	—	60	49	60	—	—	—	—	—	—	77
Canada Western Hard White Spring												
HW021	55	—	56	47	54	—	—	—	—	—	—	61
Canada Western Soft White Spring												
SWS408	73	—	71	64	66	—	—	—	—	—	—	89
Canada Western General Purpose												
GP047	70	—	53	55	80	—	—	—	—	—	—	92
GP080	57	—	53	38	62	—	—	—	—	—	—	74
SITE GRAND MEAN (bu/acre)		45	57	45	57	49	45	73	65	45	51	72
CV%		7.2	5.7	7.7	6.9	6.6	10.7	6.4	7.7	4.3	8.2	5.1
LSD (bu/acre)		5	5	6	6	5	8	8	8	3	7	6
Sign Diff		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Seeding Date		09-May	09-May	11-May	15-May	09-May	09-May	04-May	16-May	23-Apr	25-Apr	04-May
Harvest Date		14-Aug	14-Aug	06-Sep	10-Sep	16-Aug	24-Jul	08-Aug	29-Jul	30-Jul	01-Aug	23-Aug

Composite Protein values for 2012 Spring Wheat locations.

		2012 Protein (%)										
Class/Variety	2012 Average Protein (%)	Beausejour	Boissevain	Dauphin	Hamiota	Melita	Neepawa	Rosebank	Souris	St. Adolphe	Stonewall	Thornhill
Canada Western Red Spring												
5603HR🌾	14.9	14.1	14.8	15.4	14.5	15.7	15.4	—	15.6	14.3	13.8	15.5
5604HR CL🌾	15.0	14.6	15.2	15.3	14.8	14.9	15.7	—	15.1	—	13.5	15.6
AAC Bailey🌾	15.7	—	15.0	16.0	15.8	—	—	—	—	—	—	15.9
AAC Redwater🌾	14.1	—	15.6	15.1	15.2	—	—	—	—	—	—	10.4
AC Barrie🌾	15.4	14.8	15.4	15.4	14.8	16.0	16.4	—	15.0	15.9	14.2	16.2
Carberry🌾	15.1	15.0	15.3	15.5	15.1	14.2	—	—	15.5	14.5	14.7	15.7
Cardale🌾	14.2	—	15.2	15.9	14.7	—	—	—	—	—	—	11.1
CDC Kernen🌾	15.2	14.6	15.3	15.5	15.4	15.5	15.9	—	14.9	15.0	14.6	15.7
CDC Plentiful🌾	15.5	—	15.7	15.1	15.3	—	—	—	—	—	—	15.9
CDC Stanley🌾	15.2	15.0	15.1	15.1	15.5	15.3	16.1	—	15.6	15.0	13.4	15.6
CDC Thrive🌾	15.2	14.6	15.2	15.6	15.0	14.7	15.9	—	15.8	14.8	13.4	16.7
CDC Utmost VB🌾	15.5	—	15.0	15.5	15.4	—	—	—	—	—	—	16.1
CDC VR Morris🌾	15.6	—	15.3	15.7	15.1	—	—	—	—	—	—	16.1
KANE🌾	15.0	14.5	15.2	15.4	15.0	15.7	15.9	—	14.9	14.5	13.5	15.7
Muchmore🌾	14.8	14.4	15.1	15.2	14.7	13.9	15.8	—	15.2	14.4	13.9	15.3
Shaw VB🌾	15.1	15.1	15.3	15.2	14.4	15.5	16.4	—	15.8	13.3	13.6	16.3
SY433🌾	14.9	14.1	14.8	15.1	14.6	14.3	15.6	—	15.2	15.0	14.0	15.8
Vesper VB🌾	15.2	14.8	15.4	15.1	15.0	15.5	—	—	15.9	15.1	13.9	16.1
Canada Prairie Spring Red												
Conquer VB🌾	14.1	14.1	14.2	14.0	12.9	14.9	15.7	—	13.6	13.1	14.3	14.5
Enchant VB🌾	13.5	—	14.3	13.6	13.6	—	—	—	—	—	—	12.3
SY985🌾	14.0	14.3	14.0	14.4	13.7	13.6	14.8	—	14.3	12.7	13.9	14.1
Canada Western Hard White Spring												
Whitehawk🌾	13.8	13.5	13.3	13.8	13.2	13.9	—	—	14.1	13.7	14.7	14.2
Canada Western General Purpose												
CDC NRG003🌾	13.7	13.9	14.3	13.6	13.3	13.9	14.9	—	13.0	13.5	12.9	13.9
NRG010🌾	13.5	14.6	13.5	13.3	12.3	12.9	14.1	—	12.7	—	14.6	13.5
Pasteur🌾	14.2	13.4	13.7	13.9	13.1	13.2	16.4	—	14.7	14.4	15.1	13.9
Varieties that have been supported for registration												
Canada Western Red Spring												
BW931🌾	15.2	—	15.0	15.1	15.0	—	—	—	—	—	—	15.5
BW932🌾	15.2	—	15.3	15.2	14.6	—	—	—	—	—	—	15.7
Canada Prairie Spring Red												
HY1312🌾	13.6	—	14.2	14.2	13.3	—	—	—	—	—	—	12.6
HY1603🌾	14.5	—	14.7	14.6	14.0	—	—	—	—	—	—	14.7
Canada Western Hard White Spring												
HW021🌾	13.0	—	13.5	14.0	13.4	—	—	—	—	—	—	11.0
Canada Western Soft White Spring												
SWS408🌾	12.4	—	13.0	12.3	11.8	—	—	—	—	—	—	12.3
Canada Western General Purpose												
GP047🌾	12.6	—	13.8	13.5	11.7	—	—	—	—	—	—	11.5
GP080🌾	12.6	—	13.7	13.1	12.6	—	—	—	—	—	—	11.1
SITE GRAND MEAN (%)		14.4	14.7	14.7	14.2	14.6	15.7	—	14.8	14.3	14.0	14.4

Oats

Cooperators:

MCVET & Seed Manitoba

Site Location:

Melita, MB

Location: NE 36-3-27 W1

Previous Crop: Summer fallow

Soil Texture: Liege Sandy Loamy

Soil Test:

Site	Depth	pH	N lbs/ac	P ppm Olsen	K ppm	S lbs/ac
Melita	0-6"	7.9	15	10	340	44
	6-24"		21			36
	0-24"		36			80

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 6 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 9th at a depth of 5/8". Fertilizer was sideband at 87 lbs/ac nitrogen and 30 lbs/ac phosphorous using liquid 28-0-0 UAN and granular 11-52-0 MAP. Plots were maintained weed free using Stampede herbicide and MCPA Ester 500 herbicides at rates of 1.25 lbs/ac and 0.5 L/ac, respectively, applied with a 20 gal/ac water volume on May 28th. Plots were desiccated with an application of glyphosate and Heat herbicides on August 6 at a rate of 1 L/ac and 10 g/ac, respectively. Plots were harvested at full maturity September 4th. Protein samples were analyzed from composite samples of each variety. Data collected included plant stand, 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. Agronomic characteristic data can be made available upon request. Yield and protein are summarized.

Results

Variety	2012 Average Yield (bu/acre)	2012 Yield (bu/acre)									
		Arborg	Beausejour	Boisevain	Dauphin	Hamlet	Melita	Rosebank	St. Adolphe	Stonewall	Thornhill
CDC Big Brown	105	101	113	113	70	118	82	127	104	101	121
CDC Seabiscuit	96	67	117	108	79	114	68	105	89	90	119
Leggett	102	85	117	111	72	111	71	132	96	98	129
Stride	99	71	108	101	74	104	73	134	106	99	121
Varieties that have been supported for registration											
OT3054	118	101	122	128	101	114	98	137	111	113	156
OT3056	102	93	115	119	71	84	81	134	97	110	112
SITE GRAND MEAN (bu/acre)		86	115	113	78	107	79	128	100	103	126
CV %		5.9	4.4	5.9	5.3	8.2	5.7	9.0	2.3	2.9	6.5
LSD (bu/acre)		9	—	12	8	16	9	—	4	5	15
Sign Diff		Yes	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
Seeding Date		10-May	09-May	09-May	11-May	15-May	09-May	08-May	23-Apr	25-Apr	04-May
Harvest Date		21-Aug	14-Aug	21-Aug	09-Sep	10-Sep	16-Aug	17-Aug	30-Jul	01-Aug	31-Aug

Variety	2012 Average Protein (%)	2012 Protein (%)									
		Arborg	Beausejour	Boisevain	Dauphin	Hamiota	Melita	Rosebank	St. Adolphe	Stonewall	Thornhill
CDC Big Brown	14.3	12.7	13.5	14.8	13.7	14.1	14.5	14.5	14.9	14.9	14.9
CDC Seabiscuit	14.5	—	13.1	15.5	—	14.2	14.1	14.2	15.4	15.1	14.6
Leggett	15.1	13.3	13.8	15.9	14.3	15.7	15.3	15.0	16.8	15.9	15.2
Stride	15.8	13.5	14.3	16.1	16.6	16.3	16.1	15.6	16.2	17.0	16.5
Varieties that have been supported for registration											
OT3054	13.9	12.6	13.6	14.1	13.1	13.4	13.5	13.7	15.9	15.7	13.6
OT3056	14.5	13.5	14.4	14.6	13.5	14.5	14.0	14.2	16.4	15.0	14.8
SITE GRAND MEAN (%)		13.1	13.8	15.2	14.2	14.7	14.6	14.5	15.9	15.6	14.9

Barley

Cooperators:

MCVET & Seed Manitoba

Site Location:

Melita, MB

Location: NE 36-3-27

Previous Crop: Summer fallow

Soil Texture: Loamy

Soil Test:

Site	Depth	pH	N lbs/ac	P ppm Olsen	K ppm	S lbs/ac
Melita	0-6"	7.8	13	14	213	62
	6-24"		21			36
	0-24"		34			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 12 varieties in plots that were 1.44 m wide x 8.5 m long. Varieties were organized in a 3x4 rectangular lattice design. Variety plots were replicated three times. Plots were direct seeded May 3rd at a depth of 5/8". Fertilizer was sideband at 86 lbs/ac nitrogen and 30 lbs/ac phosphorous using 28-0-0 UAN and granular 11-52-0 MAP. Plots were maintained weed free using Tundra herbicide applied at a rate of 0.8 L/ac applied on May 28th. Plots were harvested at full maturity August 23rd. Data collected includes stand, height, leaf disease, maturity, lodging, yield and test weight.

Results

Unfortunately the Melita Barley data was not included into Seed Manitoba's 2013 Seed Guide due to a severe Aster yellows infestation. That being said the CV% for the plot was acceptable and the plot itself looked okay so the data can be used as a reference but should be used with caution (Table below).

Table: Varieties of barley grown in Melita illustrating their market class, yield, leaf disease and days to maturity compared to the AC Metcalf check.

Variety	Market	Yield kg/ha	% of AC Metcalfe	Leaf Disease 1-11, 11-severe	Days to Maturity Days
BT589	6 row feed	2971	182	8.3	71.0
Muskwa	6 row feed	2255	138	9.7	69.3
Gadsby	2 row feed	2682	164	8.7	74.0
CDC Anderson	6 row malt	2920	179	9.7	68.3
Innovation	6 row malt	2807	172	10.0	68.0
AC Metcalfe	2 row malt	1632	100	9.7	72.0
CDC Kindersley	2 row malt	1788	110	8.3	69.3
CDC PolarStar	2 row malt	2097	129	8.3	70.3
Cerveza	2 row malt	2091	128	8.0	70.0
Major	2 row malt	2030	124	8.7	72.0
TR09208	2 row malt	2229	137	8.7	72.7
HB08304	2 row hulless	1456	89	7.3	76.0
CV (%)		14.3		8.8	2.8
LSD (p<0.05)		586		1.3	3.4
P value		0.0013		0.0084	0.0023
Grand Mean		2246.5		8.8	71.1
R-square		0.92		0.64	0.70

Buckwheat

Cooperators

MCVET & Seed Manitoba
Nestibo Agra
Manitoba Buckwheat Growers Association

Site Location

Melita, MB Location: NE 36-3-27
Previous Crop: Summer Fallow Soil Texture: Liege Loamy Sand
Soil Test:

Site	Depth	pH	N lbs/ac	P ppm Olsen	K ppm	S lbs/ac
Melita	0-6"	8	11	8	204	34
	6-24"		21			30
	0-24"		32			64

Background

In 2005, Manitoba was the only province in Canada producing buckwheat. Buckwheat is one of the best sources of high-quality, easily digestible proteins in the plant kingdom. Its 74% protein absorption rate makes it an excellent meat substitute. It is also very high in carbohydrates (80%) and in antioxidants as well as in numerous minerals and vitamins such as zinc, copper and niacin. This makes buckwheat an ideal ingredient for a wide range of food products. Buckwheat starch can also act as a fat alternative in processed foods. (AAFC)

Production of buckwheat in Manitoba is limited to its long growing season of 100- 110 days needed for full maturity as well as its sensitivity to spring and fall frosts. This is an attractive crop since it uses lower fertility rates and is very weed competitive.

Objective

To demonstrate and examine the yield performance of varieties of buckwheat and explore value-added potential in Manitoba.

Methods

The trial consisted of 7 varieties of buckwheat in plots that were 1.44 m wide by 9 m long. Varieties were organized in randomized complete block design replicated three times. A pre-seed burnoff was applied May 25th with glyphosate and Liberty herbicide at a rate of 1 L/ac each tank mixed. Plots were direct seeded June 1st at a depth of 5/8". Fertilizer applied was 62 lbs N and 30 lbs P in the form of granular 11-52-0 MAP and 28-0-0 UAN. Clethodim (Select) herbicide was applied at a rate of 150 mL/ac to control grassy weeds on June 26th and 28th. Plots were swathed at physiological maturity September 5th. Plots were harvested September 18th.

Results

There were no significant yield differences at all sites across Manitoba (Table below).

Variety	Yield % Check	Site Years Tested	Days to 50% Bloom +/- Check	Height +/- Check	2012 Average Yield	2012 Yield: % of Koma			
						Arborg	Carberry	Melita	Roblin
AC Manisoba	104	13	-3	-2	117	87	86	181	138
AC Springfield	102	13	-1	-5	110	92	93	108	125
Horizon	113	4	—	—	114	87	129	143	124
Koma	100	13	0	0	100	100	100	100	100
Koto®	104	13	-2	-3	97	62	85	119	127
Mancan	99	13	-2	-6	99	81	88	106	123
Manor	111	4	—	—	—	—	—	—	—
CHECK CHARACTERISTICS									
Koma	1521	13	47	45	Koma (lb/acre)	653	795	480	706
	lb/acre	site years	days	inches	CV%	20.7	12.4	15.9	3.9
					LSD%	—	—	—	—
					Sign Diff	No	No	No	No
					Seeding Date	01-Jun	11-Jun	01-Jun	05-Jun
					Harvest Date	20-Sep	02-Oct	18-Sep	20-Sep



Corn

Cooperators:

Manitoba Corn Growers Association
MCVET

Site Information

Melita, MB

Previous Crop: Grazed Corn

Location: NE 4-4-26 W1

Soil Texture: Sandy Loam, stony

Wawanesa

Previous Crop: Grazed Corn

Location: NE 14-7-17 W1

Soil Texture: Clay Loam

Soil Tests:

Site	Depth	pH	N lbs/ac	P ppm Olsen	K ppm	S lbs/ac
Melita	0-6"	6.9	19	22	323	20
	6-24"		96			60
	0-24"		115			80
Wawanesa	0-6"	7.4	83	31	539	44
	6-24"		114			132
	0-24"		197			176

Objective

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

Methods

Each company assigns a corn heat unit (CHU) rating to each of their hybrids. The CHU rating is a measure of relative maturity and is one criterion for choosing a hybrid which will mature in your area. Moisture content at harvest, density and days to 50% silk are other measurements to look at when evaluating the relative maturity of a hybrid.

All hybrids are evaluated at a plant population of 28,000 plants per acre. Plots are planted at a higher rate and thinned to achieve the target population.

Trial consisted of 21 varieties grown in a randomized complete block design replicated three times. Plots were seeded in Melita and Wawanesa on May 15th and May 18th, respectively. 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" depth. Plots were fertilized with 106 lbs/ac nitrogen (28-0-0) and 30 lbs/ac phosphorous (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 glyphosate applied as a 0.75 L/ac split application. In Melita a tank mix of Mextrol 450 at a rate of 0.3 L/ac was applied on the second glyphosate application to control wild mustard and volunteer canola. Plots were harvested for yield Mid - October. Samples were bagged and weighed, moisture and bushel weight were recorded. Yields are corrected to 15.5% moisture content.

Weather data is reported from April 15th to September 15th. The percentage of the normal was calculated using the long-term average for the past 30 years.

Melita Corn Results

CHU	Hybrid	Traits	Distributor	2012 Results		
				Yield (bu/ac)	Moisture (%)	Density (lbs/bu)
2050	P7213R	RR2	DuPont Pioneer	91	16.1	59.8
2100	LR9074RB	RR2/ECB	Delmar Commodities	96	19.0	54.5
2100	P7443R	RR2	DuPont Pioneer	94	15.9	59.5
2125	DKC26-25	RR2	DEKALB	99	18.1	56.1
2125	LR9975RR	RR2	Delmar Commodities	98	18.9	53.7
2125	A4023BTRR	BT/RR2	PRIDE Seeds	93	16.5	55.5
2150	A4176BTRR	BT/RR2	PRIDE Seeds	81	19.3	52.5
2150	N04F-3000GT	GT/CB/LL/RW	Syngenta Seeds	108	16.7	56.8
2175	DKC27-54	RR2	DEKALB	98	19.1	56.3
2175	39D95	RR2	DuPont Pioneer	101	15.9	58.0
2175	2262RR	RR2	PICKSEED	99	19.8	55.2
2175	TH 4377RR	RR	Quarry Seeds Ltd.	99	18.1	52.6
2200	39B90	RR2	DuPont Pioneer	101	15.9	61.1
2200	A4240RR	RR	PRIDE Seeds	90	18.4	55.4
2250	X4033	RR	BrettYoung	109	17.5	55.4
2250	HL R208	RR2	Hyland Seeds	87	17.5	56.3
2250	MZ 1261BR	YGBT/RR2	Maizex Seeds Inc.	101	18.5	57.5
2250	MZ 1244RR	RR2	Maizex Seeds Inc.	89	18.9	54.3
2250	N08N - GT	GT/CB/LL	Syngenta Seeds	94	17.0	54.1
2275	HL 3085	RR2	Hyland Seeds	92	20.7	53.1
Site Average				96	17.9	55.9
CV				10.7	7.6	3.2
Sign Diff				No	Yes	Yes
LSD				-	2.2	2.9
Planting Date				15-May-12		
Harvest Date				8-Oct-12		
CHU Accumulation				2681		
% of Normal CHU				103%		
Precipitation (mm)				223		
% of Normal Precipitation				76%		

Wawanesa Corn Results

CHU	Hybrid	Traits	Distributor	2012 Results		
				Yield (bu/ac)	Moisture (%)	Density (lbs/bu)
2000	39F44	RR2	DuPont Pioneer	84	20.9	54.9
2050	P7213R	RR2	DuPont Pioneer	93	16.2	58.7
2100	P7443R	RR2	DuPont Pioneer	102	17.1	54.5
2100	LR9074RB	RR2/ECB	Delmar Commodities	91	19.7	52.6
2125	A4023BTRR	BT/RR2	PRIDE Seeds	94	17.5	54.3
2125	DKC26-25	RR2	DEKALB	85	20.3	51.8
2125	LR9975RR	RR2	Delmar Commodities	86	20.5	51.4
2150	A4176BTRR	BT/RR2	PRIDE Seeds	87	20.8	50.4
2150	N04F-3000GT	GT/CB/LL/RW	Syngenta Seeds	86	17.9	53.8
2175	DKC27-54	RR2	DEKALB	100	19.4	56.3
2175	2262RR	RR2	PICKSEED	87	19.9	53.6
2175	39D95	RR2	DuPont Pioneer	100	15.9	56.1
2175	TH 4377RR	RR	Quarry Seeds Ltd.	75	25.8	45.4
2200	A4240RR	RR	PRIDE Seeds	80	21.8	49.1
2200	39B90	RR2	DuPont Pioneer	97	18.0	57.0
2250	MZ 1261BR	YGBT/RR2	Maizex Seeds Inc.	97	20.5	54.7
2250	MZ 1244RR	RR2	Maizex Seeds Inc.	79	21.1	52.1
2250	X4033	RR	BrettYoung	86	19.0	50.5
2250	N08N - GT	GT/CB/LL	Syngenta Seeds	82	23.5	46.0
2250	HL R208	RR2	Hyland Seeds	88	18.7	55.1
2275	HL 3085	RR2	Hyland Seeds	82	22.0	49.0
Site Average				89	19.8	52.7
CV \$				10.0	10.0	3.3
Sign Diff				Yes	Yes	Yes
LSD				12	2.7	2.4
Planting Date				18-May-12		
Harvest Date				12-Oct-12		
CHU Accumulation				2667		
% of Normal CHU				110%		
Precipitation (mm)				280		
% of Normal Precipitation				90%		

Discussion

Producers should take into account grain moisture values choosing varieties. This can provide valuable information when comparing varieties and the potential drying costs associated with that variety. Those with higher moisture values will cost more to dry taking value away from the potential farm gate income. Choosing varieties with lower moisture values may require not only less drying cost but less grain handling overall. Be aware that corn buyers may desire a certain moisture value before accepting deliveries. A handy website in regards to cold weather, storage tips and drying potential can be found in the North Dakota State University website at:

http://www.ag.ndsu.edu/extension-aben/documents/Corn_Drying_and_Storage_Tips_for_2011.pdf

For more information about corn production, market development, research and education please visit the Manitoba Corn Growers Website at: <http://www.manitobacorn.ca> and the Manitoba Agriculture Food and Rural Initiatives website at: www.gov.mb.ca/agriculture .

Peas

Cooperators:

Manitoba Pulse Growers Association
MCVET & Seed Manitoba

Site Information

Melita, MB

Location: NE 36-3-27

Previous Crop: Summer Fallow

Soil Texture: Liege Loamy Sand

Soil Test:

Site	Depth	pH	N lbs/ac	P ppm Olsen	K ppm	S lbs/ac
Melita	0-6"	8.0	11	8	204	34
	6-24"		21			30
	0-24"		32			64

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 15 varieties in plots that were 1.44 m wide x 8.5 m long. Varieties were organized in a 3x5 Rectangular Lattice and blocks were replicated three times. A pre-seed burn-off was applied April 26th after seeding with glyphosate and a pre-emergent herbicide Rival. Plots were direct seeded into summerfallow at a depth of 1.5" on April 25th. Seed was inoculated with granular pea/lentil Rhizobia (BeckerUnderwood) and 11-52-0 MAP was sideband at a rate of 58 lbs/ac. Plots were maintained weed-free with Assure II, Arrow and Odyssey herbicides. Plots were desiccated July 26th with Reglone at a rate of 0.9 L/ac. Plots were harvested July 31st.

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 at the Melita site among pea yields, lodging, days to maturity and bushel weight (Table 1). There were no differences in percent stand or height (Table 2).

Table 1: Average yield of pea varieties in Arborg, Boissevain, Hamiota, Melita and Thornhill in 2012.

2012 Average Yield		2012 Yield (bu/acre)				
Variety	(bu/acre)	Arborg	Boissevain	Hamiota	Melita	Thornhill
Yellow						
Agassiz🌾	67	52	82	85	47	67
Argus🌾	67	51	86	80	54	65
CDC Hornet	70	54	84	92	52	68
CDC Meadow	69	58	81	92	53	62
CDC Saffron	68	59	84	79	47	70
CDC Treasure	63	54	86	91	54	32
Cutlass	67	54	86	81	59	55
Hugo🌾	68	60	82	76	56	65
Sorento🌾	71	57	85	93	59	60
Green						
CDC Patrick	64	51	85	76	48	62
CDC Tetris	64	54	85	71	42	68
Other						
CDC Dakota	74	52	91	97	51	77
CDC Mosaic	64	52	76	71	51	69
CDC Horizon	63	52	79	72	48	66
Stella🌾	53	38	69	60	49	52
SITE GRAND MEAN (bu/acre)		53	83	81	51	62
CV %		5.5	5.8	4.8	9.0	14.0
LSD (bu/ac)		5	8	7	8	15
Sign Diff		Yes	Yes	Yes	Yes	Yes
Seeding Date		10-May	09-May	15-May	25-Apr	04-May
Harvest Date		13-Aug	27-Aug	10-Sep	31-Jul	23-Aug

Table 2: Variety characteristics in Melita plots including market class, stand, lodging, plant height, days to maturity and bushel weight in 2012.

Variety	Market Class	Stand %	Lodging 1-9, 9 flat	Height cm	Days to Maturity Days	Bushel Wt lbs/bu (Avery)
CDC Dakota	Dun	91.7	2.0	70.0	86.3	65.2
CDC Patrick	Green	93.3	5.3	68.3	86.0	62.4
CDC Tetris	Green	95.0	5.0	73.3	87.3	64.0
CDC Mosaic	Maple	95.0	1.3	71.7	88.0	65.8
CDC Horizon	Silage	93.3	2.7	73.3	86.3	64.9
Stella	Silage	93.3	3.7	75.0	87.7	64.6
Agassiz	Yellow	95.0	2.7	70.0	85.0	63.5
Argus	Yellow	90.0	1.3	76.7	85.0	63.3
CDC Hornet	Yellow	93.3	1.7	75.0	86.0	64.1
CDC Meadow	Yellow	95.0	1.7	71.7	84.0	64.2
CDC Saffron	Yellow	93.3	2.7	66.7	86.3	65.0
CDC Treasure	Yellow	91.7	3.7	66.7	84.3	65.5
Cutlass	Yellow	91.7	3.3	63.3	86.7	63.8
Hugo	Yellow	93.3	4.7	65.0	85.7	63.8
Sorento	Yellow	93.3	8.3	73.3	86.7	64.8
CV%		4.7	46.7	6.9	0.7	1.3
LSD (p<0.05)		7.3	2.6	8.2	1.0	1.4
Grand Mean		93.2	3.3	70.7	86.1	64.3
P value		0.9813	0.0004	0.0616	<0.0001	0.0029
R-squared		0.38	0.69	0.53	0.85	0.64

Dry Beans

Cooperators:

MCVET & Seed Manitoba
Manitoba Pulse Growers Association

Site Information

Melita, MB

Location: NE 36-3-27

Previous Crop: Summer fallow

Soil Texture: Liege Loamy Sand

Soil Test:

Site	Depth	pH	N lbs/ac	P ppm Olsen	K ppm	S lbs/ac
Melita	0-6"	8.0	14	6	199	42
	6-24"		21			30
	0-24"		35			72

Background

Dry bean production in Southwest Manitoba is limited to the amount of frost free days, moisture and accumulated heat units over the growing season. Typically dry beans require 90 to 110 days to reach full maturity. Given a late seeding date (normally seeded in late May), this requires a season finish by late August. The growing season of the dry bean also requires a 24°C optimum temperature and a cool flowering period under 30°C to prevent bloom blasting. If any of these factors are lacking or are in abundance, the dry bean production will suffer. With careful production practices many varieties and types of dry bean can be produced in many southern areas of the province including the Southwest regions. The 2012 growing season would be considered above average year for dry bean production due to the excess of accumulated heat units.

Objective

To evaluate and demonstrate varieties of dry beans including Pinto, Black and Navy types for yield in the Southwest region of Manitoba.

Methods

Trials consisted of 16 varieties of narrow row dry beans in plots that were 1.44 m wide by 5 m long. Varieties were organized 4x4 lattice square design and replicated three times. Plots were direct seeded May 17th at a depth of 1". No nodulator was used rather, fertilizer was sideband at 60 lbs N/ac and 30 lbs P/ac using liquid 28-0-0 UAN and granular 11-52-0. Plots were maintained for weeds with Basagran Forte herbicide sprayed at a rate of 0.91 L/ac, applied June 20th and July 9th with 20 gal/ac water volumes. Arrow herbicide was applied May 30th and June 12th at a rate of 150 mL/ac to control grassy weeds. Plots were desiccated with Reglone (0.9 L/ac) and glyphosate (1 La/c) on August 23rd. Plots were harvested August 28th with the Hege plot combine.

Results

There were significant differences in final yield among varieties (Table 1). This data was not included into the Manitoba Seed guide due to weed competition of red root pigweed and cattails. For those reasons data should be used as a reference with caution.

Table1: Varieties of dry bean and their corresponding yield to varieties Envoy or CDC Pintium.

Variety	Market Type	Grain Yield		
		kg/ha	% of Envoy	% of CDC Pintium
CDC Jet	Black	2315	108	140
CDC Blackcomb	Black	2198	103	133
Carman Black	Black	2750	129	166
CDC Superjet	Black	2235	105	135
OAC Spark	Navy	2033	95	123
Lightning	Navy	2187	102	132
Skyline	Navy	2048	96	124
1190m-13	Navy	2094	98	127
Envoy	Navy	2138	100	129
CDC WM-2	Pinto	1524	71	92
Winchester	Pinto	1492	70	90
CDC Pintium	Pinto	1652	77	100
Island	Pinto	1935	91	117
Winmor	Pinto	1667	78	101
Mariah	Pinto	2138	100	129
2537-12	Pinto	2007	94	121
CV (%)		11.9		
Grand Mean		2026		
LSD (p<0.05)		403		
P value		0.00005		
R-square		0.73		

Western Manitoba Soybean Adaptation Trial

Cooperators:

Manitoba Pulse Growers Association
MCVET & Seed Manitoba

Site Information

Melita, MB

Location: NE 36-3-27

Previous Crop: Summer Fallow

Soil Texture: Liege Loamy Sand

Soil Test:

Site	Depth	pH	N lbs/ac	P ppm Olsen	K ppm	S lbs/ac
Melita	0-6"	8.1	17	6	190	58
	6-24"		27			48
	0-24"		44			106

Background

Over the last several years, soybean acres have climbed to record highs in Manitoba. In 2012, harvested area was reported at 800,000 acres, up 40.4% from 2011 in Manitoba. Yield also increased, from 26.7 bushels per acre in 2011 to 34.9 in 2012 in Manitoba (Statistics Canada) . Reasons for this increase may include new varieties of soybean with improved earliness to maturity and new genetic yield potential that are more competitive to canola yields and cost of production.

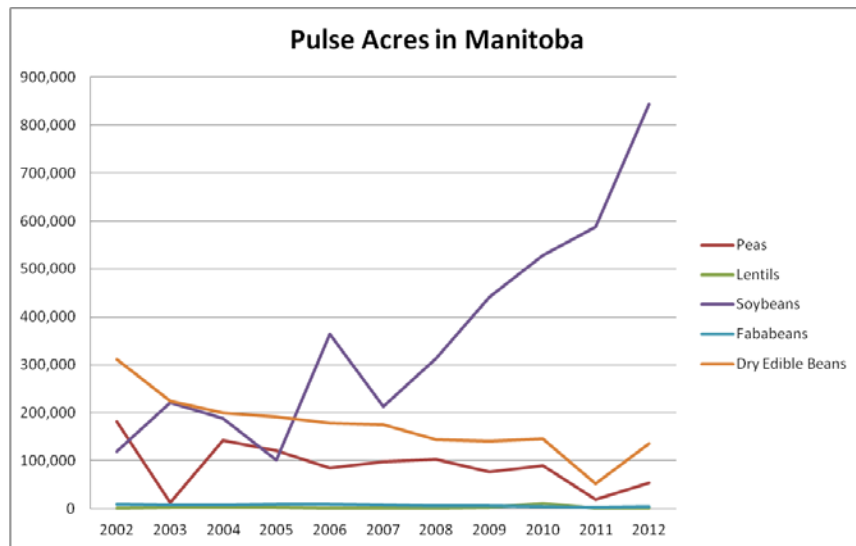


Chart Source: Manitoba Pulse Growers Association, 2012.

Melita has been testing varieties of soybean for some time. The increase number of entries in the trials over the years is a good indicator of industry's interest in the crop. Another reason for acceptance by producer is that soybeans are now an insured crop in western Manitoba.

Methods

Trials consisted of 18 varieties of glyphosate tolerant varieties arranged in a 3x6 rectangular lattice design. Varieties were replicated three times. Seed was inoculated with granular Rhizobia (Becker Underwood) just prior to planting. Plots were solid seeded with a Seedhawk dual knife opener air drill and phosphate was sideband. Plots were 1.44 m wide by 9 m long with six rows at 9.5" spacing. Agronomic parameters for establishment and growing season are summarized in the table below.

Preseed Burnoff	Seed Date	Seed Depth	Fertilizer Applied	Herbicides	App. Date	Dessication	Harvest
Liberty 1 L/ac Glyphosate 0.75 L/ac Rival 0.6 L/ac (tank mixed)	17-May	1"	58 lbs/ac 11-52-0 MAP	Glyphosate applied @ 1.35 L/ac	13-Jun	Reglone and Glyphosate 0.9 L/ac and 1 L/ac (tank mixed) applied Sep 10	18-Sep
				Glyphosate applied @ 0.5 L/ac	05-Jul		

Data collected included height, maturity date and test weight. Plots were harvested with a Hege plot combine at full maturity. Composite samples were used to determine seed size and oil content (results available in 2013).

Results

There were significant differences in final yield among varieties (Table 1). This data was not included into the Manitoba Seed guide for several reasons. The plots suffered from weed competition of red root pigweed and cattails. For those reasons data should be used as a reference with caution.

Table 1: Varieties of soybean and their corresponding company distributor and yield in Hamiota and Melita locations. Height and days to maturity have been included in the Melita location.

Variety	Company	Hamiota		Melita			
		kg/ha	% Check	kg/ha	% Check	Height (cm)	Days to Maturity
23-10RY	Monsanto	4020	100	3581	100	87.0	103.7
24-10RY	Monsanto	3783	94	3745	105	93.3	112.3
900Y61	Pioneer Hi-Bred	3535	88	3114	87	89.7	112.3
900Y71	Pioneer Hi-Bred	3948	98	3499	98	93.7	112.0
Bishop R2	SeCan	3486	87	3342	93	100.0	109.3
G10 R2	NORTHSTAR	3585	89	3455	96	101.0	111.0
HS 006RYS24	HYLAND	3549	88	3579	100	103.0	112.7
HX 007RY32	HYLAND	3275	81	3745	105	95.0	112.3
LS 002R23	Delmar Commodities	3763	94	3383	94	96.3	106.3
LS 004R21	Delmar Commodities	3739	93	3278	92	94.7	112.0
NSC Libau RR2Y	NORTHSTAR	3612	90	3347	93	96.3	111.7
NSM EXP 1225 R2		3664	91	3427	96	94.0	109.7
Pekko R2	FEDERATED COOP	4138	103	3294	92	88.0	108.3
Sampsa R2	FEDERATED COOP	3705	92	3446	96	86.7	112.7
SC2375R2	SeCan	3818	95	3427	96	95.7	111.7
TH 32004R2Y	Quarry	4515	112	3570	100	95.7	110.0
TH 33003R2Y	QUARRY	3811	95	3333	93	98.7	111.7
Vito R2	SEMENCES PROGRAIN	3888	97	3240	90	92.7	113.0
CV (%)		6.1		6.2		7.7	2.1
LSD (p<0.05)		383		449		12.1	3.8
Grand Mean		3768		3434		94.5	110.7
P value		0.0002		0.34		0.323	0.0009
R-square		0.69		0.57		0.62	0.71

Canola

Cooperators:

Manitoba Canola Growers Association
MCVET & Seed Manitoba

Site Information

Melita, MB

Location: NE 36-3-27

Previous Crop: Summer fallow

Soil Texture: Liege Loamy Sand

Soil Test:

Site	Depth	pH	N lbs/ac	P ppm Olsen	K ppm	S lbs/ac
Melita	0-6"	8.1	17	6	190	58
	6-24"		27			48
	0-24"		44			106

Background

This was the first year WADO hosted the Prairie Canola Variety trials (PCVT) in Melita. Small replicated plots are grown in block pertaining to their specific herbicide system. The three systems of herbicide tolerance include Liberty (glufosinate) tolerant, Roundup Ready (glyphosate) tolerant and Clearfield (imi) tolerant canola systems. The Seed Manitoba Guide now contains an additional large plot (field scale) data that is used in comparison to the small plot data. Field scale trials range (page 54, 58) from 0.5 to 1.5 acres in size and are managed by growers using their typical production practices. The trials are planted, swathed, harvested and in some cases sprayed by growers using the respective herbicide systems according to established protocols. The performance results presented are those varieties that were also included in the testing under small plot, replicated trials.

Blackleg Rating for Canola

The rating represents a variety's blackleg tolerance relative to the highly susceptible variety Westar. Varieties with a resistant (R) or moderately resistant (MR) rating for blackleg have shown the greatest ability to suppress blackleg incidence and severity, but can still develop some lesions or cankers. Individual field performance and tolerance may vary from tolerance levels reported in the registration trials. In fields showing higher than expected levels of blackleg or where there has been history of a tight rotation with canola, it may be necessary to lengthen rotation to achieve sufficient blackleg control.

Methods

In Melita, the plot area was burned off on May 8th with a tank mix of Rival EC and NuGlo glyphosate at a rate of 0.5 L/ac and 0.75 L/ac, respectively. Plots were seeded 1.44 m wide by 9 m long with a Seedhawk dual knife opener air drill. Row spacing was 9.5". Seeding depth was 3/8" and fertilizer was sidband at a rate of 101 lbs/ac actual nitrogen and 30 lbs/ac phosphorous using 28-0-0 UAN and 11-52-0 MAP. Herbicides were applied to keep plots weed free using the following systems:

- Liberty Link (LL) - Liberty herbicide, applied June 4 & 25 at a rate of 1.65L/ac tankmixed with Arrow at 25.5 ml/ac.
- Roundup Ready (RR) – Glyphosate applied June 1 & 25 at a rate of 0.5 L/ac and 0.65 L/ac (both 540 g a.i./L).
- Clearfield (CL) – Odyssey and Equinox applied June 1 & 4 at rates of 8 and 10 g/ac and 67 ml/ac, respectively .

Data collected included height, days to maturity (60% seed color change), sample moisture, seed weight and yield. Plots were swathed at full maturity August 6 and harvested August 20.

Results

There were significant yield differences in Melita. Long season yield data is summarized in the adjacent table. Overall plant growth characteristics are also summarized in the next table.

Variety (B.napus)	Bushels per Acre				
	Boisvevain	Dauphin	Melita	Portage la Prairie	Average YIELD
Clearfield					
5525 CL	38	35	34	58	41
5535 CL	41	30	39	53	40
VR 9560 CL	44	39	34	58	44
LSD (bu/ac)	3.9	6.9	4.6	10.3	6.4
Liberty Link					
5440	34	39	37	57	42
L120	40	31	26	53	38
L130	46	35	32	57	43
L150	39	36	31	58	41
L154	40	40	36	58	44
L159	42	32	36	60	43
LSD (bu/ac)	4.4	6.1	7.5	5.5	5.9
Roundup Ready					
CANTERRA 1970	36	31	25	54	36
CANTERRA 1990	29	34	36	54	38
CANTERRA 1999*	48	39	38	55	45
6050 RR	44	29	34	49	39
6060 RR	32	32	33	54	38
72-65 RR	41	31	33	48	38
73-45 RR	44	31	37	59	43
73-75 RR	46	38	41	55	45
74-44 BL **	39	33	32	55	40
74-47 CR **	-	-	-	-	-
94H04	40	33	30	52	39
V12-1 *	42	34	35	51	40
VR 9559 G	41	39	37	55	43
VT 520 G **	35	36	33	52	39
LSD (bu/ac)	5.2	5.0	6.1	5.5	5.4
Grand Mean (bu/ac)	40	34	34	55	41
CV	11	12	12	8	
Seeding Date	18-May	11-May	08-May	21-May	

* Indicates varieties with Specialty oil profiles

** Indicates varieties with interim registration.

Variety				LONG Season Zone (4 trials)				WCC/RRC
Distributor	(B.napus)	Average Yield MID-LONG Zone		Yield (bu/ac)	Maturity (days)	Lodging (1-5)	Height (inches)	Blackleg Tolerance
		bu/ac	%73-75RR					
Clearfield Tolerant								
BrettYoung	5525 CL	46	91	41	91.7	1.4	46	R
BrettYoung	5535 CL	42	85	40	88.0	1.5	45	R
Viterra	VR 9560 CL	49	98	44	92.2	1.8	47	R
	LSD (bu/ac)			6				
Liberty Tolerant								
Bayer CropScience	5440	50	100	42	90.7	1.2	46	R
Bayer CropScience	L120	45	89	38	90.2	1.4	44	R
Bayer CropScience	L130	49	97	43	88.6	1.3	44	R
Bayer CropScience	L150	49	99	41	90.3	1.8	46	R
Bayer CropScience	L154	52	103	44	91.0	1.5	46	R
Bayer CropScience	L159	51	101	43	91.8	1.4	49	R
	LSD (bu/ac)			6				
Roundup Tolerant								
CANTERRA SEEDS	CANTERRA 1970	47	94	36	92.9	1.3	48	R
CANTERRA SEEDS	CANTERRA 1990	48	96	38	89.7	1.7	45	R
CANTERRA SEEDS	CANTERRA 1999**	51	101	45	89.7	1.5	45	R
BrettYoung	6050 RR	45	90	39	87.7	2.2	43	R
BrettYoung	6060 RR	47	94	38	93.2	1.4	47	R
DEKALB	72-65 RR	45	91	38	90.0	2.2	42	R
DEKALB	73-45 RR	47	93	43	87.6	2.2	41	R
DEKALB	73-75 RR	50	100	45	89.3	1.8	44	R
DEKALB	74-44 BL **	47	94	40	90.1	1.6	43	R
DEKALB	74-47 CR **	52	100	-	-	-	-	R
FP Genetics	94H04	44	89	39	88.5	1.9	46	R
Cargill - Victory Hybrid Canola	V12-1 *	49	99	40	91.1	1.8	45	R
Viterra	VR 9559 G	49	97	43	91.0	1.6	47	R
Viterra	VT 520 G **	49	94	39	93.7	1.2	48	MR
	LSD (bu/ac)			5.4				
GRAND MEAN (bu/ac)		48		41	90	1.6	45	

* Indicates varieties with Specialty oil profiles

** Indicates varieties with interim registration.

National Hemp Coop Variety Trials

Keith Watson¹, Jeff Kostuik¹, Susan McEachern¹ and Angel Melnychenko¹

Site Information

Locations: Arborg, Manitoba
 Carberry, Manitoba
 Gilbert Plains, Manitoba
 Melita, Manitoba
 Kemptville, Ontario
 Laird, Saskatchewan
 Melfort, Saskatchewan
 Vegreville, Alberta

Cooperators: Parkland Crop Diversification Foundation (PCDF), Roblin, MB (Project Lead)
 Westman Agricultural Diversification Organization (WADO), Melita, MB

¹ PCDF, Roblin

Prairies East Sustainable Agriculture Initiative (PESAI), Arborg, MB
Canada-Manitoba Crop Diversification Centre (CMCDC), Carberry, MB
Cecil Vera, Agriculture and Agri-Food Canada, Melfort, SK
Bert Vandenberg, Hemp Genetics International Inc., Melfort, SK
Hugh Campbell, Terramax, Qu'Appelle, SK
Jan Slaski, Alberta Innovates Technology Futures, Vegreville, AB
Wendy Asbil, University of Guelph, Kemptville, ON

Plant Breeding Programs:

Parkland Industrial Hemp Growers Coop (PIHG)
Hemp Genetics International (HGI)
Ontario Hemp Alliance
PhytoGene Resources Inc.
Alberta Innovates Technology Futures

Background

Industrial Hemp has been licensed to grow in Canada by Health Canada since 1998. Since that time, grain processing and market development has led the industry. In 2012, there were about 53,000 acres of hemp grown in Canada, mainly in the Western Provinces. This is an increase from about 38,000 acres in 2011.

Canadian plant breeding programs are developing varieties that are adapted and suitable for grain and or fibre production in Canada.

In 2012, Canadian Hemp Trade Alliance (CHTA) secured funding through the Adaptation Innovation Program (AIP) to undertake the evaluation of hemp grain and fibre varieties for agronomic characteristics that will give high yielding, low THC hemp varieties for grain, fibre or dual purpose grain and fibre production. Testing included grain and fibre yields, as well as quality evaluation of oil profiles and % fibre content.

THC, oil profiling was undertaken at CMH Biotechnologies Inc., an accredited lab located in Steinbach, Manitoba. Fibre analysis was undertaken by Biolin Research Incorporated located in Saskatoon, Saskatchewan.

Financing for 2012 variety evaluation trials was made possible by:

- Canadian Hemp Partners- Co-operators and Plant Breeding Programs
- Canadian Hemp Trade Alliance (CHTA)
- Agricultural Innovation Program (AIP)

Hemp varieties exhibit considerable differences in maturity, seed size, height, fibre yield and ease of harvest. These factors are also influenced by location, seeding date, climate, irrigation and fertility. It is recommended to seek professional advice when selecting varieties most suitable for your area and production system.

Alyssa Registered in 2004. Alyssa is a monoecious, large seeded, grain variety. It is of medium height with medium branching. Alyssa is about 7 days later maturing (115 days maturity) than Delores. Alyssa is a taller variety averaging about 185 cm. This makes it suitable as a dual purpose variety for grain as well

as fibre. Alyssa is THC testing exempt in Manitoba. Available from Parkland Industrial Hemp Growers Coop – (PIHG), Dauphin. (204) 629-4367

Anka is one of the first varieties licensed in Canada. Anka is a monoecious variety and was developed by Peter Dragla while working for the University of Guelph and Kennex in Ontario. Anka is a tall, late maturing grain and fibre variety. It is most suited for Ontario growing conditions. It is exempt from THC field testing in Ontario and Quebec. Distributed by UniSeeds Inc.

Canda Registered in 2010. Monoecious, medium height, large seeded, hemp variety maturing at an average of 165 cm. Flowering is 55 – 70 days after seeding depending on the season and heat units (110 days maturity),. It will mature about a week earlier than Alyssa similar to Delores. Canda will have GLA (Gamma Linolenic Acid) averaging consistently in excess of 3.5%. * **GLA** - Gamma Linolenic Acid - this is a highly desirable Essential Fatty Acid component that Parkland has been able to tease upwards in their traditional variety development program. Available from Parkland Industrial Hemp Growers Coop – (PIHG) Dauphin. (204) 629-4367 or email pihg@mts.net

CanMa: - selected for grain production in short-season areas in Ontario, or southern prairies. Is a cross between some vigorous Finola derivatives and an early ESTA-1 line. Selections were made in northern Ontario. Selection criteria were early maturity, long head, no branching, large seed and uniform seed maturity. CanMa is a dioecious variety. The males tend to be about the same height as the females. Distributed by PhytoGene Resources Inc., Ontario. Larry Marshall at Shellbrook is multiplying and distributing CanMa in western Canada.

CFX-1 is a moderately large seeded, high yielding, moderate season, dioecious variety that is suitable for grain production typically grown in the central and southern prairies. Maturity is halfway between Finola and CRS-1 – approximately 105 days. Height averages approximately 5.5 to 6.5 feet depending on location. CFX-1 was developed by Bert Vandenberg, U of S. Distributed by Hemp Genetics International (HGI) of Saskatoon, Saskatchewan. Call (604) 607-4953 or email hempgenetics@gmail.com

CFX-2 is a moderately large seeded, high yielding, moderate season, dioecious variety that is suitable for grain production, typically grown in the central and northern prairies and under irrigation in southern AB. It is slightly earlier maturing in about 103 days and a shorter variety (4 to 6 inches shorter) than CFX-1. CFX-2 was developed by Bert Vandenberg, U of S. Distributed by Hemp Genetics International (HGI) of Saskatoon, Saskatchewan. (Call 604) 607-4953 or email hempgenetics@gmail.com

CRS-1 is a large seeded, high yielding, full season (110 days maturity), dioecious variety that is suitable for grain production. CRS-1 is typically grown in the southern prairies, throughout Manitoba and in eastern Canada. CRS-1 was developed by Bert Vandenberg, U of S for Hemp Genetics International of Saskatoon, Saskatchewan. Available in Manitoba from Fisher Seeds, Dauphin, (204) 622-8800 or in SK and AB distributed by Hemp Genetics International (HGI) of Saskatoon, Saskatchewan. Call (604) 607-4953 or email hempgenetics@gmail.com

Debbie Registered in 2012. A monoecious, large seeded, medium height hemp variety maturing at about 185 cm. It will mature about a week earlier (110 days maturity) than Alyssa, similar to Delores. Debbie is higher in GLA (Gamma Linolenic Acid) consistently averaging in excess of 5%. Suitable for good grain and biomass production. Available from Parkland Industrial Hemp Growers Coop – (PIHG) Dauphin. (204) 629-4367 or email pihg@mts.net

Delores Registered in 2007. A monoecious, medium height, large seeded hemp variety maturing at an average of 160 cm. Flowering is 55 – 70 days after seeding depending on the season and heat units (110 days maturity). It will mature early similar to the variety Canda. Certified seed is available from Parkland Industrial Hemp Growers Coop – (PIHG) Dauphin. (204) 629-4367 or email pihg@mts.net

Finola is a small seeded, high yielding, dioecious grain variety developed in Finland. It is the shortest and earliest to bloom of any variety of hemp, maturing in about 100 days. The crop typically begins to flower at 25 to 30 days after seeding. Finola can be straight cut or swathed and is known as the easiest hemp variety to harvest. Typically grown in the central and northern prairies and under irrigation in southern AB, where the crop grows 5 to 6 feet tall. Distributed by Hemp Oil Canada, Ste. Agathe. Call 1-800-BUY-HEMP or kevin@hempoilcan.com

Joey Registered in 2010. A monoecious, large seeded, high **GLA***, (4% or higher), medium height, large seeded hemp variety that matures at about 160 cm. Joey matures a few days earlier than Delores (107 days maturity). Seed available from Parkland Industrial Hemp Growers Coop – (PIHG) Dauphin. (204) 629-4367 or email pihg@mts.net

Jutta is a later maturing, dual purpose, monoecious variety developed in Ontario by Ontario Hemp Alliance (OHA) and Ridgeway College. Licensed in 2011. Distributed by UniSeeds Inc.

Petera Registered in 2006. A dioecious, large seeded variety. For grain production it is late maturing, low to moderate seed yield. Petera is suitable mainly for fibre or biomass production. Can grow 3 to 3.5m tall yielding 6 to 8 tonnes of fibre (biomass) per acre. Available from Parkland Industrial Hemp Growers Coop – (PIHG) Dauphin. (204) 629-4367 or email pihg@mts.net

Silesia is a monoecious, late maturing, dual type variety originally bred in Poland. Silesia was purchased by Alberta Innovates Technology Futures in 2008 and it is presently maintained at Vegreville, Alberta. (780) 632-8436 or email jan.slaski@albertainnovates.ca

X59 is an earlier, shorter, dioecious grain variety developed by Terremax Corporation, Qu'Appelle SK. (306) 699-7368 or email terramax@terramax.sk.ca

Note:

Short varieties are considered to be for grain only. After combining, there is little fibre left that could be used for processing.

Dual Purpose varieties are considered to be good for grain production as well as yielding a reasonable fibre yield. These are generally considered to be the taller varieties.

Objective

To evaluate industrial hemp varieties for fibre and grain yield, as well as other characteristics.

Design, Materials & Operation

There were 13 site locations selected for the trials:

- Vegreville, Alberta
- Lethbridge, Alberta
- Scott, Saskatchewan
- Melfort, Saskatchewan
- Laird, Saskatchewan
- Gilbert Plains, Manitoba
- Melita, Manitoba
- Carberry, Manitoba
- Arborg, Manitoba
- Kemptville, Ontario
- Swift Current, Saskatchewan
- Qu'Appelle, Saskatchewan
- St-Marc-sur-Richelieu, Quebec

St. Marc-sur-Richelieu, Scott and Lethbridge did not participate in the project for 2012 as confirmation of funding was not received until late in the planting season.

Of the sites listed, 10 seeded plots. However, weather conditions resulting in the loss of 3 sites, Qu'Appelle, SK, Laird, SK and Kemptville, ON, (Note: Kemptville was harvested but the % variation was too great for dependable data).

Experimental design was small plot, random complete block design utilizing small plots with 4 replicates.

Table 1. 2012 Industrial Hemp Variety Trial Locations and Varieties Grown

Gilbert Plains	Melita	Carberry	Arborg	Laird	Melfort	Vegreville	Kemptville
Alyssa	Alyssa	Alyssa	Alyssa	Alyssa	CanMa	Alyssa	Anka
Anka	Anka	Canda	Canda	Canda	CFX-1	Canda	Canda
Canda	Canda	CanMa	CFX-1	CFX-1	CFX-2	CFX-1	CFX-1
CanMa	CanMa	CFX-1	CFX-2	CFX-2	CRS-1	CFX-2	CFX-2
CFX-1	CFX-1	CFX-2	CRS-1	CRS-1	Canda	CRS-1	CRS-1
CFX-2	CFX-2	CRS-1	Debbie	Delores	Finola	Finola	Finola
CRS-1	CRS-1	Debbie	Delores	Finola	Silesia	Joey	Jutta
Debbie	Debbie	Delores	Finola	Joey	x59	Silesia	Silesia
Delores	Finola	Finola	Joey	Silesia	--	x59	x59
Finola	Joey	Silesia	Silesia	x59	--	--	--
Joey	Jutta	x59	x59	--	--	--	--
Jutta	Silesia	--	--	--	--	--	--
Silesia	x59	--	--	--	--	--	--
x59	--	--	--	--	--	--	--
14	13	11	11	10	8	9	9

Table 2. 2012 Industrial Hemp Variety Trial Inputs at Gilbert Plains, Melita, Arborg and Carberry, MB, Melfort, SK and Vegreville, AB

	Gilbert Plains	Melita	Arborg	Carberry	Melfort	Vegreville
Treatments	14	13	11	11	8	9
Replication	4	4	4	4	4	4
Plot Size	1m x 5m (5m ²)	1.44m x 11.44m (16.5m ²)	1.37m x 6m (8.22m ²)	1.2m x 7m (8.4m ²)	4.85m ²	1.6m x 7.5m (12m ²)
Seeding Date	May 31	May 14	May 31	May 26	May 27	May 30
Seeding Rate	250 plants/m ²	250 plants/m ²	250 plants/m ²	250 plants/m ²	250 plants/m ²	250 plants/m ²
Fibre Harvest Date	Aug. 17	Jul. 27	Sep. 17	None	Sep. 13: Finola, CFX1&2 Sep. 17: CanMa, X59, CRS-1, Canda Sep. 20: Silesia	Oct. 1
Grain Harvest Date	Sep. 10	Aug. 15: Finola, CFX-1 Aug. 17: CFX-2 24. Aug: Silesia, Alyssa, Debbie, CRS-1, CanMa, Canda Aug. 27: X95	Sep. 24	Sep. 5	Sep. 13: Finola, CFX1&2 Sep. 17: CanMa, X59, CRS-1, Canda Sep. 20: Silesia	Oct. 3
Grain Days from Seeding to Combining	102	93, 95, 102, 105	107	102	109-116	126

Table 3. 2012 Spring Soil Nutrient Analysis from 0-24" Depth at Gilbert Plains, Melita, Arborg and Carberry, MB, Melfort, SK and Vegreville, AB**

	Gilbert Plains	Melita	Arborg	Carberry	Melfort	Vegreville
	Estimated Available Nutrients	Estimated Available Nutrients	Estimated Available Nutrients	Estimated Available Nutrients	Estimated Available Nutrients	Estimated Available Nutrients
N*	70 lbs/ac	92 lbs/ac	39 lbs/ac	21 lbs/ac	127 lbs/ac	22 lbs/ac
P	16 ppm	9 ppm	14 ppm	19 ppm	50 ppm	24 lbs/ac
K	145 ppm	188 ppm	278 ppm	388 ppm	>540 ppm	292 lbs/ac
S*	44 lbs/ac	50 lbs/ac	120 lbs/ac	59 lbs/ac	34 lbs/ac	12 lbs/ac
Ph	7.8	7.4	8.0	6.0	7.1	N/A

* Nitrate – N

* Sulphate - S

** Analysis by Agvise Laboratories

Table 4. 2012 Spring Nutrient Applications (lbs/acre) at Gilbert Plains, Melita, Arborg and Carberry, MB, Melfort, SK and Vegreville, AB*

	Gilbert Plains	Melita	Arborg	Carberry	Melfort	Vegreville
	Fertilizer Applied (actual lbs)	Fertilizer Applied (actual lbs)	Fertilizer Applied (actual lbs)	Fertilizer Applied (actual lbs)	Fertilizer Applied (actual lbs)	Fertilizer Applied (actual lbs)
N*	120	91	90	132	42	120
P	60, 25 with seed	30	27	21	21	40
K	30	--	15	0	0	22
S*	10	--	--	1	16	11

* Nitrate – N

* Sulphate - S

Industrial Hemp Grain Variety Trial

Keith Watson¹, Jeff Kostuik², Susan McEachern¹ and Angel Melnychenko¹

Site Information

Locations: Arborg, Manitoba
 Carberry, Manitoba
 Gilbert Plains, Manitoba
 Melita, Manitoba
 Kemptville, Ontario
 Laird, Saskatchewan
 Melfort, Saskatchewan
 Vegreville, Alberta

Cooperators: Parkland Crop Diversification Foundation (PCDF), Roblin, MB
 Westman Agriculture Diversification Organization (WADO), Melita, MB
 Prairies East Sustainable Agriculture Initiative (PESAI), Arborg, MB
 Canada-Manitoba Crop Diversification Centre (CMCDC), Carberry, MB
 Cecil Vera, Agriculture and Agri-Food Canada, Melfort, SK
 Bert Vandenberg, Hemp Genetics International Inc., Melfort, SK
 Hugh Campbell, Terramax, Qu'Appelle, SK
 Jan Slaski, Alberta Innovates Technology Futures, Vegreville, AB
 Wendy Asbil, University of Guelph, Kemptville, ON

Plant Breeding Programs:
 Parkland Industrial Hemp Growers Coop (PIHG)
 Hemp Genetics International (HGI)
 Ontario Hemp Alliance
 PhytoGene Resources Inc.
 Alberta Innovates Technology Futures

Design, Materials & Operation

Please refer to the Industrial Hemp Variety Trials Forward (previous section) for information on trial treatments and locations, inputs, spring soil nutrient analysis and spring nutrient applications at each trial location.

Results

% *THC*

All hemp varieties grown in Canada must be on the Health Canada list of approved varieties. New varieties or lines in Plant Breeding programs can also be licensed to grow under a research license.

¹ PCDF, Roblin

All hemp varieties must be tested for % THC (delta-9-Tetrahydrocannabinol) unless exempted by Health Canada. Varieties must test below 0.3% THC to be legal to grow in Canada. In 2012, the varieties Alyssa was exempt in Manitoba and Anka in Ontario. All other varieties had to be tested for % THC. Table 1 is a summary of the THC tests on the varieties that were tested at the various locations in 2012.

Table 1. 2012 Industrial Hemp Grain Variety Trial % THC Analysis by Variety Plot Locations

	Gilbert Plains	Melita	Carberry	Arborg	Laird	Melfort	Vegreville	Kemptville
Alyssa	--	--	--	--	0.07	--	<0.02	--
Anka	0.12	0.08	--	--	--	--	--	0.02
Canda	0.11	0.09	0.09	0.11	0.04	0.05	0.04	0.05
CanMa	0.21	0.08	0.12	--	--	0.05	--	--
CFX-1	0.13	0.14	0.08	0.13	0.12	0.02	0.15	0.09
CFX-2	0.11	0.10	0.14	0.14	0.10	0.04	0.17	0.08
CRS-1	0.17	0.09	0.13	0.08	0.11	0.02	0.07	--
Debbie	0.09	0.08	0.05	0.05	--	--	--	--
Delores	0.04	--	0.07	0.08	0.04	--	--	--
Finola	0.20	0.20	0.09	0.20	0.10	0.06	0.20	0.07
Joey	0.07	0.08	--	0.05	0.03	--	0.03	--
Jutta	0.10	0.09	--	--	--	--	--	0.10
Silesia	0.06	0.05	0.06	0.05	0.04	0.03	0.02	0.06
x59	0.08	0.05	0.10	0.07	0.08	0.02	0.03	0.05

Based on the results above, all varieties tested in 2012 are well below the THC permissible level established by Health Canada.

Plant Population

Plant population does vary from plot to plot and field to field each year. Plant population or emergence was taken when the hemp was 2 to 6 inches tall. This provides a measure of how many seeds germinated and became visible plants.

A target seeding rate of 250 plants per square meter was used. The seed rate for each variety was adjusted for percent germination and thousand kernel weight. Plant stands for Gilbert Plains and Kemptville were the highest.

Overall, less than 25% of the seeds (Table 2) that were planted germinated and became visible plants. This level of germination and viable plants is not an abnormality, but supports what is generally found regarding the germination and emergence of hemp. Research is needed to determine factors that are contributing to the high mortality rate.

Table 2. 2012 Industrial Hemp Grain Variety Trial Plant Population in Plants/m² by Location

Variety	2012 Average Pop.	% of 250 Target Seeding Rate	Gilbert Plains	Melita	Melfort	Vegreville	Kemptville
Alyssa	55	21.9%	115	28	--	21	--
Anka	62	24.8%	71	34	--	--	81
Canda	44	17.7%	85	21	46	15	55
CanMa	37	14.9%	55	24	33	--	--
CFX-1	53	21.3%	80	37	39	25	85
CFX-2	42	16.8%	65	37	38	19	50
CRS-1	30	12.0%	58	21	24	11	37
Debbie	43	17.1%	61	24	--	--	--
Delores	54	21.5%	54	--	--	--	--
Finola	45	17.9%	69	32	34	31	58
Joey	44	17.4%	83	27	--	21	--
Jutta	67	26.8%	85	37	--	--	79
Silesia	54	21.5%	66	26	43	--	79
X59	50	20.1%	71	37	39	32	72
Target Population - 250 seeds/m ²							

Plant Height

Plant height is recorded before harvest as an average height of the variety canopy. Plant heights did vary from site to site. Overall, the plant height at harvest time was generally higher than what has been reported in previous years from independent variety trials. The highest crops this year were at the Melita and Melfort sites. Table 3 summarizes the heights that have been recorded at variety trials since 1999 for the varieties listed. Plant height is an important dependent on the end use of the crop. A grain only use may want a short crop while a producer that has a market for the fibre will want a taller variety that will give a good grain yield, as well as a good fibre yield to maximize return per acre from both income streams. A fibre only crop will want the tallest variety available for maximum tonnes per acre.

Table 3. 2012 Industrial Hemp Grain Variety Trial Plant Height (cm) from 1999-2012 Variety Trials

Plant Height at Harvest time (cm)					2012						
Variety	Average Height (cm)	Site Years	Min. Height (cm)	Max. Height (cm)	Arborg	Gilbert Plains	Carberry	Melita	Vegreville	Kemptville	Melfort
Alyssa	183	25	84	240	190	162	194	239	179	--	--
Anka	180	15	85	243	--	185	--	243	--	85	--
Canda	163	12	100	233	190	161	182	233	163	106	224
CanMa	178	4	141	210	--	141	159	203	--	--	210
CFX-1	131	12	86	181	142	130	150	148	135	86	181
CFX-2	131	12	78	187	145	130	145	148	135	78	187
CRS-1	155	12	106	226	168	137	164	225	144	106	226
Debbie	197	4	165	239	194	165	188	239	--	--	--
Delores	164	12	91	215	196	163	191	--	--	--	--
Finola	107	14	73	150	123	103	119	125	103	100	150
Joey	163	7	131	189	183	151	--	189	166	--	--
Jutta	175	5	106	234	--	179	--	234	--	106	--
Silesia	204	7	111	259	216	183	212	258	190	111	259
X59	143	7	80	193	150	137	143	164	133	80	193

1000 Kernel Weight

The 1000 kernel (1000 K) weight is a measure of seed size. It is the weight in grams of 1000 seeds. Seed size and the 1000 K weight can vary from one crop to another, between varieties of the same crop and even from year to year or from field to field of the same variety. The way the seed has been cleaned (screen size) can also affect the thousand kernel weight.

Because of this variation in seed size, the number of seeds and, consequently, the number of plants in a pound or a bushel of seed is also highly variable.

By using the 1000 K weight (Table 4), a producer can account for seed size variations when calculating seeding rates, calibrating seed drills and estimating shattering and combine losses.

Table 4. 2012 Industrial Hemp Grain Variety Trial 1000 Kernel Weight for 2011-2012 Variety Trials

Variety	Average 1000 Kernel Weight (g)	Site Years	Minimum 1000 Kernel Weight (g)	Maximum 1000 Kernel Weight (g)	Seeding Rate* (lbs/acre)
Alyssa	18.1	7	15.7	19.0	24.9
Anka	16.2	7	13.5	17.5	22.3
Canda	19.5	8	14.8	21.5	26.8
CanMa	16.3	2	15.5	17.0	22.3
CFX-1	16.9	8	14.1	18.5	23.2
CFX-2	15.9	8	14.6	17.0	21.8
CRS-1	17.3	8	15.6	19.0	23.8
Debbie	18.0	3	16.4	19.5	24.6
Delores	18.2	7	14.5	20.0	25.0
Finola	13.1	8	11.0	14.6	18.0
Joey	18.3	5	15.3	19.6	25.1
Jutta	18.4	3	17.4	19.8	25.2
Petera	20.0	1	20.0	20.0	27.5
Selesia	15.5	4	14.2	17.0	21.3
USO14	17.0	4	15.0	18.0	23.3
X59	17.2	4	13.5	21.0	23.6

* Seeding rate assumptions:

100 Target seeds per square metre
95.0% germination
30.0% mortality

Precision in seeding is important. Using the same seeding rate for all varieties is probably not the most efficient and cost effective decision. The variability in seed weight from year to year is something that could seriously affect a farmer's bottom line. A 1000 kernel weight and seed rate calculation is recommended for each variety each year.

Establishing a seeding rate using the 1000 kernel weight is of critical importance to ensure a correct seeding rate. Not compensating for large seed could result in a very thin stand, susceptible to more competition from weeds. Small seed on the other hand can mean extra cost for a higher seeding rate then required.

Table 4 shows that the average 1000 kernel weight in hemp in 2011 and 2012 varies amongst varieties from 13.1 to 20 grams per 1000 kernels. Table 4 also shows that at a target seeding rate of 100 seeds per square meter, seeding rate would vary from 18 to 27.5 pounds per acre which would impact not only the plant population, but also the producers seed cost.

1000 kernel weight is also useful to processors. A large seed will give a larger nut which may be desirable for products for a visual presentation to the buyer or consumer. Research needs to be done to determine if the percent of nut to shell remains the same with increasing size of the seed.

Grain Yields

Variety trials were located in 9 locations across Canada in Ontario, Manitoba, Saskatchewan and Alberta. The trial at Laird, Saskatchewan was lost due to wind damage at harvest time, Qu'Appelle, Saskatchewan was lost due to early excessive rains and Kemptville, Ontario was lost due to extreme hot and dry growing conditions. The trial was harvested but % variation (CV's) was too great for dependable data.

Table 5 is data for 2012. This is individual locations and one year data only. Use with caution.

Table 5. 2012 Industrial Hemp Grain Variety Trial Yields- Individual Sites*

2012 Yield: % of CRS-1						
Variety	Arborg	Carberry	Gilbert Plains	Melita	Vegreville	Melfort
Alyssa	68	89	61	55	94	--
Anka	--	--	81	78	--	118
Canda	84	137	108	116	136	98
CanMa	--	91	85	90	--	92
CFX-1	100	118	74	90	105	101
CFX-2	79	103	88	92	114	100
CRS-1	100	100	100	100	100	100
Delores	76	105	95	--	--	80
Finola~	74	70	55	61	66	--
Joey	100	--	100	93	137	--
Jutta	--	--	83	52	--	87
Silesia	60	71	69	58	80	105
X59	116	109	106	83	137	--
<i>Varieties that are being evaluated for approval</i>						
Debbie	67	110	84	80	--	--
CHECK CHARACTERISTICS- CRS-1						
Yield (lbs/acre)	1299	980	1197	1314	972	1863
CV %	10.6	13.3	15.1	8.9	15.4	12.5
LSD	13	19	18	12	24	18
Sign Diff	Yes	Yes	Yes	Yes	Yes	Yes

*Table 5 is expressed as a % of the check variety CRS-1.

Manitoba Trials have been conducted for a number of site years. Data has been and is presented in the annual Seed Manitoba Publication (www.seedmb.ca).

2012 Industrial Hemp Variety Trial Grain Yield Summary (Seed Manitoba 2013) Arborg, Carberry, Gilbert Plains and Melita, MB*

Comments:

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

THC testing for some varieties is required.

As per the *Industrial Hemp Regulations*, industrial hemp varieties must be approved for commercial cultivation under licence for the current crop year. Please refer to Health Canada's "List of Approved Cultivars" for the 2013 Growing Season" report prior to seeding.

Please note that the *Industrial Hemp Regulations* requires that all seed planted for the production of industrial hemp in Canada must be of pedigreed status (Certified or better).

For more information, please refer to Health Canada's website at www.healthcanada.gc.ca/hemp.

Table 6. Variety Yields as a % of the Check- Manitoba Sites ****

	Yield %	Site Years		2012		2012 Yield: % of CRS-1			
Variety	Check	Tested		Yield		Arborg	Carberry	Gilbert Plains	Melita
Alyssa	82	13		67		68	89	61	55
Anka	81	10		79		-	-	81	78
Canda	119	10		110		84	137	108	116
CanMa	88	3		88		-	91	85	90
CFX-1	94	13		94		100	118	74	90
CFX-2	92	9		90		79	103	88	92
CRS-1	100	13		100		100	100	100	100
Delores	96	12		91		76	105	95	-
Finola~	53	9		65		74	70	55	61
Joey	111	6		98		100	-	100	93
Jutta	94	8		67		-	-	83	52
Silesia	64	4		64		60	71	69	58
X59	103	4		103		116	109	106	83
Varieties that are being evaluated for approval									
Debbie	98	4		84		67	110	84	80
CHECK CHARACTERISTICS				CRS-1 (lb/acre)		1299	980	1197	1314
CRS-1	1601 lbs/acre	13 site years		CV%**		10.6	13.3	15.1	8.9
				LSD%**		13	19	18	12
				Sign Diff		Yes	Yes	Yes	Yes

* Reproduced from Seed Manitoba 2013

** Use single site data with caution. The more site years indicate 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.

Long Term Data

Always use caution when using minimal years of data. Varieties are tested over a number of years and are entered into the MCVET database for inclusion in the 2013 Seed Manitoba Guide (www.seedmb.ca). Environmental conditions vary so performance will be variable. The more site years, the more

dependable the data. Site years of 15 to 20 will start to give a reasonable predictability of what a variety will or can do in an average year.

Oil Analysis

Grain samples from the various cooperating sites were sent to CMH Biotechnologies Inc. laboratory at Steinbach, MB for Oil Quality analysis.

Fatty Acid Profile

Essential Fatty Acids (EFAs) are necessary fats that humans cannot synthesize and must be obtained through diet. EFA's are long-chain polyunsaturated fatty acids derived from Linolenic, Linoleic and Oleic acids. The term "essential fatty acid" refers to fatty acids required for biological processes and not those that can only act as fuel. There are two families of EFAs: Omega-3 and Omega-6. Omega-9 is necessary, yet "non-essential" because the body can manufacture a modest amount on its own, provided essential EFAs are present. The number following "Omega-" represents the position of the first double bond, counting from the terminal methyl group on the molecule. Omega-3 fatty acids are derived from Linolenic Acid, Omega-6 from Linoleic Acid and Omega-9 from Oleic Acid.

Gamma-linolenic acid (GLA) is an Omega-6 fatty acid that is found mostly in plant based oils such as borage seed oil, evening primrose oil and black currant seed oil and is also found in hemp. Omega-6 fatty acids are considered essential fatty acids: They are necessary for human health, but the body can't produce them -- they have to be provided through intake of food. Along with Omega-3 fatty acids, Omega-6 fatty acids play a crucial role in brain function, as well as normal growth and development. Also known as polyunsaturated fatty acids (PUFAs), they help stimulate skin and hair growth, maintain bone health, regulate metabolism and maintain the reproductive system.

GLA is found in hemp, borage oil, spirulina, black currant and evening primrose oil. Fish oil is another common source. Hemp is the only crop that can supply GLA that will grow across Canada in a variety of climates and environments.

Note: Analysis will be completed by February 2012. This report will be reissued containing the results of the fatty acid testing.

Important Considerations and Recommendations

Canadian varieties are performing well under a wide range of growing conditions. The variety trials this year did show variation amongst varieties and different responses to growing conditions in various locations in the province. More research is required to help determine varieties best suited for different areas and for different end uses.

Variety testing is one of many tools farmers can use to determine the varieties they should grow in their location and conditions. 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. For example, the past hot dry summer may have had more effect on particular varieties than other varieties.

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.

Hemp is a crop that should be grown under contract to ensure a market. It is important for producers to ensure that variety choice is supported by regional variety data and that the variety is acceptable to the contractor/processor. Most processors will accept contracts for most varieties.

Conclusions

Newly adapted varieties from the Canadian plant breeding programs are now available and show promise of improved long term grain yields. It will be important to continue variety testing throughout the various geographic regions of Canada to gather more site years of data, to further explore the variability that was identified in the 2012 growing season. Areas of particular importance are yield performance, mortality, 1000 kernel weight and plant height. Hemp seeding mortality is a significant concern and factors that contribute need to be further explored.

This data is of key importance to hemp producers as it plays a major role in crop planning, contracting decisions and the resulting economic return.



Industrial Hemp Fibre Variety Trial

Keith Watson¹, Jeff Kostuik¹, Susan McEachern¹ and Angel Melnychenko¹

Site Information

Locations: Arborg, Manitoba
 Carberry, Manitoba
 Gilbert Plains, Manitoba
 Melita, Manitoba
 Kemptville, Ontario
 Laird, Saskatchewan
 Melfort, Saskatchewan
 Vegreville, Alberta

¹ PCDF, Roblin

Cooperators: Parkland Crop Diversification Foundation (PCDF), Roblin, MB
Westman Agriculture Diversification Organization (WADO), Melita, MB
Prairies East Sustainable Agriculture Initiative (PESAI), Arborg, MB
Canada-Manitoba Crop Diversification Centre (CMCDC), Carberry, MB
Cecil Vera, Agriculture and Agri-Food Canada, Melfort, SK
Bert Vandenberg, Hemp Genetics International Inc., Melfort, SK
Hugh Campbell, Terramax, Qu'Appelle, SK
Jan Slaski, Alberta Innovates Technology Futures, Vegreville, AB
Wendy Asbil, University of Guelph, Kemptville, ON

Plant Breeding Programs:

Parkland Industrial Hemp Growers Coop (PIHG)
Hemp Genetics International (HGI)
Ontario Hemp Alliance
PhytoGene Resources Inc.
Alberta Innovates Technology Futures

Background

Traditionally around the world hemp has been grown for the fibre. The bast fibre is the long, strong fibres around the outside of the plant and comprise about 30 to 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 major component of the stem.

Canada has a very small fibre processing industry to date with small plants operating in Manitoba and Ontario. A large decortication plant (Parkland Industrial Hemp Processing- PIHP) is currently under construction in Gilbert Plains, MB.

The hemp fibre project aims to evaluate existing 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 as a grain-only, fibre-only or dual grain-fibre crop.

Canadian Plant Breeding programs are developing varieties that are adapted and suitable for grain and/or fibre production in Canada.

In 2012, Canadian Hemp Trade Alliance (CHTA) secured funding through the Adaptation Innovation Program (AIP) to do variety testing across Canada. Testing included grain and fibre yields, as well as quality evaluation of oil profiles and percent fibre content.

Design, Materials & Operation

Please refer to the Industrial Hemp Variety Trials Forward (Pg. 107) for information on trial treatments and locations, inputs, spring soil nutrient analysis and spring nutrient applications at each trial location.

Results

Plant Height

Plant height is one characteristic that can enter into the decision of which variety a grower wishes to plant. Shorter varieties are more suited to grain production. Mid-height varieties may be suitable for both grain and fibre production, while the tallest varieties may be suitable for fibre-only production.

Plant height measurements are taken from the variety trials close to harvest when the plants are no longer growing and the crop could be harvested as a fibre-only crop. The height is measured as the average height of the canopy.

Plant heights did vary from site to site. Overall, the plant height at harvest time was generally higher this year than most. The highest crops this year were at the Melita and Melfort sites. Table 1 summarizes the heights that have been recorded at variety trials since 1999 for the varieties listed. Plant height is an important dependent on the end use of the crop. A grain only use may want a short crop while a producer that has a market for the fibre will want a taller variety that will give a good grain yield, as well as a good fibre yield to maximize return per acre from both income streams. A fibre only crop will want the tallest variety available for maximum tonnes per acre.

Table 1. 2012 Industrial Hemp Fibre Variety Trial Height Summary

Hemp plant Height (cm) from 1999-2012 Variety Trials					Plant Height at Harvest Time (cm)						
Variety	Average Height (cm)	Site Years	Min Height (cm)	Max Height (cm)	2012 Arborg	2012 Gilbert Plains	2012 Carberry	2012 Melita	2012 Vegreville	2012 Kemptville	2012 Melfort
Alyssa	183	25	84	240	190	162	194	239	179	--	--
Anka	180	15	85	243	--	185	--	243	--	85	--
Canda	163	12	100	233	190	161	182	233	163	106	224
CanMa	178	4	141	210	--	141	159	203	--	--	210
CFX-1	131	12	86	181	142	130	150	148	135	86	181
CFX-2	131	12	78	187	145	130	145	148	135	78	187
CRS-1	155	12	106	226	168	137	164	225	144	106	226
Debbie	197	4	165	239	194	165	188	239	--	--	--
Delores	164	12	91	215	196	163	191	--	--	--	--
Finola	107	14	73	150	123	103	119	125	103	100	150
Joey	163	7	131	189	183	151	--	189	166	--	--
Jutta	175	5	106	234	--	179	--	234	--	106	--
Silesia	204	7	111	259	216	183	212	258	190	111	259
X59	143	7	80	193	150	137	143	164	133	80	193



Table 1 summarizes the average hemp height from variety trials since 1999. The variation of height recorded is summarized in the table by the inclusion of the minimum and maximum heights. More site years of data are desirable to give a good average under a variety of conditions. Year to year growing conditions have a significant effect on the height of hemp plants.

Table 2. 2012 Industrial Hemp Fibre Variety Trial Yield - Manitoba Locations

Variety	Yield % Check	Site Years Tested	2012 Average Yield	2012 Yield: % of Alyssa		
				Arborg	Gilbert Plains	Melita
Alyssa	100	20	100	100	100	100
Anka	110	10	118	--	135	110
Canda	107	6	117	140	91	100
CanMa	61	2	60	--	46	67
CFX-1	55	5	63	--	59	65
CFX-2	50	5	52	--	48	54
CRS-1	81	6	87	110	51	73
Debbie	122	3	122	140	78	120
Delores	106	9	134	150	90	--
Finola	28	4	32	--	22	36
Joey	105	5	126	160	92	97
Jutta	108	3	108	--	100	112
Silesia	107	1	116	130	106	102
X59	68	3	68	70	58	71
Check Characteristics			Alyssa (tonnes/acre)	3.4	1.2	2.5
Alyssa	3.8	20	CV	19.8	21.2	12.0
	tonnes/acre	site years	LSD%	36	23	17
			Sign Diff	yes	yes	yes

Note: Leaves and small branches are removed to give stalk yield only. No allowance is made for field, equipment or handling losses.

% Fibre Content Analysis

Stalks were harvested at their physiological maturity and 9 inch samples were taken at the midpoint of the plant once the stalks were dried. These fibre samples were sent to Biolin Research Inc. located in

Saskatoon, SK. Biolin is able to water rett the fibre samples to determine the fibre/bast content. It is calculated by retting and extracting and cleaning the dry bast fibre. The weight of this fibre is then divided by the original dry weight of the unretted stems and expressed as a percentage. This will give how much clean fibre should theoretically come out of a decortivating system if the stalks are retted and fiber and shive are clearly separated.

This is the first year for this type of analysis. The data is limited and should be used with caution.

Table 3. % Fibre in All Locations

Variety	Number of Samples	% Fibre Mean	Minimum %	Maximum %
Alyssa	9	21.1	17.2	27.2
Anka	5	19.2	18.0	21.7
Canda	13	19.4	16.8	23.1
CanMa	4	12.7	11.7	14.2
CRS-1	12	17.7	15.4	20.8
Debbie	5	17.5	14.6	19.7
Delores	4	22.9	20.6	27.2
Joey	9	19.7	15.6	22.5
Jutta	6	21.8	20.5	23.7
Silesia	14	21.6	16.6	27.9

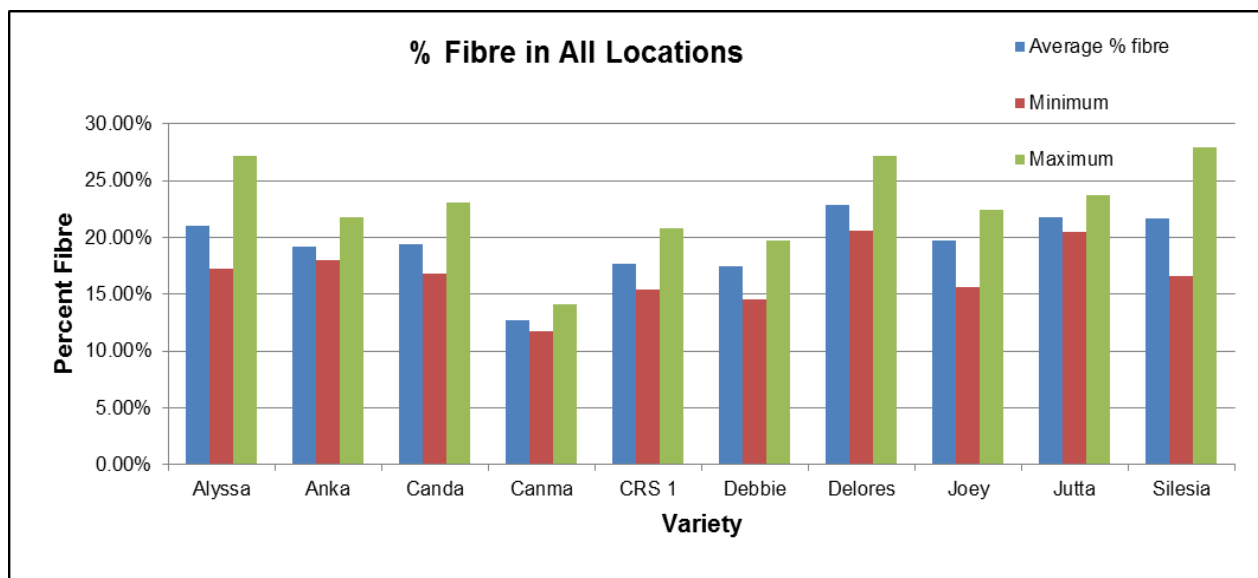


Chart 1: % Fibre in all locations

Table 3 and Chart 1 show the mean % fibre that was found in the various varieties. **This is limited data.** All varieties show a range of % fibre which indicates there is probably an influence from the various factors that affect growth from climate, location, fertility, plant populations, etc. The mean % fibre in Table 3 will be more represented and predict the % fibre in the different varieties as more samples and sites are done. It is expected that there will be variance at different locations as more years and data are

added. This demonstrates the need for more testing over more years to have reliable prediction of variety performance.

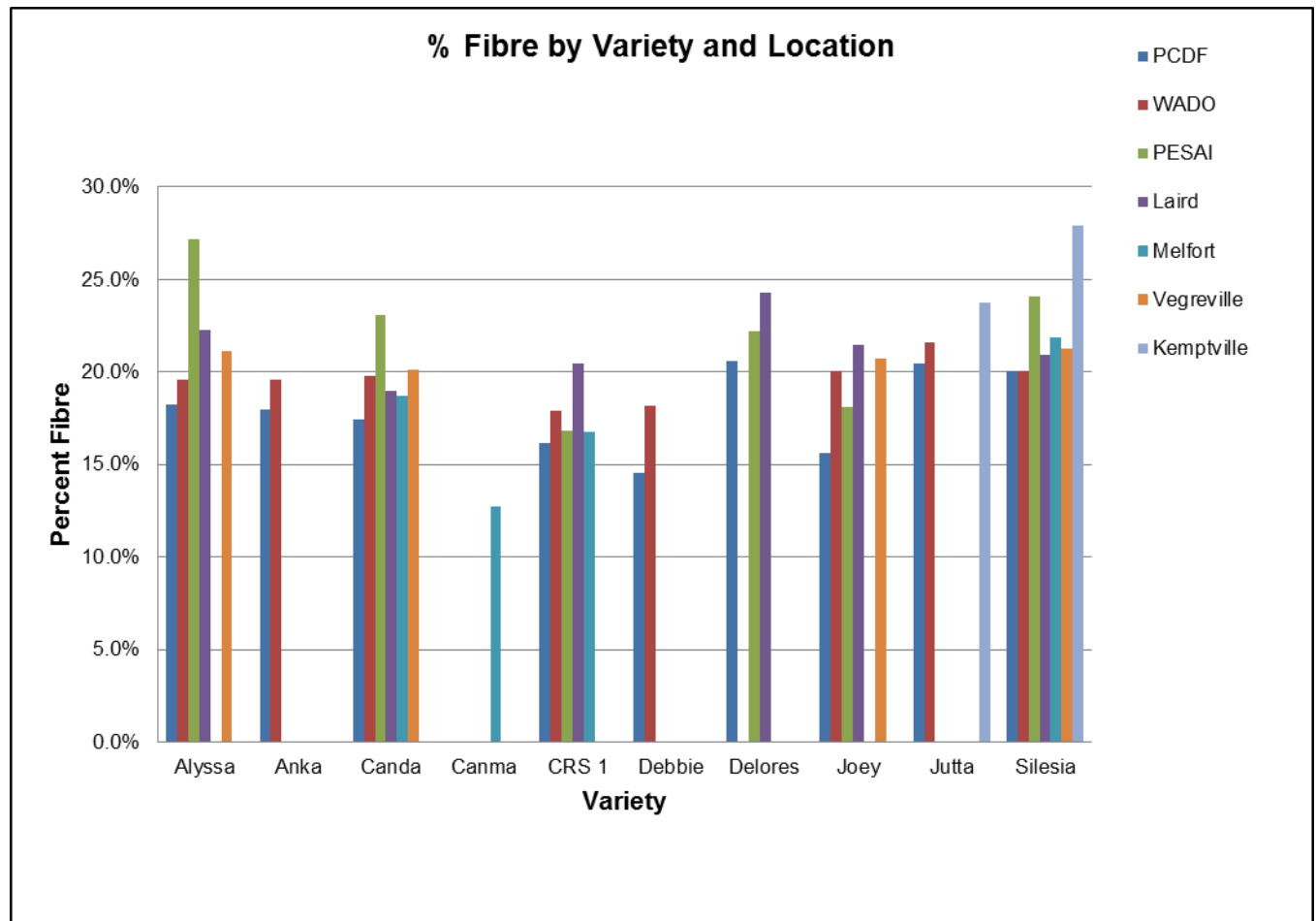


Chart 2. % Fibre by Variety and Location

Chart 2 reports the % fibre from each variety at each location. This is the first year this analysis has been done. This is limited data. It does show there is variability amongst the varieties at the various locations. Ultimately with enough data, it may be possible to grow the varieties in areas where they may have a higher % fibre if that is what the market place is looking for. More research is required to draw any conclusions.

The fibre content of males versus females was not analyzed in this trial. It is expected the males have higher fibre content but are less weight so they will bring up the average fibre content a little, but not a lot. Likely the bast fibre is found only in the inner bark of the stem and hence is a higher portion in small diameter male stems. This needs to be evaluated with further research.

Plant Population Effect on Fibre Content

Table 4. % Fibre at Increasing Plant Population at Arborg, MB

Treatment	Plants Emerged (pl/m ²)	Fibre Content of Unretted Straw (%)
25 pl/m ²	14	20.1
50 pl/m ²	25	21.6
100 pl/m ²	56	21.3
150 pl/m ²	72	20.8
200 pl/m ²	116	21.2
250 pl/m ²	104	20.6
300 pl/m ²	214	22.5
250 pl/m ²	180	21.4

The Arborg location evaluated % fibre in the variety Alyssa from a plant population trial. The target seed population ranged from 25 to 350 seeds per square metre. The increasing plant population is noted in Table 4 along with actual emerged plants.

The % fibre content did not change significantly from the increased plant population that would have seen a progression of stalk size from large to small.

This is one trial and one location. Further research is required to substantiate these findings.

Diameter Analysis by “Shape System”

The fibre samples from the Gilbert Plains location were analyzed by the Shape System as a way to evaluate the system and introduce it to a method of evaluating hemp fibre.

The Shape System is a research tool available at Biolin Research Inc. in Saskatoon. The samples are mounted on a slide, scanned and then an optical recognition system plus software make a graph of the percentage of fibres that falls between different micron ranges (e.g., 5-9.9, 10.0-14.9, 15.0-19.9....). It also calculates the median, the mean and various percentile cut-offs.

C.V. = St Dev/mean (for fibres, hemp has a relatively big mean and an even bigger St Dev). The smaller the CV, the less variation and the more desirable the fibre for end uses where consistency and evenness is valued (e.g., textiles for garments). Hemp has a generally larger consistency than flax; flax has a larger CV than cotton and cotton has a higher CV than synthetic fibres.

The sheerest, finest yarn and hence fabrics are made from synthetic fibres and the coarsest are made from hemp. However, there are certain end uses where a large CV could be a good thing. For example, in batt insulation, you need coarse fibres to give stiffness and friction so the batt stays stuck between the studs and you need finer fibres to trap and/or stop air flow- hence a high CV would be a good thing. Similarly, some types of coarse filters and geotextile mats might be best made with high CV fibres. Fine textiles would be challenging because most chemical and mechanical treatments will act differentially on different diameter fibres.

“Ideal numbers” will depend on the end use. Generally, but not always, you will get higher prices for fibre lots that have a relatively low CV because it will be easier to make a consistent product. Fibres with a smaller mean value are generally more valuable.

If the samples are too small and/or not truly representative, the bias can be both ways. You might be fooled into thinking the fibres are more consistent than they really are or you might get fooled into thinking your fibres are much less consistent than they really are. If one has the time and money, one can do trials with different size and different numbers of sub-samples to develop confidence limits around how likely the sample results really reflect the total lot of fibre or a field of hemp.

Ultimately the number of samples and the size of the samples will depend on the natural variation that occurs for the property in question in that lot or field and on the confidence level you need to have for a given application. The smaller the natural variation and the lower the confidence level required the fewer and/or smaller the samples need to be.

The 10 percentile number tells you the diameter of fibre that is just bigger than 10% of the fibres in the sample that was scanned. The 50 percentile number tells you the diameter of the fibre that is just bigger than 50% of the fibres that were scanned. The 90 percentile tells you the diameter of the fibre that is just bigger than 90% of the fibres that were scanned. The 50 percentile would also be the “median” fibre since 50% are smaller than this number and 50% are bigger. Again the ideal and most useful fibre depends on the end use.

The average diameter ranges from 29 to 39 μm in size. Is this significant? The answer is yes. This means we have mostly small bundles of fibre. An estimate for ultimate fibres might be 5 to 20 microns. In general, the more mature the plant, the larger the fibre bundles because the ultimate fibres are getting filled with cellulose and hence are being stretched outward (as a balloon does when you fill it with air) and/or because the pectin between the ultimate bundles is drying up and gluing the ultimate fibres more firmly together. Genetically some varieties may have less pectin and/or finer ultimate fibres. Some varieties may also be more mature and hence have bigger average bundle diameters.

Measuring different varieties at different locations over a number of years is necessary to understand the natural variation that can exist, why it exists and how it could possibly be altered. If you want a real industry with industrial buyers and users, then you have to really know your product and the natural variations you can expect in it; how to test for these variations and how to compensate (e.g., blending and/or other treatments) to make these variations less noticeable or less of a problem for commercial scale end users.

Table 5. Fibre Diameter Analysis by “Fibre Shape” Analysis on Samples from Gilbert Plains, MB

	CFM Lab Decorticator- “Fibre Shape”					Fibre Diameter Distribution Percentile			
	Fibre Diameters								
Variety	Maximum (µm)	Minimum (µm)	Arith Avg. (µm)	St Dev	C.V. (%)	Percentile 5%	Percentile 10%	Percentile 50%	Percentile 90 %
Alyssa	143.3	5.0	29.2	18.3	62.5	12.08	15.85	36.48	70.12
Anka	160.5	5.1	38.9	25.4	65.4	15.12	21.23	52.57	92.27
Canda	153.3	5.1	33.3	21.1	63.4	13.65	18.53	42.83	79.56
CRS-1	158.9	5.4	35.5	22.5	63.2	14.92	19.09	45.41	86.98
Debbie	159.2	5.1	30.5	18.6	61.1	12.87	16.92	38.00	72.74
Delores	157.6	5.3	39.1	25.6	65.5	15.38	21.35	53.39	91.16
Joey	161.9	5.1	37.7	27.7	73.6	12.83	17.74	60.01	92.51
Jutta	159.0	5.1	39.5	27.1	68.5	14.79	21.39	54.54	95.65
Silesia	150.5	5.1	34.1	34.1	64.4	13.71	18.36	44.34	81.98

Alyssa and Debbie have the finest fibre in terms of smallest average diameters, in terms of the lowest 50% percentile cut-off and in terms of the smallest C.V. Their fibre width distributions also look the best with a tight range of fibres at the lowest diameters. The fibre content of Debbie was only 14%. Perhaps it is slower maturing and hence both the fibre content and the average diameter are still low. Maybe genetically it does really have finer fibre or maybe it retts faster. On the other hand, Joey has a very wide range of fibre diameters and even a secondary peak between 68 and 80 microns. Is it the most mature one? Is it because of genetics or because it doesn't ret as fast? It will take more samples from different sites and years to determine the real cause of those differences.

Important Considerations and Recommendations

This is the first bast fibre yield analysis that has been done on Canadian hemp varieties, so it is only a snapshot of the varieties fibre quality.

Hemp fibre has a multitude of uses. The hemp fibre industry is in its early infancy in North America. There still remain challenges ahead to successfully grow and market this versatile commodity, while ensuring that both the producer and processor realize a positive economic return.

Farmers and industry are encouraged to use long-term, multi-site data as a management tool to select varieties. The more site years, spread over more than one season, reflect more dependable data.

Conclusions

More research is needed to evaluate the varieties so that different locations and regions can select varieties that are suited to their area and will provide the fibre yield they are looking for. This will also help the hemp plant breeders to refine or develop the lines/varieties to assist the industry to grow and develop.

Industrial Hemp Plant Population Trial

Keith Watson¹, Jeff Kostuik¹, Susan McEachern¹ and Angel Melnychenko¹

Site Information

Locations: Arborg, Manitoba
Carberry, Manitoba
Gilbert Plains, Manitoba
Melita, Manitoba

Cooperators: CMCDC
PCDF
PESAI
WADO
Plains Industrial Hemp Processing

Background

Plant population for any crop needs to be at an optimum density to ensure producers receive the highest returns. At present, the hemp industry recommends a seeding rate of 20 to 25 pounds per acre for grain production. The higher seeding rates of 35 to 40 pounds per acre are generally recommended for fibre production. The question is what seeding rate recommendation can producers use to maximize their yield for grain, fibre or dual purpose production? The correct seeding rate and plant population recommendations need to be established to maximize yield and returns.

Objective

To evaluate the effect of seeding rate on plant populations and grain and fibre yield.

Design, Materials & Operation

Table 1. 2012 Industrial Hemp Plant Population Trial Design Summary at Arborg, Carberry, Gilbert Plains and Melita, MB.

	Arborg	Carberry	Gilbert Plains	Melita
Treatments	8 (Table 2)	8 (Table 2)	8 (Table 2)	8 (Table 2)
Replication	4	4	4	4
Plot Size	1.37m x 6m (8.22m ²)	1.2m x 7m (8.4m ²)	1m x 5m (5m ²)	1.44m x 11.44m (16.5m ²)
Seeding Date	May 31	May 26	May 31	May 14
Seeding Rate	Various (Table 2)	Various (Table 2)	Various (Table 2)	Various (Table 2)
Fibre Harvest Date	Sep. 17	None	Aug. 23	July 27
Grain Harvest Date	Sep. 24	Sep. 5	Sep. 10	Aug. 27
Grain Days from Seeding to Combining	107	102	102	105

¹ PCDF, Roblin

When it was determined that the hemp had reached its full fibre yield potential, 1m² from each plot was cut and bound individually. When the hemp reached its full potential fibre yield, the wet weight for this sample was recorded before it was dried down. Once it was dry, the leaves were stripped and the stalks were weighed. When mature, the grain was harvested from the remaining area of each plot using a small plot combine. The grain samples were then dried and weighed.

Table 2. 2012 Industrial Hemp Plant Population Trial Treatments at Arborg, Carberry, Gilbert Plains and Melita, MB.

25 plants/m ²	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. 2012 Spring Soil Nutrient Analysis from 0-24" Depth and Spring Nutrient Applications at Arborg, Carberry, Gilbert Plains and Melita, MB. **

	Arborg		Carberry		Gilbert Plains		Melita	
	Estimated Available Nutrients	Fertilizer Applied (actual lbs.)	Estimated Available Nutrients	Fertilizer Applied (actual lbs.)	Estimated Available Nutrients	Fertilizer Applied (actual lbs.)	Estimated Available Nutrients	Fertilizer Applied (actual lbs.)
N*	39 lbs/ac	90	21 lbs/ac	132	70 lbs/ac	120	92 lbs/ac	91
P	14 ppm	27	19 ppm	21	16 ppm	85	9 ppm	30
K	278 ppm	15	388 ppm	--	145 ppm	30	188 ppm	--
S*	120 lbs/ac	--	59 lbs/ac	1	44 lbs/ac	10	50 lbs/ac	--

* Nitrate – N

* Sulphate - S

** Analysis by Agvise Laboratories

Results

Table 4. 2012 Industrial Hemp Plant Population Trial Mean Planting Densities and Grain Yield (lbs/acre) at Arborg, Carberry, Gilbert Plains and Melita, MB

Plants/m ²		Grain Yield (lbs/acre)				
Target Population	Emerged	Mean (4 sites)	Arborg	Carberry	Gilbert Plains	Melita
25	14	902	871	544	928	1706
50	24	1006	947	587	832	1873
100	37	1105	863	644	882	2079
150	55	1093	906	549	929	2045
200	75	1033	800	633	999	1948
250	81	1095	836	628	874	2133
300	102	996	810	525	800	1846
350	112	1120	943	732	1029	2043
Grand Mean	N/A	1044	872	605	909	1959
CV %	N/A	12.22	8.66	11.39	15.98	12.11
LSD	N/A	63.24	111.05	101.36	213.58	348.81
Sign Diff	N/A	Yes	Yes	Yes	Yes	Yes

Table 4 summarizes plant emergence compared to the target seeding rate as well as the grain yield at the corresponding target plant populations. The grain mean yield increases with an increase in seeding

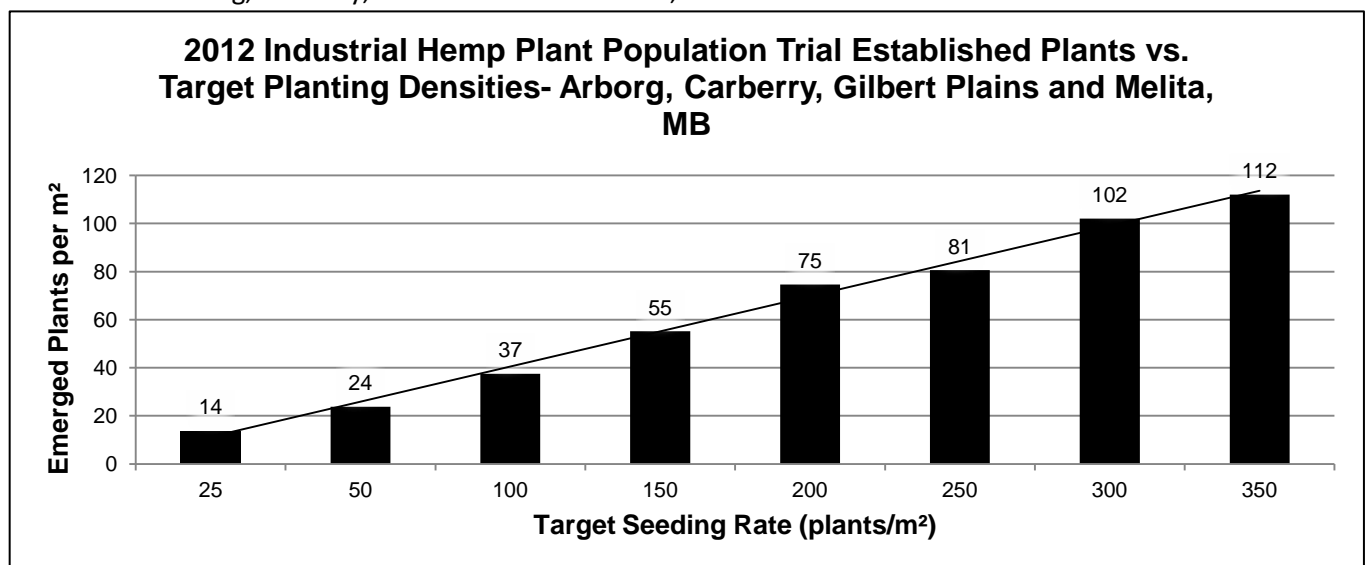
rate and levels off at the 200 seeds/m² target seeding rate. Plant counts were taken at all sites at approximately 3 weeks post-emergence. At 200 seeds/m² seeding rate, the actual emerged plants are 75 per square metre.

Table 5. 2012 Industrial Hemp Plant Population Trial Mean Planting Densities and Fibre Yield (t/acre) at Arborg, Carberry, Gilbert Plains and Melita, MB

Plants/m ²		Fibre Yield (tonnes/acre)				
Target Population	Emerged	Mean (4 sites)	Arborg	Carberry	Gilbert Plains	Melita
25	14	1.25	1.53	0.95	0.87	1.13
50	24	1.81	1.36	1.37	2.23	1.51
100	37	2.10	1.53	1.40	2.70	1.70
150	55	2.42	1.87	1.35	3.11	2.08
200	75	2.78	2.22	1.64	3.96	2.06
250	81	2.49	2.04	1.52	3.09	1.82
300	102	2.62	2.04	1.32	3.68	1.66
350	112	2.85	2.39	1.48	4.06	2.10
Grand Mean	N/A	2.89	1.87	1.38	2.96	1.76
CV %	N/A	18.07	16.36	26.73	12.62	26.04
LSD	N/A	0.21	0.45	0.54	0.55	0.67
Sign Diff	N/A	Yes	Yes	Yes	Yes	Yes

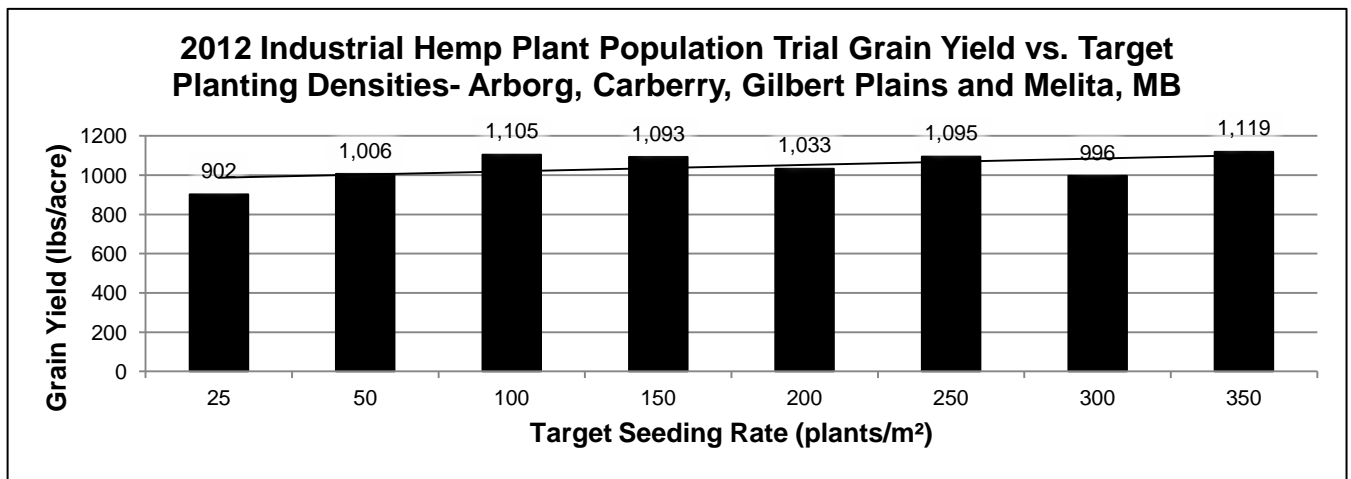
Table 5 summarizes plant emergence compared to the target seeding rate as well as the fibre yield at the corresponding target plant populations. The fibre mean yield increases and levels off at the 200 seeds/m² target seeding rate or at the actual plant counts of 75 per square metre.

Chart 1. 2012 Industrial Hemp Plant Population Trial Established Plants (m²) vs. Target Planting Densities at Arborg, Carberry, Gilbert Plains and Melita, MB



The plant population does increase with an increased target seeding rate as expected. Approximately half of the seeds planted emerged. Hemp is a crop that has high variability in plant stand emergence. Factors such as weather, seeding depth and wet soils affect mortality leading to thinner stands.

Chart 2. 2012 Industrial Hemp Plant Population Trial Grain Yield (lbs/acre) vs. Target Planting Densities at Arborg, Carberry, Gilbert Plains and Melita, MB



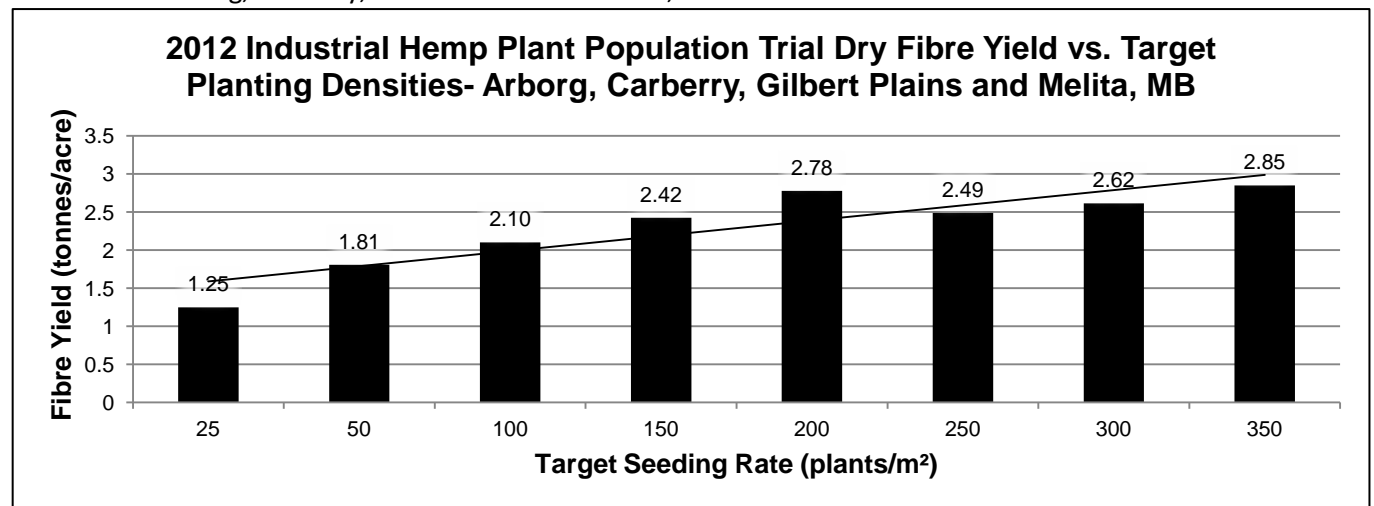
CV = 12.22 %

LSD = 63.24

Sign Diff : Yes

Chart 2 shows a steady increase in grain yield as the target seeding rate increases. At a target seeding rate of about 100 plants/m², the yield plateaus and there is not a significant yield increase after that. This is at an actual plant stand count of 37 plants/m².

Chart 3. 2012 Industrial Hemp Plant Population Trial Dry Fibre Yield (tonnes/acre) vs. Target Planting Densities at Arborg, Carberry, Gilbert Plains and Melita, MB



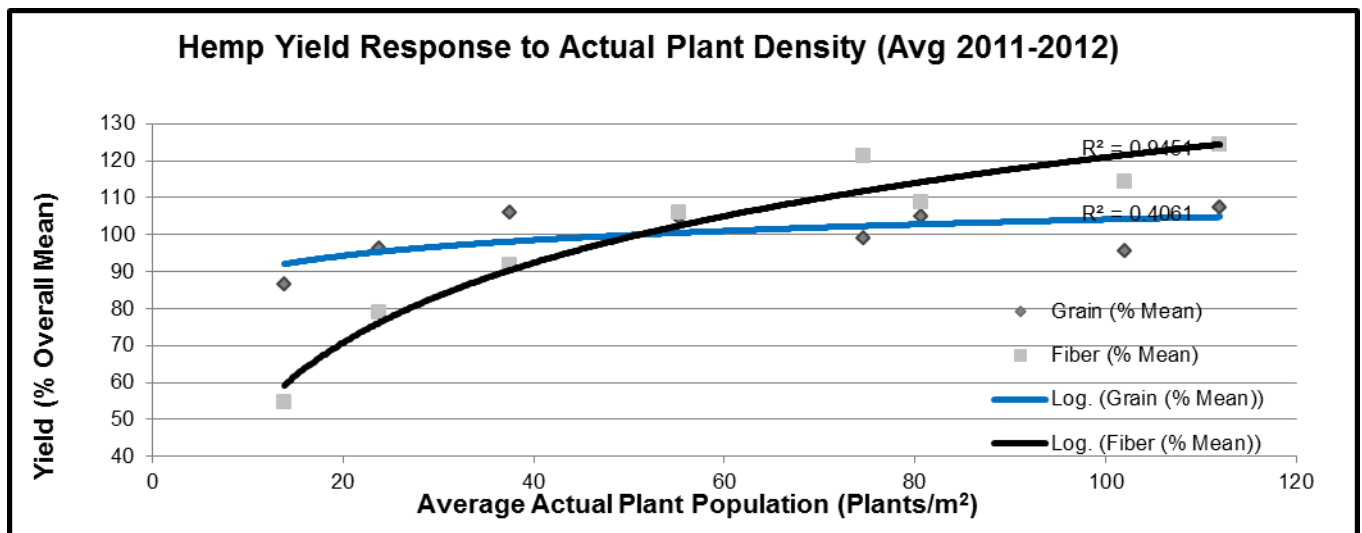
CV = 18.07 %

LSD = 0.21

Sign Diff : Yes

Chart 3 shows a steady increase in fibre yield as the target seeding rate increases. At a target of about 200 plants/m² or actual plant stand of 75 plants/m², the yield stabilizes and there is not a significant yield increase after that.

Chart 4. Industrial Hemp Plant Population 2011 & 2012 Combined Data- 5 Locations*



* Grain Yields: Carberry (2011 & 2012), Melita (2011 & 2012), Arborg, (2012)

* Fibre Yields: Carberry (2011), Gilbert Plains (2012), Arborg (2012)

Chart 4 gives the relative yield increase of grain and fibre with the increasing actual plant population. Grain yield increases to a plant population of about 40 actual plants/m². Fibre yield increases significantly to an actual plant population of about 100 plants/m².

Important Considerations and Recommendations

At low planting populations, hemp plants will compensate with larger seed heads and give similar grain yield as at a higher plant population. Low plant populations can result in increased weed pressure. Hemp exhibited about a 50% mortality rate of the seeds that were planted. Mortality will vary from year to year dependent on soil conditions- temperature, seeding depth, moisture, etc.

Conclusions

Hemp grain and fibre yield increases as the target seed rate and plant population increases.

Grain yield maximized at a plant population of about 50 to 60 actual plants/m². A target seeding rate of 100 seeds/m² (20 to 25 lbs/acre) was required to meet that actual plant population.

Fibre yield maximized at an actual plant population of 75 to 100 plants/m². A target seeding rate of 200-250 seeds/m² (40 to 50 lbs/acre) was required to meet that actual plant population. For dual purpose production of high grain and fibre yields, increasing the seeding rate to a target of 200 to 250 seeds per square metre (about 40 to 50 lbs/acre) gives a good fibre yield as well as a good grain yield.

Seeding rate has a major effect on fibre quality. High quality hemp fibre requires stalk size to be about the size of a pencil. Lower seeding rates may not have as much of an effect on yield as the hemp plant makes up for this extra space with large stems and larger plants. More research is needed to find a target hemp fibre seeding rate that will give the best yield and quality for hemp fibre markets.

Industrial Hemp Seed Treatment Trial

Keith Watson¹, Jeff Kostuik³, Susan McEachern¹ and Angel Melnychenko¹

Site Information

Locations: Arborg, Manitoba
Carberry, Manitoba,
Gilbert Plains, Manitoba
Melita, Manitoba

Cooperators: CMCDC
PCDF
PESAI
WADO
Plains Industrial Hemp Processing

Background

At present, there are no seed treatments registered for use on hemp seed.

Most commercial seed treatment products are fungicides and/or insecticides applied to seed before planting. Fungicides are used to control diseases of seeds and seedlings; insecticides are used to control insect pests. Some seed treatment products are sold as combinations of fungicide and insecticide.

Fungicidal seed treatments are used for control of fungal disease three separate ways:

1. To control soil-borne fungal disease organisms (pathogens) that cause seed rots, damping off, seedling blights and root rot
2. To control fungal pathogens that are surface-borne on the seed, such as those that cause covered smuts of barley and oats, bunt of wheat, black point of cereal grains
3. To control internally seed-borne fungal pathogens such as the loose smut fungi of cereals

Seed treatments promote seedling establishment and plant health, helping to reduce losses in seed quality and yield due to many diseases and insects. The ability of seed treatments to control many fungal diseases has made them one of the biggest success stories of plant disease prevention. Most seed treatments do not control bacterial pathogens and none control seed-borne viruses.

It is always important to start with good quality seed. Examine seed lots carefully before purchase or when using sorted seed. A seed laboratory can conduct standard seed quality tests at a low cost. Seed lots with low test weights, low germination rates or discolored kernels often produce less vigorous plants, even when this seed is treated. Poor quality seed may be damaged further by seed treatments and possibly some seeding equipment (air seeders and wind speed). Seed treatment dosage and environmental conditions affect the ability of seed treatments to control target diseases and insects.

Using recommended rates and minimizing environmental stresses through good management practices will maximize the benefits of any seed treatment. Seed treatments may become less effective over time; plant seed as soon as possible after it is treated.

There are two main categories of seed treatments- protectant (effective only on the seed surface) and systemic (effective within the seedling). Protectants help control pathogens that reside on the seed

¹ PCDF, Roblin

surface. In contrast, systemic seed treatments control seed-borne fungi that reside within the seed or infect the seed surface.

Industrial hemp has been observed to have a high mortality rate. In other words, of the seed that is planted, often 40 to 60% of the seeds do not end up as plants.

Common seed treatment products were used for this trial that have a broad spectrum control, are systemic and have a contact mode of action. The trial was designed to evaluate the effect on plant population.

The products Gemini (BASF) and Raxil (Bayer CropScience) were used in this trial to get a sense of the potential to increase hemp germination and seedling survival.

Gemini is a triazole fungicide that provides systemic broad spectrum protection against seed and soil born disease. Thiram is a dithiocarbamate fungicide with contact activity.

Raxil is a systemic triazole fungicide that provides broad-spectrum protection against seed and soil borne diseases. The active ingredient thiram is a dithiocarbamate fungicide with contact activity.

There is no attempt to suggest one product is better than the other. The purpose of the trial is to see if there is any response that would make it desirable to do further evaluations for a possible minor use registration.

Objective

To evaluate the effect of different seed treatments and planting depths on hemp grain yield.

Design, Materials & Operation

Table 1. 2012 Industrial Hemp Seed Treatment Design Summary at Arborg, Carberry, Gilbert Plains and Melita, MB.

Location	Arborg	Carberry	Gilbert Plains	Melita
Treatments	6 (Table 2)	6 (Table 2)	6 (Table 2)	6 (Table 2)
Replication	4	4	4	4
Plot Size	1.37m x 6m (8.22m ²)	1.2m x 7m (8.4m ²)	1m x 5m (5m ²)	1.44m x 11.44m (16.5m ²)
Test Design	Split Plot Design with 3 main treatments and 2 subplots	Split Plot Design with 3 main treatments and 2 subplots	Split Plot Design with 3 main treatments and 2 subplots	Split Plot Design with 3 main treatments and 2 subplots
Seeding Date	May 31	May 26	May 31	May 14
Target Seeding Rate	250 seeds/m ²	250 seeds/m ²	250 seeds/m ²	250 seeds/m ²
Harvest Date	Sep. 24	Sep. 5	Sep. 10	Aug. 27
Days from Seeding to Combining	107	102	102	105

At the Gilbert Plains site, prior to seeding, the area was cultivated then heavy harrowed. Fertilizer was broadcast using a Valmar applicator. The trial was seeded into hemp stubble with 25 lbs. actual P applied with the seed. Two seeding depths were used to simulate the extra stress on hemp seed.

All plots were harvested using a small plot combine. Each treatment was individually bagged then dried. Once dry, the sample was weighed and the weight was recorded.

Table 2. 2012 Industrial Hemp Seed Treatment Trial Treatments at Arborg, Carberry, Gilbert Plains and Melita, MB.*

Gemini seeded @ $\frac{1}{2}$ " depth	Raxil seeded @ $2\frac{1}{2}$ " depth
Gemini seeded @ $2\frac{1}{2}$ " depth	Untreated @ $\frac{1}{2}$ " depth
Raxil seeded @ $\frac{1}{2}$ " depth	Untreated @ $2\frac{1}{2}$ " depth

Table 3. 2012 Spring Soil Nutrient Analysis and Spring Nutrient Applications from 0-24" Depth at Arborg, Carberry, Gilbert Plains and Melita, MB. **

	Arborg		Carberry		Gilbert Plains		Melita	
	Estimated Available Nutrients	Fertilizer Applied (actual lbs.)	Estimated Available Nutrients	Fertilizer Applied (actual lbs.)	Estimated Available Nutrients	Fertilizer Applied (actual lbs.)	Estimated Available Nutrients	Fertilizer Applied (actual lbs.)
N*	39 lbs/ac	90	21 lbs/ac	132	70 lbs/ac	120	92 lbs/ac	91
P	14 ppm	27	19 ppm	21	16 ppm	85	9 ppm	30
K	278 ppm	15	388 ppm	--	145 ppm	30	188 lbs/ac	--
S*	120 lbs/ac	--	59 lbs/ac	1	44 lbs/ac	10	50 ppm	--

* Nitrate – N

*Sulphate - S

**Analysis by Agvise Laboratories

Results

Results presented are for 6 station years in Manitoba from the 2011 and 2012 growing years.

Plants per Square Meter

Table 4. Hemp Seed Treatment Trial Plants per Square Meter at Arborg, Carberry, Gilbert Plains and Melita, MB for 2011 & 2012 (6 site years)

Seeding Depth (Inches)	Seed Treatment	Plants per Square Meter
0.5	Untreated	56
0.5	Gemini	77
0.5	Raxil	82
2.5	Untreated	48
2.5	Gemini	47
2.5	Raxil	63
Grand Mean	--	62
LSD Factor A	--	5.2

Yield

Table 5. Hemp Seed Treatment Trial Grain Yield (lbs/acre) at Arborg, Carberry, Gilbert Plains and Melita, MB for 2011 & 2012 (6 site years)

Seeding Depth (Inches)	Seed Treatment	Yield (lbs/acre)
0.5	Untreated	1182
0.5	Gemini	1118
0.5	Raxil	1170
2.5	Untreated	1080
2.5	Gemini	1140
2.5	Raxil	1119
Grand Mean	--	1135
LSD Factor A	--	43

The yield of hemp was not significantly different with the use of a seed treatment (Table 5). The hemp plant is able to compensate the low plant population by producing a larger seed head which will give about the same yield as the high plant population. This is further demonstrated by Diversification Center's trials on seeding rates that also shows hemp produces bigger heads at low populations and is still able to maintain the same grain yield as at higher plant populations.

Important Considerations and Recommendations

Hemp has been observed to have a high mortality with 40 to 60% of the planted seeds not emerging or producing plants.

Hemp, under ideal conditions of warm soils and good moisture, will germinate and emerge from the soil in less than 5 days. Under these ideal conditions, seedling diseases are not as much of an issue. In these research trials, the plots were seeded later in the season when there was good moisture and warm soil temperatures. Seed treatment influence may show up more positive for earlier seeded crops or crops seeded under more stressful environmental conditions.

Seedling stresses such as deep seeding, cool soils, excessive rain after seeding or other events benefit from seed treatments. It is not expected seed treatments will work in all circumstances.

This trial does demonstrate the need for shallow seeding of hemp. Plant mortality significantly increases as seeding depth increases.

Anything that will increase the number of seeds that emerge is a positive benefit to producers. Hemp seed cost is on average \$2.00 per pound. For grain crops, a target of 100 seeds per square metre is used (approx. seeding rate of 20 lbs/acre) and 250 to 300 per square metre is used for fibre only crops. Seed treatment cost is low at less than 5 cents a pound (\$0.44 cents a pound in 2012). If a farmer is able to reduce seeding rates by 10 to 20% by the use of seed treatments and still get the same population, he will save 2 to 4 pounds of seed per acre or 4 to 8 dollars/acre. For fibre production at a seeding rate of 50 pounds per acre, he could seed 10 pounds per acre less seed and realize a savings of about \$20 per acre.

Conclusions

Seed treatment on hemp has a minimal effect on yield when it is seeded under good soil temperature and moisture. Seed treatment does not have an effect on seedling stand numbers, especially under adverse growing conditions.

There was a drop in the plant stand by about 30% due to a deeper seeding depth.

Further work is required especially under stressed growing conditions such as early seeding where the ground is cooler and wetter to fully understand the potential benefit of seed treatments.

A minor use registration and mark acceptance is required before seed treatments can be used.

Industrial Hemp Trial- Dormant Seeded vs. Spring Seeded

Keith Watson¹, Jeff Kostuik⁴, Susan McEachern¹ and Angel Melnychenko¹

Site Information

Locations:	Roblin, Manitoba Carberry, Manitoba Melita, Manitoba
Cooperators:	PCDF CMCDC WADO

Background

Industrial hemp is grown for grain and fibre. It has been observed that hemp can volunteer and grow the next year from the shelling that occurs from the previous harvest. The plants that germinate are some of the first growth on the field in the spring, even before some of the hardy winter annuals like stinkweed and flaxweed. These volunteer hemp plants seem to withstand multiple early frosts.

This project is to evaluate the potential of late fall seeding of hemp varieties and to evaluate their survival and potential yield production for grain and fibre. If a successful management plan can work into the hemp production cycle, it could help farmers spread out their workload and potentially increase both fibre and grain yields.

There are weather related risks involved, but if guidelines can be established that show potential yield increases of fibre and or grain from fall seeding, there would be justification for farmers to utilize this management in their production cycle. Yield advantage may be enough to offset the risk of having to occasionally re-seed if the crop does not establish the following spring. These thresholds along with other agronomy factors need to be studied.

¹ PCDF, Roblin

Objective

To evaluate the potential of late fall, dormant seeded industrial hemp versus spring seeded in terms of fibre and grain yield.

Results

All varieties at all locations did not emerge in the spring of 2012 with enough plants to salvage as a crop. The plots were abandoned. Varieties used included Alyssa, Delores and Petera.

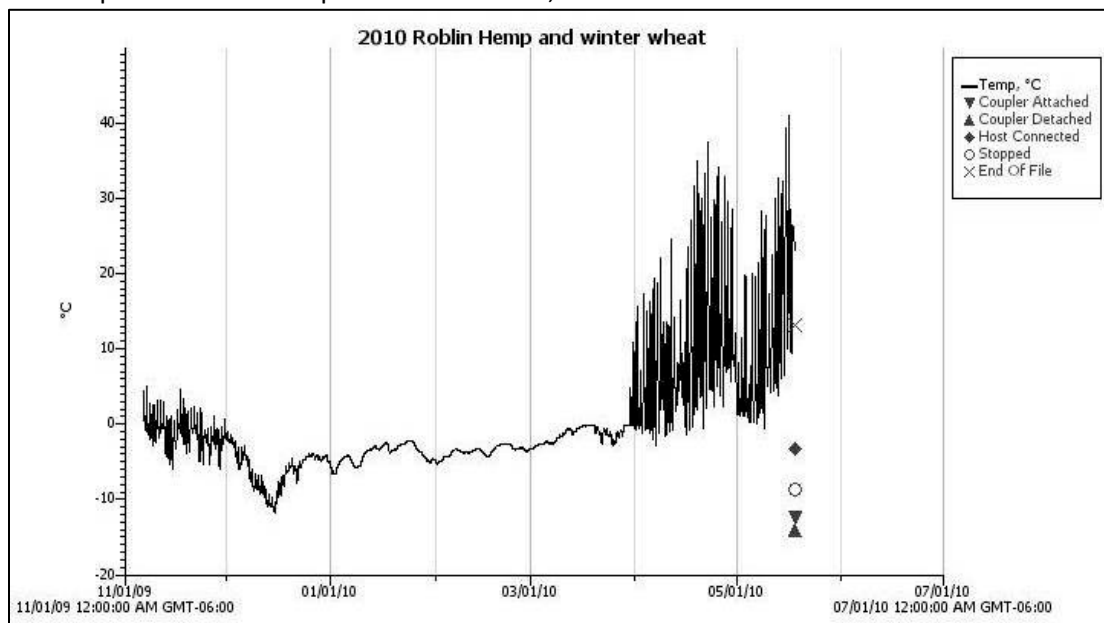
The plots were seeded at a target density of 250 plants/m². These trials were direct seeded into canola or wheat stubble. Starter fertilizer (12-52-0) was placed with the seed during planting. The fall seeded hemp trial was seeded late in the fall when soil temperatures had cooled down to less than 5°C, but just before freeze up. Traditionally, the last week of October or the 1st week of November is the proper time. It requires monitoring of the weather to determine seeding date.

To ensure hemp does not germinate and freeze through the winter, hemp needs to be seeded late enough to prevent germination. The plots were seeded shallow at about ½ inch depth. The same seeding rates and seed lots were used for both the fall and spring seeded plots. Hemp is daylight sensitive so regardless of time of seeding, varieties tend to mature at the same time. Therefore, both the fall and spring seeded plots were harvested for fibre and for grain on the same dates.

All varieties at all locations did not emerge in the spring of 2011 with enough plants to salvage as a crop. The plots were abandoned.

Multi Year Summary

Chart 1. Temperature- Soil Temperature °C- Roblin, MB- 2009 to 2010



Roblin- 2010 - A Hobo temperature data logger was buried in the soil at the 2 inch level at seeding time (November 2009) to monitor the soil temperature over the winter months. The soil temperature

dropped to -12°C about the 3rd week of November then leveled out to 13 to 15°C for the rest of the winter. The soil began to warm up after the 1st week of March.

2 Year Summary

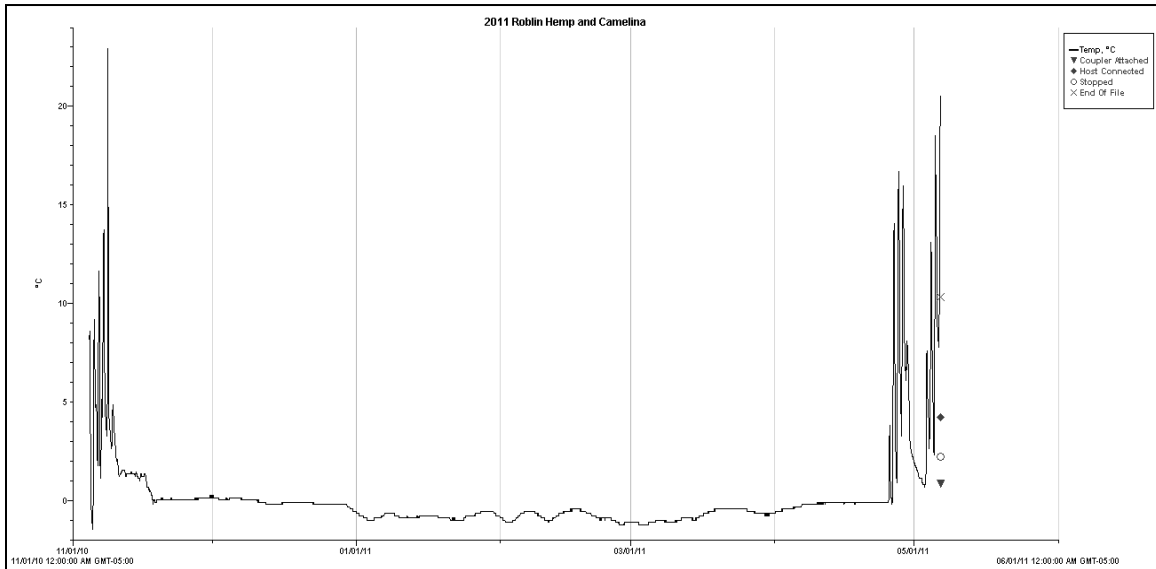


Chart 2. Temperature – Soil Temperature °C – Roblin, MB- 2010 to 2011

Roblin- 2011 - A Hobo temperature data logger was buried in the soil at the 2 inch level at seeding time to monitor the soil temperature over the winter months. Over this period of time, (November 1, 2010 to May 1, 2011) the soil temperature was mainly in the -1 to 0°C range. In early May we can see the soil temperatures started to warm up during the daytime. There was deep snow all winter which would contribute to the high soil temperature. There was deep snow all winter which would contribute to the high soil temperature.

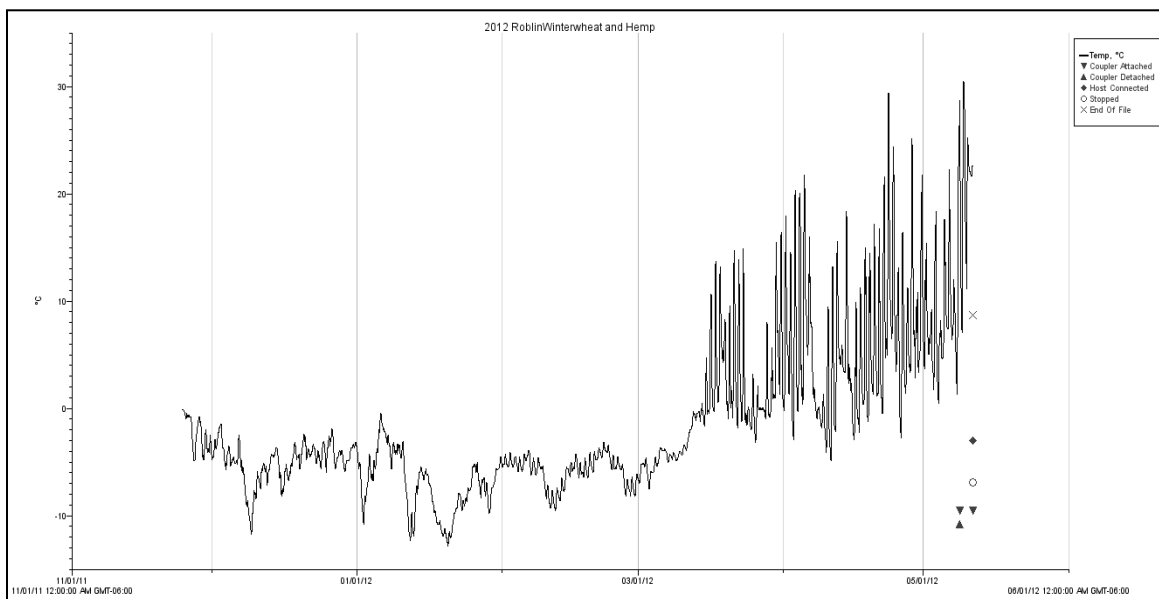


Chart 3. Temperature- Soil Temperature °C- Roblin, MB- 2011 to 2012

Roblin- 2012 - A Hobo temperature data logger was buried in the soil at the 2 inch level at seeding time to monitor the soil temperature over the winter months. Over this period of time (November 1, 2011 to May 1, 2012), the soil temperature was mainly in the 0° to -5° C range until January. From January 1 to March 1 the temperature was -5 to -10° C with a few spikes below -10°C. By the middle of March, the soil temperature was above 0°C in the daytime and 0°C at night. In early May we can see the soil temperatures started to warm up during the daytime. There was some, but not a lot of snow all winter which would contribute to the lower soil temperatures.



Chart 4: Temperature- Soil Temperature °C- Melita, MB- Spring 2012.

Melita - 2012 - A Hobo temperature data logger was buried in the soil at the 2 inch level early January to monitor the soil temperature over the spring months. Over this period of time the soil temperature was mainly in the 0° to -10° C range until January. From January 1 to March 1 the temperature was -5 to -10° C with a few spikes below -10°C. By the middle of March, the soil temperature was above 0°C in the daytime and 0°C at night. In early May we can see the soil temperatures started to warm up during the daytime. There was some, but not a lot of snow all winter which would contribute to the lower soil temperatures. Emergence of plots occurred March 20, 2012.

Plant Populations

In 2012, there were 3 locations (Roblin, Carberry and Melita) in Manitoba that had very few plants survive so the plots were destroyed. In 2011 all of the 4 locations in Manitoba (Roblin, Carberry, Arborg and Melita) did not have hemp from the fall plantings that survived. All plots were destroyed. In 2010 there was one site in Roblin that yielded about 50% more grain than the spring seeded hemp. In 2009, there were 2 locations (Roblin and Melita) in Manitoba. The plants survived but yields were variable so the data cannot be published.

Important Considerations and Recommendations

To successfully seed hemp in the fall, it should be planted before freeze up. This would be possible on most farms as it would be the last field operation that would take place in most years the last week of October or first week of November. Hemp needs to be seeded into cold ground so it will not germinate in the fall.

It is important to seed shallow for hemp to get an early start in the spring. Seeding rates need to be increased to ensure a good stand in the spring.

Hemp can be one of the earliest plants/crops to start growing in the spring. Volunteer or fall seeded plants will withstand freezing temperatures in the spring if conditions for hardening off are favourable. Not all of the plants will survive.

The type of stubble and ground cover may have an effect on the ability of hemp to germinate in the spring. Heavy cereal stubble may be too cool too long, making it difficult for hemp to germinate and grow. Canola stubble with less trash may be more suitable.

Economics needs to be applied to the model to determine how many years of success are required to give enhanced yields that will mitigate the loss of reseeding in early spring.

The winter of 2010 to 2011 had a very heavy snow fall early in the season without extreme cold. The snow had an insulating effect and the ground did not freeze. These conditions were not favourable for hemp to survive. Also, the spring of 2011 was cool and wet. There was rain, cloud and poor drying conditions until June.

The winter of 2012 had colder soil temperatures than the previous winters but maybe the spring freeze thaw cycle also affected the germinating hemp.

Conclusions

Past years have shown increased yields of both fibre and grain through dormant seeding hemp if the plants grow in sufficient plant population in the spring.

Hemp that does grow in the spring is one of the first plants to emerge and is relatively tolerant to spring frosts.

Fields utilized should have good drainage with minimal ponding areas. Similar to winter wheat, low areas in a field that are prone to ponding water in the spring will drown out the hemp.

Of the 10 locations established from 2009 to 2012, one location gave reliable, increased yields. In 2010, one location survived but the data was not statistically valid. 7 of the 10 locations did not have enough plants to leave as for crop.

Fall or dormant seeding hemp is not recommended at this time as the risk of a poor population in the spring is high.

Effect of Timing Combinations of Folicur and Prosaro Fungicide Applications on Varieties of Winter Wheat Pertaining to Yield and Quality

Cooperators:

Ducks Unlimited Canada

BAYER Crop Science Canada

Manitoba Diversification Centres – Melita, Roblin, Carberry, Arborg (Beausejour), MB

Background

Recent advances in winter wheat breeding have developed varieties that are now more resistant to fusarium head blight (FHB). Traditionally most winter wheat varieties are more susceptible to FHB as compared to spring wheat. In 2012, a FHB resistant winter wheat variety named 'Emerson' (formerly W454) was released by AAFC for C level variety testing. This is the first FHB resistant winter wheat variety for the prairies. Moreover, there are several fungicides on the market available for winter wheat production used to combat FHB and several common leaf diseases. Little is known about the combination of using a resistant variety compared to a susceptible variety when fungicides are used. A few questions begin to arise from this point:

1. Do we need to use fungicides if the variety is intrinsically superior in terms of FHB resistance?
2. Can we use seed varieties intrinsically prone to FHB infection and use fungicides to achieve a satisfactory yield and sample quality?
3. Does using a resistant variety and fungicide lead to an even greater yield and sample quality compared to just using a superior variety or just fungicides?

In the fall of 2011, a multi-site by multi-year trial was initiated among the four Diversification Centres set out to answer these questions. Funding was provided by a partnership between Ducks Unlimited Canada and Bayer Crop Science. In 2011 the winter wheat varieties including 'Falcon', 'Buteo' and 'Flourish' were used. FHB resistance is rated as susceptible, moderately resistant and susceptible, respectively. Variety 'Emerson' was added in the fall of 2012 to the experiment and is rated as resistant to FHB. Varieties were treated with fungicide including the following variety of treatments:

1. Untreated check
2. Folicur at Flag
3. Prosaro at Flower
4. Folicur at Flag and Prosaro at Flower

Materials and Methods

Plots were arranged in a randomized split plot design. Variety was considered the main plot effect and fungicide application was considered the subplot effect. Treatments were replicated three times. Varieties were seeded in respect to each site's specifications (Table 1) and soil tested prior to seeding (Table 2). Folicur 432 F was applied at a rate of 118 ml/ac and Prosaro 250 EC was sprayed at a rate of 324 ml/ac using a water volume of 10 gal/ac (Table 3).

Table 1: Summary of each trial location and the respective seeding dates, plot sizes, applied fertilizer, herbicide use, fungicide application date and harvest dates for 2012.

Location	Plot Size	Seeding Date	Applied Fertilizer	Herbicides	Harvest Date
Melita	12.96 m ²	15-Sep-11	56 lbs/ac N, 30 lbs/ac P sideband at seeding 46 lbs/ac N, April 4th, spring broadcast	Glyphosate and Heat (preseed) Achieve and Mextrol - May 8, In-crop Preharvest Glyphosate - July 23	30-Jul-12
Roblin	5.0 m ²	15-Sep-11	101 lbs/ac N spring broadcast	Puma and Buctril M - May 30	10-Aug-12
Beausejour	8.22 m ²	15-Sep-11	120 lbs/ac N spring boardcast 27 lbs/ac P at seeding 27 lbs/ac K at seeding		12-Aug-12
Carberry	7.2 m ²	19-Sep-12	130 lbs/ac N, 40 lbs/ac P Broadcast	Target - May 16	02-Aug-12

Table 2: Summary of soil tests of each trial location prior to seeding trials in the fall of 2012.

Site	Legal	Previous	Depth	N	P	K	S	pH
	Land Location			Crop	lbs/ac	Olsen ppm	ppm	
Melita	NW 1-4-27 W1	Canola	0-6"	14	11	130	14	7.8
			6-24"	18			36	
			0-24"	32			50	
Roblin	NE 20-25-28 W1	Canola	0-24"	Not Taken				
Beausejour	NE 4-13-7 E1	Canola	0-6"					
			6-24"					
			0-24"					
Carberry	S1/2 8-11-14W	Canola	0-6"	21	11	388	59	na

Table 3: Application of fungicide treatments and growth stage according to each site in the summer of 2012.

Treatment/Location	Date of Application			
	Melita	Roblin	Beausejour	Carberry
Folicur at Flag	30-May	12-Jun	07-Jun	13-Jun
Prosaro at Head	12-Jun	03-Jul	18-Jun	25-Jun

Data collected included emergence, flag leaf date, heading date, grain yield, grain moisture and test weight. Data was analyzed with an analysis of variance at the 0.90 level of significance using Agrobases Gen II statistical software. Main plot and subplot treatments were also analyzed for interaction. Results are presented as year 1 of 2. Composite subsamples were sent to Intertek (Winnipeg, MB) for quality analysis including protein, *Fusarium* damaged kernels.

Results

Plant Emergence, Test Weight, Yield

There were significant differences in plant emergence among varieties only in Roblin and Carberry but not Beausejour (Table 3). Plant counts were not taken in Melita. In Roblin, Buteo resulted in lower plant emergence while in Carberry Falcon had lower emergence.

In Melita, test weight was significantly different among varieties resulting in Buteo having the highest test weight than Flourish and Falcon (Table 3). Test weights were not measured in Beausejour, Carberry and Roblin.

In terms of yield, there were significant differences among use of variety in Roblin and Beausejour (Table 3). In Melita, Buteo out yielded Falcon and Flourish. This was not the case in Roblin where Buteo

yielded lower. Conversely in Beausejour, Flourish resulted in the highest yield compared to Buteo and Falcon. Both in Roblin and Melita, there were significant differences in yield when Prosaro fungicide was used at flower exclusively, with an increase yield trend when Prosaro was split with a Folicur application at flag, despite the variety used. In Carberry there was no significant difference in yield, despite the use of variety or fungicide use. There were no significant interactions between the use of variety and fungicide applications in terms of yield or test weight among all sites.

Table 3: Summary of plant emergence, test weight, height and grain yield among trial sites from use of different varieties and fungicide regimes. Values in bold indicate a significant value.

Variety	Fungicide Treatment	Melita		Roblin			Carberry		Beausejour		Sites Average
		Test WT	kg/ha	Height	kg/ha	p/m ²	kg/ha	p/m ²	kg/ha	p/m ²	
CDC Falcon		380	4154	73	1714	158	3543	58	3447	206	3137
CDC Buteo		394	4256	87	1355	129	3572	72	3468	187	3061
Flourish		381	4238	76	1789	158	3502	70	3699	212	3176
	Untreated	383	3956	78	1163	152	3481	71	3435	201	2867
	Folicur@flag	383	3985	78	1557	159	3520	70	3535	204	3021
	Prosaro@flower	387	4572	78	1918	140	3645	63	3777	208	3378
	Folicur@flag+Prosaro@flower	386	4351	80	1838	141	3509	62	3404	194	3233
CDC Falcon	Untreated	378	4063	74	1477	153	3327	62	3401	201	2956
	Folicur@flag	377	4022	70	1438	163	3388	62	3415	195	2949
	Prosaro@flower	381	4323	74	1912	143	3724	49	3583	212	3320
	Folicur@flag+Prosaro@flower	382	4210	75	2030	170	3650	59	3389	218	3296
CDC Buteo	Untreated	394	3952	86	859	138	3522	77	3381	184	2777
	Folicur@flag	391	3942	88	1335	127	3718	71	3456	202	2998
	Prosaro@flower	394	4771	85	1759	133	3679	72	3743	184	3403
	Folicur@flag+Prosaro@flower	395	4358	89	1468	117	3791	67	3291	177	3206
Flourish	Untreated	378	3854	74	1155	163	3595	74	3522	219	2868
	Folicur@flag	381	3990	76	1900	187	3453	77	3735	214	3115
	Prosaro@flower	386	4623	75	2083	143	3367	68	4005	229	3357
	Folicur@flag+Prosaro@flower	380	4484	77	2017	137	3509	60	3532	186	3337
Coefficient of Variation (%)		0.9	6.2	5.4	15.7	12.7	8.4	16.4	7.7676	14.863	
Grand Mean		385	4216	79	1619	148	3539	67	3538	202	
R-Square		0.92	0.92	0.84	0.87	0.75	0.65	0.75	0.7669	0.4686	
LSD (p<0.10)	Variety	2	185	4	221	16	264	9	196	21	
	Fungicide	4	415	4	594	27	384	21	396	19	
	Variety x Fungicide trt	5	370	7	441	36	527	19	392	43	
P values	Variety	0.00001	0.60	0.0001	0.0016	0.002	0.88	0.013	0.072	0.13	
	Fungicide	0.24	0.074	0.41	0.072	0.34	0.86	0.65	0.34	0.53	
	Variety x Fungicide trt	0.25	0.42	0.74	0.23	0.12	0.59	0.72	0.96	0.62	

Quality

Composite samples of each treatment have been sent to laboratories among the sites for further analysis. Results below summarize only the Roblin (Table 4), Beausejour (Table 5) and Melita (Table 6) site samples for 2012. In Roblin, Buteo despite having the lowest overall yield among varieties, resulted in the best final sample grade when sprayed with Prosaro at flower, or with a split application of fungicide compared to the untreated varieties. However, when this is compared to that specific treatment in terms of yield, there was no significant difference in yield regardless of the steep trend that exists. Generally, lowest grades (low test weight) and the highest protein values were those that were untreated by a fungicide.

Most samples from Beausejour were graded as feed or as a number 3 from sprouting damage. It appears that there were no trends otherwise.

In Melita, there were no discernable differences in seed quality relative to fungicide application or variety.

Table 4. 2012 Winter Wheat Variety x Fungicide Trial Report of Analysis at Roblin, MB*

Treatment	Grade	Reason for Grade	DKG %	PTN %	MST %	TWT (kg/hl)	Ergot %	Fus Dmg %	Midge %
Untreated Falcon	CW Feed	72.3 kg/hl	2.6	14.6	12.4	72.3	0.5	0.1	Nil
Untreated Buteo	3 CWRW	75.3 kg/hl	2.5	14.1	12.3	75.3	0.5	Nil	Nil
Untreated Flourish	CW Feed	72.5 kg/hl	3.4	14.3	12.5	72.5	0.4	0.1	Nil
Folicur@flag Falcon	3 CWRW	74.5 kg/hl	2.1	14.3	12.3	74.5	0.3	0.2	Nil
Folicur@flag Buteo	2 CWRW	77.1 kg/hl	2.7	13.7	12.1	77.1	0.2	0.1	0.001
Folicur@flag Flourish	3 CWRW	74.1 kg/hl	2.6	14.1	12.3	74.1	1	0.2	Nil
Prosaro@flower Falcon	2 CWRW	76.5 kg/hl	1.9	13.8	12.3	76.5	0.4	0.1	0.002
Prosaro@flower Buteo	1 CWRW	79.7 kg/hl	1.4	13.3	12.3	79.7	0.2	0.3	0.002
Prosaro@flower Flourish	2 CWRW	76.5 kg/hl	1.8	13.3	12.3	76.5	0.4	0.1	0.003
Folicur@flower+Prosaro@flower Falcon	2 CWRW	77.1 kg/hl	1.3	13.8	11.9	77.1	0.3	0.1	Nil
Folicur@flower+Prosaro@flower Buteo	2 CWRW	76.5 kg/hl	1.9	13.8	12.3	76.5	0.4	0.1	0.002
Folicur@flower+Prosaro@flower Flourish	2 CWRW	76.9 kg/hl	1.8	13.7	12.1	76.9	Nil	0.2	0.3

* Analysis by Intertek, Winnipeg

* DKG = Dockage

* PTN = Protein

* MST = Moisture

* TWT (kg/hl) = Test Weight in Kilograms per Hectolitre

* Fus Dmg = Fusarium Damage

* CW Feed = Canadian Western Feed

* CWRW = Canadian Western Red Winter

Table 5. 2012 Winter Wheat Variety x Fungicide Trial Report of Analysis at Beausejour, MB*

Treatment	Grade	Reason for Grade	DKG %	PTN %	MST %	TWT (kg/hl)	Ergot %	Fus Dmg %
Untreated Falcon	CWF RW	2.9% Sprouted	1.3	14.5	12.6	71.9	Nil	0.1
Untreated Buteo	CWF RW	3% Sprouted	1.0	14.1	12.6	76.9	Nil	0.1
Untreated Flourish	CWF RW	3.2% Sprouted	8.3	14.4	12.9	73.3	Nil	0.15
Folicur@flag Falcon	CWF RW	3.5% Sprouted	1.2	14.6	12.6	72.9	Nil	Nil
Folicur@flag Buteo	3 CWRW	1.3% Sprouted	0.9	14.5	12.6	77.5	Nil	Nil
Folicur@flag Flourish	CWF RW	5.6% Sprouted	0.9	14.1	12.0	74.5	Nil	0.2
Prosaro@flower Falcon								
Prosaro@flower Buteo	CWF RW	4.7% Sprouted	1.0	13.9	12.6	76.9	Nil	0.1
Prosaro@flower Flourish	CWF RW	3% Sprouted	1.2	14.6	12.7	72.5	Nil	0.2
Folicur@flower+Prosaro@flower Falcon	CWFD RW	Lt. Wt.	1	14.9	12.5	71.3	Nil	Nil
Folicur@flower+Prosaro@flower Buteo								
Folicur@flower+Prosaro@flower Flourish	3 CWRW	2.4% Sprouted	1.2	14.3	12.7	74.1	Nil	0.4

* Analysis by Intertek, Winnipeg

* DKG = Dockage

* PTN = Protein

* MST = Moisture

* TWT (kg/hl) = Test Weight in Kilograms per Hectolitre

* Fus Dmg = Fusarium Damage

* CWF RW Feed = Canadian Western Feed Red Winter

* CWRW = Canadian Western Red Winter

Table 6: 2012 Winter Wheat Variety x Fungicide Trial Report of Analysis at Melita, MB*

Variety	Fungicide Timing	Grade	Reason	Dockage %	Protein %	MST %	TWT (kg/hL)	Fus Dmg %	Ergot %
Buteo	Folicur @ Flag	1 CWRW		0.4	12	12.5	80.5	Nil	Nil
Falcon	Folicur @ Flag	2 CWRW	Mildew	0.5	12.3	12.7	77.9	Nil	Nil
Flourish	Folicur @ Flag	2 CWRW	Mildew	0.5	12.4	12.5	78.7	Nil	0.001
Buteo	Folicur @ Flag, Prosaro @ Flower	1 CWRW		0.4	12	12.5	80.7	Nil	Nil
Falcon	Folicur @ Flag, Prosaro @ Flower	1 CWRW		0.5	12	12.6	79.7	Nil	Nil
Flourish	Folicur @ Flag, Prosaro @ Flower	2 CWRW	Mildew	0.4	12.3	12.4	78.1	Nil	Nil
Buteo	Prosaro @ Flower	1 CWRW		0.4	11.8	12.3	80.3	Nil	Nil
Falcon	Prosaro @ Flower	1 CWRW		0.5	11.9	12.4	78.7	Nil	Nil
Flourish	Prosaro @ Flower	1 CWRW		0.5	12.3	12.5	78.9	Nil	Nil
Buteo	Untreated	1 CWRW		0.4	11.6	12.4	80.5	Nil	Nil
Falcon	Untreated	2 CWRW	Mildew	0.7	12	12.6	78.3	Nil	Nil
Flourish	Untreated	1 CWRW		0.5	12.5	12.2	78.3	Nil	Nil

* Analysis by Intertek, Winnipeg

* DKG = Dockage

* PTN = Protein

* MST = Moisture

* TWT (kg/hl) = Test Weight in Kilograms per Hectolitre

* Fus Dmg = Fusarium Damage

* CWRW = Canadian Western Red Winter

Discussion

In response to questions 1, 2 and 3 in the introduction, the results this year suggest that there is no interactions to variety use and fungicide application but rather react independently. Two out of four sites illustrate that use of variety solely resulted in significant yield differences despite fungicide regime. Roblin and Melita exhibited a yield advantage to using Prosaro fungicide at flower despite which variety was used. In all sites, there was no significant difference in all parameters measured that would connect the use of a variety with a certain fungicide regime.

It will be interesting in 2012 to see the results from the new FHB resistant variety 'Emerson'. Perhaps fungicides will be unresponsive, or provide an positive and/or additive effect on quality and yield. Unfortunately Emerson was not used in this data since it was not yet released in the fall of 2011 by AAFC.

Photo: Harvest begins at the Melita winter wheat site.



Effect of Seeding Date, Fungicide Application and Seed Treatments in Winter Wheat Production in Manitoba

Cooperators:

Ducks Unlimited Canada

BAYER Crop Science Canada

Manitoba Diversification Centres – Melita, Roblin, Carberry, Arborg, MB

Introduction

Establishment and care of winter wheat stands can be directly related to crop success. Seeding date can have a dramatic effect on final yield. Generally, earlier seeded fields yield better than later seeded fields. MASC usually sets the final insurable seeding date for winter wheat in Manitoba for Sept 15 for this reason as well as winter survival. Later sowings are more susceptible to winter kill during late winter temperature drops than earlier seeded stands that have larger seedling crowns. Late seeded stands may be weaker and more susceptible to seed borne diseases. Moreover, later seedlings often develop florescence later in the summer (when it is warmer and wetter) during climatic conditions of greater Fusarium Head Blight (FHB) risk.

The use in fungicides and seed treatments in winter wheat can be useful tools in providing protection to FHB and seed borne diseases, respectively. The questions arise when seeding date is introduced to this scope including the following:

1. What is the effect of early and late seeding stands on plant stand, yield and final sample quality?
2. What is the effect of a single fungicide application on yield and final sample quality and are these characteristics affected in combination with different seeding dates? That is, can a late seeding date be “rescued or improved” by a fungicide application?
3. What effect does using a seed treatment have on winter wheat production in terms of plant stand and winter kill survivability yield and possibly sample quality? That is, can late seeded stands be “rescued or improved” by seed treatments and can these effects be compounded through the use of a fungicide application?

In the fall of 2011, a multi-site experiment was initiated by the four Diversification Centres set out to answer these questions. Funding was provided by a partnership between Ducks Unlimited Canada and Bayer Crop Science. Plots were seeded by three factors (effects) including the following:

Main Plot Effect	Sub Plot Effect	Sub-Sub Plot Effect
Early Seed Date (Early to Mid Sept.)	Fungicide	Untreated
		Raxil WW
		Cruiser Maxx
	No Fungicide	Gemini
		Dividend
Late Seed Date (Late Sept to Early Oct.)	Fungicide	Untreated
		Raxil WW
		Cruiser Maxx
	No Fungicide	Gemini
		Dividend

Methods

Treatments were arranged in a split-split plot design and replicated three times. The variety CDC Buteo was used in this trial. Plots were seeded at a rate of 287 plants per acre (approx. 100 lbs/ac). Folicur 432F was applied at a rate of 118 mL/ac as a single application. Seed treatments were used according to their labeled rate as seen in Table 1.

Table 1: Seed treatments and the rated used

Seed Treatment Product	Rate (ml/100 kg seed)
Raxil WW	Raxil MD: 300 ml; Stress Shield: 63 ml
Cruiser Maxx	325
Dividend	650
Gemini	360

Trials were managed to their respective characteristics found in table 2.

Table 2: Management of each site according to crop production, fungicide application and soil test parameters from 2011-2012.

Site	Previous Crop	Plot Size (m ²)	Seeding Dates	Herbicides Used	Fungicide Application Dates	Harvest Date
Melita	Canola	12.96	Early: Sept 15, 2011 Late: Sept 29, 2011	Glyphosate & Heat (preseed) Achieve & Mextrol - May 8, In-crop Glyphosate (preharvest) - July 23	Early SD: June 12 Late SD: June 15	30-Jul-12
Roblin	Canola	5.00	Early: Sept 15, 2011 Late: Oct 7, 2011	Buctril M & Puma Super, May 30, In-crop	Early & Late SD: June 12 Folicur Early & Late SD: July 3 Prosaro	10-Aug-12
Carberry	Canola	7.20	Early Sept 19 Late Oct 3, 2011	Target @ 0.6L/ac May 16	Early SD: None Late SD: None	02-Aug-12
Arborg	Fallow	8.22	Early: Sept 15, 2011 Late: Sept 29, 2011	Glyphosate preseed Axial June 2, In-crop Target June 5, in crop	Early SD: June 15, 2012 Late SD: June 20, 2012	7-Aug-12

Site	Legal Land Location	Fertilizer Applied	Preseed Soil Test				
			Depth	N	P	K	S
			inches	lbs/ac	Olsen ppm	ppm	lbs/ac
Melita	NW 1-4-27 W1	56 lbs/ac N, 30 lbs/ac P sideband at seeding 46 lbs/ac N, April 4th, spring broadcast	0-6"	14	11	130	14
			6-24"	18			36
			0-24"	32			50
Roblin	NE 20-25-28	110 lbs/ac N broadcast, April 5	Not taken				
Carberry	S1/2 8-11-14W	130 lbs N, 21lbs P Spring broadcast May 10th	0-6"	12	18	310	52
			6-24"				
			0-24"				
Arborg	NW16-22-2E	90lb/ac N deep banded 27lb/ac P with seed 15lb/ac K with seed	0-6"	30	14	278	120
			6-24"	9			120
			0-24"	39			

Data collected included spring plant density, flag leaf date, heading date, grain yield, grain moisture, test weight and sample quality parameters including protein, *Fusarium* damaged kernels. Plant density and yield data was analyzed with an analysis of variance at the 0.90 or 0.95 level of significance using Agrobases Gen II statistical software. Main plot and subplot and sub-subplot treatments were also

analyzed for interaction. Least significant difference (LSD), grand mean, R-squared and probability (P value) of each effect was calculated.

Results

Spring Plant Density

There were significant differences in plant density induced by seeding date in Melita (Table 3). In Melita earlier seeding resulted in a greater plant density than late seeding. In Melita, a late fall drought issue began to take effect in late seeded stands likely reducing their winter survivability in those spring counts. Other stand differences in the other sites did occur likely more by chance since seed treatment would and planting date was not significant enough to bring about real effects in stand density. There were no interactions in the use of seed treatments and seeding dates as well among all sites.

Yield

There were differences in grain yield in all sites at various levels of effects (Table 3). In Arborg, there were greater yields with the use of seed treatments especially with Raxil WW than plots untreated. Arborg did not respond to seeding date or fungicide use. In Melita, seeding date interacted with fungicide use. In Melita, greater yield was obtained in an early seed date with fungicide use or a late seed date without fungicide. Seed date or seed treatments were not responsive in Melita. In Carberry there was no response to seeding date, seed treatments or fungicide (none was applied). Only by chance did early seeded fungicide applications yield greater than others, but based solely on seeding date effect this was not the case. In Roblin, there were significant differences in seeding date, use of fungicide and interaction between fungicide and seed treatments. Roblin resulted in greater yields in later seeded plot than early. Greater yield was achieved by spraying fungicide than not despite seed treatment or seeding date. There was significant interaction between the use of seed treatments and fungicide favoring fungicide application and the use of Raxil WW seed treatment.

Seed Quality

Roblin, Arborg and Melita sent composite samples to the Intertek laboratory (Winnipeg, MB) prior to this report therefore are included. In Roblin, more #1 grades were achieved in early seeding combined with a fungicide application compared to those without a fungicide. However late seeded plots resulted in more or less a #1 grade despite using a fungicide or not. It appeared using a fungicide in general despite seeding dates resulted in a greater test weight. In Arborg, early seeding combine with a fungicide resulted in an improvement in grade from a #3 to a #2 in general and an improvement in test weight. Late seeded crop had few obvious differences in grade and test weight. In Melita, few differences were apparent except in late seeding dates fungicide appeared to improve issues with Fusarium found in untreated fungicide plots. This appears not to have an effect on test weight or protein content.

Table 3: Effect of seeding date, fungicide and seed treatments on plant emergence and yield in Arborg, Melita, Carberry and Roblin trial sites in 2

Effect	Seeding Date	Fungicide	Seed Treatment	Mean Spring Plant Emergence				Mean Grain Yield				Sites Average		
				Plants/m ²				kg/ha				Plants/m ²	kg/ha	
				Arborg	Melita	Carberry	Roblin	Arborg	Melita	Carberry	Roblin			
Seeding Date (SD)	Early			155	197	63	130	4146	4237	2671	2649	136	3426	
	Late			133	171	54	147	4015	4342	2653	3188	126	3549	
Fungicide (F)		Fungicide		152	186	56	146	4078	4317	2796	3427	135	3654	
		No Fungicide		136	182	60	131	4082	4262	2528	2410	127	3320	
Seed Treatment (ST)			Untreated	139	180	56	124	3840 a	4318	2495	2874	125	3229	
			Raxil WW	152	175	60	153	4395 d	4216	2826	3039	135	3361	
			Cruiser Maxx	138	194	63	143	4018 abc	4320	2677	2829	135	3275	
			Dividend	139	184	54	137	4157 bc	4265	2702	2843	128	3270	
			Gemini	151	186	58	137	3989 ab	4328	2609	3005	133	3314	
SD x F	Early	Fungicide		173	197	58	139	4148	4440 b	2933	3161	142	3414	
		No Fungicide		137	197	68	123	4143	4089 a	2430	2062	131	2879	
	Late	Fungicide		130	174	54	153	4010	4249 a	2660	3692	128	3454	
		No Fungicide		135	167	53	141	3991	4434 b	2625	2683	124	3100	
SD x ST	Early		Untreated	159	187	58	114	3753	4295	2585	2823	130	3364	
			Raxil WW	161	193	64	150	4520	4163	2874	2794	142	3588	
			Cruiser Maxx	142	204	67	137	4143	4348	2768	2658	137	3479	
			Dividend	150	209	57	115	4250	4131	2701	2596	133	3419	
			Gemini	161	193	70	137	4063	4358	2609	2620	140	3412	
			Untreated	119	173	53	137	3927	4341	2404	3091	120	3441	
	Late		Raxil WW	144	156	57	155	4302	4269	2843	3285	128	3675	
			Cruiser Maxx	135	185	59	148	3894	4354	2705	3000	132	3488	
			Dividend	127	160	51	158	4064	4399	2704	3173	124	3585	
			Gemini	140	179	47	137	3917	4346	2540	3390	126	3548	
			Untreated	145	188	57	125	3685	4320	2836	3272 de	129	3614	
			Raxil WW	167	182	59	172	4516	4272	2929	3825 f	145	3906	
F x ST		Cruiser Maxx	139	189	59	145	4001	4497	2849	3396 d	133	3782		
		Dividend	149	180	48	148	4221	4347	2722	3152 d	131	3763		
		Gemini	160	190	57	138	4058	4269	2645	3489 def	136	3657		
		No Fungicide	Untreated	133	173	54	128	3995	4317	2153	2551 c	122	3488	
		Raxil WW	138	168	62	133	4350	4160	2771	2254 a	125	3760		
		Cruiser Maxx	138	200	67	140	4036	4229	2596	2262 ab	136	3620		
		Dividend	129	188	60	125	4094	4183	2683	2628 bc	125	3653		
		Gemini	142	183	59	135	3921	4421	2497	2520 c	130	3613		
SD x F x ST	Early	Fungicide	Untreated	165	199	51	123	3558	4615	2899	3048	135	3530	
			Raxil WW	196	187	60	160	4587	4365	3130	3601	151	3921	
			Cruiser Maxx	147	199	57	137	4058	4555	3113	3249	135	3744	
			Dividend	178	197	50	133	4363	4135	2782	2740	140	3505	
			Gemini	179	204	71	140	4175	4632	2739	3168	149	3678	
			No Fungicide	Untreated	154	176	65	100	3948	3974	2272	2145	124	3085
	Early		Raxil WW	126	199	67	140	4453	3960	2490	1987	133	3223	
			Cruiser Maxx	137	208	76	137	4228	4209	2251	2066	140	3189	
			Dividend	123	220	64	97	4137	4127	2619	2163	126	3262	
			Gemini	143	182	68	133	3951	4176	2478	2072	131	3169	
		Late	Fungicide	Untreated	124	177	63	127	3812	4024	2774	3495	123	3526
				Raxil WW	138	176	58	183	4409	4179	2728	4048	139	3841
			Cruiser Maxx	130	179	60	153	3944	4459	2584	3542	131	3632	
			Dividend	120	164	47	163	4078	4560	2662	3564	123	3716	
			Gemini	140	175	43	137	3942	4026	2550	3811	124	3582	
	Late		No Fungicide	Untreated	113	170	43	147	4042	4659	2033	2686	118	3355
			Raxil WW	150	136	56	127	4196	4359	2958	2521	117	3508	
			Cruiser Maxx	139	191	59	143	3845	4248	2826	2457	133	3344	
			Dividend	135	155	56	153	4050	4238	2747	2783	125	3455	
			Gemini	141	183	50	137	3891	4666	2525	2969	128	3513	
		Alpha level (α)			0.05	0.1	0.1	0.1	0.05	0.1	0.05	0.1		
	Coefficient of Variation			26.4	13.9	26.4	21.0	6.0	10.7	15.6	13.1			
	R-Square			0.74	0.51	0.65	0.51	0.69	0.42	0.61	0.84			
	Grand Mean			144	184	58	138	4080	4289	2662	2918			
LSD (p<α)	Seeding Date (SD)		na	13	na	na	na	na	na	na	329			
	Fungicide (F)		na	na	4	na	na	na	na	na	876			
	Seed Treatment (ST)		na	na	na	na	na	205	na	na	na			
	SD x F		28	na	na	na	na	na	284	309	na			
	SD x ST		na	na	na	na	na	na	na	na	na			
	F x ST		na	na	na	na	na	na	na	na	374			
	SD x F x ST		na	na	na	na	na	na	na	na	na			
P Values	Seed Date (SD)		0.65	0.029	0.49	0.23	0.54	0.61	0.88	0.052				
	Fungicide (F)		0.75	0.43	0.089	0.16	0.94	0.71	0.48	0.048				
	Seed Treatment (ST)		0.80	0.43	0.64	0.23	0.0002	0.97	0.43	0.60				
	SD x F		0.041	0.61	0.16	0.67	0.89	0.059	0.029	0.93				
	SD x ST		0.87	0.36	0.58	0.37	0.23	0.97	0.96	0.68				
	F x ST		0.92	0.62	0.78	0.49	0.18	0.88	0.34	0.090				
	SD x F x ST		0.65	0.28	0.49	0.49	0.69	0.22	0.39	0.95				

Seed Quality

Roblin Early Seed Date

Treatment	Grade	Reason for Grade	Dockage %	Protein %	MST %	TWT (kg/hl)	Fus Dmg %	Ergot %
Fungicide Untreated	1 CWRW		1.5	13.2	12.5	79.9	Nil	0.2
Fungicide Raxil WW	1 CWRW		0.9	13.1	12.4	82	0.4	0.004
Fungicide Cruiser Maxx	1 CWRW		1	13.2	12.4	81.8	0.4	Nil
Fungicide Dividend	1 CWRW		1.5	13	12.8	79.7	0.5	Nil
Fungicide Gemini	1 CWRW		1	13.1	12.4	81.2	0.3	Nil
No Fungicide Untreated	2 CWRW	76.7 kg/hl	1.7	13.4	12.5	76.7	0.7	Nil
No Fungicide Raxil WW	1 CWRW		1.2	13.3	12.4	79.5	0.5	Nil
No Fungicide Cruiser Maxx	2 CWRW	78.1 kg/hl	1.5	13.2	12.1	78.1	0.3	Nil
No Fungicide Dividend	2 CWRW	77.9 kg/hl	1.5	13.2	12.3	77.9	0.5	Nil
No Fungicide Gemini	1 CWRW		1	13.1	12.4	81.2	0.3	Nil

Roblin Late Seed Date

Treatment	Grade	Reason for Grade	Dockage %	Protein %	MST %	TWT (kg/hl)	Fus Dmg %	Ergot (%)
Fungicide Untreated	1 CWRW		1.2	12.6	12.4	82	0.2	Nil
Fungicide Raxil WW	1 CWRW		0.9	12.6	12.3	82.4	0.8	Nil
Fungicide Cruiser Maxx	1 CWRW		1.4	13	12.1	81.4	0.3	0.001
Fungicide Dividend	1 CWRW		1.2	12.6	13.4	82.4	0.6	0.02
Fungicide Gemini	1 CWRW		1.2	12.7	12.2	81.8	0.4	0.001
No Fungicide Untreated	1 CWRW		1.2	12.2	12.2	81.6	0.9	Nil
No Fungicide Raxil WW	1 CWRW		2	12.3	11.8	80.7	0.3	Nil
No Fungicide Cruiser Maxx	2 CWRW	0.9% Fus Dmg	0.9	12.3	11.7	79.9	0.9	0.001
No Fungicide Dividend	1 CWRW		1	12.4	12	81.2	0.4	Nil
No Fungicide Gemini	1 CWRW		1.3	12.4	11.9	80.7	0.5	Nil

Arborg Early Seed Date

Treatment	Grade	Reason for Grade	Dockage %	Protein %	MST %	TWT (kg/hl)	Fus Dmg %	Ergot (%)
Fungicide Untreated	2 CWRW	LT.WT.	2.0	13.7	13.0	76.5	1.0	Nil
Fungicide Raxil WW	2 CWRW	1.0% Fus DMG.	1.2	12.9	12.9	77.1	1.0	Nil
Fungicide Cruiser Maxx	2 CWRW	LT.WT.	1.7	13.2	13.0	77.3	0.7	Nil
Fungicide Dividend	2 CWRW	LT.WT.	1.1	12.9	12.9	76.7	0.8	Nil
Fungicide Gemini	2 CWRW	1% Fus DMG.	1.2	13.0	12.9	76.5	1.0	Nil
No Fungicide Untreated	3 CWRW	LT.WT.	1.4	13.8	13.0	75.1	0.6	Nil
No Fungicide Raxil WW	3 CWRW	LT.WT.	1.4	13.2	12.9	75.7	0.8	Nil
No Fungicide Cruiser Maxx	2 CWRW	LT.WT.	1.5	12.8	12.9	76.5	1.0	Nil
No Fungicide Dividend	3 CWRW	LT.WT.	1.2	13.4	12.9	75.5	0.5	Nil
No Fungicide Gemini	3 CWRW	LT.WT.	1.2	13.4	12.9	74.9	0.8	0.002

Arborg Late Seeding Date

Treatment	Grade	Reason for Grade	Dockage %	Protein %	MST %	TWT (kg/hl)	Fus Dmg %	Ergot (%)
Fungicide Untreated	3 CWRW	1.2% Fus DMG.	1.4	13.2	12.7	74.7	1.2	Nil
Fungicide Raxil WW	2 CWRW	LT.WT.	1.3	12.7	12.9	76.5	1.0	Nil
Fungicide Cruiser Maxx	3 CWRW	LT.WT.	1.2	12.9	13.0	74.9	1.0	Nil
Fungicide Dividend	2 CWRW	LT.WT.	1.2	13.2	12.9	76.5	1.0	Nil
Fungicide Gemini	2 CWRW	1% Fus DMG, Lt.Wt.	1.2	13.0	12.9	76.5	1.0	Nil
No Fungicide Untreated	3 CWRW	LT.WT.	1.4	12.8	12.9	75.9	1.0	Nil
No Fungicide Raxil WW	3 CWRW	LT.WT.	1.2	12.6	13.0	75.3	1.0	Nil
No Fungicide Cruiser Maxx	2 CWRW	LT.WT.	1.5	12.8	12.9	76.5	1.0	Nil
No Fungicide Dividend	3 CWRW	1.5% Fus DMG.	1.2	12.8	12.8	76.5	1.0	Nil
No Fungicide Gemini	3 CWRW	LT.WT.	1.7	13.1	12.9	75.7	0.6	Nil

* Analysis by Intertek, Winnipeg

*Fus Dmg = Fusarium Damage

*MST = Moisture

*CWRW = Canadian Western Red Winter

*TWT (kg/hl) = Test Weight in Kilograms per Hectolitre

Melita Early Seeding Date

Fungicide Treatment	Seed Treatment	Grade	Dockage %	Protein %	MST %	TWT (kg/hL)	Fus Dmg %	Ergot %
Fungicide	Untreated	1 CWRW	0.4	12.4	11	81.6	Nil	0.001
Fungicide	Crusier Maxx	1 CWRW	0.4	12.4	10.9	81.4	Nil	Nil
Fungicide	Dividend	1 CWRW	0.5	12.3	10.9	80.7	Nil	Nil
Fungicide	Gemini	1 CWRW	0.4	12.9	10.8	81.8	Nil	Nil
Fungicide	Raxil WW	1 CWRW	0.4	12.3	11	81.2	Nil	Nil
No Fungicide	Untreated	1 CWRW	0.4	12.2	10.9	80.3	Nil	Nil
No Fungicide	Crusier Maxx	1 CWRW	0.4	12.3	11.1	81	Nil	Nil
No Fungicide	Dividend	1 CWRW	0.4	12.3	11.1	81	Nil	Nil
No Fungicide	Gemini	1 CWRW	0.5	12.1	10.8	81	Nil	Nil
No Fungicide	Raxil WW	1 CWRW	0.4	12.1	10.8	80.7	0.1	Nil

Melita Late Seeding Date

Fungicide Treatment	Seed Treatment	Grade	Dockage %	Protein %	MST %	TWT (kg/hL)	Fus Dmg %	Ergot %
Fungicide	Untreated	1 CWRW	0.4	13.4	10.9	81	Nil	Nil
Fungicide	Crusier Maxx	1 CWRW	0.4	13.1	11.4	81.2	Nil	Nil
Fungicide	Dividend	1 CWRW	0.5	13.3	10.9	80.5	Nil	Nil
Fungicide	Gemini	1 CWRW	0.6	13.2	10.9	80.1	Nil	Nil
Fungicide	Raxil WW	1 CWRW	0.7	13.2	10.9	81.4	Nil	Nil
No Fungicide	Untreated	1 CWRW	0.6	12.8	10.9	81.8	0.1	Nil
No Fungicide	Crusier Maxx	1 CWRW	0.5	13	10.8	81	Nil	0.001
No Fungicide	Dividend	1 CWRW	0.4	12.9	10.9	80.3	Nil	Nil
No Fungicide	Gemini	1 CWRW	0.5	12.8	10.9	81	Nil	Nil
No Fungicide	Raxil WW	1 CWRW	0.5	12.9	10.9	83	0.1	Nil

* Analysis by Intertek, Winnipeg, MB. MST = Moisture TWT = Test Weight Fus Dmg = Fusarium Damage
CWRW = Canadian Western Red Winter

Discussion

Results are from four sites in one year. Multiple years and multiple site data analysis would be more desirable to draw conclusions from based on variable environmental and climatic differences from one year to the next. Incidence of Fusarium was not a great concern in 2012 but has been much greater in the past years. In addition, it should be noted that leaf disease was rather low as well in 2012. The fall of 2011 also experienced a warmer than normal late fall and a rather snowless warm winter therefore pressure from winterkill was rather low. Adding to this, lack of saturated soil moisture resulted in low seed borne disease issues. In general, it was a good year for winter wheat production.

This study suggests that fungicide application is important even during a low risk FHB risk. Fungicide appeared to make the difference between low grade wheat and a higher grade, in addition to increased yield. This research also suggests that depending on the seeding date used, this date can lead to certain crop developmental stages that are at a greater or lesser risk to FHB. Note that risk of FHB is depended on the environmental conditions at play within that time of the wheat's developmental stage. A producer should be aware of the regional and local FHB risk when their crop is most at a developmental growth stage risk (between flag and flower). Seed treatment effects were minimal except Arborg and Roblin which show some benefit.

If conditions are in favor for high seed borne disease or FHB infection, producers should take the necessary precautions to protect their crop. MAFRI usually updates a FHB risk map in the spring for

producers to forecast their field applications of fungicide. Other tools like www.weatherfarm.com can assist producers in making those decisions in their region.

Seeding into standing stubble with proper snow catching capability will also insure that stands remain protected during the cold winter/spring months. In the fall of 2012, many field of winter wheat in Manitoba did not germinate well into October despite being seeded in early September. Many seeds will have sprouted but failed to emerge making for an interesting spring scenario on winter survivability. Producers should pay attention to soil temperatures in March and April and assess stand performance in late April. As for now at least there is stubble with modest snow cover to help protect stands.

Reference

University of Saskatchewan. Winter Cereal Production Manual. Available Online: http://www.usask.ca/agriculture/plantsci/winter_cereals/index.php

Korean Rye Variety Trial

Cooperator: Boissevain Select Seeds - Wes Froese, Boissevain, MB

Introduction

Rye is used all over the world not only as a grain crop but as a cover crop. In Korea, rye is subsidized by the Korean government for farmers to use in their fields as a cover crop. Seed production is limited in the country so they seek additional sources of rye around the world. Apparently the variety 'Goku' is of particular interest there for whatever reason. 'Goku' seed was acquired from Boissevain Select Seeds to tests its' performance in southwest Manitoba. Rye is one of the most winter hardy crops in Manitoba; however given this variety is from Korea, WADO was unsure of its true winter hardiness and growth characteristics.

Methods

Large blocks were grown near Boissevain, as well as replicated small plots in Melita, MB. In Melita, plots were seeded September 29, 2011 on the legal land location of NW 1-4-27W1, a Mentieth sandy loam. Varieties were seeded in a randomized complete block design and replicated three times. Varieties used were Danko, Hazlet and Goku. Seeding depth was 0.5" deep. Target seeding rate was 250 plants/m². Thousand kernel weight (TKWT) and germination was measured and seeding rates were determined with estimated germination values. Real germination were assessed later and found to be different (Table below).

Variety	TKWT g/1000 seeds	Est. Germ %	Real Germ %	Seeding Rate lbs/ac
Hazlet	35.3	95	77	83
Drako	35.6	95	90	83
Goku	26.1	95	90	61

Fertilizer was side band during seeding at a rate of 56 lbs/ac nitrogen (28-0-0 UAN) and 30 lbs/ac phosphorous (11-52-0 MAP). Plots were topdressed later in April of 2012 with 56 lbs/ac nitrogen using 46-0-0 urea. Plots dimensions were 1.44 m wide by 9 m long. Plots were sprayed with Achieve and Mextrol 450 herbicides on May 8th at recommended rates. Plots were monitored during the seasons for

emergence in the fall and spring, crop height, lodging, bushel weight, seed yield, seed moisture, flower and maturity dates. Plots were harvested July 31st. Variety data was subject to a two-way analysis of variance (ANOVA) using Anlayze-it v2.03 statistical software.

A soil temperature probe was place near the plots in January to assess ground temperatures during the spring freeze-thaw season (Graph 1).

Fall Soil Test Prior to Seeding

Site	Legal Land Location	Previous Crop	Depth	N	P	K	S	pH
				lbs/ac	Olsen ppm	ppm	lbs/ac	
Melita	NW 1-4-27 W1	Canola	0-6"	14	11	130	14	7.8
			6-24"	18			36	
			0-24"	32			50	

Results

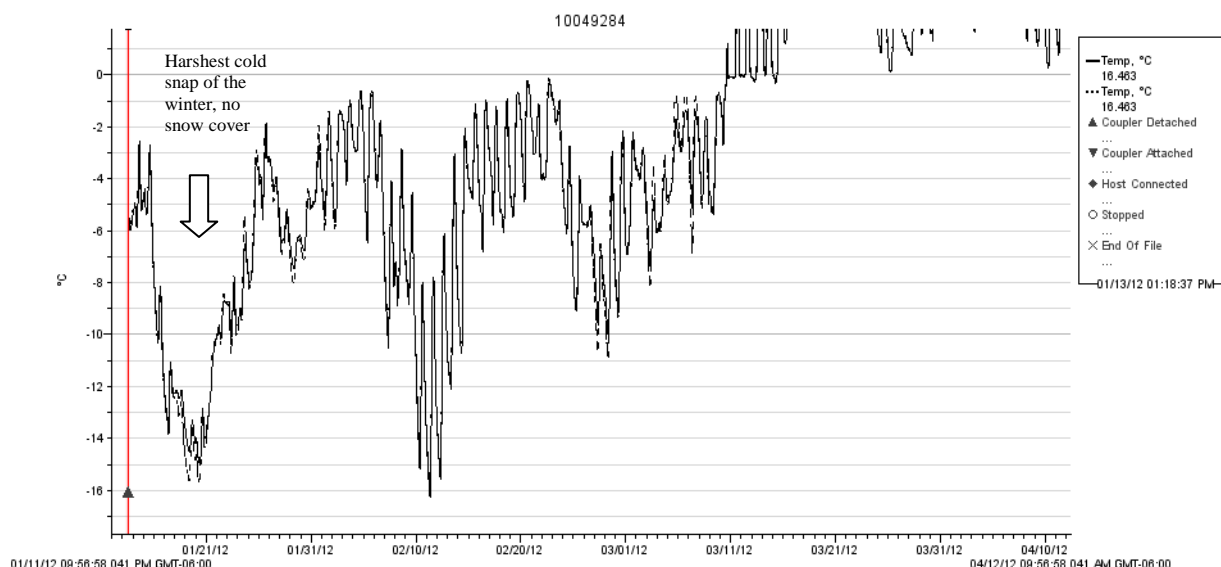
Emergence was similar among varieties in both fall and spring counts. The spring emergence values among varieties suggests that Goku has similar winter hardiness as the Canadian varieties given the conditions that winter (see temperature probe - Graph 1). Snow fall was well below normal which would have magnified the effects of winter kill. Goku plant height and lodging was similar to Hazlet and Danko.

There were significant differences among varieties with respect to bushel weight and yield. Goku was characterized as having a lighter bushel weight compared to Danko and Hazlet. Seed yield for Goku was nearly half of that of Danko and Hazlet; and Danko was superior to Hazlet.

Variety	Fall Emergence (pl/m)	Spring Emergence (pl/m)	Height (cm)	Lodging (1-9, 9=flat)	Bushel Wt. lbs/ avery bu	Yield		Date of Flower	Date of Maturity
						kg/ha	bu/ac		
Danko	32	48	122	1	56.8	7031	110	12-Jun	23-Jul
Goku	34	41	118	1	53.7	2940	49	12-Jun	23-Jul
Hazlet	41	41	122	1	57.2	6118	95	12-Jun	23-Jul
CV%	14.4	17.6	3.2	-	1.0	7.7	6.2	-	-
LSD (p<0.05)	NS	NS	NS	NS	1.3	934	12	NS	NS
R squared	0.67	0.39	0.50	1.00	0.94	0.98	0.99	-	-
P value	0.16	0.48	0.54	-	0.0037	0.0006	0.0003	-	-
Grand Mean	36	43	121	1	55.9	5363.0	84.7	12-Jun	23-Jul

Composite samples were sent to a laboratory (Intertek, Winnipeg MB) for quality testing and grading (table below).

Variety	Grade	Reason for Grade	Dockage %	TFM %	TWT (kg/hL)	Sprouted %	Moisture %	Ergot %	Comments
Hazlet	1 CW		2.7	0.1	74.6	0.1	11.7	0.04	0.1 Wheat
GoKu	Sample Account Ergot	0.9 Ergot	5.6	0.1	69.1	Nil	11.2	0.9	0.1 Wheat
Danko	2 CW	0.06 Ergot	2	Nil	73.4	Nil	11.2	0.06	



Graph 1: Soil Temperature of rye plots during the winter and spring months in Melita from January to April. Temperatures reaching -15°C a couple times in January and February, then -9°C in March possibly causing some winterkill stress.

Conclusion

Ergot test results indicated that Goku was highly infested by Ergot disease compared to Hazlet and Danko. In addition, Goku proved to yield much lower than the Canadian varieties as well. However, given its small seed weight compared to Danko and Hazlet, less freight would be needed to transport seed to the end user in order to establish populations in the field thus reducing production costs. Goku also exhibited early season (May-June) vigor superior to Danko and Hazlet. This characteristic may be desirable in terms of weed competition desired by cover crop systems.

Photos: (Left) Near Boissevain, large block site of (L-R) Hazlet, Goku and Danko rye. (Right) Goku rye heads.



Secan – PepsiCo (Quaker) Oats Variety Trial

Cooperators: Secan Seeds
PepsiCo

Background (taken from Wikipedia)

Oat bran is the outer casing of the oat. Its consumption is believed to lower LDL ("bad") cholesterol and possibly reduce the risk of heart disease. Oats contain more soluble fibre than any other grain. One type of soluble fibre, *beta-glucans*, has proven to help lower cholesterol.

After reports of research finding that dietary oats can help lower cholesterol, an "oat bran craze" swept the U.S. in the late 1980s, peaking in 1989, when potato chips with added oat bran were marketed. The food fad was short-lived and faded by the early 1990s. The popularity of oatmeal and other oat products again increased after a January 1998 decision by the Food and Drug Administration (FDA), when it issued a final rule that allows food companies to make health claims on food labels of foods that contain soluble fibre from whole oats (oat bran, oat flour and rolled oats), noting that 3 grams of soluble fibre daily from these foods may reduce the risk of heart disease. To qualify for the health claim, the whole oat-containing food must provide at least 0.75 grams of soluble fibre per serving.

A class of polysaccharides known as beta-D-glucans comprise the soluble fibre in whole oats. Beta-D-glucans, usually referred to as beta-glucans, comprise a class of indigestible polysaccharides widely found in nature in sources such as grains, barley, yeast, bacteria, algae and mushrooms. In oats, barley and other cereal grains, they are located primarily in the endosperm cell wall.

Oat beta-glucan is a soluble fibre. In comparison, the indigestible polysaccharide cellulose is also a beta-glucan, but is not soluble. The percentages of beta-glucan in the various whole oat products are: oat bran, greater than 5.5% and up to 23.0%; rolled oats, about 4%; and whole oat flour about 4%.

The food and beverage company PepsiCo has partnered with Secan Seeds to evaluate varieties of oats keeping these beta-glucans in mind, while evaluating growth characteristics, yield and milling quality. The purpose being to find the best milling oat, with the best marketable beta-glucan content, that farmers will want to grow.

Trials were set up around the Prairies by Secan and PepsiCo with cooperation of research groups like WADO, to evaluate some classic and some new varieties of oats available and assess the geographical/environmental parameters that affect the quality and quantity of the oats being grown. One of these trial sites were grown in Melita by WADO.

Methods

Twelve varieties were arranged in a randomized complete block design and replicated three times. Trial area was burned off with glyphosate (NuGlo) and Cleanstart herbicides tank mixed at a rate of 0.75 L/ac and 20 ml/ac, respectively. Plots were direct seeded into summerfallow at a depth of 5/8" using a Seedhawk dual knife opener. Fertilizer was sideband at a rate of 92 lbs/ac actual nitrogen and 30 lbs/ac actual phosphorous using 28-0-0 UAN and 11-52-0 MAP. Plots were kept weed free by spraying in crop with Stampede EDF herbicide tank mixed with MCPA ester 500 at a rate of 1.25 lbs/ac and 0.5 L/ac, respectively. Herbicides were tankmixed and applied May 28 with a water volume of 20 gal/ac. Plots were desiccated with glyphosate (Maverick III) and Heat herbicide a full maturity at a rate of 1 L/ac and

10 g/ac, respectively. Plots were harvested August 16 with a Hege 140 plot combine. Data collected throughout the season included percent stand, days to maturity, crop height, lodging, leaf disease rating on *Septoria* and Barley Yellow Dwarf Virus (BYDV), test weight, sample moisture and yield. Plot samples were combined by variety and sent to PepsiCo for milling and beta-glucan content analysis (results confidential).

Data was analyzed with a two-way analysis of variance (ANOVA) using Analyse-it 2.03 statistical software (Microsoft). Pearson correlation was also used to determine the relationship between some of the characteristics collected (ex. DTM and bushel weight). Coefficient of variation (CV), least significant difference (unprotected), grand mean and R-squared were calculated.

Results

There were significant differences among all characteristics except BYDV (Table). Highest yielding oat variety was BetaGene but was not significant different from several other varieties such as OT3056, Souris, Bradley, OT3056, OT3068, OT3061 and CDC Dancer. Interestingly, there was a significant negative correlation between DTM and bushel weight, [$r(43) = -0.44$, $p < 0.003$]. It was speculated that lack of rain during the crucial stage of early dough stage likely contributed to lower bushel weights in later maturing varieties. Measurement of seed weights in correlation with the varieties maturity would help support this. Seed weights were not recorded by WADO. There was no significant correlation between DTM and final yield [$r(43) = -0.22$, $p < 0.155$], or *Septoria* incidence and final yield [$r(43) = -0.20$, $p < 0.195$].

Variety	DTH days	DTM days	Height cm	Lodging 1-9, 9 flat	Septoria 1-11, 11 severe	BYDV 1-5, 5 severe	Bushel Weight lbs/bu (avery)	Yield kg/ha
BetaGene (WI8787-1)	53.0	79.7	98	1.0	3.7	2.7	39.8	4266
OT3056	55.7	84.0	105	1.0	3.7	2.0	39.0	4109
Souris	53.0	79.0	93	1.7	4.3	2.3	40.8	4108
Bradley	54.7	82.0	102	1.0	3.7	2.0	37.6	4017
OT3065	53.0	80.3	98	3.3	5.0	2.7	40.8	3979
OT3068	56.7	84.0	103	1.0	4.3	1.3	39.3	3897
OT3061	55.3	83.3	103	1.0	3.3	2.0	40.8	3877
CDC Dancer	54.0	81.7	102	1.0	4.0	2.7	40.8	3871
OT3054	55.7	83.7	93	1.0	3.3	2.7	37.5	3730
Leggett	55.0	83.7	90	1.0	4.0	3.0	40.3	3711
CDC Morrison	53.3	80.3	92	1.0	5.0	3.3	40.5	3665
AC Morgan	54.7	83.7	100	1.0	5.3	2.0	36.3	3655
OT3063	56.0	83.7	85	1.0	4.3	3.0	37.7	3625
ND090011	54.3	81.0	100	3.0	3.7	2.7	38.5	3560
OT3070	54.0	82.3	97	1.0	5.0	3.0	40.4	3336
CV%	1.4	0.7	3.2	53.3	15.7	28.2	2.1	6.7
LSD ($p < 0.05$)	1.3	1.0	5	1.2	1.1	1.2	1.4	427
P value	<0.0001	<0.0001	<0.0001	0.0024	0.0070	0.1071	<0.0001	0.0100
Grand Mean	54.6	82.2	97.4	1.3	4.2	2.5	39.3	3827
R squared	0.80	0.93	0.85	0.65	0.67	0.63	0.83	0.64

DTH – days to heading

DTM – days to maturity (rachis turns brown above seed)

BYDV – Barley Yellow Dwarf Virus

Participatory Wheat Breeding Project

Partners: University of Manitoba
Iris Vaisman – Technician, Department of Plant Science
Gary Martens – Professor, Department of Plant Science
Agriculture and Agri-Food Canada
Stephen Fox

Location:

Melita, MB

Land Cooperator: Wayne White

Previous Crop: Summer Fallow

Location: NE 36-3-27 W1

Soil Texture: Liege Sandy Loam

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 is 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

A PPB also fights the loss of agricultural diversity or agrobiodiversity. The loss of agrobiodiversity in turn leads to a reduction in the capacity of agricultural ecosystems to continue producing renewable resources (<http://www.idrc.ca>). It also limits the ecosystem's ability to deal with change. The PPB program is a way to recognize the key roles of farmers and their knowledge and social organization in the management and maintenance of agrobiodiversity.

Developing close farmer-researcher collaboration and a clear vision together with the stakeholders in the breeding process is important.

2012 Summary

In 2012, WADO grew three lines of wheat including BJ25A-N, BJ10A-N and BJ11A-N of which were the F4 seed based selections from 2011's F3 generation. A separate microplot of individual rows of industry standard varieties was grown and used as a comparison during the selection process. These common varieties included: Unity, BW430, Vesper, Somerset, BW429, Superb.

During the season, plants were removed (negative selection) that were inferior in each plot. Characteristics such as leaf disease, *Fusarium* infected heads, smut and bunt, weak, short plants and small heads were often pulled. Well after maturity on August 30, 300 of the most desirable heads were picked (positive selection) to be sent back to the University of Manitoba for threshing. These seeds are

to be used again in the 2013 season for another selection. Heads were chosen by and in preference of large size, shatter tolerance, taller heights, even head height development and *Fusarium* tolerance. WADO students often found that the closer to 300 heads was reached the harder the selections were to make.

The F5 generation will be grown at WADO again in 2013, of which selection will be made again and used as lines in Stephen Fox's breeding trials.

Photos: (Left) Bucket full of 300 desirable wheat heads of the BJICA-N line. (Right) Three plots of wheat lines compared to the industry standards on deep right side.



For more information regarding the participatory wheat breeding program, please contact the University of Manitoba:

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Western Feed Grains Development Cooperative Variety Trial

Cooperators:

Westman Agricultural Diversification Organization – Melita, MB

Prairies East Sustainable Agriculture Initiative – Arborg, MB

Parkland Crop Diversification Foundation – Roblin, MB

Canada-Manitoba Crop Diversification Centre – Carberry, MB

Ag-Quest Inc. – Minto MB – Mitch Bohrn, Dana Rourke

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 WFGD 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.

The Co-op has selected WFT 603 as a superior line from the co-op's 600 series. WFT 603 has a good disease package and preliminary trials have shown that it is 98% of the yield of check AC Andrew. This line will be eligible for "Request for Support for Registration" at the PGDC Meetings in February 2013. Based on the data collected in the past couple years the co-op has identified that there may be potential in the following lines: WFT 717, WFT 736, WFT 805 and WFT 813. The winter nursery has been planted by Research Designed for Agriculture in Yuma, Arizona again this year and consists of multiplication of superior lines and also the advancement of early generations (F1-F6) within the program.

A partnership has been underway for several years between the coop the Manitoba Diversification Centres. Regional variety trials have offered insight into variety strengths and weaknesses over a variety of year, sites, climatic conditions and soil types.

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. Melita site was planted into a Liege loam on Souris River flat, while the Hamiota site was planted on a Newdale clay loam. Soils in

Arborg and Roblin are clay and loamy textures, respectively. In Carberry, soils are clay loam textured. Seeding dates, seeding fertility, weed control and harvest dates varied among sites (Table 1).

Table 1: Seeding date, fertility regime, herbicide use and harvest dates for Hamiota, Roblin, Carberry and Melita sites.

Location	Seed Date	Fertilizer Applied	Herbicides	Harvest Date
Melita	9-May	93 lbs/ac from 28-0-0, 11-52-0 30 lbs/ac from 11-52-0	Glyphosate & Heat, preseed Simplicity & Mextrol, incrop	Aug 21 & 23
Hamiota	22-May	63 lbs/ac from 28-0-0, 11-52-0 30 lbs/ac from 11-52-0	Glyphosate & Liberty, preseed Puma & Attain, incrop	6-Sep
Roblin	9-May	60 lbs/ac N, 30lbs/ac P 10 lbs/ac K, 10 lbs/ac S	Glyphosate, preseed Barricade & Axial, in crop	29-Aug
Arborg	10-May	90lb/ac N, 27lb/ac P, 15lb/ac K	Glyphosate preseed Target & Axial, Incrop	20-Aug

Soil tests were taken prior to seeding at each site (Table 2).

Data collected included, plant stand, heading dates, lodging, plant height, leaf disease, shatter loss, test weight, maturity, grain yield and moisture. Data was analyzed with an analysis of variance using Agrobases Gen II statistical software at the 0.05 level of significance.

Site precipitation is summarized in the next table according to each site collected from May 9 to August 17. Data taken from Manitoba Ag-Weather Program.

Site	Actual Precip. (mm)	Normal Precip. (mm)	% of Normal
Roblin	308	208	148
Hamiota	218	216	101
Melita	165	259	64
Arborg	253	222	114

Table 2: Soil fertility levels and rotation prior to seeding of the trial at each location.

Location	Legal Land Location	Plot size (m ²)	Previous Crop	Soil Test				
				Depth	N	P	K	S
				inches	lbs/ac	Olsen ppm	ppm	lbs/ac
Melita	NE 36-3-27 W1	12.96	Chemical Fallow	0-6"	11	4	189	54
				6-24"	15			36
Hamiota	NE 18-14-23 W1	12.96	Canola	0-6"	17	28	437	12
				6-24"	45			54
Roblin	NE 20-25-28 W1	5.00	Silage Corn	0-24"	82	6	177	88
Arborg	NW 16-22-2 E1	8.22	Fallow	0-6"	30	14	278	120
				6-24"	9			

Results

There were significant yield differences among all sites (Table 3). Several of the varieties listed in the introduction were top yield performers such as WFT 805, WFT 603, WFT 717 and WFT 736. Many of these had higher mean test weights as well.

Table 3: Mean days to heading, days to maturity, height (HT), test weight and yield (in kg/ha and bushels per acre) of each variety in Roblin, Arborg, Melita and Hamiota.

Variety	Heading days	Maturity days	HT cm	Test Wt lbs/bu	Mean Yield (kg/ha)					Mean bu/ac
					Roblin	Arborg	Melita	Hamiota	Mean	
WFT 805	58	96	76	58	3024	3190	3587	4330	3533	54
WFT 603	56	96	76	58	2890	2694	3529	4574	3422	53
WFT 717	59	98	68	58	3201	2590	3160	4661	3403	53
WFT 728	58	96	81	59	2979	2754	3299	4560	3398	52
5702PR	57	95	70	58	2410	2673	4113	4130	3331	51
WFT 806	55	92	70	56	3250	2648	3228	4199	3331	53
WFT 736	57	99	83	58	2470	2913	3669	4161	3303	51
AC Sadash	59	98	109	58	2220	2941	3281	4551	3248	50
WFT 705	59	97	88	57	2831	2875	2813	4415	3233	50
WFT 703	59	98	93	58	2917	2672	3089	4215	3223	49
WFT 709	58	97	97	59	2862	2731	3329	3965	3222	49
WFT 816	58	99	97	58	2597	3183	2898	4146	3206	50
WFT 701	56	97	99	57	2113	2735	3501	4423	3193	50
WFT 624	59	98	94	58	2613	2799	3150	4183	3186	49
AC Andrew	58	99	93	53	2548	2867	2887	4382	3171	53
Pasteur	56	97	85	58	1892	2867	3641	3972	3093	48
WFT 409	59	97	76	59	2558	2812	3560	3367	3074	47
WFT 810	57	96	82	59	2262	2890	2928	4192	3068	46
WFT 807	58	97	78	58	2657	2465	3453	3524	3025	46
WFT 813	56	96	79	57	3020	2389	2555	3999	2991	46
WFT 804	57	93	74	57	2246	2178	2966	4405	2949	46
WFT 812	57	95	79	58	2221	2572	2980	3984	2939	45
WFT 801	57	95	66	57	1997	2547	3439	3681	2916	45
WFT 802	56	92	72	56	2523	2631	3154	3297	2901	46
WFT 809	58	95	78	57	1871	2748	2971	3915	2876	45
WFT 803	57	93	68	57	2383	2405	2898	3610	2824	44
WFT 814	57	92	72	57	2391	2311	2686	3691	2770	43
WFT 817	58	95	74	57	2159	2244	3255	3352	2752	43
WFT 811	56	93	75	57	2289	2495	2809	3357	2738	43
WFT 818	58	95	76	58	2301	2418	2730	3402	2712	42
WFT 735	57	94	74	57	1989	2226	3451	3177	2711	43
WFT 808	59	97	85	58	2009	2433	3181	3146	2692	41
WFT 411	58	95	77	59	1980	2204	2764	3601	2638	40
WFT 739	58	95	84	56	1648	2037	3169	3347	2551	41
WFT 815	56	95	78	57	2519	2522	2543	2081	2416	38
Coefficient of Variation (%)					9	8	12	7		
Grand Mean					2453	2619	3162	3886		
LSD (p<0.05)					374	322	599	443		
P Value					<0.0001	<0.0001	0.0121	<0.0001		
R-Square					0.83	0.74	0.51	0.86		

Discussion

On Feb 28, 2013 the WFGDC was proud to announce that variety WTF 603 was approved to be registered with the Canadian Food Inspection Agency in the General Purpose (GP) class by the disease committee.

Producers interested in participating in the coop are encouraged to contact the cooperative headquarters directly at:

Ag Quest
Box 144
Minto, Manitoba
R0K 1M0
Phone: 204-776-5558
Toll Free: 1-877-250-1552
Fax: 204-776-2250
Email: info@wfgd.ca
Website: <http://www.wfgd.ca>



Viterra Soybean Variety Trail

Cooperators: Viterra – Rosebank, MB
MCVET

Site Information:

Melita, MB

Previous Crop: Summer Fallow

Soil Test:

Location: NE 36-3-27

Soil Texture: Liege Loamy Sand

Site	Depth	pH	N lbs/ac	P ppm Olsen	K ppm	S lbs/ac
Melita	0-6"	7.7	17	14	230	94
	6-24"		18			36
	0-24"		35			130

Objective

To evaluate varieties of soybean in terms of agronomic characteristics during the growing season and final yield.

Background

The Viterra location in Rosebank one of the soybean variety trial locations for the MCVET's Seed Manitoba guide. In trade of this work and that WADO is a MCVET partner, WADO hosts a soybean variety trial for Viterra in return. This is the results of that work.

Methods

Trials consisted of 25 varieties of glyphosate tolerant varieties arranged in a 5x5 square lattice design. Varieties were replicated three times. Seed was inoculated with Rhizobia just prior to planting. Plots were direct seeded with a Seedhawk dual knife opener air drill and phosphate was sideband. Plots were 1.44 m wide by 9 m long with six rows at 9.5" spacing. Agronomic parameters for establishment and growing season are summarized in the table below.

Preseed Burnoff	Seed Date	Seed Depth	Fertilizer Applied	Herbicides	App. Date	Dessication	Harvest
Liberty 1 L/ac Glyphosate 0.75 L/ac Rival 0.6 L/ac (tank mixed)	24-May	1"	58 lbs/ac 11-52-0 MAP	Glyphosate applied @ 1.35 L/ac Glyphosate applied @ 0.5 L/ac	13-Jun 05-Jul	Reglone and Glyphosate 0.9 L/ac and 1 L/ac (tank mixed) applied Sep 10	24-Sep

Data collected included height, maturity date and test weight. Plots were harvested with a Hege plot combine at full maturity. Data was analyzed using a two-way analysis of variance (ANOVA) using Agrobase Gen II statistical software.

Results

There were significant differences in crop height, vigor and yield ($p < 0.05$). There were also significant differences in days to maturity ($p < 0.1$). Greatest yield was found with 23-10 RY, but was not significantly different from several other varieties.

Variety	Height cm	Lodge 1-5, 5 flat	DTM days	Vigor 1-5, 5 most	Yield kg/ha
23-10 RY	87	1	108	5	2652
SC 2375 R2	94	1	106	4	2519
24-10 RY	85	1	107	4	2496
Name 67	107	4	105	5	2492
Chadburn R2	90	1	106	5	2488
Thunder	91	1	105	4	2468
NSC Anola RR2Y	97	4	113	3	2455
PR 0083 R2	85	1	109	5	2441
SC 2450 R2	83	1	108	4	2437
Name 99	74	1	97	5	2422
25-10 RY	98	3	108	5	2407
NSC Libau RR2Y	95	1	107	4	2404
NSC Elie RR2Y	100	3	104	3	2387
Vito R2	103	1	103	5	2382
Currie R2	99	1	107	4	2376
NSM Exp. 1225 R2	100	2	98	4	2349
G10 R2	104	4	107	4	2322
Bishop R2	95	2	104	3	2317
G8	93	2	109	4	2311
NSC Richer RR2Y	97	3	110	4	2287
24-61	104	3	109	5	2286
SOOB7	92	2	107	5	2219
PHI 900Y61	87	1	109	4	2185
K08	88	1	110	5	2171
Beurling R2	102	2	107	3	2139
CV (%)	8.9	78.9	4.3	15.0	5.2
Grand Mean	93.9	1.9	106.6	4.2	2377
LSD ($p < 0.05$)	14	2	6	1	202
P value	0.0017	0.2541	0.0753	<0.0001	0.0013
R-square	0.71	0.52	0.46	0.67	0.59

Ukrainian Apical Dominate or Terminal Florescent Soybeans 2012

Cooperators:

Westman Agricultural Diversification Organization

Soya UK Ltd. – Southampton, United Kingdom <http://www.soya-uk.com/SoyaUKseeds/soya.php>

Background

Soybeans are a relatively new crop to Manitoba. Recent developments in plant breeding and genetics have introduced soybean into more northern latitudes increasing acres grown in Manitoba dramatically in the last five years. In addition, farm gate values for soybeans have also increased dramatically making them a very profitable and attractive crop for producers. Crop production limitations are complicated in Manitoba since many producers lack proper seeding and harvest equipment. Soybeans are generally seeded with a row crop planter and are harvested with a flex header. Seeding in Manitoba for most crops is done with a narrow row air seeder and harvest done usually with a ridged header. Ridged headers increase losses in soybean harvest dramatically since soybeans characteristically grow some of their pods very close to ground level. This can vary based on field topography, field stoniness and variety height. Short varieties are generally prone to greater harvest losses when using a ridged header since their internodes are closer together, making the chances of this loss more frequent.

WADO's Scott Day, attended a conference in the UK in 2010. Here he met David McNaughton of South Hampton, UK, who was presenting a few new promising varieties of soybean that expressed an unusual growth habit of soybeans producing pods at the apex of the plant termed terminal florescent. These varieties including 'Elena' and 'Vilshanka' originated in the Ukraine (Kiev Oblast) and 'Pripyat' originating in Belarus (Minsk Oblast). These varieties were imported from Soya UK Ltd from Hampshire in the United Kingdom, to Manitoba, Canada. Phytosanitary certificates had to be applied for from FEMA in the UK to clear the varieties in terms of foreign matter such as weed seeds, dirt and most importantly cyst nematode from the Ukraine. The Canadian Food Inspection Agency accepted the conditions of the seed analyzed by the UK's Department for Environment, Food & Rural Affairs so importation into Canada was granted. 'Elena' and 'Vilshanka' were the two varieties that were successfully imported into Manitoba. They were grown around the province at each of the Manitoba Diversification Centres at Melita and Hamiota, Roblin, Carberry and Arborg. Plant and yield characteristics were collected. These varieties were compared to a roundup ready variety commonly grown in Manitoba called 23-10 RY from Dekalb.

Plant Descriptions

Elena - Елена

Elena was bred by Slava Mikhaylov: <http://uaan.gov.ua/content/mihaylov-vyacheslav-grigorovich>

Bred from multiple individual selection of hybrid populations (Kherson longifolia's Spark) x Kiev 27. Plant height is 85-90 cm. Beans are attached 12-13 cm from lower stalk. Inflorescence - multiflorous tassel on peduncle of 10-15 purple flowers. Beans with 2-3 seeds. Belongs to the Manchurian subspecies adapted to Ukraine. Leaves ternate, with a pointed tip. Seeds are oval, yellow, light brown scar, medium and oval with white hilum. Thousand seed weight is 160-175 g. Maturity in Kiev region is in 102-105 days. Resistant to damage the most common diseases, low temperature during flowering and fruit formation. The seeds contain 41-42% protein and 20-21% fat. Plants are resistant to lodging and pod shelling. In the comparative variety testing at "Shepherds" experimental farm (1999-2002 years) it yielded about 3.2 t / ha.

Vilshanka - Вильшанка

Vilshanka was bred by Slava Mikhaylov: <http://uaan.gov.ua/content/mihaylov-vyacheslav-grigorovich>
Derived from multiple individual selection of hybrid by crossing L.955/Chernyatka. Belongs to the Manchurian subspecies, suited for Ukraine. Plant height is 92-95 cm. Pods are attached 13-15 cm from base of stalk. Seeds oval, yellow, brown scar, medium, with white hilum. Thousand Seed Weight is 240-250 g containing 41-42% protein and 21-22% fat. Maturity in the Kiev region is in 100 to 105 days. Resistant to damage the most common diseases, as well as low temperature during flowering and fruit formation. Variety is recommended for cultivation in the forest-steppe regions of Ukraine. Yield achieved 30-35 t/ha in wide or narrow rows at seeding rates of 650-700 thousand viable seed/ha when grown with use of proper herbicides and agronomic techniques.

Info taken from: http://www.nbu.gov.ua/portal/Chem_Biol/Sin/2011_100/306.pdf

Both Ukrainian varieties are marketed by either/or of these companies:

<http://sanbinos.narod.ru/company/>

<http://novasoya.jimdo.com/>

23-10 RY (local Manitoba Variety)

Bred by Dekalb as a GENRR2Y. Plant is 66 cm in height compared to Elena and Vilshanka at 88 and 75 cm, respectively. Resistant to shatter compared to Elena and Vilshanka. Corn Heat Unit rating is 2325. Intermediate growth habit. Hilum color is black. Susceptible to cyst nematode. Purple flower color. Tawny pubescence color. Approximately 2600 seeds per pound. High protein content, average oil content.

Info taken from: <https://www.dekalb.ca/Western/Products/Soybeans/Documents/23-10RY.pdf>

Table: Variety characteristics in 2012 plot trials in Melita MB.

Variety	Maturity days	Emergence p/m2	Plant Height cm	Seed Wt grams/100 seeds	Test Wt g/0.5L	Yield kg/ha	Shatter %
23-10YR (check)	104.7	62.1	66.7	15.6	374.1	1570.4	0
Elena	112.0	43.5	88.3	13.4	371.4	1239.4	1
Vilshanka	112.0	13.1	74.7	16.4	374.6	1408.7	40
CV%	2.3	37.4	3.2	2.8	1.6	5.1	-
LSD (p<0.05)	5.8	33.5	5.6	1.0	NS	164.1	-
R-squared	0.83	0.81	0.97	0.95	0.18	0.99	-
Significant	Yes	Yes	Yes	Yes	No	Yes	-
P value	0.0389	0.0372	0.0011	0.0023	0.7909	0.0001	-

Shatter rating was taken just prior to harvest on September 18. Yields are not corrected for shatter losses.

Trial Comments

Plots were seeded May 17th at a depth of 1 inch. Fertilizer was side band at 58 lbs/ac as granular 11-52-0 MAP. All varieties were seeded with granular inoculant containing soybean rhizobia (Becker Underwood).

Herbicides used were Arrow (150 ml/ac @ 10 gal/ac) and Basagran Forte (0.91 L/ac @ 20 gal/ac). Basagran was used as a single rate June 12th then as a double pass rate June 20th. The second application did not harm the soybeans and actually controlled cattails growing in the plot.

Plots were harvested September 18th, same day as the shatter rating.

The terminal florescence characteristics were somewhat variable in expression among the Ukrainian Varieties. The variety 23-10 RY does not express this trait.



Vilshanka

Elena

23-10RY (check)

Vilshanka germination prior to seeding was very poor with a 30% germination rate. Seeding rates were tripled in order to make up for this, however field germination was poor resulting in both low plant populations and yield. Shatter losses in Vilshanka may be attributed to spacious planting emergence. Its' true morphological growth habit and yield may have not been captured in this trial. Seed has been saved for 2013 trials with greater quality in hopes that a more fair trial will prevail.

Economic and Ecological Implications of Volunteer Canola in Soybean

Dr. Rob Gulden & Paul Gregoire (M.Sc. candidate)

Funded by Agri-Food Research Development Initiative (ARDI)

Based on seeded acreage, soybean has recently risen to be the third most abundant crop in Manitoba behind wheat and canola. Volunteer canola is a common agricultural weed found in canola growing areas where it often ranks in the top 10 weeds in fields after in-crop weed control. Large harvest losses and the potential to develop seed dormancy in the seedbank lead to seedbank persistence of this species that rivals common agricultural weeds. In western Canada, volunteer canola seeds can persist for at least 3-4 years in the seedbank. Herbicide-resistance traits make it difficult to manage volunteer canola in soybean crops as no effective in-crop herbicide options may be available. Uncontrolled, volunteer canola can lead to loss in soybean yield and contribute to future volunteer canola populations. How detrimental volunteer canola populations are to soybean yield is not known. The goal of this research project is to determine how much yield loss can be caused by volunteer canola in soybean and what is the economic threshold of volunteer canola in soybean.

Field studies are being conducted to establish an economic threshold of volunteer canola in soybean. Each field study will assess the effect of increasing glyphosate-resistant, volunteer canola density on soybean yield loss. The experiment will be conducted in soybeans planted in narrow and wide rows and volunteer canola densities will range from none to several hundred plants per square meter. The studies were conducted at the Westman Agricultural Diversification Organization Research Farm at Melita, MB, the Ian N. Morrison Research Farm in Carman, MB, the Richardson Research Farm at Kelburn, MB and will be repeated at these locations in 2013.

In addition to soybean yield, several other soybean response variables will be evaluated. These will include soybean densities, height, number of branches, biomass and leaf area at select sample dates. At harvest, final yield, seed moisture content and soybean seed size will be determined. To determine volunteer canola seed contributions to the seedbank, volunteer canola biomass and seed return will be determined at physiological maturity.

Standard mathematical and statistical approaches will be used to determine economic thresholds from the yields obtained at various volunteer canola densities. These data will be subjected to equation fitting to generate yield loss equations that will be used to calculate economic thresholds for volunteer canola in soybean. Examples of the outcome of this research can be found on the tables on pages 31 to 37 of the 2013 Guide to Crop Protection. Data from the first year of this field study have been collected and are being evaluated.

Including soybean in crop rotations in Manitoba offers a number of benefits. One of the challenges to effective soybean production in western Canada seems to be volunteer canola which is an obvious and difficult to manage weed in this crop. In order to fully understand the intricate effect of volunteer canola on soybean production, we need to determine soybean yield loss and economic thresholds and seed return of volunteer canola in soybean. To minimize volunteer canola in soybean, effective integrated management strategies that target the volunteer canola seedbank, seedlings and seed return of volunteer populations are required. Future herbicide-resistance traits are expected to assist with managing volunteer canola in soybean.



Photo: Field trials in Melita, wide row spacing on August 15, 2012

Growth Development Modeling of Manitoba Oilseed Crops

ARDI Report Project: 12-1146

Commodity Lead : National Sunflower Association of Canada
Funded by: Agri-Food Research Development Initiative (ARDI)
Principal Investigator: Anastasia Kubinec (Crops Knowledge Centre) -
 Manitoba Agriculture, Food and Rural Initiatives
Site Investigators: Paula Halabicki (Arborg) - Manitoba Agriculture, Food and Rural Initiatives
 Scott Chalmers (Melita)- Manitoba Agriculture, Food and Rural Initiatives
 Craig Linde (Carberry)- Manitoba Agriculture, Food and Rural Initiatives

Background and Objectives

The Manitoba crop growing region is widely variable in regards to daily temperature and accumulation of heat. The impact is differing amounts of days that a crop takes to reach specific growth and development milestones at specific locations. With the expansion of new oilseed crops like soybeans and increased interest in other oilseed crops like sunflower, a better understanding of the impact of temperature and influence of Growing Degree Days (GDD) accumulation on growth development is needed. Calculated GDD with available web-based or home weather monitoring systems are available to farmers and could be used as another risk management tool to assess the viability of introducing other oilseed crops in rotations or success in planting in late seasons.

GDD growth and development models are publically available for the 'traditional' oilseed crops canola and flax (print format and on-line Growers Guides from Canola Council of Canada and Flax Council of Canada). Soybean models have been proposed and sunflower models have been developed. Both have been tested in the United States using varieties that Manitoba farmers may not have access to. The models should still be applicable to Manitoba conditions, but the testing and verification has not been published.

Using accepted canola and flax GDD models, the intent of this project was to examine the applicability of the GDD models developed for soybean and sunflower under Manitoba conditions.

Locations proposed in the application were Arborg, Carberry, Carman, Melita and Roblin. Roblin (Parkland Diversification Research Foundation) was not planted.

Carman location was planted on May 11th, May 24 and June 12th. Site had excess green foxtail weed problems. Herbicide control measures to control the green foxtail had spray drift and crop damages occurred. Site was terminated in mid-July.

Arborg location was planted on May 31st, June 7th and June 14th. Data for days to reached growth and development milestones was only taken on the first replicate and not all milestones achievement dates recorded. Data has been excluded from the report due to concerns with reliability of the data as records are incomplete.

Carberry location was planted May 12th, May 22nd and May 31st. Stage development observations have been included in this report. No yield data has been received.

Melita location was planted on May 15th, May 24th and June 4th. Stage development observations have been included in this report. Yield data was received for canola, flax and soybean. Bird predation in the sunflower plots made data unusable.

Trial Methodology

Five locations were selected that had notably different accumulations for GDD throughout the season (Table 1). These areas also represented

- locations where all four oilseed crops have typically been grown (Carman, Melita),
- areas where soybean and sunflower are expanding into (Arborg and Carberry), or
- where soybean and sunflower are not typically grown.

Table 1: Growing Degree Days (GDD) Accumulation at 5 Locations in Manitoba from Short-Term Weather Data and 30 year Averages.

	Carman	Melita	Arborg	Carberry	Roblin
GDD base 0°C (May 1-Oct 1)	2381	2332	2303	2269	2133
GDD base 5°C (May 1-Oct 1)	1674	1633	1618	1577	1443
GDD base 6.7°C (May 1-Oct 1)	1445	1407	1396	1357	1224

Source: Manitoba Ag-Weather Program (2006-2011)

Crop varieties and seeding rates were established by the Principal Investigator and pre-packaged based on pre-determined plot size at each location. The crop variety and seeding rate were as follows:

Canola (variety = 5440)	(seeding rate 5.5 lbs/ac)
Flax (variety = AC Lightning)	(seeding rate 45 kg/ac)
Soybean (variety = NSC Anola)	(seeding rate 210,000 seeds/ac)
Sunflower (variety = 6946)	(seeding rate 20,000 seeds/ac)

The trials were established in Carman, Carberry, Melita and Arborg and consisted of three planting dates for the four crop types and three replicates (12 plots/replicate, 36 plots total), with the targeted planting timelines were May 1-14, May 15-31 and June 1-10.

Data to be recorded was days from seeding to growth stage milestones and harvest yields. Pre-determined growth and development milestones (Table 2) were to be recorded on all plots as they were achieved from the time of seeding to plot harvest or November 1st, whichever was earlier.

All information was submitted to the MAFRI Oilseed Crop Specialist to determine the GDD accumulation from time of seeding to growth and development milestone stage and examine the observations from 2012 and compare to the models.

Table 2: Growth and Development Milestones by Crop Type

Canola		Flax		Sunflower		Soybean	
Stage	Description	Stage	Description	Stage	Description	Stage	Description
1	Emergence	1	Emergence	VE	Emergence	VE	Emergence
1.2	2 leaves unfolded	1.2	2 leaves unfolded	V6	6 leaves unfolded	V1	Unifoliate
1.6	6 leaves unfolded	1.6	6 leaves unfolded	V12	12 leaves unfolded	R1	Flower induction
3	Bolting begins	---	---	R2	Immature bud elongates above the nearest leaf attached to stem	R2	First Flower developed
6	Flowering begins, at least 1 flower open on 50% of plants	6	Flowering begins, at least 1 flower open on 50% of plants	R4	Inflorescence begins to open. When viewed from above immature ray flowers visible.	R3	First Pod developed
6.5	Flowering at 50% complete	6.5	Flowering at 50% complete	R5.1	Beginning of flowering with 10% disk flowers opened	R5	First Seed developed
6.9	Flowering complete	6.9	Flowering complete	R6	Flowering complete and the ray flowers are wilting	R6	End leaf formation
8.1	10% seeds have changed color	8.1	10% seeds have changed color	R7	Back of the head has started to turn a pale yellow color.	R7	End pod formation, pods turning brown
8.5	50% seeds have changed color (indicates time of swathing)	8.9	90% seeds have changed color	R9	Bracts become yellow and brown. Physiological maturity.	R8	Physiological maturity

Results and Discussion

The summer of 2012 for Manitoba, was very warm (Table 3), as well as dry into late August and September (Table 4). As a result, the calendar days between seeding and maturity were much shorter than what is considered normal. For example, farmers in Manitoba expect to be swathing canola 95-102 days after planting, flax 85-100 after planting, combining sunflowers and soybean 115-130 days after planting (Agricultural Climate of Manitoba, Crops Knowledge Centre).

Once calculated, the actual calendar days (Tables 5, 7, 9 and 11) required to reach the development stage for swathing or combining, all four oilseed crops were at the minimum days we think as normal, or earlier.

Table 3: 2012 Trial Location Growing Degree Days (GDD) Accumulation (May to October) and 30 year Averages.

	Melita (2012 GDD)	30yr Average (Pierson Station)	Carberry (2012 GDD)	30yr Average (Brandon Station)
GDD base 0°C (May 1-Oct 1)	2554	2444	2471	2364
GDD base 5°C (May 1-Oct 1)	1743	1686	1670	1610
GDD base 6.7°C (May 1-Oct 1)	1445	-	1363	-
GDD base 10°C (May 1-Oct 1)	986	973	923	907

Source: _Manitoba Ag-Weather Program (2012) and Environment Canada 30year Normal (1971-2000)

Table 4: 2012 Trial Location Precipitation (mm) Accumulation (May to October) and 30 year Averages.

	Melita (2012)	30yr Average (Pierson Station)	Carberry (2012)	30yr Average (Brandon Station)
May	28.9	54.7	149.2	52.7
June	66.2	76.8	80.3	74.4
July	75.8	67.6	45.8	75.8
August	26.2	51.8	66.6	69.2
September	5.4	46.8	2.8	50.1
TOTAL	202.5	297.7	344.7	322.2

Source: _Manitoba Ag-Weather Program (2012) and Environment Canada 30year Normal (1971-2000)

Canola

Looking at the 2012 canola development stages and according GDD range (Table 5 and Figure 1) from published sources, the 2012 data supports the GDD model at base temperature 0C found in the Canola Council of Canada Canola Growers Manual. GDD accumulation to days to flowering is slightly higher than documented, but taking into consideration the standard deviation, the GDD accumulation would be within the range.

It is also interesting to note, the actual days to achieve stage 8.5 is 10 to 15 days earlier than what is typical. Under very warm temperatures, flowering timing in canola can be shortened to 15 days as compared to the 'typical' 21-28 days (Canola Growers Manual), heat and specifically the maximum temperatures will drive the time that flowering begins and finishes.

Table 5: Canola, base temperature 0C (based on data from Carberry and Melita, 2012 trials)

Stage	Description	GDD from literature	2012 Average GDD	Standard Deviation	Calendar Days	Standard Deviation
1.0	Emergence	152-186	163	71	12	8
1.2	2 leaves unfolded	282-324	279	85	20	7
1.6	6 leaves unfolded	411-463	452	97	31	8
6.0	Flowering begins, at least 1 flower open on 50% of plants	582-666	709	75	44	3
6.5	Flowering at 50% complete	759-852	835	101	50	5
6.9	Flowering complete	972-1074	1054	136	60	6
8.1	10% seeds have changed color	1326-1445	1335	124	74	9
8.5	50% seeds have changed color (time of swathing)	1432-1557	1496	80	83	7

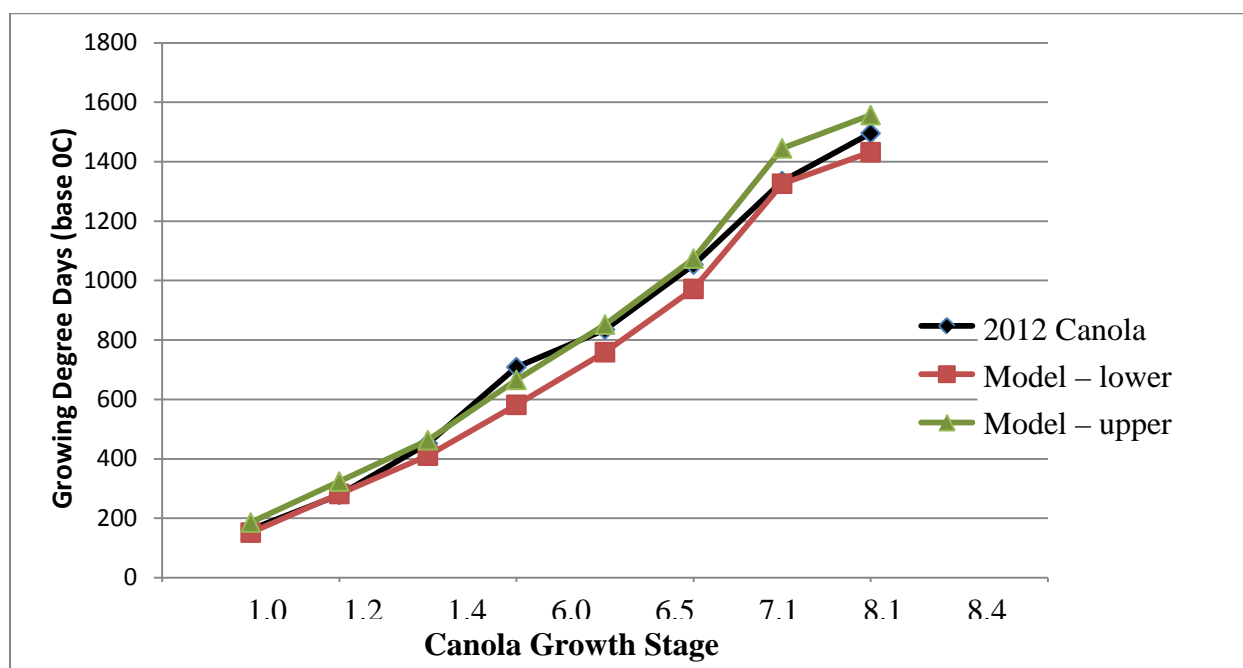


Figure 1: 2012 Canola GDD Accumulation Compared to GDD model, base temperature 0C

The observations, separated by the seeding date still fall very close to the model predictions for stage achievement by GDD (Table 6). The later the seeding date, the more GDD required (as days are getting warmer and accumulating higher GDD for each day) for emergence to 50% flowering. Past 50% flowering stage, the latest seeding date begins to need less GDD than the other two seeding dates to get to maturity, which may be due to the lack of moisture in August and September. The reduction of 363 kg/ha in yield also indicates that suitable growing conditions had declined between the last two seeding date periods.

Table 6: Canola Development, base temperature 0C by Seeding Date Range

Stage	Description	GDD from literature	2012 Average GDD	Seeding Date		
				May 1-16	May 16-30	May 31-June 10
1.0	Emergence	152-186	163	131	135	145
1.2	2 leaves unfolded	282-324	279	257	220	249
1.6	6 leaves unfolded	411-463	452	488	387	373
6.0	Flowering begins, at least 1 flower open on 50% of plants	582-666	709	676	741	762
6.5	Flowering at 50% complete	759-852	835	768	876	894
6.9	Flowering complete	972-1074	1054	1059	1012	996
8.1	10% seeds have changed color	1326-1445	1335	1253	1399	1349
8.5	50% seeds have changed color (time of swathing)	1432-1557	1496	1472	1522	1466
	Yield (kg/ha) *Melita only		1557	1678	1683	1310

Flax

Flax has been documented to complete the vegetative stage in 45 – 60 days, flowering stage in 15 – 25 days and maturation period of 30 – 40 days (Flax Council of Canada). Like canola, high temperatures can reduce the amount of days it takes to reach the development milestones. In Table 7, the vegetative stage is completed in 46 days, flowering complete in 15 days and swathing could have occurred at in 95 days. These follow the lower end of documented ‘calendar’ date information. The GDD documented in 2012, follows the model (base 0C) trend as documented in the Flax Council of Canada Growing Flax booklet, but with slightly higher GDD than estimates until stage 7.1 (seed filling stage), after this point the 2012 observations fall between the higher and lower end of the accumulated GDD in the model (Figure 2).

Table 7: Flax, base temperature 0C

Stage	Description	GDD from literature	2012 Average GDD	Standard Deviation	Calendar Days	Standard Deviation
1.0	Emergence	104-154	174	85	13	7
1.2	2 leaves unfolded	150-208	246	103	17	8
1.6	6 leaves unfolded	243-315	317	92	22	8
6.0	Flowering begins, at least 1 flower open on 50% of plants	582-706	759	79	46	7
6.5	Flowering at 50% complete	758-895	935	147	54	10
7.1	Seed Fill: 10% seed reached final size	969-1121	1068	143	61	10
8.1	10% seeds have changed color	1321-1499	1395	69	77	6
8.5	50% seeds have changed color (time of swathing)	1603-1801	1723	238	95	14

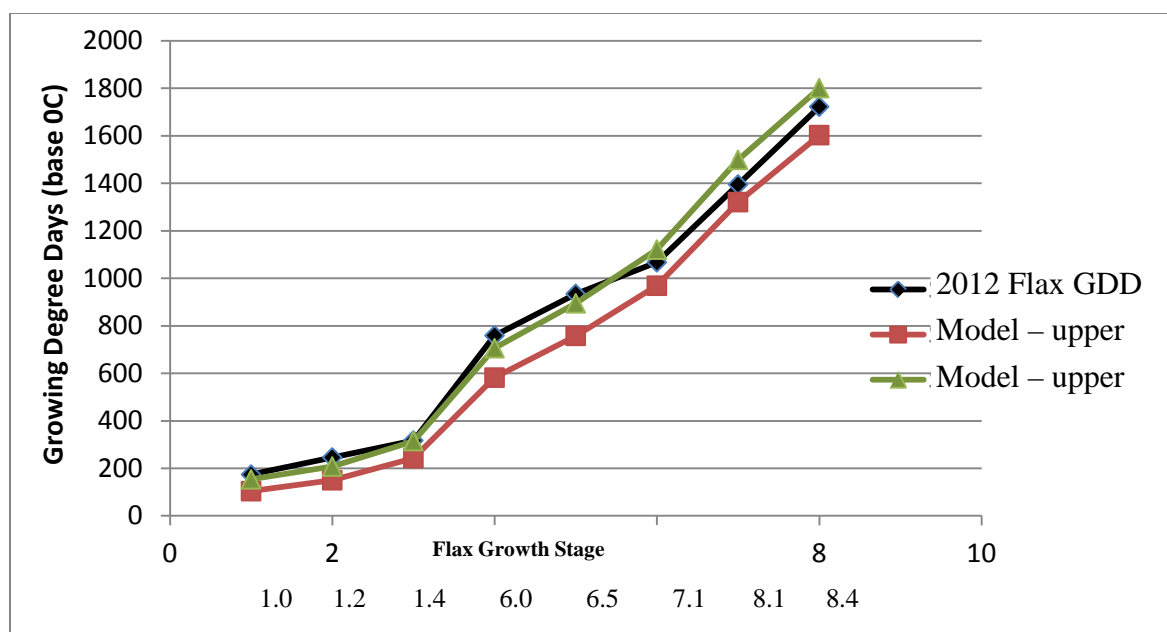


Figure 2: 2012 Flax GDD Accumulation Compared to GDD model, base temperature 0C

Observations for flax development based on the three different seeding dates (Table 8) show GDD needed to achieve the different growth stages still follows the model, but as seeding date becomes later, the GDD needed for flowering and maturity becomes less. An explanation may be due to moisture stress, specifically lack of moisture. Flax has a very shallow root system (Johnson et al.) and with prolonged lack of rainfall, the ability of the plant to access moisture may become limited which could cause the plant to advance through the growth stages faster and have premature ripening. Another indicator that growing conditions had declined is the reduction in yield 281 kg/ha from the first seeding date to second seeding date period and a further 102 kg/ha from the second to the third seeding date range.

Table 8: Flax Development, base temperature 0C by Seeding Date Range

Stage	Description	GDD from literature	2012 Average GDD	Seeding Date		
				May 1-16	May 16-30	May 31-June 10
1.0	Emergence	104-154	174	211	134	177
1.2	2 leaves unfolded	150-208	246	304	211	224
1.6	6 leaves unfolded	243-315	317	374	307	272
6.0	Flowering begins, at least 1 flower open on 50% of plants	582-706	759	827	733	719
6.5	Flowering at 50% complete	758-895	935	1027	917	861
7.1	Seed Fill: 10% seed reached final size	969-1121	1068	1162	1054	988
8.1	10% seeds have changed color	1321-1499	1395	1459	1342	1385
8.5	50% seeds have changed color (time of swathing)	1603-1801	1723	1809	1691	1669
	Yield (kg/ha) *Melita only		775	997	716	614

Sunflower

The sunflower model was developed in the northern US plains (North Dakota, Minnesota, South Dakota) and may have used varieties that were much later maturing than those we have access to in Manitoba. The 2012 GDD documented, supports the model (base temperature 6.7C) at the earlier stages and later stages, but is noticeably different during the flowering stages.

The 2012 data indicates that during the entire flowering period, the Manitoba sunflower crop needs less GDD than the developed model would predict (Table 9). This difference may be due to the difference in maturity of the variety we used compared to the variety the model was based on. In shorter season growing regions, sunflower varieties are selected that have a reduced flowering time but maintain yield potential. The difference may also be due to the increased daylight hours in July and August in Manitoba as compared to the northern US states, as sunflowers are somewhat sensitive to photoperiod.

An interesting observation from the raw data, is that all sunflower plots, regardless of planting date, reached R9 on the same calendar date at individual testing location. This occurred after prolonged dry conditions, which may have advanced the crop faster, regardless of GDD accumulation.

Table 9: Sunflower, base temperature 6.7C

Stage	Description	GDD from literature	2012 Average GDD	Standard Deviation	Calendar Days	Standard Deviation
VE	Emergence	97	93	35	14	5
V6	6 leaves unfolded	196-294	222	25	30	6
V12	12 leaves unfolded	314-392	364	59	42	6
R2	Immature bud elongates	647	585	132	57	13
R4	Inflorescence opening	805	664	100	63	13
R5.1	Beginning of flowering 10% disk flowers opened	883	797	78	72	9
R6	Flowering complete, ray flowers are wilting	1040	922	47	83	8
R7	Back of head started to turn a pale yellow	1119	1139	37	102	7
R9	Physiological maturity. Bracts turning brown	1276	1225	57	111	9

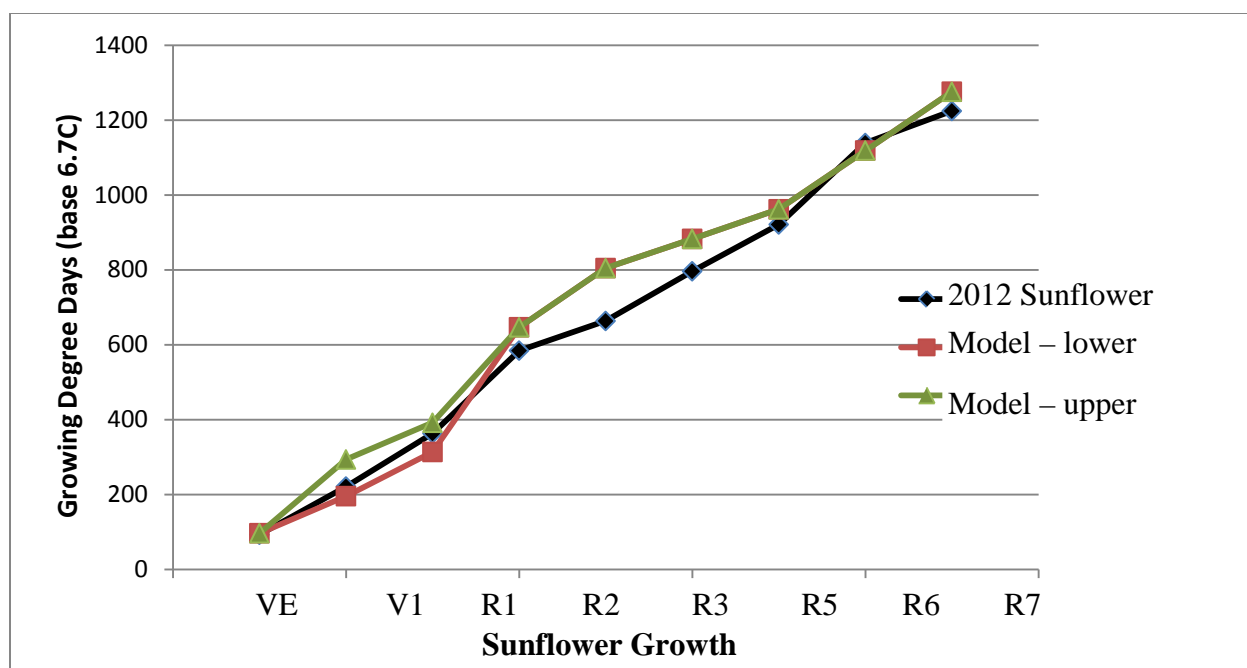


Figure 3: 2012 Sunflower GDD Accumulation Compared to GDD model, base temperature 6.7C

Looking closer at the sunflower data by seeding date, the GDD required to reach the growth stages follows the model, like the average with the flowering period needing less GDD. In the later seeding dates, less GDD are required to reach maturity, which could be again, due to dry conditions in August and September.

Table 10: Sunflower Development, base temperature 6.7C by Seeding Date Range

Stage	Description	GDD from literature	2012 Average GDD	Seeding Date		
				May 1-16	May 16-30	May 31-June 10
VE	Emergence	97	93	93	68	119
V6	6 leaves unfolded	196-294	222	235	201	230
V12	12 leaves unfolded	314-392	364	327	352	412
R2	Immature bud elongates	647	585	620	533	601
R4	Inflorescence opening	805	664	702	673	686
R5.1	Beginning of flowering 10% disk flowers opened	883	797	806	740	844
R6	Flowering complete, ray flowers are wilting	1040	922	927	905	933
R7	Back of head started to turn a pale yellow	1119	1139	1172	1115	1121
R9	Physiological maturity. Bracts turning brown	1276	1225	1275	1206	1193

Soybean

A 'standard' model to predict the growth and development for soybean has not really been accepted for the northern US plains or Canada. Soybean is very photoperiod sensitive and varieties are bred for the regional of adaptation to account for flowering and maturity dates. Using the model developed by Kunmar et al., the 2012 data looks similar until the end of pod formation and maturity, where the Manitoba sites observed the soybean maturing in much less GDD (Table 11). Looking closer at the development by GDD in the three different seeding dates period (Table 12), from flower induction to maturity, all three seeding date periods show the GDD to reach development spread is much closer than in other crop types, but still at the end of pod formation to maturity, the 2012 Manitoba data does not come close to the GDD the 10C model estimates.

Table 11: Soybean, base temperature 10C

Stage	Description	GDD from literature		2012 Average GDD	Standard Deviation	Calendar Days	Standard Deviation
VE	Emergence	64-78		37	27	13	27
V1	Unifoliate	83-151		70	30	19	26
R1	Flower induction	178-321		228	8	42	19
R2	First Flower developed	326-382		359	92	55	19
R3	First Pod developed	80-180	482-562	521	51	71	11
R5	First Seed developed	118-187	631-749	605	48	83	11
R6	End leaf formation	51-84	782-833	693	31	95	14
R7	End pod formation, pods turning brown	123-202	912 - 1035	780	41	103	13
R8	Physiological maturity	306-788	1517-1832	788	21	110	6

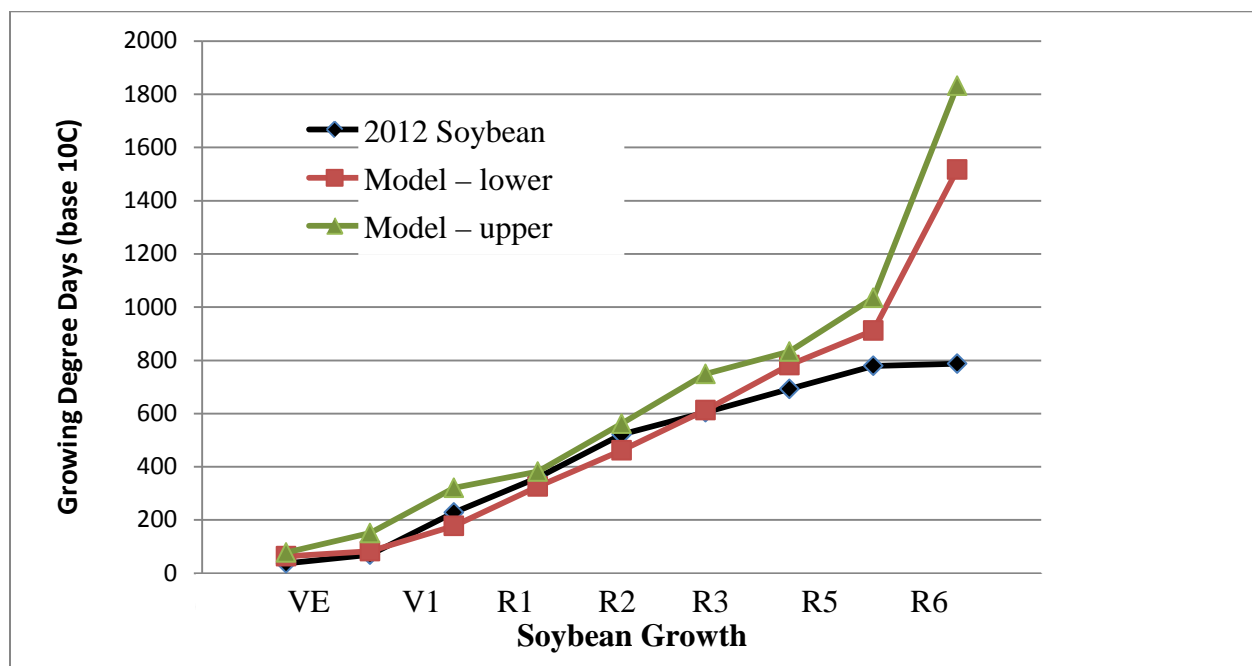


Figure 4: 2012 Soybean GDD Accumulation Compared to GDD model, base temperature 10C**Table 12:** Soybean Development, base temperature 10C by Seeding Date Range

Stage	Description	GDD from literature		2012 Average GDD	Seeding Date		
					May 1-16	May 16-30	May 31-June10
VE	Emergence	64-78		37	9	41	62
V1	Unifoliate	83-151		70	38	73	98
R1	Flower induction	178-321		228	230	220	235
R2	First Flower developed	326-382		359	368	354	357
R3	First Pod developed	80-180	482-562	521	491	537	537
R5	First Seed developed	118-187	631-749	605	615	608	593
R6	End leaf formation	51-84	782-833	693	698	678	702
R7	End pod formation, pods turning brown	123-202	912 - 1035	780	783	758	798
R8	Physiological maturity	306-788	1517-1832	788	799	786	779
	Yield (kg/ha) *Melita only			1463	1540	1374	1475

Conclusions

The growth and development models established for canola, flax and sunflower were very similar to the observations at the Carberry and Melita in 2012. Soybeans however, followed the model closely until the R7 stage, with less GDD required to reach the R6, R7 stage and much less to reach the R8 stage. One factor that may have influence final GDD needed in all crop to reach maturity would be very dry conditions throughout August and September in both locations. Water is a limiting factor for crops and if it is not available, the GDD needed may not be necessary as crop dry up.

With only two locations being successful, this dataset good for observation, but not great for definitively being able to make claims that these models are applicable under all years and conditions.

The main conclusions that were drawn from this experiment were:

1. GDD was observed to better to estimate growth stages than calendar days.
2. The sunflower model is very narrow in range for GDD. Additional trials would be good to help develop a slightly wider range of GDD for Manitoba. But with the present model, it could be used to calculate time from seeding to flower and maturity.
3. The soybean model was surprisingly accurate in 2012 up to R6-R7, but was not accurate afterwards.
 - a. The model needs to be tested for the maturity grouping that we grow in Manitoba, as it is much earlier to what is grown in Ontario or the USA.
 - b. 2012 was very sunny, more trials are needed during very cloudy summers to see how much the GDD changes, as soybean are very photoperiod sensitive.
4. Human monitoring may not always be completely accurate. With multiple projects occurring, constant monitoring to catch the correct stages or to need to calculate forward and back to determine the stage may not always be accurate. Looking into mechanical systems to record growth stage daily may be beneficial.

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Intercropping Pea and Canola based on Row Orientation and Nitrogen Rates (Year 2 of 3).

Introduction

Intercropping is the agricultural practice of cultivating two different crops in the same place at the same time (Andrews & Kassam 1976). In nature, plant species rarely are found as sole members in a population but rather are usually found as a diverse mix of different species. 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.

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 them into specific individual crop rows, the crop will be less likely to become in-efficient or “lazy” in symbiotic 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.

In 2009, WADO conducted a trial investigating the effects of pea and canola plant density on one another. Results indicate as expected that the higher the seeding rate for one crop over the other will favor grain production due to increased competition. Large grain production responses were found in all intercropping treatments compared to their sole crop components i.e., canola or pea grown by itself. The real question was; why is it doing this? Was it better water use, something to do with light use, or was it better use of nutrients?

In 2010, WADO tried to understand the nutrient question a little more. An attempt was made to make canola and pea more efficient in utilizing and converting their nutrients better by dividing rows into individual crops. Canola received all the applied nitrogen while pea rows did not. Results were inconclusive since canola yields were statistically similar for all treatments despite changes in row orientation and applied nitrogen rates. Peas on the other hand were more responsive to row orientation and the effects of nitrogen applied to the canola rows relating likely to greater competition from canola on pea. Results were still stuck on whether row orientation or nitrogen rates were to blame.

In 2011 and 2012, a trial was set up in Melita to understand nitrogen dynamics when comparing mixed, single, double and triple row intercropping scenarios compared to mono crop components. This was an attempt to better explain the results from the 2010 Melita experiments. Unfortunately, flooding inflated error into the results in 2011. However there were some trends to pay attention to. A yield advantage was achieved for mixed row intercropping only compared to all other options. A separate trial in cooperation with the Indian Head Agricultural Research Foundation was also planted with had a slightly different twist than the previous trial. Results in this report will be concerned with the previous study for 2012.

Results from Indian Head, SK and Melita, MB (second study) in 2011, indicate that both row configuration and nitrogen applications played roles in their effect on intercropping performance. At Indian Head site, canola yields were favored by alternate rows, whereas pea yields were favored by mixed rows. Pea yields were not affected by N rates, whereas canola yields are. In Melita, intercropping configurations were favorable compared to monocrop treatments, specifically favoring mixed row configurations compared to alternate row configurations. As well, Melita peas were sensitive to row configuration but not nitrogen application.

It was originally hypothesized that double row configurations would be most efficient with respect to canola-nitrogen use while preserving the physical interaction of pea and canola side by side. It was hypothesized that mixed row configurations would be less efficient with nitrogen use, as peas would become lazy in the presence of applied nitrogen and would rather compete for nitrogen with canola, than fix their own. The triple row configuration would be least efficient as an intercropping system with the only reason being there would be fewer physical pea-canola crop interactions (light, water use, nutrient use). Results from 2011 and 2012 suggest that mixed row configuration were most efficient in terms of yield and land equivalent ratio compared to all other configurations. Now, it is hypothesized that there is more that is happening below ground than expected, accounting for a mutual positive interaction between these two crops.

Trial Main Objectives:

1. Observe and quantify effect of row configuration on component crop yield of pea and/or canola
2. Evaluate the response of nitrogen application in canola rows and its effect on component canola and pea yields
3. Evaluate the relationship between component yield, percent light interception, soil moisture to land equivalent ratios in pea-canola intercrops.

Methods

There was no previous crop in 2011 on the site location, rather it was summer fallow, worked with a discer. Plot stubble was maintained with a spring harrow operation to deal with excess residues and firm the ground. On May 2 plot area was sprayed prior to seeding with Rival (0.57 L/ac), Credit (2 L/ac) and Liberty (0.75 L/ac) herbicides tank mixed then sprayed with a water volume application rate of 10 gal/ac.

Plots were seeded with a SeedHawk dual knife single side band air seeder. Plots were seeded on May 2 near Melita MB on a Leige sandy loam (NW 36-3-27 W1). Six rows at 9.5" spacing were planted twice to result in a single plot 2.88 m wide by approximately 8.5 meters long. Plots were land rolled after seeding. Seed was placed $\frac{3}{4}$ " below the furrow surface base.

Fertilizer was side band 1" below and beside the seed during the seeding operation. Target seeded plant stand for canola was 100 p/m² in the monocrop treatments. Variety 71-40 CL (Monsanto) was used. For peas, variety CDC Meadow was used with a target seeded plant density of 75 p/m². All plots received 58 lbs/ac of granular 11-52-0 (MAP). Additional nitrogen was supplied by 28-0-0 (UAN liquid solution). Only canola or pea monocrop treatments and canola intercrop rows received applied nitrogen. This was accomplished by the use of ball valves located along fertilizer distribution lines, turned on when nitrogen was applied and turned off when denied to the pea rows. Fertilizer applications were pre-calibrated depending on the treatment being seeded so that applications between treatments would be pre-determined as outlined in Table 1. Peas were inoculated with proper rhizobium (granular Nodulator®, Becker Underwood) applied at 5 lbs/ac and were not fertilized with additional nitrogen unless in mixed rows with canola (trt 6&7), or treatment 2 (check).

Table 1. Trial treatment descriptions with their corresponding row orientation, seeding rate, nitrogen fertility level in both the canola row and overall field (plot) area including peas.

Trt	Crop/Row Orientation	Crop Row and Nitrogen Placement Arrangement* (underscore = row gap)	Nitrogen Rate (lbs/ac)		Seeding Rate (lbs/ac)	
			Canola Row Equivalent	Overall Field	Canola	Pea
1	Peas Monocrop (Check)	P_P_P_P_P_P	0	0		221
2	Peas Monocrop	Pn_Pn_Pn_Pn_Pn_Pn	0	90		221
3	Canola Monocrop (Check)	CN_CN_CN_CN_CN_CN	90	90	5	
4	Canola Monocrop	Cn_Cn_Cn_Cn_Cn_Cn	45	45	5	
5	Canola Monocrop	CNN_CNN_CNN_CNN_CNN	180	180	5	
6	Peas & Canola Mixed	CnP_CnP_CnP_CnP_CnP_CnP	45	45	2.5	110
7	Peas & Canola Mixed	CNNP_CNNP_CNNP_CNNP_CNNP_CNNP	180	90	2.5	110
8	Peas & Canola Single Rows	CN_P_CN_P_CN_P	90	45	5	
9	Peas & Canola Single Rows	CNN_P_CNN_P_CNN_P	180	90	5	
10	Peas & Canola Double Rows	CN_CN_P_P_CN_CN_P_P	90	45	5	
11	Peas & Canola Double Rows	CNN_CNN_P_P_CNN_CNN_P_P	180	90	5	
12	Peas & Canola Triple Rows	CN_CN_CN_P_P_P	90	45	5	
13	Peas & Canola Triple Rows	CNN_CNN_CNN_P_P_P	180	90	5	

*P= Peas, C= Canola, n=45 lbs/ac Nitrogen, N=90 lbs/ac Nitrogen, NN=180 lbs/ac Nitrogen

A spring soil test was taken as a composite of samples taken over the trial area prior to seeding (Table 2) to determine residual fertility levels. Plots were kept weed free using a single application of Odyssey herbicide applied at 17 g/ac (plus Merge adjuvant) at a water spray volume of 20 gal/ac, when both crops reached three nodes of plant growth.

Table 2: Spring pre-seed soil test. Sampled in late April, across entire trial area.

Depth	pH	N lbs/ac	P ppm Olsen	K ppm	S lbs/ac
0-6"	8.1	18	8	230	44
6-24"		51			54
0-24"		69			98

Data collected from plots included plant emergence (4 counts in 1 meter of row of each crop per plot), yield, grain moisture and percent light intercepted. Percent light interception was measured with a Li-Core LI-191 quantum light sensor (1 m long) on July 6. Crop stage during observation was approximately late flower. The probe was placed under the crop canopy perpendicular to the seed row direction. Two measurements above the canopy and four measurements below canopy were observed per plot. Only the inside 8 rows of the plot were taken into account. Light units were $\mu\text{moles s}^{-1} \text{m}^{-2}$ for each reading measuring photosynthetic active radiation (PAR). Percent light intercepted (PLI%) was calculated as follows:

$$\text{PLI\%} = [\text{mean above canopy PAR} / \text{mean below canopy PAR}] \times 100$$

Plots were desiccated with Reglone herbicide at a rate of 0.91L/ac at maturity (canola reached 70% seed color change) applied August 17. Plots were harvested August 22 with a Hege plot combine set to normal canola harvest settings. No shattering was present at harvest. Grain sample components were separated into individual crops. Final grain yield was calibrated to a final grain moisture content of 10% for peas and 10% for canola. Final grain yields were also converted to partial land equivalent ratios (PLER) for peas and or canola, which were combining into a total land equivalent ratio value using the following equation:

Total LER = $I_a/S_a + I_b/S_b$ = partial LER peas + 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.

In addition to light interception, covariates such as soil moisture (HydroSense II, Campbell Scientific) measuring percent soil moisture and SPAD meter readings (SPAD 502 plus, Spectrum Technologies) measuring chlorophyll content (only canola) were recorded in 2012. Soil moisture content was taken as an average of two readings per plot.

Data was analyzed with a two-way analysis of variance (ANOVA) using Analyze-it version 2.03 (Microsoft) statistical software. Coefficient of variation (CV%) was determined and Fisher's 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 of statistical significance.

A factorial analysis was applied to only the intercrop treatments to test for interaction between row orientation and nitrogen rate. This analysis was applied to the grain yields and land equivalent ratios.

Results

Grain Yield & LER

There were significant differences in grain yield and land equivalent ratio in pea and canola components and total yield among treatments (Table 3). Peas yielded very well in 2012, while canola yielded poorly. Poor canola yields may be attributed to a high incidence of aster yellows and lack of rain for pod fill after flowering. Intercrops generally yielded between monocrop pea and canola yields. A trend of decreasing yield going from single rows to double rows to triple rows existed suggesting that the lesser the crops are in an intercrop fashion and approach the more monocrop fashion the more the yields represent their monocrop derivatives. This was similar in trends overall for crop components and more the case in total Land Equivalent Ratio suggesting that mix row were superior in terms in row orientation compared to all other orientations. Addition of nitrogen did appear to give canola a slight advantage in yield, LER, light interception and SPAD meter reading. However the addition of nitrogen did appear to be inferior to pea yield and PLER likely due to the increase in competition and resources from canola benefiting from this application.

Table 3: Grain yield, land equivalent ratios, percent light interception, percent soil moisture and SPAD meter rating of various intercrop and monocrop components under variable nitrogen rates.

Trt#	Description	N-Rate (lbs/ac)		Grain Yield (kg/ha)			Land Equivalent Ratio			Light	Soil Moisture	SPAD
		in canola & overall field		Peas	Canola	Total	PLER	CLER	TLER	%	%	
1	Pea Monocrop (check)	0	0	6265.6	-	6265.6	1.00	-	1.00	91.5	36.2	-
2	Pea Monocrop	0	90	6474.8	-	6474.8	1.04	-	1.04	93.7	35.0	-
3	Canola Monocrop (check)	90	90	-	2007.9	2007.9	-	1.00	1.00	93.7	33.5	57.0
4	Canola Monocrop	45	45	-	1598.9	1598.9	-	0.79	0.79	93.3	35.3	56.1
5	Canola Monocrop	180	180	-	2277.6	2277.6	-	1.13	1.13	93.8	34.2	52.0
6	Mixed Rows	45	45	3581.9	952.9	4534.8	0.58	0.48	1.06	93.5	36.3	50.5
7	Mixed Rows	180	90	3369.6	1222.8	4592.4	0.54	0.61	1.15	91.7	36.0	54.1
8	Single Rows	90	45	4159.0	580.6	4739.6	0.67	0.29	0.96	92.8	36.7	53.5
9	Single Rows	180	90	4355.6	735.2	5090.9	0.70	0.36	1.06	91.5	33.7	56.4
10	Double Rows	90	45	3772.1	768.9	4541.0	0.61	0.38	0.99	91.7	34.3	50.1
11	Double Rows	180	90	3497.9	1082.8	4580.7	0.56	0.53	1.10	92.9	34.2	55.9
12	Triple Rows	90	45	3708.3	710.6	4418.8	0.60	0.36	0.96	92.9	34.0	53.6
13	Triple Rows	180	90	3541.9	775.4	4317.2	0.57	0.39	0.96	92.9	35.1	56.3
Significant				Yes	Yes	Yes	Yes	Yes	Yes	No	No	No
Least Significant Difference (p<0.05)				546.0	275.5	485.7	0.08	0.11	0.13	NS	NS	NS
Coefficient of Variation				8.8	16.5	7.9	7.8	13.3	9.1	1.6	9.8	7.5
P value				0.0001	0.0001	0.0001	0.0001	0.0001	0.0007	0.25	0.96	0.21
R-squared				0.93	0.93	0.96	0.95	0.95	0.70	0.33	0.17	0.63

Test of Row Orientation with Nitrogen Applications

There were significant differences in mean grain production in pea and canola as separate components and total land equivalent ratio (TLER) with the use of row orientation and nitrogen, but no interaction between these factors was found (Table 4). Generally, raising nitrogen levels from 45 to 90 lbs/ac increased TLER by about 8%. There were differences in total yield at the 0.1 level of significance. In terms of TLER, row orientation favoured mixed row orientation, followed in order of significance by double rows, single rows, then triple rows. Interestingly, canola favoured the mixed row orientation compared to all other row orientations suggesting a more beneficial interaction than when separated into individual rows as in single, double, or triple rows. Differences in pea yields favoured single row orientation, followed by double, triple, then mixed. This may be evidence that canola may be benefiting more than the pea for growing together and that the pea prefers to be somewhat separated in the system from canola receiving the nitrogen applications. As a trend, it appears that the addition of nitrogen caused the greater yield in canola and lesser of pea, but overall provided a bump up effect in TLER.

Table 4: Interaction of row orientation and nitrogen rate on pea and canola components, total yield and total land equivalent ratio.

Row Orientation	N-Rate	Yield (kg/ha)			Total LER
		Pea	Canola	Total	
Mixed Row		3476 a	1088 c	4564	1.11 c
	45	3582	953	4535	1.06
	90	3370	1223	4592	1.15
Single Row		4257 b	658 a	4915	1.01 ab
	45	4159	581	4740	0.96
	90	4356	735	5091	1.06
Double Row		3635 ab	926 b	4561	1.04 bc
	45	3772	769	4541	0.99
	90	3498	1083	4581	1.09
Triple Row		3625 a	743 a	4368	0.96 a
	45	3708	711	4419	0.96
	90	3542	775	4317	0.96
	45	3805	753 a	4559	0.99 a
	90	3691	954 b	4645	1.07 b
LSD (p<0.05)	Row	317	153	264	0.06
	Nitrogen	224	109	186	0.04
	R x N	448	217	373	0.08
CV (%)		8.1	17.3	5.5	5.6
P value	Row	0.0002	<0.0001	0.0566	0.0005
	Nitrogen	0.3014	0.0009	0.5247	0.0013
	R x N	0.4268	0.3451	0.6849	0.3132

Light Interception, Soil Moisture, SPAD meter

There were no statistical differences in the percent light intercepted, soil moisture and SPAD meter reading, among all treatments (Table 3). A trend does appear with canola intercepting more light and pea and intercrops intercepting an intermediate value to the monocrop components. However there

were no discernable differences based on the analysis used. Furthermore, an analysis of covariance ANCOVA was used where total yield and total Land equivalent ratio were the independent variable and percent light interception or soil moisture or SPAD meter reading was the dependent variable and still no statistical differences were found.

Gross and Net Revenues

There were highly significant gross and net revenue differences among all treatments (Table 4). Cost of production values (outlined in appendix) were applied to gross revenues on a per plot basis to achieve total net revenues. Maximum total net revenues were achieved with mixed row systems of intercropping, however this was overshadowed by monocrop pea net revenues. Net revenues in monocrop canola regimes were the lowest of all treatments. Among intercrop treatments net revenues diminished as row orientation frequency became more monocrop like from mixed row orientation.

Table 4: Gross and Net revenues of various monocrop and intercrop pea canola treatments as affected by row orientation and nitrogen applications.

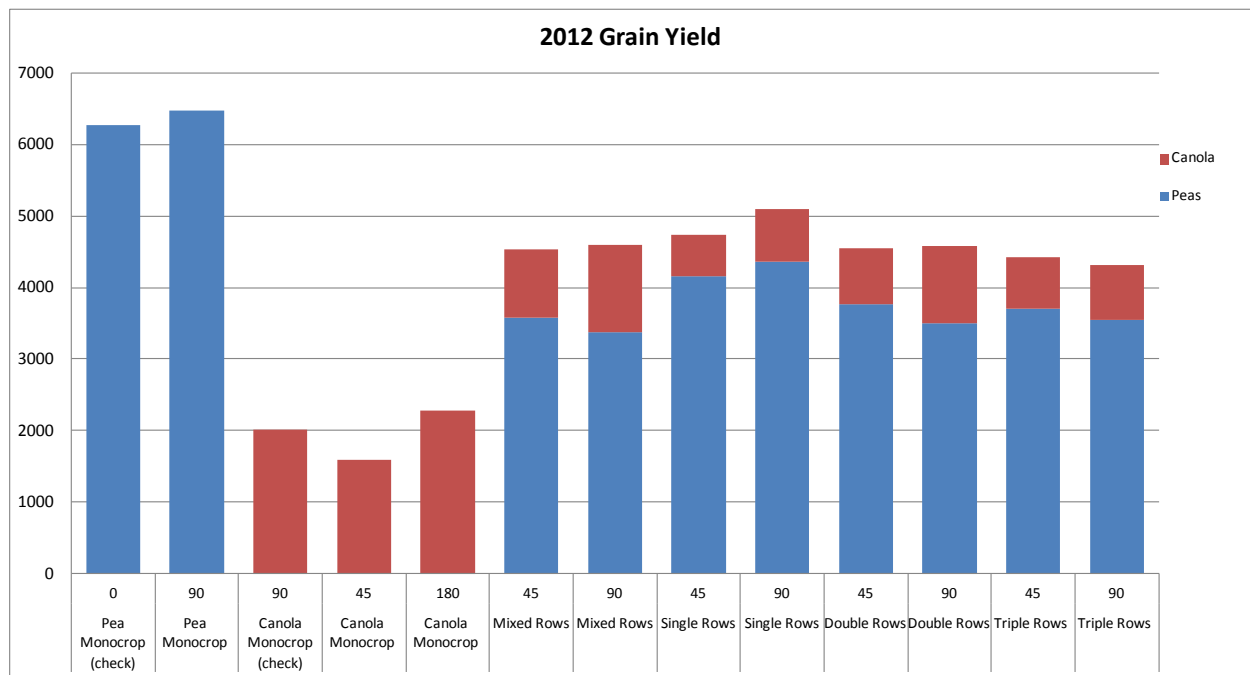
Trt#	Description	N Rate (lbs/ac)		Total COP	Canola Gross Rev	Pea Gross Rev	Total Gross Rev	Total Net Rev
		Canola Row	Overall Field					
1	Pea Monocrop (check)	0	0	\$ 205.61	\$ -	\$ 790.60	\$ 790.60	\$ 584.98
2	Pea Monocrop	0	90	\$ 265.63	\$ -	\$ 816.99	\$ 816.99	\$ 551.37
3	Canola Monocrop (check)	90	90	\$ 280.67	\$ 482.86	\$ -	\$ 482.86	\$ 202.19
4	Canola Monocrop	45	45	\$ 252.08	\$ 384.52	\$ -	\$ 384.52	\$ 132.44
5	Canola Monocrop	180	180	\$ 337.87	\$ 547.72	\$ -	\$ 547.72	\$ 209.86
6	Mixed Rows	45	45	\$ 251.96	\$ 229.17	\$ 451.97	\$ 681.13	\$ 429.17
7	Mixed Rows	180	90	\$ 280.56	\$ 294.06	\$ 425.18	\$ 719.24	\$ 438.68
8	Single Rows	90	45	\$ 251.96	\$ 139.62	\$ 524.79	\$ 664.42	\$ 412.46
9	Single Rows	180	90	\$ 280.56	\$ 176.81	\$ 549.60	\$ 726.41	\$ 445.85
10	Double Rows	90	45	\$ 251.96	\$ 184.91	\$ 475.97	\$ 660.88	\$ 408.92
11	Double Rows	180	90	\$ 280.56	\$ 260.39	\$ 441.37	\$ 701.76	\$ 421.20
12	Triple Rows	90	45	\$ 251.96	\$ 170.88	\$ 467.91	\$ 638.79	\$ 379.68
13	Triple Rows	180	90	\$ 280.56	\$ 186.46	\$ 446.92	\$ 633.38	\$ 352.82
Least Significant Difference (p<0.05)					\$ 66.26	\$ 68.89	\$ 78.05	\$ 78.69
Significant					Yes	Yes	Yes	Yes
Coefficient of Variation					16.5	8.8	8.4	14.4
P value					0.0001	0.0001	0.0001	0.0001
R-squared					0.93	0.93	0.88	0.90

Pea Breakage, Seed Weights, Test Weights

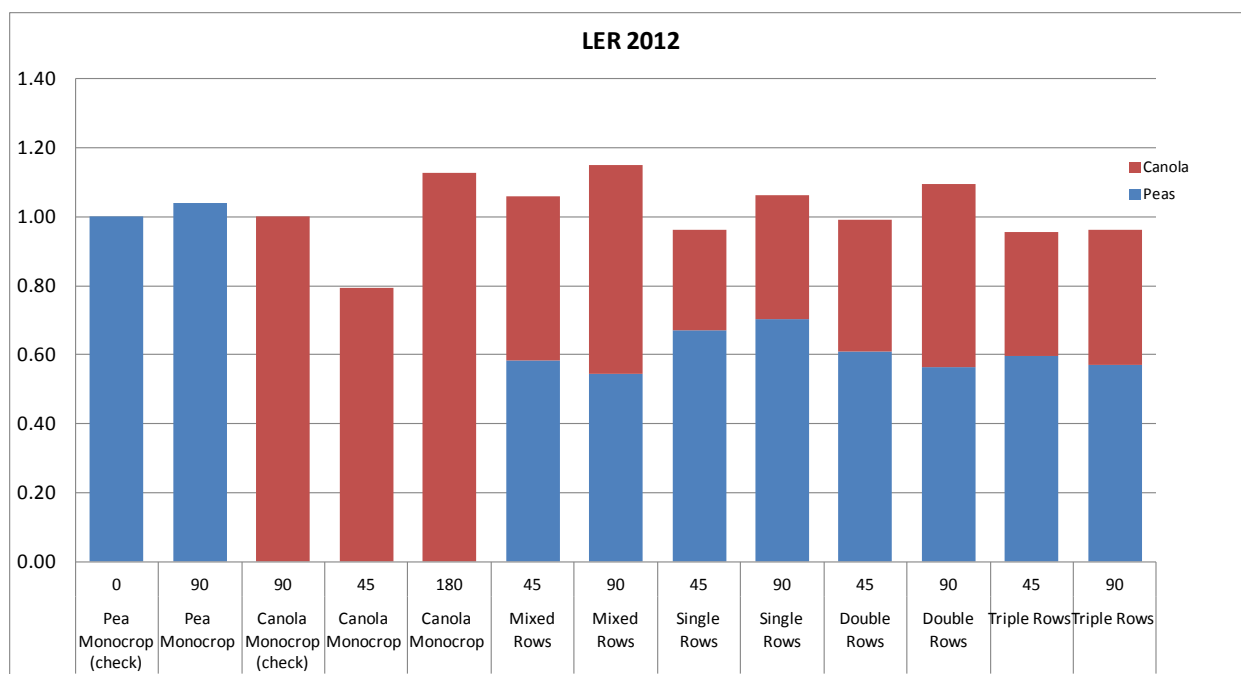
Additional differences in pea seed breakage ($p < 0.0001$) during harvest and canola seed size ($p < 0.1$) were apparent (Table 5). Pea seed breakage is significantly reduced when intercropped with canola compared to pea monocrop treatments. Canola may aid as a buffer to pea seed breakage during threshing by as much as 32%. Application of nitrogen trended to assist in this reduction but was only significant when oriented in double rows. Canola seed size was significant but no discernable trend could be derived from the analysis. Test weights were not statistically different for either crop component.

Table 5: Pea seed breakage, seed weight and test weight of various monocrop and intercrop pea canola treatments as affected by row orientation and nitrogen applications.

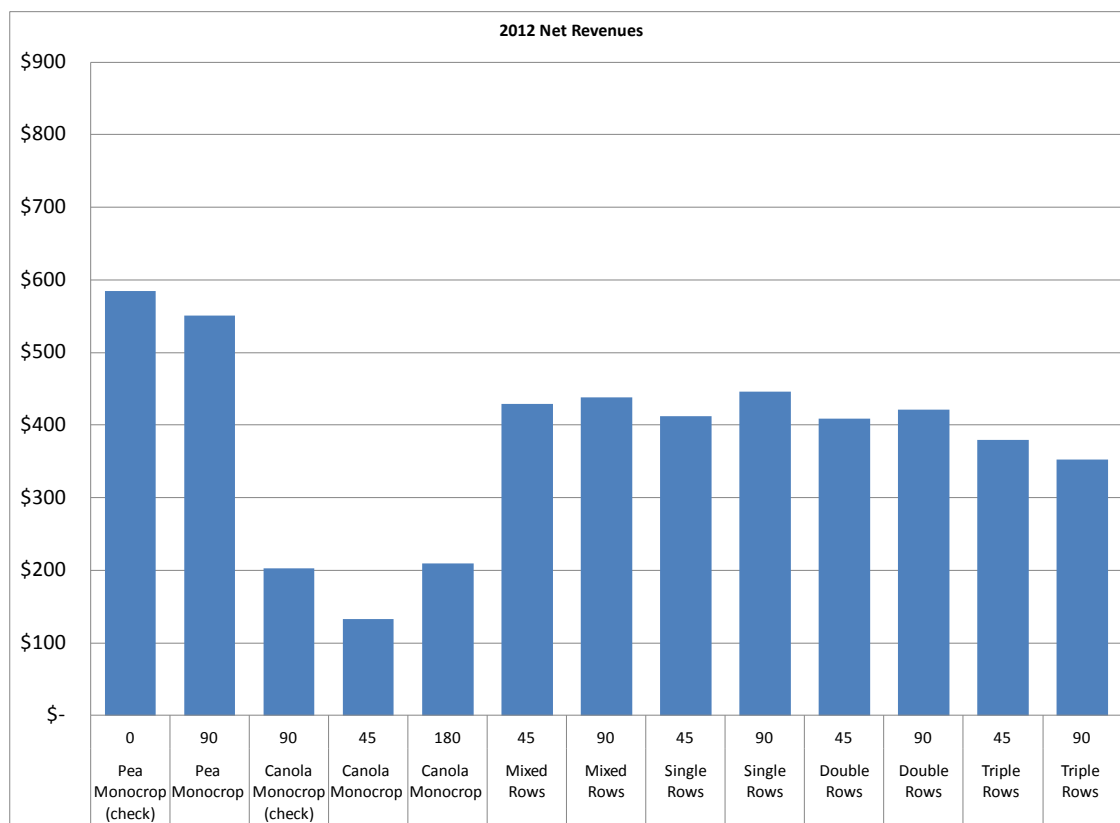
Trt#	Description	N Rate (lbs/ac)		Pea Seed Breakage %	Pea		Canola	
		Canola Row	Overall Field		g/100	g/0.5L	g/500	g/0.5L
1	Pea Monocrop (check)	0	0	12.8	19.5	420.0	-	-
2	Pea Monocrop	0	90	12.8	19.9	418.9	-	-
3	Canola Monocrop (check)	90	90	-	-	-	1.610	338.0
4	Canola Monocrop	45	45	-	-	-	1.845	336.5
5	Canola Monocrop	180	180	-	-	-	1.655	338.9
6	Mixed Rows	45	45	8.7	19.4	415.1	1.868	339.1
7	Mixed Rows	180	90	8.8	19.5	419.2	1.815	333.2
8	Single Rows	90	45	10.3	19.9	415.6	1.873	341.6
9	Single Rows	180	90	9.9	19.3	418.9	1.913	336.9
10	Double Rows	90	45	10.1	19.8	425.0	1.843	336.0
11	Double Rows	180	90	8.6	19.8	418.1	1.610	336.8
12	Triple Rows	90	45	10.6	20.0	419.3	1.785	337.9
13	Triple Rows	180	90	9.5	20.4	419.1	1.823	339.3
Least Significant Difference (p<0.05)				1.5	0.7	5.8	0.214	5.9
Significant				Yes	No	No	No	No
Coefficient of Variation				10.064	2.47	0.95	8.29	1.22
P value				0.0001	0.138	0.113	0.051	0.382
R-squared				0.89	0.47	0.52	0.55	0.37



Graph 1: Combined intercrop yields of canola and pea and monocrop canola and pea based on row orientation and nitrogen application in 2012 at Melita.



Graph 2: Combined intercrop Land Equivalent Ratios of canola and pea and monocrop canola and pea based on row orientation and nitrogen application in 2012 at Melita.



Graph 3: Net revenues of canola and pea and monocrop canola and pea based on row orientation and nitrogen application in 2012 at Melita.

Discussion

For the past three years WADO has been researching the merits of intercropping pea and canola a few noticeable trends have appeared. Mixed row orientation appears to be the superior orientation for intercropping. Reasons for this may be many, however recent research by Frustec et al. (2010) with hairy vetch and faba and Sawatsky (1987) with pea, may suggest that legumes may contribute fixed nitrogen to the companion crop and leak nitrogen as in the case of field pea, from their root zones, respectively. This may be somewhat responsible for the additional yield and LER responses that WADO has observed over the years. Other interactions not yet defined may be related to but not limited to light, disease incidence, maturity differences, nutrient demands and or water use between these crops. Intercropping has already been adopted by some early pioneers with some moderate success in Manitoba and Saskatchewan.

Risk of crop performance appears to be more resilient in net revenues than cropping one of both crops. This could provide some sort of intrinsic insurance when one of the crop components does poorly in one year while the other component does well. This is similar in terms of yield in other year's research done previously by WADO (2011).

Crop insurance for this system remains to be an issue in Manitoba due to the lack of available insurance in general; however a couple firms in Saskatchewan have developed ways to insure intercropping pea canola in terms of hail insurance.

WADO has been tracking producer intercropping involvement. Producers are encouraged to contact WADO and report their intentions, agronomic and yield information for research purposes.

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4. 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

Appendix: Cost of Production Calculations

Treatment No.	1	2	3	4	5	6	7	8	9	10	11	12	13
Crop Orientation	pea monocrop	pea monocrop	canola monocrop	canola monocrop	canola monocrop	mixed rows	mixed rows	single rows	single rows	double rows	double rows	triple rows	triple rows
Field N Rate lbs/ac	0	90	90	45	180	45	90	45	90	45	90	45	90
Operating Cost													
Seed and Treatment	\$ 45.00	\$ 45.00	\$ 60.00	\$ 60.00	\$ 60.00	\$ 52.50	\$ 52.50	\$ 52.50	\$ 52.50	\$ 52.50	\$ 52.50	\$ 52.50	\$ 52.50
Fertilizer	\$ 13.75	\$ 72.30	\$ 72.30	\$ 44.40	\$ 128.10	\$ 44.40	\$ 72.30	\$ 44.40	\$ 72.30	\$ 44.40	\$ 72.30	\$ 44.40	\$ 72.30
Herbicide*	\$ 25.75	\$ 25.75	\$ 25.75	\$ 25.75	\$ 25.75	\$ 25.75	\$ 25.75	\$ 25.75	\$ 25.75	\$ 25.75	\$ 25.75	\$ 25.75	\$ 25.75
Fuel	\$ 14.56	\$ 14.56	\$ 14.24	\$ 14.24	\$ 14.24	\$ 14.24	\$ 14.24	\$ 14.24	\$ 14.24	\$ 14.24	\$ 14.24	\$ 14.24	\$ 14.24
Machinery Operating	\$ 10.50	\$ 10.50	\$ 10.50	\$ 10.50	\$ 10.50	\$ 10.50	\$ 10.50	\$ 10.50	\$ 10.50	\$ 10.50	\$ 10.50	\$ 10.50	\$ 10.50
Crop Insurance	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Other**	\$ 8.25	\$ 8.25	\$ 8.25	\$ 8.25	\$ 8.25	\$ 10.25	\$ 10.25	\$ 10.25	\$ 10.25	\$ 10.25	\$ 10.25	\$ 10.25	\$ 10.25
Land Taxes	\$ 4.35	\$ 4.35	\$ 4.35	\$ 4.35	\$ 4.35	\$ 4.35	\$ 4.35	\$ 4.35	\$ 4.35	\$ 4.35	\$ 4.35	\$ 4.35	\$ 4.35
Drying Cost	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Interest (5% for 6 months)	\$ 3.05	\$ 4.52	\$ 4.88	\$ 4.19	\$ 6.28	\$ 4.05	\$ 4.75	\$ 4.05	\$ 4.75	\$ 4.05	\$ 4.75	\$ 4.05	\$ 4.75
Total Operating	\$ 125.21	\$ 185.23	\$ 200.27	\$ 171.68	\$ 257.47	\$ 166.04	\$ 194.64	\$ 166.04	\$ 194.64	\$ 166.04	\$ 194.64	\$ 166.04	\$ 194.64
Fixed Cost													
Land Investment	\$ 22.50	\$ 22.50	\$ 22.50	\$ 22.50	\$ 22.50	\$ 22.50	\$ 22.50	\$ 22.50	\$ 22.50	\$ 22.50	\$ 22.50	\$ 22.50	\$ 22.50
Machinery Depreciation	\$ 27.50	\$ 27.50	\$ 27.50	\$ 27.50	\$ 27.50	\$ 27.50	\$ 27.50	\$ 27.50	\$ 27.50	\$ 27.50	\$ 27.50	\$ 27.50	\$ 27.50
Machinery Investment	\$ 6.88	\$ 6.88	\$ 6.88	\$ 6.88	\$ 6.88	\$ 6.88	\$ 6.88	\$ 6.88	\$ 6.88	\$ 6.88	\$ 6.88	\$ 6.88	\$ 6.88
Storage Cost***	\$ 3.52	\$ 3.52	\$ 3.52	\$ 3.52	\$ 3.52	\$ 7.04	\$ 7.04	\$ 7.04	\$ 7.04	\$ 7.04	\$ 7.04	\$ 7.04	\$ 7.04
Total Fixed	\$ 60.40	\$ 60.40	\$ 60.40	\$ 60.40	\$ 60.40	\$ 63.92	\$ 63.92	\$ 63.92	\$ 63.92	\$ 63.92	\$ 63.92	\$ 63.92	\$ 63.92
Labour Cost^	\$ 20.00	\$ 20.00	\$ 20.00	\$ 20.00	\$ 20.00	\$ 22.00	\$ 22.00	\$ 22.00	\$ 22.00	\$ 22.00	\$ 22.00	\$ 22.00	\$ 22.00
TOTAL COST	\$ 205.61	\$ 265.63	\$ 280.67	\$ 252.08	\$ 337.87	\$ 251.96	\$ 280.56	\$ 251.96	\$ 280.56	\$ 251.96	\$ 280.56	\$ 251.96	\$ 280.56
* based one burnoff application of Cleanstart (Credit @ 0.5L/ac, Aim @ 15 mL/ac), Odyssey @ 17.3g/ac, Merge Adjuvant, Arrow @ 80 mL/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													

Effect of Banded and Topdressed Nitrogen in Pea-Canola Intercrops

Background

Peas (*Pisum sativum* L.) are legumes that can fix atmospheric nitrogen with the symbiotic association with *Rhizobium* bacteria, but can also absorb soil nitrogen within the soil profile to facilitate proper growth. Producers typically plant peas on low nitrogen soils and inoculate with commercial based rhizobia in order reduce fertilizer costs from using expensive applied commercial urea, ammonia and nitrate fertilizers. Well nodulated plant can derive 50% to 80% of their nitrogen requirement under favorable growing conditions with the remainder coming from soil borne sources. Low nitrogen containing soils do little to affect the normal nodulation process, however prior to nodulation, plants may experience nitrogen deficiencies if soil levels are less than 10 lbs N/ac. A small amount of starter N fertilizer can reduce the effects of a N-deficiency. However, when combined levels of soil and fertilizer levels reach 18 to 37 lbs N/ac, any additional nitrogen will reduce nodulation. Excessive nitrogen levels past 45 lbs N/ac cause peas to become rather lazy and roots will choose to delay nodule formation and rather absorb excess nitrates for growth. Three to four weeks can pass before nodulation is fully restored. (Saskatchewan Pulse Growers)

Canola (*Brassica napus* L.) absorbs the nitrogen from ammonium or nitrate forms in the soil nitrogen pool. Consequently, canola is depended upon this nitrogen pool and usually requires the use of external applied fertilizers to fill this void. Applying nitrogen at seeding is common, however risks such as denitrification, leaching and immobilization can results and generally only 47% of applied nitrogen fertilizer is recovered by the plant (Lafond *et al.* 2007). Timing of nitrogen uptake is critical to plant stage. Delayed application during these stages can reduce nitrogen losses associated with applying during seeding. This method comes with a risk of dry climatic conditions causing nitrogen fertilizer to fail to migrate with timely rains. Holzapfel *et al.* (2007) suggests that in canola nitrogen can be delayed at least 30 days after seeding without yield reduction.

Intercropping is the process of growing two or more crops in the same place and at the same time. It been researched by WADO for several years. Initial research from WADO suggests that peas and canola prefer to be intercropped together in the same row rather than being separated into individual crop rows (2011, 2012). This may be explained by Sawatsky (1987) who found peas to leak nitrogen form their root zones (rhizodeposition) accounting for 22-46% of the below ground N-budget. It is suspected that peas may be passing excess fixed nitrogen to canola that would have been unused in monocrop pea. Isotope nitrogen experiments would have to confirm this theory. Fustec *et al.* (2010) have described with the use of isotopic N15 associated with rhizodeposition in the transfer of nitrogen in intercrops of pea and barley (*Hordeum vulgare* L.), faba bean (*Vicia faba* L.) and forage rapeseed (*Brassica napus* L.) and common vetch (*Vicia sativa* L.) and fodder cabbage (*Brassica oleracea* L.).

Interviews done by WADO in 2013 of several farmers in Manitoba and Saskatchewan over 14 field years of data suggest that the addition of nitrogen in the pea canola system is inferior to total grain production and or total land equivalent ratios (Chart 1). Real yields were compared to local crop insurance values for monocrops. Results indicate that the addition of nitrogen may be related to the negative impact on nodulation formation in the legume component causing the pea to act more like a parasitic weed to the canola rather than mutualistic companion for resources.

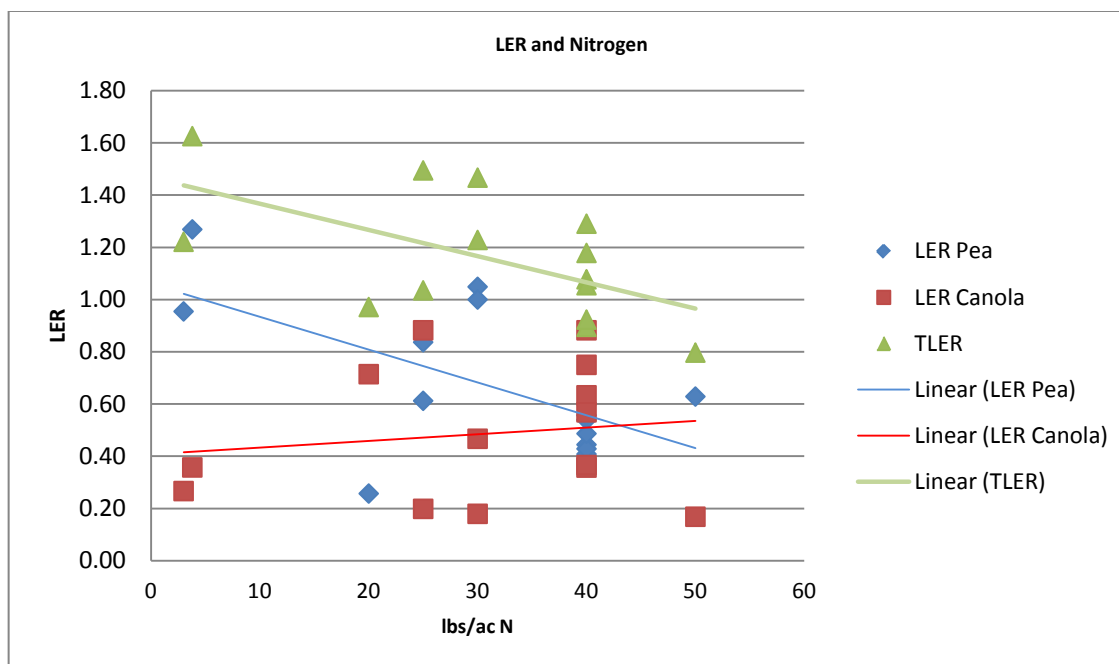


Chart 1: Land Equivalent Ratio (LER) of pea-canola components and total yield with variable rates of nitrogen surveyed by WADO in 2012 from 14 producer fields between 2010-2012 in Manitoba and Saskatchewan.

WADO hypothesized that a timely addition of nitrogen to the pea-canola intercrop system could be delayed and topdressed later in development to insure proper nodulation in pea, reduced residual soil nitrogen balances by growing canola inducing a soil environment for maximum pea nodulation and feed the canola system in time to produce a satisfactory canola crop providing a sufficient nitrogen supply for pod development. It is hypothesized that if peas have nodulated properly that the demand for applied fertilizers will be less by pea giving canola a competitive advantage in sourcing the majority of applied nitrogen. That is if pea N-fixing system and canola N-sourcing systems are working with less competition for nitrogen, then pea may be more willing to transfer fixed nitrogen to canola during later stages in development when nitrogen is more limiting. A trial was conducted in 2012 to investigate this hypothesis.

Methods

The trial was located near Melita, MB on NE 36-3-27W1 on a Liege loamy sand. A soil test was taken prior to seeding to account for the background nutrient values in the field. These values are summarized in Table 1.

Table 1: Soil test parameters prior to seeding the trial in Melita.

Site	Depth	pH	N lbs/ac	P ppm Olsen	K ppm	S lbs/ac
Melita	0-6"	8.0	11	9	216	34
	6-24"		21			42
	0-24"		32			76

Plot treatments were arranged in a randomized complete block design and replicated three times. Plots were seeded May 11th with an air seeder using a Seedhawk dual knife air seeding system with 6 openers on 9.5" spacing. Plots were seeded into summerfallow. Plot dimensions were 1.44 m wide by 9 m long. Varieties included 'CDC Golden' field peas and a '71-40 CL' canola. Seeding rates were 100 seeds/m² for pea and 84 seeds/m² for canola. Planting depth of seed was 5/8". Peas were inoculated with granular based rhizobia suited for peas and lentils (Becker Underwood). During seeding phosphate fertilizer was applied at a rate of 58 lbs/ac using granular 11-52-0 MAP. Nitrogen was sideband at seeding using liquid 28-0-0 UAN according to the specific treatment (see results; Table 2). Topdressing applications were applied when canola reached the 4.5 leaf stage on June 8th using granular urea (46-0-0). After topdressing a significant rain occurred amounting to 25 mm within 3 days after application, followed a week later by two events of 7 mm each. Canola plants, at the 4.5 leaf stage, were sampled for chlorophyll content with a SPAD 502 Meter (Spectrum Technologies) during (June 8) and after topdressing (June 26). During SPAD meter sampling the second newest canola leaf was sampled randomly in five places in the plot. Samples combined to form an average plot value. SPAD meter values would offer insight into the canola plant's demand for nitrogen where low values would indicate a greater need for nitrogen than higher values at the point in time.

Plots were kept weed free using Odyssey and Arrow herbicides applied at a rate of 17.3 g/ac and 150 mL/ac applied on May 28 and May 30, respectively. Plots were harvested with a Hege 140 plot combine set for canola. Samples were cleaned and separated using a seed cleaner. Sample yields were adjusted for 10% moisture content in both crops.

Data was subject to a two-way analysis of variance (ANOVA) using Agrobases Gen II statistical software. Coefficient of variation (CV), least significant difference (LSD), grand mean and R-squared were calculated.

Results

There were significant differences only in pea yield (Table 2). When nitrogen applications were exclusively made at seeding (trt 6, 10-12), increased nitrogen applications cause peas to reduce yield. This was likely from canola competition that had a trend to yield greater as nitrogen increased. Applied nitrogen at seeding may have inhibited nodule formation restricting early nitrogen fixation reducing pea yield. When applications were exclusively made as a topdress (trt 6-9), from the sole crops and total yields remained fairly stable. When nitrogen applications were split (trt 1-5) pea yields responded slightly negatively to increase nitrogen balances, but total yield remained steady among all treatments.

Table 2: SPAD meter readings and pea-canola component and total yield from various nitrogen application rates at seeding and later during topdressing.

Treatment No.	Applied N Rate lbs/ac		SPAD Meter Reading			Pea	Canola	Total
	With Seed	Topdressed	Before	After	% Change	Seed Yield kg/ha		
1	90	0	46.6	54.6	17.2	1126	979	2105
2	67.5	22.5	47.2	53.9	14.1	915	959	1874
3	45	45	45.5	52.5	15.3	1095	1022	2117
4	22.5	67.5	45.4	53.8	19.1	812	1252	2064
5	0	90	46.2	52.7	14.5	924	1177	2100
6	0	0	45.0	49.3	10.6	1389	842	2231
7	0	22.5	44.7	51.1	14.4	1251	1040	2291
8	0	45	44.6	50.8	14.0	1340	915	2255
9	0	67.5	45.9	50.4	9.9	954	1193	2147
10	22.5	0	46.8	51.1	9.0	1055	1011	2066
11	45	0	46.1	50.5	10.0	1430	761	2191
12	67.5	0	45.5	49.3	8.1	1418	894	2312
CV%			6.3	5.9	8.1	20.2	22.6	9.0
Grand Mean			45.8	51.6	13.0	1142	1004	2146
LSD (p<0.05)			4.9	5.1	15.5	393	386	330
P value			0.990	0.421	0.929	0.026	0.317	0.365
R-Square			0.16	0.68	0.49	0.62	0.46	0.55

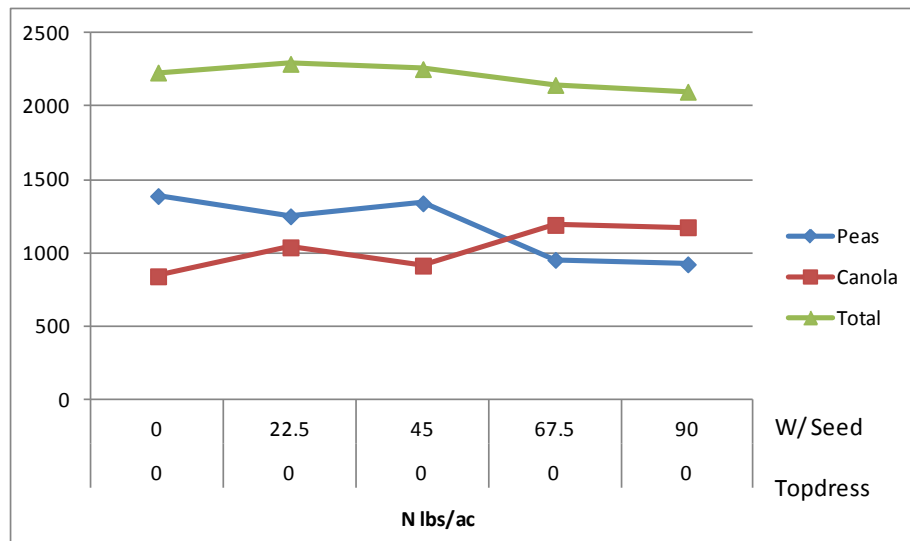


Chart 2: Total and component grain yield of pea and canola exclusively applied with variable rate of nitrogen at seeding.

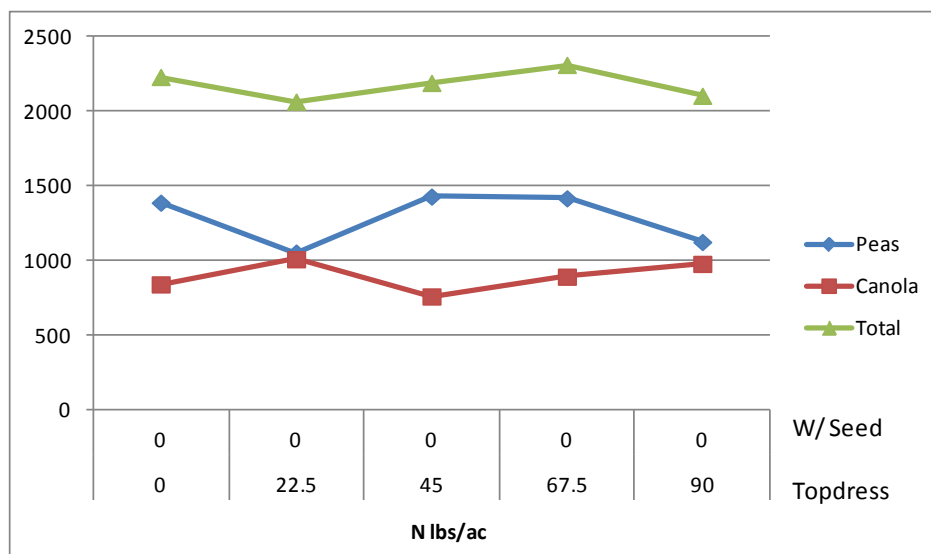


Chart 3: Total and component grain yield of pea and canola exclusively topdressed with variable rates of nitrogen.

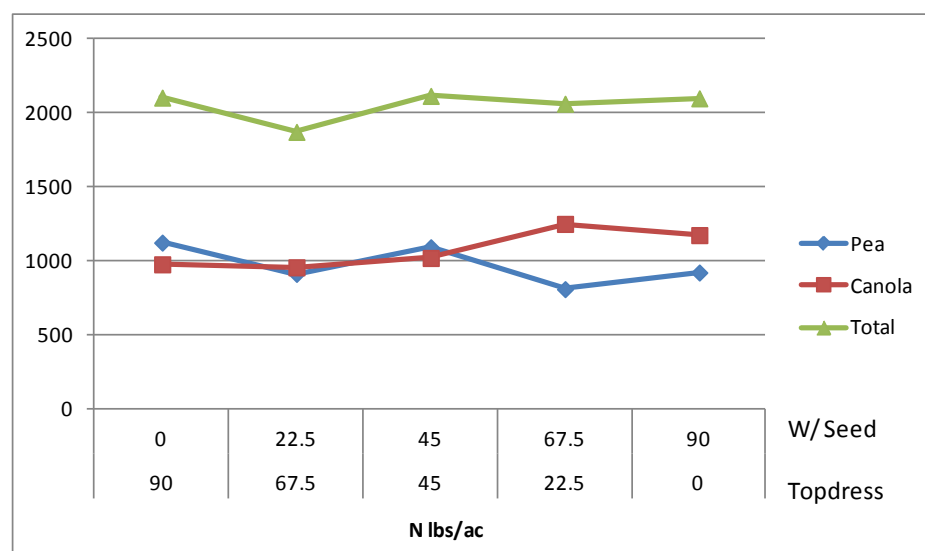


Chart 4: Total and component grain yield of pea and canola with variable amounts of nitrogen applied at seeding or topdressed.

Discussion

According to a single year of data, topdressing as an attempt to satisfy canola yield potential and reduce risk of failure of nodule formation did not result in an improvement of total crop yield regardless of the rate compared to applying nitrogen exclusively at seeding. Nitrogen applications did appear to increase canola yield as a trend but this was not significant. Nitrogen applications at seeding usually resulted in a loss of yield in pea. Exclusive topdressed application of nitrogen caused inconclusive results in nitrogen response in both crops. Visual observations did indicate a clear response relative to crop vigor in the field to nitrogen application in canola and likely caused the pea to be somewhat outcompeted.

Secondly during topdressing, some peas were dug up in plots containing 90 lbs/ac applied nitrogen and were compared to those that had not had applied nitrogen (June 26). Those plots with applied nitrogen had peas that were low in nodule formation while those plots without the application did have significant nodule formations. Based on this observation it is likely that pea nodulation was affected by nitrogen application. Pea roots in plots that were exclusively topdressed with high rates of nitrogen were not inspected after topdressing from failure of nodule formation. It is assumed exclusively topdressed plots would have sustained nodulation, but this should be confirmed in future experiments.

When nitrogen was applied exclusively at seeding, total yield of both crops tended decrease with increase nitrogen applications further supporting WADO's investigation into producer intercrop pea-canola fields with applied nitrogen reducing total yield and land equivalent ratios (Chart 1).

It is also interesting that canola failed to respond to applied low or nil rates of nitrogen significantly despite the yield trend and visual observations during plant development. This may be evidence that canola was sourcing rhizo-deposited free nitrogen from pea buffering the applied nitrogen response.

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Intercropping Winter Wheat and Hairy Vetch

Introduction

Hairy Vetch (*Vicia villosa* L.) is considered a winter annual and also noted as a biennial or perennial. It is popular among Canadian organic growers and progressive American cover crop system farmers. It's popularity is growing with experience on the Canadian Prairies as well. There is historical interest in the Ontario corn and dairy belt too. The plant is a fine stemmed, viney legume that is adapted to most soil types and is very competitive. The Hairy Vetch under our winter wheat plots grew about 100 cm, whereas Hairy Vetch on its own lodges and tangles profusely with a height of 30 cm, similar to a good crop of Laird Lentils. It apparently can contribute 60-120 lbs/ac nitrogen back to the soil from nitrogen fixation (Undersander *et al.* 1990). However, expectations of N-fixing from Hairy Vetch in our northern and shorter growing season would be less than that amount. Our observations with Hairy Vetch indicate the plant has good early and late season frost tolerance, but is poorly to moderately adapted for winter survivability in Manitoba. Pod maturity is uneven and prone to shatter. WADO has observed, if hairy vetch is planted during the normal spring seeding times of May, hairy vetch will grow profusely, flower in July and August and fail to produce viable mature seed by frost. However, if planted in the fall like winter cereals, dormant planted, or planted very early in the spring, hairy vetch will produce viable seed in the Manitoba climate.

Canadian producers generally had to import seed from deep in the United States as it was thought seed could not be produced in northern climates. However, some Canadian producers have found innovative ways to produce the seed. Producers have found that seeding in the fall like a winter cereal produces seed the next season relatively early. In addition, recent advancements by Maul *et al.* (2011) in genetic phylogeny have determined important groups of hairy vetch across the world with distinctive characteristics such as earliness to flower, cold hardiness and nitrogen fixation.

In 2009, WADO investigated the merits of intercropping winter wheat and hairy vetch. Those results indicated that modest hairy vetch seed could be produced when intercropped with winter wheat or sole cropped by itself. Hairy vetch seed production was directly related to winter wheat and hairy vetch seeding rates. Hairy vetch, despite growing among winter wheat stands, did not have a significant effect on winter wheat in that trial. That is, we can grow hairy vetch in winter wheat, produce hairy vetch seed and still maintain a normal winter wheat yield at the same time. This significantly improved net returns per acre when intercropping was practiced.

In 2012, WADO wanted to revisit those results with a simple trial of intercropping. Simply put, does hairy vetch affect winter wheat production? WADO also wanted to measure the sole crop output of hairy vetch seed production in comparison.

Methods

In the fall of 2011, treatments including plots of hairy vetch, winter wheat and a combination of hairy vetch and winter wheat were seeded near Melita, MB on the legal land location of NW 1-4-27W1, a Mentieth sandy loam. Prior to seeding the area was burned off with a tank mix of glyphosate (Maverick) and Heat and Liberty herbicide at a rate of 1 L/ac, 4 g/ac and 0.5 L/ac, respectively. The treatments were direct seeded in a randomized complete block design and replicated three times using a Seedhawk dual knife air drill with six rows at 9.5" spacing. Plots were seeded September 15, 2011 into rather dry conditions. Seeding depth was 0.5" deep. Target seeding rate was 100 lbs/ac for winter wheat (CDC

Falcon) and 35 lbs/ac for hairy vetch (from producer, Allan McKenzie, Nesbit MB). Six month old granular pea-lentil inoculant (Becker Underwood) was seed with both crops to promote hairy vetch nodulation. Fertilizer was sideband at a rate of 46 lbs/ac N (28-0-0 UAN) and 30 lbs/ac P (11-52-0 MAP). Plots were topdressed in early April with 56 lbs/ac N (46-0-0 Urea). Plots were kept weed free by spraying Achieve (and adjuvant Turbocharge 5L/100L) and Basagran Forte tank-mixed at a rate of 0.2 L/ac and 0.91 L/ac applied with 20 gal/ac water volume, on May 14, 2012. Plots were desiccated with Reglone herbicide at a rate of 0.91 L/ac with a water volume of 20 gal/ac on July 23, 2012. Harvest commenced July 27th for both crops. Data recorded during the seasons included soil temperature (Chart 1), fall and spring emergence, date of flower, date of maturity seed moisture and seed yield. Harvest seed components were separated using a spiral cleaner with 1 core located at AAFC Brandon. Data was analyzed with a two-way analysis of variance (ANOVA) using Analyze-it v 2.03 (Microsoft Corp.) statistical software. An economic analysis relating a theoretical cost of production (Appendix) to each treatment was applied and also analyzed.

Results

There were no significant differences in winter wheat emergence and emergence survival in hairy vetch in sole crop or intercrop treatments. About 61-80% of the hairy vetch survived winter-kill (Compared to 17% survival in 2009 trials). This may be due to the use of locally produced seed acclimatized to Manitoba conditions from the 2009 crop year supplied by producer Allan McKenzie (Nesbitt, MB). There may have been a slight delay in flower intercropped hairy vetch by 1 day ($p < 0.1$) compared to sole crop hairy vetch. However both crops matured simultaneously on July 23rd.

Crop System	Winter Wheat		Hairy Vetch			Total Yield	Gross\$/ac	Net\$/ac	COP*
	Emergence (p/m2)	Yield (kg/ha)	Winter Survival	DTF Julian	Yield (kg/ha)	(kg/ha)			
Hairy Vetch	-	-	61.3%	163.0	1303.1	1303.1	\$ 2,901.62	\$ 2,523.46	\$ 378.16
Winter Wheat	47.0	4367.8	-	-	-	4367.8	\$ 603.01	\$ 290.35	\$ 312.66
Winter Wheat + Hairy Vetch	51.6	4065.6	79.5%	164.3	75.6	4141.2	\$ 729.61	\$ 537.73	\$ 430.90
Coefficient of Variation (%)	10.2	3.6	32.9	0.2	12.8	8.1	8.4	10.8	
LSD $p < 0.05$	17.7	537.7	NS	1.4	310.7	597.1	\$ 269.86	\$ 272.35	
R-squared	0.84	0.97	0.36	0.90	0.99	0.99	0.99	0.99	
P value	0.38	0.14	0.44	0.057	0.0034	0.0002	<0.0001	<0.0001	

*Cost of production assumptions summarized in Appendix

There were significant differences in hairy vetch seed yield, gross revenue and net revenues among cropping treatments. There was no significant difference in winter wheat yield as a sole crop compared to intercropped winter wheat yield. Hairy vetch sole cropped dramatically yielded more seed than hairy vetch intercropped with winter wheat. However, enough hairy vetch seed was generated in the sample to make that treatment more profitable than just growing wheat alone with regards to gross and net returns. Hairy vetch as a sole crop was by far the most profitable crop and intercropping or sole crop winter wheat.

Comments

Hairy vetch production is obviously more productive as a sole crop, however given the growth habit of hairy vetch, specialized equipment would be required to produce it as a sole crop. In sole crop production equipment such as land rollers, flex headers, lifter bars may be required in order to bring the crop in properly. However growing hairy vetch as a companion crop with winter wheat proved to be

beneficial as a source of greater income per acre and as a potential renewable local source for hairy vetch seed.

As a side note, hairy vetch seed has been reported to cause poisoning in cattle, horses and poultry (Government of Canada, 2009).

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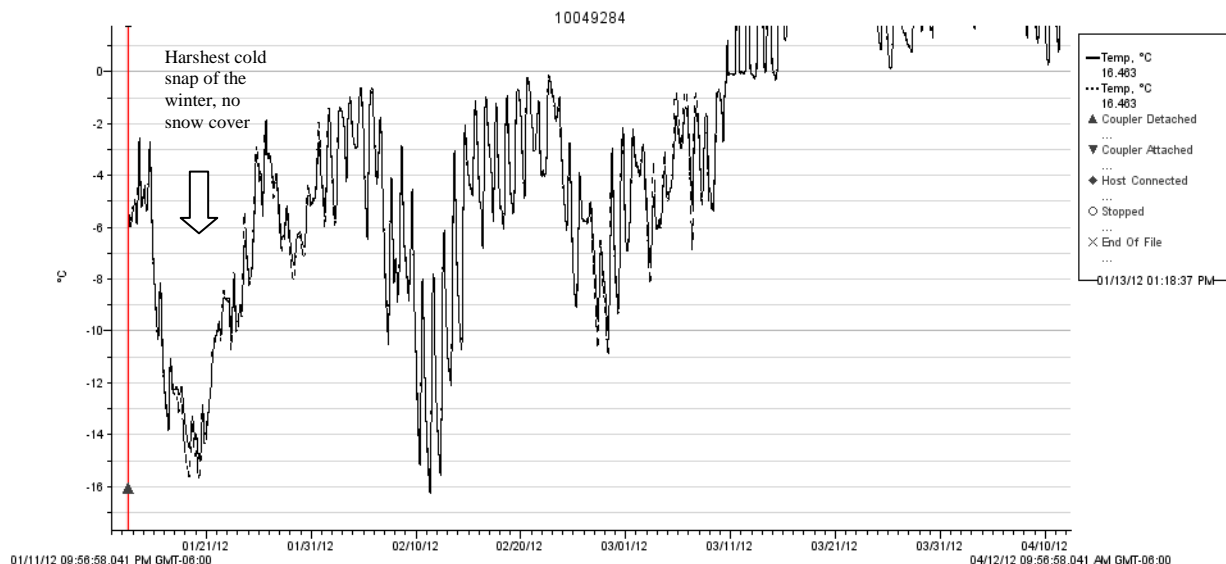


Chart 1: Soil Temperature graph of hairy vetch and winter wheat plots during the winter and spring months in Melita from January to April. Temperatures reaching -15°C a couple times in January and February, then -9°C in March possibly causing some winterkill in hairy vetch stands.



Hairy vetch climbing the winter wheat



Winter wheat sole crop (left) and hairy vetch sole crop (right).



Harvest of a sole crop of hairy vetch seed.



Hairy vetch about a week from physiological maturity. Note the edge of the plot blooming where the mowers were maintaining the edge of the plot, delaying seed production.



Seedlings of hairy vetch in mid December, plant on left is desiccated from winterkill and right is alive. Note lack of snow cover this far into winter.



Hairy vetch pods and winter wheat heads ready for harvest.

Appendix – Cost of Production

		Winter Wheat
A. Operating Costs		
Seed & Treatment		\$ 22.00
Fertilizer		\$ 78.00
Herbicide		\$ 7.22
Fungicide		\$ 16.25
Insecticide		\$ -
Fuel		\$ 16.15
Machinery Operating		\$ 8.00
Crop Insurance		\$ 10.76
Other Costs		\$ 7.75
Land Taxes		\$ 4.35
Drying Costs		\$ -
Interest on Operating		\$ 4.69
Total Operating		\$ 175.17
B. Fixed Costs		
Land Investment Costs		\$ 31.25
Machinery Depreciation		\$ 30.00
Machinery Investment		\$ 7.50
Storage Costs		\$ 3.52
Total Fixed		\$ 72.27
Total Operating & Fixed		\$ 247.44
C. Labour		
		\$ 26.25
Total Costs		\$ 273.69
Estimated Farmgate		
Price \$ per unit	bu	\$ 7.76 bu
Price \$ per tonne	t	\$ 285.00 t
Yield per acre	bu	\$ 58.00 bu
Gross Revenue / acre		\$ 450.08

Hairy Vetch Cost of Production Assumptions

Assumptions per acre		per acre		
	HV farm gate	\$2.50/lbs	\$ 5.50	per kg
	WW farm gate	\$7.76/bushel	\$ 0.34	per kg
	HV Seed Cost	\$ 87.50	\$ 216.13	per ha
	WW seed cost	\$ 22.00	\$ 54.34	per ha
	WW COP*	\$ 312.66	\$ 772.27	per ha
	HV COP	\$ 378.16	\$ 934.06	per ha
	WWHV COP	\$ 400.16	\$ 988.40	per ha
	N- 100	\$ 63.00	\$ 155.61	per ha
	P - 30	\$ 15.90	\$ 39.27	per ha
	Cleaning Cost for HV in WW	\$ 1.20	per bushel	
	Achieve + Basagran	\$ 46.19	\$ 114.09	
*Used the 2013 WW COP Manitoba ,changed the herbicide cost to \$46.19, then worked a \$1.20 per bushel cleaning cost in for the WWHV.				
Achieve 2010 price		\$19.43 per acre		
Basagran forte price		\$29.41/L		

Intercropping Hairy Vetch in row cropped Corn or Sunflower for Grain and Forage Production

Introduction

Grazing or silage corn is a cost effective option for feeding beef livestock during the winter months. Corn is a high energy feed with protein levels matching nutritional feeding requirements of a dry cow in mid and late pregnancy. It has the potential to produce more dry matter than tame hay and other annual forage cereals.

Grazing corn has several advantages compared to other feed types. One advantage is the reduced costs associated with managing manure removal from winter pens. Grazing corn allows the cows to spread the manure. This manure is evenly distributed in the field. Additionally the nutrients produced from livestock grazing will be available for the following crop season on those fields, reducing fertilizer needs. Research at the Western Beef Development Centre indicates that significantly more nutrients are available in the soil after grazing feed in fields rather than spreading manures and compost from a conventional pen feeding system (B. Lardner, 2005, Winter Feeding Beef Cows – Managing Manure Nutrients, Western Beef Development Centre, Lanigan, SK, Fact Sheet No. 2005-02). Grazing corn eliminates the need for bale handling machinery typically used during the winter months in pens for daily feeding. Grazing corn also eliminates the need to



convert grain land into hayland providing a short term option when a long term forage establishment may not be needed.

Some producers in 2007 were commenting on corn feed quality when cows were reluctant to feed on the lower stems of corn plants. In 2008, WADO conducted feed tests on corn parts to determine the differences in feed quality of those parts. Producers were observing cows intentionally bypassing the last 24 to 26 inches of the base of the plant. It was speculated that due to the early maturity of the plant, high fibre values were accumulating in these lower stems compared to the values above this level. Samples were taken from two varieties from two fields in which this problem was occurring. Corn feed quality results indicated that lower stems indeed had higher acid detergent fibre contents similar to wheat straw than the cobs and the upper stems and leaves more typical of ideal feeds. In addition, protein and energy content is low in lower stalks than in the cob and upper stems. These tests put numbers to observation that indeed the lower stems are less desirable by the livestock. Could something be grown with corn to improve its palatability?

Hairy Vetch (*Vicia villosa* L.) is considered a winter annual and also noted as a biennial or perennial. The plant is a fine stemmed, viney legume that is adapted to most soil types and very competitive. Vines can grow over 100 cm long when able to trellis, whereas Hairy Vetch grown on its own lodges and tangles profusely with a height of 30 cm, similar to a good crop of Laird Lentils but becomes difficult to swath. It apparently can contribute 60-120 lbs/ac nitrogen back to the soil from nitrogen fixation (source www.hort.purdue.edu). Hairy vetch has become popular in organic plow downs and the cover crop cultures for this reason. However, expectations of N-fixing from Hairy Vetch in Manitoba's northern latitude and narrow growing season would be less than that amount. WADO's observations with Hairy Vetch indicate the plant has good late season frost tolerance, but a poor to fair potential for winter survivability. Root development is rather shallow and similar to field pea, which may make it a good candidate with deep rooted crops in intercropping systems. Pod maturity is late seasoned (late August) when planted in the spring (May) and prone to shatter. Hairy vetch pasturage and seed can be toxic to livestock and should not be fed as forage in full bloom or containing seed, but is safe as a silage or hay. (Panciera R.J, Ritchey J.W & D.A 1992. Hairy Vetch Poisoning in Cattle: Update and Experimental Induction of Disease. J VET Diagn Invest. Vol. 4: 318-325). However prior to seed production, hairy vetch feed quality is exceptional and is similar to alfalfa (WADO feed analysis, Oct 2008). Hairy vetch can be pastured, hayed, or ensiled (Heson P.R., Schotch H.A., 1968 Vetch culture and uses. US Department of Agriculture Farmers' Bulletin 1740. US Government Printing Office, Washington DC.).

In 2010 and 2012, WADO conducted an experiment where corn was grown as a row crop (on 30" & 60" rows) and hairy vetch was seeded (intercropped) in between the rows and allowed to grow to its full potential. In 2010 the experiment was sort of a bust since weed control was rather poor and the hairy vetch overran the corn. It was obvious from this trial the corn suffered both from spray drift, competition and lack of corn row weed control. Clethodim herbicide that was used to attempt to control weeds between the rows of corn in the hairy vetch at times drifted and damaged the corn and allowed hairy vetch to grow predominately and take over the corn. Also not all weeds were controlled close to the corn rows as the herbicide would have killed the corn. In 2012, use of Accent herbicide (Dupont) was more effective at controlling grassy weeds since this herbicide is safe on corn and somewhat safe on hairy vetch. Grassy weeds are likely the greatest downfall of the weed control, further testing of other chemicals (such as Ultim herbicide by Dupont) is warranted in addition to alternative cultural practices (green manure mulching). There are no herbicides registered for hairy vetch production in Manitoba and even fewer that are in common with corn.

The objective of intercropping corn with hairy vetch was to observe differences in corn grain yield, observe biomass and feed quality if potentially grazed and assess soil nutrient parameters before and after production. It is hypothesized that hairy vetch may assist not only in grain corn production (root-nutrient interactions) but also in terms of increasing corn fodder feed quality overall in the field having a nutrient and energy rich forage available.

Unfortunately in 2010, corn was damaged by herbicides and a minor seeding error. Results were not recorded. A few photos were taken. In 2012, plots were relatively fine most of the season until deer severely browsed the crop. A SPAD meter readings were taken. Some photos were also taken.

Methods (2012)

Plot treatments were arranged in a randomized complete block design and replicated three times. Treatments included 30 and 60 inch corn rows treated with or without hairy vetch rows between. Plots consisted of 4 rows of corn approximately 3 meters wide by 9 meters long seeded May 25. Seed Depth was 1" deep. DK26-79RR corn was seeded at a rate of 24,000 plant/ac on either 30" rows (8" b/w plants) or 60" rows (4" b/w plants). Hairy vetch was seeded between the corn rows on 9.5" row spacing at a rate of 24 lbs/ac excluding in the corn rows. Fertilizer was sideband at a rate of 95 lbs/ac nitrogen and 30 lbs/ac phosphorous with 28-0-0 UAN and 11-52-0 MAP. Hairy vetch was inoculated with granular pea/lentil rhizobia (BeckerUnderwood) at a rate of 5 lbs/ac. Plots were kept relatively weed free with Accent herbicide applied twice at a rate 15 g/ac, June 8 and 13th. Basagran herbicide was applied July 9th at a rate of 0.9 L/ac using a water volume of 20 gal/ac.

A SPAD 502 meter (Spectrum Technologies) was used to measure leaf chlorophyll content. Readings were taken from each plot by sampling 5 random corn leaves per plot during early silk. The second most new leaf was used. The five samples were calculated as a plot average. Corn grain harvest and biomass of corn and hairy vetch was not taken due to deer damage.

Data was subject to a two-way analysis of variance (ANOVA) using Analyse-it 2.03 statistical software (Microsoft). Coefficient of variation, least significant difference at the 0.90 level of significance and R-squared were calculated.



Photo: Corn and hairy vetch intercropped

Results

There were significant differences in the mean days to silk and mean SPAD meter reading among treatments. Days to silk were at least 1 day earlier on 30 inch rows compared to 60 inch rows, however the use of hairy vetch did not affect date of silk. Mean SPAD meter reading also were different among row width but not with the addition of hairy vetch.

Trt	Description	Mean Days To Silk		Mean SPAD Reading	
1	Corn 30" Row	59.7	a	61.9	b
2	Corn 60" Row	62.3	b	53.3	a
3	Corn 30" Row + Hairy Vetch	59.7	a	59.8	b
4	Corn 60" Row + Hairy Vetch	62.0	b	57.5	ab
Coefficient of Variation (%)		1.3		5.7	
LSD (p<0.10)		1.3		5.3	
R-squared		0.85		0.68	
P value		0.010		0.079	
Significant?		Yes		Yes	

Discussion

Hairy vetch did not significantly affect corn plant development. This is good news as there was no negative effect of intercropping hairy vetch and may suggest that grain development may also not be affected. Further testing is required without wildlife damage over several site years to confirm this hypothesis.

Use of applied nitrogen fertilizers in Hairy vetch is likely unorthodox. In legumes such as pea, addition of nitrogen fertilizers and or peas grown on nitrogen rich soils may fail to nodulate properly and prefer to uptake nitrogen from soil based nitrogen reserves. This may create a nutrient deficiency overall for corn. Results from the SPAD meter readings in this trial suggest otherwise. Specific nitrogen placement or slow release products may assist in proper nodulation in hairy vetch and corn nutrition.

Hairy vetch is also a possible host for cutworm and earworm development. This may aggravate the already susceptible corn plant who is also a favorite for cutworms. Further examination may be required in future testing to determine the extent of this issue.

Sunflower Intercropped with Hairy Vetch

Intercropping sunflower and hairy vetch may have some similar objectives as in corn and hairy vetch. Compatibility in herbicide use, timing of physiological development of both crops, potential fall-winter grazing in sunflower fields and differing root zones make these two crop ideal candidates for intercropping. Authority 480 herbicide (sulfentrazone) by NuFarm and FMC was registered for use in sunflower in 2011 in Manitoba is also compatible (unregistered) for weed control in hairy vetch according to observations by WADO (2009, 2011). By nature sunflower planted in spring develops its growth stages rather quickly in June. Hairy vetch on the other hand, develops rather slow initially, then peaks significant biomass development in August when planted in the spring. By this time, sunflower has finished physiological development, drops its leaves and allows hairy vetch to continue to flourish. The potential of intercropping sunflower and hairy vetch is rather large.

WADO conducted an experiment with row cropped sunflowers and intercropped hairy vetch in 2012.

Methods

Plot treatments consisted of 30" row confectionary sunflowers (10" spacing, var. 6946) with and without hairy vetch inter-seeded (24 lbs/ac on 9.5" spacing) between the rows of sunflower. Hairy vetch was inoculated with pea/lentil granular rhizobia (BeckerUnderwood). Trial area was pre-treated with Rival,

glyphosate and Authority herbicide at 0.6 L/ac, 1L/ac and 100 ml/ac, respectively, prior to seeding. Seed was seeded 1.25" deep in plots 1.44 m wide by 9 meters long.

A SPAD 502 meter (Spectrum Technologies) was used to measure leaf chlorophyll content in sunflower. Chlorophyll content can be correlated to potential yield. Readings were taken from each plot by sampling 5 random corn leaves per plot during R5.5 (mid-flower) stage of sunflower development. The second most new leaf was used. The five samples were calculated as a plot average. Sunflower grain harvest and biomass was not taken due to bird damage.

Composite soil tests were taken in the fall prior to freeze up to assess any noticeable differences in soil nutrient content. These results were inconclusive, un-randomized and will not be included in this report.

Data was subject to a two-way analysis of variance (ANOVA) using Analyse-it 2.03 statistical software (Microsoft). Coefficient of variation, least significant difference at the 0.90 level of significance and R-squared were calculated.

Results

There were no significant differences in mean SPAD meter reading in sunflower with or without hairy vetch intercropped between their rows. This data suggests that at this late stage of sunflower development that yield may not be affected when hairy vetch is intercropped in sunflower stands.

Treatment	Mean SPAD	St. Err.
Sunflower	34.1	2.6
Sunflower & Hairy Vetch	36.3	1.1
Coefficient of Variation	12.6	
Least Significant Difference	NS	
R-squared	0.28	
P value	0.60	

Discussion

Hairy vetch did not significantly affect sunflower plant development. This is good news as there was no negative effect of intercropping hairy vetch and may suggest that grain development may also not be affected. Further testing is required without wildlife damage over several site years to confirm this hypothesis.

Hairy vetch is also a possible host for cutworm and earworm development. This may aggravate the already susceptible sunflower plant who is also a favorite for cutworms early in development. Further examination may be required in future testing to determine the extent of this issue.

The potential for grazing sunflower stubbles intercropped with hairy vetch seems promising but poisoning from hairy vetch in livestock is still a risk. The extent of biomass production in hairy vetch under row crops like sunflower is undetermined. Plots were left to overwinter and may be sampled in the spring to assess biomass potential from hairy vetch litter.

Direct seeding into hairy vetch mulches may prove difficult with current seeding equipment commonly used by farmers. A vertical tillage unit or a discer may be required to manage such heavy and tangled residues. However with the development of seeding openers designed to manage thick thatches of biomass may prove beneficial in this concept.

Nitrogen fixation by hairy vetch may offset nitrogen demand in future crop rotations after sunflower and hairy vetch. The significance of a replicated soil test in the spring of 2013 and a biomass of hairy vetch may shed light on these economics for future rotations.

Again, use of applied nitrogen fertilizers in Hairy vetch is likely unorthodox. In legumes such as pea, addition of nitrogen fertilizers and or peas grown on nitrogen rich soils may fail to nodulate properly and prefer to uptake nitrogen from soil based nitrogen reserves. This may create a nutrient deficiency overall for sunflower. Results from the SPAD meter readings in this trial suggest otherwise. Specific nitrogen placement or slow release products may assist in proper nodulation in hairy vetch and sunflower nutrition.

Photos: (left) Hairy vetch growing between the rows of sunflower. At this stage sunflowers are sensitive to competition. Hairy vetch is still quite small. (Right) Sunflowers at the R6 stage with hairy vetch starting to bloom underneath the canopy of leaves.



Response of *Brassica carinata*, Canola and Camelina to Applied Nitrogen

Brassica carinata Variety Trial

Cooperators: Agrisoma Biosciences Inc. – Ottawa ON, www.agrisoma.com
Paterson Grain, Melita

Introduction

Brassica carinata A. Braun, commonly known as Ethiopian mustard, has an oil profile optimized for use in the biofuel industry, specifically for biojet fuel. This crop is extremely well suited to production in semi-arid areas. It offers good resistance to biotic stressors, such as insects and disease, as well as abiotic stressors, such as heat and drought. Carinata is a vigorous crop with a highly branching growth pattern and large seed size. It has excellent harvestability, with good lodging and shatter resistance. An elite line has been developed by Agrisoma Biosciences Inc. selected for 2012 and has the following production characteristics:

- Oil Content 44%
- Protein 28%
- Maturity Zone is Mid-long season (12-14 days later than oriental mustard)
- Blackleg Resistance Excellent
- Lodging Resistance Very Good to Excellent³

Brassica carinata will be able to access the full suite of *Brassica* spp. pest control options. Minor use registrations targeting seed treatments, selective broadleaf and grass control herbicides have been initiated. (source: Agrisoma Biosciences Inc.)

Brassica carinata has 34 chromosomes with genome composition BBCC and is thought to result from an ancestral hybridization event between *Brassica nigra* L. (genome composition BB) and *Brassica oleracea* L. (genome composition CC). *B. carinata* has high levels of undesirable glucosinolates and erucic acid making it a poor choice for general cultivation as an oilseed crop in comparison to the closely related *Brassica napus* L. (canola). On October 29 of 2012, the first flight of a jet aircraft powered with 100 percent biofuel, made from *Brassica carinata*, was completed by Agrisoma Biosciences Inc. (Source: Wikipedia)

Camelina sativa (L.) Crantz., from the plant family Brassicaceae, commonly called just camelina, false-flax, linseed dodder, or gold-of-pleasure, originated in the Mediterranean to Central Asia. Similar to the other Cruciferous species, it is likely best adapted to cooler climates where excessive heat during flowering is not harmful to reproduction. Camelina is short-seasoned (85 to 100 d). It is speculated that camelina may play a significant role as a low input oil source for biodiesel production as well as have a role in the health food market for its omega-3 benefits. Oil content is about 38-42%, near to that of canola at 44%. Oil properties are similar to that of flax, with 34% being a source of Omega-3 fatty acids (linoleic and linolenic). Markets include that of the health foods area for enrichment of its omega-3 oil use, biodiesel production, soaps, cosmetics, bird seed and cooking qualities. (Source: Putman et al. 1993)

In 2007, research by WADO across 3 climatic zones in Manitoba determined camelina to yield 37% less than canola but economically was similar to canola in terms of net returns.

In Johnson et al. (2007) reported that nitrogen requirements for *Brassica carinata* are similar to *Sinapis alba* L. (Yellow Mustard) and *Brassica napus* (Argentine Canola).

In 2012, WADO partnered with Agrisoma Biosciences Inc. to determine the yield response of *B. carinata*, compared to canola and camelina. Nitrogen was applied at 60, 90 and 120 lbs/ac. WADO also conducted a variety trial evaluate cultivars of *B. carinata* in southwest Manitoba. Four ethiopian cultivars developed by Agrisoma and their partners were compared to the standard AC Cutlass (oriental) variety.

Methods

A soil test was taken prior to seeding the plots to determine background nutrient profiles. Trials were planted into a Lieve loam on Souris River flat, located at Melita, MB. Plots were seeded into chemical fallow from the 2011.

Soil Test			N	P	K	S
Location	Depth	pH	lbs/ac	ppm Olsen	ppm	lbs/ac
NE 36-3-27W	0-6"	7.9	14	12	247	54
	6-24"		18			42
	0-24"		32			96

Variety Trial

Five cultivars were seeded into plots arranged in a randomized complete block design and replicated three times. Plots were seeded May 1, 2012 at a depth of 3/8". Final plot dimension was 1.44 m wide by 9 m long. Fertilizer was side band at a rate of 106 lbs/ac nitrogen and 30 lbs/ac phosphorous using liquid 28-0-0 UAN and granular 11-52-0 MAP. After seeding the area was burned off with a tank mix of glyphosate and Rival at a rate of 1 L/ac and 0.5 L/ac, respectively. Matador insecticide was applied May 30 to control flea beetle infestations at a rate of 34 mL/ac. On June 4, Muster herbicide was sprayed at a rate of 12 g/ac (plus adjuvant Agral 90). Assure II herbicide was applied May 17 at a rate of 0.15 L/ac to control grassy weeds. Plots were desiccated August 6 with a tank mix of Reglone, glyphosate and Heat applied at rates of 0.3 L/ac, 1 L/ac and 10 g/ac, respectively. Plots were harvested for seed yield on August 16, 2012 with a Hege 140 plot combine. Data collected included emergence, stand, days to flower, days to maturity, height, test weight, seed yield and seed moisture content. Sub samples were sent to Agrisoma for oil content analysis. Data was analyzed with a two-way analysis of variance (ANOVA) Agrobase Gen II statistical software using the nearest neighbors analysis (NNA).

Nitrogen Response Trial

Agronomic preparations were similar to the variety trial except nitrogen rates were adjusted for each treatment. Crop type (main plot) and nitrogen rate (subplot) treatments were arranged in a split plot design and replicated three times. Varieties and seeding rates used in this experiment were as follows:

Crop	Variety	Seeding Rate
Brassica carinata	AACA100 (Agrisoma)	6 lbs/ac
Canola	71-40 CL	5 lbs/ac
Camelina	Calena	5 lbs/ac

Data collected included emergence, stand, days to flower, days to maturity, height, test weight, seed yield, seed moisture content. Data was analyzed with a two-way analysis of variance (ANOVA) Agrobase Gen II statistical software. Main plot and subplot effects were tested for interaction.

Results

Variety Trial

There were significant differences among cultivars only in height. All other parameters were not significant. AC Cutlass was the shortest of the cultivars.

Cultivar	Emergence (p/m ²)	Stand (%)	Days to Flower	Days to Maturity	Height (cm)	Test Wt. (kg/0.5L)	Yield (kg/ha)
100880EM	36	88	51	85	127	344	1790
080820EM	54	88	46	83	137	341	1680
AAC A100	44	83	53	88	130	346	1897
AC Cutlass	37	83	54	89	113	341	1651
080814EM	33	88	54	88	127	308	1719
CV (%)	26.2	8.8	10.4	4.5	5.4	7.5	13.8
Grand Mean	41	86	52	87	127	336	1748
LSD (p<0.05)	20	14	10	7	13	48	482
P value	0.22	0.81	0.42	0.41	0.0312	0.40	0.52
R-Square	0.54	0.57	0.36	0.37	0.81	0.48	0.41

Nitrogen Response Trial

There were significant differences in days to flower, shatter and yield among crop type used. There were no significant responses to nitrogen. Emergence and stand were similar among all crop types and nitrogen rates. In order of flowering date, camelina was the first to flower at 44 days, canola second to flower at about 49 days and then *B. carinata* at about 54 days. This means *carinata* would be most at risk of late season heat blasting causing seed abortions. Camelina shattered the least (0%), followed by *B. carinata* (2%) then by canola (5%). Final seed yield was statistically similar between canola and *B. carinata*, but not camelina. Camelina yielded much less than canola and *carinata*. There was no response to nitrogen application for any crop. Background nitrate levels may have increase after the soil test was taken rendering any nitrogen response nil.

Main Plot	SubPlot	Days to Flower	Emergence (p/m ²)	Stand (%)	Shatter (%)	Yield (kg/ha)
Canola		49	34	77	5	1947
	60N	49	37	80	6	1858
	90N	50	36	78	5	1902
	120N	50	30	73	5	2081
Camelina		44	43	78	0	347
	60N	44	39	82	0	364
	90N	44	48	75	0	390
	120N	44	41	77	0	288
Carinata		54	32	77	2	2042
	60N	53	32	78	2	1888
	90N	54	31	73	2	2041
	120N	54	33	78	2	2199
All Crops	60N	49	36	80	2	1370
	90N	49	38	76	2	1444
	120N	49	35	76	2	1523
CV		1.4	16.0	10.3	31.9	11.8
Grand Mean		49	36	77	2	1446
R-Square		0.99	0.82	0.45	0.95	0.98
LSD (p<0.05)	Main Plot	1	21	12	1	523
	Subplot	1	6	8	1	177
	MP x Sub	1.1	10.4	14.1	1.3	307.2
P value	Main Plot	0.0001	0.42	0.97	0.0003	0.0014
	Subplot	0.12	0.48	0.46	0.76	0.21
	MP x Sub	0.44	0.36	0.84	0.50	0.36

Observations

Brassica carinata appeared to resist the heavy infestation of Aster Yellows that invaded the camelina and canola plot. Aster yellows was a significant disease of 2012 and was believed to be the demise of some of the yield loss associated with canola that year. Camelina and Canola appeared to have contracted Aster Yellow more than ever (photos) in 2012.



Photos: Canola (left) and Camelina (right) with an Aster Yellows infection with distinctive abnormal tuft on top.

Conclusions

In 2012, *Brassica carinata* appeared to be a promising crop offering shatter resistance, early season vigor (observation) and early maturity and yield, compared to Canola and camelina. Paterson Grain may be marketing *B. carinata* for production in the 2013 season. Given the extensive ancestry of carinata in

the rather large and diverse mustard family, *carinata* has a promising future. WADO plans to continue its research efforts with *B. carinata* and Agrisoma Biosciences Inc.

References

1. Johnson E., 2007, Falk K., Klein-Gebbinck H., Lewis L., Malhi S., Leach D., Shirtliffe S., Holm F. A., Sapsford K., Hall L., Topinka K., May W., Nybo B. Agronomy of *Camelina sativa* and *Brassica carinata*. Agriculture and Agri-Food Canada (AAFC). Scott, SK. Saskatchewan Ministry of Agriculture. Agriculture Development Fund Project #20070130
2. 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.

WADO Flax Fibre Project 2012

Cooperators: European Flax Fibre Company
Eric Liu – MAFRI – Fibre and Composites Specialist (Winnipeg MB)
Manitoba Diversification Centres (Portage, Arborg, Melita)

Objectives:

1. To grow two fibre flax varieties across several regions in Manitoba and assess for flax fibre yield and quality (in a small field scale of 4 acres).
2. Pull the large plots of each variety and leave to rot over fall/winter 2012
3. In Wawanesa, the grain variety Bethune was also grown to compare to the fibre varieties.
4. Bale and ship back to Europe for quality and fibre yield assessment (spring 2013).

Location

Located along the lane of the Ellis Seed Farm (Black Creek Farms Ltd.) approximately 2 km north of the town Wawanesa, MB. Legal Land Description: NE 35-7-17 W1
GPS Points: Lat 49.615298; Long -99.679856

Crop Rotation

In 2010 the area was wheat, soybean plots. In 2011 no crop was seeded so the property was maintained with chemical fallow. Plot area is prone to group 1 herbicide resistant green/yellow foxtail. Weeds were burned off prior to seeding including:

Green Foxtail [*Setaria viridis* (L.) P.Beauv]
Yellow Foxtail [*Setaria pumila* (Poir.) Roem. & Schult.]
Pygmy Flower (*Androsace septentrionalis*) L.
Sow Thistle (*Sonchus arvensis* L.)
Stinkweed (*Thlaspi arvense* L.)

Pre-seed soil Test

Not taken in 2012 or 2011. Site in 2010 was last sampled as the following:

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

Site likely had a high nitrate and phosphate level in the soil due to the chemical fallow of 2011

Soil Characteristics

MCIC Soil Zone: B Ramada Clay Loam

Pre-seed Herbicide application (burnoff): May 30, 1 L/ac Roundup and 0.9L/ac Rival (trifluralin). Land owner also sprayed at least 0.5 L/ac of glyphosate as well before seeding). Rival has control of green and yellow foxtail.

Seed Date: May 31, 2012

Seed Rate: 50 lbs/ac

Seed Depth: 5/8"

Varieties, Layout, Size:

Two flax fibre varieties named Alize and Melina were seeded in blocks about 2 acres in size per variety side by side. Extra area was seeded to the local grain flax variety Bethune as well but to a much small extent (1/8 acre). The block was 212 meters long. Approximately 14 strips (1.44 meter wide) of Alize and Melina were seeded. Long strips aided in fiber harvest in terms of the number of turns required at the headlands of each variety.

Fertilizer Applied:

Sideband 42 lbs/ac N from 28-0-0 UAN, ~5 lbs/ac P applied by 11-52-0 MAP

Seeder: Seedhawk dual knife system with 6 rows with 9.5" spacing.

Soil Seeding Conditions: Perfect with good soil moisture. Tractor traveling about 4 mph.

Season Weather Conditions (at request from WADO)

Herbicide Application in Crop

Product : Poast Ultra + Flax Max (Clopyralid + MCPA)
Rate 250 mL/ac and 0.81L/ac
Date July 3, 2012



Measurements

August: pulled a sample area and let to ret in field.

Plant parameters at harvest including plant height, plant density, stem density.

Photos of seeding and harvest.

Table: Results of height, plant density and stem density of fibre flax varieties including Melina and Alize, taken same day as pulling harvest.

Variety	Height	Plant Density	Stem Density
	cm	p/m	stems/m
Melina	82	80	160
	84	60	167
	88	108	165
	92	90	145
Mean	87	85	159
Standard Deviation	4	20	10
Alize	92	87	160
	90	95	175
	88	77	130
	81	67	176
Mean	88	82	160
Standard Deviation	5	12	21

Comments

Plots were visually impressive. All operations including seeding and herbicide applications were successful. Seeding was accomplished using GPS guidance which kept rows in a straight and easy to pull at fibre harvest. Minor lodging was noted in both varieties but where lodging was most prevalent was in areas infected with stem disease (Pasmo).

The puller unit worked fantastic in general, pulling 5 rows at a time. Soil



conditions were dry that day however there was a heavy dew on the crop in the morning. Little issues with weeds present. Some portulaca (*Portulaca oleracea* L.) and redroot pigweed (*Amaranthus retroflexus* L.) were present but not of concern due to low population numbers. Apparently in Portage, heavy populations of redroot pigweed caused significant pulling issues at harvest. Frost had already occurred by this date. It was noted that portulaca was killed by frost.

We began pulling at 11:00 am, despite the heavy dew conditions. Apparently the operator commented that pulling was easier when the sun came out. Plant stage was at physiological maturity where 95% of the bolls were brown, stems were generally green and leafs were only on the upper third of the plant whereas all other leaves had dropped naturally. Unit would travel about 4-5 mph. To pull the 4 acres it took about 2 ¼ hours.



Some minor plugging stopped the unit about two times. Plugging occurred at a point of the discharge belt (photo below) likely from soil and plant matter build-up (after 3 acres of pulling).





The pulling unit was rather heavy to haul and load on a flat deck. A running start was required to load the unit onto the trailer. Backing on was attempted but by the sound of the reverse gear rumbling and horsepower groaning was not in good condition to do so.



What's Next?

We plan to bale the site into 150 kg hard core round bales. We plan to use a local baler unit in the area to do so. Baling is scheduled to occur in late spring of 2013. Concerns about being able to pick up the swath are being considered. Bales plan to be shipped back to Europe for analysis.

Biocontrol of canola cutworms: identification and attraction of parasitoids

Cooperators:

University of Manitoba –Dr. Barbra Sharanowski – Entomology Department
Westman Agricultural Diversification organization (WADO) – summer staff

Funded by: Agri-Food Research Development Initiative (ARDI)
Canola Council of Canada – Canola Agronomic Research Program (CARP)

Project Overview (taken from ARDI proposal)

Cutworms are a significant pest in canola production. Insecticide treatment strategies are often ineffective and inefficient due to the subterranean and nocturnal nature of cutworms, their sporadic distribution within fields and difficulty of timing applications when they will be the most effective for controlling cutworms. Parasitoid wasps provide a natural and efficient means of control of cutworms and other agricultural pests. Unfortunately, we have a very limited understanding of which parasitoid species are involved, which species of cutworm they attack and the effectiveness of the parasitoids to reduce cutworm damage.

This research will investigate the species of parasitoids attacking cutworms in canola and determine the most effective parasitoids for minimizing cutworm damage. Tools for the identification of these parasitoid wasps will be created, which will allow for their presence to be used in pest management decision making. Additionally, this research will investigate which plants can be utilized as a nutritional source for parasitoids to increase their effectiveness in killing cutworms to develop continual and sustainable control.

At least seven cutworms species can cause economic damage to Western Canadian crops. These species are dingy, army, redbacked, glassy, darksided, pale western and bertha armyworm. We often generalize when it comes to cutworms and cutworm management recommendations, but some of these species behave in quite different ways and generalizations can result in crop losses or revenge spraying. Losses can approach 100% during outbreaks and be devastating for individual farmers. Bertha armyworm is probably the best known of the cutworm species, but dingy, pale western, redbacked and others can wipe out large patches of field in the spring — often before a grower notices. Even when growers do notice the missing plants, other issues are typically blamed such as weather, disease, herbicide carryover or machinery issues. We have a lot to learn about cutworms.

Action

During the late spring seeding season, WADO summer staff were encouraged to participate in cutworm collection efforts for the University of Manitoba study. Students were eager to participate as a new iPad was in scope for as a potential prize for participation. During replanting of the WADO sunflower variety trials, WADO staff collected over 25 cutworms. With a severe infestation in the area, students became fine-tuned in cutworm hunting. Cutworms were collected, stored in solo cups with an agar feed pellet provided by the University of Manitoba. Students had to record the date, GPS location, crop host and collector's name for each worm. Several worms survived their journey from WADO to the University for study and reportedly they nearly all had parasitoids.

Photo: Cutworms found in WADO sunflower plots in 2012.

Future Developments

The study was approved for three years. This was year 1. It is likely that future collection efforts will be needed for the 2013 and 2014 growing seasons.



What's Giant Ragweed Doing in Southwest Manitoba?

During the spray season of 2012, the Melita research field site was greeted by a new to WADO guest, a few plants of Giant Ragweed (*Ambrosia trifida* L).

Giant Ragweed is an annual plant in the aster family, native throughout much of North America. Its flowers are green and are pollinated by wind rather than by insects and the pollen is one of the main causes of late summer hay fever. The plant is erect, growing to over 6 meter though 2– 3 meters is more typical. It is one of agriculture's most competitive weeds. (Wikipedia) Giant Ragweed has become a superweed resistant to glyphosate in many US states and the province of Ontario. In 2006, glyphosate resistance among several weed species was found in southern counties in Minnesota and since then has moved northwest into Central Minnesota and eastern North Dakota. No reports of giant ragweed resistance had been found in North Dakota. (Stachler J. Sept 16, 2012. Herbicide Resistance in MN and ND, Presentation available online :



<http://www.ag.ndsu.edu/weeds/herbicide-resistance-files/hr-maps-2006-12>)

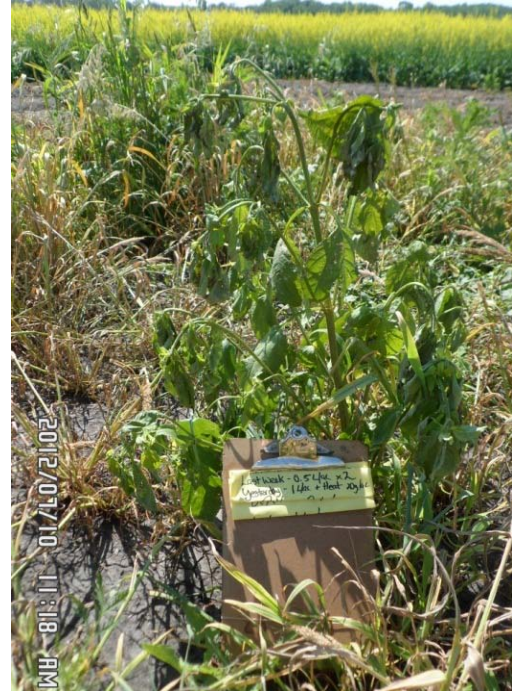
This is the first of its kind in the area and had shown up randomly in our plot area (photos). Normally, giant ragweed does not grow on an annual basis in the southwest region in Manitoba. It is speculated that the plants come from seeds that had floated north from state side during the 2011 flood along the Souris River.

WADO conducted a glyphosate resistance test on the few plants that were growing in the plots. One plant was left as an unsprayed check while other plants were sprayed on July 10th with a 1X, 2X and 3X rate where 1X was equivalent to 1 L/ac using Maverick III glyphosate containing 480 g a.i./L). Plants

were sprayed using a hand powered bottle sprayer normally used for house plants. Plants were assessed a couple weeks later after application. Observation of herbicide damage indicated that all treatments did in fact inflict severe damage on plants, however those at the 1X and 2X rates, the seed containing raceme did appear to survive while all leaves had browned off.

A giant ragweed plant separate from this experiment in the same field was previously sprayed with a two simultaneous applications of a 0.5X rate. Over a week went by and the plant showed no signs of harm. However a second application of a 1X application with a tank mix of Heat (10g/ac, sulflufenacil 70% WSG) did eventually kill the plant (photo right).

Producers are encouraged to properly maintain fields with a proper crop and herbicide rotation. Many other weed species exist in Manitoba with various levels of resistance to other herbicides such as Group or Group 2 herbicides, some with multiple forms of resistance. Tank mixes of different chemical groups are a more effective way than increasing rates of a single chemical. Hand pulling small patches of suspected resistance is always the best control option.



Risk Assessment of *Sclerotinia* Ascospore Movement into Sunflower Fields

Cooperators:

Westman Agricultural Diversification Organization (partial funding)
National Sunflower Association of Canada

Objective/Background

Sclerotinia is the most devastating disease to affect sunflowers in Canada.

Ascospores are air borne. Studies have been conducted in some field crops such as canola to determine how far the spores can travel to cause infection. This has not yet been studied in sunflowers.

With the registration of fungicides targeting *sclerotinia* head rot, it is important that sunflower growers are able to calculate the risk of *sclerotinia* based on the sunflower fields crop rotation and the crop rotation of neighboring fields

This project aims to develop a Disease Risk Model for growers to determine whether a fungicide application will be beneficial and to determine if strategically planting sunflowers to lower inherent risk from neighboring fields is beneficial.

Design, Materials and Operation

4 locations were selected across the province based on sclerotinia pressure in 2009 and 2010. These years had high sclerotinia pressure. The previously heavily infected field was at the center of each site, around which wooden posts were erected into the surrounding fields to the north, south, east and west.

The posts were staggered at 0, 5, 10, 20 and 50 meters into the fields to track spore travel using blue agar petri dishes. The petri dishes were placed on the posts at 0, 3 feet and 5 feet above ground.

Petri dishes were placed on the wooden posts for 3 hours at 3 crop stages; before, during and post flowering. The petri dishes were visually assessed for ascospore infection. Infield disease assessments were conducted prior to harvest.

Materials included 180 6 ft wooden posts, post pounder and petri dishes

Results/Observations

Each distance into the field was equally likely to show ascospore infection

Wind direction did not have an effect on petri dish infection

Where disease incidence was higher, a relationship emerged between actual head rot and ascospore infection on the petri dishes.

Disease incidence was low in the sites this year because of the dry growing conditions

Petri dish infection at ground level was approximately half at ground height as the 3 and 5 ft heights. There was no significant difference in petri dish infection between the 3 and 5 ft heights.

Discussion

Sunflowers are susceptible to infection by *Sclerotinia sclerotiorum* during flowering. It is well documented that both moisture (humidity) and heat are required for ascospore infection. It was determined that the optimum temperature range for spore infection was 7 to 26°C and humidity over 80%. Although this is a wide range for temperatures, the humidity level was only reached overnight or when it was raining.

At one site with higher sclerotinia incidence a trend did appear between head rot incidence and ascospore infection on the petri dishes. This indicated that with higher levels of sclerotinia, there is a role for ascospore detection by the blue plate method. More research would be required to understand the relationship utilizing the blue plate method and plant infection.

It was found that each distance into the field (0, 5, 10, 20 and 50 meters) were equally likely to show ascospore infection on the petri dishes. Studies in canola have found that spore travel dropped within 40 meters from the source (Qandah and Mendoza, 2012) but the apparent differences in plant physiology would affect spore travel through the plant stand. A trend such as this was not evident within the trial. Based on the findings above, higher concentrations of ascospores were required to evaluate spore travel.

Wind direction did not have an effect on spore travel into the fields north, south, east and west of the previously infected field. It could prove beneficial to have more sample dates to further model the effect of weather and petri dish spore infection.

How the project achieved its goal to support ASI priorities related to Agricultural sustainability

Since sclerotinia has a very wide host range and many commonly grown crops are a host, understanding the impacts of crop rotation and disease infection from one year to the next will help make control of the disease sustainable long term.

Through developing an understanding of how spores travel and studying the correlation between petri dish infection and infield head rot infection the petri dishes could be used as a disease risk tool. Through quantifying their risk growers could make informed decisions on fungicide applications.

Integrated pest management to incorporate crop rotations, strategically planting based on previous field history, an understanding of disease risk and utilization of fungicides when needed will allow for consistent yield and quality for all host crops within a rotation.

Communication

The results were published within the Canadian Sunflower Grower, winter 2012-2013 edition. An electronic copy of the guide will be available at: <http://canadasunflower.com>.

Conclusions/Recommendations

Disease pressure was too low during the time the study was being conducted. With adequate humidity only reached over night or when it was raining, the concentration of ascospores within the environment was low. In fields with higher incidences of disease, the petri dishes exhibited ascospore infection correlating to infield infection. The methodology will be refined to streamline the sampling method and focus on sunflower in future research, working towards developing a disease risk model that growers could easily implement within their farming operation.

Buckwheat Herbicide Screening Trial

Cooperator: Nestibo Agra – Mike Durand

Introduction

Currently buckwheat has few herbicides registered for controlling weeds in Manitoba. Only Poast Ultra (450 g/L sethoxydim, BASF Canada) is currently registered for use preseed or in-crop at all stages. Restrictions for its use must be followed to avoid unacceptable residues of sethoxydim in the harvested crop. Sethoxydim is also a Group 1 herbicide of which recent herbicide resistance among several weed species including Wild Oats (1990) and Green Foxtail (1991) have become accustomed to in Manitoba fields. Other weed species such as Redroot Pigweed, Wild Buckwheat, Cleavers and volunteer canola have herbicide tolerances of their own and often populate buckwheat stands. As a result growing buckwheat can be a difficult to manage crop to first time growers due to these weeds.

Linuron (Linuron 400 SC; United Agri-Products) had already been studied by Lee et al. (2001) shown to be promising for pre-seed used in buckwheat in addition to Methabenzthiazuron and Alachlor.

Heat (saflufenacil) and Spike-Up (tribenuron) have become popular pre-seed/emergent burndown herbicides among popular crops across the prairies such as pulses and cereals. Both have action against volunteer canola, wild buckwheat, red root pigweed, cleavers as well as others typically in tame buckwheat stands. Little is known on its effects on tame buckwheat.

Muster Toss N Go (ethametsulfuron-methyl) has some action on redroot pigweed but can offer poor control of wild buckwheat which might lend some tolerance to tame buckwheat. This may offer a slight window of opportunity for tame buckwheat.

In the summer of 2012, WADO initiated a small herbicide screening trial on buckwheat to explore the response of buckwheat to several herbicides (non-registered) including post-seeding pre-emergent use of:

1. 0.75 L/ac Linuron (400 g a.i./L Linuron)
2. 1.5 L/ac Linuron (400 g a.i./L Linuron)
3. 10.4 g/ac Heat (saflufenacil 70% WSG) applied with glyphosate
4. 4 g/ac Spike-Up (tribenuron methyl 75% WDG) applied with glyphosate
5. 12 g/ac Muster (ethametsulfuron 75% WSG) and Agral 90 (0.2L/100L)

Methods

Plot area for treatment was located in an area preseeded to winter wheat initially seeded in early June and conditioned with mowers. The area was sprayed with glyphosate (R/T 540) at a rate of 2 L/ac applied with 20 gal/ac water volume. Buckwheat was seeded into 6 row plots (9.5" spacing) 1.44 m wide by 9 meters long using SeedHawk dual knife openers. Seeding rate was 13 lbs/ac using the 'Horizon' variety provided by Nestibo Agra (Deloraine, MB). Plots were seeded July 13, 2012 in to the winter wheat sod.

The area had been recorded not to have any residual pre-emergent herbicide applications that season. Spray treatments were commenced right after seeding on the same day. A hand held sprayer pressurized by CO₂ was used to spray each herbicide treatment. Four fan nozzles (8002VS) at 50 cm spacing were pressurized to 40 psi during application. Herbicides were applied with water at a rate of 10 gal/ac. Plots were allowed to grow through the spray treatments until frost in September to allow full potential of observations during various plant stages. On August 17, plots were rated for plant emergence, percent crop injury and crop height. Photos were taken on August 21 of visual treatment effects on crops.



Photo: Seeding of buckwheat into winter wheat stand on July 13, 2012. Rain showers were in the forecast.

Results

Results are representative of a single plot in a single year and are not replicated. Use results with caution and as a reference only.

Description	Application	Active	Formulation	Rate	Mean Emergence n=3 (p/m2)	Visual Crop Injury (%)	Crop Hieght (cm)
Unsprayed Check	-	-	-	-	117	0	25
0.5X Linuron	post seeding, pre-emerg	linuron	400 g/L	0.75 L/ac	108	5	35
1X Linuron	post seeding, pre-emerg	linuron	400 g/L	1.5 L/ac	80	30	25
Heat	post seeding, pre-emerg	saflufenacil	70% WSG	10.4 g/ac	66	25	30
Spike-Up	post seeding, pre-emerg	tribenuron methyl	75% WDG	4 g/ac	68	50	15
Muster	post seeding, pre-emerg	ethametsulfuron	75% WSG	12 g/ac	62	90	10

Conclusions

Linuron at the 0.5X rate appeared to be a very promising herbicide application in terms of mean emergence, percent crop injury and crop height. In contrast to the unsprayed check, there was little difference among parameters measured. The 1X rate did show some negative activity in buckwheat with regards to emergence and crop injury. This will provide some insight to a ceiling rate that we can expect some degree of injury with the use of Linuron. Environmental conditions such as rainfall, soil temperature and soil type may play a role in herbicide efficacy.

Heat, Spike Up and Muster, had expectations going into the experiment that were lower but now their use can be confirmed as inferior for future buckwheat production. A more applicable experiment would be the effect of these herbicides when buckwheat is recropped in month to a year after application. This information would be useful in the label of these products for recropping restrictions.

Seeding buckwheat into an established winter wheat stand that was burned off with glyphosate prior to seeding seemed to offer a very clean stand of buckwheat. Maybe this type of cultural practice has value to weed control as well since winter wheat can offer some allelopathic control over certain weeds too.

Reference

Yeong Ho Lee, Sung Kook Kim, Deug Yeong Song, Hyeon Gui Moon, Seung Keun Jong. 2001. Effects of Chemical Control on Annual Weeds in Buckwheat. National Crop Experiment Station, RDA, Suwon 441-100, Korea. The proceedings of the 8th ISB: 168-171. Available online at: <http://lnmcp.mf.umi-lj.si/Fago/SYMPO/2001sympoEach/2001s-168.pdf>



Unsprayed Check



0.75 L/ac Linuron



1.5 L/ac Linuron



Heat



Spike Up



Muster

Tillage Radish and Turnips - Can we produce seed in Manitoba?

Cooperators:

ProducerA – Melita Area Farmer

Scott Chalmers - Westman Agricultural Diversification Organization

Introduction

Use of tillage radish has gained recent popularity in the world of cover crops. The crop is relatively unknown to the Canadian Prairies including all aspects of crop use, development and production. Most Canadian producers buy radish seed, of which most is originally sourced from the United States. Little is known and documented on the Canadian prairies in regards to radish seed production. Seed is valued from \$3 to \$5 per pound retail.

Key References:

<http://www.agcanada.com/wp-content/uploads/2012/01/GNN120109.pdf>

<http://www.extension.org/pages/64400/radishes-a-new-cover-crop-for-organic-farming-systems>

Objective

Grow several varieties of radish and turnips and assess the crops for root development, flower production and viable seed production.

Methods


WADO purchased various seed types from Northstar Seeds in 2012. Tillage Radish, Pacer Brassica, Oilseed Radish and GroundHog Radish were grown in addition to Appin Turnip, Purple Top Turnip and Samson Turnip. All crops were seeded May 17, 2012 at a depth of 0.5" deep with a seeding rate of 8 lbs/ac. Fertility applied was 50 lbs/ac N and 30 lbs/ac P. Rival (pre-seed) & Assure II (in crop) herbicides were used for weed control.

A small packet of Daikon type radish was purchased by Scott Chalmers at Lindenberg seeds in Brandon, MB and planted in his garden at his residence in Melita, MB. They were also compared in the results below.

Results

GroundHog and Oilseed radish produced flowers July 10. Tillage radish and Daikon radish produced flowers later, around July 20th, 2012. Those that had produced flowers all produced some viable seed. Pacer Brassica, Appin turnip, Samson turnip and Purple Top turnip did not produce flowers or seed.

Plants were pulled on July 10 and photographed (below). Root length and shape were estimated.

<p>Pacer Brassica - 4" pencil shaped root</p> 	<p>GroundHog Radish – 7" Tap root</p> 	<p>Tillage Radish – 4" pencil shaped root</p> 
<p>Oilseed Radish – 4" root (peanut shaped)</p> 	<p>Samson Turnip - 4" root (egg shaped)</p> 	<p>Purple Top Turnip - 4" cylinder root</p> 
<p>Appin Turnip – 5" Cone shaped tap root</p> 	<p>Daikon Radish – 8" Cone Shaped Root - July 25</p> 	<p>Daikon Radish – 14" root Sept 17</p> 

Observations

All crop varieties grow vigorous and generally weed free. Flea beetles were attracted to radish pods just after the majority of flowering. Most of the turnips (including purple top turnip in photo below-right) were suffering from drought stress in September, whereas the radish that produced seed was ripening their pods in (below right photo).



In addition to the plots at WADO, producer ProducerA grew some radish as well. ProducerA decided to swath the area the day we were there visiting Sept 17. ProducerA found that pods were shattering off the plant during swathing and piled along the ground where the swather canvas was rotating. Some roots were intact growing up to 6 inches into the ground. Other roots succumb to root disease of some kind including Black Leg and Sclerotinia.



Aster Yellows infected some plants too.



Long Live Roots



Purple Flower



Diseased Root

Seed samples were taken from the ProducerA's harvest. Sample 1 was harvested before a frost in the swath and sample 2 was harvest after a frost, straight cut. WADO cleaned and measured the parameters of each sample (below).

ProducerA's Radish Seed Harvest 2012					
Bag 1 Early Harvest prior to frost, swathed					
Initial Sample Wt	0.8 kg	volume	1460 mL	Moisture (canola chart) @ 250 grams	
Clean sample Wt	0.39 kg	volume	590 mL	calibrated at 53 on 11°C	
Dockage (by Wt)	51 %	Vol. Dock.	60 %	Cleaned	6.4 % Moisture
Comments: fewer splits than bag 2				Dirty	6.9 % Moisture
Clean sample initial weight	137.79 grams	Percent Good Seed	84.8 %		
Bad Seed Weight	20.99 grams				
Good Seed Germination (2 samples @ 250 each tested):					
Germination1	95.6 %	250 seed Wt	3.63 grams		
Germination2	98.3 %	250 seed Wt	3.56 grams		
Average Germination (500 seeds)	97.0 %	Average 1000 Kernel WT	14.38 grams		
Seed Disease Analyis (Discovery Seed Lab, Saskatoon, SK)					
Bag 1	17.8 alternaria alternata				
	no blackleg				
	no sclerotina				
	0.1% Botrytis				
Bag 2 Late harvest after frost, straight cut					
Initial Sample Wt	0.69 kg	volume	1460 mL	Moisture (canola chart) @ 250 grams	
Clean sample Wt	0.26 kg	volume	380 mL	calibrated at 53 on 10°C	
Dockage (by Wt)	62 %	Vol. Dock.	74 %	Cleaned	6.2 % Moisture
				Dirty	6.3 % Moisture
Clean sample initial weight	140.0 grams	Percent Good Seed	88.2 %		
Bad Seed Weight	16.6 grams				
Germination1	95.6 %	250 seed Wt	3.66		
Germination2	96.7 %	250 seed Wt	3.53		
Average Germination (500 seeds)	96.2 %	Average 1000 Kernel WT	14.38 grams		
Seed Disease Analyis (Discovery Seed Lab, Saskatoon, SK)					
Bag2	17.1% Alternaria alternata				
	no black leg				
	no sclerotinia				
	0.1% botrytis				
	0.1% Alternaria brassicae				
Cleaning Specifications:					
Used a 3/16 Round on top and a 5/64 x 1/2" slotted below, wind was on the fast pully with baffles 2" open. Made a nice sample free of wild oats, foxtail, and redroot pigweed					
Comments: More weed seeds than bag 1					

According to these results, it appears radish seed production could be viable in Manitoba. Significant care at harvest to prevent seed breakage should be taken and considerable cleaning should be expected.

Soil tests were also taken that fall from ProducerA's field. Soil tests were taken from the radish field and from a nearby Oat field. Results are summarized in the table next:

Field	Depth	pH	Organic Matter (%)	Nitrate lbs/ac	Phosphorous Olsen ppm	Potassuim ppm	Zinc ppm	Sulfur lbs/ac
Radish	0-6"	8.5	2.6	25	9	94	0.34	82
	6-24"			12				84
	0-24"			37				166
Oats	0-6"	8.1	1.5	10	9	120	1.08	76
	6-24"			12				222
	0-24"			22				298

Soil tests results are not replicated and consist of a single sample from each field. Effect of crop may vary results.

WADO Urban Orchard Establishment Demonstration

Westman Agricultural Diversification Organization
West Souris River Conservation District - Tim Gompf
Town of Melita

In 2011, WADO committed to establishing an Urban Orchard in the town of Melita. WADO proposed to the Town of Melita an orchard to be on town property located between 55 Walter Thomas Drive and 49 Walter Thomas Drive. On July 13 2011, town council approved the request with a 10 year commitment as long as the land was to be maintained by WADO at all times to councils` satisfaction. Conveniently, a drainage ditch and a north shelter of trees were located on the site for the plantation`s protection from the elements.

WADO purchased three trees of five varieties of each haskap, saskatoon and dwarf sour cherry from Prairie Plant Systems in Saskatoon, SK. Trees were planted temporarily in 2011 and cared for at the residence of Scott Chalmers in the adjacent property. The town property was assessed for power and communication lines prior to the site being sprayed with glyphosate and roto-tilled.

In 2012, the property was sprayed with glyphosate and roto-tilled in April. The fruit trees were transplanted into plastic rows (sponsored by the West Souris River Conservation District). Drip line irrigation was installed after planting. Alleys were maintained with glyphosate in 2012 and will be seeded to grass in 2013.



Photos: Establishment of the plastic mulch with the help of the West Souris River Conservation District

Varieties to be planted and showcased include the following:

Haskap

- Tundra
- Borealis
- Indigo Yum
- Indigo Gem
- Berry Blue



Saskatoon

- Martin
- Thiessen
- Smoky
- JB30
- Honeywood



Dwarf Sour Cherry

- SK Carmine Jewel
- Romeo
- Juliet
- Cupid
- Valentine



This location has several advantages for this project. Advantages include the size of the lot, location in an undeveloped area and it being clearly visible near a busy intersection. WADO sees this project as an opportunity for the town of Melita by means of hosting a point of interest in the community. It would also act as a unique green space and reduce town maintenance by not mowing that part of the lot.

In the fall of 2012, rabbit damage was noted first on the cherries then later on haskap and Saskatoon. Mesh chicken wire was wrapped around each tree and staked to prevent further damage and provide initial protection.

Haskaps are extremely hardy and they are circumpolar (found in northern climates). Haskaps are known to survive temperatures to -50°C and at open flower they can tolerate -7°C without sustaining damage. Haskaps are the first fruit of the season and this gives growers the opportunity to achieve organic certification for their produce. The best soil type has not been confirmed. Haskaps are related to potatoes and tomatoes so a similar soil type may be applicable. Haskaps require a non-competitive environment to achieve yield targets and optimize berry size. Control of weeds and grasses are essential. Weed barrier products such as mulch wood chips are a good option. Haskaps would be adapted to the Parkland area and offer another berry option for local u-pick and cooperative fruit organizations such as Fruit Share, Prairie Fruit Growers Association, etc.

Dwarf Sour Cherry breeding has been around since the 1940s but hasn't gained significant attention until the last decade or so. Dr. Bob Bors and the University of Saskatchewan have been successful in developing a number of varieties that are hardy for Canadian Prairie production. Dwarf Sour Cherries are relatively easy to establish since they are grown on their own root stock and they are self-pollinated by bees. Production generally starts at four to five years after transplanting with yields around four to ten lbs/plant. In 2010 there were 10 acres of commercial orchards in Manitoba. SFGA (Saskatchewan Fruit Growers Association) anticipates 2 million pounds of cherries to be produced annually across the Prairies and Saskatchewan will have the majority of the production due to their long cold winters and dry summers (inhospitable to insects and disease).

Saskatoon plants are native to the Prairies so adaptability is not a concern. Saskatoon plants can survive temperatures of -50°C to -60°C. It is well adapted to a wide range of soils and climatic conditions. Saskatoon plants bear fruit when they reach three to five years old. Production significantly increases at six to eight years and maximum yield potentials are finally reached at twelve to fifteen years of age. This coincides with profitability occurring at ten to eleven years. Therefore interested parties considering Saskatoon production do not venture into it unless they are committed for the long term.

More information please visit Prairie Plant Systems website: <http://www.prairieplant.com/>
Production: <http://www.gov.mb.ca/agriculture/crops/fruit/index.html>
University of Saskatchewan Fruit Tree Program <http://www.fruit.usask.ca/>

Tribute to Scott Day

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Scott Day resigns from MAFRI

by Judy Wells

November 2, 2012 was Scott Day's last day with Manitoba Agriculture, Food and Rural Initiatives (MAFRI). He resigned after almost 24 years with the department.

"It is with much hesitation and melancholy that I have tendered my resignation," he said.

Being an Ag Rep was a childhood dream of Day's and he feels it's been an honour and a privilege to act out his dreams in his home region. As well, he's grateful to the people he's worked with that gave him the freedom and support to do the things he felt were important.

"I also feel lucky to have worked with so many excellent farmers, committees and ag industry people from throughout the Southwest corner, across the province and beyond. I always looked forward to going to 'work' because of these people and organizations."

So why the resignation?

To answer that question, we have to look back to 2006. Day was in Western Australia where he and two other farmer/researchers (from the USA) were speaking at some zero-till conferences. One of these fellows was Clay Mitchell from Iowa who has been called the most technologically advanced farmer in the world.

Mitchell has a biomedical degree from Harvard and has been at the leading edge of developing and implementing many of the precision Ag equipment and software that many farmers use or will be using in the future.

Fast-forward a few years. Day attended Mitchell's wedding where he met several of Mitchell's friends from his days at Harvard. One of these friends Eric, was an investment fund manager.

"Fast forward to 2011: Clay phoned me wondering if I would be up for an interesting challenge. As we all remember, we were battling muddy fields and

nothing else at that time, so I was a little frustrated and looking for a distraction," said Day.

Mitchell invited Day to Kansas to meet up with Eric and another friend by the name of Larry. Eric had left his job as a tech investment fund manager to create a new company that invested in agriculture. But, he needed people with agriculture experience, so that's where Mitchell and Day came into the picture.

"Larry was from a farming family and was also a management expert with some companies that Eric had been involved in. After our time together in Kansas it was apparent that we shared a lot of interests and values and that we could easily work together," said Day.

So in the fall of 2011 Day took a leave of absence from MAFRI and moved to San Francisco. Why San Francisco? Well, two of the partners were already living there and the group thought - we have to start somewhere, why not somewhere interesting? Their current head office is in Palo Alto in the heart to the Silicon Valley.

"It was an interesting experience being a partner in a company that was starting right from scratch like that and we had a great time living in one of the more fascinating cities in North America," added Day.

In addition to several places in the USA, Day was also in Russia for a week in March.

Day and his wife Ann and daughter Alex, returned to Manitoba in April 2012. At that time Day slipped back into his role with MAFRI and working with WADO, as well as returning to the spring work at the farm.

"However, over the past several months I have also been trying to help our new company as much as I can as well. It has been a busy year to say the least."

And what does the company do? It invests in agriculture opportunities. They have been looking at certain existing tech-

nologies that might have a fit in agriculture. There is a possibility the company may be partners in the development of certain new products as well.

"At this point we are concentrating on properties that have the potential for agriculture or the potential for better production."

Day's job will essentially be as an agronomist. He will help evaluate the investment opportunities and then work with the people and the organizations that will be managing these assets.

Back to MAFRI. Day was grateful to MAFRI when they granted him a leave of absence to help get the company started and see if this opportunity was something of interest to him and his family.

"It wasn't fair to ask for another leave, so I have resigned after 23.5 years," said Day.

Day started in 1989 as the Ag Rep in Killarney. In 1995, he moved to Boissevain as the Ag Rep there for 10 years and then in 2005 Day took over the WADO manager's job in Melita.

Through the years, Day has seen many changes in the agriculture scene. When he started in 1989 in Killarney it was in the peak of that year's drought and things in agriculture were bleak in general.

"Though the changes seemed to come in slowly, in retrospect we have such a dynamic industry."

"Anyone care to guess where we will be 23 years

from now? It is with this excitement about the future that I have chosen to change careers."

The Days will return to Manitoba every spring/summer to live in their home and continue farming with their family north of Deloraine. While they are away their house is being rented out. They will be returning in the spring of 2013 in time for their daughter Alex to finish her Grade 12 with her Grad class at Deloraine School.

Day will work for the new company as much as possible from Manitoba each summer and then return to the USA each fall.

In closing, Day said he has always tried to encourage agriculture as an exciting and worthwhile career and he's never regretted that philosophy. Agriculture has provided him with many travel opportunities and interesting experiences.

"These opportunities are available to everyone with an Ag background. There are few professions that can rival the nobility and satisfaction that one can receive from helping to produce food, yet provide the opportunity to connect with some different people and cultures around the globe. It is often so much more than you expected. Please encourage Agriculture as a career with the people you influence," concluded Day.

Best of luck to Scott, Ann and Alex. We look forward to hearing all about it next spring.



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