

# 2004 Canola Industry Meeting Minutes

8. December 2004

Delta Bessborough Hotel

Saskatoon, SK.

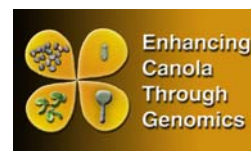


Conseil national  
de recherches Canada



Agriculture et  
Agroalimentaire Canada

This meeting is possible thanks to the support of Genome Prairie, the Saskatchewan Canola Development Commission, AgWest Bio Inc., The "Enhancing Canola through Genomics" Genome Canada project, the National Research Council and Agriculture and Agri-Food Canada.



**MINUTES****2004 Canola Industry Meeting****8. December 2004, Delta Bessborough Hotel, Saskatoon****8:30 a.m. – 4:00 p.m.****1. Welcome and Chairperson's remarks**

The Chairperson, Dr. R.K. Downey, thanked everyone for their interest and attendance today and acknowledged Ag-West Bio Inc., Saskatchewan Canola Development Commission, Genome Prairie, National Research Council Canada and Agriculture and Agri-Food Canada for sponsoring the 2004 Canola Industry Meeting and the Genomics Workshop, 9 December 2004 - providing coffee and juice for refreshment breaks and partial funding for room rental.

**2. Western Canada Canola/Rapeseed Recommending Committee (WCC/RRC)****Update on 2004 Trials. Presented by Raymond Gadoua, WCC/RRC****Coordinator/Secretary, Canola Council of Canada, Saskatoon, SK.**

Mr. Gadoua provided an overview of the 2004 WCC/RRC Test and reported on the WCC/RRC meeting which was held the day before the Canola Industry meeting, 7 December 2004, Delta Bessborough Hotel, Saskatoon.

The purpose of the public Co-op Test is to evaluate the agronomic, quality, and disease resistance attributes of candidate cultivars of canola. The collected data is combined with data derived from the previous year(s) private trials. Merit scores are derived from the data on the basis of yield, oil, protein and blackleg resistance (as well as other minimum criteria). A summary package is prepared according to guidelines developed by the WCC/RRC and is used to evaluate candidate cultivars for recommendation for registration as a variety. The guidelines for both private and public trials are contained in the WCC/RRC Procedures and Appendices (published yearly).

The WCC/RRC co-ordinated 105 research trials (public Co-op Test) for the purpose of variety registration. There were 73 agronomic (yield) and quality tests of which 14 were cancelled, 30 blackleg trials were conducted (10 trials cancelled), and 2 white rust trials.

A total of 82 *B. napus* canola candidates were tested: 60 Roundup Ready (8 of which were tested as LowLin), 15 Clearfield, 6 Liberty Link, and 1 conventional. Four entries were tested in the Early *B. napus* Test (all 4 were Roundup Ready).

A total of 805 private trials were conducted in 2004, 743 trials were successful and passed inspection by CSGA-approved breeders, 1 trial failed and 61 were cancelled. 778 *Brassica napus* and 27 *B. juncea* candidates were evaluated.

**Calculation of % yield of the check cultivars**

The seed yield of candidate lines are expressed as a percent seed yield of the check cultivars. The relative yield is then expressed in multi-location summaries, calculated by addition of the percent yield per location and dividing by the total number of locations.

**Calculation of % of check cultivars**

Check cultivars were added to some trials due to cancellation of some entries. This caused some trials to have 2 entries of one check and 1 entry of another. The percent of check value is expressed such that each check is given equal weighting in the check average.

**Oil and Protein Content**

The oil content of the seed and protein content of the meal are expressed as a percent, on a dry matter basis, using Near Infrared Reflectance (NIR) method. The oil and protein content was determined on 4 sites per growing season zone.

**Fatty Acid Composition**

The fatty acid composition of seed planted are expressed as a percent of total fatty acids using Gas Chromatography method.

**Chlorophyll Content**

Chlorophyll content was determined on the sites which were selected for oil and protein analysis using NIR method.

**Total Glucosinolate Content**

Total glucosinolate contents are expressed on a whole seed, 8.5% moisture basis, using NIR method.

The 2004 Prairie Canola Variety Trial (PCVT) was comprised of 116 trials (Randomized Complete Block or Lattice Design) at 53 locations across western Canada. The trials were distributed across three growing zones: short, mid, and long season zones. Of the 116 trials planted, 82 trials were successful (Coefficient of Variability for yield < 15 % and site inspected).

The publication, Seed Manitoba, will have the data summarized from the mid and long season zones. The CCC will also have the publication available on their website. More detailed information is available from Raymond or Cheryl Keiffer.

**3. Eastern Canada canola situation. Presented by Laima Kott, University of Guelph, ON.**

The estimated crop acreage for the 2004 crop was ~ 40,000 acres for spring canola, ~ 4,000 acres for winter canola. Planted acreage this fall is estimated at 7,500 acres.

In general, spring canola yields were highly variable with a provincial average of 3/4 tonne/acre (1650 lbs/acre), which is lower than the long-term average of 1755 lbs/acre. Winter yields averaged 1.25 - 1.5 tonnes/acre, also lower than yields reported in 2003.

Bunge Canada (Hamilton) received 36,000 tonnes of canola for crushing: 31,000 tonnes from Ontario; and 5, 000 tonnes from Quebec at 40.5% oil content. Bunge will not crush any more canola at Hamilton as of 2005. Archer Daniels Midland (ADM) will continue to crush. *Note: Bunge Canada is the new name for CanAmera in Ontario.*

The 2004 weather was challenging – a wet spring and cold/cloudy conditions. The spring canola crop had late planting due to wet spring conditions and harvest showed uneven maturity with green stalks which made harvest difficult. The winter canola crop had uneven emergence due to dry weather during August-September. Below normal rainfall in March/April along with cold winds caused some losses due to desiccation. Cool weather and good soil moisture during seed set resulted in good pod set. Cool wet weather produced excellent conditions for disease. *Sclerotinia* and *Alternaria* disease was very bad this year in Ontario. The blackleg disease assessment tests were not successful this year, and are not reported. Cabbage seedpod weevil was prevalent and did considerable damage to winter canola. There was also damage on late planted spring canola with ~ 20% seed loss reported in spring canola. Swede midge is a relatively new pest to Ontario and is mostly affecting cole crops. It is now poised to impact spring canola and these insects go through several cycles per growing season.

<b>Winter Canola Coop Summary</b>										
<b>Elora and Ripley, 2003/2004</b>										
					<b>Spring</b>			<b>%</b>	<b>%</b>	<b>%Oil</b>
			<b>Yield</b>	<b>Percent</b>	<b>Visual Stand</b>	<b>Spring</b>	<b>1000</b>	<b>Green</b>	<b>Brown</b>	<b>@ 8.5%</b>
<b>Entry</b>	<b>Variety</b>	<b>Rank</b>	<b>(kg/ha)</b>	<b>of</b>	<b>Assessment</b>	<b>Stand</b>	<b>Seed</b>	<b>Seed</b>	<b>Seed</b>	<b>Moisture</b>
				<b>Check</b>	<b>(%)</b>	<b>(pl/m2)</b>	<b>Wt</b>	<b>Seed</b>	<b>Seed</b>	<b>Moisture</b>
6	NPZ 0327 (1)	1	2606	156	81	112	4.2	0.3	4.6	42.4
2	Baldur	2	2531		69	102	4.0	0.3	3.5	43.6
5	NPZ 0326 (1)	3	2462	148	78	102	4.0	0.0	3.8	43.2
4	NPZ 0325 (1)	4	2295	138	76	73	3.9	0.3	3.0	44.3
3	Kronos	5	2285		72	70	4.1	0.3	3.6	43.4
10	X01W692C (1)	6	2230	134	58	86	4.4	0.0	3.9	44.1
7	NPZ 0391 (1) Y01W694C	7	2103	124	58	78	4.1	0.1	3.0	42.1
9	(1) X01W522C	8	2067	124	54	82	4.2	0.0	3.6	43.7
8	(1)	9	2015	121	49	92	4.4	0.2	5.0	43.4
1	Arctic	10	1664		48	68	4.0	0.4	4.7	43.2
No. Locations			<b>2</b>		<b>2</b>	<b>1</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>

Note: Yield adjusted to 10% moisture.

**Summary of Spring Canola Coop****Elora, Grand Valley, Dundalk, Wartburg, New Liskeard, 2004**

Entry	Variety	Rank	Yield	% of			Lodg.	Ht	TSW	% Gr	% Br	%oil @ 8.5% moist.
			(kg/ha)	Check	DTF	DTM	(1-5)	(cm)		Sd	Sd	
1	Hyola 401 (C1)	8	2659		52	124	1.4	108	3.8	0.9	0.9	43.0
2	Senator (C1)	12	2543		55	125	1.3	133	3.3	1.8	2.1	43.7
3	Hyola 357 RR	17	2455		50	123	1.5	106	3.3	1.1	1.5	43.4
4	OAC Hurricane	27	2185		54	124	1.2	118	3.3	1.9	1.4	45.7
5	OAC Tornado	21	2333		54	124	1.0	112	3.6	1.4	2.4	45.7
6	Canterra 1492CA	11	2587		54	125	1.2	125	3.2	2.4	2.4	43.5
7	SC990158	14	2517		53	124	1.1	118	3.1	1.6	1.7	44.2
8	45H21	6	2756		53	123	1.3	126	3.2	1.0	1.2	45.5
9	46H02	5	2804		53	123	1.3	125	3.1	0.9	0.5	47.2
10	5020	2	2920		52	124	1.3	122	3.3	0.7	1.8	45.6
11	5030	1	3210		55	124	1.1	139	3.3	1.2	2.0	44.4
12	5070	3	2916		56	125	1.1	137	3.3	1.8	2.3	43.3
13	AP 7978 RR (1)	4	2879	111	54	123	1.1	124	3.4	1.4	1.6	44.9
14	AP 7554 RR (1)	7	2728	105	54	123	1.5	124	3.1	1.3	1.7	44.3
15	AP 7910 RR (1)	13	2533	97	56	124	1.3	130	3.2	1.4	2.1	43.8
16	AP 504 RR (1)	28	2111	81	55	124	1.4	125	3.0	1.0	2.1	
17	AP 8244 (1)	9	2619	101	56	127	1.4	139	3.3	2.8	2.7	42.6
18	45H24 (1)	10	2612	100	54	123	1.5	130	3.0	1.1	1.2	45.2
19	SC010081 (1)	19	2389	92	54	123	1.1	110	3.5	1.0	1.1	
20	SC010241 (1)	25	2254	87	52	123	1.3	117	3.3	1.1	2.6	
21	SC010238 (1)	18	2400	92	56	124	1.1	119	3.2	1.2	2.6	
22	+PR10461 (1)	24	2296	88	55	124	1.2	128	3.1	1.4	2.5	
23	+PR10462 (1)	16	2513	97	55	123	1.3	129	3.2	1.6	1.7	
24	Z2409 (1)	15	2514	97	55	124	1.3	128	3.0	1.3	2.3	45.7
25	Z2363 (1)	20	2381	92	54	124	1.3	126	3.0	1.8	1.7	46.0
26	Z2365 (1)	23	2321	89	53	124	1.5	122	3.2	1.3	1.5	45.2
27	Z2104 (1)	22	2328	90	54	123	1.5	123	3.0	0.9	0.9	46.2
28	D1166 (1)	26	2232	86	54	123	1.3	120	3.2	1.1	1.3	45.3
No. Locations			<b>5</b>		<b>3</b>	<b>1</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>5</b>	<b>5</b>	<b>5</b>

4. **Report from the Plant Biosafety Office (PBO). Presented by Tanya Fielding, PBO, Canadian Food Inspection Agency (CFIA), Ottawa, Ontario.**

A workshop to review current terms and conditions of canola confined field trial was held in September, 2003. The main outcomes from this workshop were:

- the report, which is now available on the PBO website:  
<http://www.inspection.gc.ca/english/plaveg/bio/consult/canolae.pdf>
- revisions of the terms and conditions of canola confined field trials have now been revised. The main changes are removal of *Sinapis arvensis* from the list of related species from which *Brassica napus* field trials must be reproductively isolated. Dir2000-7 revised terms and conditions 2004 for *B. napus* appears at the following website:  
<http://www.inspection.gc.ca/english/plaveg/bio/dt/term/2004/branape.shtml>.  
Revised Dir2000-7 includes more detailed information on the use of guard rows and tenting and bagging as reproductive isolation techniques; and soil incorporation for disposal of residual plant material.
- revisions of Directive 94-08 (as of October, 2004, a revised is posted on the CFIA website: <http://www.inspection.gc.ca/english/plaveg/bio/dir//dir9408e.shtml>.)  
The revision includes more guidance regarding novelty trait determination, mandatory submission of a stewardship plans for herbicide tolerant (HT) and insect resistant (IR) plants, and more guidance on the type of information to be included as part of a complete application.
- HT Stewardship Initiatives: In February, 2004, a workshop was held on Ecosystem Effects of Novel Living Organisms. Nodes established to identify research priorities in several key areas. The PBO is responsible for the node regarding stewardship of approved products and will be holding a workshop in February, 2005, for invited academia, government researchers and industry members, to identify research projects to fund the areas of HT stewardship.
- discussions on Plant Molecular Farming (PMF): (Regulatory Directive 2000-7 Interim Amendment website reference:  
<http://www.inspection.gc.ca/english/plaveg/bio/dir/dir0007ie.shtml>.  
In March, 2004, a technical workshop was held on segregation and handling. The Executive Summary is available on the following website reference:  
<http://www.inspection.gc.ca/english/plaveg/bio/mf/segrege.shtml>. The next steps include expanding and finalizing a Memorandum of Understanding (MOU) between CFIA and Health Canada, outlining each organization's responsibilities in the assessment and authorization of Plants with Novel Traits (PNT) intended for PMF, as well as expanding the table of contents for a code of best agricultural practices for PMF, in collaboration with CFIA and USDA-APHIS. An internal workshop with inspection staff is planned for February, 2005, with a follow-up technical workshop on PMF planned for March, 2005.
- discussions on the definition of PNT: CFIA met with plant breeders to informally discuss the issue of novelty. The key message was that breeders want a clearer definition of novelty, and want to be involved in this process. The PBO plans to host a follow-up workshop, encouraging active participation and input from the plant breeding community to determine what a table of contents would be for a guidance document.

## 5. Canola Breeding

### 5.1 Engineering drought tolerance in *Brassica napus*. Presented by Tina Uchacz, Performance Plants Inc.

The product development pipeline for Performance Plants Inc. begins with gene discovery. Technology is first evaluated using the model plant *Arabidopsis*. If the technology shows promise then it is tested in crop plants such as canola and corn in both greenhouse and field conditions. Commercialization is carried out with partners.

Environmental stress, such as drought stress, is the largest factor preventing realization of potential yield. Peter McCourt's drought tolerant *era 1* mutant of *Arabidopsis* shows reduced water loss during drought stress compared to wild-type (WT) *Arabidopsis*. Although drought tolerant, the growth of the *era 1* mutant is negatively affected. The *era 1* mutation makes stomata more sensitive to abscisic acid (ABA). Under water stress conditions lack of turgor in plant cells induces ABA synthesis. Since the *era 1* guard cells are hypersensitive to this ABA signal, they close faster and tighter.

Performance Plants Inc. wanted to make a transgenic version of the mutant. The goal was to down-regulate the gene, as it is in the mutant, but to avoid negative growth effects and preserve drought tolerance. Germination assays are done to look for enhanced sensitivity to ABA. Germination is normally inhibited by ABA.

Yield protection technology (YPT) *Arabidopsis* transgenics are hypersensitive to ABA and germination is inhibited at a lower concentration of ABA than in the wild type (WT). YPT *Arabidopsis* transgenics are drought tolerant and have increased yield compared to WT after drought stress. When fully watered YPT *Arabidopsis* transgenics do not have a yield drag. YPT canola transgenics are more sensitive to ABA than control canola. YPT transgenics have a faster drought response and recovery than controls. In field trials YPT canola had higher yields than control canola after water stress. There was no yield drag for YPT canola under well-watered conditions. YPT has no negative impact on canola seed quality or other agronomic traits.

In summary, Performance Plants Inc. produced a transgenic version of the *era 1* mutant in both *Arabidopsis* and canola. The transgenics have enhanced ABA response and drought tolerance but do not have the negative growth effects seen in the *era 1* mutant. YPT has been shown to be effective in a crop plant in both greenhouse and field conditions.

Website: <http://www.performanceplants.com>

#### Questions:

1. What would be reaction to PBO? – is this truly novel? What is relationship between *Arabidopsis* and *B. napus*? Performance Plants Inc have confined field trials as per CFIA requirements for field trials.
2. Dr. Downey indicated there is a need to answer these questions as soon as possible – less regulation and testing. This is a very important advance, drought has been a main factor in Saskatchewan in 2 of every 5 years of canola production and this technology could be very beneficial.

## 5.2 Feeding Value of yellow-seeded *Brassica napus*. Presented by Jo-Anne Relf-Eckstein, AAFC, Saskatoon Research Centre.

- Performance data collected from field trials of most advanced yellow-seeded *B. napus* germplasm (YN01-429) developed by AAFC, Saskatoon was presented.

Lines	Yield <sup>1</sup>		Oil <sup>2</sup>	Protein <sup>3</sup>	SW	T-GSL	Fibre (% dry meal) <sup>4</sup>		
	kg/ha	%	(%)	(%)	(g/1000)	( $\mu$ mol/g)	ADL	ADF	NDF
<b>YN01-429</b>	<b>2030</b>	<b>109</b>	<b>49.1</b>	<b>46.9</b>	<b>3.3</b>	<b>12.9</b>	<b>1.3</b>	<b>8.2</b>	<b>14.9</b>
46A65/Q2	1890	100	45.8	49.0	2.8	17.7	5.4	13.6	19.1
Station yrs	6	6	6	5	4	4	4	4	4
SED	380		2.2	2.7	0.4	1.7	0.7	1.0	-

1 = 4-replicate, 4 row plots 6-m row length, AAFC Saskatoon, Scott and Melfort, 2002-2004, 2 = Oil by NMR 3 = Protein meal by Leco combustion, 4 = Fibre by Ankom 200 Fibre Analyzer ADL= acid detergent lignin, ADF = acid detergent fibre (cellulose + lignin), NDF = neutral detergent fibre (hemicellulose + cellulose + lignin + pectin)

- Meal fibre analyses were conducted by Dr. Phil Raney and technical staff. Seed and meal quality analyses directly comparing black and yellow *B. napus* was also presented. This data was collected by Jacques Evrard of CETIOM, Pessac, France. Seed of YN01-429 and black-seeded line, N89-53 (a parental component in the pedigree of YN01-429) were produced on same field, Saskatoon, 2003 and used for this study. There was a reduction of 37% in ADF with yellow-seeded YN01-429 compared to black-seeded N89-53; ~ 70% reduction in ADL, 56% reduction in tannins and 13% reduction in the cell walls (Carré method, INRA).
- Economic simulations done by Evard and his colleagues at CEREOPA, France were presented. This research work will be published in the next issue of the GCIRC Bulletin. The simulations were done using YN01-429, N89-53 and French rapeseed. Assumptions were similar price and availability of meal from both yellow and black-seeded forms of rapeseed meal, based on average conditions of price and quantity of rapeseed meal in France, 2002/03 with predictions for 2007.
  - In a “low price for protein” scenario, where no yellow-seeded forms of rapeseed were available, only 534,000 tonnes standard (black-seeded) rapeseed meal would be used in France, 2007. If meal from yellow-seeded rapeseed was available, no more standard rapeseed meal would be used, and the quantity of yellow-seeded rapeseed meal used would increase to 1,417,000 tonnes.
  - In a “high price for protein” scenario, where no yellow-seeded forms of rapeseed were available, only a small quantity of standard rapeseed meal would be used, 63,000 tonnes, in France, 2007. If meal from yellow-seeded rapeseed was available, no more standard rapeseed meal would be used, and the quantity of rapeseed meal (yellow) used would increase to 1,150,000 tonnes.

- Without meal from yellow-seeded rapeseed, very little meal from standard rapeseed would be used in France, 2007, and especially so in a market with high prices for protein. With the reductions in ADL and ADF, and low glucosinolate content, the meal from the yellow-seeded rapeseed would increase the amount of total rapeseed meal used, irrelevant of low or high price predictions for protein sources in France, in 2007. This new quality class of rapeseed meal would substitute other protein sources (e.g. soybean meal).
- Questions on this presentation and Information Packages on the development of AAFC yellow-seeded *B. napus* germplasm with abstracts of relevant publications, should be directed to Gerhard Rakow ([rakowg@agr.gc.ca](mailto:rakowg@agr.gc.ca)) who was unavailable to make the presentation today. Access to yellow-seeded YN01-429 is available through collaborative research agreements with AAFC-Saskatoon.

#### Questions:

1. What was the colour like in the field in 2004? In the 2004 field nursery at Saskatoon, there was an overall difference among the species and the expression of yellow-seed colour. The species, *Brassica juncea*, had excellent expression of yellow-seed colour, in comparison to *B. rapa*, *S. alba* and *B. carinata*. The expression of yellow-seed colour in YN01-429, was much better than expected given the early frost of August 19<sup>th</sup>.
2. Dr. Downey commented that the environment does influence expression of seed colour. The northern grain belt did not produce as good yellow seed as did the southern grain belt. (experiments done years ago with Polish type, Candle).
3. Have you noticed any difference in vigour of the yellow-seeded material? In the Saskatoon nurseries, the seed for all rows is counted (100 seeds per 10-foot row length). With the improved germplasm of yellow-seeded *B. napus*, there does not seem to be any major difference in emergence between the yellow and the black-seeded material. Earlier generations of yellow-seeded germplasm had reduced vigour, but these were still “early generation interspecifics” and had reduced fertility.

## **6. Research Highlights**

### **6.1 Targeted Growth. Presented by Jonathan A. Green.**

Targeted Growth Inc. is focused on the development of technologies that will enhance crop yield through greater seed size, increased seed number, or through improved disease resistance. Targeted Growth's efforts to date have been directed primarily to trait development in canola using cell cycle regulatory genes directed to yield increase and harpin genes for disease resistance traits.

We have shown in three years of replicated field trials across the prairie provinces, that modified expression of cell division regulating genes can give significant double digit yield increases.

*NOTE: update:* Targeted Growth Inc. has reached an agreement with Monsanto licensing the first of these genes for commercialization. Targeted Growth continues to develop a second class of cell division regulatory genes for increased yield traits in canola and has expanded this work to include soybean. Because the underlying mechanisms of these genes are highly conserved across species, we expect that these technologies will translate effectively to a broad range of crop species.

**6.2 Agrisoma. Chromosome Engineering and Canola Improvement. Presented by Steve Fabijanski, Agrisoma Biosciences Inc., Burnaby, B.C.**

Founded in 2000, Agrisoma Biosciences Inc. is a Canadian agricultural biotechnology company committed to the development and commercialization of its innovative artificial chromosome technologies. Agrisoma's business focus is in two primary areas: development of high value crops with enhanced yield, quality and commercial value, and efficient production of high value therapeutic and industrial proteins in plant-based production systems.

Agrisoma's chromosome technology is a broad enabling platform technology, which overcomes many of the limitations of existing transformation systems used to develop novel crops. Current plant transformation technologies do not allow the rapid development of new plants carrying multiple traits or large complex genes. Agrisoma's chromosome technology can allow multiple genes, or very large regions of chromosomal DNA that encode multiple traits, to be transferred to different crops, creating new valuable products.

This technology, with very large DNA carrying capacity, non-integrating structure, stability of expression and superior flexibility offer a new means to develop crops with enhanced value and performance.

The system described above is termed the "ACE" system (Amplification-based Chromosome Engineering) and represents a robust set of technologies that uniquely allow for the development of new chromosomes specifically engineered to contain multiple novel genes large DNA arrays or complex loci. Its capacity far exceeds current systems to validate genes in terms of ability to deliver genes into a pre-auditioned environment that assures appropriate expression and its reliability, predictability and inherent stability provide a needed technology for crop improvement.

The ACE system allows for genes of interest to be introduced in a chromatin context that recapitulates the higher order genomic structure of their natural environment, providing superior expression and stability. In addition, the ACE system represents the only system that can be used to introduce a multiplicity of genes into a defined environment in a fashion that is non-disruptive to the host genome. The ACE System provides the following advantages over existing technologies:

- The ACE exists stably side by side with and does not interfere with the function of host cell chromosomes
- The ACE contains multiple site specific integration sites for insertion of heterologous genes
- Heterologous genes integrated onto the ACE are expressed at reproducibly high levels
- Multiple copies of one gene or different genes can be integrated onto the ACE
- The ACE can be transferred to multiple related species and new varieties without having to create new "events", allowing for traits to be disseminated rapidly and reproducibly
- The ACE can carry mega-base amounts of heterologous genetic material

These attributes make the ACE system an ideal technology for use in the integration of multiple beneficial genetic traits and introduction of these traits into a crop species. The ability to engineer complex loci using the ACE system enables the reprogramming of complex cellular processes such as seed protein deposition or oil composition, allowing for compositional and nutritional improvements to crops and crop by-products, development of rational designs that represent the synthesis of multiple genetic loci that combine genes and DNA sequences for disease resistance, and finally produce plants engineered to produce complex biomolecules and proteins of substantial value.

Website [www.agrisoma.com](http://www.agrisoma.com)

#### Questions:

1. What is an artificial chromosome – does it get lost in cell division and what is its use? An artificial chromosome is a completely independent and stable chromosome.
2. Access to this technology? Agrisoma has collaborations and the specific use of this technology is on case by case basis.

#### **Announcement:**

Robin Morrall of the University of Saskatchewan, Biology Department, announced the French language version of: Diseases of Field Crops is now available and copies may be purchased for \$25.00 instead of the regular price of \$35.00.

### **7. Agronomy**

#### **7.1 Saskatchewan AgriARM (Applied Research Management). Presented by Larry Gutek, Crop Development Branch, SAFRR, co-ordinator Jody McConnell.**

The Partners/Financial support for AgriARM include SAFRR, AAFC, PCAB, Provincial Council of Agriculture Development and Diversification (ADD) Boards for Saskatchewan Inc., Agri-Food Innovation Fund, CARDS, University of Saskatchewan, Ducks Unlimited, and the Canadian Wheat Board.

The AgriARM mission statement is to conduct producer-driven applied research and demonstrations with results extending beyond the farm gate, to increase the value of crop production and improve agricultural sustainability.

Achieving this purpose is done by maintaining an effective network of applied research and demonstration sites. We strive to increase public awareness of agriculture's role in environmental stewardship and in the overall economy; increase the adoption of new agricultural production technologies, crops and practices by local farmers and improve producer's decision-making capacity for more environmental and economic on farm options.

The scope of current projects include: crop production, focusing on varieties and agronomy; environmental stewardship, looking at biodiversity, safety, Beneficial Management Practices (BMP) and promoting awareness of opportunities (e.g. strawberry crown production, pesticide-free production, forestry).

Farm sites were located at: Canora, Redvers, Swift Current, Scott, Kindersley, Melfort, Indian Head, Prince Albert and Rosthern. Each farm site has a board of directors consisting of local producers who serve to provide guidance for project development, administration and staffing. There is no provincial AgriARM board. The funding for farm sites is distributed: ~SAFRR core funding 30%, contract work 37 %, crop fill area income 23%, in-kind 8 % and grants 2 %.

Core projects in 2004 included: variety trials – Cereals/Pulses/Oilseeds; cropping systems; environmental stewardship-CARDS; minor use herbicide efficacy; field evaluation of inputs/equipment; forage variety testing; field pea seeding depth and warm season and cool-season crops trial. Outside funding supported initiatives such as:

- Establishment of AgriARM Forage Advisory Committee
- Flax Fibre Agronomy Trial (3 sites funded ADF)
- Flex Cropping Wheatland (ADF)
- Low Cost of Production of Chickpea (ADF)
- Conservation Learning Centre (NSERC)
- *Brassic*as for forage (WARC)
- Canaryseed and Oat projects (IHARF)
- Industry trials and other projects

#### Specific Projects 2004:

- 1 Scott (WARC): Seed placed urea with Agrotain and a polymer coating in canola (SSCA); farm saved versus certified seed of OP and H canola (SCDC); options for flea beetle control-canola input study (MII project); residual effect of Spartan herbicide on canola 2 years after application; additive effects of group 2 herbicides on crop tolerance and re-cropping (industry funded); copper sulfate application to reduce Pursuit residue injury on canola (Loon Lake site).
- 2 Rosthern (Seager Wheeler Farm): AgriARM showcased biodiesel at: “Seeding Trends 2004” and the Rosthern Country Fair and the Saskatoon Exhibition with a biodiesel tractor and float. “Canola Fact” plots were grown; “Canola Day” speakers from: CCC (Jim Bessel) and SCDC (David Blais), covering topics such as diseases, insects, economic thresholds and swathing time; Milligan Bio and Monsanto.
- 3 Melfort (NARF): Crop diversification study includes *B. napus* and *B. juncea* in rotations; project to test weather station model for sclerotinia stem rot control in canola (SCDC and MII); Paper -Evaluation of the uMetos Sclerotinia Stem Rot Fungicide Application Model for Canola (H.R. Kutcher and C. Kirkham).
- 4 Indian Head (IHARF): Field scale canola trials with the green seeker sensors; response of canola to N as a function of long term and short term zero-tillage (large plots); response of canola to nitrogen as it relates to management zones at a field level and adaptation of oilseed crops across Saskatchewan.
- 5 Prince Albert (CLC): Field scale demos- Invigor 5020 and Millenium 03; plot demos- 389, 3585, 3395, 3455, 3235, LBD422RR, and LBD588RR; 1500 students participated in the school program where students received age/grade specific canola materials More Yellow Stuff, Fun Facts With Canola Buddie, Canola Rocks, etc.

- 6 Canora (ECRF): Fall seeded canola trial (NRC); nitrogen timing on canola; Cargill Victory hybrid variety trial and Milligan Bio trial.
- 7 Redvers (SERF): Canola response to swine manure (PAMI); fall seeded canola seed coatings in cooperation with NRC; canola variety showcase in cooperation with Redvers Co-op and their seed suppliers- Monsanto, Bayer CropScience, Brett Young Seeds, Dow AgroSciences, and Advanta; fertility trials canola, *B. juncea*, sunflower, flax and hybrid canola trials (SCDC and PCVT in cooperation with CCC).
- 8 Swift Current (Wheatlands): “Optimizing harvest yield in Oilseeds” - objectives: to determine the optimum timing of harvest for mustard, *B. juncea* and canola; time of swathing versus straight cutting and a Dow AgroSciences canola variety trial.

Invitation to industry to partner with AgriArm.

Dr. Downey commented that it is good to see sites out there. It is a excellent opportunity to make use of equipment.

## **7.2 Herbicide carryover in canola. Presented by Eric Johnson, AAFC-Scott Research Farm.**

The issue of herbicide residue is very complex and highly unpredictable. There were more issues of carry over in the last three years. The carry over potential is much greater here than in many areas of the U.S.A. as our soils are frozen and have relatively high levels of organic matter. This means that in many of our soils, there are many potential binding sites for herbicide and therefore, the herbicide is not bio-available. Clay responds similarly as well as herbicide itself (shown in other studies).

Some of the possible reasons for herbicide residue in 2004 are:

- precipitation in 2002: the rain came late (August) and it was very dry in May, June and July – these are typical breakdown months for herbicide, thus a critical time.
- 2003 was a dry year, setting up the potential for lots of carryover.
- In the absence of soil water, herbicides are tightly bound to soil colloid and unavailable for microbial attack. The worst case scenario for carryover is an extremely dry fall combined with a wet spring and then the herbicide becomes available. The process is reversible for most herbicides.

2004 saw better conditions with above normal precipitation. Also in 2004, it was cooler than normal, therefore probably not as much microbial activity and setting the stage for optimistic conditions going into 2005.

With the different Group 2 herbicides, there are different mechanisms for breakdown. There is usually a higher carryover in the NW region, SK., where the soil pH can vary considerably over a field e.g. a low area in the field can result in a low pH and corresponding high levels of organic matter.

Symptomology of herbicide carryover: start to see discolouration in growing point and may have purpling at growing point. A sublethal dose will affect main growing point causing excessive branching and shortened internodes. There may also be a synergistic effect by back-to-back applications of Group 2 herbicides in drought years.

We are working on improving predictors for herbicide carryover. We also want to look at different locations, monitor herbicide breakdown using root bioassays and develop a model to improve the predictability of carryover for producers.

**7.3 Canola Vigour Studies conducted by Dr. Bob Elliott, AAFC-Saskatoon Research Centre. The report was presented by Roy Button, of SCDC for Bob Elliott.**

Dr. Elliott has three Seedling Vigour studies addressing: factors limiting germination, emergence and vigour of canola (CARP 1998-2000); factors influencing germination, seed vigour and agronomic performance of canola (CARP 2001-2004); and factors influencing seed vigour, seed deterioration and agronomic performance of canola (SCDC 2004-2007). The objectives of these studies are:

1. identify key factors influencing germination, emergence and seedling growth of canola
2. develop standardized vigour tests
3. determine the effect of seed quality on agronomic performance and tolerance to flea beetle damage
4. determine the effect of seed treatments and storage conditions on seed vigour
5. develop standardized tests to identify seed lots that deteriorate prematurely in storage

**FACTORS INFLUENCING CANOLA VIGOUR**

**SEED LOT SELECTION**

1. Recent germination or vigour test - within 3-4 months of seeding
2. Select bare or treated seed lots with germination above 90% after 7 days  
- germination test for untreated seed; pre-chill test for treated seed
3. Select high quality seed lots: Polish canola (>90% germ. after 4 days),  
- Argentine canola (>90% germ. after 5 days)
4. Select seed lots with low chlorophyll - less than 30 mg/kg chlorophyll
5. Select seed lots with high seed weights - op and double haploid (>3.3g)  
- advantage of hybrids

## FINAL REPORTS CARP 2001-2004

1. Effect of seed treatments on flea beetle damage and agronomic performance of Polish canola, *Brassica rapa*, in 2001-2003. September. 33 pages.
2. Effect of seed treatments on flea beetle damage and agronomic performance of Argentine canola, *Brassica napus*, in 2001-2003. September. 71 pages.

A series of graphs were shown of: Damage (%surface eaten), Total plant Weight (g/m-row) and Seed Yield (g/m<sup>2</sup>), versus the treatments with the early seeding date of May 12, 2003 and hybrid Argentine canola, 'Invigor 2733'.

Treatments included F.Lite®, Gaucho CS FL®, Assail 50 SL® Prosper® 200, Prosper® 400, Helix® and Helix XTra®.

## CONCLUSIONS

- In the early May planting (May 12), Helix XTra® followed by Assail 50 SF®, Helix® and Prosper 400® provided the best protection.
- Treatments reduced damage to 25-45%.
- Compared to untreated seed, treatments improved seedling establishment 50-65% and total plant weight 300-900 times.
- Treatments improved seed yield 14-20 bu/acre in an op variety and 20-27 bu/acre in a hybrid variety.

A series of graphs were shown of: Damage (%surface eaten), Total plant Weight (g/m-row) and Seed Yield (g/m<sup>2</sup>), versus the treatments with the late seeding date of May 27<sup>th</sup> and May 28<sup>th</sup>, 2003 and hybrid Argentine canola, 'Invigor 2733'.

Treatments included F.Lite®, Gaucho CS FL®, Assail 50 SL® Prosper® 200, Prosper® 400, Helix® and Helix XTra®.

## CONCLUSIONS

- In the late May planting (May 27-28), Helix XTra®, Helix® and Prosper 400® provided the best protection.
- Treatments reduced damage to 10% or less.
- Compared to untreated seed, treatments improved seedling establishment 15-20% and total plant weight 1.3-3.4 times.
- Treatments improved seed yield 4-5 bu/acre in a hybrid variety and 6-9 bu/acre in an op variety.

## FINAL REPORTS CARP 2001-2004 continued.

3. Effect of seed weight, germination and vigour index on the agronomic performance of Argentine canola, *Brassica napus*, in early and late May plantings in 1998-2000. September. 79 pages.
4. Evaluation of seed quality tests for assessing seed and seedling vigour of Argentine varieties in the 2001 regional test. October. 32 pages.
5. Evaluation of seed quality tests for assessing seed and seedling vigour of Argentine varieties in the 2002 regional test. October. 31 pages.

## BACKGROUND

In 2002, Canola Vigour Steering Committee recommended adoption of 3 vigour tests. Germination in the standard germination test (SGT-7 days) and pre-chill tests (PCT-12 days) provided the best indication of emergence and establishment in early and late May plantings. Leaf areas and seedling weights in the seedling assay (SA) provided the best indication of seedling growth in early and late May plantings. SA not adopted because the test requires more space, better lighting and specialized imaging equipment. Seed yields at multiple locations in 1998-2004 were more strongly correlated with shoot fresh weight and total plant weight than with seedling density. In lieu of the SA, require alternate methods of evaluating seedling vigour.

## CONCLUSIONS

- Field tests in 1995-2000 demonstrated that seed size has a significant effect on the agronomic performance of Polish and Argentine canola.
- Seedlings grown from large seeds (1.8-2.0 mm diameter) provided better establishment, better growth and higher seed yield than seedlings grown from small seeds (1.6-1.8 mm diameter).
- Direct relationship between 1000-seed weight and initial shoot weight.

**Statistical correlation between germination in the SGT or PCT2 and performance of Argentine seed lots in early and late May plantings in 1998-2000.**

Year	Locations	Planting date	Seedlings/row		Shoot fresh wt.		Total plant wt.		Seed yield
			14DAS	21DAS	14DAS	21DAS	14DAS	21DAS	
1998	S, W, R	early May	***	***	NS	NS	***	**	**
		late May	***	***	NS	NS	***	***	***
1999	S, W, R	early May	***	***	NS	NS	***	***	NS
		late May	***	***	NS	NS	***	***	***
1999	S, E, DC	early May	**	***	NS	NS	NS	NS	NS
		late May	***	***	NS	NS	NS	NS	NS
2000	S, W, R	early May	**	***	NS	NS	NS	NS	NS
		late May	***	***	NS	NS	NS	NS	NS

\*, \*\*, \*\*\* Pearson coefficient significant at 5%, 1% and 0.1% probability levels, respectively. NS-not significant, S-Saskatoon, W-Watrous, R-Rosebank, E-Ellerslie, DC-Dawson Creek.

### Statistical correlation between 1000-seed weight and performance of Argentine seed lots in early and late May plantings in 1998-2000.

Year	Locations	Planting date	Seedlings/row		Shoot fresh wt.		Total plant wt.		Seed yield
			14DAS	21DAS	14DAS	21DAS	14DAS	21DAS	
1998	S, W, R	early May	NS	NS	***	***	**	*	*
		late May	NS	NS	***	***	*	*	*
1999	S, W, R	early May	NS	NS	***	***	NS	NS	NS
		late May	NS	NS	***	***	NS	NS	NS
1999	S, E, DC	early May	NS	NS	***	***	*	*	NS
		late May	NS	NS	***	***	**	**	NS
2000	S, W, R	early May	NS	NS	***	***	***	**	NS
		late May	NS	NS	***	***	***	***	***

\*, \*\*, \*\*\* Pearson coefficient significant at 5%, 1% and 0.1% probability levels, respectively. NS-not significant, S-Saskatoon, W-Watrous, R-Rosebank, E-Ellerslie, DC-Dawson Creek.

### VIGOUR INDEX

#### Vigour index = 1000-seed weight (final % germination/100)

Example○ seed lot (3.00g/1000 seeds) has 95% germination at 7 days in the SGT  
○ vigour index = 3.00 (0.95) = 2.85

### Statistical correlation between vigour indices in the SGT or PCT2 and performance of Argentine seed lots in early and late May plantings in 1998-2000.

Year	Locations	Planting date	Seedlings/row		Shoot fresh wt.		Total plant wt.		Seed yield
			14DAS	21DAS	14DAS	21DAS	14DAS	21DAS	
1998	S, W, R	early May	-	-	***	***	***	***	***
		late May	-	-	***	***	***	***	***
1999	S, W, R	early May	-	-	***	***	***	***	NS
		late May	-	-	***	***	***	***	NS
1999	S, E, DC	early May	-	-	***	***	***	***	*
		late May	-	-	***	***	***	***	NS
2000	S, W, R	early May	-	-	***	***	***	***	NS
		late May	-	-	***	***	***	***	***

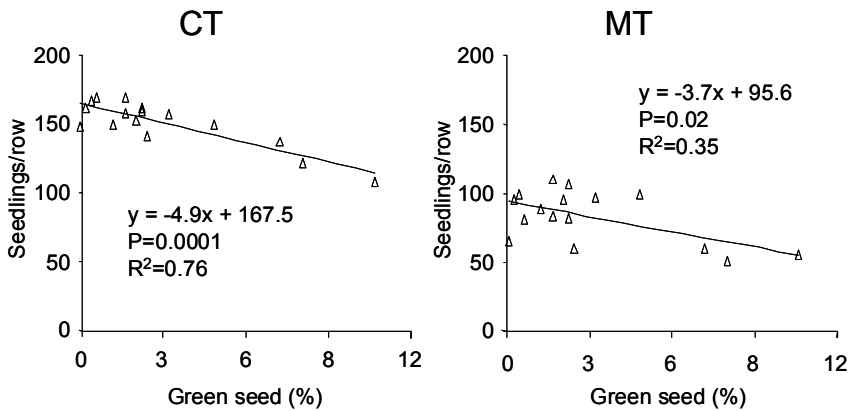
\*, \*\*, \*\*\* Pearson coefficient significant at 5%, 1% and 0.1% probability levels, respectively. NS-not significant, S-Saskatoon, W-Watrous, R-Rosebank, E-Ellerslie, DC-Dawson Creek.

FINAL REPORTS CARP 2001-2004 continued.

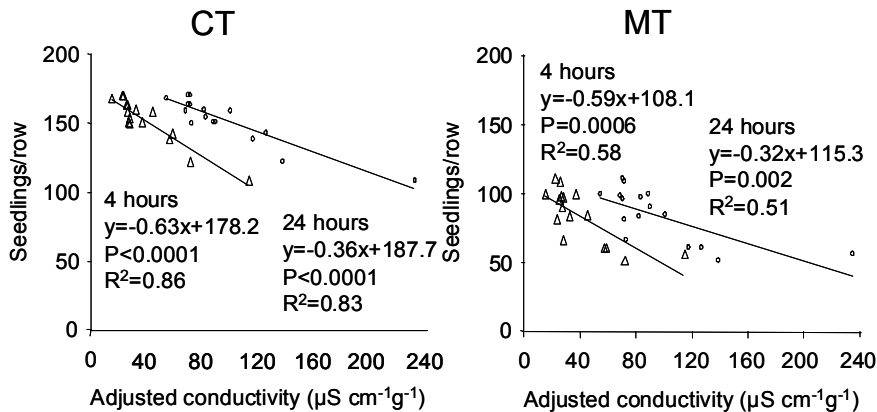
6. Effect of seed production practices on quality, vigour and performance of open-pollinated Argentine canola in 2003. November. 83 pages.
7. Influence of green seed, chlorophyll content and seed weight on the quality, vigour and agronomic performance of Argentine canola. November. 97 pages.

SEED PRODUCTION

Seed lots of an op variety produced in swathing experiments at Melfort in 2000 and 2001. Each year, seeds were planted early and late. Seed lots were swathed at 8-day intervals when the moisture content of seeds at the base of the main raceme averaged 63-70%, 46-56%, 37-45% and 26-38%. The seed lots were harvested and 1000-seed weight, green seed content determined. The different seed lots produced were evaluated in MGT, CDT, AAT and ECT.



Relationship between % green seed and seedlings/row of Argentine seed lots after 21 days in conventional and minimum tillage.



Relationship between adjusted electrical conductivity and seedlings/row of Argentine seed lots after 21 days in conventional and minimum tillage.

## CONCLUSIONS

- Swathing time had a significant effect on the performance of the seed lots at Saskatoon, Scott, Loon Lake and Indian Head.
- Performance of seed lots improved the longer they were allowed to mature before swathing.
- 18 to 24-day delay in swathing improved seedling establishment (5-35%), shoot weight (1.2-2.5 times), total plant weight (1.2-10.0 times) and seed yield (3-11 bu/acre).

## FINAL REPORTS – in preparation

8. Effect of elevated temperatures on germination, vigour index and agronomic performance of Polish and Argentine canola.
9. Effect of seeding rate on establishment, growth and seed yield of open-pollinated and hybrid Argentine canola.
10. Effect of moisture content and temperature on germination, grade and vigour index of untreated Polish and Argentine canola during extended storage.
11. Effect of seed treatments on germination, grade and vigour index of Polish and Argentine canola during extended storage.
12. Factors influencing the stability of Argentine varieties during extended storage.

## CURRENT RESEARCH

- Effect of seeding date and swathing time on quality, vigour and performance of open-pollinated Argentine canola.
- Effect of seeding rate and seed weight on establishment, growth and seed yield of open-pollinated and hybrid Argentine canola.
- Seed treatments.
- Effect of seed treatments on germination, grade and vigour index of Polish and Argentine canola during extended storage (December completion).
- Effect of seeding date and swathing time on the stability of open-pollinated Argentine canola during extended storage (January completion).
- Effect of green seed and chlorophyll content on germination, grade and vigour index of op and hybrid Argentine canola during extended storage (January completion).

Thanks to SCDC, MCGA, CCC and Syngenta Crop Protection for funding these projects

**9.4 Rapeseed/Canola Yields Overtime and Impacting Factors - Ed Seidle  
Seidle Seed Farm, Medstead, SK**

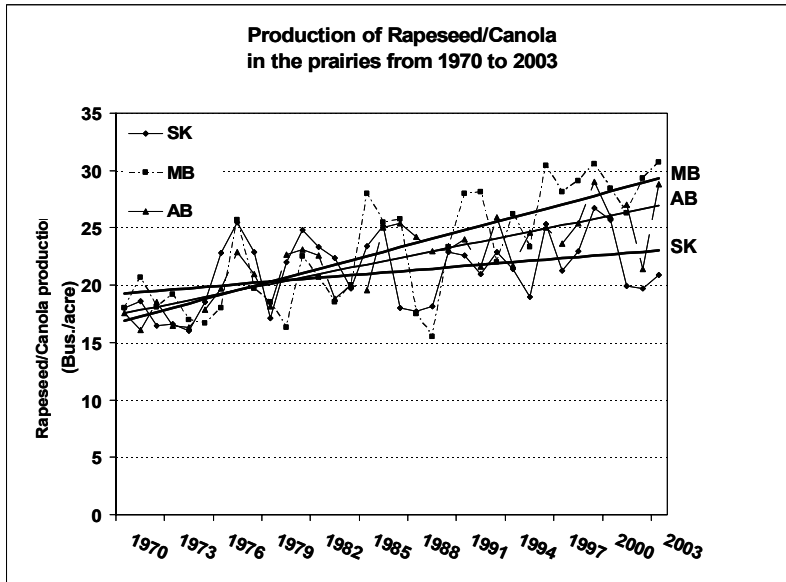


Figure 1

Source: Statistical handbook (CGC).  
Compiled Ed Seidle.

**Western Canada Rapeseed / Canola Yields  
1970-2003 (34 years- 4 periods)**

	Bus. / Acre and % <i>B. napus</i>								Bus/Ac Aver.
	1970-1977		1978-1986		1987-1995		1996-2003		
SK	19.1	51%	22.3	68%	20.4	62%	22.8	92%	21.2
AB	18.2	8%	21.2	33%	23.7	40%	25.8	85%	22.2
MB	19.2	65%	21.1	81%	23.3	90%	29.1	99%	23.1

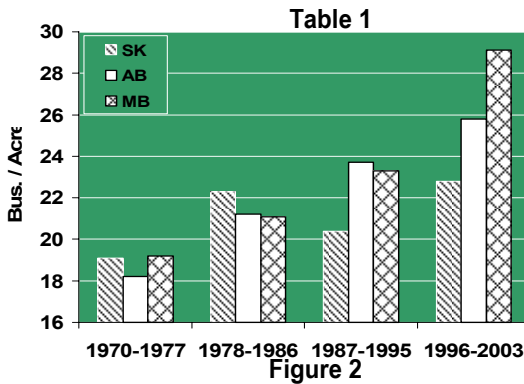


Figure 2

Source: Statistical handbook (CGC).  
Compiled Ed Seidle.

Provincial acreage by % of the Total Production (Western Canada)

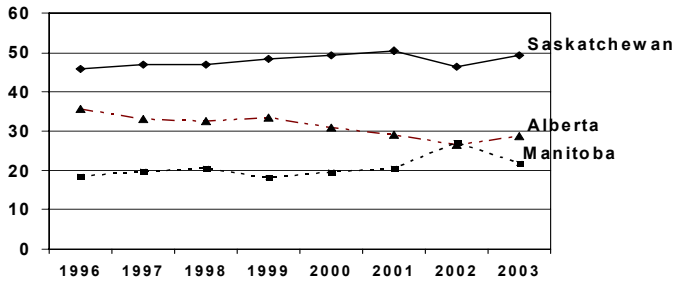


Figure 8

Source: Statistical handbook (CGC).  
Compiled Ed Seidle.

Canola Production Systems in Saskatchewan (% of Total Acres)

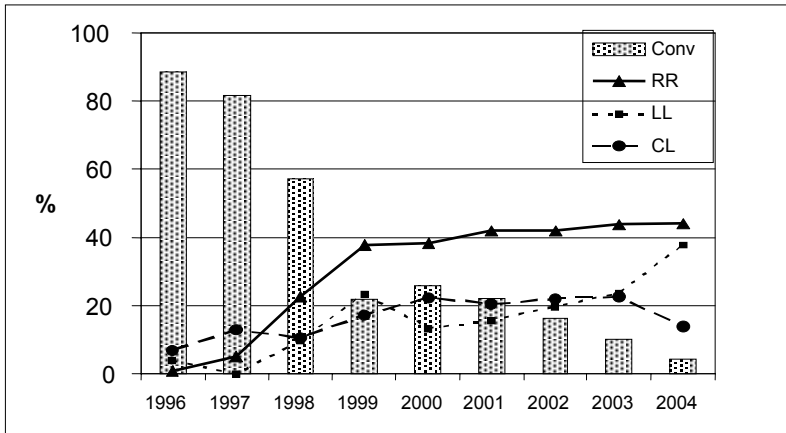


Figure 5

Source: Sask Crop Insurance Corp.  
Compiled by Ed Seidle.

Canola Production Systems in Alberta (% of Total Acres)

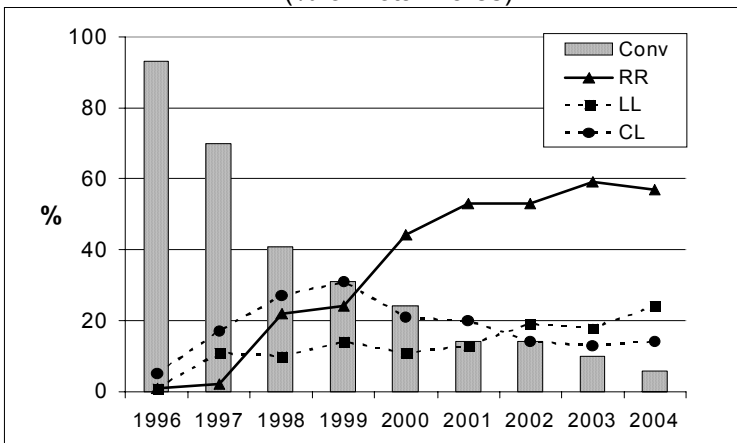


Figure 6

Source: Alberta Agric. Food & Rural Development  
Compiled by Ed Seidle.

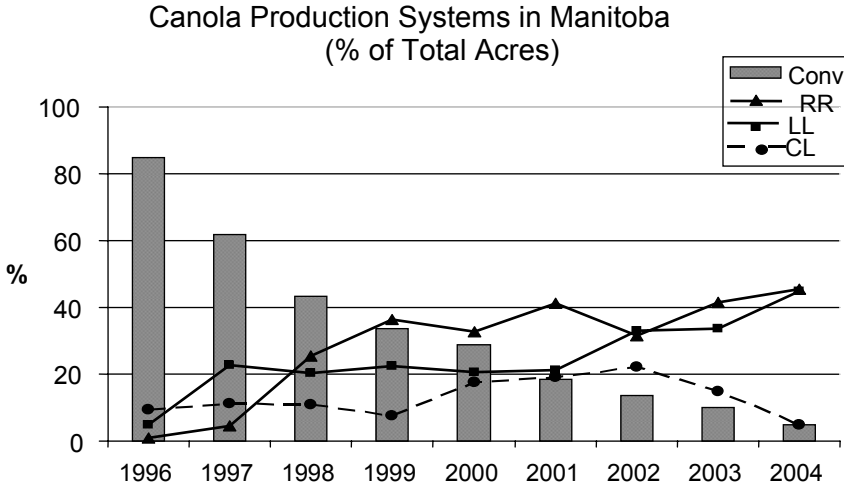
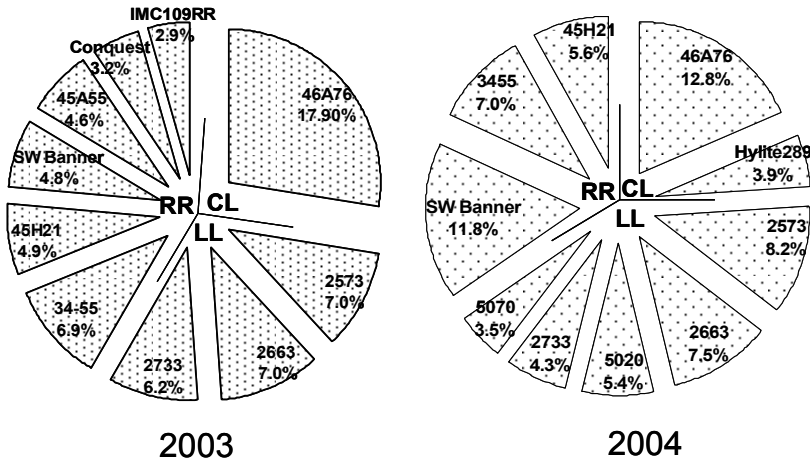


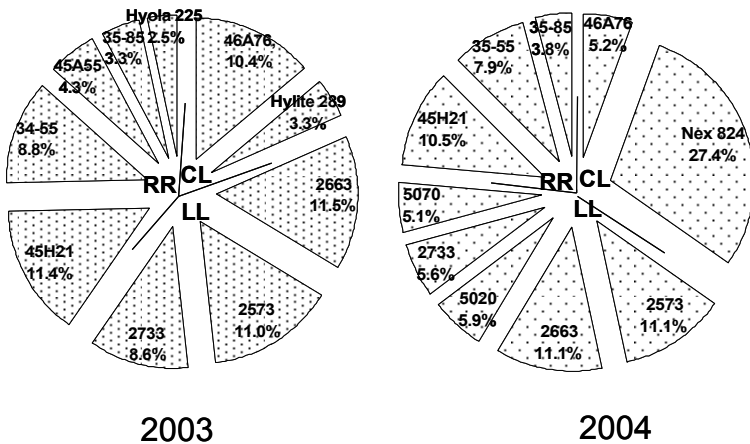
Figure 7

Source: Manitoba Crop Insurance Corp.  
Compiled by Ed Seidle

### Top 10 Ranking varieties by % acres in Saskatchewan in 2003 and 2004



### Top 10 Ranking varieties by % acres in Manitoba in 2003 and 2004



### Factors impacting Rapeseed/Canola yields in Western Canada

**Climatic Factors**

- 1. Moisture (Precipitation)
  - 1. Insufficient moisture
  - 2. Excessive moisture
- 2. Ambient (Air) Temperatures
  - 3. Low
  - 4. Too high
- 3. Sunlight
  - 5. Obstructed (Cloudy-Overcast)
  - 6. Unobstructed (Clear day)s

Precipitation and Canola Yield in Western Canada (1987-1995)

	Yields (Bus. / acre)	Precipitation (MM) May to August	Prec. / Bus
SK	20.4	231	11.32
AB	23.7	288	12.15
MB	23.3	281	12.06
Average	22.5	267	

Table 2

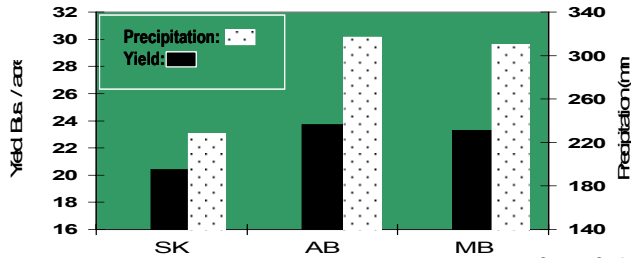
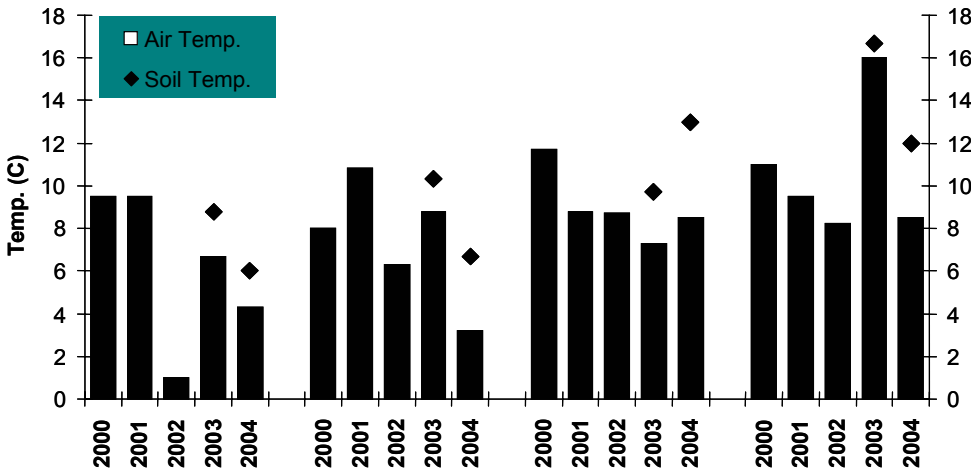


Figure 3

Source: Statistical handbook (CGC).  
Compiled Ed Seidle.

Soil and Air Temperatures in May(Weekly average) Bare Loam Soil (5cm depth) at Medstead, SK



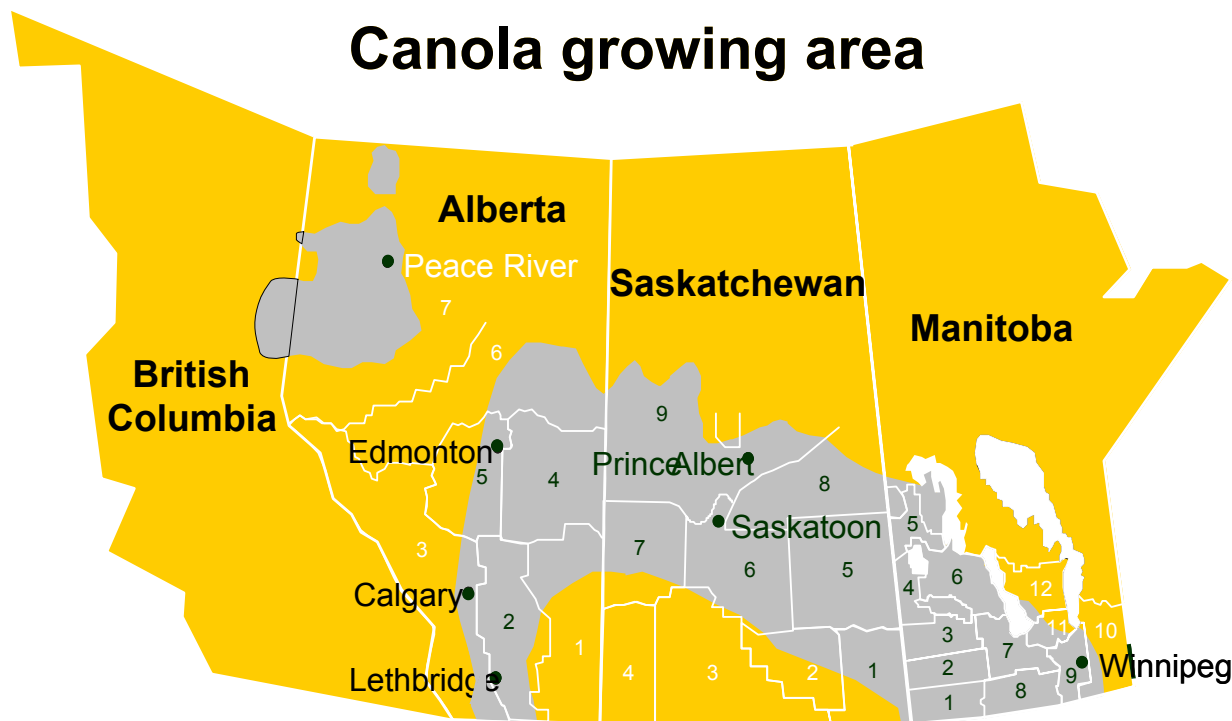
## **Factors impacting Rapeseed/Canola yields in Western Canada**

### **Agronomic Factors**

1. Harmful (unwanted) herbicide residue
  - In surface soil
  - Released from sprayer systems
2. Spray drift
  - Direct (Wind)
  - Inversion (Clouds)
3. Varying degrees of plant suppression from herbicide's applications (?)
4. Rotations too close
5. Lack of balanced fertility
6. Reduced tillage practices (Both positive and negative impacts)
7. Planting seed (Quality problems)
8. Use of "marginal land"
  - Previously excessive weed pollution (host plant)
  - High acid soil (low pH)
  - High salinity soils
9. Diseases (many)
  - Blackleg, Sclerotinia
  - Alternaria blackspot
  - Seedling disease complex
  - Root rot complex, Fusarium
  - White leaf spot, Aster Yellows
10. Insects
  - Flea beetles, Cut worms
  - Army worms, Aphids, Lygus
  - Diamond Back moths, Root maggots
  - And others....

**8. Crop Reports**

**8.a Canadian Grain Commission Canola Report. Presented by Doug DeClercq, Canadian Grain Commission, Grain Research Lab., Winnipeg, MB.**



The 2004 western Canada canola acreage was 5,283,000 ha compared to 4,705,000 ha in 2003. Total canola production in 2004 was 7,651,000 tonnes (6,274,000 tonnes in 2003) higher than the 10-year average, 1994-2003, of 6,372,000 tonnes.

**Harvest samples received by grade**

CGC received 1,145 samples of No. 1 Canada in 2004: compared to 1,921 samples in 2003.  
 512 samples of No. 2 Canada were received in 2004, compared to 210 in 2003.  
 162 samples of No. 3 Canada were received in 2004, compared to 18 in 2003.  
 Sample Canada: 27 samples in 2004, compared to 7 samples in 2003.

**Samples received by province and grade**

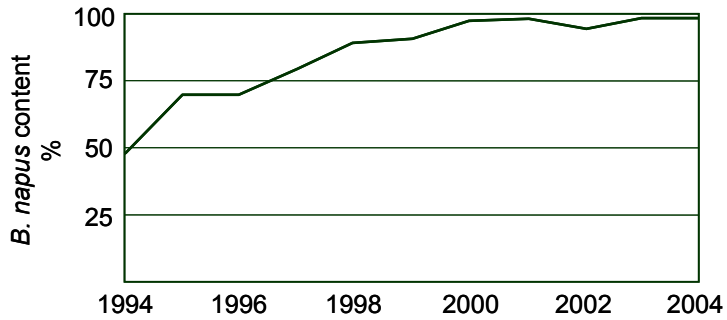
	No. 1 Canada		No. 2 Canada		No. 3 Canada	
	2004	2003	2004	2003	2004	2003
Manitoba	263	636	114	21	38	2
Saskatchewan	465	812	289	122	101	12
Alberta	417	473	109	67	23	4
<b>Western Canada</b>	<b>1145</b>	<b>1921</b>	<b>512</b>	<b>210</b>	<b>162</b>	<b>18</b>

***B. napus* content of No. 1 Canada canola**

2004 average 98%

2003 average 98%

1994-03 mean 80%



**Canola varieties—2004 survey**

Type	Number of samples	Percent
GMO	999	75.1
Pursuit/Clearfield	179	13.5
Non-GMO	152	11.4
Total	1330	100.0

Source: variety identified canola survey samples

**Canola varieties in GRL survey**

Type	Percent of total identified varieties			
	2004	2003	2002	2001
GMO	75.1	71.6	65.7	59.7
Pursuit/Clearfield	13.5	16.6	18.1	17.3
Non-GMO	11.4	11.8	16.2	23.0
Total	100	100	100	100

Source: Variety identified canola survey samples

**2004 harvest survey No. 1 Canada canola**

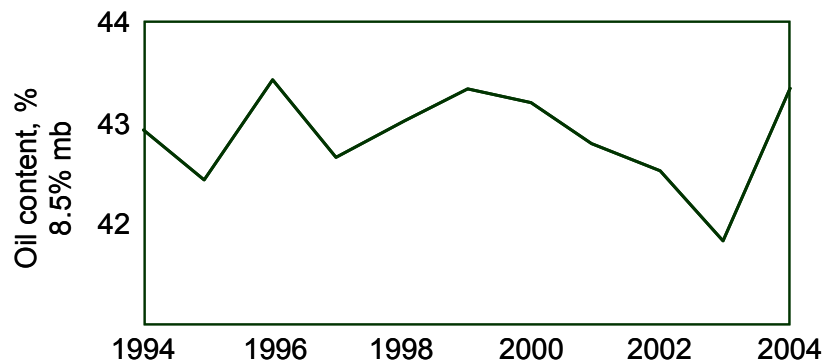
	Oil content	Protein content	Chlorophyll content
	%	%	mg/kg
Manitoba	42.9	21.5	13
Saskatchewan	43.6	20.9	18
Alberta	43.3	21.9	17
Western Canada	43.3	21.5	17

**Oil content in 2004 western Canadian canola**

	No. 1 Canada	No. 2 Canada	No. 3 Canada
	%	%	%
Manitoba	42.9	40.6	39.9
Saskatchewan	43.6	41.2	39.8
Alberta	43.3	42.9	41.8
Western Canada	43.3	41.6	40.2

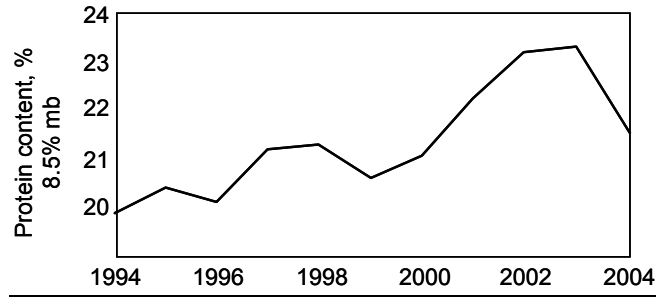
**Oil content of No. 1 Canada canola**

2004 average 43.3%  
 2002 average 41.8%  
 1994-03 mean 42.8%



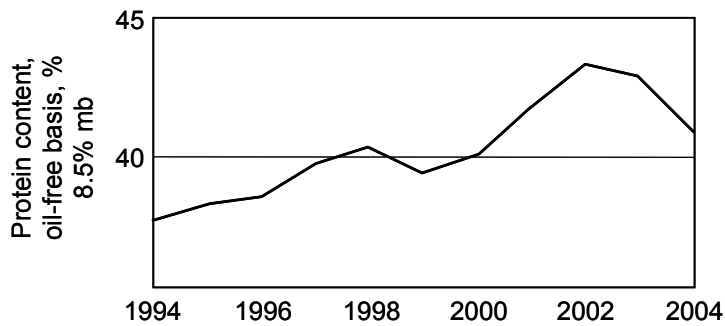
**Protein content of No. 1 Canada canola**

2004 average	21.5%
2003 average	23.3%
1994-03 mean	21.3%



**Protein content (oil-free basis) of No. 1 Canada canola**

2004 average	40.8%
2003 average	42.9%
1994-03 mean	40.0%



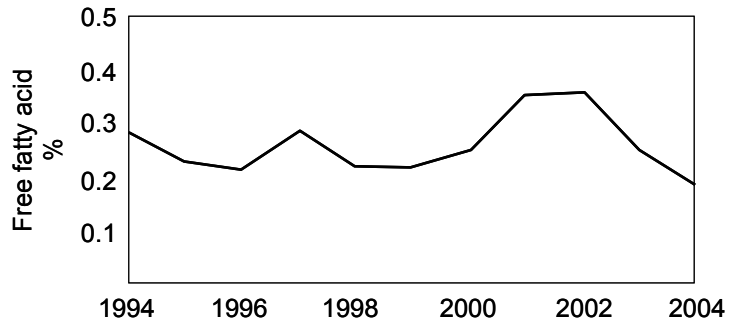
**Chlorophyll content of No. 1 Canada canola**

2004 average	17 mg/kg
2003 average	15 mg/kg
1994-03 mean	14 mg/kg



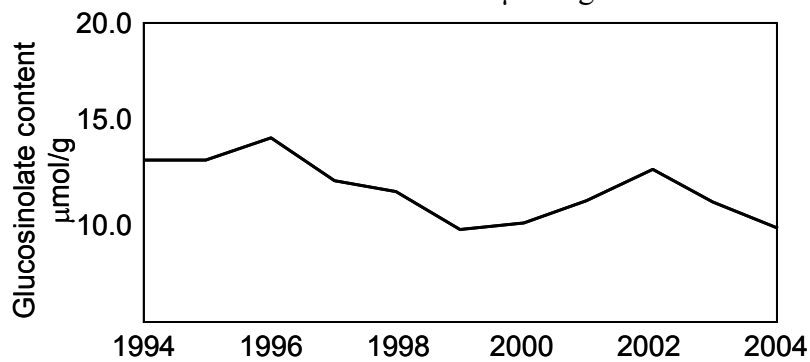
**Free fatty acid content of No. 1 Canada canola**

2004 average	0.19%
2003 average	0.23%
1994-03 mean	0.26%



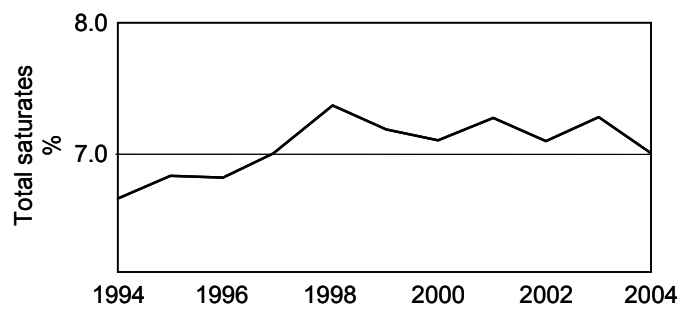
**Total seed glucosinolate content of No. 1 Canada canola**

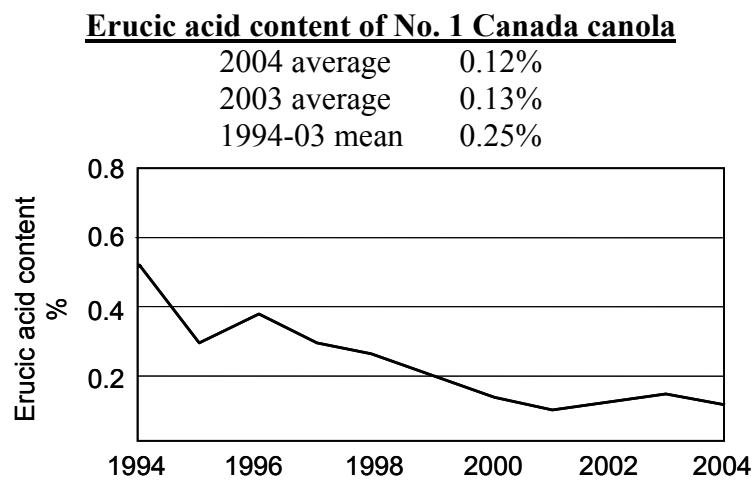
2004 average	9 $\mu\text{mol/g}$
2003 average	11 $\mu\text{mol/g}$
1994-03 mean	12 $\mu\text{mol/g}$



**Saturated fatty acid content of No. 1 Canada canola**

2004 average	7.0%
2003 average	7.3%
1994-03 mean	7.0%





The complete harvest survey reports are available on the internet at the following site:

<http://www.grainscanada.gc.ca/Quality/Canola/canolamenu-e.htm>

The 2004 survey in pdf-form:

<http://www.grainscanada.gc.ca/Quality/Canola/2004/canola-2004-e.pdf>

## **8. Crop Reports continued.**

### **8.b Provincial Alberta update presented by Murray Hartman, Oilseed Specialist, AAFRD, Lacombe, AB.**

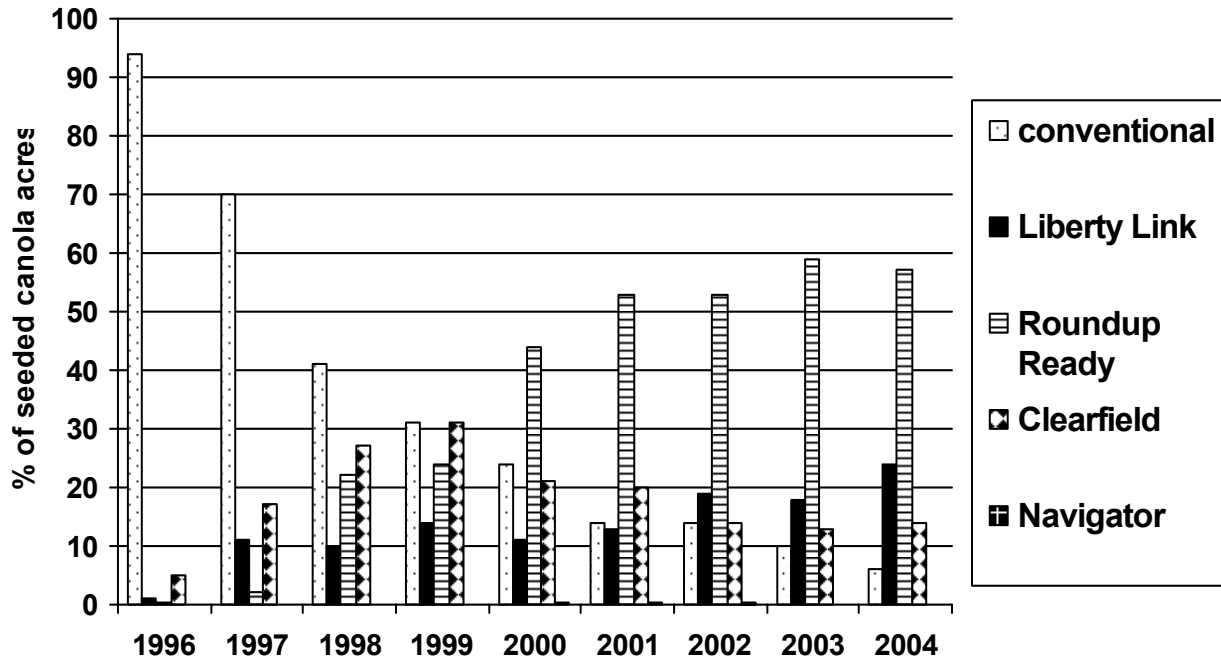
The **weather** in 2004 will probably produce a record Alberta canola yield average of 30 bu/acre. Growing season precipitation over much of the traditional canola growing area was near normal except for drought in the north Peace and east central Alberta. The majority of the precipitation fell in the late June through August, which benefited yield and oil content. However, May, June, August and September temperatures were below normal, resulting in late maturity.

The 2004 Alberta canola seeded acreage increased to about 4 million acres, and harvested acres to date are about 3.6-3.8 million acres. The remaining crop will likely wait until spring for combining as the swaths are covered with snow. With record yields, Alberta canola production should be around 2.5 Million tones.

The **major challenges** to many Alberta canola producers in the 2004 crop season included poor emergence in cold dry soils (increasing the potential for seedling blight), deep seeding and a late, wet harvest.

- Frosts in May caused some reseeding, although this reseeding usually is not warranted.
- Insect problems tended to be minor and localized (flea beetles, cutworms, wireworms, bertha armyworm) and grasshopper infestations did not develop to forecast severity due to the cool, wet weather in mid-season.
- In areas with good summer rain, sclerotinia developed into moderate late season infections, and in some cases caused significant yield losses.
- Clubroot incidence did not appear to increase.

**Alberta Canola Herbicide System Use from AFSC data**



Graph based on 3 million insured acres (75% of estimated total seeded acres of canola/rapeseed in Alberta in 2004). Non-HT and non-specialty oil Argentine was 2.3% in 2004. Polish canola 2.2% (probably underestimate). 7% specialty oil types (including rapeseed), 1% was non-HT specialty oil. 40% were hybrids.

- In 2004, top ten varieties (in order) accounted for 55% of insured acreage:  
45H21, 34-55, 46A76, 2733, 2573, 2663, 9550, 3235, 5020, 5070.

**8. Crop Reports continued.****8.c Saskatchewan update. Presented by Bill Greuel, Oilseed Specialist for SAFFR, SK.**

Canola Production Statistics				
Year	Area		Yield bu/acre	Production Tonnes
	Acres	Hectares		
2004	5,700,000	2,306,717	22.0	2,950,000
5 Year	4,982,000	2,016,809	20.8	2,490,560
10 Year	5,326,000	2,156,178	21.7	2,721,260
20 Year	4,433,450	1,794,870	21.6	2,235,490

**Production Issues** for Saskatchewan producers were: cool growing conditions; flea beetles; delayed maturity; early frost and poor harvest conditions.

Cool Growing Conditions in 2004 = cool soils; cool air temperature resulted in delayed seeding. Many acres were planted past the Sask Crop Insurance deadline. When the crop did germinate, emergence and growth was slow. The weak and spindly plants had reduced Leaf Area Index.

**Flea Beetles**

2004's greatest insect threat. Feeding on hypocotyls below or at the soil surface. Slow germination and emergence led some people to question the longevity of seed treatments.

**Delayed Maturity**

Cool, wet weather persisted throughout the growing season leading to delayed maturity. Canola was two to three weeks behind normal for most of the growing season.

**Early Frost**

A large portion of the province received frost on August 19<sup>th</sup> and 20<sup>th</sup>. Temperatures ranged from 0°C to -6°C for various durations. Led to yield losses and quality deterioration.

**Poor Harvest Conditions**

Weather was uncharacteristically wet in September and October. Much of the crop was harvested late with a high moisture content. Stored canola will need to be monitored closely.

**2005 Forecast**

- Statistics Canada estimates a small increase in area and production
- The SAFFR subsoil moisture map shows adequate levels of fall moisture
- Disease inoculums are low, except for sclerotinia
- Insect populations are relatively low

**9. Flax Canada 2015. Presented by Ashley O’Sullivan, AgWest Bio Inc., Sktn, SK.**

Flax Canada 2015 is a federal/provincial/flax industry initiative to turn flax into a \$1.5B farm gate industry value by 2015. \$1.2M has been committed by the partners to develop a strategic plan by December, 2005.

Working Groups have been established to focus on opportunities in human health, animal health, fiber, industrial uses and breeding and agronomy.

Notionally, it is planned to raise about \$100M over the next 10 years to support the initiative. Ag-West Bio has been contracted by the parties to develop the strategic plan. We have contracted with Kelley Fitzpatrick to co-ordinate the strategic planning process.

The Flax 2015 Steering Committee:

John Oliver, Chair and Maple Leaf Bio-Concepts; Barry Hall, Vice Chair of Committee and Flax Council of Canada; Brian Freeze, AAFC; Christine Murray, Government of Alberta; Abdul Jalil, Government of Saskatchewan; Daryl Domitruk, Government of Manitoba; Linda Braun, Saskatchewan Flax Development Commission and Ashley O’Sullivan, Ag West Bio.

Flax Canada 2015:

Flax represents an OPPORTUNITY – To become Canada’s 21st century bio-economy crop.

- A unique initiative that will build links and accelerate innovation across the value chain. Flax 2015 will focus on research, innovation and commercialization
- We will develop a “branding” strategy for Flax
- The goal is to develop higher-value flax based products and processes through total utilization of the whole plant – both traditional & non-traditional products and markets

Flax represents an OPPORTUNITY – To address the health of Canadians

- Human Health: higher-value flax based products such as bulk oil, bottled liquid flax oil, high lignan flax oil, soft gelatin flax capsules (Bioriginal Food & Science, Saskatoon). Liquid oils tend to have a short shelf life, even if antioxidants are added, and must be consumed within 4-8 weeks of opening. Flax is popular in capsule form because it solves the problem of oxidation and rancidity. It is also more convenient, and for those who don’t care for the taste of flax oil, it solves that problem too. However, encapsulation is an expensive process and adds significantly to the cost of the finished goods
- Animal Health: higher-value flax based products such as Omega Dog Treats and Organic Feline Formula.

Flax represents an OPPORTUNITY – To enhance use of fibre flax and use as industrial feedstock.

For more information contact: Dr. Ashley O’Sullivan, [ashley.osullivan@agwest.sk.ca](mailto:ashley.osullivan@agwest.sk.ca)

## 10. Insect situation and forecasts

### 10.1 Development of an Integrated Management Strategy for the Cabbage Seedpod Weevil in Canola. Presented by Lloyd Dosdall, University of Alberta, Edmonton, AB.

The Life Stages of the Cabbage Seedpod Weevil were shown: adult, egg, larva, mature larva, pupa.

Coloured photographs of crop damage by *C. obstrictus* showed destruction of flowers and buds by adults, larval feeding on developing seeds and new generation adults feeding on pods. Survey maps (weevils per 25 sweeps) were presented for 2000 and 2004.

Research Funding for the Seedpod Weevil Integrated Management Strategy is provided by: Alberta Agricultural Research Institute, Canola Producer Commissions of Alberta, Saskatchewan, and Manitoba and agribusiness collaborators (Dow, Bayer, Gustafson, Syngenta).

There are five components for the Integrated Management of Cabbage Seedpod Weevil:

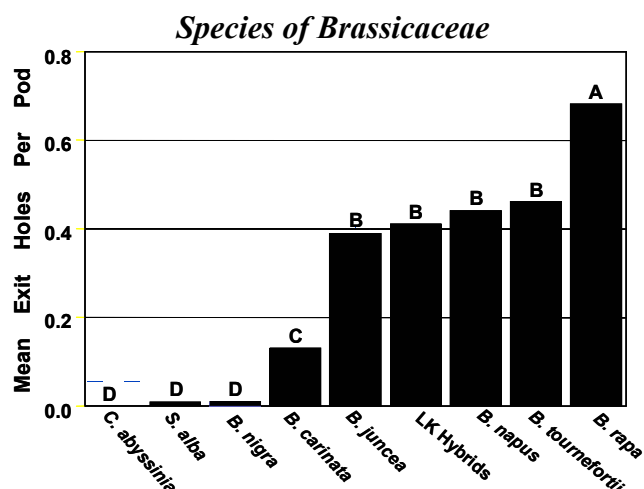
- 1) Chemical Control
- 2) Host Plant Resistance
- 3) Cultural Control Strategies
- 4) Biological Control
- 5) Technology Transfer

#### 1) Monitoring and Chemical Control

Studies were done, determining product efficacies, the best timing for sprays and the economic thresholds for the weevil. Different insecticidal seed treatments were tested to determine the effects on Weevil Development. Contact Lloyd Dosdall directly for possible access to this information.

#### 2) Host Plant Resistance

The objective is to evaluate different species and varieties of *Brassicaceae* to identify sources of resistance, and to move genes for resistance to elite cultivars of canola. First we looked at the individual species: *Sinapis alba*, *Brassica napus*, *B. nigra*, *B. tournefortii* and *C. abyssinica*.



Then in 2001, 236 intergeneric hybrids (resistant parent *Sinapis alba*, susceptible parent, *Brassica napus*) were developed and field-tested for susceptibility to attack by the weevil. Weevil resistance assessments were done in both laboratory tests considering pods of uniform size, mated, gravid females and replicated trials. Pods were examined for eggs and feeding marks. Field Trials were done considering exposure to field populations, using replicated trials if possible. Pods were examined for exit holes. A series of graphs were presented. Contact Lloyd Dossdall for detailed information.

### 3) Cultural Control

Primary Initiatives included looking at the use of trap crops for weevil control and manipulating canola canopy by altering seeding date and seeding rate

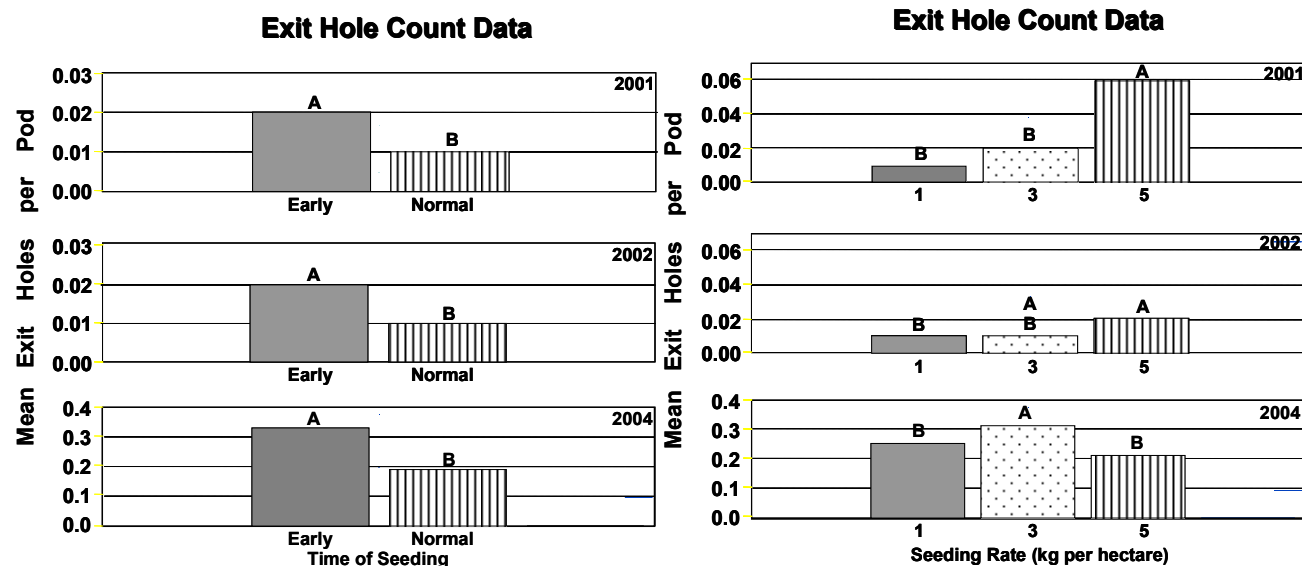
Seeding Dates: 'Early' = late April, 'Normal' = early May

Seeding Rates: 'Low' = 1 kg/ha, 'Normal' = 3 kg/ha, 'High' = 5 kg/ha

Pan Trap Sampling was used for collections of weevil adults. Weekly collections were done throughout the season, from seeding emergence until end of flowering.

Exit Hole Counts counts of numbers of larval exit holes per pod. Pods were assessed at the end of the season, at maturity.

Emergence Trap Sampling was also done to assess the emergence of new generation adults. Cages, 1 m<sup>2</sup>, were placed on canola stubble late in the season. A series of graphs were presented. Contact Lloyd Dossdall for detailed information.



#### 4) Biological Control

Primary Initiatives included host specificity testing in Europe for possible introductions of biocontrol agents to North America and monitoring parasitism in weevil populations in western Canada.

- Parasitoids of Cabbage Seedpod Weevil  
1998: 0 of 821 adults parasitized  
1999: 0 of 750 adults parasitized and 0 of 950 pods had larval parasitoids  
2000: 0 of 1,100 adults parasitized and 0 of 750 pods had larval parasitoids  
In 2001, evidence of ectoparasitism of weevil larvae within canola pods was found at Lethbridge, AB and Creston, BC.
- Larval Ectoparasitoids of the Cabbage Seedpod Weevil  
Pteromalidae: *Trichomalus lucidus*, *Chlorocytyus* sp., *Pteromalus* sp., *Lycrus maculatus*, *Mesopolobus* n. sp. and *Mesopolobus bruchophagi*  
Chalcididae: *Conura albifrons* and *Conura side*  
Eurytomidae: *Eurytoma* sp.  
Eulophidae: *Necremnus tidius* and *Euderus albitarsis*  
  
*Necremnus tidius* (Walker) (Hymenoptera: Eulophidae)  
*Necremnus tidius* Mean Development Time: Egg to Adult = 18.2 days
- Monitoring Weevil and Parasitoid Movements on Spatial and Temporal Scales  
Weevil Distributions in *Brassica napus*, 2003:  
June 26<sup>th</sup> (bud) mean= 27.9  
July 4<sup>th</sup> (early flower) mean=30.8  
July 24<sup>th</sup> (late flower) Mean: 24.0

#### 5) Technology Transfer

Primary Initiatives targeted to make research results readily available to canola producers and agrologists. An Alberta Agriculture Fact Sheet was prepared, (Doddall *et al.*, 2001), [Agdex 622-21](#).

#### Summary:

- insecticides are registered and effective for weevil control in canola.
- seed treatment with clothianidin (Prosper®) reduces weevil larval survival within pods.
- some canola genotypes selected from *Sinapis alba* x *Brassica napus* intergeneric hybrids have levels of resistance approximately four times greater than the *B. napus* check.
- weevil densities, crop damage, and development of new generation adults were highest in early-seeded stands grown at higher densities. However, plants at higher densities could better compensate for weevil attack.
- weevil parasitoids have been increasing annually from 2001 to 2004 in southern Alberta and Saskatchewan.
- enhancing the effectiveness of parasitoids should be a key component in the integrated management of the cabbage seedpod weevil.

**10. Insect situation and forecasts continued.****10.2 2004 Insect Review and Forecast – Saskatchewan. Presented by Scott Hartley, Insect Specialist, SAFRR, SK.**

Scott presented several maps of Bertha Armyworm and the Heat Requirements for western Canada and Degree Growing Days, Cumulative Moth Counts July 31, 2002; July 31, 2003 and August 11, 2004.

Spring 2004 showed high levels of populations and stem feeding. The higher seed treatment rates provided best control. The fall 2004 survey indicates populations lower than last few years.

The Grasshopper Forecast Maps for 2000, 2004 and 2005 were presented. Contact Scott Hartley for copies of these maps. Beneficials include: blister beetles, bee flies and fungal (Entomophaga) disease.

Maps were presented for the Cabbage Seedpod Weevil Survey, 2003 and 2004.

Swede Midge *Contarinia nasturtii* (Kieffer)

Swede midge is classified in the same family as wheat midge – Cecidomyiidae. It is prevalent in Europe where it is a pest of cole crops creating “blind heads” and unmarketable product (cabbage, broccoli), but is considered only a minor pest of canola. In North America, swede midge is in Ontario and Quebec, primarily affecting cole crops. The effects on canola not known but damage was noted in 2003 in the form of stunted growth and reduced racemes.

Stored Grain Insects. 2004 had poor harvest conditions. If moisture content high there is the potential for fungal growth. Fungus feeding insects not feeding on sound grain. Aeration is considered the best management option.

**11. Disease Reports****11a. Clubroot of canola, 2004. Presented by Murray Hartman, Oilseed Specialist, AAFRD, AB.**

Background Information: Clubroot is a serious disease of cruciferous crops worldwide. It occurs on cole crops: cabbage, broccoli, cauliflower, radish, turnip, etc. Clubroot is a problem on rapeseed in Europe and Australia. In North America, it is established in eastern Canada and B.C. Clubroot has now been confirmed on canola in a field near St. Albert, in the Edmonton area. Recent surveys of 70 fields in that area found 12 fields that were infected, involving four producers. This indicates that there is still a low level of infestation, but that it is not isolated to one small area or producer.

The causal agent of clubroot is the fungus *Plasmodiophora brassicae* Woronin, an obligate parasite (protist). The pathogen infects roots and causes galls to form which restrict the flow of water and nutrients to the plant resulting in wilting, stunting, yellowing and seed shrivelling. There are no airborne spores but the (resting) spores are long lived

Images were shown of severe infection, deteriorating galls – noting the white stem.

A clubroot bioassay is developed.

Conducive conditions: Since the zoospores are motile swimmers, good moisture promotes the disease. In a field situation, potential areas of infection could be: low lying areas, loam-clay textures, poor drainage (Bt for example), acid soils (< pH 6.5).

- Recent report from France found that out of 17 infested fields, 80% with high soil infection had pH < 6.1.
- Liming to above 7.2 is an accepted control measure but it does not eradicate the disease.
- A map was presented of the Surface pH of Alberta Soils (township average, 0-15 cm depth) A significant % of the soil in the traditional canola growing area in Alberta is acidic.
- A map was presented of the CLIMEX draft model (Turkington, AAFC, Lacombe).

#### What happened in 2004?

No clubroot was found in provincial canola disease survey (over 200 fields), or in 40 fields in Sturgeon county (Dr. Strelkov). Clubroot was found on volunteer canola and Chinese cabbage at CDC North, AAFRD in those areas with clubroot last year. No clubroot was found in a limited number of commercial cole crops surveyed (Dr. Howard).

The bioassay and root hair infection techniques for detection of clubroot were compared, and the bioassay works well but is slow, while the root hair test is too laborious and impractical. PCR-based tests hold the most promise and are being developed.

All four of the Alberta samples were classified as race 3 according to Williams' hosts, and as 16/15/12 according to the ECD differential set whereas a sample from Abbotsford BC was race 6 or ECD 16/2/12.

A clubroot advisory committee was formed in Alberta and met once. This group felt that enforcement under the Pest Act was not advisable at present, and that additional surveys are needed. Suspicious samples would be sent to Ralph Lange (canola and mustard) or Ron Howard (cole crops) for confirmation. For 2005, a more in depth survey will be funded by AARI and ACIDF (Dr. Strelkov, U of A).

Extension activities. Meetings were held and a color factsheet was developed. The Canola Mortality Diagnostic Flowchart (NO EMERGENCE ABOVE GROUND – 3 WEEKS AFTER SEEDING) was developed and presented. This flowchart was prepared in an easy-to-display poster format and is available from the CCC.

**11. Disease Reports continued.**

**11.b Resistance to Blackleg in *Brassica napus*. Presented by Roger Rimmer, AAFC, Saskatoon Research Centre, SK.**

An evolving pathogen – different pathogenicity groups were found in a survey of isolates in western Canada. Future changes in pathogen populations are to be expected

Blackleg on *Brassica napus*. Blackleg is primarily a monocyclic disease. Ascospores are released from pseudothecia on infected residue to infect leaves of seedlings. The initial inoculum consists of wind-borne ascospores released from pseudothecia which form on residues of infected canola plants. Ascospores initiate infection on young leaves of seedlings in the spring. The disease progresses in a latent infection from the leaf lesions into the stem and cankers may form at various stages of crop development. Stem cankers restrict water transport and nutrient flow resulting in premature ripening or with very susceptible cultivars, the crop may be destroyed. Infected plants (which may include symptomless latently infected plants) allow sexual reproduction on the resulting plant residues to continue the cycle in subsequent years.

Variability in the pathogen - How can we define variation for pathogenicity in *L. maculans*?

*Leptosphaeria maculans* exhibits a gene-for-gene interaction with *Brassica napus*. Specific resistance genes encode proteins which recognize directly or indirectly cognate avirulence gene products from the pathogen. This was first recognized by the definition of pathogenicity groups.

- Pathogenicity groups are based on cotyledon reaction of isolates to specific cultivars which are useful in distinguishing among isolates – called differential lines.
- Koch *et al.* 1991 and Mengistu *et al.*, 1991, in Paul Williams lab, first identified three cultivars which could distinguish between isolates of *L. maculans*. (Westar, Glacier and Quinta, used for identification)
- This system is now inadequate to characterize the race structure of *L. maculans*. Our goal at this time was to define major gene resistance lines which could be used as a model system to study the genetics of the host pathogen interaction. Interaction phenotypes on cotyledons of three differential lines defines pathogenicity groups
- Images were presented showing race specific seedling reactions to two isolates on differential lines of *B. napus* (Glacier, Quinta and Westar with PG2 and PG4 reaction). It is possible to characterize all isolates with this system. But is it useful?

Pathogenicity Groups of *L. maculans*

Host Differential		Pathogenicity Group			
		PG2	PG3	PGT	PG4
Westar	No <i>R</i> gene	+	+	+	+
Glacier	<i>Rlm2 Rlm3</i>	-	+	-	+
Quinta	<i>Rlm1 Rlm4</i>	-	-	+	+

Two differentials can only define 4 pathotypes. These systems have been useful in Canada and France. Analysis of these interactions using both host and pathogen genetics has resulted in defining seedling resistant genes in the differentials. Glacier and Quinta have two seedling resistant genes each so the system is still ambiguous. Development of single gene differentials will be extremely useful

Survey of *L. maculans* isolates in western Canada 1998 - 2000

PG	% of total isolates		
	1998	1999	2000
<b>PG1</b>	<b>48</b>	<b>18</b>	<b>28</b>
<b>PG2</b>	<b>41</b>	<b>42</b>	<b>39</b>
<b>PG3</b>	<b>0</b>	<b>1</b>	<b>0</b>
<b>PG4</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>PGT</b>	<b>11</b>	<b>38</b>	<b>33</b>
<b>Total isolates</b>	<b>80</b>	<b>71</b>	<b>111</b>

Keri, Kutcher & Rimmer unpublished

Note that fairly high numbers of PG1 – or non-aggressive isolates were identified based on virulence to Westar. PG2 isolates was still the predominant aggressive group. PGT isolates which have not been identified elsewhere but were almost as frequent as PG2 in 2000. PG3 was identified in a sample from Manitoba in 1999. Keri and Rimmer had previously identified a single PG3 isolate from Manitoba in 1995. Dilantha Fernando and Clinton Jurke have recently determined that PG3 isolates are prevalent in some locations in Manitoba. PG4 pathotypes will develop easily by sexual recombination in regions where PGT and PG3 isolates occur together. This will put further stress on the resistance of Canadian cultivars. Resistance to PG3 and PGT isolates has been identified and may already be in Canadian cultivars. The risk is that if PG3 becomes more prevalent nature crossing between PG3 and PGT will produce PG4 isolates. PG4 isolates should be expected to be found in the near future especially in areas where PG3 is occurring.

Known genes for blackleg resistance in *Brassica napus*

Source	Cultivar	R gene	Map
<i>B. napus</i>	Quinta, Scoop	<i>Rlm1</i>	N7
<i>B. napus</i>	Glacier	<i>Rlm2</i>	DY16
<i>B. napus</i>	Columbus, Doublol	<i>Rlm3</i>	N7
<i>B. napus</i>	Jet Neuf, Maluka +	<i>Rlm4</i>	N7
<i>B. napus</i>	French Accession	<i>Rlm7</i>	N7
<i>B. napus</i>	Darmor- <i>bzh</i>	<i>Rlm9</i>	N7
<i>B. juncea</i>	Aurea, Picra	<i>Rlm5</i>	B
<i>B. juncea</i>	Aurea, Picra	<i>Rlm6</i>	B
<i>B. rapa</i>	French Accession	<i>Rlm8</i>	?
<i>B. rapa sylvestris</i>	<i>B. napus</i> breeding line	<i>LepR1</i>	N2
<i>B. rapa sylvestris</i>	<i>B. napus</i> breeding line	<i>LepR2</i>	N10
<i>B. rapa sylvestris</i>	Surpass 400	<i>LepR3</i>	N10

Rlm1 is present in the differential Quinta. This is the major resistance gene effective against PG3 isolates and has protected French cultivars for most of the 1990s. Rlm1, Rlm2, Rlm3 and Rlm4 control resistance to PG2 PG3 and PGT isolates. Rlm4 seems to be the most commonly occurring R gene in Australian cultivars and is present in some Canadian cultivars (Quantum, Q2). LepR1, LepR2 and LepR3 are effective against PG2, PG3 and PG4 isolates but still race-specific. Nevertheless, some isolates of these groups are virulent on these genes. LepR3 resistance in Australia has broken down in some areas.

#### Developing differential single R gene lines in *Brassica napus*

Genes	Single R gene lines
<i>Rlm1</i>	Under construction
<i>Rlm2</i>	Under construction
<i>Rlm3</i>	Under construction
<i>Rlm4</i>	Available
<i>Rlm7</i>	-
<i>Rlm9</i>	-
<i>LepR1</i>	Available
<i>LepR2</i>	Available
<i>LepR3</i>	Available

Using 7 single R gene lines we can define 128 pathogenicity groups or races. 7 isolates with a single corresponding Avr gene can be used to define which, if any, R genes are present in any cultivar.

A slide was presented showing the Key pathotypes used to screen for *B. rapa* resistance

Differentials and the corresponding R gene: Westar (none), Glacier (Rlm2/Rlm3), Quinta (Rlm1/Rlm4), AD9 (LepR1), AD49 (LepR2), Surpass 400 (LepR3), Cresor (LmFr1), Maluka (Rlm4) and RB8762(?)

#### Blackleg resistance in Canadian canola cultivars *B. napus*

<u>Canola Type</u>	<u>Total</u>	<u>Resistant</u>
Conventional	142	47
Clearfield	17	7
Liberty Link	43	17
Navigator	9	0
<u>Round-Up Ready</u>	<u>92</u>	<u>51</u>
<u>Total</u>	<u>303</u>	<u>123</u>

Resistance in canola to isolates from western Canada:

Although we have a lot of R and MR registered cultivars, we don't know the basis of this resistance. Resistance is effective against PG2 isolates. Resistance is probably effective against PGT isolates. Some cultivars have *Rlm4*. The resistance genes in individual cultivars are not known. Resistance in some cultivars is breaking down. *Rlm1* is effective against PG3 isolates. Perhaps, race non specific resistance is present in some cultivars.

Evaluating blackleg resistance in Canadian canola cultivars:

- We should collaborate to develop a better understanding of the resistance in Canadian canola cultivars, identify the types of resistance in different cultivars and maintain a diversity of resistance genes in our cultivars and not rely on a single resistance gene to control black leg.
- Develop a more refined classification of pathotypes.
- Develop single resistance gene differentials to monitor virulence in the pathogen population.
- Define pathotypes based on virulence combination on defined single gene differentials.
- Define pathotypes at locations used for resistance evaluations.
- WCC/RRC needs to move in this direction or resistance classifications will become uninterpretable as pathogen populations become more variable.

Crop rotation is as essential as ever to proper disease control. Seed treatments can help restrict long distance spread of new pathogenic types.

*B. rapa subsp. sylvestris*: a major source of blackleg resistance A wild *B. rapa* was collected in Sicily and found to be resistant to *L. maculans* (Mithen *et al.* 1987). An amphidiploid *B. napus* line was re-synthesized from the *B. rapa* (AA) crossed with *B. oleracea* (CC) (Crouch *et al.* 1994). Advanta Inc. developed blackleg resistance canola breeding lines and cultivars using this re-synthesized *B. napus* as a resistant parent.

Identification of *LepR1* derived from *B. rapa subsp. sylvestris*

*LepR1*. The most resistant of *Brs* resistance genes in seedling tests. Resistance in DHP95 mapped (RFLP) on linkage group N2. Further genetic analysis with crosses with Westar showed that a single gene was responsible. The pathogen was restricted to the site of wounding and virtually no fungal tissue could be observed.

Identification of *LepR2* derived from *B. rapa subsp. sylvestris*

*LepR2*. Behaves as recessive gene to many isolates. Mapped (RFLP) on linkage group N10. Resistance in DHP95 was associated with N10 and further genetic analysis with crosses with Westar showed that a single gene was responsible. The pathogen was restricted to the site of wounding with limited fungal tissue observed but substantially more than with *LepR1*.

Identification of *LepR3* derived from *B. rapa subsp. sylvestris*

*LepR3*. Highly resistant to some isolates and partially resistant to most isolates. Mapped on linkage group N10 (microsatellites) *LepR3* is about 15 cM away from *LepR2*. Resistance in Surpass 400 was associated with N10 also and further genetic analysis with crosses with Westar showed that a single gene was responsible. Fine mapping of the N10 linkage group showed that *LepR2* and *LepR3* are about 20cM apart.

**11. Disease Reports continued.****11.c Fusarium Wilt and other diseases. Presented by Ralph Lange, Alberta Research Council, Vegreville, AB.**

2004 was the year of sclerotinia. There were several hotspots of blackleg disease (e.g. Lethbridge, and Stettler) and also increased reports of blackleg in Polish canola and in crops grown under short rotations. Fusarium wilt was observed in new areas, but overall less incidence than last year – probably due to moisture and temperature conditions of 2004. Fusarium wilt is very dependant on dry conditions, but will show up in less favourable environmental conditions if the disease pressure is high.

Symptoms of Fusarium Wilt include: poor seed set resulting in yield loss. Other typical symptoms to aid in diagnosis of Fusarium Wilt include: premature senescence, the siliques shatter easily. It causes yellowing, wilting, poor seed set, poor seed filling - a unilateral symptom. Also note vascular discolouration. There are no lesions, lodging or cankers. The disease was first noticed by farmers. Although it may have been present for years, it was identified in 1999 in east-central AB. and the Peace River region. The pathogens are: *Fusarium avenaceum* and *Fusarium oxysporum*.

- *Fusarium oxysporum* is a soil-inhabiting fungus with 300 *formae speciales* affecting hundreds of plant species. *Fusarium oxysporum* causes wilt diseases by plugging the plant's water-conducting tissues with mycelium. The plant also reacts to infection by producing gum in the vessels, further blocking the passage of water.
- *Fusarium avenaceum* probably over winters as mycelium in infested plant debris. Host range studies indicate that isolates that cause Fusarium wilt of canola can infect cereals, and may cause disease in those crops. *F. avenaceum* has long been known to cause root rots and seedling blights on canola.

Ralph's presentation also included assessment methods and the reaction of cultivars under field and controlled environment conditions. More details on the Fusarium Wilt presentation are available through Ralph Lange: [Ralph@arc.ab.ca](mailto:Ralph@arc.ab.ca)

**12 Update Canola Council Canada****12.a The CCC Canola Oil Promotion presented by Shelley Hiron, Program Manager, Canola Utilization Winnipeg, MB.**

A detailed discussion was given by Ms. Hiron, explaining the program co-ordinated by the CCC to promote canola to target audiences in the United States.

One of the major concepts for the promotion was "Influencing the Influencers". Examples of the "Influencers" would be the media (radio talk shows, magazines), health professionals (dietitians, cardiologists, nutritionists), and culinary experts (chefs as well as culinary schools). The Canola Council of Canada display was staffed at trade shows and annual meetings held throughout the U.S.A. Examples of such events were the Annual Meetings of the American Health Professionals, American Dieticians Association, American College of Cardiologists, International Association of Culinary Professionals (IACP) and the American Oil Chemists Society (AOCS). A target audience of (current and future) culinary chefs was reached through promotion of canola oil in magazines such as the Chef Educator, cooking demonstrations and traveling to various culinary schools and incorporating the use of canola into the lesson plans at the schools.

An additional program known as the Canola Camp was developed to bring professionals from the food media and other “Influencers” directly to Saskatchewan to experience a weekend with Canola. Weekend camps were held on Saskatchewan farms, educating the participants on canola production, processing and biotechnology. This has proven to be a very successful program and will most likely be continued.

To promote canola to the general public, the “Canola Truck” traveled across the U.S.A., conducting cooking demonstrations and interacting with consumers on a one-on-one basis as well as participating in radio media tours (RMP’s). The use of canola oil also appeared as cooking features in the family sections of major newspapers and very effective partnerships were established. One example of a very successful (media) partnership was realized with the consumer magazine, Cooking Light. Education of the value of canola to the writers, editors and publishers of this magazine resulted in this magazine replacing the term “vegetable oil” with “canola oil” in its publications!

In summary, the promotion campaign focused on educating a targeted audience who will in turn promote the use of canola as well as direct interaction with the consumer through the highly visible Canola Truck, cooking demonstrations, radio talk shows and coverage in the press. Based on levels of participation and feedback, this type of campaign was very successful in promoting canola in the U.S.A., which remains the major customer for Canadian canola.

## **12 Update Canola Council Canada continued.**

### **12.b Update on Research and Extension Activities 2004. Presented by Jim Bessel, Senior Agronomist and Project Leader, Northern Saskatchewan, Saskatoon, SK.**

The Canola Advantage program: The CCC activities for this program for 2004 included: publication of Canola Watch Weekly Crop Reports and agronomic Press Releases; media interviews; tours and crop walks; addressing grower questions (mostly through phone & email, but also on-farm calls) and case studies - enhanced fertility, sclerotinia control, straight cutting using BISO header, speed of seeding and seed integrity.

Canola Watch Survey Results. 22 weekly reports were prepared from Apr. 28 to Sept. 22, with over 1500 subscribers. The survey was conducted on-line using *surveymonkey.com*. The professions participating and the rate of participation in the survey include:

- Agronomist 42.7%
- Ag chem/seed co. rep 25.3%
- Producer 14.7%
- Dealer 16.0%
- Marketer 13.3%
- Media 2.7%
- Other 13.3%

- The participants were asked questions such as:
  1. “How useful did you find the weekly Canola Watch reports?”  
The responses were: “Very useful” 67.6%, “Somewhat useful” 31.1% and “Not useful” 1.4%.
  2. “What parts of the report were most useful to you?”
 

Time of swathing related to frost	74%
Frost assessment (fall)	72%
Crop progress	71%
Swathing/assessing SCC	68%
Frost (spring)	61%
Crop & field conditions	60%
Flea beetles	54%
Maturity considerations	53%
Sclerotinia	49%
Swathing tips	47%

Research Issues: Review of the CARP program (more direction, scientific publication, research workshop to determine direction, need a sound, clear priority list).

- There is a need for co-ordination and direction and research on practical solutions. In the area of applied versus basic research, an economic and risk analysis needs to be done for each research project – not necessarily by the researcher, but by an agronomist or economist.
- Regarding dissemination and archiving of results – there is a need for a research database of all projects (allocate dedicated resources, perhaps a graduate student?), need inter-provincial co-ordination to improve communication.
- Funding agencies could develop a list of all funding programs, including contacts and focus of program.
- Utilize independent on-farm research as a tool

#### Canola College 2005

Theme for the college would be canola fertility. Possible locations would be: Nisku, AB., Saskatoon, SK. and Brandon or Winnipeg for MB. Limit of 75 participants at each location.

#### Integrated Pest Management Project:

- Working with World Wildlife Fund (WWF) & Agri-Trend Agrology. The funding for the pilot project was approved. There is interest from federal and provincial governments under the Environmental Farm Plans and the Risk Reduction Program – AAFC/PMRA.

For more information, contact Jim Bessel or John Mayko, Agronomic Research Extension Manager, AB. or visit the CCC website: [www.canada-council.org](http://www.canada-council.org).

### 13. Closing Remarks

Acknowledgement of the sponsors. Tomorrow’s (Wednesday, 8, December, 2004) workshop, “The Application of Biotechnology in Canola Breeding”, will be held in the same room as today.

The next Canola Industry Meeting will be held on Wednesday, 30 November, 2005, in Saskatoon. There will most likely be a workshop on “Applying Genomics to Canola Improvement”, on the day following the Canola Industry Meeting - Thursday, 01. December 2005. The meeting was adjourned at 16:10 hours.