AAFC RESEARCH BRANCH
Research Project Final Report
Developing Innovative Agri-Products Program (Vote 10 Funding)

Project Title:	Activity B.1: Development of high oil canola varieties/genotypes packaged with superior traits and suitable for cultivation in Eastern Canada
Start Date (yyyy-mm-dd):	2010-04-01
Expected End Date (yyyy-mm-dd):	2013-03-31
Actual End Date (yyyy-mm-dd):	2013-03-31
Principal Investigator (PI):	Peter B.E. McVetty
Short Executive Summary of report:	

Canola production in Eastern Canada is limited to the use of cultivars developed specifically for Western Canadian growing regions. The objective of the ECODA B1 project was to identify *Brassica napus* strains adapted to Eastern Canada that can be utilized as the foundation for Eastern Canadian canola breeding programs. This research was conducted at six locations in 2011 and seven locations in 2012. Over this two-year period numerous *B. napus* strains were identified with high oil and high protein content, and low glucosinolate content that also had acceptable yield in comparison to the local hybrid check. These open pollinated population or DH line selections could be incorporated into one of several pollination control systems along with herbicide tolerance to develop herbicide tolerant canola hybrids specifically developed for Eastern Canadian production regions.

A. Research Progress and Accomplishments (to date in relation to expected milestones and deliverables / outputs)

- Include brief summary of:
  - Introduction, literature review, objectives, milestones and deliverables / outputs.
  - Approach / methodology (summary by objectives).
- Include results and discussion (overview by objectives and milestones), next steps and references.

Introduction

Over 20 million acres of canola were grown in 2012 in Western Canada. This industry contributes $15.4 billion to the Canadian economy annually. Cultivar development is a significant reason for the success of the canola industry in Canada; however, the vast majority of canola hybrids are developed for production in Western Canada currently. The development of canola breeding programs designed to produce canola strains adapted to production in Eastern Canada could greatly enhance canola production in Eastern Canada.

Objective

The main objective of the ECODA B1 project was to identify and develop high oil content open pollinated population or DH line canola strains adapted to Eastern Canadian growing conditions.

Output

The main output of the ECODA B1 project was the identification of high oil strains with acceptable agronomic performance for direct use as new canola cultivars suited for production in Eastern Canada or for use as parental germplasm in new canola breeding programs for Eastern Canada.

Methodology

2010 - Selection and Multiplication of Canola Strains: Ninety-three *Brassica napus* spring habit strains collected from several different countries and taken from the University of Manitoba accessions were selected and increased at the University of Manitoba in sufficient qualities to permit multi-location field evaluations for seed quality in 2011. Seventy-seven strains had sufficient seed for planting at all ECODA B1 trial 2011 locations while 16 strains had insufficient seed for planting at all ECODA B1 locations in 2011.

2011 - The 77 to 93 *B. napus* strains were planted at AAFC stations at Charlottetown, Normandin and Ottawa, at the University of Laval, at McGill University and at the University of Manitoba in 2011. Both Charlottetown and McGill University trials were lost, leaving four successful trials in 2011. Oil, protein, glucosinolate and erucic acid content were determined for the strains grown at each location and mean seed quality averaged over the four successful locations grown in 2011 was determined and reported in the 2011 annual progress report. Twenty-seven *B. napus* strains grown in 2011 were selected based on superior seed quality, for retesting in 2012.

2012 - Sixty-nine canola quality *B. napus* selections, 27 *B. napus* strains selected based on superior seed quality from 2011 and 42 new high oil content *B. napus* canola strains along with three checks, Polo, 45A65 and a local hybrid check were grown in ECODA B1 trials in 2012. There was sufficient seed of all entries available to permit three replicate nursery row trials or two replicate yield trials at all locations. Preliminary seed yield/seed quality field trials were planted at the AAFC research stations at Charlottetown, Normandin, Ottawa, Dalhousie University (Truro), the University of Laval (Quebec City), McGill University (Montreal) and the University of Manitoba in May 2012. All seven locations produced seed samples for seed quality analyses while the Charlottetown and Ottawa trials were not harvested for seed yield due to extreme drought conditions. Oil, protein, glucosinolate, saturate and erucic acid content were determined for the strains grown at each location and mean seed quality averaged over the seven successful locations grown in 2012 was determined and reported in the 2012 annual progress report. Preliminary seed yield results for five successful locations and mean seed yield averaged over the five successful locations was reported in the 2012 annual report.

Results

2011-2012 Combined Seed Quality Results

Oil, protein, glucosinolate, saturate and erucic acid content results for the 27 *B. napus* strains grown in 2011 and 2012, for each location in each year, for the 2011 mean, the 2012 mean and the mean over 2011 and 2012 are shown in tables 1 to 5. Seed quality for the local check is included in these tables for comparative purposes. A few of the 27 *B. napus* strains equaled or exceeded the local hybrid check for oil content, protein content and saturate content. Several of the 27 *B. napus* strains had lower glucosinolate and lower erucic acid content than the local hybrid check (tables 1 to 5). However, the superior performing *B. napus* strains in this research program were found in the new strains added to the ECODA B1 trials in 2012.

2012 *B. napus* Strain x Location Interaction Results

Analyses of variance for the 2012 ECODA B1 trials combined over locations was conducted for seed yield (for all 72 entries grown at five locations); oil, protein, and glucosinolate content for all 72 entries grown at seven locations in 2012 (tables 6 to 9). Differences among strains for yield, oil, protein and glucosinolate content were observed (tables 6 to 9). Strain x location interactions were observed for only yield and glucosinolate content (table 6 and table 9), while strain x location interactions were non-significant for oil and protein content in 2012 (table 7 and table 8). Oil content and protein content were stable over a wide range of Eastern Canadian locations in 2012, in spite of dramatic differences in weather among locations. This outcome bodes well for commercial canola production in Eastern Canada.

Conclusions

The ECODA B1 results for 2011-2012 indicate that tremendous improvement in oil content, protein content and glucosinolate content compared to the local check is possible. These seed quality improvements have been achieved in lines with reasonable seed yields compared to the local check. The stability of oil content and protein content for the canola stains tested in 2012 suggests that most of these strains are well adapted to production in Eastern Canada.

Many of these high oil content, high protein content, low glucosinolate content canola lines will make excellent parents in a canola breeding program for Eastern Canada designed to produce high oil content, high protein content, low glucosinolate content, high yield canola cultivars. The lines could be combined with herbicide tolerant canola lines in one of several pollination control systems to produce herbicide tolerant hybrid canola cultivars adapted to production in Eastern Canada. A successful hybrid canola breeding program could easily be built on the exceptional quality *B. napus* strains created in this ECODA B1 research program.

Table 1. Oil content (%) for ECODA B1 trials, 2011-2012

Entry	Name	2012 Charlottetown	2012 Dalhousie	2011 Laval	2012 Laval	2012 McGill	2011 Normandin	2012 Normandin	2011 Ottawa	2012 Ottawa	2011 Winnipeg	2012 Winnipeg	2011 Mean	2012 Mean	2 year Mean
1	UM NO 2051	45.9	45.9	41.0	44.4	44.2	42.8	43.0	47.5	44.1	50.4	44.0	45.4	44.5	44.8
2	UM NO 2217	46.2	43.0	45.0	45.1	41.9	45.2	42.8	42.5	45.0	46.5	43.0	44.8	43.9	44.2
3	UM NO 2257	44.8	45.7	43.0	44.6	43.4	46.5	45.3	46.3	44.6	51.8	45.7	46.9	44.9	45.6
4	UM NO 2359	42.9	43.2	41.9	43.1	42.0	42.2	41.9	44.3	43.7	48.8	43.1	44.3	42.8	43.4
5	UM NO 2361	45.2	43.6	42.4	45.0	41.7	42.8	42.0	47.7	42.7	49.7	42.8	45.6	43.3	44.1
6	UM NO 2363	44.8	44.0	45.1	45.2	41.7	44.4	42.7	44.2	44.0	50.0	44.5	45.9	43.8	44.6
7	UM NO 2385	42.9	42.2	43.4	44.8	42.2	42.6	41.9	42.4	43.3	48.9	44.2	44.3	43.1	43.5
8	UM NO 2388	40.3	43.4	42.9	44.5	40.6	40.4	41.5	49.8	43.3	47.5	45.1	45.1	42.7	43.6
9	UM NO 2407	44.5	44.6	42.2	45.7	43.3	41.4	41.4	43.8	44.0	49.9	44.6	44.3	44.0	44.1
10	UM NO 2419	44.1	43.9	46.3	44.9	42.6	43.7	42.8	49.1	46.1	47.7	44.7	46.7	44.2	45.1
11	UM NO 2427	45.8	42.2	43.3	44.6	40.4	41.3	41.6	45.7	43.0	46.8	43.6	44.3	43.0	43.5
12	UM NO 2428	44.5	43.8	43.4	43.9	42.5	42.7	42.9	45.7	43.0	47.9	43.7	44.9	43.5	44.0
13	UM NO 2430	44.5	43.7	43.8	45.5	41.9	42.0	42.1	44.3	44.7	49.3	43.3	44.9	43.7	44.1
14	UM NO 2434	46.0	43.4	45.4	45.4	42.2	42.4	42.2	46.0	45.1	47.6	43.6	45.3	44.0	44.5
15	UM NO 2440	43.5	43.2	45.7	46.0	41.4	41.5	41.9	46.5	43.3	48.4	43.5	45.5	43.2	44.1
16	UM NO 2443	46.5	43.1	46.1	45.4	41.9	40.5	41.9	44.8	44.0	49.0	43.4	45.1	43.7	44.2
17	UM NO 2444	45.2	43.7	47.0	44.4	42.0	40.9	41.2	44.6	42.9	49.6	43.9	45.5	43.3	44.1
18	UM NO 2446	43.1	43.8	45.3	45.1	42.4	40.9	40.9	46.0	44.4	49.3	44.7	45.4	43.5	44.2
19	UM NO 2447	44.8	43.3	44.7	45.1	42.7	40.1	40.9	43.4	44.8	50.1	43.9	44.6	43.6	44.0
20	UM NO 2530	45.1	45.0	47.3	45.6	43.6	42.9	42.6		45.5	49.7	44.3	46.6	44.5	45.2
21	UM NO 2194	44.6	44.6		45.0	43.6		42.5		43.0	49.3	44.8	49.3	44.0	44.7
22	UM NO 2405	47.9	47.0		48.5	45.8		46.4		46.9	47.0	46.6	47.0	47.0	47.0
24	UM NO 2408	44.5	45.1		46.3	44.8		43.4		46.5	45.6	45.2	45.6	45.1	45.2
25	UM NO 2431	45.6	42.9	44.8	45.0	43.1	41.7	40.8	46.7	44.9	47.8	43.8	45.2	43.7	44.3
26	UM NO 2432	45.4	42.2	44.5	45.0	42.2	41.4	41.4	45.9	45.0	49.9	43.7	45.4	43.6	44.2
27	UM NO 2433	44.4	43.2	45.3	45.5	43.0	42.9	42.1	43.8	44.7	48.2	43.6	45.1	43.8	44.2
72	Local Check	48.1	47.3	46.2	47.3	42.5	44.5	45.5	51.6	45.9	52.6	45.3	48.7	46.0	47.0

Table 2. Protein content (%) for ECODA B1 trials, 2011-2012

		2012	2012	2011	2012	2012	2011	2012	2011	2012	2011	2012	2011	2012	2 year
Entry	Name	Charlottetown	Dalhousie	Laval	Laval	McGill	Normandin	Normandin	Ottawa	Ottawa	Winnipeg	Winnipeg	Mean	Mean	Mean
1	UM NO 2051	39.8	43.9	47.2	42.3	46.0	47.8	46.2	45.4	47.5	38.7	47.1	44.8	44.7	44.7
2	UM NO 2217	41.9	46.8	44.5	45.0	48.9	48.3	47.6	50.3	47.2	43.9	46.9	46.8	46.3	46.5
3	UM NO 2257	40.5	45.8	44.7	43.5	47.7	47.1	46.2	45.1	46.9	35.5	45.3	43.1	45.1	44.4
4	UM NO 2359	39.5	43.8	43.6	43.7	46.1	46.2	45.0	45.0	43.8	38.5	45.9	43.3	44.0	43.7
5	UM NO 2361	40.8	45.0	43.6	43.0	47.6	46.0	44.0	42.4	47.0	37.7	46.7	42.4	44.9	44.0
6	UM NO 2363	42.3	44.6	42.5	43.6	47.2	45.7	44.9	43.0	47.1	36.8	44.8	42.0	44.9	43.9
7	UM NO 2385	39.1	43.8	45.1	43.9	47.2	49.5	45.1	46.8	47.2	39.6	46.4	45.3	44.7	44.9
8	UM NO 2388	39.0	43.6	44.0	41.9	47.3	48.8	45.0	38.0	46.5	39.4	44.2	42.5	43.9	43.4
9	UM NO 2407	39.1	42.8	45.5	43.4	46.7	47.2	46.0	44.6	46.7	36.7	44.8	43.5	44.2	44.0
10	UM NO 2419	39.0	42.1	43.0	42.8	47.8	47.6	43.2	41.4	43.3	42.0	45.8	43.5	43.4	43.4
11	UM NO 2427	40.1	42.9	41.9	42.4	47.9	46.7	44.5	41.6	45.3	36.7	44.3	41.7	43.9	43.1
12	UM NO 2428	39.5	43.1	44.9	42.8	45.5	45.7	45.3	41.1	46.1	36.4	44.9	42.0	43.9	43.2
13	UM NO 2430	40.5	42.1	42.4	41.8	46.1	45.1	44.4	41.1	43.0	36.6	44.3	41.3	43.2	42.5
14	UM NO 2434	39.0	43.5	41.7	42.6	47.1	46.3	45.6	42.0	44.3	38.7	46.1	42.2	44.0	43.3
15	UM NO 2440	39.5	44.1	39.7	40.6	47.2	47.5	43.5	42.9	46.5	38.6	46.0	42.2	43.9	43.3
16	UM NO 2443	39.2	44.6	41.0	41.2	47.2	46.4	43.8	44.8	44.0	36.4	46.1	42.1	43.7	43.2
17	UM NO 2444	39.9	43.1	40.2	42.4	45.6	47.1	46.2	43.3	45.7	37.6	45.1	42.0	44.0	43.3
18	UM NO 2446	39.9	42.4	39.0	41.2	47.0	47.2	46.6	43.1	42.7	36.6	44.4	41.5	43.5	42.7
19	UM NO 2447	39.3	43.7	41.0	41.2	45.9	47.3	44.3	48.2	44.9	37.2	45.0	43.4	43.5	43.4
20	UM NO 2530	41.0	44.6	44.2	43.4	47.5	49.7	45.7		44.0	36.1	47.1	43.3	44.8	44.3
21	UM NO 2194	42.4	46.8		45.1	47.7		48.5		48.8	40.6	47.9	40.6	46.7	46.0
22	UM NO 2405	41.2	45.2		44.9	47.9		47.7		47.7	45.9	48.6	45.9	46.2	46.1
24	UM NO 2408	40.7	44.5		43.0	45.4		46.5		43.8	44.9	47.3	44.9	44.5	44.5
25	UM NO 2431	39.3	43.3	42.1	43.0	44.5	45.2	43.5	42.5	47.5	37.0	45.4	41.7	43.8	43.0
26	UM NO 2432	39.5	43.3	43.3	42.2	46.2	46.0	45.0	42.0	43.0	36.2	46.2	41.9	43.6	43.0
27	UM NO 2433	40.0	43.6	42.9	43.4	46.8	46.3	44.2	43.3	44.9	38.2	45.8	42.7	44.1	43.6
72	Local Check	41.0	43.1	43.9	44.8	49.6	48.4	43.9	39.7	44.8	39.0	48.0	42.7	45.0	44.2

Table 3. Glucosinolate content (µmol/g) % for ECODA B1 trials, 2011-2012

		2012	2012	2011	2012	2012	2011	2012	2011	2012	2011	2012	2011	2012	2 year
Entry	Name	Charlottetown	Dalhousie	Laval	Laval	McGill	Normandin	Normandin	Ottawa	Ottawa	Winnipeg	Winnipeg	Mean	Mean	Mean
1	UMNO 2051	8.2	8.7	33.8	23.9	23.1	33.3	13.6	15.5	21.4	33.9	32.9	29.1	18.8	22.6
2	UMNO 2217	8.2	24.3	21.8	23.5	33.7	23.0	24.8	11.8	29.1	19.8	33.8	19.1	25.3	23.1
3	UMNO 2257	7.0	19.0	22.6	26.9	28.1	20.2	18.6	8.6	20.9	24.0	27.7	18.8	21.2	20.3
4	UMNO 2359	10.1	17.9	29.6	31.5	27.8	27.3	19.5	14.5	28.5	24.6	31.8	24.0	23.9	23.9
5	UMNO 2361	9.3	16.2	31.2	23.1	26.6	27.3	15.4	16.4	26.8	18.5	32.1	23.4	21.4	22.1
6	UMNO 2363	11.2	16.2	29.1	29.0	30.6	24.5	15.4	33.2	27.2	21.0	31.4	26.9	23.0	24.4
7	UMNO 2385	10.1	10.8	20.6	20.9	22.6	28.3	14.9	8.2	17.1	13.9	23.8	17.7	17.2	17.4
8	UMNO 2388	9.0	9.2	24.3	17.6	13.2	24.4	17.3	6.7	15.0	15.8	17.1	17.8	14.0	15.4
9	UMNO 2407	7.6	9.9	27.2	14.3	20.6	25.3	18.8	13.9	18.8	11.7	19.5	19.5	15.6	17.0
10	UMNO 2419	9.0	7.3	23.1	23.2	22.6	23.5	13.8	12.5	21.1	17.2	22.5	19.1	17.1	17.8
11	UMNO 2427	10.4	13.9	20.9	34.5	30.2	31.9	19.3	14.3	25.0	22.5	33.5	22.4	23.8	23.3
12	UMNO 2428	10.2	16.0	27.7	32.4	24.5	26.3	22.3	21.9	27.9	23.8	31.2	24.9	23.5	24.0
13	UMNO 2430	12.3	13.5	20.4	24.8	28.8	25.9	18.2	24.7	28.2	29.5	31.2	25.1	22.4	23.4
14	UMNO 2434	7.8	11.6	26.8	22.7	21.5	25.7	17.6	13.3	24.6	21.1	26.2	21.7	18.9	19.9
15	UMNO 2440	10.9	12.1	19.5	21.2	23.2	28.7	16.8	16.3	20.9	19.4	27.8	20.9	19.0	19.7
16	UMNO 2443	11.8	17.9	22.9	23.7	28.5	27.9	12.8	10.8	25.2	21.5	28.3	20.8	21.2	21.0
17	UMNO 2444	9.3	9.8	21.0	26.8	24.5	30.4	19.7	20.2	28.0	17.3	26.0	22.2	20.6	21.2
18	UMNO 2446	8.4	7.5	17.3	19.2	15.4	29.1	15.9	13.2	16.6	14.7	16.6	18.6	14.2	15.8
19	UMNO 2447	8.3	11.9	15.9	22.9	21.2	21.3	16.2	16.1	15.2	12.2	27.4	16.4	17.6	17.1
20	UMNO 2530	7.7	13.7	25.6	27.1	18.5	24.7	11.3		17.7	17.4	26.1	22.5	17.4	19.0
21	UMNO 2194	8.1	6.8		21.2	17.0		12.7		12.5	20.3	19.1	20.3	13.9	14.7
22	UMNO 2405	2.2	4.9		11.4	8.4		9.1		9.1	17.6	12.5	17.6	8.2	9.4
24	UMNO 2408	5.3	6.5		14.7	10.5		15.6		13.0	25.1	17.1	25.1	11.8	13.5
25	UMNO 2431	8.6	15.2	22.0	27.8	24.6	26.5	14.8	11.8	18.9	25.6	30.4	21.5	20.0	20.6
26	UMNO 2432	10.9	11.6	24.3	25.0	21.3	25.7	15.4	19.5	22.7	19.9	24.5	22.3	18.8	20.1
27	UMNO 2433	9.0	12.4	24.5	19.2	21.5	28.7	15.0	17.8	22.0	20.3	24.9	22.8	17.7	19.6
72	Local Check	3.5	6.1	17.4	10.8	14.9	14.2	9.8	9.8	10.8	13.5	14.1	13.7	10.0	11.4

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Table 4. Saturate content (%) for ECODA B1 trials, 2011-2012

		2012	2012	2011	2012	2012	2011	2012	2011	2012	2011	2012	2011	2012	2 year
Entry	Name	Charlottetown	Dalhousie	Laval	Laval	McGill	Normandin	Normandin	Ottawa	Ottawa	Winnipeg	Winnipeg	Mean	Mean	Mean
1	UMNO 2051	7.0	6.2	6.5	6.8	6.6	6.1	6.4	6.5	6.8	6.2	6.9	6.3	6.7	6.5
2	UMNO 2217	7.0	6.2	6.2	6.5	6.0	6.0	6.6	6.4	6.4	6.1	6.9	6.2	6.5	6.4
3	UMNO 2257	7.0	6.4	6.3	6.5	6.2	6.0	6.2	6.4	6.9	6.2	6.7	6.2	6.6	6.4
4	UMNO 2359	7.3	6.4	6.7	6.5	6.6	6.4	7.0	6.8	6.7	6.5	7.2	6.6	6.8	6.7
5	UMNO 2361	7.0	6.7	6.8	6.6	6.7	6.5	7.1	6.5	6.8	6.6	7.0	6.6	6.8	6.8
6	UMNO 2363	6.8	6.8	6.4	6.5	6.7	6.1	6.7	6.1	6.5	6.4	6.9	6.3	6.7	6.5
7	UMNO 2385	6.9	6.4	6.6	6.3	6.5	5.9	6.5	6.7	6.7	6.5	6.8	6.4	6.6	6.5
8	UMNO 2388	7.3	6.6	6.6	6.5	6.6	6.5	6.6	7.5	7.2	6.6	6.9	6.8	6.8	6.8
9	UMNO 2407	7.0	6.8	6.3	6.7	6.7	6.0	6.6	6.2	6.5	6.4	6.7	6.2	6.7	6.5
10	UMNO 2419	6.6	6.9	6.4	6.5	6.5	6.1	6.8	6.1	6.5	6.5	6.8	6.3	6.7	6.5
11	UMNO 2427	6.7	6.7	6.8	6.6	6.2	6.6	6.9	6.7	6.5	6.5	6.8	6.6	6.6	6.6
12	UMNO 2428	6.9	6.3	6.7	6.4	6.5	6.7	7.0	6.4	6.8	6.6	7.0	6.6	6.7	6.7
13	UMNO 2430	6.7	6.5	6.7	6.5	6.5	6.6	7.1	6.7	6.7	6.6	7.1	6.7	6.7	6.7
14	UMNO 2434	6.8	6.7	7.0	6.7	6.5	6.7	7.1	6.5	6.6	6.4	7.0	6.6	6.8	6.7
15	UMNO 2440	7.0	6.5	6.8	6.3	6.6	6.5	6.7	6.8	6.5	6.3	7.0	6.6	6.7	6.6
16	UMNO 2443	6.7	6.6	6.7	6.2	6.3	6.3	6.5	6.4	6.3	6.2	6.8	6.4	6.5	6.4
17	UMNO 2444	6.8	6.3	6.6	6.2	6.6	6.4	6.6	6.3	6.5	6.2	6.8	6.4	6.5	6.5
18	UMNO 2446	7.0	6.8	6.9	6.5	6.8	6.7	6.9	6.5	7.0	6.6	7.0	6.7	6.8	6.8
19	UMNO 2447	7.2	6.5	6.9	6.7	6.4	6.6	7.1	6.4	6.6	6.5	6.9	6.6	6.8	6.7
20	UMNO 2530	6.8	6.2	6.1	6.3	6.3	5.9	6.3		6.6	6.1	6.5	6.0	6.4	6.3
21	UMNO 2194	6.3	6.1		6.2	6.1		6.5		6.6	6.2	6.5	6.2	6.3	6.3
22	UMNO 2405	6.7	6.3		6.3	6.4		6.4		6.6	6.4	6.7	6.4	6.5	6.5
24	UMNO 2408	6.9	6.4		6.3	6.6		6.7	6.6	6.9	6.4	6.9	6.5	6.7	6.6
25	UMNO 2431	6.8	6.6	6.6	6.4	6.4	6.7	7.0	6.3	6.2	6.5	6.7	6.5	6.6	6.6
26	UMNO 2432	6.8	6.8	6.9	6.5	6.8	6.9	7.5	6.5	6.5	6.4	6.8	6.7	6.8	6.8
27	UMNO 2433	6.7	6.9	6.9	6.6	6.6	6.9	7.2	6.4	6.6	6.5	6.9	6.7	6.8	6.7
72	Local Check	6.5	6.2	6.2	6.4	6.1	5.5	6.2	6.1	6.3	6.1	6.4	6.0	6.3	6.2

Table 5. Erucic acid content (%) for ECODA B1 trials, 2011-2012

		2012	2012	2011	2012	2012	2011	2012	2011	2012	2011	2012	2011	2012	2 year
Entry	Name	Charlottetown	Dalhousie	Laval	Laval	McGill	Normandin	Normandin	Ottawa	Ottawa	Winnipeg	Winnipeg	Mean	Mean	Mean
1	UMNO 2051	3.3	1.5	1.5	2.1	1.6	1.2	2.9	2.1	3.1	1.1	0.3	1.5	2.1	1.9
2	UMNO 2217	4.5	8.0	7.2	4.3	10.0	7.7	3.5	6.1	5.3	6.9	6.6	7.0	6.0	6.4
3	UMNO 2257	1.8	1.8	4.5	1.9	3.3	1.3	1.6	9.7	0.0	2.1	3.1	4.4	1.9	2.8
4	UMNO 2359	1.0	2.2	1.5	0.5	0.8	2.5	0.2	1.2	0.2	0.6	1.1	1.4	0.9	1.1
5	UMNO 2361	0.8	0.0	1.7	0.1	0.3	1.1	0.4	0.3	0.0	0.7	0.6	0.9	0.3	0.5
6	UMNO 2363	0.6	0.0	0.9	1.4	0.0	0.5	2.3	0.6	1.0	0.6	1.2	0.6	0.9	0.8
7	UMNO 2385	4.3	4.6	2.7	4.3	5.2	2.8	6.3	2.0	4.5	0.5	1.5	2.0	4.4	3.5
8	UMNO 2388	0.7	1.9	1.4	0.4	2.6	0.9	3.9	0.4	0.0	0.4	1.7	0.8	1.6	1.3
9	UMNO 2407	0.6	0.4	0.5	0.4	0.9	0.5	0.9	1.4	1.1	0.7	0.8	0.8	0.7	0.7
10	UMNO 2419	0.4	0.2	0.7	0.5	0.3	0.3	0.5	0.0	1.4	1.2	0.6	0.6	0.6	0.6
11	UMNO 2427	0.2	1.0	0.0	0.3	1.7	0.6	2.5	0.0	1.7	0.2	0.7	0.2	1.2	0.8
12	UMNO 2428	1.4	1.6	0.0	0.9	1.5	0.7	0.2	0.1	0.0	0.1	0.2	0.3	0.8	0.6
13	UMNO 2430	1.4	1.5	0.2	2.1	2.1	2.3	1.2	0.0	0.7	0.0	1.4	0.6	1.5	1.2
14	UMNO 2434	0.9	2.1	0.3	0.9	0.5	1.9	0.7	0.7	0.0	0.0	1.9	0.7	1.0	0.9
15	UMNO 2440	0.2	0.3	0.0	0.1	0.0	0.0	0.1	0.7	0.1	0.1	0.1	0.2	0.1	0.2
16	UMNO 2443	1.3	0.2	1.4	0.9	1.0	1.5	3.0	0.8	0.8	0.2	0.4	1.0	1.1	1.0
17	UMNO 2444	0.3	0.2	0.5	0.9	0.3	0.3	1.1	0.0	0.0	0.4	0.4	0.3	0.5	0.4
18	UMNO 2446	0.1	0.0	1.0	0.6	0.1	0.7	0.3	0.0	0.0	0.0	0.4	0.4	0.2	0.3
19	UMNO 2447	0.1	0.0	0.4	0.1	0.0	0.0	0.2	0.0	0.0	0.1	0.2	0.1	0.1	0.1
20	UMNO 2530	2.1	1.9	6.3	1.3	0.7	2.3	1.8		1.2	8.4	1.6	5.7	1.5	2.8
21	UMNO 2194	0.5	2.1		3.2	0.7		1.5		2.6	1.4	1.4	1.4	1.7	1.7
22	UMNO 2405	0.2	0.4		0.2	0.4		0.4		0.0	0.0	0.0	0.0	0.2	0.2
24	UMNO 2408	0.8	1.6		1.3	0.0		1.6	1.8	0.0	0.0	0.5	0.9	0.8	0.8
25	UMNO 2431	0.3	0.3	0.3	0.5	1.5	1.3	1.4	0.8	0.0	0.3	1.3	0.7	0.8	0.7
26	UMNO 2432	0.2	0.0	0.0	0.5	3.0	0.3	0.9	0.7	0.8	0.1	0.7	0.3	0.9	0.6
27	UMNO 2433	0.7	0.3	0.6	2.4	2.7	1.3	0.9	3.3	1.3	0.0	1.3	1.3	1.4	1.3
72	Local Check	0.0	0.0	0.6	0.1	0.3	27.2	0.0	0.4	0.0	1.0	0.2	7.3	0.1	2.7

Analysis of variance for 2012 ECODA B1 trials, combined locations

Table 6.
Dependent variable: Yield kg/ha

Source	df	SS	MS	F-value	Pr> F
Total	1007	1021643399.5			
LOC	4	624070739.0	156017684.8	527.64	0.0000
BLOC in LOC	8	17762605.0	2220325.6	7.51	0.0000
ENTRY	71	76428858.3	1076462.8	3.64	0.0000
ENTRY by LOC	284	114140417.5	401902.9	1.36	0.0009
Residual	640	189240779.713	295688.718		

Grand mean = 2210.941 R-squared = 0.8148 C.V. = 24.59%
LSD for ENTRY = 263.6652 S.E.D. = 205.5268 Heritability = 0.566
t (1-sided a=0.100, 640 df) = 1.2829 MSE = 295688.71830

Table 7.
Dependent variable: Oil Content %

Source	df	SS	MS	F-value	Pr> F
Total	1223	7481.896			
LOC	6	594.219	99.037	54.79	0.0000
BLOC in LOC	6	126.644	21.107	11.68	0.0000
ENTRY	71	4668.520	65.754	36.37	0.0000
ENTRY by LOC	426	801.809	1.882	1.04	0.3177
Residual	714	1290.705	1.808		

Grand mean = 46.097 R-squared = 0.8275 C.V. = 2.92%
LSD for ENTRY = 0.5916 S.E.D. = 0.4612 Heritability = 0.604
t (1-sided a=0.100, 714 df) = 1.2827 MSE = 1.80771

Table 8.
Dependent variable: Protein Content %

Source	df	SS	MS	F-value	Pr> F
Total	1223	12048.833			
LOC	6	5506.474	917.746	372.54	0.0000
BLOC in LOC	6	477.240	79.540	32.29	0.0000
ENTRY	71	3180.312	44.793	18.18	0.0000
ENTRY by LOC	426	1125.902	2.643	1.07	0.2056
Residual	714	1758.905	2.463		

Grand mean = 45.874 R-squared = 0.8540 C.V. = 3.42%
LSD for ENTRY = 0.6906 S.E.D. = 0.5383 Heritability = 0.817
t (1-sided a=0.100, 714 df) = 1.2827 MSE = 2.46345

Table 9.
Dependent variable: Glucosinolate content µmol/g

Source	df	SS	MS	F-value	Pr> F
Total	1223	92324.164			
LOC	6	18052.214	3008.702	236.85	0.0000
BLOC in LOC	6	866.634	144.439	11.37	0.0000
ENTRY	71	55589.403	782.949	61.63	0.0000
ENTRY by LOC	426	8745.842	20.530	1.62	0.0000
Residual	714	9070.072	12.703		

Grand mean = 11.153 R-squared = 0.9018 C.V. = 31.96%
LSD for ENTRY = 1.5681 S.E.D. = 1.2225 Heritability = 0.597
t (1-sided a=0.100, 714 df) = 1.2827 MSE = 12.70318

AAFC RESEARCH BRANCH
Research Project Final Report

B (I). Funded Collaborators (Co-PI, AAFC, other federal scientists) • Include the name of scientist / organization.
• Richard Martin (2011) and Aaron Mills (2012), AAFC, Charlottetown • Denis Pageau, AAFC, Normandin • Baoluo Ma, AAFC, Ottawa • Claude Caldwell and Doug MacDonald, Dalhousie University • Anne Vanesse and Marie-Eve Bernard, University of Laval • Jaswinder Singh and Don Smith, McGill University • Muhammed Tahir (2010/11) and Peter B.E. McVetty (2012), University of Manitoba

B (II). Acknowledgement of non-funded collaborators (who provide support, e.g. access to other laboratory or other facilities and equipment input / advice / guidance / assistance, etc). • For research supported by targeted funding programs (e.g. DIAP, Clusters, etc.) please list any collaborators who are receiving Contribution Vote 10 funds (e.g., university and industry collaborators). In addition, please list separately the participants who support your project but are not receiving any funding through the program. • Include name of scientist / organization.
None

C. Variance Report (if applicable, describe how the work differs from the proposed research) • Include changes to objectives and project work plan / budget, changes to the team, other constraints.
• No changes to the objectives or project work plan. • No changes to the budget. • Changes have occurred to the team with Dr. Peter B.E. McVetty replacing Dr. Muhammad Tahir as the PI on January 1, 2012. • Major constraints included limited seed supply and adverse environmental conditions in 2011 and 2012.

D. Impact Assessment (if applicable, describe how the variance factors above will impact project continuation) • Include changes to the objectives, changes to the project work plan / budget, changes to performance (i.e. meeting targets).
• The variance factors did not impact the objectives or work plan. • The change in PI from Dr. Tahir to Dr. McVetty resulted in some funding being lapsed. • Changes of the PI did not impact the quality of the project. • Seed supply limited the number of locations that could be evaluated in 2011 and 2012 and two trials were lost in 2011 as well as in 2012 due to extreme environmental conditions.

AAFC RESEARCH BRANCH
Research Project Final Report

E. Achievements (include only those related to this project) • Include innovations, publications / conferences, technology transfer, capacity building, success stories, media, recognition and other outputs.
Achievements resulting from this project include: • Training of highly qualified personnel. • Identification of *B. napus* strains with high oil content, high protein content and low glucosinolate content along with acceptable agronomic characteristics. • A successful hybrid canola breeding program could be developed on the quality *B. napus* strains created in this ECODA B1 research project.

F. Lessons learned (self-evaluation of project)
Lessons learned: • Tremendous improvement in oil content, protein content, and glucosinolate content in canola strains adapted to Eastern Canada is possible utilizing current University of Manitoba germplasm. • It would be possible to develop herbicide tolerant canola and herbicide tolerant hybrid canola cultivars adapted to Eastern Canadian growing conditions at the University of Manitoba provided that there were sufficient collaborative testing sites throughout Eastern Canada for evaluation of the newly developed canola strains.

Peter B. E. McVetty	05/29/2013	Peter B E McVetty
PI Name	**Date**	**Signature**

Note: After completion and signature, this report must be provided to the appropriate Science Director for assessment. A PDF copy of this report will be sent to Science Operations by the Science Director's office along with the project assessment.