UNIVERSITY OF MINNESOTA

Twin Cities Campus

Agronomy and Plant Genetics
College of Food, Agricultural and Natural Resource Sciences

411 Borlaug Hall
1991 Upper Buford Circle
St. Paul, MN 55108-6026
Office: 612-625-7773
Fax: 612-625-1268
E-mail: agro@umn.edu
http://agronomy.cfans.umn.edu/

March 16, 2009

Ms. Ona Vig
Agricultural Administration
North Dakota State University
Morrill Hall 315E
Fargo, North Dakota 58105

Dear Ms. Vig:

It is my intent to enter into a sub-contractual agreement with North Dakota State University regarding the USDA North Central Region Canola Research proposal, "The Minnesota Canola Production Centre and Canola Research" from 09/15/2009 through 09/14/2010. The subcontract budget for the University of Minnesota will be $33,174 for the one-year period.

Sincerely,

Paul M. Porter, Ph.D.
Principal Investigator
Professor

Nancy J. Ehlke, Ph.D.
Professor and Head
Department of Agronomy
and Plant Genetics

Edward F. Wink
Acting Associate Director
Sponsored Projects Administration
University of Minnesota

North Central Region Canola Research
FY 2009 Proposal

Project Title:

The Minnesota Canola Production Centre & Canola Research

(Variety and Systems Comparison Trial, Nitrogen Application and Timing Trial,
Winter Wheat following Canola Trial, Canola Impact Crop Rotation Trial,
Winter Canola Variety Evaluation and Over-wintering Trial,
Pre-harvest Desiccants and Straight Harvesting Trial,)

Principal Investigator:

Dr. Paul Porter
Department of Agronomy and Plant Genetics
411 Borlaug Hall
1991 St. Paul, MN 55108
612-625-6719
Fax: 612-625-1268
pporter@umn.edu

Amount Requested:

$ 33,174

Grants Manager
Sponsored Projects Administration
University of Minnesota
Edward F. Wink
Acting Associate Director

3/17/09
Date

History:

The Minnesota Canola Production Centre has been a public-private partnership between the Minnesota Canola Council and the University of Minnesota since 1998. The Canola Council of Canada initiated Canola Production Centres to address the ongoing need for canola production technology transfer. The Canola Production Centre is a joint effort between producer groups, industry representatives, and government and extension personnel. Field scale agronomic trials utilizing commercial farm equipment are conducted at the Centre, and the information generated is utilized for extension activities throughout the year.

Part 1: Variety and Systems Comparison Trial

Objectives:

To establish agronomic and economical criteria (such as yield, contribution margin, crop quality, lodging resistance, harvestability, and disease resistance) for choosing among canola (*Brassica napus L.*) varieties and their respective herbicide options.

Procedures:

This study will be located at the Canola Production Centre, which in 2009 will most likely be located on the Brian and Sheldon Rice farm near Roseau, MN. Varieties for the Variety and Systems Comparison Trial are submitted for testing by the canola seed industry. An invitation is sent to all the area seed dealers in March with final confirmations made by April 1. The seed is treated with the strongest commercially available seed treatment for each variety, either Helix Xtra or Prosper 400. Varieties are seeded with a 10-foot 9350 JD double-disk press drill at seed company recommended seeding rates. Plots are 400 feet long by 30 feet wide. The trial is laid out in a modified RCB design with four replicates. The Roundup Ready varieties are grouped together to help avoid drift problems between the different systems. The other herbicide systems are also grouped together. All varieties receive the same tillage, fertilizer and post-emergent fungicide treatments. All the herbicide tolerant varieties are sprayed with their respective herbicides at the recommended rates for the weed spectrum in the field. Herbicide spraying is done with a 30 foot open boom sprayer on a calm day. If conditions are conducive for sclerotinia, all varieties are sprayed with a fungicide such as Ronilan at 20 to 50% bloom to reduce the risk of yield loss due to this disease. Each plot is swathed individually when seed color change in that plot reaches 30 to 40 % on the main stem and threshing is completed when suitable conditions exist. Swathing is done with an 18 foot Versatile 400 swather with side cutter bar and the plots are threshed with a commercial combine rented from a grower or local dealership. Yields are measured with a weigh wagon and 5 lb samples taken for dockage and quality testing.

Data collection during the season includes; canopy closure, beginning and end bloom dates, height, lodging, maturity date, swathing harvestability, and combining harvestability. After harvest, seed quality is measured by evaluating for damaged seed, green seed count, and oil and protein content. Contribution margins are calculated using the value of the crop at harvest minus variable costs (seed, fertilizer, herbicides, fungicides, insecticides, fuel, lube and machinery repair, check-off, and interest/opportunity costs).

All data, except the contribution margins, will be analyzed using SAS. The data will be compiled and published in a report that is made available to growers during winter meetings.

Justification:

Many canola growers prefer to see how varieties perform and compare in "field scale" plots rather than small plots. When appropriately designed, field scale plots take into account more field variability in the yield equation by including high ground and ditches. Small plots are typically located in an area of the field where the soil is uniform and well drained to reduce variability among treatments. The large plots allow each variety to be treated with its' respective herbicide so that the varieties are treated like they would be in the grower's field. Many growers select varieties based on not only yield and disease resistance, but also on ease of harvest. Comparing harvestability of varieties is not possible in small plots because the equipment is not comparable to what a grower uses.

The Canola Production Centre provides a focal point for canola producers to come to a summer field day and look at the plots. They will hear from industry representatives as well as from University of Minnesota and North Dakota State University extension personnel about important current topics such as insect and disease concerns on canola and other crops.

Literature Review:

The Variety and Systems Comparison Trial has been conducted on the Canola Production Centres across Canada since 1997 and in Minnesota since 1999. Results have been published in each year's copy of the Canola Production Centre annual report. One exception occurred in 2006 when the trials at the Canola Production Centre failed due to lack of timely rainfall resulting in a variable and ultimately unacceptable plant stand. Other systems comparison work has been done in company strip trials which are also large plot. To our knowledge, no one else but the above mentioned has done the same kind of systems and variety comparison like we have conducted in the past and propose to conduct in 2009.

Current Work:

In 2008, the Variety and Systems Comparison Trial at the Minnesota Canola Production Centre near Wannaska included fourteen varieties. Of these, twelve varieties were Roundup Ready and two were Liberty Link. Included in the 2008 small plot trials were thirty-five varieties of Roundup Ready and Conventional varieties. Additional research included straight harvesting, no-till planting, evaluation of plant-health products, and additional screening of germplasm for shattering resistance.

Part 2: Nitrogen Application and Timing Trial

Objectives:

1. Evaluate canola response to multiple rates of nitrogen (N) applied pre-plant or at the 4- to 6-leaf stage of growth using field-scale equipment.
2. Evaluate the effectiveness of top dressing urea N (46-0-0) compared to Ammonium Nitrate (34-0-0).
3. Evaluate the effectiveness of ESN (controlled release) product when compared with conventional nitrogen.

Procedures:

This study will be located at the Canola Production Centre near Wannaska, MN. In fall of 2008 soil samples were taken at 0 to 6" and at 0 to 24" depths in order to identify a location with relatively low residual soil nitrogen. The trial area was sampled for phosphorous, potassium, and sulfur, and fertilized accordingly to its needs. All treatments will have approximately 50 lb/ac seed placed MAP (6-26-0). The canola variety Pioneer 45H21 will be seeded at a rate of 5 lb/ac. The field layout will consist of a randomized complete block (RCB) design with four replicates. Plots will be field scale (30 ft by 400 ft) and managed and harvested with field scale equipment.

Nitrogen treatments will consist of a set of pre-plant and top dress application rates of dry urea (46-0-0) and dry ammonium nitrate (34-0-0) fertilizer. ESN treatments will consist of a fall applied and spring applied treatment. All top dress applications will be applied at the 4- to 6-leaf stage or as close to that stage as possible. The no N check and pre-plant N application treatments will allow for meaningful treatment yield comparisons. Top dress applications will be applied prior to a rainfall event if possible. Urea requires approximately 0.30 inches of rain within 2 to 4 days after application for proper incorporation and the reduction of volatilization.

Rates of pre-plant (PPI) and post emergence N applications

Trt	PPI	4 to 6 leaf stage	N source	Targeted total N
	-Applied lbs N/ac -			lb/ac
1.	0	0	no additional N applied	45
2.	30	0	(46-0-0)	75
3.	60	0	(46-0-0)	105
4.	90	0	(46-0-0)	135
5.	0	30	(46-0-0)	75
6.	0	60	(46-0-0)	105
7.	0	90	(46-0-0)	135
8.	0	60	(34-0-0)	105
9.	30	0	(ESN) (Fall)	75
10.	60	0	(ESN) (Fall)	105
11.	90	0	(ESN) (Fall)	135
12.	30	0	(ESN) (Spring)	75
13.	60	0	(ESN) (Spring)	105
14.	90	0	(ESN) (Spring)	135

Canola growth stage data will be collected at canopy, begin bloom, end bloom and maturity. Plant height, lodging, sclerotinia infection ratings, seed yield, oil content, contribution margins, and weather data will also be collected. Abnormal growing conditions and pest occurrence will be monitored and managed if possible. The results will be statistically analyzed using SAS, and the data will be made available to the public and private sectors through a variety of oral and written presentations (SAS, 1999).

This study is a good example of what the Canola Production Centres were designed for: taking the best treatments from small plot research and putting them into large production scale plots that are more closely related to the grower's experiences.

Justification:

The cost and high use of Nitrogen (N) by canola has been a major limit in the production of canola in North America. Research has indicated that N accumulation in canola increases from about 20 lb/ac to 100 lb/ac in a 30 day period beginning twenty days after emergence, with the most N accumulation (about 110 lb/ac) occurring 55 days after emergence (Thomas, 2000). Rainfall during this period of rapid nitrogen accumulation could leach soil N beyond the canola-rooting zone. A top dress application of N, with a little or no N applied preplant and the remainder applied at 4- to 6- leaf stage, could be more efficiently utilized by the plants, which could result in less N needing to be applied. A split application of N would provide growers an additional month to evaluate their canola crop prior to purchasing and applying the additional N. ESN has been shown to prevent nitrogen loss during the growing season, optimizing nitrogen use by growing canola. This product may be able to decrease the total nitrogen applied to grow a canola crop when compared to traditional nitrogen sources.

Literature Review:

Canola requires high levels of N and usually shows increased yields with an N fertilizer application. The high N requirement of canola is one reason why canola acreage in Minnesota is being replaced with soybeans, which require very little to no additional N. If canola N levels could be managed to obtain more yield with the same or lower N input, then canola would be more economically competitive with soybean. Minnesota and North Dakota both recommend 130 lb/ac of available N to obtain a 2000 lb/ac yield (Rehm et al., 2001; and Franzen, 1999). Manitoba Agriculture recommends 150 lb/ac of available N to reach a 2000 lb/ac.

Studies on top dress applications of N fertilizer are limited. An Australian study on irrigated canola indicated that top dress applications were not effective (Taylor et al., 1991). Ty Dewitz, a canola grower from Tappen, North Dakota has been seeing a 15 to 20% yield increase by using top dress applications of N on both irrigated and dry-land canola (personal communications through Eric Eriksmoen). A 2001 study conducted at two locations in North Dakota showed a yield increase of up to a 30% when top dress applications of N were used (Bob Henson, personal communications). The trial was repeated in 2002 with an average yield increase of 9% across four site-years when all or part of the N was applied at the 3 to 5-leaf stage (Eric Eriksmoen, personal communications). In 2003 an extensive nitrogen application trial including 7 nitrogen levels PPI and 4 nitrogen levels top dress was conducted at 7 locations in North Dakota. Results from this trial showed no yield difference between applying fertilizer PPI and top dressing (John Lukach, personal communications). The results also indicated a range of 5 to 10 lb/ac of canola increase per pound of nitrogen applied, depending on location. In the last 4 years, 3 out of 10 site years (Langdon, Carrington and Valley City) showed yield increases of 300 to 500 lb/ac from top dressing nitrogen compared to PPI.

In 2003 a nitrogen trial was conducted at the Canola Production Centre near Roseau which looked at adding 30 and 60 lb/ac N at PPI and the 4 to 6 leaf stage as a top dress treatment. The field was flooded in 2002 and had high levels of residual nitrogen. Top dress treatments included three nitrogen sources; urea, ammonium nitrate and 28-0-0 liquid. The only

significant yield increase obtained from top dressing occurred with urea at 30 lb/ac N. In 2004 the trial was repeated near Roseau looking at applications of 60 and 90 lb/ac PPI and topdress with no difference in yield between the two application timings.

In 2004 an extensive nitrogen application trial including 7 nitrogen levels PPI and 4 nitrogen levels top dress was conducted at 7 locations in North Dakota. Results from the Valley City location showed significant yield increase of approximately 300 lb/ac from top dressing (John Lukach, personal communications). Langdon also showed yield increases from top dressing.

Studies on the timing of top dress applications are also limited. In 1999, the Canola Production Centres conducted a study at 5 sites with top dressing 10 lb N/ac and 10 lb S/ac at 7, 14, 21, and 7 plus 21 days after emergence (Canola Council of Canada, 1999). The total recommended rate of N fertilizer was applied prior to seeding. Increased yield from top dressing was observed at only one site. The 2001 North Dakota trials showed no yield difference with a split application at bolting compared to a 9% yield increase with the split application at the 3 to 5-leaf stage (Eric Eriksmoen, personal communications). A top dress application of N for winter canola seed production is recommended in Kansas with one third to one half applied in the fall and the remainder applied in late winter (Kansas State University, 1989).

References:

Canola Council of Canada. 1999. Top dressed sulphur and nitrogen trial. 1999 Canola Production Center annual report. pp. 108-112.

Franzen, D. W. 1999. Fertilizing mustard and canola. NDSU Ext. Bul. SF-1122.

Kansas State University. 1989. Canola Production Handbook. Ext. Bul. C-706. p. 7.

Rehm, G., M. Schmitt, J. Lamb, and R. Eliason. 2001. Fertilizer Recommendations for Agronomic Crops in Minnesota. Univ. of Minnesota Ext. Bul. BU-06240-S.

SAS. 1999. SAS/STAT user's guide. Version 8. SAS Inst., Cary, NC.

Taylor, A.J., C.J. Smith, and I.B. Wilson. 1991. Effect of irrigation and nitrogen fertilizer on yield, oil content, nitrogen accumulation and water use of canola (*Brassica napus L.*). Fert. Res. 29:249-260.

Thomas, P. 2000. Nutrient uptake by canola. Alberta Canadian Agric, Melfort, AAFC.

Current Work:

A trial very similar to this proposed trial was conducted on the 2005 CPC near Grygla in a tile drained field, see attached data for 2005 results. Very wet weather from 20 to 50 days after planting provided optimum conditions to show significant differences between the PPI and top dress treatments. Top dressed treatments provided 12, 14 and 20% higher yield than the PPI treatments for the 30, 60 and 90 lb/ac N application rates respectively. Top dressing 30 lb/ac N provided a similar yield to 60 lb/ac N PPI. Top dressing 60 lb/ac N provided a better yield (131 lb/ac) than 90 lb/ac PPI.

This research was proposed for the 2006 Canola Production Centre. Preplant nitrogen applications were made and the trial was planted. Lack of rainfall at the site for over a month resulted in a very uneven stand. Because of that the trial was terminated prior to topdress application

In 2008, preliminary work was performed at the Canola Production Center comparing nitrogen timings and sources. The findings were not significantly different, but provided evidence that lower rates of nitrogen applied at the 4-leaf stage may yield as well as conventionally applied nitrogen.

Facilities and Equipment (Canola Production Centre):

The research will be conducted on-farm at the Canola Production Centre near Roseau, MN. Dr. Paul Porter has had canola responsibilities since 2000. He and a technician (previously Dave LeGare, currently Derek Crompton) implement the majority of the University of Minnesota canola research and the canola variety evaluation trials. They are equipped with the appropriate field equipment (tractor, 10 foot press drill, 30 foot sprayer, 18 foot swather) to plant, maintain and harvest the crops grown in this effort. The canola project has a 12' drop spreader for applying the fertilizer on the nitrogen plots. The weigh wagon is borrowed and the combine is rented locally at threshing time. They also have the ability to transport the all the equipment to the Roseau site with the exception of the combine. Paul and Derek have access to the necessary laboratory infrastructure to process plant samples, as well as the statistical packages required for the analysis (SAS, 1999).

Project Timetable:

Invitation to companies for variety testing will be sent out in March, 2009 with variety confirmation by April, 2009. These projects will consist of field trials during the 2009 growing season. A summer field day will held in late June or early July to show the research and offer other extension information to growers from industry people and University personnel. Results will be available via the internet web pages, presented at scientific and grower meetings, cited in area and regional extension newsletters, and published in an extension fact sheet and scientific journals when applicable.

Personnel:

Dr. Paul Porter (1%) & Derek Crompton (20%).
Minnesota Canola Council - support will provided by organizing the summer field day, writing the land rental agreement, and providing the land rent to the grower.

Part 3: Winter Wheat following Spring Canola

Objectives:

To evaluate any possible yield advantages of a crop rotation of winter wheat planted into spring canola stubble.

Procedures:

In the spring of 2009 Dr. Porter and Derek Crompton will work with industry and University representatives who are promoting the rotation of winter wheat following canola to design appropriate large-scale evaluations on the Canola Production Centre. These trials will involve randomized and replicated treatments either as stand-alone experiments or embedded within the Variety and Systems Comparison Trial.

The field layout will consist of a randomized complete block (RCB) design with four replicates. Plots will be field scale (30 ft by 400 ft) and managed and harvested with field scale equipment. In plot rotation trials winter wheat, spring wheat, spring canola, winter rape (*B. napus* L.), and soybeans will be grown prior to a winter wheat crop. Winter wheat will be uniformly cropped across the previous crop areas before dividing into sub-plots for variable N fertilizer application evaluation. The previous crop influences will be assessed for winter wheat crop agronomic performance and N fertilizer response. Yield responses for previous crop effects on winter wheat will be compared as a percent of the yield of wheat yield following soybean.

Justification:

A limiting factor to the production of canola is a perception of no rotational benefits to the subsequent crops grown in rotation with it. However, research in Northern Idaho and Eastern Washington has indicated that winter wheat following canola had a yield advantage over a winter wheat crop following winter wheat. We therefore intend on ascertaining any yield advantage of winter wheat following canola by initiating a crop rotation experiment in 2009.

In the last several years, the acres of winter wheat grown in Northern Minnesota have been substantial. In 2000, 20,000 acres were planted, increasing to 75,000 acres planted in 2008. Yields have been comparable to spring wheat yields in most years, and higher than spring wheat in several. This fact coupled with lower wheat prices may attract more grower interest in winter wheat production. A potential advantage of canola crop rotation influence could help to benefit both winter wheat and canola yield and provide financial benefits to farmers.

Current Work:

Work done at the University of Idaho projected a 17% yield increase in winter wheat following canola versus winter wheat, and a 21% increase when following field peas. Recent work in Oklahoma saw wheat yields increase over 20% following winter canola versus following winter wheat. Our work would attempt to substantiate these results in our local clime, and offer producers an alternative crop rotation strategy to enhance yields and profitability.

The **Facilities and Equipment, Project Timetable** and **Personnel** have been described in Parts 1 and 2 above.

References:

Jason C. Duke, Francis M. Epplin, Jeffrey D. Vitale, and Thomas F. Peeper. Canola-Wheat Rotation versus Continuous Wheat for the Southern Plains. Selected Paper prepared for presentation at the Southern Agricultural Economics Association Annual Meeting, Atlanta, Georgia, January 31-February 3, 2009

Stephen O. Guy. Crop Rotation and Residue Durability Effects of Brassicas and other Crops on Winter Wheat. Proceedings, 10th International Rapeseed Congress, Canberra, Australia, 1999.

Jochum J. Wiersma. 2006. Winter Wheat in Minnesota. Extension Bulletin MI-08421.

USDA, NASS. 2008. Minnesota Data-Crops, Winter Wheat. Online. http://www.nass.usda.gov/QuickStats/PullData_US.jsp. Accessed, March 5, 2009.

Part 4: Canola Impact Crop Rotation Trial

Objectives:

To evaluate crop rotation effects on yield and quality of annual crops grown in Northern Minnesota including canola, wheat, soybeans, perennial ryegrass, and sunflower in crop years 2009, 2010, 2011, 2012. Specifically, the experiment is meant to identify any benefit of canola's impact on the successive crop grown in rotation. These findings would add an economic benefit to the use of canola in crop production rotations.

Procedures:

Table 1. Proposed crop rotations by year and sequence. 2009-2010, 2010-2011, 2011-2012.

Rotation	Replicates				SPECIES
	B-C	B-F	B-W	B-R	B = soybeans
	C-B	C-F	C-W	C-R	C = canola
	W-C	W-F	W-B	W-R	F = sunflower
	F-W	F-B	F-C	F-R	W = wheat
	R-W	R-F	R-B	RC	R = ryegrass

Justification:

Crop choices made my Northern Minnesota growers are quite different than those of growers in other parts of the North Central cropping region. There are still large acreages of oilseeds (sunflower, soybean, canola) planted in rotation with wheat and perennial ryegrass grown for seed production. We intend to investigate rotational effects of these commodities on yield and quality over a three year study in Roseau County. Roseau County is a representative area of high crop diversity and the rotational study would mimic many of the systems in place by area growers.

A long-term rotation trial established near Roseau in 2000 to evaluate the influence of varying rotation lengths on canola growth and development was compromised by the 2002 floods. The site selection for the proposed studies in 2009 will be based on proper drainage and low potential for overland flooding.

Procedures:

Twenty crop rotations will established at Roseau, MN in 2009. This study will continue the same crop sequences every season so a two year rotation may be observed. At time of establishment, the "effecting" crop will be established in an area of fallow ground. This will minimize confounding effects of more than one crop in the rotation history. Each crop will be planted into a 20 foot by 100 foot plot, with a 10-foot border around all sides of each plot. In each year there will be 4 canola plots, 4 soybean plots, 4 wheat plots, and 4 sunflower plots, and 4 perennial ryegrass plots. Each treatment will be replicated four times. Every crop of the

rotation must be grown in every year to help explain the effect of individual years. Therefore, we will need to establish and maintain 80 plots per year.

Current Work:
In Minot, ND, Dr. Brian Jenks of NDSU initiated a long term rotational study focusing on canola. "Impact of Preceding Crops on Incidence and Severity of Disease in Canola".

Six crop rotations were initiated in spring 2000 to evaluate the influence of previous crops and cropping sequences on disease levels in canola, flax, wheat, and barley. This study will continue the same crop sequences so a true rotation may be observed. The study will consist of three 4-year rotations, one 3-year rotation, one 2-year rotation, and one 1-year rotation with different sequences of canola, flax, wheat, and barley. The study will be conducted at the North Central Research Extension Center, Minot, ND.

Objectives:

1. Document the influence of crop rotation on the incidence and severity of sclerotinia, blackleg, and alternaria black spot in canola.
2. Determine the impact of the previous crop on disease levels in canola.
3. Determine if fungicide applications can be eliminated or rates reduced by altering the sequence of crops in the rotation.

Current Findings.

Overall, there have been no canola yield differences between fungicide-treated and untreated plots, nor have there been yield differences between rotations (data not shown).

The work done by Dr. Jenks has focused on the impact of rotational impacts of canola on yield in respect to disease pressure. The proposed study will focus on the short term effect of crop species only, and not consider long-term effects already a component in his Minot study.

Facilities and Equipment:

The research will be conducted on land in Roseau County. Paul Porter and Derek Crompton are equipped with the appropriate field equipment (tractor, Hege small plot seeder, 30 foot sprayer, 6 foot swather, small plot combine) to plant, maintain and harvest the crops grown in this project. The hay rake was borrowed from a local farmer. The canola project has a 12' drop spreader for applying the fertilizer. We also have the ability to transport the all the equipment to the Roseau site. Both Paul and Derek have access to the necessary laboratory infrastructure to dry and process plant samples, as well as the statistical packages required for the analysis (SAS).

Project Timetable:

This study will be planted with the first replications of plant species in 2009. The harvest of plots within the study will begin in 2010, and include 2011, concluding with harvest 2012. Results will be published in peer reviewed journal such as Agronomy Journal.

Literature Review:

Brown J. and J.B. Davis. 2006. Examine the effect of cropping systems that include canola (*Brassica napus* L.),
yellow mustard (*Sinapis alba* L.) or oriental mustard (*B. juncea* L.) on yield of subsequent spring
wheat in western Whitman County, Washington State. Available at: http://www.ag.uidaho.edu/brassica/Variety-trial-info/Western%20Whitman%20County%20Crop%20Rotation.pdf. Accessed online on March, 10, 2009.

Mazurek, S.A. and B. M. Jenks. 2007. Impact of Preceding Crops on Incidence and Severity of Disease in Canola. NCGA North Dakota-Minnesota Canola Researchers Meeting. October. Fargo, North Dakota.

Mazurek, S.A. 2009. Personal Communication.

Part 5: Variety Evaluation of Winter Canola

Objectives:

To evaluate different winter canola varieties for their ability to survive the winter and produce grain yield in northwestern Minnesota.

Procedures and Current Work:

A collection of 54 winter canola varieties were seeded on August 21, 2008 on a timothy stubble field just north of Wannaska, MN. The canola was seeded at 5 lb/ac with a Hege 1000 double disk small plot seeder. Emergence was fair to excellent and the canola was in a range of 4 to 8 leaf stages going into the winter. Plots were 6 feet wide X 30 feet long and replicated 4 times. Fertilizer was top dressed on September 8 at 40 lb/ac (40-40-40) prior to emergence.

As of early January the plants appeared to be in good shape. At that time there was approximately 12 inches of snow cover on the site.

Additionally, a study was conducted to investigate the use of a family of fungicides, commonly known as triazols, that have been known to increase the winter hardiness of winter rapeseed grown in Germany.

In the fall of 2007, three varieties of winter canola planted north of Wannaska, MN were treated with two fungicides with two rates (4oz/acre, and 8 oz/acre) of applications for each fungicide. The fungicides used were Folicur and Proline, which are both triazol containing products. The plots will be examined in the spring of 2008 and evaluated for winter survival differences.

2007-2008 Winter Canola Fungicide Trial

Site: 2007-2008 Minnesota CPC, Kraig Lee Farm, Wannaska, MN
Treatments:

1 Proline 4.5 oz
2 Proline 9.0 oz
3 Folicur 4.0 oz
4 Folicur 9.0 oz
5 Untreated

Varieties:

1 KS3248
2 KS7436
3 Sumner

Replicated treatments 3 times per variety
Plot size 5 ft x 9 ft

Sprayed with hand sprayer @ 12 gallons per acre
Date sprayed, October 30, 2007
Plant stage 4-6 leaves

Our results found significant survival differences with the Folicur 9.0 oz treatment resulting in a 64 % survival compared with 12 % survival in the untreated check.

Justification:

Winter canola has the potential of producing larger yields than the spring canola currently grown in northwestern Minnesota. Winter canola is seeded in the fall after small grain harvest. It grows to a large rosette plant in the fall and over winters that way. In the spring, most of the old leaves appear frozen and dead however the crown shoots out new leaf growth in early to mid April and is flowering by the end of May. The early flowering avoids the heat stress of July and August and harvest is usually earlier than spring wheat. Winter canola variety trials were conducted in northern Minnesota in the late 1980s with limited success. Most years the trials were seeded on tilled soil , and 'winter kill' resulted. In fall 2001 a National winter canola variety trial was seeded south of Thief River Falls, MN into heavy wheat straw residue. Germination was delayed due to dry weather and poor seed/soil contact. The plants were very small going into the winter and none survived. In fall 2002 a seeding date x seeding rate trial was conducted west of St. Hilaire, MN into approximately 10 inch wheat stubble that had the straw removed by raking and baling it. Plant sizes varied from large 6-leaf to very small 2-leaf. There was good snow cover that winter with excellent survivability. In fall 2003 the trial was repeated just south of Thief River Falls, MN along with the national winter canola variety trial into 12 inch wheat stubble with the straw baled off. The canola was good and healthy going into the winter, but only one range near the gravel road survived to make a crop.

2007-2008 Trial:

In fall of 2007, 54 winter canola varieties were seeded on a timothy stubble field south of Roseau, MN. The straw was light and was raked off of half of the plot area prior to seeding. The canola was seeded at 5 lb/ac with a Hege 1000 double disk small plot seeder with 40 lb/ac of

seed placed fertilizer. Emergence was fairly erratic due to dry conditions and the canola was in a healthy 6 leaf stage going into the winter. Plots were 6 feet wide X 30 feet long and replicated 4 times. Ammonium nitrate was top dressed on May 1 at 100 lb/ac (34-0-0) when the canola was starting to regrow in the spring.

Winter survivability was severely low and trial was not harvested.

Facilities and Equipment:

The research will be conducted on land farmed by Kraig Lee north of Wannaska. Paul Porter and Derek Crompton are equipped with the appropriate field equipment (tractor, Hege small plot seeder, 30 foot sprayer, 6 foot swather, small plot combine) to plant, maintain and harvest the crops grown in this project. The canola project has a 12' drop spreader for applying the fertilizer. We also have the ability to transport the all the equipment to the Wannaska site. Both Paul and Derek have access to the necessary laboratory infrastructure to dry and process plant samples, as well as the statistical packages required for the analysis (SAS).

Project Timetable:

The canola will be evaluated for winter survival in spring after the frost is out and the canola has a chance to grow. Spring stand counts will be compared to fall stand counts in the exact areas in each plots. Nitrogen and sulfur (approximately 100-0-0-25) will be top dress applied in early spring before bolting. Data will be collected throughout the summer and harvest will commence when the plots are mature. Results will be available via the internet web pages, presented at scientific and grower meetings, cited in area and regional extension newsletters, and published in an extension fact sheet and scientific journals when applicable.

Literature Review:

Currently all canola cultivars grown in Minnesota are spring-type cultivars, and virtually all the crop is sown in the spring. Winter-type canola cultivars differ from spring-type canola cultivars in that they generally have a greater vernalization requirement and are typically planted in the fall. They germinate in the fall, develop to the rosette stage prior to freeze-up, flower the following spring, and are harvested that summer. In general, winter-type cultivars have a greater yield potential than spring-type cultivars. One disadvantage of growing spring-type cultivars is that they need to be planted as early in the spring as possible in order to obtain maximum yield potential. Research suggests a yield decrease of approximately 1.6% per day that planting is delayed from late April to late June (Oelke et al., 2000). Spring planting is often delayed until soils are dry enough for sowing. In Minnesota, severe winter-kill of fall-planted winter-type canola cultivars occurred at 13 of 16 location/years from 1988 through 1990 (Putnam et al., 1991). Based on these and other results (Auld and Mahler, 1991), the canola industry that has developed in the north-central U.S. consists of spring-planted, spring-type canola cultivars. In the 1990s little to no University and private industry research has been conducted on fall-planted, winter-type canola cultivars. Topinka et al. (1991) stated a greater range in plant size prior to winter freeze-up could be tolerated in winter canola seeded into standing stubble, as it would not be exposed to the extremes of temperature. Putnam et al. (1991) concluded that when winter-type canola survived the winter, time of seeding and use of small grain stubble was critical, but no research has been conducted on this. They found mid-August sowing performed best, and late August or September sowing produced lower yields. This window for sowing effectively

precludes the use of winter-type canola following long-season crops such as corn and soybean. However, it does not preclude the use of winter-type canola following most small grains (MN Ag. Statistics, 2003). Recent weather patterns in northwest Minnesota across the last 20 years relative to the long-term 100-year data set suggest that there has been a higher frequency of mild winters (Mark Seeley, personal communication). This trend favors chances of over-wintering success of winter-type canola.

Part 6: Pre-harvest Desiccants and Straight Harvesting Trial

Objectives:

The objective of this study is to evaluate the potential for pre-harvest desiccation and straight harvest in Minnesota canola production.

Procedures:

A field site north of Roseau, MN will be planted with the P45H21 variety of canola. It will be seeded with a 10-foot 9350 JD double-disk press drill at seed company recommended seeding rates. Plots are 400 feet long by 30 feet wide. The trial is laid out in a modified RCB design with four replicates. Plots will be fertilized at recommended rates for 2,000 lbs/acre production.

Treatments consist of harvest method (straight or swathed), desiccating agent (Reglone) (application or non-application), and harvest date. Straight harvest treatments will be sprayed with the desiccating agent applied at early pod yellowing. There will also be non-sprayed straight harvest control treatments and a traditional swathed treatment. The first harvest date to occur at the optimum time with subsequent weekly harvests at 7, 14, and 21 days.

Reglone spraying will be done with a 30 foot open boom sprayer on a calm day. If conditions are conducive for sclerotinia, all varieties are sprayed with a fungicide such as Ronilan at 20 to 50% bloom to reduce the risk of yield loss due to this disease. Each conventionally harvested plot is swathed individually when seed color change in that plot reaches 30 to 40 % on the main stem and threshing is completed when suitable conditions exist. Swathing is done with an 18 foot Versatile 400 swather with side cutter bar and the plots are threshed with a commercial combine rented from a grower or local dealership. Yields are measured with a weigh wagon and 5 lb samples taken for dockage and quality testing.

Data collection during the season includes; Reglone application date, beginning and end bloom dates, height, lodging, maturity date, swathing date, and combining date. After harvest, seed quality is measured by evaluating for damaged seed, green seed count, and oil and protein content. Contribution margins are calculated using the value of the crop at harvest minus Reglone or swathing cost.

Justification:

In dry years, many canola crops are short and thin. Windrowing is recommended where yield potential exceeds 1 tonne/ha and crops are tall and thick enough to sit on 25-30cm of stubble. With light crops, where windrows may be blown about by strong winds, other options are desiccation and harvest or direct heading, depending on seed moisture levels.

Desiccation

Reglone® is registered for use as a pre-harvest desiccant in canola. Rates are 1.5 to 3.0 L/ha. Spray when 70% of the pods are yellow and the seeds are browny/bluish and pliable. Harvest 4 to 7 days after spraying.

In 2000, the Muresk Institute of Agriculture compared the effects of windrowing, desiccation and direct harvesting on the yield and quality of canola grown at Dowerin (WA). The highest yield of **0.91 tonnes/ha** was achieved by applying Reglone® (1.5 L/ha) at 56% seed colour change. Windrowing achieved a yield of **0.68 tonnes/ha,** whilst the direct harvest yield was **0.79 tonnes/ha**.

Timing is important. Windrowing or desiccating too early can significantly reduce seed yield and oil content compared with direct harvesting at maturity.

Facilities and Equipment:

Paul Porter and Derek Crompton are equipped with the appropriate field equipment (tractor, Hege small plot seeder, 30 foot sprayer, 6 foot swather, small plot combine) to plant, maintain and harvest the crops grown in this project. The hay rake was borrowed from a local farmer. The canola project has a 12' drop spreader for applying the fertilizer. We also have the ability to transport the all the equipment to the Roseau site. Both Paul and Derek have access to the necessary laboratory infrastructure to dry and process plant samples, as well as the statistical packages required for the analysis (SAS).

Project Timetable:

The canola will be evaluated for differences in yield and profit potential. Data will be collected throughout the summer and harvest will commence when the plots are mature. Results will be available via the internet web pages, presented at scientific and grower meetings, cited in area and regional extension newsletters, and published in an extension fact sheet and scientific journals when applicable.

Literature Review:

Currently all canola grown in Minnesota is swathed and harvest approximately 14-21 days after cutting takes place.

References:

Auld, D.L. and K.A. Mahler. 1991. Production of canola and rapeseed in the U.S. *In* McGregor, D.I. (ed.) *Proc. of the Eight Int. Rapeseed Congress*, Saskatoon, Canada. pp. 978-983.

MN Ag. Statistics. 2000. Minnesota Ag. Statistics Service. 90 West Plato Boulevard, St. Paul MN 55107. Electronic version at: http://www.nass.usda.gov/mn/

Northwest and West Central Minnesota On-Farm Cropping Trials. 2007. p.42. Univ. of Minnesota Extension Service.

Oelke, E.A., D.G. LeGare, K.B. Andol, P.M. Porter. 2000. Planting date influences canola yield and growth in northwestern Minnesota. Agron. Abst. p.38.

Putnam, D.H., L.L. Hardman, E.A. Oelke, M.O. Johnson, E.I. Fuller, D.M. Noetzel, R.A. Meronuck, M.E. Morris, and K.N. Sannes. 1991. Prospects for canola in Minnesota. Center for Alternative Plant and Animal Products, Univ. of MN.

Specht, M. 2004. High Yields of Winter Oilseed Rape in Germany 2004. www.ufop.de/downloads/**High**_Yield.pdf

Topinka, A.R.C., R.K. Downey, and G.F.W. Rakow. 1991. Effect of agronomic practices on the overwintering of winter canola in southern Alberta. *In* McGregor, D.I. (ed.) *Proc. of the Eight Int. Rapeseed Congress*, Saskatoon, Canada. pp. 665-670.

University of Minnesota Varietal Trials Results bulletin. 2007. p.53. (MP 113-2007).

Budget:

	All Trials
Technician (700 hours x $18.00/hr)	$12,600
Student (600 hours x $10.50/hr)	6,300
Fringe (36.5% T & 7.7% S)	5,084
Travel (St. Paul – Roseau: 800 miles X 5 X $0.485	1,940
Combine rental and fuel (CPC)	3,000
Materials & Supplies (chemicals, fertilizer, stakes)	1,250
NDAWN Weather stations maintenance and service at Mavie, Roosevelt, and Greenbush	3,000
Total costs	**$33,174**

Budget breakdown by trial:

		Treatments	Dollars
1-3	Base costs of having a CPC site		11,099
1.	Systems Comparison Trial	(~8 x $800)	6,400
2.	Nitrogen Top Dress Trial	(~8 x $800)	6,400
3.	Product Evaluation	to be determined	1,775
4.	Winter Canola Variety Trial	(50 x $90)	4,500
5.	NDAWN Stations		3,000
	Total costs		**$33,174**

Budget justification:

Items listed as wages will be used for summer support staff to assist in conducting the field research, collecting samples, and data summarization. Labor will be paid at a rate of $10.50/hr for a summer student at 650 hours, and $18.00/hr for a technician at 700 hours. Fringe benefits are calculated at 7.7% and 36.54% for students and technicians, respectively.

Materials and supplies include the herbicides, insecticides and fertilizer needed to conduct the trials. On the CPC we will utilize a field combine to harvest the plots. The owner of the combine will be compensated for the use of that equipment.

The data from the NDAWN Weather stations at Mavie, Wannaska, and Greenbush are used to help generate the Sclerotinia Forecasting Maps that provide growers timely information for then to decide how to manage sclerotinia. Costs included here are for telephone line service ($500 x 3 stations = $1500) and maintenance provided by NDSU ($500 x 3 stations = $1500).

See attached page for CSREES-2008 budget page.

RESEARCH & RELATED BUDGET - SECTION A & B, BUDGET PERIOD 1

* ORGANIZATIONAL DUNS: 5559179960000

* Budget Type: ☐ Project ☑ Subaward/Consortium

Enter name of Organization: Regents of the University of Minnesota

Reset Entries * Start Date: 09/15/2009 * End Date: 09/14/2010 Budget Period: 1

(If the Reset Entries button is pressed, please navigate to previous year to enable the submission of the form.)

A. Senior/Key Person

	Prefix	* First Name	Middle Name	* Last Name	Suffix	* Project Role	Base Salary ($)	Cal. Months	Acad. Months	Sum. Months	* Requested Salary ($)	* Fringe Benefits ($)	* Funds Requested ($)
1.		Paul	M.	Porter	PhD	PD/PI		12.00			0.00	0.00	0.00
2.													
3.													
4.													
5.													
6.													
7.													
8.													
9.	Total Funds requested for all Senior Key Persons in the attached file												

Total Senior/Key Person 0.00

Additional Senior Key Persons: Add Attachment

B. Other Personnel

* Number of Personnel	* Project Role	Cal. Months	Acad. Months	Sum. Months	* Requested Salary ($)	* Fringe Benefits ($)	* Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
1	Undergraduate Students	12.00			6,300.00	4,599.00	10,899.00
	Secretarial/Clerical						
1	Technician	12.00			12,600.00	485.00	13,085.00
2	Total Number Other Personnel					Total Other Personnel	23,984.00

Total Salary, Wages and Fringe Benefits (A+B) 23,984.00

OMB Number: 4040-0001

Expiration Date: 04/30/2008

RESEARCH & RELATED BUDGET - SECTION C, D, & E, BUDGET PERIOD 1

* ORGANIZATIONAL DUNS: 5559179960000

* Budget Type: [ ] Project [✓] Subaward/Consortium

Enter name of Organization: Regents of the University of Minnesota

Reset Entries | * Start Date: 09/15/2009 | * End Date: 09/14/2010 | Budget Period: 1

(If the Reset Entries button is pressed, please navigate to previous year to enable the submission of the form.)

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

	Equipment Item	* Funds Requested ($)
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.	**Total funds requested for all equipment listed in the attached file**	
	Total Equipment	

Additional Equipment: | Add Attachment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	1,940.00
2.	Foreign Travel Costs	
	Total Travel Cost	1,940.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees	**Total Participant/Trainee Support Costs**

RESEARCH & RELATED BUDGET - SECTION F-K, BUDGET PERIOD 1

Next Period

* ORGANIZATIONAL DUNS: 5559179960000

* Budget Type: Project ✓ Subaward/Consortium

Enter name of Organization: Regents of the University of Minnesota

Reset Entries | * Start Date: 09/15/2009 | * End Date: 09/14/2010 | Budget Period: 1

(If the Reset Entries button is pressed, please navigate to previous year to enable the submission of the form.)

F. Other Direct Costs	Funds Requested ($)
1. Materials and Supplies	1,250.00
2. Publication Costs	
3. Consultant Services	
4. ADP/Computer Services	
5. Subawards/Consortium/Contractual Costs	
6. Equipment or Facility Rental/User Fees	6,000.00
7. Alterations and Renovations	
8.	
9.	
10.	
Total Other Direct Costs	7,250.00

G. Direct Costs	Funds Requested ($)
Total Direct Costs (A thru F)	33,174.00

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	* Funds Requested ($)
1.			
2.			
3.			
4.			
		Total Indirect Costs	

Cognizant Federal Agency

(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	33,174.00

J. Fee	Funds Requested ($)

K. * Budget Justification | Add Attachment

(Only attach one file.)

RESEARCH & RELATED BUDGET - Cumulative Budget

		Totals ($)
Section A, Senior/Key Person		0.00
Section B, Other Personnel		23,984.00
Total Number Other Personnel	2	
Total Salary, Wages and Fringe Benefits (A+B)		23,984.00
Section C, Equipment		
Section D, Travel		1,940.00
1. Domestic	1,940.00	
2. Foreign		
Section E, Participant/Trainee Support Costs		
1. Tuition/Fees/Health Insurance		
2. Stipends		
3. Travel		
4. Subsistence		
5. Other		
6. Number of Participants/Trainees		
Section F, Other Direct Costs		7,250.00
1. Materials and Supplies	1,250.00	
2. Publication Costs	0.00	
3. Consultant Services		
4. ADP/Computer Services		
5. Subawards/Consortium/Contractual Costs		
6. Equipment or Facility Rental/User Fees	6,000.00	
7. Alterations and Renovations		
8. Other 1		
9. Other 2		
10. Other 3		
Section G, Direct Costs (A thru F)		33,174.00
Section H, Indirect Costs		0.00
Section I, Total Direct and Indirect Costs (G + H)		33,174.00
Section J, Fee		

OMB Number: 4040-0001

Expiration Date: 04/30/2008