**Title:** Winter canola production in the low- to intermediate-rainfall zones of the Pacific Northwest

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**Co PI:** Bill Pan, Ian Burke, and Dale Whaley

**Funding term and duration:** July 2008 to present

**Graduate student:** Lauren Young.

**Technical support:** Funding provides one, half-time support and one, quarter-time support for Associates in Research and time slip personnel through the Crop and Soil Sciences Department, Washington State University.

**Background:** Approximately 60% of the cereal and grain legume production areas of the PNW are characterized by the winter wheat/summer fallow system which is plagued by winter annual grass weeds such as jointed goatgrass, feral rye, and downy brome. This region provides the greatest opportunity to expand oilseed acreage in the PNW. Growers are becoming more interested in producing winter canola in this region to improve pest management strategies, diversify markets (food, fuel, and feedstock), and increase sustainability. Previous funding from the WBCS allowed us to research for the first time winter canola seeding date and rate in the non-irrigated, low- to intermediate rainfall zones to improve canola emergence and stand establishment. Data indicates that the optimum time to plant winter canola is between July 25 and August 25 and most importantly when “Mother Nature tells you”, i.e., when cooler temperatures (85°F) are forecast after planting. Planting prior to July 25, soil water may be limiting for the canola and insect pests may have to be controlled at a significant cost to the grower. Planting after August 25 yields may be reduced because of the shortened fall growing season. At the present time, there has been no research on winter canola variety trials in the wheat/fallow region. The U of I conducts variety trials in the irrigated area, high rainfall annual cropping region, and the high-end of the intermediate rainfall zone. Varieties that tolerate cold temperatures and open winters need to be found for this region to reduce production risks. In the PNW, winter annual grass weeds (especially feral rye) are a major problem in winter wheat. The only effective control measure for feral rye in the growing crop is to use imazamox resistant winter wheat varieties. However, research in the southern Great Plains has shown great variation in feral rye tolerance to imazamox (Peeper et al., 2008). Therefore crop and chemical rotation are important strategies for the management of feral rye. In the PNW there has been no research on herbicide efficiency and time of herbicide applications for the control of feral rye in winter canola. Previous funding from the WBCS has also allowed us to collect 1-yrs data on feral rye control in winter canola. As with canola varieties and herbicide efficacy research, there is currently no entomology research being conducted in winter canola in the low – to intermediate
rainfall zone. As more and more canola acres are planted in eastern WA, so does the potential of having to contend with one or more insect pests that infest this crop.

**Objectives:**

**Research:** 1) Monitor insects in first-time planted winter canola, second-time planted winter canola, and frequently planted winter canola in north central WA. 2) Evaluate herbicides for feral rye control in winter canola to improve quality of future winter wheat crops and prevent herbicide resistance in weeds; 3) Evaluate several winter canola varieties for winter survival in the wheat/fallow region of WA; 4) Evaluate the use of the stripper header and tall cereal varieties to introduce winter canola into the high residue chemical fallow system; and 5) Assist with research to evaluate the effectiveness of KCl to improve winter survival of canola.

**Methods:**

**Monitor insects.** In Douglas and Okanogan Co. there are winter canola fields planted the first time, twice, and four to five times. These fields will be monitored throughout the growing season for insect infestations. The cabbage seed pod weevil and aphids are of primary concern in this region.

**Herbicide efficacy study in winter canola.** A third year of the herbicide efficacy study for the management of feral rye is being conducted at Okanogan, WA in 2013-14. Select (clethodim), Assure II (quizalofop), and Roundup (glyphosate) were applied in the fall, in the spring, and in the fall plus spring to a natural infestation of feral rye in winter canola which was planted September 2013. Percent weed control, weed seed produced, weed biomass, crop yield, and oil quantity will be recorded.

**Winter canola variety trials.** We are continuing to conduct winter canola variety trials to determine the best varieties to plant in the wheat/fallow region. Last year, twelve varieties were planted at Bridgeport, Ralston, Davenport, Pomeroy, and Pullman and included conventional and herbicide tolerant/resistant varieties. Varieties included were from the University of Idaho, Kansas State University, CROPLAN, and Spectrum Crop Development. Depending on seeding conditions, an array of drills were used to plant winter canola and included a Monosem plate planter, JD deep-furrow HZ, and AGPRO air seeder. Cold hardiness/winter survival was determined by recording crop stand counts in the fall before freeze-up and in the spring after dormancy was broken. Additional data collected will include crop yield and oil content and quality. This year 14 varieties were planted at Okanogan, Bridgeport, Pomeroy, and Pullman. Two additional varieties were from Rubisco.

**Ralston stripper header project.** We are in the fourth year of a project located in an 11.5 inch rainfall zone to increase residue which will increase subsequent soil moisture so that winter canola can be planted no-till into chemical fallow. We harvested the 2012-2013 wheat and triticale with both the stripper header and conventional header. Winter canola was planted no-till and conventionally on July 28, 2013. Bare areas of conventional planted canola were reseeded 10 days later.
Potassium chloride project. In the past, KCl has been applied to late July-mid August planted winter canola that were “ideal size” going into the winter. At the Wilke Farm, winter canola was planted September 3, 2013 and KCl was applied at 25 and 100 lbs Cl/A to much smaller canola.

**Results and Discussion:**

**Research:**

Monitor insects. During the 2012-13 growing season, numerous winter canola fields in Douglas an Okanogan Co. were sprayed for the cabbage seed pod weevil. Cabbage aphid and turnip aphid were present but the Ladybird beetle was also present which preyed on the aphids.

Herbicide efficacy study in winter canola. This study is being conducted in a grower’s field naturally infested with feral rye (Figure 1). Average rye density in October was 340 plants/yd². Winter canola was planted early September, 2013 and fall treatments of Assure II, Select, and Roundup were applied on October 10. Optimum time of application was delayed because of high winds and/or rain. Feral rye was in the 1 to 2 tiller stage on October 10. Fourteen days after application rye control was 15 to 20% with Assure II and Select and approximately 70% with Roundup.

**Winter canola variety trials.** Twelve winter canola varieties were planted at Bridgeport, Ralston, Pomeroy, and Pullman. Varieties included: 1) Four from the University of Idaho (Athena, Amanda, WC1, and 05.6.33); 2) Two from CROPLAN (HyClass 115 and 125); 3)
Three varieties from Spectrum Crop Development (Largo, Falstaff, and Casino); and 4) Three varieties from Kansas State University (Sumner, Claremore, and Griffin). CROPLAN varieties are resistant to glyphosate and tolerant to sulfonylureas, while the U of I and Spectrum varieties are conventional varieties. Largo and Griffin are varieties with presumably winter hardiness traits. Sumner is tolerant to sulfonylurea herbicides and Claremore is tolerant to imidazolinone herbicides. At Pullman, planting was very late because of the dry fall, plants had only 1 to 2 true leaves, and winter survival was 0%. At Bridgeport harvest data was not collected because of aphids, cabbage seed pod weevil, and deer grazing. Winter survival at Bridgeport (fall and spring plant counts) ranged from 47% (U of I 5.6.33) to 87% (Largo) (Table 1). At Pomeroy (Table 1), winter canola yield ranged from 2070 to 3020 lbs/A (Table 1). Sumner and Amanda varieties yielded highest at 3020 lbs/A followed by Falstaff at 2925 lbs/A. The lowest yield was with Largo at 2070 lbs/A. Largo is a *rapa* and the other varieties are *napus*. Winter survival ranged from 62 to 77% (Table 1). Winter canola yield at Ralston ranged from 1490 lbs/A (Largo) to >3000 (Amanda, Falstaff, and Griffin) (Table 1). Winter survival ranged from 77 to 99% with six varieties having winter survival ≥90%. One reason yield of Largo was low was because *rapa* varieties need to be pollenated (personal communication, Jack Brown).

**Table 1:** Yield and winter survival of winter canola in WA in 2012-2013.

<table>
<thead>
<tr>
<th>Variety</th>
<th>Pomeroy Yield (lbs/A)</th>
<th>Pomeroy Survival (%)</th>
<th>Ralston Yield (lbs/A)</th>
<th>Ralston Survival (%)</th>
<th>Bridgeport Survival (%)</th>
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</thead>
<tbody>
<tr>
<td>UI WC1</td>
<td>2660</td>
<td>62</td>
<td>2385</td>
<td>85</td>
<td>67</td>
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<tr>
<td>UI 05.6.33</td>
<td>2470</td>
<td>66</td>
<td>2610</td>
<td>83</td>
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<td>Amanda</td>
<td>3020</td>
<td>77</td>
<td>3100</td>
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<td>49</td>
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<td>72</td>
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<tr>
<td>Claremore</td>
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<tr>
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<tr>
<td>Largo</td>
<td>2070</td>
<td>69</td>
<td>1490</td>
<td>91</td>
<td>87</td>
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</table>

**Increasing residue with the stripper header.** The objective of this long-term study is to replace traditional tillage fallow with chemical fallow so that winter canola can be planted at an optimal time and not rely on “Mother Nature” telling you when to plant. Winter wheat in 2013 yielded between 2500 and 3200 lbs/A depending on the previous crop. In contrast, fall triticale yielded >4300 lbs/A. In late July 2013 Sumner winter canola was planted into reduced tillage fallow and CP125 was planted no-till in standing stripper-header stubble (Figure 2) which produced more than 8000 lbs/A biomass the previous crop year. We used an Agpro air seeder with 16” row spacing equipped with a single-edge colter ahead of the opener to plant no-till. The reduced tillage fallow was planted with a modified JD HZ 14 drill with 28” row spacing. Stand establishment with the no-till drill was excellent (Figure 3).
Planting no-till WC into stripper header stubble

Going into winter plants were large and stand establishment in the reduced tillage fallow (Figure 4) was considerably less than in the stripper header chem. Fallow (Figure 5).

**Potassium Chloride project.** This year winter canola was planted in September so that plants were considerably smaller entering the winter. Either 25 or 100 lbs/A Cl were applied September 26 and plant counts recorded on October 4 to determine winter survival. Plants were considerably smaller going into winter than in previous experiments. Recorded temperatures were -4 F on December 7 and 8.

**Impact / Potential Outcomes:** Since we have initiated winter canola research in the wheat-fallow region of Okanogan and Douglas Co. in 2007, winter canola acreage has increased from
<100 acres to > 10,000 acres in 2013. This does not include acreage planted from seed purchased from dealerships other than Central Washington Grain Growers. Producers in the region have requested monthly meetings (similar to the Direct Seed Breakfasts at Colfax and Lewiston) to discuss no-till and canola production systems. The first one was organized by Dale Whaley after the holidays.

Because of the feral rye management and variety studies being conducted and the respective field days, producers are rotating crops, varieties, and herbicides on their farms to reduce/delay weed resistance.

The stripper header, high residue, no-till Ralston project is developing cropping systems that allow producers to build residue, transition from tillage fallow to chemical fallow, and no-till winter canola at an optimal time. Several stripper headers have been purchased by growers in the region.

**Affiliated Projects and Funding:** We are cooperating with USDA-ARS at Pendleton, OR to increase residue in the wheat/fallow region. These studies are included in the Pendleton and Pullman USDA-ARS five year plans that are appropriated by Congress. We have received a small grant from the Washington State Canola Commission to help with travel expenses for the winter canola variety studies we have established throughout the PNW. We receive a small amount of funding from REACCH to assist with maintaining the study site and collect data at Ralston, WA.

**Extension/Outreach:** Two members of our team had interaction with more than 1400 growers, agribusiness personnel, administrators, and scientists during the year. Highlights included oilseed workshop (220); two hosted field days (>110); and organized a canola symposium at the Farwest Agribusiness Association’s annual meeting (>100).

**Publications:**
Manuscripts: Submitted to *Crop Management*

**Proposed Future Research/Extension.** We plan on hosting several field days throughout the state describing winter canola varieties performance at several locations. In addition, we are having a farm tour in Okanogan/Douglas Co. to visit canola growers’ fields. Lastly we are describing no-till winter canola in standing stripper header stubble. When the above manuscript is accepted for publication we will write an extension bulletin. An extension bulletin (factsheet) is in review on spring canola planting methodology. We are working with growers in the wheat/fallow region to integrate winter canola and chemical fallow into their system to delay/prevent weed resistance.

We will continue to conduct variety trials in areas where the U of I does not evaluate varieties. This is in the wheat/fallow area where 60% of the wheat production area is located in the PNW. We also evaluate some different varieties compared to the U of I. Our research is located in
different elevations, snow accumulation, and rainfall amounts compared to the U of I evaluations. Research on “residue building” and moisture retention with the stripper header will continue so growers can plant winter canola when they want to and not when “Mother Nature” tells you to. One area of research we will initiate this year is monitoring insects in Douglas and Okanogan Co. in northern WA. Canola acreage and insects have increased greatly and we must learn why cabbage seed pod weevils and aphids are such a problem in this region and not in the other areas of the wheat/fallow region.

References: