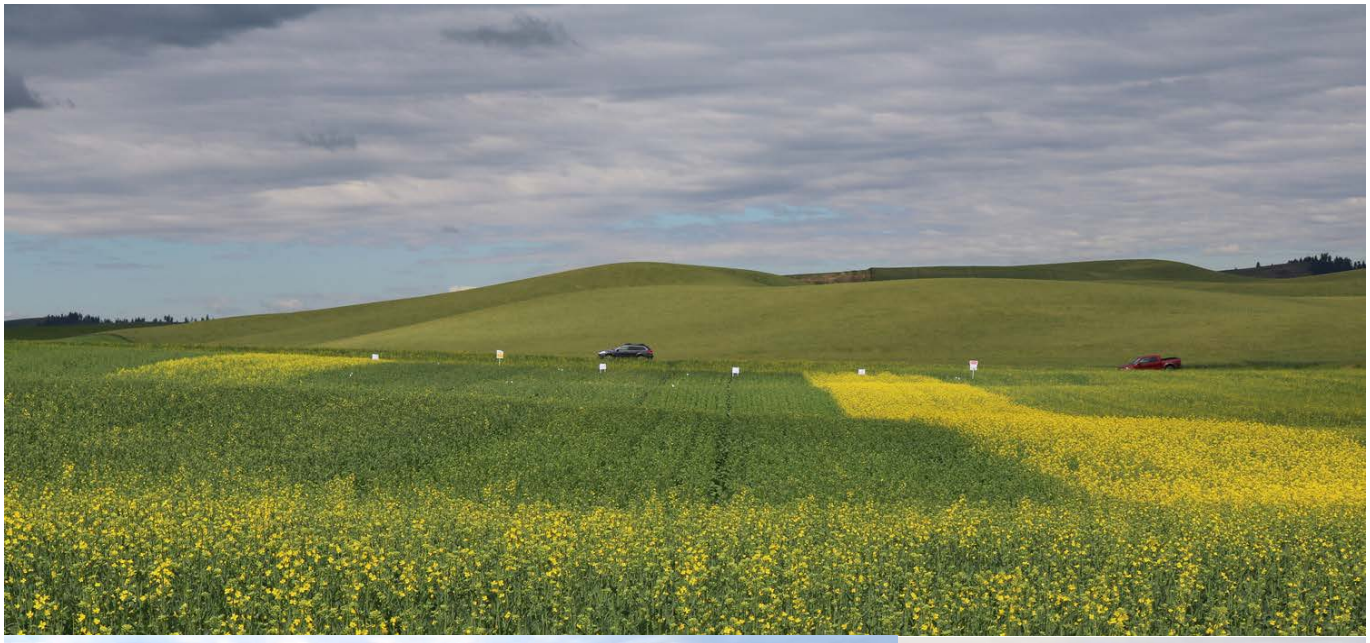
2016 On-Farm
Spring Canola Variety Trials
Final Report



*** funding provided by Viterra, trials managed by WSU-WOCS team

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Introduction

Spring canola has proven to be a viable rotation crop in eastern Washington (WA), yet many growers remain hesitant it will work on their farm, or make a difference economically, or that there will be a local market to buy the crop. As a result, acreage has not exploded as in other spring canola production regions of the U.S. and Canada. With continued Extension and outreach by Washington State University (WSU)-based Washington Oilseed Cropping Systems (WOCS) Project, and the acquisition by Viterra, Inc. of the Pacific Coast Canola facility in Warden, WA, the interest in spring canola is on the upswing. One of the primary concerns about growing canola in the predominantly cereal rotations is residual herbicides, yet there are herbicide tolerant or resistant traits in spring canola that can address many of those situations. In addition, the herbicide traits offer growers the opportunity to rotate to different chemistries, reducing the chance of weed resistance to certain groups of herbicides. With funding from Viterra, faculty and staff from the WOCS team established on-farm spring canola variety trials at three locations in eastern WA to evaluate performance in different rainfall, soil pH and soil types. The plots also served as a visual for growers, ag industry, and other stakeholders to see the six varieties on a larger scale rather than in trial-sized plots commonly used for research.

Materials and Methods:

The trials were established on farms in eastern WA representing a range of crop rotations, soil types, soil pH, and rainfall, and in areas where the potential for a significant increase in spring canola acreage is high: Fairfield, St. John, and Davenport (Table 1). The plots were replicated four times in a randomized complete block design. Preplant and post-harvest soil samples were taken to a depth of 48" in the following increments: 0-6", 6-12", 12-24", 24-36", and 36-48". Planting, fertilizing and harvesting was completed with the cooperator's equipment, and the herbicides were applied by WSU. Seeding rate varied between the 3 locations (Table 1).

Table 1. Location-specific details for 2016 Spring Canola Variety Trials.

	Fairfield (Emtman Farms)	**St. John (Eriksen Farm)**	**Davenport (WSU Wilke Farm)**
Annual Precipitation (in)	16-18	15	13-14
Growing season rain (in)*	2.83	3.03	2.56
Soil pH	5.1	8.0	5.4-6.6
Plot size (ft)	30 x 500	24 x 500	20 x 500
Previous crop	Spring canola	Spring pea	DNS wheat
Seeding date	May 2	April 18	April 19
Seeding rate (lbs/acre)	3.5	5	5
Fertilizer	70N-15P-10K-15S-0.5B	70N-10P-10S	75N-12P-0K-8S
Drill type	CrossSlot	Cross Slot	Fabro double disk
Row spacing	10"	10"	9"
Herbicide application date	June 1	May 26	May 31
Harvest date	September 8	September 3	July 25
Combine make/model	Case IH 8240	John Deere 7700	John Deere 6622

*=data from AgWeatherNet for Fairfield and Davenport; St. John data collected by cooperator.

Six varieties were selected from Bayer CropScience, BrettYoung, Caldbeck Consulting, Croplan, Dow, and Spectrum Crop Development to encompass a range of herbicide tolerant or resistant traits: Roundup Ready®, Liberty Link®, Clearfield® (including a high-oleic), a non-GMO hybrid, and a *Brassica rapa*. Herbicide was applied specific to the trait of each variety and according to label instructions (Table 2).

Table 2. Spring canola varieties planted at each location, herbicides applied, and cost per acre of herbicides.

Cultivar	Source	Herbicide package[1]	$/acre
5535 CL	BrettYoung	Beyond® + NIS + AMS	15.65
Early One	Spectrum Crop Development	Assure II® + Crop Oil + AMS	15.15
HyCLASS 930	Croplan	Roundup PowerMax® + NIS + AMS	7.02
LL140P	Bayer CropScience	Liberty® + Assure II + NIS	19.44
NCC101S	Caldbeck Consulting	Assure II + Crop Oil + AMS	15.15
Nexera 2020CL	Dow	Beyond + NIS + AMS	15.65

[1] Beyond herbicide was not applied at Wilke due to preferred farm practice; Assure II was substituted.

Field tours were held at each trial location during early summer with a total of 165 contacts made at the three sites. A weigh wagon was used at harvest to determine yield, and subsamples from each plot at St. John and Fairfield were taken for oil analysis. The University of Idaho analyzed the subsamples using Nuclear Magnetic Resonance (NMR) equipment.

Results and Discussion:

As expected, 'Early One' was the first variety to flower at all locations (data not shown), and had the lowest yield (Table 3). *Brassica rapa* typically flower and mature 7-10 days earlier than *B. napus* and have a lower yield potential. The remaining five varieties flowered within a few days of each other. The mean yield across all sites and treatments was 2,202 lbs/acre, with a range of 1,887 to 2,420 lbs/acre (Table 3). The mean yield at each site followed precipitation (Fig. 1); Fairfield has the highest annual precipitation and had the highest yield, followed by St. John and Davenport. The higher CV at St. John is attributed to high weed pressure, relatively high pH (8.0) and some soil variability within the study. The treatments and locations are highly significant. The TRT x LOC interaction is not significant, which indicates each treatment performed similarly at each location. Thus, the data set was combined for yield analysis (Fig. 1), gross returns (Table 5) and returns over costs (Table 6).

The average oil content of all cultivars at St. John was 38.7%, and ranged from 36.5 (NCC101S) to 40.8% (HyCLASS 930). Oil content at Fairfield was higher with an average of 42.5% for all cultivars, with a low of 41.4 (LL140P) to a high of 44.4% (HyCLASS). Oil content differences between locations are most affected by environmental stressors, namely temperature and moisture (Jim Davis, UI, personal communication), and St. John had higher temperatures and lower precipitation than Fairfield. The higher weed pressure at St. John may have also added the stress of reduced soil moisture availability. Like the yield data, the TRT x LOC interaction was not significant, so the data set was combined for statistical analysis (Table 4).

Economics play a large part in grower decisions about crop rotation. Vicki McCracken, WSU, has developed enterprise budgets that are valuable tools growers can use to determine if having an oilseed

in rotation will work economically on their farm. The budgets are designed for users to enter as little or as much information as they prefer, including chemical costs, machinery costs, insurance, etc. These on-farm trials can help growers see the performance of different varieties and use the data from the trial closest to their farm in the enterprise budgets to aide in decision-making. Yield is just one of the considerations when choosing a canola variety and other factors play a role in overall profitability. Gross economic returns are calculated by multiplying the yield by the market price and include premiums offered for non-GMO and high oleic canola. Early One had significantly less gross returns than the other five cultivars (Table 5). However, when seed and herbicide costs are taken into account, more differences are realized in economic returns over input costs (Table 6). Seed costs varied from $18/acre to $59/acre, herbicide options between the six cultivars ranged from $7/acre to $19/acre, and total costs ranged from a low of $33/acre for Early One to the highest costs for LL140P at $78/acre. NCC101S had higher return over costs than LL140P and Early One at $380/acre compared to only $335 and $311/acre, respectively. Fertilizer costs were not factored into the economic analysis because rates were held constant across all varieties at a given location.

Because of the positive response from producers and industry of the value of the on-farm spring canola variety trials, winter canola trials were established in late August to early September at four locations in eastern Washington: Ralston, St. John, Hartline, and Odessa (irrigated). Another set of spring variety trials is in the final planning stages for 2017.

Table 3. Yield results of the 2016 Spring Canola Variety Trials including mean yield and rank

	Mean		Davenport		Fairfield		St. John	
Cultivar	**Yield**	**Rank**	**Yield**	**Rank**	**Yield**	**Rank**	**Yield**	**Rank**
	----------		----------		lbs/acre ----------		----------	
NCC101S	2,420	1	2,063	1	2,657	3	2,539	1
HyCLASS 930	2,368	2	1,945	3	2,785	1	2,374	2
LL140P	2,272	3	1,960	2	2,691	2	2,164	4
BrettYoung 5535CL	2,181	4	1,752	4	2,263	5	2,263	3
Nexera 2020CL	2,081	5	1,621	5	2,544	4	2,077	5
Early One	1,887	6	1,565	6	2,103	6	1,993	6
Mean	2,202		1,818		2,552		2,235	
Tukey HSD $_{(0.05)}$			398		415		650	
CV			9.3		7.1		12.7	

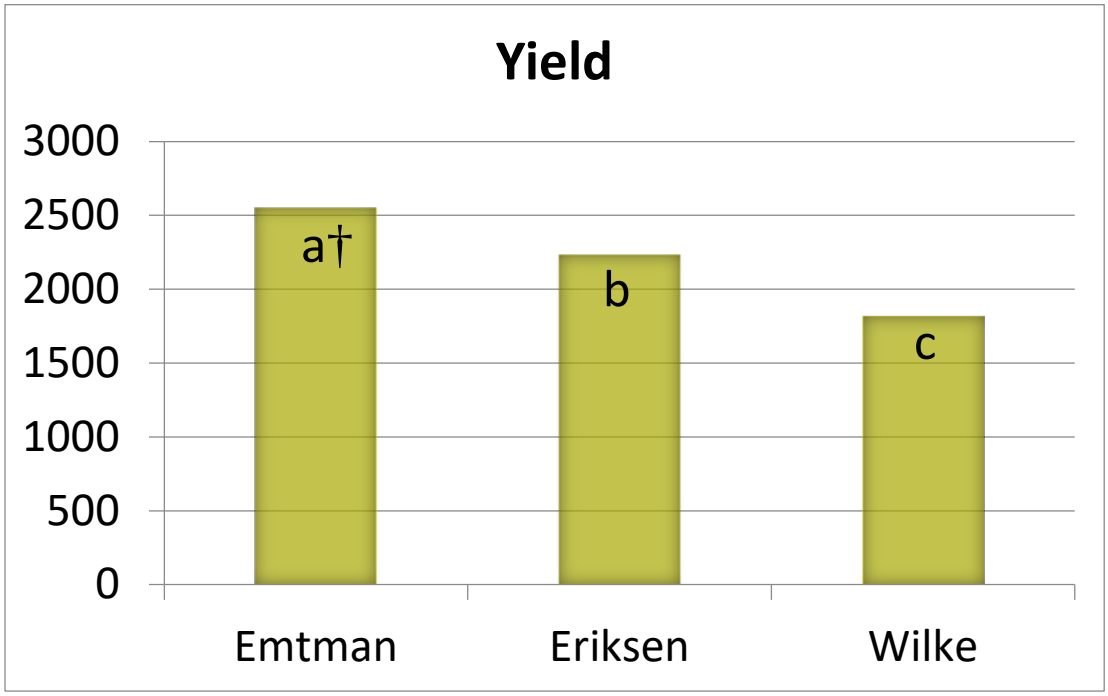

Figure 1. Mean yield at each location.

† P<0.05

Table 4. Key end-use oil characteristics of the six canola varieties averaged over the Emtman and Eriksen sites. Oil analysis was not completed for the Davenport site.

Treatment	Oleic Fatty Acids (%)		Linolenic Fatty Acids (%)		Total Oil Content (%)	
Nexera 2020CL	75.4	a	2.6	c	40.8	bc
LL140P	66.6	b	7.3	b	39.5	bc
HC 930	66.5	b	7.3	b	42.6	a
BY 5535CL	65.1	bc	7.5	b	40.2	bc
NCC101S	64.6	bc	8.3	ab	39.2	c
Early One	62.9	c	9.9	a	41.0	ab
Significance	0.001		0.001		0.0001	
Tukey HSD $_{(0.05)}$	2.30		1.40		1.8	

Table 5. Yield and gross returns for each variety across locations.

Treatment	Yield (lb/ac)		Mkt Price ($/lb)		Gross ($/ac)	
NCC101S	2420	a	0.1822		441	a
HC 930	2368	ab	0.1672		396	b
LL140P	2272	abc	0.1672		414	ab
BY 5535CL	2181	bc	0.1822		397	b
2020CL	2081	cd	0.1972		410	ab
Early One	1887	d	0.1822		344	c
Significance	0.001				0.001	
Tukey HSD (0.05	235				43	

Table 6. Economic return over costs with the assumption that seed cost and herbicide costs are the primary costs, and all other costs are equal at each location.

Treatment	Seed Costs ($/ac)	Herbicide Costs ($/ac)	Total Costs ($/ac)	Return over Input Costs ($/ac)	
NCC101S	46	15	$61	$380	a
HC 930	51	7	$58	$338	abc
LL140P	59	19	$78	$335	bc
BY 5535CL	37	16	$53	$345	abc
2020CL	37	16	$53	$358	ab
Early One	18	15	$33	$311	c
Significance				0.001	
Tukey HSD (0.05)				$25	

Personnel:

Cooperators

Randy Emtman, Fairfield
Kye & Tracy Eriksen, St. John
Derek Appel/WSU Wilke Research & Extension Farm, Davenport

WSU Faculty

Bill Pan, Professor of Soil Science, Washington Oilseed Cropping Systems (WOCS) Project Director
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Viterra

Daniel Stenbakken, agronomist

Seed provided by Bayer CropScience, BrettYoung, Caldbeck Consulting, Croplan by Winfield, Dow, and Spectrum Crop Development.

Report written by Karen Sowers and Aaron Esser.

Spring canola variety trials at Emtman Farms near Fairfield, WA. Photo taken June 20, 2016