

2015 PACIFIC NORTHWEST CANOLA VARIETY TRIAL RESULTS

Jim B. Davis, Megan Wingerson, and Jack Brown

PSES Dept., University of Idaho, Moscow, ID 83844-2339

ABSTRACT

The 2015 winter canola and rapeseed variety trial contained 32 cultivars or advanced breeding lines (including two control cultivars) and was planted at seven locations in the Inland Pacific Northwest in the late summer of 2014. Severe freezes in early November and December caused widespread winter kill of winter canola, and all trial sites were lost. A few cultivars showed slightly better survival than others in the trial, including 'DKW 46-15 RR,' 'DKW 45-25 RR' and 'Griffin'. During the summer of 2015, a trial with 30 spring canola and rapeseed cultivars or advanced breeding lines (including three control cultivars) from ten companies or breeding programs was planted at seven locations in the Inland Pacific Northwest. Cultivar mean yields ranged from 1,174 to 2,213 lbs. per acre when averaged across the six sites with a full complement of entries. Mean seed yield varied widely between locations, ranging from 559 to 2,738 lbs. per acre, with an overall mean of 1,741 lbs. per acre. The five cultivars with highest yields were 'HyCLASS 930 RR,' 'HyCLASS 955 RR,' 'NCC 101S,' 'DKL G28101 RR' and 'DKL 55-55 RR.'

INTRODUCTION

Growers in the Pacific Northwest continue to show a strong interest in spring canola (*Brassica napus*, *B. juncea*, and *B. rapa*) in part because spring canola offers growers an alternative crop for rotation in an agricultural system predominated by small cereal grains. Comprehensive yield trials are needed to evaluate new cultivars throughout the varied environments found in the Inland Pacific Northwest (PNW). With this objective in mind, researchers at the University of Idaho established the PNW Canola Variety Trial (PNWCVT) in 1994 and the PNW Winter Canola Variety Trial (PNWWVT) in the fall of 1995. These trials have successfully attracted cultivar entries from a number of seed companies, with 168 winter varieties from 22 companies and 292 spring varieties from 29 companies submitted for testing over the lifespan of the trials. In 2015, 13 different commercial companies and public breeding programs submitted 57 distinct cultivars. The trials were funded in 2015 by the University of Idaho and the commercial companies that submitted their cultivars or advanced breeding lines to be tested in the PNWCVT.

MATERIALS AND METHODS

Winter Trial. Thirty different *Brassica napus* cultivars plus two control cultivars ('Ericka' and 'Athena') were planted in the fall of 2014 at seven locations across the Inland Pacific Northwest (Table 1). Each of the evaluated cultivars was canola quality, except for three industrial rapeseed cultivars; 'Durola,' '05.WI.42.4' and '05.WI.45.2.2.' All of the industrial rapeseed cultivars have canola quality seed meal that is low in glucosinolates. Entries for this year's trial came from DL Seeds, Limagrain Cereal Seed, Kansas State University, Monsanto Company, Star

Specialty Seed, Winfield LLC, and the University of Idaho. Entries with a RR at the end of their name are a Roundup Ready[®] types, while CL or IMI denotes a Clearfield[®] canola or other variety with resistance to imidazolinone herbicides. Seeds of all varieties were treated with Helix[®] XTra or Prosper[™] 400 for control of flea beetles and seedling diseases.

Table 1. Location, tillage regime, and planting date of trials in the 2014-2015 Pacific Northwest Winter Canola Variety Trial.

Location	Tillage Regime	Planting Date
Odessa, WA	irrigated, conventional recrop	September 5, 2014
St. John, WA	direct seed, chemical fallow	July 22, 2014
St. John, WA Replant	direct seed, chemical fallow	August 19, 2014
Pendleton 1, OR	conventional fallow	September 18, 2014
Pendleton 2, OR	irrigated, conventional recrop	October 2, 2014
Genesee, ID	conventional fallow	September 2, 2014
Moscow, ID	conventional fallow	September 2, 2014
Grangeville, ID	conventional fallow	July 24, 2014

The experimental design used in the PNWWVT was a randomized complete block with four replications, and the size of an individual plot was 4 feet by 15 feet. A seeding rate of approximately 7 lbs. per acre was used. Trials were fertilized and managed according to local practices. All sites established well except the first site planted at St. John, WA, which did not establish due to dry soil conditions. A second site with better soil moisture near the first St. John site was located, and the trial was replanted after the site was lightly pre-irrigated to insure that the trial would establish. Winter survival was evaluated in April 2015.

Spring Trial. The 2015 spring trials were grown at seven locations: Bonners Ferry, ID; Moscow, ID; Genesee, ID; Craigmont, ID; Odessa, WA; Fairfield, WA; and Dayton, WA; Pendleton, OR. The tillage regimes and the planting dates for each site are shown in Table 2. Three canola cultivars ‘Profit,’ ‘Westar’ (*B. napus*) and ‘Goldrush’ (*B. rapa*) were used as controls in the trial. All cultivars tested were Argentine type (*B. napus*) canola-quality except for ‘Gem’ and ‘07.SI.8A10’, which are industrial Argentine rapeseed cultivars. Three breeding lines entered by the University of Idaho (05SC... or 07SC... lines) are specialty oil types with canola quality oils that are high in oleic acid and/or low in linolenic acid for improved frying properties and shelf life. Entries ending in “RR” are Roundup Ready[®] types (resistant to glyphosate herbicide); those with “LL” are Liberty Link[®] cultivars (resistant to glufosinate herbicide); “SU” indicates resistance to sulfonylurea herbicides, and “CL” denotes Clearfield[®] canola (resistant to imazamox herbicide) or other cultivars that are resistant to the imidazolinone herbicides. The companies that entered cultivars are listed with the yield data in Table 4.

Seed of two varieties, ‘DKL G28101 RR’ and ‘P3H 13005,’ was not available at the planting date for the Odessa site. For each site, a randomized complete block design with 4 replicates, and plot dimensions were 4 feet by 16 feet. The seeding rates were approximately 7 lbs. of seed per acre for *B. napus* cultivars and 5 lbs. per acre for *B. rapa* cultivars; although

lower seeding rates were used for some cultivars with small seed size to achieve approximately 450,000 plants per acre. Seed from each variety was treated with Helix[®] Xtra or Prosper[™] 400 prior to planting for control of flea beetles and seedling diseases. All trials were grown on recrop ground and were fertilized according to local practice.

Table 2. Location, tillage regime, and planting date of trials in the 2015 Pacific Northwest Spring Canola Variety Trial.

Location	Tillage Regime	Planting Date
Bonnors Ferry, ID	tilled	April 21
Moscow, ID	tilled	April 27
Genesee, ID	tilled	April 27
Craigmont, ID	no till	May 1
Odessa, WA	tilled, irrigated	April 8
Fairfield, WA	minimum till	April 30
Dayton, WA	no till	April 28

The date of flower onset and plant height at maturity was recorded for each plot at the Moscow and Genesee locations. Flowering date was recorded when 50% of the plot was in bloom and is presented as days from planting to flowering. No lodging was observed, so plots were not scored for that trait. After harvest, the seed was weighed to determine yield, and a cleaned subsample from each plot was saved for oil content analyses. Oil content was estimated using a Nuclear Magnetic Resonance (NMR) analyzer after samples were dried to approximately 2% moisture.

RESULTS AND DISCUSSION WINTER TRIAL

By October, all winter canola trial sites had established well; however, severe freezes in early November and December caused widespread winter kill of winter canola in the PNW. Temperatures for the first frost of the season in early November reached as low as 5°F to -5°F, depending on the locale. This hard freeze without snow cover lasted for several days and occurred after very little cold acclimation, and it was accompanied by steady winds that desiccated the plants. A second, similar freeze occurred in early December. Much of the commercial acreage of winter canola in the PNW was lost, and in some areas of the PNW, a significant acreage of winter wheat was lost as well. Losses in the trial were bad enough that all sites were abandoned. In some cases, absolutely no plants survived. At some locations, a few cultivars did show slightly better survival than others in the trial, including ‘DKW 46-15 RR,’ ‘DKW 45-25 RR’ and ‘Griffin’ (Table 3.)

RESULTS AND DISCUSSION SPRING TRIAL

Goldrush was the earliest flowering cultivar at 41 days after planting (Table 4). Since Goldrush is a *B. rapa* cultivar, it typically flowers earlier than *B. napus* cultivars. Flowering dates for the

remainder of the cultivars varied by a week and ranged from 46 to 54 days after planting, with a mean flowering time of 49 days after planting, typical for the region. Plant canopy height varied from 42 to 52 inches by cultivar, and the average plant canopy height was 48 inches.

The overall mean seed yield was 1,741 lbs. per acre when averaged across the six locations with all entries and ranged from 1,174 to 2,213 lbs. per acre by cultivar (Table 4.) The Genesee, ID site had the highest mean yield at 2,738 lbs. per acre, while the lowest yielding site was at Craigmont, ID, with a mean yield of 559 lbs. per acre. The five cultivars with highest yields were 'HyCLASS 930 RR,' 'HyCLASS 955 RR,' 'NCC 101S,' 'DKL G28101 RR' and 'DKL 55-55 RR.'

The average seed oil content for all cultivars was 39.8%, and the oil content of individual cultivars ranged from 36.6% for NCC 101S to 42.8% for 'Star 402 RR' (Table 5.) Average oil content by site ranged from 36.0% at Odessa, WA to 41.9% at Moscow, ID. The ranking of the cultivars by oil production in lbs. per acre (data not shown) was remarkably similar to the rank by seed yield. The notable exception was the change of Star 402 RR from a yield rank of 6 to an oil yield rank of 3, while NCC 101S moved from a yield rank of 3 to an oil per acre rank of 7.

The Pacific Northwest had below average precipitation and above average temperatures during the 2015 growing season, and this was reflected in commercial yields throughout the region and our plot yields at Fairfield, Dayton and Craigmont. Commercial yields were roughly 60% of recent averages throughout the region. The effects on the trials from the lack of moisture and high temperatures were aggravated by relatively late planting dates at Dayton and Craigmont as compared to previous years. The Craigmont site was hit particularly hard, with the trial being planted about a week after nearby commercial fields and producing yields of about 45% of the average commercial yield in the area. Yields at some sites that received isolated rain storms during June did remain high despite above average temperatures, particularly near Moscow and Genesee. Light, overhead irrigation at the Odessa site during the hottest days of the growing season kept the relative humidity high in the crop canopy, and that appears to have helped maintain good yields at that site.

In spite of the challenging season, twelve cultivars had mean yields of over 1,800 lbs. per acre, and seven were over the one ton mark. The increase in spring canola yields as compared to those seen during the mid-1990s even in the face of an extreme season can be attributed to both genetics advances and improved production practices. The availability of high yielding spring canola varieties from numerous sources allows growers to weigh other considerations such as seed price, contract terms, and herbicide resistance packages when choosing a cultivar. Growers should carefully examine the data from individual sites when choosing a cultivar and focus on sites that have growing conditions similar to their own farms rather than relying completely on the overall mean yields presented.

Table 3. Winter survival scores (1.0 to 9.0 scale, 1.0 indicates complete winterkill, and 9.0 indicates complete survival.) from the 2014-2015 PNW Winter Canola & Rapeseed Variety Trial with mean scores from five locations and an overall mean score of the four locations with all entries.

Varieties Tested	Mean Survival**		Survival by Location				
			Moscow	Genesee	Grangeville	St John	Odessa
			ID	ID	ID	WA	WA
	<i>score</i>	<i>rank</i>	<i>score</i>				
Controls							
Erica	1.3	18	1.5	1.4	1.3	1.0	1.5
Athena	1.4	17	1.0	1.4	1.0	1.5	1.8
DeKalb							
DKL41-10	1.6	12	1.5	1.8	*	1.3	1.8
DKL44-10	1.6	11	1.3	2.1	*	1.0	2.0
DKL46-15.RR	3.2	1	2.8	5.8	*	1.3	3.0
DKL47-15.RR	1.8	8	1.4	2.2	*	2.0	1.5
Rubisco Seeds							
Edimax.CL	1.5	14	1.3	1.8	1.0	1.5	1.5
Inspiration	1.3	20	1.0	1.8	1.0	1.3	1.3
Mercedes	1.5	13	1.3	1.6	1.3	2.0	1.3
Visby	1.5	15	1.3	1.9	1.0	1.3	1.5
Limagrain Cereal Seed							
Alabaster	1.3	22	1.5	1.4	1.0	1.0	1.3
Albatros	1.2	26	1.3	1.1	1.0	1.3	1.3
Artoga	1.2	28	1.0	1.1	1.0	1.5	1.0
Kansas State University							
Griffin	2.9	2	3.1	3.9	1.0	1.0	3.8
DKW 45-25 RR***	2.3	3	2.3	2.8	1.8	1.0	3.0
KSR.07363	2.0	6	2.0	2.5	2.5	1.0	2.5
KSUR.21	2.0	5	2.4	2.8	2.0	1.0	2.0
Star Specialty Seeds							
Star.915W.RR	2.1	4	2.5	2.8	1.0	1.3	1.8
Winfield							
HyCLASS.115W.RR	1.7	10	1.9	2.0	1.5	1.3	1.8
HyCLASS.125W.RR	1.4	16	1.8	1.8	1.5	1.0	1.3
Exp.13-26.RR	1.0	32	1.0	1.0	1.0	1.0	1.0
University of Idaho							
Amanda	1.3	21	1.0	1.6	1.0	1.0	1.5
06.WC.1	1.3	18	1.3	1.4	1.5	1.3	1.5
UI.05.6.33	1.2	28	1.0	1.1	1.0	1.0	1.5
04.WL.4.4.404	1.2	25	1.4	1.4	1.3	1.3	1.0
05.WC.6.4.3 IMI	1.3	24	1.0	1.3	1.0	1.5	1.3
05.WC.9.7.5.6 IMI	1.1	30	1.1	1.3	1.0	1.0	1.0
05.WC.10.B2A4	1.1	30	1.0	1.1	1.0	1.3	1.0
05.WC.15.7.5 IMI	1.3	22	1.5	1.4	1.0	1.0	1.3
Durola Rapeseed	1.9	7	1.5	2.6	1.0	1.5	2.0
05.WI.42.4 Rapeseed	1.2	27	1.0	1.3	1.0	1.3	1.3
05.WI.45.2.2 Rapeseed	1.8	9	1.6	2.9	1.5	1.3	1.3
Mean	1.6		1.5	1.9	1.2	1.2	1.6
LSD	0.4		0.6	1.0	0.6	NS	0.8

* Variety not tested

** Mean of the four sites with all entries

*** Formerly KSR.07352S

Table 4. Results of the 2015 PNW Spring Canola & Rapeseed Variety Trial including mean yield (lbs./acre) and rank at sites with all entries (all sites except Odessa), yield by site (lbs./acre), flower date at Moscow and Genesee (days after planting), and plant height at Moscow and Genesee (inches)..

Varieties Tested	Mean Yield		Mean Yield by Location						Mean Flower Start	Mean Plant Height	
	and Rank		Odessa WA	Fairfield WA	Dayton WA	Bonnerr Ferry ID	Moscow ID	Genesee ID			Craigmont ID
	<i>lbs per acre</i>	<i>rank</i>	-----			<i>lbs per acre</i>			<i>days</i>		<i>inches</i>
Control Varieties											
Westar	1,383	28	2,534	1,396	1,232	1,293	2,004	2,083	288	48	44
Profit	1,514	22	2,137	1,580	1,153	1,752	1,960	2,329	307	48	47
Goldrush	1,236	29	2,540	1,171	959	1,434	1,483	1,995	375	41	46
Bayer CropScience											
InVigor L130 LL	1,921	8	2,478	1,697	1,458	2,314	2,048	3,324	687	50	51
InVigor L140P LL	1,914	9	2,514	1,758	1,096	2,700	2,203	3,123	602	51	52
InVigor L120 LL	1,828	12	2,615	1,891	1,374	1,967	1,930	3,054	750	50	49
Brett Young Canola											
5535.CL	1,858	10	2,795	1,725	1,239	2,231	2,288	3020	646	49	51
6044.RR	1,741	18	1,850	1,690	1,239	1,941	2,409	2638	526	52	48
6074.RR	1,844	11	2,115	2,035	1,101	1,926	2,515	2884	600	52	50
Cargill Specialty Seeds and Oils											
V12-1 RR	1,696	19	2,019	1,709	1,190	2,070	2,038	2,499	669	52	51
V22-1 RR	1,492	24	1,772	1,737	1,043	1,835	1,761	2,133	445	52	46
Cibus											
C 1511 SU	1,788	13	1,958	1,752	1,229	2,163	2,219	2,809	554	51	52
C 1516 SU	1,606	20	*	1,441	961	1,997	2,162	2,708	365	54	50
Winfield											
HyCLASS 930 RR	2,213	1	2,976	2,313	1,535	2,551	2,641	3,410	827	47	46
HyCLASS 955 RR	2,185	2	2,966	2,226	1,403	2,687	2,984	3,137	670	47	48
HyCLASS 970 RR	1,769	16	*	1,790	1,233	2,437	1,992	2,828	332	49	49
DeKalb											
DKL 38-48 RR	1,779	14	2,435	1,750	1,263	2,393	2,033	2,676	557	47	46
DKL 55-55 RR	2,095	5	2,941	2,262	1,469	2,157	2,588	3,344	747	47	49
DKL G28101 RR	2,103	4	*	1,998	1,538	2,350	2,788	3,116	830	48	49
P3 Hybrids Inc											
P3H 13005	2,047	7	*	1,952	1,505	2,420	2,442	3,081	882	48	50
Phytosyntech LLC											
NCC 101 S	2,109	3	2,888	1,658	1,411	2,224	2,827	3,391	1,144	46	44
Star Specialty Seed											
Star 402 RR	2,069	6	2,624	2,028	1,469	2,461	2,823	3,076	557	48	49
University of Idaho											
Gem Rapeseed CL	1,447	25	2,116	1,470	1,041	1,529	1,988	2,334	317	47	45
07.SI.8.A10 Rapeseed	1,772	15	2,530	2,022	1,446	1,955	1,927	2,670	613	46	43
Empire Canola	1,744	17	2,619	1,692	1,278	1,797	2,265	2,831	598	46	45
Cara Canola CL	1,541	21	2,192	1,545	1,236	1,522	1,963	2,531	449	48	47
Arriba Canola	1,432	27	2,284	1,747	1,159	1,172	1,391	2,638	483	46	42
05SC12A10.19.12	1,174	30	1,720	878	973	1,595	1,422	1,848	328	49	46
07SC17.20.B4	1,503	23	2,539	1,524	1,182	1,610	2,021	2,379	304	50	48
07SC27.12.19.B3	1,444	26	2,227	1,497	1,114	1,518	1,949	2,263	321	49	46
Mean	1,741		2,399	1,731	1,251	2,000	2,169	2,738	559	49	48
LSD ($p = 0.05$)	137		353	364	191	364	424	458	206	0.6	2
C.V.	15.3		10.5	14.9	10.8	12.9	13.9	12.9	26.2	1.3	4.3

Table 5. Seed oil content (%) of entries in the 2015 PNW Spring Canola & Rapeseed Variety Trial with mean values from each site and overall means from all sites except Odessa, which did not have all entries.

Varieties Tested	Mean Oil Content		Mean Oil Content by Location						
	and Rank		Odessa WA	Fairfield WA	Dayton WA	Bonnors Ferry ID	Moscow ID	Genesee ID	Craigmont ID
	<i>percent</i>	<i>rank</i>	<i>percent</i>						
Control Varieties									
Westar	39.1	23	35.8	39.3	36.3	39.9	41.4	39.7	37.9
Profit	40.5	8	36.3	39.8	37.7	41.8	42.5	41.3	39.8
Goldrush	37.8	28	37.4	38.7	36.3	39.8	38.9	38.1	35.2
Bayer CropScience									
InVigor L130 LL	40.0	12	35.8	39.3	36.9	42.0	42.5	40.7	38.7
InVigor L140P LL	39.3	21	35.2	38.2	36.0	41.7	41.4	40.1	38.4
InVigor L120 LL	40.0	13	34.8	40.5	36.5	41.6	41.9	40.8	38.7
Brett Young Canola									
5535.CL	39.8	17	35.3	39.6	36.3	40.3	42.1	40.9	39.6
6044.RR	39.9	14	34.3	40.6	37.3	40.8	42.3	40.7	37.6
6074.RR	40.1	10	34.5	40.9	37.4	40.7	42.6	41.1	38.2
Cargill Specialty Seeds and Oils									
V12-1 RR	39.8	16	35.1	39.4	36.0	41.9	42.6	40.7	38.4
V22-1 RR	39.8	15	34.6	39.6	36.7	41.7	42.3	40.7	38.1
Cibus									
C 1511 SU	37.9	27	33.1	37.9	35.5	39.4	39.9	38.0	37.0
C 1516 SU	38.6	25	*	37.3	36.3	40.5	41.1	38.9	37.8
Winfield									
HyCLASS 930 RR	42.1	2	39.0	42.3	38.4	44.3	44.7	42.8	40.4
HyCLASS 955 RR	41.8	3	37.9	43.4	37.4	43.4	43.8	42.5	40.4
HyCLASS 970 RR	40.6	7	*	40.9	37.0	43.1	42.8	41.3	38.8
DeKalb									
DKL 38-48 RR	39.7	19	35.6	40.0	36.2	41.9	42.2	39.6	38.6
DKL 55-55 RR	41.8	4	38.5	42.6	38.0	42.9	44.1	42.6	40.4
DKL G28101 RR	41.0	6		41.8	37.1	42.8	42.7	42.4	39.4
P3 Hybrids Inc									
P3H 13005	38.4	26	*	38.6	35.5	40.6	40.7	39.2	36.0
Phytosyntech LLC									
NCC 101 S	36.6	30	32.3	36.0	32.3	38.7	38.6	38.3	35.9
Star Specialty Seed									
Star 402 RR	42.8	1	38.7	43.4	38.7	44.4	45.3	43.8	41.3
University of Idaho									
Gem Rapeseed CL	41.0	5	38.2	41.2	37.9	41.9	43.4	41.7	40.3
07.SI.8.A10 Rapeseed	40.4	9	37.8	41.6	36.6	41.1	41.9	41.4	39.5
Empire Canola	37.3	29	35.8	39.6	35.7	39.0	40.2	39.4	30.1
Cara Canola CL	40.0	11	36.3	40.8	35.8	40.9	41.0	41.6	40.1
Arriba Canola	39.2	22	36.3	40.1	36.2	39.3	41.0	39.7	38.8
05SC12A10.19.12	38.9	24	35.6	37.7	37.4	40.0	40.4	38.7	39.1
07SC17.20.B4	39.4	20	36.0	39.6	36.0	40.8	41.5	40.2	38.4
07SC27.12.19.B3	39.8	18	36.4	39.9	37.3	40.6	42.3	40.6	38.3
Mean	39.8		36.0	40.0	36.6	41.2	41.9	40.6	38.4
LSD ($p = 0.05$)	0.7		1.0	1.3	0.9	0.7	1.2	1.1	4.6
C.V.	3.0		2.1	2.2	1.7	1.3	2.1	1.9	8.6