2009 PACIFIC NORTHWEST WINTER CANOLA VARIETY TRIAL AND DEEP FURROW TRIAL RESULTS

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ABSTRACT

A winter rapeseed and canola variety trial with 22 canola or industrial rapeseed (Brassica napus or B. rapa) cultivars or advanced breeding lines was grown at six locations in the inland Pacific Northwest. Mean yield by location ranged from 2337 to 4426 lbs. per acre, and mean yields of individual cultivars across all locations ranged from 1880 to 4703 lbs. per acre. An additional trial planted with a commercial deep furrow, direct seed drill was grown at one site in eastern Washington. Five varieties were tested in the deep furrow trial, and yields ranged from 2110 to 2928 lbs. per acre.

INTRODUCTION

For many years, winter rapeseed has been grown on a few thousand acres in the inland Pacific Northwest (PNW) region of the U.S.A. Until the last decade, this production had been exclusively industrial rapeseed with high levels of erucic acid in its oil. The acreage has increased during the last 15 years, and most of this new production has been with cultivars that produce canola-quality oil and meal. Many new cultivars are now available, and yield trials throughout the region are needed to evaluate these new cultivars and to identify more areas in the region that are suited to winter canola or rapeseed production. Roundup Ready® winter canola cultivars were available commercially on a limited basis for the first time in the PNW in the fall of 2005 and are now widely available, and growers need to know how their performance compares to standard cultivars. In addition, many growers would like to plant winter canola in a recrop situation rather than planting in early August onto summer fallow as is traditional. Late planting is necessitated by recrop production, and for a winter canola or rapeseed cultivar to be successful under such conditions, it must be able to establish when planted at a later date, and it must over-winter as a small plant. Pressure from increased flea beetle populations has also pushed optimum planting times to later dates. Plant breeders at the University of Idaho have been working to develop cultivars that are suited to production in a recrop situation, and these new cultivars and other available cultivars need to be tested under recrop and late-planted conditions. In addition, cultivars need to be tested using new direct seed technology to determine varietal responses to tillage method.

To address these issues, the University of Idaho founded the Pacific Northwest Winter Canola Variety Trial (PNWWVT) in the fall of 1995. Both commercial cultivars and advanced breeding lines have been tested. In the last 14 years, the project has evaluated 122 winter cultivars or advanced lines representing 15 companies. The 2009 trial was funded by the PNW

Canola Research Program, the University of Idaho, and fees paid by the commercial companies that submit their cultivars or advanced breeding lines to be tested in the PNWWVT.

During the past few years, planting conditions at the traditional planting time for winter canola have been drier than usual, hampering crop establishment. One potential agronomic solution to the problem of dry soil conditions at planting time is the use of deep furrow drills. To further investigate this possibility, the University of Idaho canola research group undertook a small, field-scale trial in cooperation with Michael Stubbs near Dusty, Washington during the 2008-2009 crop year. Five varieties were planted using Stubbs' Agpro direct seed drill that has been customized to plant in deep furrows with a 28-inch row spacing.

MATERIALS AND METHODS

Nineteen Brassica napus canola or rapeseed cultivars and breeding lines plus three control cultivars; 'Dwarf Essex' industrial rapeseed (B. napus), 'Bridger' industrial rapeseed (B. napus), and 'Salut' canola (B. rapa), were planted in the fall of 2008 at eight locations (Table 1). The trial included canola entries from several sources; Croplan Genetics, DL Seeds, Monsanto Company, Wilbur-Ellis Company, and the University of Idaho Canola, Rapeseed and Mustard Program. All entries were canola-quality cultivars except the two rapeseed controls and two "WH" industrial rapeseed entries from the University of Idaho. One third of the cultivars entered were Roundup Ready® types, and these are designated with "RR" in their names.

Table 1. Location, tillage regime, and planting date of trials in the 2009 Pacific Northwest Winter Canola Variety Trial.

Location	Tillage Regime	Planting Date
Moses Lake, WA	irrigated, conventional till	Sept 5, 2008
Davenport, WA	direct seed, chem fallow	Sept 9, 2008
Dayton, WA	direct seed, chem fallow	Sept 8, 2008
Moscow, ID	conventional fallow	Aug 28, 2008
Genesee, ID	conventional fallow	Aug 28, 2008
Grangeville, ID	conventional fallow	Sept 4, 2008
Pendleton, OR	conventional fallow	Sept 10, 2008
Hermiston, OR	irrigated, conventional till	Sept 18, 2008

The trial design used in the regional trials was a randomized, complete block with four replications. Plot size was 4 by 16 ft., and the seeding rate was approximately 8 lbs. per acre. Trials were fertilized according to local practice. The plots at six sites established and grew well throughout the growing season. However, dry conditions at planting time resulted in no or poor seedling emergence at Davenport and Dayton, and the trials at these sites were abandoned before winter. The dates of 50% bloom were recorded at the Moscow and Genesee sites. Plant canopy height was measured at crop maturity at the Moses Lake and Genesee sites. Prior to harvest, all plots at each site were cut with a small plot swather to allow the plant stems to dry to aid harvest. After harvest, the seed from each plot was weighed to determine yield, and a subsample was taken for oil content estimation with a nuclear magnetic resonance (NMR) analyzer.

The deep furrow trial at the Stubbs' Farm was planted on August 28, 2008 in chem fallow ground. The trial consisted of five varieties planted in randomized complete block design with four replications. The trial was planted with an Agpro one pass, direct seed drill that has been customized to plant in deep furrows on 28-inch row spacing. Each plot was one drill-pass wide by 160 feet long. The varieties planted were 'Amanda,' 'Athena,' 'Baldur,' 'DKW 45-10 RR,' and 'Ericka.' To determine yield, a five-foot wide swath from each plot was harvested by direct-cutting with a small plot combine.

RESULTS

Deep Furrow Trial

The mean yield of the deep furrow trial at Dusty was 2594 lbs. per acre (Table 2). The yield rank in this trial was somewhat different than expected however. In the regional trials (see below), Baldur was among the highest yielding varieties, and DKW 45-10 RR was ranked sixteenth; however in this trial, the relative positions of those two varieties were reversed. The relatively poor performance of Baldur is similar to some growers' observations of that variety in the hotter, drier areas of the PNW. DKW 45-10 is a moderately early cultivar, and this attribute might have given it an advantage at Dusty. The relative branching ability of each variety could have had an effect on yield as well, since the trial utilized extremely wide row spacing. The performance of the three University of Idaho varieties was on par with expectations.

Table 2. Yield (lbs. per acre) of varieties in the Stubbs' Farm deep furrow trial.

Variety	Yield	
DKW 45-10 RR	2928	a*
Amanda	2775	ab
Athena	2720	ab
Ericka	2436	bc
Baldur	2110	c
Mean	2594	
LSD (p=0.05)	435	
C.V. (%)	10.9	

* means with the same letter are not different by Fisher's protected LSD test.

Regional Variety Trials

Mean flower date was day 136 (days from Jan 1, i.e., May 16). The earliest cultivars were 'Salut' and 'Ericka,' flowering on day 132 and 133, respectively. The date of flowering ranged from day 132 to day 139, or about one week's difference (Table 3). Mean plant height was 59 inches, with Ericka and 'DKW 45-10 RR' being the shortest cultivars at 55 inches, and 'UI.05.17' being the tallest at 64 inches. Other tall cultivars included 'HyCLASS 107W RR,' '06UIWC.4,' 'UI.07.15,' and '06UIWH.5.2.' The only site with a significant amount of lodging was at Grangeville, where all cultivars exhibited severe lodging.

The trial mean was 3609 lbs. per acre, and mean yields from the sites ranged from 2337 lbs. per acre at the Pendleton site to 4426 lbs. per acre at the Genesee site (Table 3). Cultivars yielded from 1880 lbs. per acre to 4703 lbs. per acre when averaged across all locations. The highest yielding line was'Visby' for the second year in a row, followed by 'Sitro' at 4314 lbs. per acre and 'Baldur' at 4166 lbs. per acre. The highest yielding University of Idaho canola-quality breeding line was 'Amanda' (formerly '06UIWC.5') at 3897 lbs. per acre.

Oil content was determined on all harvested plots (Table 4). The mean oil content across all varieties at the selected sites was 41.0%. The site with the highest oil content was Pendleton at 44.1%, while the Moscow site had the lowest oil content, 38.8%. Mean oil contents of the individual varieties ranged from 38.7% to 44.2%. In general, oil contents were higher this year than in previous years, and as expected, the industrial rapeseed cultivars had the highest oil contents.

DISCUSSION

Progress in cultivar development is being made; new cultivars tested in 2009 showed improved yield potential over those tested in previous years. However, work needs to continue to develop cultivars that are better adapted to direct seed systems and that have increased winter hardiness in the seedling stage to allow later planting during dry falls and in recrop situations.

As in previous years these trials demonstrated that even with timely late summer rains, establishing winter canola can be difficult at some sites, especially in direct seed situations. In fact, both direct seed sites were abandoned this year because of poor emergence. Cropping systems with traditional fallow or irrigation continue to provide the best chance for establishing a winter canola crop. The use of deep furrow drills is a possible alternative to establish winter canola in dry, fallow situations, as demonstrated by the trial on the Stubbs' Farm. However, other sites in the traditional wheat fallow region that were evaluated during 2008 for deep furrow planting proved to be too dry for even that method.

Recent discussions of winter canola establishment within the PNW canola-growing community have centered on earlier planting times to take advantage of the greater amount of moisture available in fallow soils in midsummer. Several growers in the region planted winter canola in early and mid July, 2009. In general, the crop established well at this time; although some problems were encountered. The problems included severe aphid pressure in late August and early September, premature bolting of at least one cultivar, and some drought-stressed patches. At least two early-planted variety trials are also in place for the 2010 crop year, one near Dusty, Washington is managed by University of Idaho personnel, and one near Davenport, Washington is managed by Washington State University personnel. Results from these field-scale trials and research plots are being anxiously awaited.

Table 3. Results from the 2009 PNW Winter Canola Variety Trial including mean yield (lbs./acre), mean yield rank, yield by location (lbs./acre), establishment score (Moscow and Genesee, 1 to 9, 9 equals best), flower date (Moscow and Genesee, days from Jan. 1), and plant height (Moses Lake and Genesee, inches).

	Mean	Yield	Site Yields						Establish-	Flower	Plant
Variety	Yield	Rank	Moses Lake	Genesee	Moscow	Grangeville	Pendleton	Hermiston	ment	Start	Height
Controls											
Dwarf Essex	3,449	14	4,545	3,880	2,447	4,074	2,465	3,282	6.1	135	63
Bridger	2,996	21	3,703	3,294	2,085	3,821	2,095	2,975	7.1	134	57
Salut	1,880	22	2,896	2,588	904	2,154	938	1,802	7.5	132	59
Monsanto Co.											
DKW.13-69 RR	3,682	11	4,730	4,243	2,698	4,755	2,353	3,313	6.6	135	62
DKW.13-86 RR	3,353	18	4,123	3,739	2,876	3,983	1,946	3,450	6.4	137	61
DKW.45-10 RR	3,418	16	4,129	3,917	2,229	4,379	2,140	3,714	5.6	135	58
DKW.46-15 RR	3,425	15	4,084	4,547	2,694	4,145	2,141	2,936	5.9	136	59
DL Seeds											
Visby	4,703	1	5,609	6,476	3,190	5,966	2,740	4,235	7.4	134	61
Sitro	4,314	2	4,966	5,434	3,397	4,894	3,098	4,093	7.1	135	62
HyCLASS 154W RR	3,896	6	4,623	5,108	3,157	4,339	2,571	3,576	7.0	136	64
Croplan Genetics											
Baldur	4,166	3	4,890	5,878	3,097	5,003	2,192	3,937	6.4	134	63
HyCLASS 107W RR	3,308	19	3,945	4,301	2,325	4,022	2,062	3,191	6.8	137	63
Wilbur-Ellis Co.											
Camas RR	3,193	20	3,960	3,162	3,461	3,653	1,444	3,480	6.5	138	60
Univ. of Idaho											
Athena	3,892	7	4,661	4,720	2,831	4,668	2,826	3,645	6.4	135	60
Ericka	3,372	17	4,483	4,075	2,680	3,076	2,302	3,616	6.9	133	57
Amanda	3,897	5	4,508	4,813	3,438	4,367	2,835	3,420	6.8	138	60
06UIWC.1	3,793	9	4,505	4,524	2,963	4,956	2,361	3,446	6.5	136	62
06UIWC.4	3,849	8	4,953	4,615	3,311	3,984	2,653	3,577	6.5	139	65
UI.05.17	3,700	10	4,427	4,591	3,233	4,100	2,555	3,295	6.9	139	67
UI.05.12	3,639	12	4,082	4,789	2,669	4,438	2,490	3,368	7.0	139	66
06UIWH.5.1	3,953	4	4,721	5,003	3,202	4,741	2,631	3,420	6.9	135	61
06UIWH.5.2	3,525	13	4,562	3,671	2,712	4,174	2,579	3,449	7.0	138	65
Trial Mean	**3,609**		**4,414**	**4,426**	**2,800**	**4,259**	**2,337**	**3,419**	**6.7**	**136**	**62**
LSD (p = 0.5%)	**306**		**812**	**865**	**646**	**957**	**567**	**547**	**0.8**	**1.4**	**2.4**
C.V. (%)	**14.6**		**13.3**	**14.1**	**14.1**	**16.0**	**17.3**	**11.3**	**8.7**	**7.5**	**4.0**

Table 4. Mean seed oil content (%) estimated by NMR, rank by meal oil content, and mean oil content (%) by site of varieties entered in the 2009 PNW Winter Canola Variety Trial.

Variety	Mean Oil Content	Oil Rank	Oil Content by Site					
			Moses Lake	Moscow	Genesee	Grangeville	Pendleton	Hermiston
Controls								
Dwarf Essex	42.0	3	41.8	39.5	44.9	39.5	46.2	40.5
Bridger	42.0	4	42.2	39.3	45.1	40.4	44.0	41.0
Salut	38.7	22	39.2	35.7	41.8	37.8	40.9	36.5
Monsanto Co.								
DKW.13-69 RR	40.9	11	40.1	37.9	44.0	39.5	43.9	40.2
DKW.13-86 RR	41.5	6	41.5	38.9	44.4	38.3	45.4	40.3
DKW.45-10 RR	39.9	20	39.3	38.1	43.3	37.1	42.7	38.7
DKW.46-15 RR	41.6	5	40.8	39.8	44.3	38.9	45.6	40.3
DL Seeds								
Visby	41.4	7	40.4	39.0	43.4	40.5	45.1	40.3
Sitro	40.6	14	39.1	37.9	43.7	38.9	44.1	39.8
HyCLASS 154W RR	40.7	13	40.6	38.1	44.0	38.2	44.3	39.0
Croplan Genetics								
Baldur	41.4	8	40.5	39.1	44.6	38.9	44.9	40.3
HyCLASS 107W RR	40.1	18	39.7	37.5	43.1	38.3	43.2	38.7
Wilbur-Ellis Co.								
Camas RR	41.3	9	41.1	39.8	44.1	40.0	43.4	39.5
Univ. of Idaho								
Athena	41.0	10	40.5	38.4	44.1	38.9	44.1	39.8
Ericka	39.8	21	38.9	37.9	42.5	38.2	42.9	38.4
Amanda	40.8	12	40.7	39.0	44.2	39.1	43.5	38.1
06UIWC.1	40.1	16	39.3	38.0	43.2	38.1	43.7	38.6
06UIWC.4	40.1	17	39.4	38.2	42.8	38.6	43.1	38.5
UI.05.17	40.4	15	40.0	38.2	42.8	38.8	43.3	39.1
UI.05.12	40.0	19	39.3	38.0	43.3	37.2	43.0	39.1
06UIWH.5.1	44.2	1	42.8	43.1	46.9	42.4	47.7	42.3
06UIWH.5.2	43.2	2	42.2	42.4	46.8	40.3	46.2	41.5
Trial Mean	**41.0**		**40.4**	**38.8**	**44.0**	**39.0**	**44.1**	**39.6**
LSD (p = 0.5%)	**0.6**		**1.7**	**1.0**	**1.6**	**1.5**	**1.5**	**1.2**
C.V. (%)	**2.5**		**3.0**	**1.5**	**2.5**	**2.8**	**2.4**	**2.1**