A Summarization of Past, Current, and Future Winter Canola Research in the PNW

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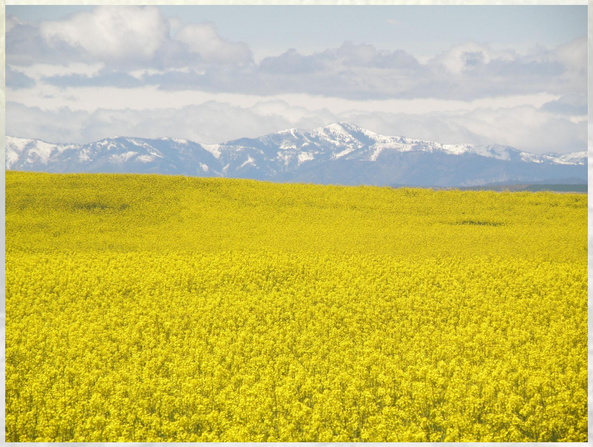
In 2007 we began to introduce winter canola into the winter wheat-summer fallow region of north central WA of the Pacific Northwest (PNW). When we initiated our research, < 225 ha of winter canola had been planted and currently >12,000 ha of winter canola are being grown in this region. Our initial studies were to determine the optimum winter canola seeding rate and date. Current and future research include variety testing, feral rye management in winter canola, and the use of high residue cereal crops and the stripper header to allow no-till winter canola planting. Planting methods, and seeding date and rate studies have reduced the risk of planting winter canola. Fourteen winter canola varieties including conventional varieties, Roundup resistant varieties, and SU and IMI tolerant varieties are being planted in 4 to 6 winter wheat-summer fallow locations. Feral rye is a major weed infesting the wheat-fallow region. Experiments have been concluded in Okanogan and Douglas Co. examining the efficacy of Select, Assure II, and Roundup on feral rye control in winter canola. In the summer of 2011 a 6-m stripper header was purchased for research at the Ralston no-till research site. This current phase of research is investigating planting tall cereal varieties and harvesting with a stripper header to increase residue and seed zone moisture and reduce soil temperatures.

Introducing Winter Canola to the Winter Wheat-Fallow Region of the PNW

Growers in the low-rainfall, winter wheat-fallow region of the PNW need an alternative crop to diversify markets, manage pests, and increase wheat yields. Winter canola is a viable crop option for this region. However, agronomic research for winter canola in this region had not been conducted and growers were reluctant to produce winter canola because of poor stand establishment and resulting high risk.

Poor Stand Establishment

This study evaluated various winter canola planting dates and rates on stand establishment and yield. Research indicated that winter canola in traditional fallow, low rainfall regions, needs to be planted between August 1 and August 25 with post-plant temperatures for 5 to 7 days of ≤29 C for successful stand establishment and acceptable yield (>1680 kg ha^{-1}). Canola planted in September (or very late August), unless covered by snow, either did not survive freezing temperatures or yielded <1000 kg ha^{-1}. Optimum seeding rate was 4.5 kg ha^{-1} compared to 9.0 kg ha^{-1} and increasing seeding rate did not improve winter survival or yield.



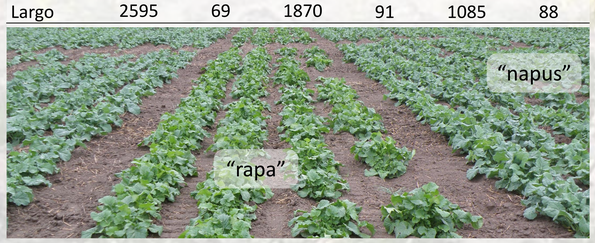
Winter Canola Variety Study

From 2007 to 2011, winter canola research examined methods to improve crop establishment and optimum seeding date and rate while introducing this crop to wheat-fallow producers. However, no winter canola variety trials to determine the best varieties to plant in this region had been conducted in the winter wheat-summer fallow region of the PNW. Our study parameters are:

- **Locations:** Okanogan, Bridgeport, Pomeroy, and Asotin, WA. These locations are in the low-rainfall zone with elevations ranging from 580 m to >1220 m.
- **Varieties:** Fourteen varieties are being evaluated including conventional and herbicide resistant/tolerant varieties at each location. Varieties include ones from University of Idaho, Kansas State University, CROPLAN, Rubisco, and Spectrum Crop Development. At least one variety will be *Brassica rapa*.
- **Seeding:** An array of drills is available to us depending on the conditions at seeding time and includes a deep-furrow HZ drill, and a no-till AGPRO drill.
- **Data:** Approximately 4 weeks after planting, visual establishment ratings will be recorded. Cold hardiness/winter survival will be determined by recording stand counts in the fall before freeze-up and in the spring after dormancy has broken. Yield and oil content and quality will be determined.
- Amanda and Falstaff, two conventional varieties, have produced very well at all three site locations.

Yield and winter survival of winter canola in WA in 2012-2013.

	Pomeroy (2013)		Ralston (2013)		Pomeroy (2014)	
Variety	**Yield (kg ha^{-1})**	**Survival (%)**	**Yield (kg ha^{-1})**	**Survival (%)**	**Yield (kg ha^{-1})**	**Survival (%)**
UI WC1	3335	62	2990	85	2690	100
UI 05.6.33	3100	66	3275	83	2570	108
Amanda	3790	77	3890	77	2505	73
Athena	3565	72	-	97	-	-
CP 115	3490	72	3130	81	2030	78
CP 125	3470	67	3220	91	2060	72
Claremore	3295	72	3430	82	2480	74
Sumner	3790	74	3180	94	2260	77
Griffin	-	-	3920	99	2300	118
Falstaff	3670	73	3840	86	2620	88
Casino	3205	75	3210	90	1980	100
Largo	2595	69	1870	91	1085	88



Herbicide Efficacy for Feral Rye Management

Feral rye continues to plague winter wheat growers even with the introduction of IMI-tolerant wheat. A study was conducted during the 2011-2012 and 2013-2014 growing seasons to evaluate Assure II, Select and Roundup for control of feral rye in winter canola.

Herbicides were applied in the fall, spring, and fall plus spring. Initial feral rye density in the fall in the first experiment was 65 plants m^{-2} and spring density was 105 plants m^{-2} regardless of fall treatments. Winter canola yields were low not only because of the feral rye competition but also because of the late planting (first week of September) of the canola. Canola in the nontreated check yielded only 275 kg ha^{-1} while canola treated in the fall plus spring with either Assure II or Roundup yielded >1000 kg ha^{-1}. Feral rye is a prolific seed producer and in the nontreated control, feral rye produced >10,000 seeds m^{-2}. No feral rye seed was produced in either the spring or fall plus spring treatments for the three herbicides. In the second experiment, initial fall feral rye density was 410 plants m^{-2}. Weed competition was so severe that canola yield in the nontreated control was zero and when herbicides were applied only in the spring yield reduction ranged from 45% to 83% compared to their respective fall+spring treatments.

Effect of three herbicides on feral rye control and winter canola yield in 2012 & 2014 in Washington.

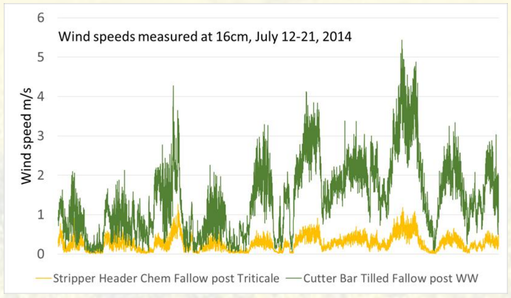
Treatment [a]	**Rate**	**2011-2012**		**2013-2014**	
	kg ha^{-1}	Control	Crop yield	Control	Crop yield
		%	kg ha^{-1}	%	kg ha^{-1}
Nontreated	-	-	275	-	0
Select (F)	0.105	67	705	70	750
Select (F+S)	0.105+0.105	83	770	89	745
Select (S)	0.105	60	600	35	95
Assure II (F)	0.062	63	682	96	865
Assure II (F+S)	0.062+0.062	96	1075	99	785
Assure II (S)	0.062	93	835	83	430
Roundup (F)	0.866	69	785	96	840
Roundup (F+S)	0.866+0.866	99	1025	99	1040
Roundup (S)	0.866	99	860	99	350

[a] Abbreviations: F = fall; S = spring.

High Residue Chemical Fallow Following Stripper Header Harvest

At Ralston we are investigating how crop residue and soil moisture can be increased by growing tall crop cultivars rather than semi-dwarf cultivars and harvesting them with a stripper header instead of a conventional cutter bar header. Rather than cutting the stem and running the head and accompanying straw through the combine, the stripper header has a rotor that spins at 500 to 1,000 rpm, and strips the grain from the head, leaving tall standing stubble.

Stripper header standing stubble is at least twice the height of the cutter bar stubble. This taller stubble height influences soil shading, and reduces wind speeds at the soil surface, leading to a difference in soil moisture.



More uniform soil moisture due to stripper header stubble has allowed no-till winter canola to establish a stand better than the conservation tillage system in our study.