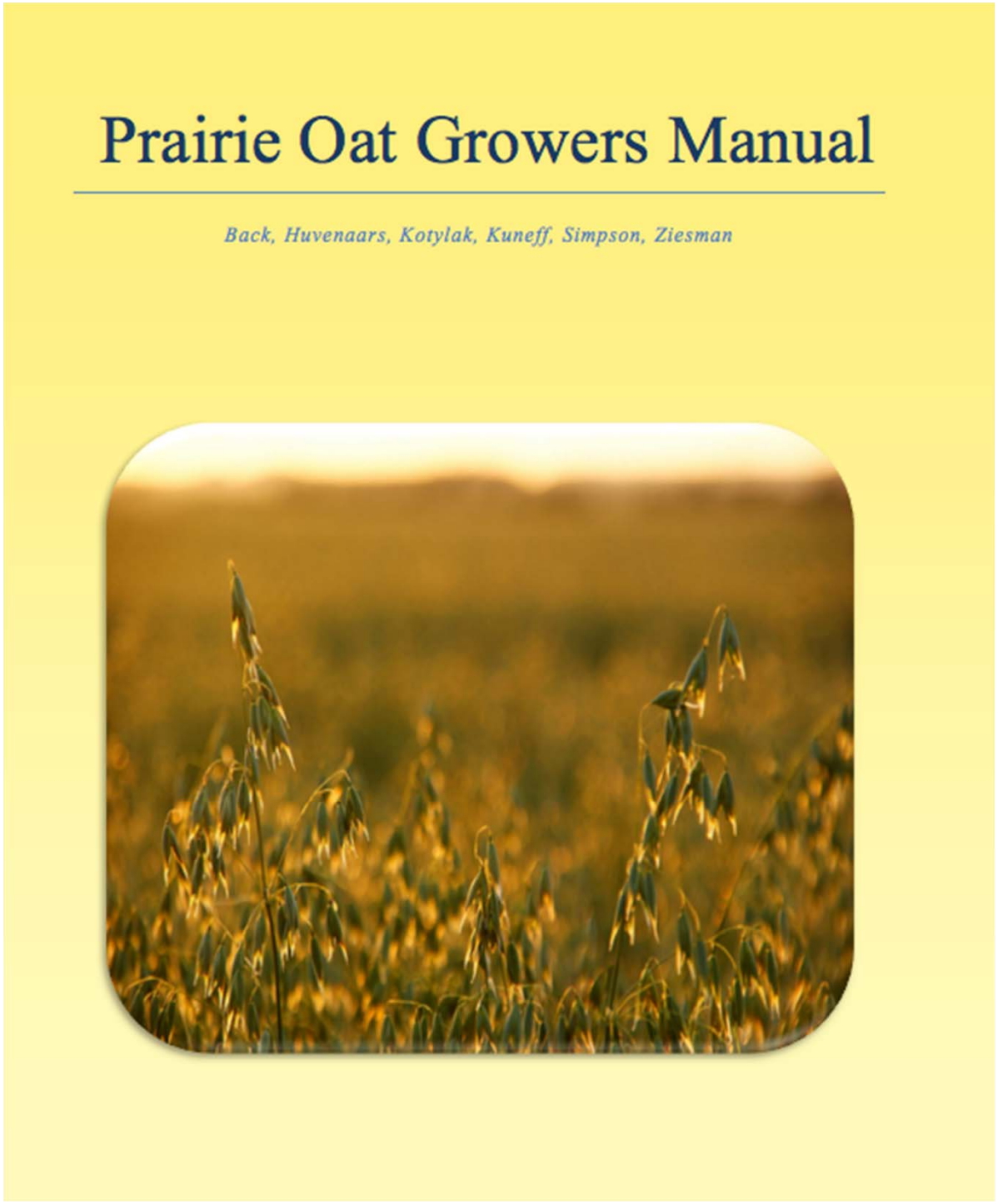

Best Oat Practices for Alberta

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Objectives

Students

- Integrate the knowledge they had obtained over 4 years of university, and 3 years of summer employment
- Agronomy, crop production, breeding, economics, marketing, pest managment

POGA

- Summarize the research and market information related to oat production on the prairies
- Useful for novice growers and growers who are considering oat as an option
- Provide information on research gaps

Topics covered

- Variety selection and class description
- Yield components,
  - fertility
  - climate
- Growth stages/scouting
- Weeds
- Insects
- Diseases
- Seeding management
- Harvest
- Storage
- Marketing
- Economics of production (provincial web sites)
- Grading
- Crop Rotation

Nitrogen rates requirements

ARD AFFIRM

Soil moisture, region

Determining N requirement in the Brown soil zone:

- *With 2" of SSM + 6" of GSP then soil N + fertilizer N apply 60 lb/ac (67 kg/ha)*
- *With 4" of SSM + 6" of GSP then soil N + fertilizer N apply 75 lb/ac (84 kg/ha)*
- *With 6" of SSM + 6" of GSP then soil N + fertilizer N apply 90 lb/ac (100 kg/ha)*

Useful illustrations

Dough Development	**Soft dough stage**: No milky liquid in the kernel	-Apply pre-harvest glyphosate
Anthesis 	-This is the flowering stage of a plants lifecycle. -Oats is self-pollinated, similar to barley (Stoskopf, 1985).	Disease: smut, fusarium -Insect: aphids

Diseases of oat

Table 17. Summary table of diseases of oats

Disease	Areas of Highest concern	Favourable conditions	When to scout	Control options
Fusarium Head Blight	Highest concern in Manitoba and Saskatchewan with little importance in Alberta. Common in the black soil zone where rain fall is high.	Humid summers	July-August	• Tillage • Crop rotation or 2 to 3 years between susceptible crops • Control alternate hosts • Plant certified disease free seed • Apply fungicides when economically viable
Crown Rust (Leaf Rust)	Highest economic concern in Southern Manitoba and south eastern Saskatchewan and occasionally important in Alberta.	Humid and windy conditions with temperatures between 10-20°C)	July - August	• Select resistant varieties • Seed early • Remove common Buckthorn when present • Apply fungicides when economically viable

Disease comparisons

Table 18. Disease comparison for oats and barley.

Disease	Oats	Barley
Fusarium Head Blight	• Highest economic concern in Manitoba and Saskatchewan. • Minimal yield losses with few in field symptoms. • Mycotoxins on seed reduces marketability.	• Highest concern in Manitoba and Saskatchewan. • Higher yield losses than in oats but similar to losses in wheat. • Presence of mycotoxins on seed reduces marketability.
Crown Rust/Leaf Rust	• Highest economic concern in Manitoba and Saskatchewan and can occasionally occur in Alberta. • Yield losses can be up to 100% if severe infection occurs. • Requires alternate host (common buckthorn) to overwinter. • Spores usually arrive in Canada on wind currents from Southern United States.	• Not of economic concern on barley in Western Canada.

Economic comparison with other crop choices

Table 31.Oats vs feed barley crop return comparison.

Direct seeded stubble crops	Oats	Barley
REVENUE PER ACRE		
Estimated Yield (bu/ac) A	74.13	58.9
Estimated On Farm Market Price/bus,lb (B)	2.19	2.96
Estimated Gross Revenue/ac (AxB) (C)	162.72	174.34
Return Per Acre		
Return Over Variable expenses (C-D)	66.44	60.14
Return Over Total Rotational Expenses	-1.37	4.39

Prairie Weed Survey

- 7.7 million ha (29% of western Canada farm land) is infested with herbicide resistant weeds (Beckie et al 2012)
- Wild Oat
  - Group 1 resistant wild oat was found in 41% of all fields surveyed
  - Group 1 resistant wild oat in 12% of fields
  - Group 1 + 2 in 8% of fields

Broadleaves – resistant to Group 2

kochia (90%)

Russian thistle (2%)

spiny annual sow thistle (100%)

chickweed (40%)

cleavers (12%)

Wild buckwheat, shephard's purse, hempnettle, sinkweed, narrow-leaved hawk's beard, green foxtail, cow cockle

- Herbicide resistant weeds are an irritant for many growers
- Wild oat has limited herbicide options in most crops (with the exception of canola)
- Wild oat and BLW in peas (where Group 2 herbicides used most consistently), Clearfield crops
- Glyphosate resistance in RR sugar beets and RR canola

Weed control starts in previous crops

- Reducing wild oat population through consistent weed control
- Competitive crops
- Non-residual herbicides

- Selection of fields for oat production is critical
- Pre-scouting

Rotational planning

Integrated weed management of oat crops

- Wild oat is ubiquitous in Alberta, difficult to control in oat and affects grain quality/value
- Pre-seeding burndown plus late seeding can reduce wild oat populations
- Wild oat emergence peaks in May
  - later emerging weeds are less competitive
- Delaying seeding reduces yield

Can early seeding at a high rate reduce wild oat populations and increase yield and quality?

Table 3. The effect of wild oat density, seeding date and seeding rate on selected variables of tame o[illegible] tame oat

	Tame oat						Wild oat		
	Plant density	Seeds on a panicle	Kernel weight	Biomass	Lodging	Height	Wild oat density	Panicles	Wild oat in harvested sample
Effect	(no. m^{-2})	(no. $panicle^{-1}$)	(g 1000 $kernels^{-1}$)	(kg ha^{-1})	(1–10)	(cm)	(no. m^{-2})	(no. m^{-2})	(%)
Wild oat									
Low	270	27.6	34.3	6353.5	1.8	92.0	10.4	7.7	0.2
High	261	26.2	34.1	5884.7	1.9	90.5	26.8	38.5	0.7
LSD 0.05	NS	NS	NS	338.4	NS	NS	10.9	NS	0.5
Seeding date									
Early May	284	27.4	35.6	5952.3	2.0	90.0	33.3	35.1	0.6
Mid May	240	27.8	33.9	6161.7	1.9	90.3	25.2	41.2	0.8
Early June	271	27.5	36.5	6355.7	1.7	91.1	12.0	14.8	0.3
Mid June	266	25	30.8	6006.5	1.8	93.4	3.9	1.2	0
LSD 0.05	NS	NS	2.5	NS	NS	NS	17.3	NS	NS
Contrast									
Linear	0.734	0.441	**0.008**	0.835	0.598	0.350	**0.001**	**0.021**	**0.018**
Quadratic	0.217	0.472	**0.027**	0.450	0.735	0.682	0.999	0.339	0.226
Cubic	0.109	0.847	**0.002**	0.736	0.865	0.914	0.696	0.291	0.32
Seeding rate									
150	153	32.7	34.2	5718.9	1.6	93.3	18.1	29.6	0.6
250	236	28.3	34.5	6059.9	1.8	91.7	20.9	25.9	0.5
350	303	24.8	34.2	6311.9	1.9	90.9	18.0	17.2	0.3
450	370	21.7	33.8	6385.5	2.1	89.1	17.5	19.7	0.4
LSD 0.05	16	1.30	NS	209.98	0.14	1.18	NS	8.82	0.14
Contrast									
Linear	**<0.001**	**<0.001**	0.100	**<0.001**	**0.001**	**<0.001**	0.364	**0.008**	**<0.001**
Quadratic	0.149	0.170	**0.032**	0.077	0.945	0.893	0.136	0.324	0.133
Cubic	0.531	0.79	0.473	0.789	0.901	0.351	0.110	0.249	0.427

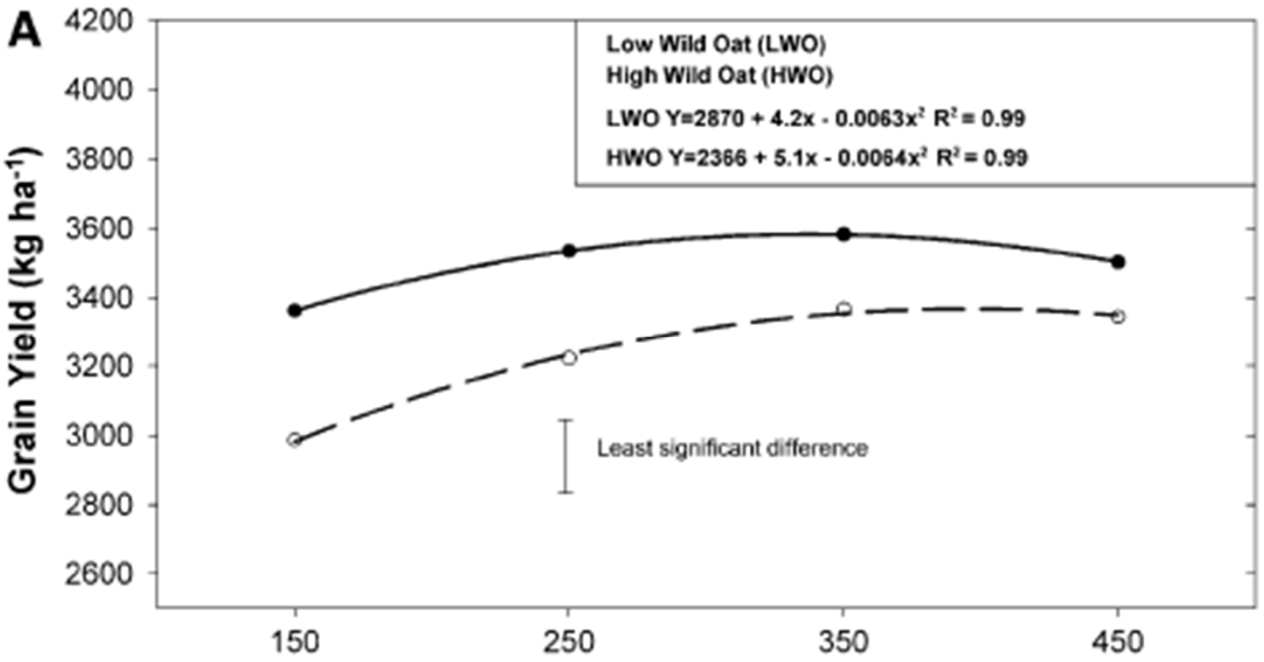
NS, not significant.

Seeding date had no significant differences in yield in the presence of wild oat but increased the test weight

Table 4. The effect of wild oat density and seeding date on the grain yield, seed density, test weight of tame oat and the biomass of wild oat averaged over all site years

	Tame oat				Wild oat
Effect	Grain yield (kg ha^{-1})	Seed density (seeds m^{-2})	Test weight (g 0.5 L^{-1})		Biomass (kg ha^{-1})
Seeding date			Low wild oat	High wild oat	
Early May	3463	9706	249	247	544
Mid May	3452	9978	238	234	427
Early June	3891	10560	242	243	152
Mid June	2645	9612	224	223	104
LSD 0.05	NS	NS	12	15	NS
Contrast					
Linear	0.142	0.922	**0.007**	**0.010**	**0.012**
Quadratic	**0.046**	0.360	0.519	0.474	0.777
Cubic	0.107	0.513	0.085	**0.030**	0.464

Seeding rate significant increased yield in both high and low wild oat populations



Recent work not included

Row Spacing and Nitrogen Fertilizer Effect on No-Till Oat Production

G. P. Lafond,* W. E. May, and C. B. Holzapfel

Influence of row spacing and nitrogen rate

Table 6. The effects of row spacing and rates of N fertilizers on grain protein concentration, groat yield, 1000 seed weight, test weight, and the proportion of plump and thin kernels.

Variable	Grain protein	Groat yield	1000 seed weight	Test weight	Plumps†	Thins†
	g kg^{-1}		g	kg m^{-3}	%	
Row spacing, cm						
25	84	725	35.0	486	94.5	1.3
30	84	718	35.5	486	94.9	1.1
35	84	723	35.6	486	94.8	1.3
40	85	722	35.1	482	94.6	1.5
LSD (0.05) ‡	-	–	0.5	-	-	-
N fertilizer rate, kg N ha^{-1}						
20	82	717	36.6	492	96.1	1.1
40	81	720	36.0	491	95.9	1.0
60	83	723	35.2	487	94.7	1.2
80	84	725	35.0	481	94.4	1.3
120	91	724	33.7	476	92.3	1.8
LSD (0.05) ‡	2	–	0.6	4	0.6	0.2
Year						
2009	84	722	38.4	497	95.5	1.1
2010	83	731	32.7	468	93.4	1.4
2011	85	712	34.8	490	95.2	1.4
LSD (0.05) ±	-	7	1.0	13	1.0	-

Variables	Biomass	Grain yield	Grain N	Grain N	Grain P	Grain P
	Mg ha^{-1}		g kg^{-1}	kg ha^{-1}	g kg^{-1}	kg ha^{-1}
Row spacing, cm						
25	9.8	5.46	14.7	80.7	2.56	13.9
30	9.4	5.33	14.8	78.7	2.54	13.4
35	8.5	5.19	14.7	76.6	2.61	13.4
40	8.5	4.66	14.9	69.1	2.65	12.2
LSD (0.05)†	0.6	0.28	0.5	5.6	0.13	1.2
N fertilizer, kg ha^{-1}						
20	7.4	4.33	14.5	62.2	2.89	12.3
40	9.0	5.10	14.1	72.1	2.66	13.5
60	9.0	5.47	14.6	79.9	2.51	13.7
80	10.1	5.49	14.7	80.8	2.41	13.2
120	9.8	5.41	15.9	86.3	2.47	13.4
LSD (0.05)†	0.4	0.21	0.4	3.7	0.1	0.8
Year						
2009	9.8	6.02	14.8	89.7	2.40	14.6
2010	10.8	5.41	14.5	78.6	2.73	14.6
2011	6.5	4.05	15.0	60.5	2.64	10.5
LSD (0.05)†	1.1	0.54	–	11.9	–	3.1

Research gaps

- No recent work on timing/application type influence of nitrolase inhibitors
  - Fall vs spring application
  - Slow release nitrogen
  - Split application
- No recent work on new soil applied herbicides
- And residual effects of new herbicides