Oilseed Variety Development: A Key to Successful Crop Adaptation

Brassica varieties; choices & traits for integration into cereal-based cropping systems

- Canola and rapeseed
- Winter canola
- Spring canola

Camelina variety development for Pacific Northwest

Canola vs. Rapeseed varieties

Canola

- Low erucic acid (22:1)
- Low glucosinolate
- Generally accepted by biofuel processors
- Mostly *Brassica napus*, some *B. rapa, B. juncea*

Rapeseed

- High erucic acid
- Glucosinolates vary, may limit meal marketing
- Acceptability depends on processor and variety
- Mostly *B. napus*

Winter canola (or rapeseed) properties

- Generally higher yielding than spring varieties in PNW
- Good PNW-focused breeding program at UI
- Some companies offer good varieties for PNW
- Generally planted into fallow unless irrigated in PNW

Canola seedlings don't survive PNW winters

Cold hardy size is hard to achieve when dryland planting after wheat harvest

- Planted Sept 25
- First rain Oct. 3
- Frost Oct 26 (20^{o}C)

- Good size for surviving winter
- Planted/Irrigated early September

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Winter canola is typically planted into fallow

- Good stands can be difficult in mid-late summer
- Some varieties perform well in earlier plantings
- Seed cost are a consideration and varieties vary in cost
- Hybrids, and varieties with engineered traits generally cost more

Spring canola (or rapeseed) properties

- Generally not as high yielding as winter types but takes only one year to produce
- Usually grown in high-intermediate rainfall areas
- Good PNW-focused breeding program at UI
- Many companies offer good varieties for PNW
- Several traits for weed control

Performance data on specific varieties:
http://css.wsu.edu/biofuels/
http://www.webpages.uidaho.edu/jbrown/brassica/

Camelina yields well when planted after wheat

Camelina yields from 2008 to 2011 at PNW research sites*

Location	Annual precipitation (in)	Number of trials or years	Yield Range (lbs/acre)	Average yield (lbs/acre)
Lind, WA	9.5	5	115-1030	600
Ralston, WA	11.0	2	760-1580	1230
Lacrosse, WA	15.5	4	1740-2000	1800
Pendleton, OR	16.5	5	1549-1756	1647
Moscow/Pullman	21.0	6	1610-3070	2300
Corvallis, OR	39.0	4	700-2200	1700

- A traditional low rainfall wheat – fallow rotation provides three wheat crops in six years
- A wheat – camelina – fallow rotation would provide two wheat crops and two camelina crops in 6 years

Trials by various researchers, Guy, Schillinger, Wysocki, Hulbert

Few pesticides required for camelina production in the PNW

Main disease encountered has been downy mildew, *Hyaloperonospora camelinae*

Approx. 5% incidence in camelina fields in Washington in 2010 - 2012

Seed transmitted pathogen

Partial control by seed treatments with Mefenoxam (Oomycete specific)

Control methods under investigation

Herbicide Resistance Traits can be Attractive to Growers

Winter canola	
Roundup-Ready	Croplan
Roundup-Ready, SU tolerant	Croplan
Clearfield (IMI resistant)	High Plains Crop Dev.

Spring canola	
Roundup-Ready	Croplan, Monsanto, Cargill, Mycogen
Liberty Link	Bayer
Clearfield (IMI resistant)	Mycogen Seeds

Camelina
None available

Herbicide use in cereal production is a problem for adapting Brassicas & camelina into wheat-based systems

- *Brassica/Camelina* sensitivity to residual amounts of ALS-inhibitor (IMI & SU) herbicides is a problem in adoption in PNW
- Many of these chemicals have very long residual activity in soil
- Good herbicides if not overused
- 300,000+ acres of CF wheat grown in Washington last year and sprayed with Beyond®. Acreage is growing!

<u>ALS-inhibitor herbicides</u>

Imidazolinones:
Beyond, Raptor, Pursuit…

Sulfonylureas:
Glean, Finesse, Osprey, Olympus Flex, Ally, Accent, Amber, Mavrick, Harmony…

Resistance arises to these chemicals at a low frequency

Selection of a camelina mutant that is resistant to Beyond®

- 10 M seeds/acre rate
- Seed mutagenized (EMS)
- One mutant tolerant to IMIs and SUs

HT camelina following Clearfield wheat

Line	Beyond® rate	Yield Kg/ha
Calena	0	1374
Cheyenne	0	1351
SM4-CC	0	1360
Calena	1x	1048
Cheyenne	1x	1142
SM4-CC	1x	1390
Calena	2x	474
Cheyenne	2x	606
SM4-CC	2x	1386
Calena	4x	31
Cheyenne	4x	33
SM4-CC	4x	1438

Herbicide injury in camelina plots

Private breeding efforts for camelina have been sporadic

Crossing

F_1s

Early generation plots in Pullman

- Crop very suitable to small breeding program
- Seed from one nice field grown plant can plant several small plots
- Main emphasis will be intermediate rainfall zone

Genetic variation is abundant for many useful traits

- Seedling vigor/competitiveness
- Seed size
- Earliness
- Oil content
- Height
- Shattering

Seed size variation

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Questions or Comments?

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