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Developing Two-row Malting Barley Cultivars and FHB Resistant Barley Germplasm for Western Canada

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Canada 

Introduction

- **Two projects:**
 - *Developing two-row malting barley varieties for western Canada*
 - **Improving Fusarium Head Blight (FHB) resistance in barley germplasm**
- **Breeding objectives**
- **New varieties**
- **Special quality related projects**

Two-row Malting Barley Breeding Program



Breeding Objectives :

Agronomic Performance:

- **wide adaptation**
- **high stable yield**
- **early maturity**
- **good lodging and shattering resistance**
- **plump, heavy kernels**

Breeding Objectives :

Improved Disease Resistance:

- **high priority**
 - *fusarium head blight (FHB)*
 - *spot blotch*
 - *stem rust*
 - *net blotch*
- **lower priority**
 - *scald*
 - *common root rot, smuts, BYD and Septoria*



Breeding Objectives :

Malting and Brewing Quality:

- develop a range of malting quality types for portfolio in collaboration with industry – **fairly narrow**
- emphasize
 - *resistance to hull peeling (barley and malt)*
 - *lower grain protein content*
 - *balanced soluble protein content*
 - *lower beta glucan content*
- increase malt extract slightly
- **improved pre-harvest sprouting resistance and viability over time**

CURRENT VARIETIES



2009 CWB VARIETY SURVEY

% of Seeded Acres in 2009/() = 2008

Variety

Prairies

- **AC Metcalfe** 60.2 (56.5)
- **CDC Copeland** 24.9 (23.2)
- **CDC Kendall** 7.0 (11.4)
- **Newdale** 5.5 (5.7)
- **Harrington** 1.5 (1.9)

1. Norman (TR05915):

- **Registered in 2009 and released to FP Genetics**
- **Joint entry with CDC / U of Sask.**
- **DH line selected from CDC Kendall using in vitro selection (IVS) as part of FHB project**
- ***25-30% lower DON content than CDC Kendall***
- ***Identical to CDC Kendall in most other traits including malting quality***
- **Adapted to Alberta and western Sask.**

2. Major (TR06297):

- **Registered in 2009 and released to Viterra**
- **Widely adapted to western Canada**
- ***9% higher yielding than AC Metcalfe with shorter, stronger straw and plumper kernels***
- **Better net blotch and spot blotch resistance than AC Metcalfe with similar FHB resistance**
- ***Similar to AC Metcalfe in malting quality***

3. Cerveza (TR06294):

- Applied for registration in 2010 (pending) and released to Mastin Seeds, Sundre, AB
- Widely adapted to western Canada
- *DH line with high, stable yield - 9% higher yielding than AC Metcalfe*
- Better net blotch and **spot blotch** resistance than AC Metcalfe with slightly poorer FHB resistance at higher infection levels
- Also performed well in Quebec & the Maritimes

3. Cerveza (TR06294):

- Interesting malting quality profile with consistently **higher malt extract and lower soluble protein content** than AC Metcalfe
- Somewhat higher beta glucan, lower enzyme activity, and similar hull peeling resistance to AC Metcalfe
- ***Enzyme activity higher than CDC Copeland***

4. HB705:

- Registered in 2009 and released to Alliance Seed Corporation
- *Two-row hulless barley cultivar with malting quality potential*
- *One of the first of this type to be released*
- Has 6% higher malt extract than AC Metcalfe
- Improved FHB resistance with significantly lower DON levels
- *Adoption by industry uncertain*

2010 Coop & Collab Entries

- TR08203 – 2nd yr. Collab entry with DON levels similar to Norman
- TR09208 – 2nd yr. Coop entry with high yield and interesting malting quality profile
- 1st yr. Coop entries:
 - *TR10214, TR10215 & TR10216 with lower DON*
 - *TR10217 very high yielding*
 - *TR10218 low phytate line (BC₅) with Newdale as recurrent parent (MC9813-13 source of 50% reducing gene)*

Special quality-related projects

- **Reduced phytate project – BMBRI funding**
 - *TR10218 advanced to coops in 2010*
 - *Although results of project were positive, we did not make many crosses ahead of time due to uncertainty and limited resources*
 - *no new entries for a number of years (1 – 2 years away from yield trials at Brandon)*
 - *First may be lines with the 95% phytate reducing gene*
 - *Rest will have the 50% phytate reducing gene*

Special quality-related projects

- **Lowering grain protein content**
 - *Purchase of NIR instrument at Brandon will allow us to screen at earlier stages for protein content, i.e., about 1,000 F₅ to F₆ lines screened last winter for first time with selections going to 2010 yield tests*
 - *Lines from numerous populations with low protein parents, such as Bentley and CDC Meredith, starting to enter yield trials at Brandon*
 - *Most advanced still 2 years away from Coop tests*

Special quality-related projects

- **Improving resistance to pre-harvest sprouting (PHS) and germination loss during storage**
 - *RVA main selection tool being used as resources allow*
 - *Samples must be “damaged” to detect PHS resistance*
 - *3 entries with the PHS resistance gene from Baudin still active in the program as a result of collaborative project with GRL and CDC to determine feasibility of combining this gene with Canadian malting quality*
 - *Industry acceptance of CDC Reserve will influence our efforts in this area*

Special quality-related projects

- **Ethanol assay (EA) project in collaboration with W. Buckley at Brandon**
 - *Continuation of project previously funded by BMBRI*
 - *Determine the utility of EA for determining germination loss potential during storage in two-row malting barley and as a tool for routine screening in the breeding program*
 - *Collect final year of data in 2010*

Acknowledgements

- **Cereal Quality Evaluation Lab, Cereal Research Centre, Winnipeg**
 - *Analyzes about 1,000 samples per year for the program*
 - *Needs new auto analyzer (add beta glucan) and upgrading of the second malting unit*
- **Funding for two-row malting barley program**
 - *New Barley DIAP led by WGRF to replace old WGRF Barley Check-off agreement and current A-base project*
 - *Has been approved but details not available yet*



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