



Crop Development Centre Barley Breeding and Research Update


A.D. Beattie
Crop Development Centre
University of Saskatchewan, Saskatoon, SK

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BMBRI-Supported Projects

- Growing Forward 2, AIP National Cluster
 - Breeding Two-Row Feed and Malting Barley Varieties
 - LOX and DMS/P
 - Scald Resistance Gene Mapping and Breeding
 - Association Mapping for Agronomic Traits
 - Micromalter refurbishment
- 




Barley Breeding Focus

- Barley (2-row)
 - malting (70%)
 - feed/forage (20%)
 - hulless food/malting (10%)
- Barley (6-row)
 - discontinued





Barley Breeding Objectives

- Agronomics
 - Yield
 - Lodging and shattering resistance
 - Maturity
 - Grain and Quality
 - TWT, TKW, Plumpness - Uniformity
 - Grain Protein
 - Malt Quality
 - Hull Adherence
 - Disease
 - FHB, spot blotch, net blotch, scald, smuts, stem/
stripe rust
- 

2015 CDC Crossing Block

Category	Percentage of Crosses
Hulless	
High Amylose	6%
Waxy	7%
Malt	5%
General Purpose	
	11%
Malt	
Introductions	9%
3-Way	6%
FHB	5%
Scald	6%
Leaf Disease	7%
Septoria	1%
Ug99	3%
Stripe Rust	2%
Craft	7%
Low Beta-glucan	2%
Yield	12%
Forage	
	6%
Total:	100%

CDC Bow

Entry	Yea	Yield (Kg/Ha)	Yield as % Met	Days to Head	Days to Maturity	Height (cm)	Lodgin	Test Weight (Kg/HL)	Kernel Weight (g/1000k)	% Plump (>6/64")
Copeland	C	5336	106	58.4	92.7	85.9	3.5	63.4	44.2	87.6
Xena	C	5599	111	56.3	92.9	81.5	3.2	65.6	47.6	88.8
AC	C	5011	100	56.4	92.4	81.5	3.6	64.7	43.1	86.8
CDC Bow	2	5472	109	58.0	93.4	83.0	2.2	65.5	47.2	92.5

Entry	Plump % >7/64"	Plump % >6/64"	1000 KWt (g)	Protein (%)	G.E.		Steepou t (%)	F. Ext. (%)	Sol. Protein (%)	Ratio S/T	DP (°L)	AA (D.U.)	BG (ppm)	Visc. (cps)	FAN mg/L	Friab. (%)	Peeled (%)
Copeland	70.3	93.4	44.6	11.9	100	95	43.4	80.0	4.6	37.7	128	56.5	88	1.46	169	81.0	2.4
AC	64.8	90.7	41.9	12.7	99	90	44.2	79.9	5.0	39.0	153	82.5	87	1.45	197	72.4	3.2
CDC Bow	83.0	97.4	46.9	11.8	100	94	44.0	81.3	5.3	44.6	146	77.4	56	1.43	203	81.9	2.5

- CDC Bow (SM04261/TR05285):
 - Good yield potential
 - Very good lodging resistance
 - Excellent malt quality
 - SeCan



2015 Supported for Registration

Entry	Yea	Yield (Kg/Ha)	Yield as % Met	Days to Head	Days to Maturity	Height (cm)	Lodgin	Test Weight (Kg/HL)	Kernel Weight (g/1000k)	% Plump (>6/64")
Copeland	C	5681	106	58.2	90.7	85.5	4.0	62.2	42.7	81.9
Xena	C	5969	111	55.6	90.5	82.9	3.8	63.9	45.6	83.6
AC	C	5357	100	55.7	90.5	82.8	3.5	63.1	41.2	81.6
TR12135	2	6090	114	57.7	91.5	81.0	3.1	62.3	44.2	86.1

Entry	Plump % >7/64"	Plump % >6/64"	1000 KWt (g)	Protein (%)	G.E. 4 mL	8	Steepo ut (%)	F. Ext. (%)	Sol. Protein (%)	Ratio S/T	DP (°L)	AA (D.U.)	BG (ppm)	Visc. (cps)	FAN mg/L	Friab. (%)	Peeled (%)
Copeland	49.1	94.4	44.0	11.2	99	91	43.4	81.3	5.08	47.2	132	59.4	91	1.44	193	89.3	7.1
AC	57.0	93.8	40.0	11.4	100	91	43.6	82.3	5.09	46.7	144	79.2	105	1.46	207	83.3	10.0
TR12135	79.6	98.0	46.3	10.5	100	90	43.7	83.3	5.02	51.0	150	70.1	44	1.43	200	95.8	6.8

- TR12135 (TR04280/SM04261):
 - Very good yield potential and good lodging resistance
 - Excellent malt quality
 - VG leaf disease resistance, Rpg1, true loose smut resistance, surface smuts
 - SeCan



TR14150

Entry	Year	Yield (Kg/	Yield as % Met	Days to Head	Days to Maturity	Height (cm)	Lodging	Test Weight (Kg/HL)	Kernel Weight (g/1000k)	% Plump (>6/64")
CDCCopelan	C	5817	104	56.9	91.7	77.8	5.9	63.8	47.6	93.9
Xena	C	6140	109	55.0	91.6	73.9	5.3	66.0	49.7	95.1
AC Metcalfe	C	5613	100	54.5	91.7	75.3	6.3	65.7	47.0	95.4
AAC Synergy	C	6247	111	54.9	92.0	75.1	5.5	65.2	49.3	96.1
TR14150	2	6367	113	54.1	92.8	69.6	5.4	64.7	48.5	95.5

Entry	Plum p % >7/6	Plum p % >6/64	100 0 (g)	Protein (%)	G.E. 4	8	Steepout (%)	Friab. (%)	PUG (%)	P&B (%)	DP (°L)	AA (D.U.)	F. Ext. (%)	Sol. Protein (%)	Ratio S/T	BG (ppm)	Visc. (cps)	FAN (mg/L)
Copeland	62.0	91.7	46.1	12.2	97.3	94.7	44.7	83.4	0.5	3.6	136	61.3	79.9	4.70	39.8	86	1.46	188
AC Metcalfe	70.5	94.7	46.1	12.9	97.7	88.3	45.0	71.6	3.1	4.3	159	83.7	79.9	5.14	40.9	97	1.46	215
AAC	73.6	94.6	47.4	12.3	99.3	92.7	45.3	80.8	4.2	4.8	144	81.5	80.7	5.03	41.3	49	1.44	202
TR14150	71.2	94.4	47.3	12.4	99.0	93.0	46.4	81.0	5.2	5.6	133	73.5	80.1	4.74	39.1	60	1.45	183

- TR14150 (TR08116/SB050739):
 - Very good yield potential, good lodging resistance
 - Scald resistant
 - Good malt quality



LOX and DMS/P Evaluation

- Supported by Molson Coors, Canada Malting, BMBRI/GF2
- Objective:
 - Evaluation of breeding lines to understand variation in LOX and DMS/P
 - Identification of parents



LOX and DMS/P Evaluation

Table 1. Description of checks (entry), years and locations for which LOX and DMS/DMSP were evaluated.

Factor	Levels	Values
Entry	2	CDC Copeland, CDC Meredith
Year	3	2011, 2013, 2014
Location	3	Goodale, KCRF, Wakaw

Table 2. ANOVA for LOX (Dry).

Source	DF	Adj SS	Adj MS	F	P
Entry	1	64.298	64.298	6.87	0.022
Year	2	169.944	84.972	9.08	0.004
Location	2	0.637	0.318	0.03	0.967
Error	12	112.291	9.358		
Total	17				

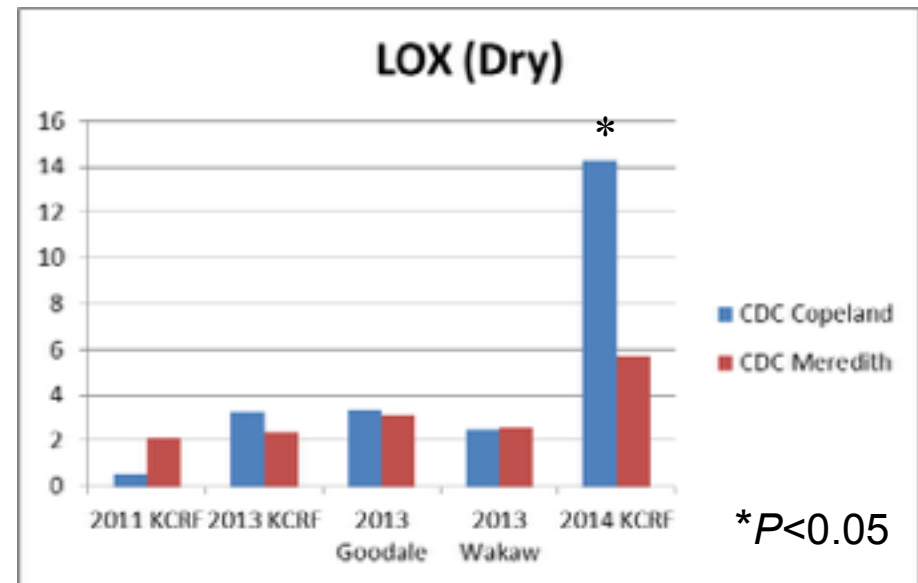
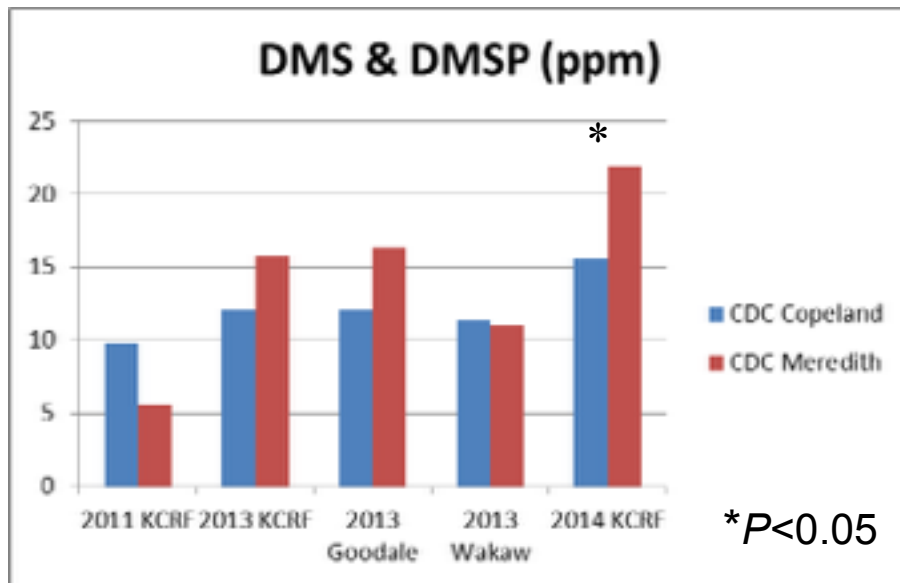
Table 3. ANOVA for DMS/DMSP.

Source	DF	Adj SS	Adj MS	F	P
Entry	1	44.431	44.431	5.34	0.039
Year	2	206.881	103.44	12.43	0.001
Location	2	16.746	8.373	1.01	0.395
Error	12	99.882	8.324		
Total	17				

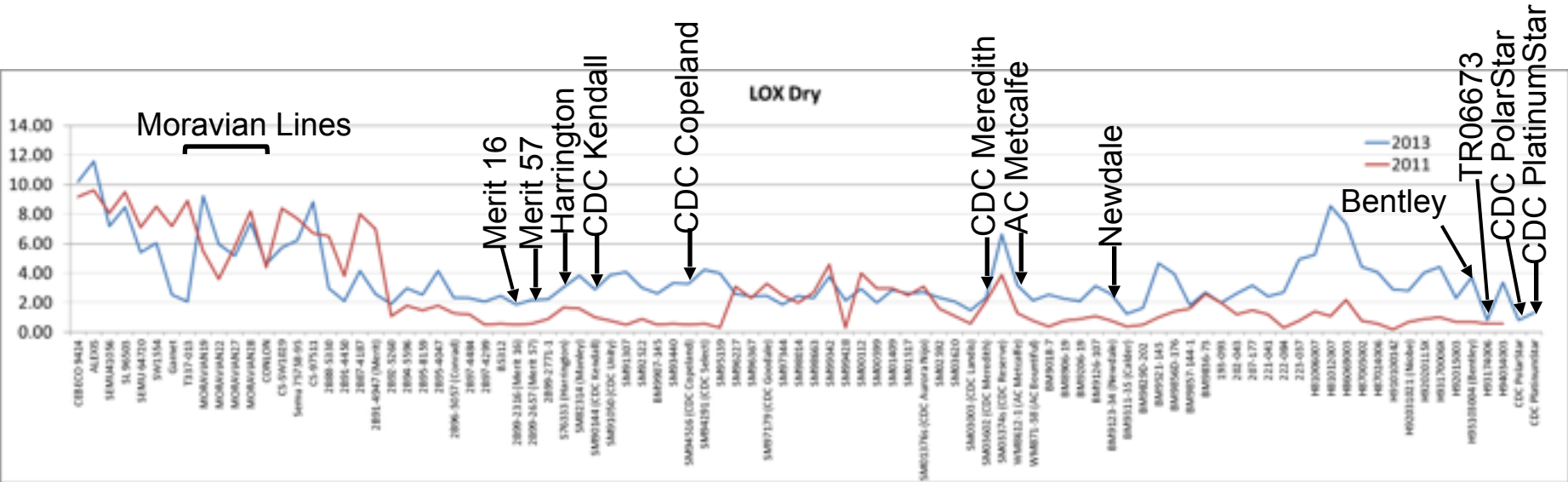
Table 4. Mean values of LOX (dry) and DMS/DMSP (ppm) for entries, years and locations.

	LOX (Dry)	DMS/DMSP (ppm)
Entry		
CDC Copeland	6.6	11.0
CDC Meredith	2.8	14.1
Year		
2011	1.3	6.8
2013	2.8	13.1
2014	10.0	17.9
Location		
Goodale	5.1	13.7
KCRF	4.7	13.4
Wakaw	4.4	10.7

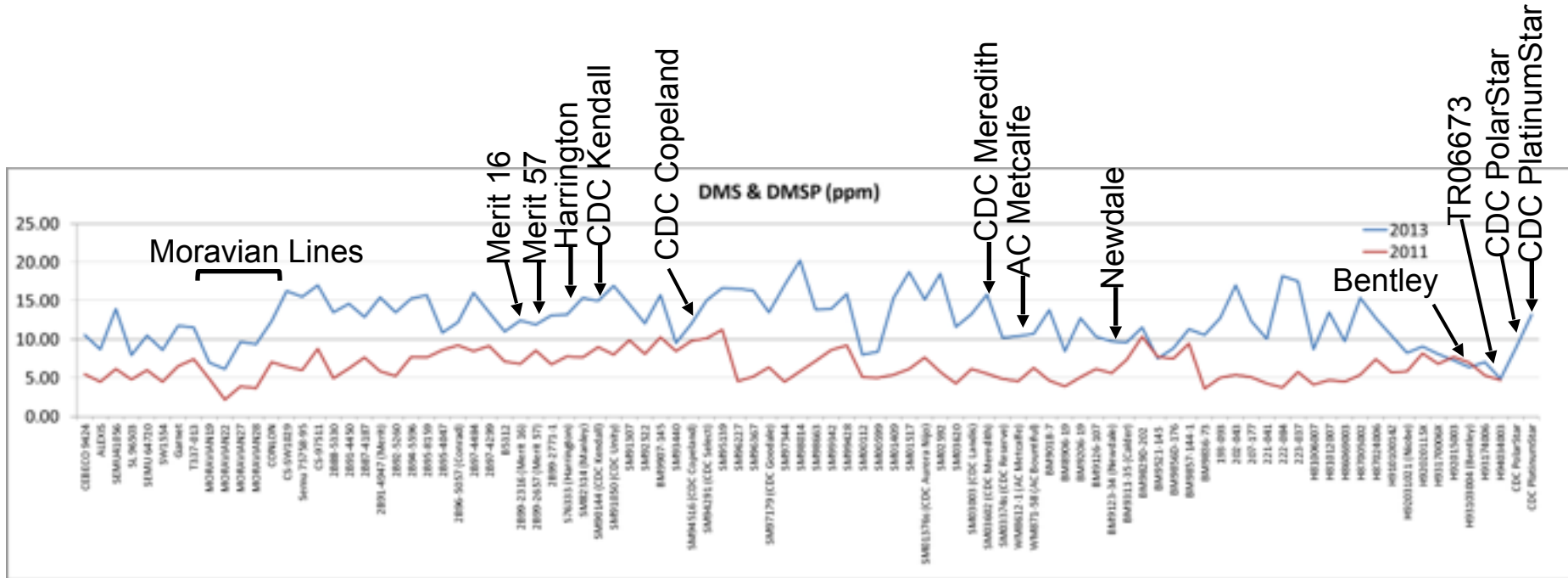
LOX and DMS/P Evaluation



LOX Evaluation



DMS/P Evaluation





Scald Resistance Breeding

- Collaboration with Kelly Turkington (AAFC-Lacombe)
- Objective:
 - To identify molecular markers linked to novel sources of scald resistance
 - To introduce these sources of scald resistance into CDC Austenson (and other breeding lines)



Scald Resistance Breeding

Scald	Barley Variety/Line						
	CDC Susceptible	Laur 3H	RP40Y 6H	RP41T 6H	SB05073 6H	Seeb ??	261G 4H
AB1	3	0.25	3	3	2.25	2.5	1
AB2	2	0.75	1	0	0	1	0
AB3	3	0	3	2.5	0.25	1.25	0
AB4	3	0.25	3	2.5	2.75	3	1
AB5	3	0	3	2.75	2	2.75	0.75
AB6	3	1	3	2.25	0	1	1
AB7	3	1	2.5	1.75	0.75	2	1
AB8	3	0.25	3	3	1.5	2	1.25
AB9	3	1	2.25	0.75	2.75	2	1
AB10	3	1	1.25	0	1	1	1
AB11	3	1	2.75	1.5	1	1	1
AB12	3	1	2.75	2	0.75	1.5	1
AB13	3	0.25	1.5	1	2	3	0.25
AB14	3	0	2.5	1.25	0.25	1.25	0
AB15	2.25	1	2.75	1.75	0	1	2
AB16	3	1	2.5	1.25	0	1	1
AB17	3	0	2.75	1.75	0.5	2	0.25
AB18	3	0	2.75	1	0.75	2.25	0
AB19	3	0	3	2.5	0.25	1.5	0.25
AB20	3	0.25	3	1.5	1	2.75	0
AB21	3	0	2	1	1.75	2.5	0
AB22	1	0	1.25	0.75	0	0.5	0
AB23	3	0.5	2.75	1.75	2.25	3	0
AB25	2.5	0	1	1	0.5	2.25	0



0

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Scald Resistance Breeding

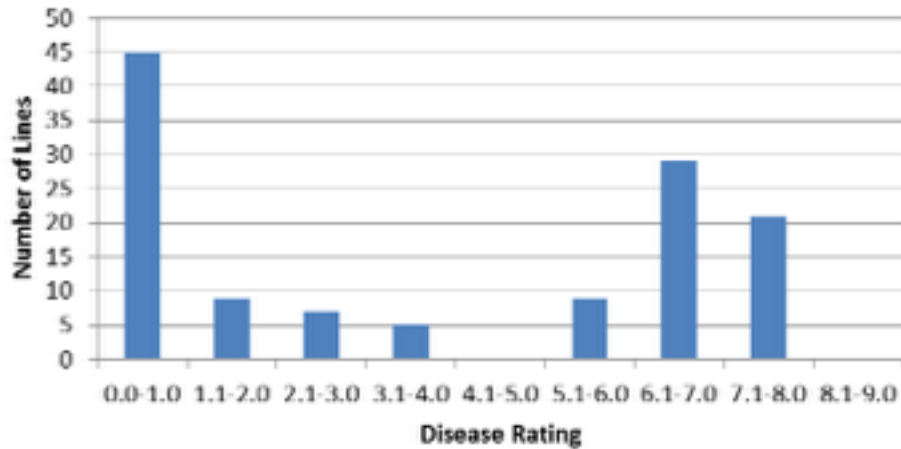
	Barley Variety/Line						
	CDC Copeland Susceptibl	Laural 3H	RP40Y 5 6H	RP41T 1 6H	SB05073 9 6H	Seeb e ??	261G 2 4H
Lacombe Field							
2014	7	1	6	0	3	5	1
2013	7	0	3	0	-	3	0
2012	8	0	7	0	3	4	3
2011	9	7	6	0	6	6	4
2010	7	0	6	0	0	5	-
2008	7	2	3	0	0	4	0

0 - 9 scale

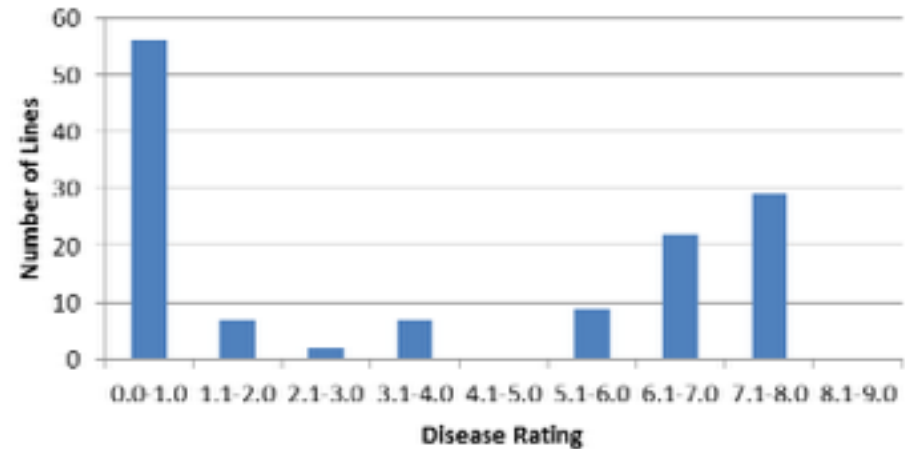


Scald Resistance Breeding

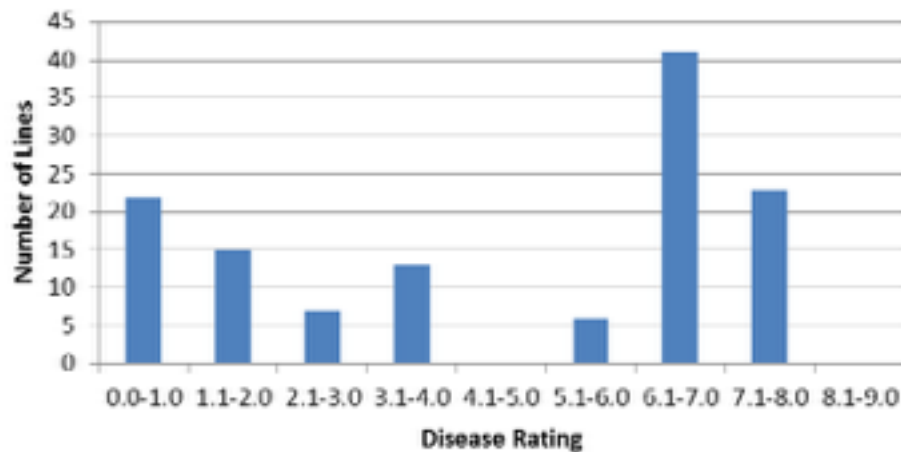
RP41T1 x CDC Austenson



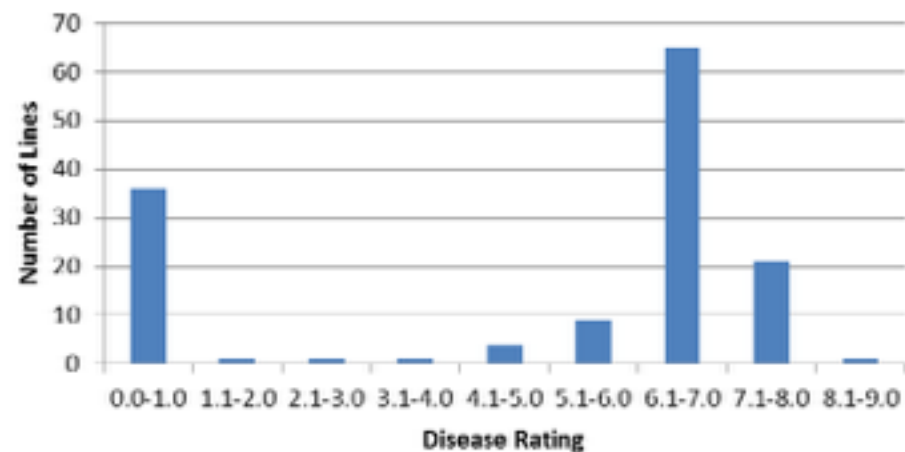
CDC Meredith x RP40Y5



TR08116 x SB050739



261G2 x TR07110




Equipment Investments



- Malt quality evaluation
 - Refurbishment of Phoenix Micromalter
 - 3,326 malted samples in 2014-15



CDC Clear (hulless malting)

- Yields 4% (Areas 1&2) lower and 1% (Areas 3&4) higher than AC Metcalfe
 - Later maturity
 - Straw strength = CDC McGwire
 - Threshability \leq CDC McGwire
 - Grain protein = AC Metcalfe, extract 5-8% higher
 - R to all smuts, SFNB, MR to stem rust
 - Distributed by SeCan
- 

Scald Resistance Breeding



**Kasota - after
one year**



**Kasota - after
three
years in a row**

Courtesy: K. Turkington

