

# Canaryseed breeding & research Update (2009)

- Pierre Hucl
  - Crop Development Centre
  - University of Saskatchewan
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# Canaryseed breeding update

- Funding agreement between CDCS and UofS signed in early July 2008
- Proceeded with 2008 program in anticipation of funding
- Program size a bit larger than in 2007
- Hired Research Officer; Donna Knievel effective August 1, 2008. Donna joined Dow Agro's canola breeding program effective early January 2009.
- Hoping to hire replacement by March 1, 2009.

# CDC Bastia Released in 2008

- CDC Bastia (C99037) glabrous variety that yields better than CDC Maria and CDC Togo under drier growing conditions
- Public Release
- Breeder seed can be purchased by Select Seed Growers (CSGA) via the University of Saskatchewan website:
- [http://www.agbio.usask.ca/departments/plsc/seed\\_form.htm](http://www.agbio.usask.ca/departments/plsc/seed_form.htm)

# Canaryseed Variety Testing in 2008

- Registration Test for glabrous canaryseed assembled & coordinated. Grown at 5 sites – 5 usable sites of data
- Regional Test Coordinated and conducted at 5 sites – Saskatoon, Melfort, Watrous, Indian Head, Swift Current

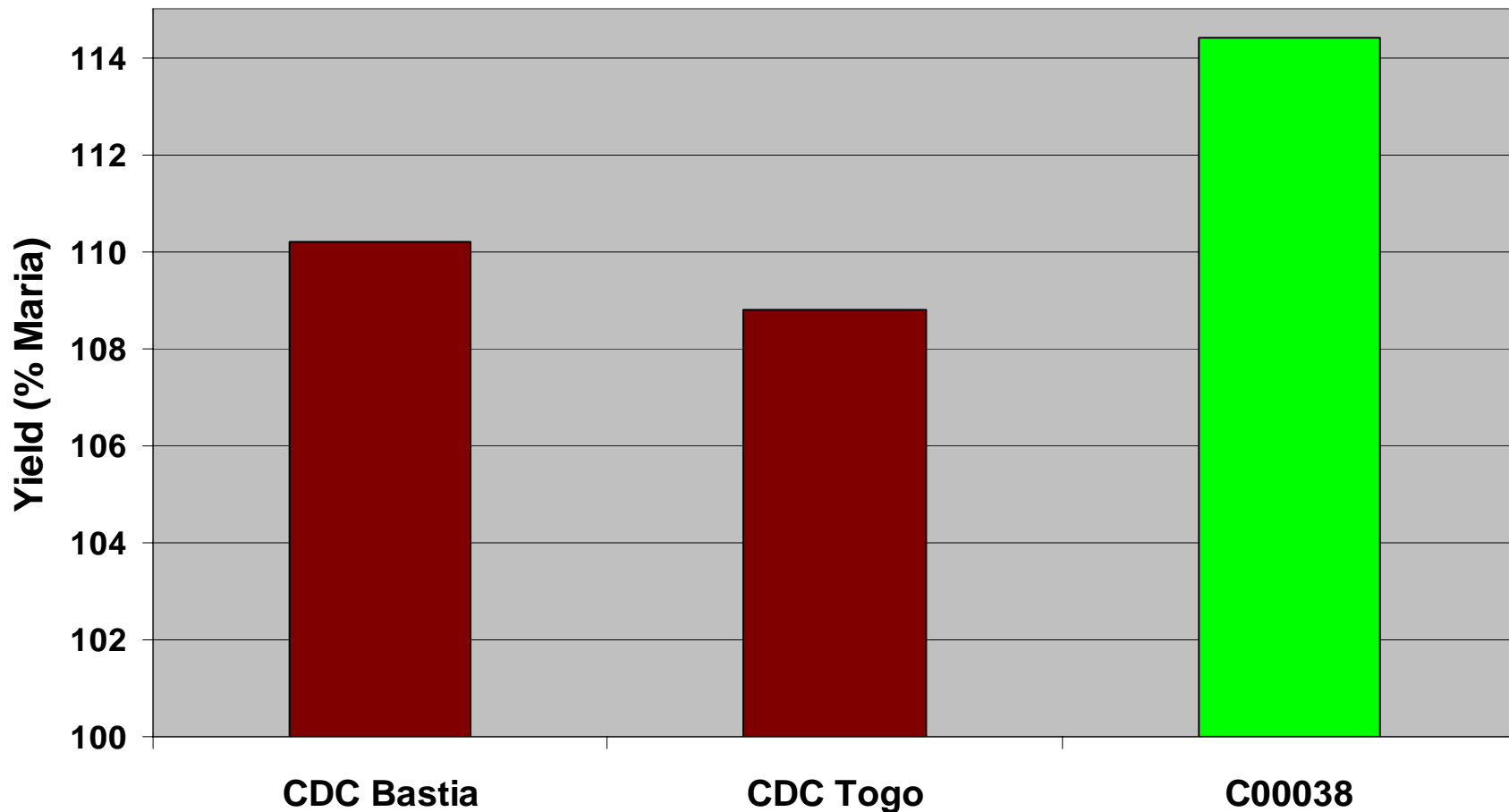
# Multiyear varietal comparisons to CDC Maria (1992-2008)

			Days to	Days to	Height	Test wt.	Kernel wt.
		%Ma	head	maturity	cm	kg/hL	mg
Variety	# of trials						
CDC Maria		100	59	103	102	70	7.5
CDC Togo	58	110	2	1	1	-1	0.7
CDC Bastia	53	111	1	1	2	0	0.0
Keet	64	117	1	1	4	-6	-0.3
Cantate	12	117	0	2	-2	-6	0.3

# Regional data (2007 and 2008); 8 trials

		Yield	Yield	
Entry	Name	kg/ha	bu/ac	type
1	CDC Maria	1041	19	glabrous
2	CDC Togo	1157	21	glabrous
3	CDC Bastia	1244	22	glabrous
4	Keet	1696	30	hairy
5	Cantate	1440	26	hairy

# Potential new Canaryseed variety (C00038) - grain yield data from 34 trials (2001-2008)



# Potential new varieties

C00038 breeder seed production in 2007 (150 kg). Brown-seeded glabrous line.

C05004 – Brown-seeded. Breeder seed stage 1 production in 2008. This line has been dropped as it did not perform any better than C00038, averaged over 2006-2008 trials.



# CDC Canaryseed breeding objectives (2008>)

- Breeding higher yielding glabrous (Canario) varieties (including Registration Testing).
- Continue breeding food-grade varieties and increase seed for food testing purposes (approx. 300 kg produced in 2008).
- Incorporating leaf mottle resistance
- Search for semi-dwarf type.
- New gene(s) for glabrous trait

# Performance of yellow-seeded glabrous canaryseed lines (2007-2008)

								Site	CV
Year	Site	Maria	C99037	C99048	C00038	<u>C05041</u>	<u>C05091</u>	average	%
2007	Watrous	1328	1300	1466	1370	1541	1493	1457	9.4
2007	Kernen	1238	1319	1383	1464	1569	1401	1319	7.1
2007	SF-Early	1190	1311	1414	1205	1376	1404	1260	15.0
2008	SF-Early	2251	2445	2551	2620	2727	2671	2538	4.3
2008	SF-Late	1748	2106	1951	2812	2795	2980	2707	5.0
2008	Kernen	2439	2545	2614	2101	2142	2092	2024	6.1
2008	Watrous	2294	2650	2245	2719	2873	2539	2619	10.3
2008	Sw. Curr.	582	712	571	755	912	865	763	12.6
	<b>Average</b>	1634	1798	1774	1881	1992	1931		
	<b>%Ma</b>	<b>100.0</b>	<b>110.1</b>	<b>108.6</b>	<b>115.1</b>	<b>121.9</b>	<b>118.1</b>		

# 2008 ADVANCED GENERATION CANARYSEED TRIALS; 2 SITES

<b>Trial</b>	<b>no. of lines tested</b>	<b>Yield &gt; than best check</b>	<b>Stat. * &gt; yield</b>
CANYT#2	32	23	8
CANYT#3	32	29	12
CANYT#4	32	24	13
CANYT#5	32	18	9
<b>Total</b>	<b>128</b>	<b>94</b>	<b>42</b>

# New gene for glabrous trait

- 2008: grew out 1 acre of Keet Na-azide M3 population (1989 seed; 85% germination). Picked 100,000 panicles.
- Screened 2,000 panicles from 2001 Cantate EMS population: Found 23 glabrous panicles. Advanced two generations in the phytotron
- Developing new Cantate population (0.3% EMS). Grew M1 generation in 2008.
- Development of camera-based Sorter for seed (95% discrimination) – Dr. Tom Pearson (ARS USDA Kansas)

# SADF Canaryseed Project (2008-2012)

## ➤ Research Plans include:

- Identifying leaf-mottle resistant lines (20%): Curt McCartney cereal pathology lab
- Continue work on controlled crossing (20%) – Gurusamy/Hucl
- Development of molecular markers for canaryseed (60%) - Li/Chibbar molecular genetics lab

# Leaf Mottle research (2008-2009)

- 2008: develop greenhouse inoculation protocol – Done
- 2009: use protocol to screen USDA canaryseed collection (approx. 50 accessions).
- Screen F5 generation lines from a cross between canaryseed and its ancestral wild species (n=150 lines).

# Gametocide research 2006-2008

- Ethrel (growth regulator): (2004-2006). Wheat/barley protocols too hot on canaryseed. With reduced rates obtained partial sterility, low repeatability (X).
- Hot water treatment of panicles: (2007-2008). Temperatures that killed pollen also sterilized ovules resulting in no seed set (X).
- Surf Excel (2007-2008): Laundry detergent from India shown to work as a CHA in rice. Obtained 100% sterility with 4% SE but no viable hybrid seed. Using lower rates (1.0 and 1.5%) and earlier plant stage obtained maximum of 18% sterility. Poor repeatability. (X)
- Attempted using benzotriazole (copper metabolism inhibitor) as a soil drench. Result: killed or stunted seedlings. Survivors transplanted to untreated potting medium produced 100% fertile pollen (X)
- Gibberellic acid (GA): can cause anther protrusion and pollen shedding outside the floret. Currently trying GA treatment with anther clipping.

# Surf Excel as a gametocide

Plant Stage	Surf excel	Pollen sterility
DAP	%(W/V)	%
28	1.0	3.9
28	1.5	2.9
29	1.0	2.9
29	1.5	1.6
30	1.0	1.6
30	1.5	5.2
31	1.0	18.2
31	1.5	5.4
32	1.0	10.9
32	1.5	3.5
33	1.0	12.7
33	1.5	4.3
34	1.0	1.9
34	1.5	1.8
35	1.0	1.2
35	1.5	0.6



# Molecular marker research

- Prior research (2006) using 109 Oat genomic microsatellites on 10 canaryseed accessions resulted in very low polymorphism (3%) and repeatability.
- 2008: screened 174 barley genomic microsats on 47 canaryseed accessions. Poor repeatability and low polymorphism.
- 2008: screened 23 wheat microsats on 47 canaryseed accessions. No polymorphism.
- Conclusion: can't use oat, barley or wheat microsatellites to fingerprint canaryseed.
- 2009 workplan: Initiate development of microsatellite markers based on the canaryseed genome.

# Potential Foxtail Millet varieties

- 2007: 2 small increases with CSGA seed certification (breeder seed).
- 2007 production 413 kg (= 4.4 mt/ha) and 266 kg (= 3.3 mt/ha) kg per line.
- If there is interest we can release breeder seed via CDC breeder seed website