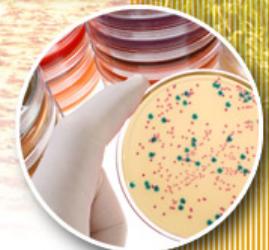




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Condiment Mustard Breeding: Update

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Outline of the presentation

- Co-op Mustard Test
- Brown and oriental mustard yield trial
- Hybrid breeding using the improved Ogura cms hybrid system in brown and oriental mustard
- Yellow mustard yield trial
- Brown, oriental and yellow mustard nursery

Entries of Co-op Mustard Test

Brown mustard (*Brassica juncea*):

- 1) Centennial Brown (check)
- 2) AAC Brown 100 (B474DH71)
- 3) B59DH7
- 4) B123DH47



Entries of Co-op Mustard Test

Oriental mustard (*B. juncea*):

- 1) Cutlass (check)
- 2) AAC Oriental 200 (O60DH17)
- 3) O123DH16
- 4) O123DH136
- 5) O1504DH3



Trial sites of Co-op Mustard Test

Saskatchewan:

1. Saskatoon 1 (AAFC): CV: 8.8% ✓
2. Scott (AAFC): CV: 7.5 % ✓
3. Vanguard (Westwind): CV: 8.2% ✓
4. Swift Current (AAFC): CV: 11.2 ✓
5. Swift Current (Wheatland): CV:13.0%, but less than 50% emergence and very poor yield. X
6. Saskatoon 2 (AAFC): Poor germination. X
7. Indian Head: lost due to poor germination. X
8. Redvers/Estivan: CV: 19.7% X

Trial sites of Co-op Mustard Test

Alberta:

1. Lethbridge (AAFC): Lost due to herbicide damage. X
2. Medicine Hat (Farming Smarter): Poor emergence. X
3. Lethbridge (Farming Smarter): Lost due to poor emergence. X
4. Oyen (CARA): Lost due to poor emergence. X
5. Taber (AgQuest): CV: 17.8% X



Trial sites of Co-op Mustard Test

Manitoba:

1. Melita 1 (Manitoba Ag): 6.4% ✓

Montana, USA:

1. Havre (U of Montana): CV:13.0%, but less than 50% emergence and very poor yield. X



Co-op Mustard Test, Havre, Montana, USA



Out of 15 Co-op Mustard Tests, only 5 (33%) are successful with CV less than 16%.



Agronomic performance of the brown mustard lines from the Co-op Mustard Tests

Entries	Average yield (Kg/ha)	Seed size (g/1000 seeds)	Oil (%)	Protein (%)	Allyl GSL (μmol/g seed)	Chloro (mg/Kg seed)	Color (WI)	Maturity (days)	White rust (2a)
Centennial Brown (check)	1825	2.77	34.2	30.5	123	2.95	-4.46	86	S
AAC Brown 100	1944	3.18**	35.0*	30.4	132**	4.47*	-3.44**	86	R
B59DH7	1861	2.33**	34.8	30.7	127**	1.58*	-6.67**	86	R
B123DH47	1828	2.25**	35.4**	31.3**	136**	2.74	-7.18**	86	S
LSD (5%)	124	0.11	0.62	0.48	4.8	1.18	1.58	2.1	
#station years	5	4	4	4	3	4	4	4	



Summary of glucosinolate contents of the brown mustard lines from the Co-op Mustard Test

	Allyl (umol/gseed)	BUT (umol/gseed)	IND umol/gseed)	Hydroxy IND (umol/gseed)
Centennial Brown (check)	123	0.68	0.03	2.78
AAC Brown 100	132**	5.30**	2.46**	2.66
B59DH7	127	0.68	0.22	3.32**
B123DH47	136**	0.52	0.05	4.00**
LSD (5%)	4.8	0.26	0.13	0.26
No of station years	3	3	3	3

Summary of the agronomic performance of the oriental mustard lines from the Co-op Mustard Tests

Entries	Average yield (Kg/ha)	Seed size (g/1000 seeds)	Oil (%)	Protein (%)	Allyl GSL ($\mu\text{mol/g}$ seed)	Chloro (mg/Kg seed)	Color (WI)	Maturity (days)	White rust (2a)
Cutlass (check)	1959	2.46	38.8	29.5	130	1.87	-33.5	86	R
AAC Oriental 200	2053	2.25**	37.1**	29.2	128	1.22	-26.3**	86	R
O123DH16	1847	2.53	38.4	29.7	128	1.86	-31.1**	86	R
O123DH25	2081	2.44	38.1*	29.4	140**	1.95	-34.9	89**	R
O123DH136	1974	2.64**	36.1**	31.0**	144**	1.25	-33.1	87	R
O1504DH3	1829*	2.74**	37.5**	30.2**	133	3.02	-27.6**	89**	R
LSD (5%)	124	0.11	0.62	0.48	4.8	1.18	1.58	2.14	
#station years	6	4	5	5	4	5	5	5	

Summary of glucosinolate contents of the oriental mustard lines from the Co-op Mustard Test (2015)

	Allyl (umol/gseed)	BUT (umol/gseed)	IND umol/gseed)	Hydroxy IND (umol/gseed)
Cutlass	130	0.59	0.27	3.36
O123DH16	128	0.34	0.25	3.61
O123DH25	140**	0.81	0.21	3.04*
O123DH136	144**	0.65	0.33	3.04*
O1504DH3	133	0.87*	0.08	3.40
LSD (5%)	4.8	0.26	0.13	.026
No of station years	4	4	4	4

Brown mustard replicated yield trial

- Entries: 10
- Check: Centennial Brown
- 4 Replicates
- Randomized complete block design
- Locations:
 1. Saskatoon (AAFC): CV: 8.0%
 2. Scott (AAFC): CV: 8.8%
 3. Vanguard (Westwind): CV: 6.9%
 4. Swift Current (AAFC): CV: 10.3%
 5. Redvers: CV: 13.9%
 6. Medicine Hat: lost due to poor emergence. X

Summary of the yield of B1630DH182 from the yield tests

	Centennial Brown (check) (kg/ha)	B1630DH182 (kg/ha)	LSD (5%)
Saskatoon	1603	1720	171
Scott	2899	2841	401
Swift	2740	2544	454
Current			
Vanguard	1601	1731	156
Redver	1131	1153	213
Station years	5	5	



Summary of the agronomic performance of B1630DH182

Entries	Average yield Kg/ha	Seed size (g/1000 seeds)	Oil (%)	Protein (%)	Allyl GSL (µmol/g seed)	Chloro (mg/Kg seed)	Color (WI)	Maturity (days)	White rust (2a)
Centennial Brown (check)	1903	2.43	38.3	27.6	81	6.0	-4.41	89	S
B1630DH182	1920	3.45**	36.8**	29.3**	108**	7.5	-5.04	90**	?
LSD (5%)	147	0.10	0.5	0.4	6.8	2.3	0.55	0.86	
#station years	5	5	5	5	5	5	5	5	



Summary of glucosinolate contents of B1630DH182

	Allyl (umol/gseed)	BUT (umol/gseed)	IND umol/gseed)	Hydroxy IND (umol/gseed)
Centennial Brown (check)	81	0.37	0.13	3.45
B1630DH182	108**	0.57	1.64**	2.82**
LSD (5%)	6.8	0.18	0.27	0.23
No of station years	5	5	5	5



Oriental mustard replicated yield trial

- Entries: 11
- Check: Cutlass
- 4 Replicates
- Randomized complete block design
- Locations:
 1. Saskatoon (AAFC): CV: 10.6%
 2. Scott (AAFC): CV: 7.7%
 3. Vanguard (Westwind): CV: 11.1%
 4. Swift Current (AAFC): CV: 9.3%
 5. Redvers: CV: 21.6%
 6. Medicine Hat: lost due to poor emergence

Summary of the yield of O2521 from the four yield tests

	Cutlass (check) (kg/ha)	O2521 (hybrid) (kg/ha)	LSD (5%)
Saskatoon	1328	1585*	227
Scott	2609	2756	302
Swift Current	2801	2973	402
Vanguard	1793	1790	292
Station years	4	4	

Summary of the agronomic performance of the selected oriental mustard lines for Co-op Mustard Test

Entries	Average yield (Kg/ha)	Seed size (g/1000 seeds)	Oil (%)	Protein (%)	Allyl GSL (μmol/g seed)	Chloro (mg/Kg seed)	Color (WI)	Maturity (days)	White rust (2a)
Cutlass (check)	2119	2.54	41.4	28.0	125	2.3	-33.7	90	R
O2521 (hybrid)	2251	2.57	39.7**	28.8*	146**	2.8	-30.1**	91	
LSD (5%)	211	0.12	0.72	0.61	11.3	2.4	2.7	1.00	
#station years	4	3	4	4	3	4	4	3	



Summary of glucosinolate contents of O2521 from the four yield tests

	Allyl (umol/gseed)	BUT (umol/gseed)	IND umol/gseed)	Hydroxy IND (umol/gseed)
Cutlass (check)	125	0.54	0.44	3.86
O2521 (hybrid)	146**	0.77	0.40	3.48**
LSD (5%)	11.3	0.18	0.07	0.24
No of station years	3	3	3	3



Hybrid breeding using the improved Ogura cms system in brown and oriental mustard

The Ogura cms A and R restorer lines developed so far

	Ogura cms A lines	Ogura cms restorer line (RfoRfo)
Brown mustard	7	15
Oriental mustard	9	25

Hybrid breeding using the improved Ogura cms system in brown and oriental mustard

Work Plan in 2016:

- 1. The Ogura cms A and R restorer lines will be evaluated for agronomic performance in the nursery in 2016.**
- 2. The seed of each Ogura cms A and R lines will be increased in isolation tent in 2016.**
- 3. Test hybrids will be made in Chile winter nursery in 2016.**

Yellow mustard replicated yield trial

- Entries: 15
- Check: Andante
- 4 Replicates
- Randomized complete block design
- Locations:
 1. Saskatoon (AAFC): CV: 8.6%
 2. Swift Current (AAFC): CV: 7.3%



Summary of the yield of the selected yellow mustard lines from the yield tests in 2013 and 2015

Lines	Saskatoon (15CYT04SA)	Swift Current (15CYT04SW)	Vanguard (13CYT03VN)	Hytech (13CYT03LE)	Station years
Andante (check) (kg/ha)	1348	2440	2811	4421	4
Y1997	1637*	2498	3171	4474	4
Y1988	1499	2376	3212	4407	4
Y1992	1464	2571	2939	4325	4
Y1989	1429	2390	3278	3957	4
Y1994	1384	2357	3544	4320	4
LSD	192	249	735	725	
CV (%)	8.6	7.3	15.0	12.3	



Summary of the agronomic performance of the selected yellow mustard synthetic lines for Co-op Mustard Test in 2016

(13CYT03VN, 13CYT03LE, 15CYT04SA and 15CYT04SW)

Entries	Average yield (Kg/ha)	Seed size (g/1000 seeds)	Oil (%)	Protein (%)	Mucilage	Hydroxyl benzyl (umol/gseed)	Chloro (mg/Kg seed)	Color (WI)	Maturity (days)
Andante (check)	2755	7.26	27.3	36.0	67	146	0.70	-30.4	97
Y1997	2945	7.40*	27.9	35.4	68	141	0.87	-31.7	98
Y1994	2901	7.16	27.4	36.7	68	147	0.69	-31.5	98
Y1988	2873	7.83**	27.0	36.6	103**	161*	0.76	-30.6	99
Y1989	2763	7.20	27.3	36.0	76	163*	0.87	-30.0	98
Y1992	2825	6.91**	27.8	35.7	91**	150	0.81	-32.5	99
LSD (5%)	269	0.11	1.45	1.75	13.9	13.5	0.58	2.36	3.6
#station years	4	4	4	4	3	2	2	4	4



Summary of the agronomic performance of the selected yellow mustard synthetic lines for 2016 Co-op Mustard Test

(13CYT04VN, 13CYT04LE, 15CYT04SA and 15CYT04SW)

Entries	Average yield (Kg/ha)	Seed size (g/1000 seeds)	Oil (%)	Protein (%)	Mucilage	Hydroxyl benzyl (umol/gseed)	Chloro (mg/Kg seed)	Color (WI)	Maturity (days)
Andante (check)	2734	7.23	26.8	36.5	72	120		-31.6	98
Y2009	2870	7.20	26.9	36.5	68	126		-31.9	98
LSD (5%)	250	0.56	0.38	1.46	4.30	12.9		4.9	4.97
#station years	4	4	4	4	4	4	0	4	4



Brown mustard DH nursery

- Entries: 85
- Check: Centennial Brown
- 2 Replicates
- Locations: Saskatoon (AAFC)
- 9 DH lines selected for 2016 replicated yield trial



Oriental mustard DH nursery

- Entries: 105
- Check: Cutlass
- 2 Replicates
- Locations: Saskatoon (AAFC)
- 9 DH lines selected for 2016 replicated yield trial



Yellow mustard inbred nursery

- 1. First generation inbred lines:** Developed via self-pollination of OP population varieties Andante, AC Pennant and Ace
- 2. Second generation inbred lines:** Produced from crosses between elite inbred lines

- Entries: 125
- Check: Andante
- 2 Replicates
- Location: Saskatoon (AAFC)
- 48 inbred lines have been selected for making synthetics in 2016



Yellow mustard synthetic nursery

- Entries: 128
- Check: Andante
- 2 Replicates and 2 rows
- Locations: Saskatoon and Swift Current (AAFC)
- 48 synthetic lines have been selected for replicated yield trial in 2016



Chile winter nursery



Chile winter nursery



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