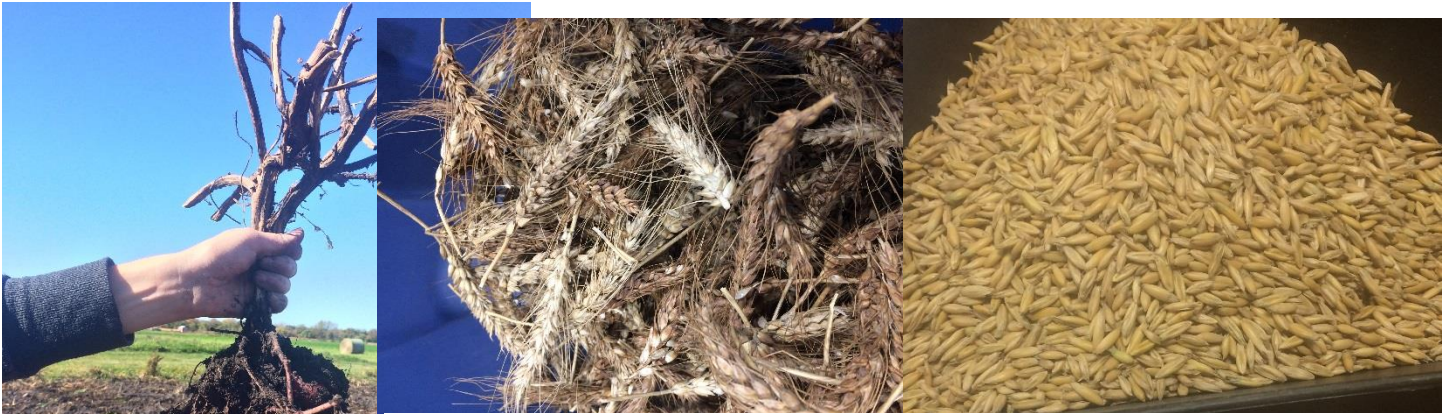


Participatory Plant Breeding

Spring 2017 Newsletter



Farmer selected potato, wheat, and oats being harvested or processed in the Fall of 2016

Greetings!

Hello from the PPB team! We hope this newsletter finds you well, and that your preparations for the 2017 growing season are coming along. Here in Manitoba we looking forward to the thaw!

Thanks to all the farmer breeders participating in the program.

Thanks to everyone who has sent in their grain samples, harvested

their potato selections, and kept open communication with us. If you were able to make the PPB phone calls last month, thanks for participating!

Included in this newsletter you will find a snapshot on the process of your cleaning grain, information on the parents and boutique wheat crosses made for the program, life after selection, and update for 2017 season.

Sample Processing at the University of Manitoba

We have successfully processed all of the received wheat and oat populations from the 2016 season and are currently readying packages to send out to farmers for 2017.



Sending farmer selections through the belt thresher



Selections sent through belt thresher; then sent through a blower to clean out the chaff



Tiny seeds and weed seeds are then screened out the sample

Parents used in some of our special crosses

Currently, the program offers 27 unique crosses made using 31 parents suggested by farmers participating in the program across Canada in 2014 and 2015. Just as each farmer-breeder is making selections with goals in mind, these breeders selected these varieties.

Parent	Year Registered/ Introduced	Initial Cross Year	Parents	Development Location	Goal of selection and cross	Crossed with	PPB Cross Contained
CDC Kernen	2012	1999	CDC Bounty/FHB4	Saskatoon, SK	The bulked F7 was selected for yield under drought conditions. Matures mid-season, erect growth habit. Susceptible to orange blossom wheat midge.	08NW109 (for quality)	PWA01A
Goodeve	2007	1998	94B43-BLW4/AC Intrepid	Swift Current, SK	Good yield stability in dry, hot conditions during kernel filling stage.	Superb	PWA02
Superb	2001	1993	AC Domain/Grandin	Winnipeg, MB	To develop a pre-harvest sprouting tolerant cultivar with yield potential of Grandin	Goodeve, Helios	PWA02, PWA17
Cardale	2011	2001	McKenzie/Alsen	Winnipeg, MB	Semi-dwarf wheat with moderate resistance to FHB	BF34A-18-1 Shaw	PWA03, PWA04
Shaw	2009	2001	Harvest/BW313	Winnipeg, MB	Wheat midge larvae resistance. The cultivar is named after Philip Shaw Barker, who originally discovered a source of previously unknown antibiotic resistance to wheat midge.	Cardale, ERA131-R3	PWA04, PWB10
Cadillac	1996	1987	BW90*3/BW553	Swift Current, SK	It combines high grain yield with high grain protein concentration, heavy kernel and volume weights.	Carberry	PWA05
AAC Scotia	2011		AC Helena//Quantum/AC Walton	Ottawa, ON	Does well in Eastern regions of Canada	BF34A-18-1 Norwell, AC Walton, Acadia	PWA06, PWA12, PWB02, PWB03, PWB16
AAC Tradition	2016	2003	98B25AS6D01'/ 'ND744	Winnipeg, MB	Selection criteria included yield, height, and tolerance to lodging, maturity and disease resistance. First organically bred registered wheat variety in Canada	08NW109, Carberry, Unity	PWA09, PWB04, PWB05
Sable	2005	1989	TG3S/B58664HCH	Oberlimpurg, Germany	Selection criteria was yield, milling and baking quality, Fusarium head blight resistance, leaf and stem rust resistance.	ERA131-R3, Helios	PWA10, PWA15
Carberry	2011	2000	Alsen/Superb	Swift Current, SK	Spikes were selected from 534 disease resistant doubled haploid lines that also matured early and had strong stems of acceptable height.	Cadillac, ERA 131-R3, AC Tradition, Glenn	PWA05, PWA11, PWB04, PWB08,

Norwell	2009	1989	Max/PT742//Blue sky///Max/Coteau//Bluesky	St-Foy, QC	Final selection of 'Norwell' was made in the F7 and F8 generations based on Fusarium resistance, Barley Yellow Dwarf resistance, kernel cross-section type, kernel size, grain density, plant appearance, number of heads produced per unit area, cleanliness of leaves, percent protein, percent moisture, alpha amylase activity and loaf characteristics.	AAC Scotia	PWA12
Helios	2007	1996	BW674/BW689//AC Barrie	Swift Current, SK	Selected F8 lines were screened for reaction to loose smut and common bunt.	Touran, Sable, Superb	PWA13, PWA15, PWA17
Touran	2013				Does well in Eastern Regions of Canada		
Unity	2009	1997	McKenzie*3//BW174*2/Clark	Winnipeg, MB	The F4 generation was grown as short rows at Glenlea where selection for resistance to midge may have occurred along with selection for agronomic traits and leaf and stem rust resistance.	Red Fife, AAC Tradition, Shaw, Brandon	PWA14, PWB05, PWB10, PWB15
Red Fife		1842		Otonabee, Ontario	Heritage, known for culinary preference	Unity, McKenzie	PWA14, PWA16,
McKenzie	1997	1989	Columbus/Amidon	Saskatoon, SK	McKenzie wheat is named after Roy Edward McKenzie, P. Ag., FAIC, whose career was dedicated to the practice of agrology and service to farmers. Mr. McKenzie was one of nine individuals who drafted the legislation that established the Saskatchewan Institute of Agrology. Selection was based on resistance to stem and leaf rust, maturity, plant height, straw strength, plant vigour, protein content	Red Fife	PWA16
Park	1963	1950	(Mida-Cadet) x Thatcher	Lacombe, AB	Selected for resistant to loose smut, stem rust.	Pembina	PWB01
Pembina	1959		Thatcher/Selkirk			Park	
AC Walton	1995	1984	Nobeoka Bozu/2/Kolibri/Janus/3/Opal/Glenlea	Charlottetown, PEI	Identified on the basis of yield, disease resistance, and straw strength.	AAC Scotia, Celtic	PWB02, PWB11
AAC Scotia				Ottawa, ON	Does well in Eastern Regions of Canada	B34A-18-1, Norwell, AC Walton, Acadia,	PWA06, PWA12, PWB02, PWB03, PWB16
Acadia	1952	1937	Marquis/Pentad//Canus	Indian Head, SK	Does well in Eastern Regions of Canada, known for culinary preference	AAC Scotia, AC Barrie	PWB03, PWB06, PWB16

AC Barrie	1996	1984	Neepawa/Columbus//BW90	Swift Current, SK	The F8 was screened for reaction to both loose smut and common bunt. Reaction to leaf and stem rust was measured in an epiphytotic nursery near Glenlea, MB. AC Barrie exhibited superior overall quality with superior ratings for protein, flour yield, and loaf volume.	Acadia	PWB06
Glenn	2009	1997	ND 2831' / 'Steele-ND	North Dakota	Selection criteria for the breeding of 'Glenn' wheat were highly heritable traits (i.e., plant vigor and height, maturity, and pest resistance) in early segregating generations F2 - F4. For the F4 - F6 generations, selection criteria also included Fusarium Head Blight (FHB) (Scab) resistance, grain yield, lodging resistance, shattering resistance, grain volume and kernel weights, and milling and bread making characteristics.	Carberry	PWB08
Champlain	1910		Black Sea/Golden Drop	Vermont		AC Brandon	PWB09
AC Brandon	2003	2012	Superb / CDC Osler // ND744	Swift Current, SK	Seed of the F3 generation was grown in a contra-season nursery in New Zealand where selections were made based on relative maturity, plant height and straw strength. The F4, F6 and F8 lines were planted and screened in various locations in Western Canada (Swift Current, Indian Head and Regina, Saskatchewan; and Morden, Manitoba) and assessed for agronomic performance, grain quality and kernel attributes. The F5 and F7 generations were grown in nurseries in New Zealand. Selected F8 lines were screened for resistance to mixtures of Loose Smut and Common Bunt.	Champlain, Unity	PWB09, PWB15
Celtic	1990		Len/Angus			AC Walton	PWB11
Cross information used from Canadian Food Inspection Agency, Canadian Journal of Plant Science and wheatpedigree.net							

List of our unique crosses using the parents featured above:

Western Canadian Suggestions		Eastern Canadian Suggestions		East meets West		Heritage vs. Modern*very special! (for disease resistance)	
Name	Pedigree	Name	Pedigree	Name	Pedigree	Name	Pedigree
PWA01A	CDC Kernen/08NW109	PWA06	BF34A-18-1 / AAC Scotia	PWA13	Helios / Touran	PWA14	Unity / Red Fife
PWA02	Goodeven/Superb	PWA10	ERA131-R3 / Sable	PWA15	Helios / Sable	PWA16	Red Fife / McKenzie
PWA03	BF34A-18-1 / Cardale	PWA12	AAC Scotia / Norwell	PWA17	Superb / Helios	PWB09	Champlain / Brandon
PWA04	Cardale / Shaw	PWB02	AC Walton / AAC Scotia	PWB06	AC Barrie / Acadia		
PWA05	Cadillac / Carberry	PWB03	AAC Scotia / Acadia	PWB09	Champlain / Brandon	Agronomics with Quality Cross	
PWA09	08NW109 / AAC Tradition	PWB11	Celtic / AC Walton			PWA14	Unity / Red Fife
PWA11	ERA 131-R3 / Carberry	PWB16	AAC Scotia / Acadia	Agronomics with Quality Cross		PWA16	Red Fife / McKenzie
PWB01	Park / Pembina			PWB06	AC Barrie / Acadia	PWB09	Champlain / Brandon
PWB04	Carberry / AAC Tradition	Agronomics with Quality Cross		PWB09	Champlain / Brandon		
PWB05	AAC Tradition / Unity	PWA06	BF34A-18-1 / AAC Scotia				
PWB08	Glenn / Carberry	PWA10	ERA131-R3 / Sable				
PWB10	Shaw / Unity	PWA12	AAC Scotia / Norwell				
PWB15	Brandon / Unity	PWB02	AC Walton / AAC Scotia				
		PWB03	AAC Scotia / Acadia				
Agronomics with Quality Cross		PWB11	Celtic / AC Walton				
PWA01A	CDC Kernen/08NW109	PWB16	AAC Scotia / Acadia				
PWA05	Cadillac / Carberry						
PWA09	08NW109 / AAC Tradition						
PWA11	ERA 131-R3 / Carberry						

Updates for the Participatory Plant Breeding Program for the 2017 Season

Agronomic Evaluation of Farmer Selections

This year, we will be conducting four field trials comparing farmer selected wheat, oat, and potato populations against registered checks and each other. The trials are done to evaluate the performance and mark differences between farmer selections and registered checks.

We ask questions like:

- “How do farmers and growing environment shape a population from the same cross?”
- “Does selecting populations under organic management result in populations that perform better than varieties selected under conventional management under an organic management environment?”
- “How do the registered checks and farmer selections differ in disease resistance?”
- “What kind of qualities are organic farmers across Canada selecting for?”
- “How to registered checks and farmer selections differ in weed competition?”

We then share this knowledge with participating farmers, and besides having interesting information on selections, the information will assist in narrowing down which population to focus increasing production on.

The evaluation trials also showcase populations to potential breeders who may want to include them in their own population evaluation trials.

The data from the evaluation trials if valuable for other farmers and research scientists that may be interested in participating in our PPB program or start their own PPB programs in their own regions/countries.

Wheat and oat trials will take place in Manitoba, and potato trials will take place in southern Ontario and Quebec. All the trials will take place on organic land.

Community Building

We have had some requests from participating farmers to be connected through the program and to share contact information with each other. In this way, you can be connected with farmers with similar goals, assess populations, and share solutions and challenges. I plan to share this information in some way with everyone at some point, if you **do not** want your name and contact information shared **please let me know**. We understand and respect people’s privacy

Life after Selection

You’ve spent countless hours planting, selecting, monitoring your populations... and now you have come to the end of 3 years... now what?!

Cereals

Submit the populations (or breeding lines) for registration

Here’s an example of the breeding process for AAC Tradition, the first organically bred wheat cultivar in Canada (this information is available for most registered cultivars on the Canadian Food Inspection Agency Website)

'AAC Tradition' (experimental designation 'BW487') originated from the cross '98B25-AS6D01' / 'ND744' conducted at the Agriculture and Agri-Food Canada Cereal Research Centre, Winnipeg, Manitoba in 2003. In 2004, F2 seeds were

grown under organic management near Carman, Manitoba and 250 spikes were collected. An F3 bulk was grown near Lincoln, New Zealand during the 2004-2005 winter season and spikes were collected. In 2005 and 2006, the F4 and F5 were grown in Manitoba. In 2007, the F6 lines were yield tested at four locations in western Canada (Brandon, Glenlea, Saskatoon, and Swift Current). Spikes were collected from the yield plots and increased as F7 rows in 2007-2008 at the off-season nursery near Palmerston North, New Zealand. The F7 lines were harvested and evaluated as F8 lines at three locations in western Canada. At advanced stages of variety development, selection criteria included yield, height, tolerance to lodging, maturity and disease resistance. In 2009, the line was advanced as an F9 to the Bread Wheat Organic 'A' test and was subsequently evaluated in the 2010 Bread Wheat Organic 'B' test. In 2011, the line was designated 'BW487' and was entered in the Central Bread Wheat Cooperative test where it was evaluated from 2011 to 2013. The variety was registered for release and named in 2016. We have heard that there is a shortage of the variety across Canada for the season of 2017.

It took 13 years from the initial cross to release in a breeding program fully funded for the intention of registration. Here at the University of Manitoba the PPB program does not have the financial and physical resources to register varieties. The farmer selection evaluation experiments we conduct showcase the varieties and allow cereal breeders in the area to look at the farmer-selected breeding lines to consider including them in their breeding lines trial for registration. The data collected from these trials are then published and breeders across Canada and potentially the world can access this information to possibly include the data in their trials.

Increase seed to grow for your operation

Making the jump from plot size amounts to seed amounts to use in your larger equipment. **The team at the University of Manitoba wants to offer our plot equipment services and organic land to increase seed for your farm.** If you're interested in this, please contact Michelle to work out seed amounts, how much you need, possible shipment costs, etc.

Potato

Submit the populations (or breeding lines for registration) for registration.

Here's an example of the breeding process for AAC Alta Cloud (this information is available for most registered cultivars on the Canadian Food Inspection Agency Website)

'AAC Alta Cloud' (experimental designation CV98112-3) originated from a cross made at the San Luis Valley Research Farm of Colorado State University in the United States and was assigned to Agriculture and Agri-Food Canada's Lethbridge Research Centre as per a reciprocal exchange agreement of unselected F1 seedlings. The cross was conducted in 1998 between the female parent designated 'AC91014-2' and the male parent variety 'Canela Russet'. In 1999, true potato seed was sown in a greenhouse at Colorado State University and the resulting seedling tubers were planted in 2000 at the Vauxhall Research Substation of Agriculture and Agri-Food Canada for selection. A clone designated CV98112-3 was selected in 2000, and progressed through 4-hill, 10-hill, and 50-hill generation stages of selection and evaluation at Vauxhall in 2001, 2002 and 2003, respectively. Selection criteria in the field in Vauxhall and in the laboratory in Lethbridge included vine maturity, shape and size of tuber, specific gravity, culinary quality, fry colour at harvest and out of long-term storage at 5 and 10°C, incidence of tuber defects, and reaction to diseases including common scab, late blight, fusarium dry rot and verticillium wilt. The final trial for 'AAC Alta Cloud' was conducted in 2012 at the Potato Research Centre of Agriculture and Agri-Food Canada in Fredericton, New Brunswick. The potato variety was registered in 2013.

The garden variety potato registration process is faster than the commercial potato variety and cereal registration process. More information on registering garden variety potatoes and production restrictions can be found [here](#).

Virus-Freeing Potatoes

The danger of continually saving potatoes for seed on your land is the potential for different viruses to build up which can devastate a potato crop. Certified potato seed growers use seed potatoes that have gone through the process of virus-freeing to avoid this build-up.

Virus-freeing potatoes requires chemotherapy or thermotherapy of meristem tip or stem cutting cultures in a lab. During my trip to British Columbia this past summer, I spoke to the Lab Director of [Phyto Diagnostics Company Ltd.](#) at a field day, who does virus freeing seed producers and researchers across Canada. He reported that it costs about \$1500 dollars/sample and takes about 6 months to complete, depending on the cultivar's response. The lab will send back 5 tubes of tissue culture to send to propagators to receive mini-tubers.

From talking to producers at the field day, it costs about \$40-\$45 per lbs of mini-tubers (25-30 minitubers per lbs). The farmers there have used [Valley Tissue Culture in Minnesota](#), however, others closer to you probably exist. A simple video of how this is done can be found [here](#). This is an important consideration for farmers in the program who are interested in saving their own potatoes.

If you have any other questions you may not have seen here, shoot me an e-mail.

Thank you for your participation in the on-farm breeding program!

If you have any questions about this program or would like to become involved please let us know.

Michelle Carkner and Martin Entz

Contact Michelle at 204-474-6236 or michelle.carkner@umanitoba.ca

Contact Martin at 204-474-6077 or m.entz@umanitoba.ca
