Agriculture and Agri-Food Canada | Agriculture et Agroalimentaire Canada

Potato Gene Resources

Number 22 – 2015

Genotyping Data as A Supplement for the Registration of Garden Potato Varieties in Canada

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As the government agency responsible for the Canadian Seed Potato Certification Program, the Canadian Food Inspection Agency (CFIA) has been using molecular confirmation of potato varieties for nearly twenty years. Requests for potato genotyping for variety verification purposes may originate due to possible mix-up of plantlets in repositories which may occur during propagation. But mostly, requests originate during seed potato certification inspections where high levels of variations in a crop are suspected to be caused by rogue varieties and which, therefore result in the refusal to certify the crop as seed potatoes. For many requests, morphological characteristics are not sufficient for identification (plantlets and tuber) and molecular identification is then sought for confirmation of variety. Appropriate identification of the potato varieties is crucial to maintain the high level of quality of the Canadian Seed Potato Certification Program which benefits all stakeholders involved.

In response to variety verification requests, the CFIA Laboratory established a reference collection of DNA extracts representing potato varieties available in Canadian repositories to develop a molecular genotyping procedure for variety verification. The DNA collection was used to establish Amplified Fragment Length Polymorphism (AFLP) fingerprints representing each of these potato varieties. Although AFLP has been a very powerful method for distinguishing varieties, it was not very suitable for high throughput diagnostic or for harmonization from one laboratory to another allowing genotype exchanges. Microsatellite markers (SSR: Simple Sequence Repeat) have been shown to be reliable, consistent and reasonably discriminative for use as a genotyping tool and can be harmonized. Most of the time, the marker set used differ from one laboratory to another so the genotypes produced can be compared only to those within the same study. With the increasing number of varieties registered and protected around the world and the exchange of genetic material, the construction of unified databases of variety reference genotype profiles would be an invaluable asset for stakeholders. Simple and accessible SSR methods with established allele calling rules are a requirement to minimise inter-laboratory variations which is mandatory for the establishment of such databases[1]. With international harmonization of testing methods in mind, the CFIA Laboratory used the reference potato variety DNA collection to establish the method used by the European

community[2,3]. The markers are based on the use of three multiplexed microsatellite (SSR) markers targeting 9 loci and identified as set 1: STM0019, STM3009, SSR1; set 2: STM2005, STM3012, STM3023; and set 3: STM2028, STM5136, STM5148[4,5,6]. These markers were proven to be sufficiently robust, consistent and have differentiated more than 6,000 clones maintained in the 4 repositories in Europe and, therefore, fit for the purpose of variety identification[7]. Using the markers established by the European community allowed CFIA to exchange data and access the European database of reference genotypes and subsequently leading to effective identification[8].

Garden potato varieties grown for some unique traits such as black flesh or distinctive tuber shape may not be of high commercial interest, but have attractive values for some specialized markets. Garden variety potatoes are not always subject to Variety Registration in Canada. Unless a garden variety is grown on more than 1.5 Ha, it is not subject to variety registration. However, when entered in the Seed Potato Certification Program, the crop is subject to inspection and its regulation to maintain the high quality standards of the Canadian Seed Potato Certification Program and facilitate crop pests management on the farm unit and surroundings (CFIA directive D-98-04: Seed Potato Program - Certification of Garden Potato Varieties in Canada). Prerequisites for the registration of varieties in Canada are the inclusion of the pedigree as well as a morphological Description of the Variety (DOV - CFIA Variety Registration procedures). However, for most of garden potato varieties listed in CFIA Program Directive D-98-04, there is no pedigree available. Recently, CFIA encountered this type of situation: an applicant was interested in the registration of a variety of unknown origin appropriately named “Mystère”. The CFIA Laboratory first investigated the origin of the variety by genotyping a sample along with the appropriate reference varieties. As the exact genetic background of the variety “Mystère” remained unknown and the registration of “Mystère” would be beneficial to all stakeholders involved, CFIA Programs decided that the genotype would supplement the registration prerequisite for the pedigree and breeding history (part of the determination of "distinguishability" for a variety). On May 2, 2012, the CFIA Variety Registration Office sent a notification of the National Registration of the potato variety named “Mystère” (CFIA Variety Registration and Notifications, #7200).

As the genotyping technology has proven to be informative and reliable to offer a suitable solution for the registration of potato varieties, it was proposed to use the same process to register garden potato varieties also lacking the pedigree information. Therefore, CFIA has initiated a review to determine the genomic and morphological similarities and uniqueness of some of the garden potato varieties listed in the Program Directive D-98-04. Thus doing so, the CFIA's molecular Identification Research Laboratory and Potato Section Program initiated a project (2012-2014) by which all garden potato varieties grown at a significant acreage in Canada were to be genotyped. In the summer of 2012 and 2013, a selection of garden potato varieties was grown in Ridgetown, Ontario (2012) and in Ottawa, Ontario (2013). For each of the varieties grown, a morphological description of the variety was generated and reference material was simultaneously sent to the laboratory for genotyping. In the last year of the project (2014), the CFIA laboratory also obtained material of potato varieties listed in the CFIA directive 98-04 for which the Agency did not have a reference genotype, from the Canadian Potato Genetic Resources (CPGR, Fredericton, NB). Furthermore, CPGR was also able to provide the laboratory with other blue potato varieties not targeted by the project. This added further value to the project as some blue varieties are known to share genotypes complicating the uniqueness characteristic of a registered variety[9].

Table 1. List of Garden, Heritage or Blue potato varieties genotyped by the CFIA laboratory.

Variety[1]	Characteristics[2]	Variety[1]	Characteristics[2]
Abnaki	Garden - CFIA list	Grand Falls*	Garden - CFIA list
AC Blue Pride*	Blue	Haida*	Garden - CFIA list
AC Domino*	Blue	Heidzel Blue*	Blue Heritage
Alaska Frostless	Garden - CFIA list	Hudson	Garden - CFIA list
Alaska Sweetheart	Garden - CFIA list	Hunter	Garden - CFIA list
All Blue	Blue Garden - CFIA list	Huron	Garden - CFIA list
All Red	Garden - CFIA list	Kerr's Pink*	Garden - CFIA list
Angelina Mahoney's Blue	Blue Garden - CFIA list	La Ratte*	Garden - CFIA list
Arran Consul	Garden - CFIA list	Lumper*	Garden - CFIA list
Arran Victory	Blue Heritage	Manota*	Garden - CFIA list
Avon*	Garden - CFIA list	McIntosh Black	Blue Garden - CFIA list
Azul	Blue	McIntyre Blue*	Blue Garden - CFIA list
Batoche	Garden - CFIA list	Nova Scotia Blue*	Blue Garden - CFIA list
Beauty of Hebron	Garden - CFIA list	OAC Royal Gold*	Blue Garden - CFIA list
Belchip	Garden - CFIA list	Pink Fir Apple	Garden - CFIA list
BelRus	Garden - CFIA list	Pungo	Garden - CFIA list
Bison	Garden - CFIA list	**Purple Chief**	Blue Garden - CFIA list
Bliss Triumph	Garden - CFIA list	**Purple Peruvian**	Blue Heritage
Blue Mac	Blue	Purple Viking	Blue Garden - CFIA list
Blue Shetland*	Blue Garden - CFIA list	Raritan	Garden - CFIA list
Blue Victor*	Blue Heritage	Red Cloud	Garden - CFIA list
Brigus	Blue	Red Ruby	Garden - CFIA list
British Columbia Blue*	Blue Garden - CFIA list	Red Warba	Garden - CFIA list
Cain's Irish Rocks*	Garden - CFIA list	Rhinered	Garden - CFIA list
Campbell 13	Garden - CFIA list	**River John Blue**	Blue Garden - CFIA list
Candy Cane	Garden - CFIA list	**Rode Eersteling**	Garden - CFIA list
Cariboo	Garden - CFIA list	Rose Gold	Garden - CFIA list
Carola	Garden - CFIA list	Royal Kidney*	Garden - CFIA list
Chippewa	Garden - CFIA list	Ruby Pulsiver's Bluenoser*	Blue Heritage
Congo	Blue Garden - CFIA list	**Russian Blue**	Blue Garden - CFIA list
Crotte D'ours*	Blue Garden - CFIA list	**Seiglinde**	Garden - CFIA list
Delta Gold	Garden - CFIA list	Sharon's Blue*	Blue Garden - CFIA list
Donna	Garden - CFIA list	Simcoe	Garden - CFIA list
Duke of York	Garden - CFIA list	Skerry Blue*	Blue Garden - CFIA list
Early Rose	Garden - CFIA list	Somerset	Garden - CFIA list
Elmer's Blue	Blue Heritage	Stella's Newfoundland*	Blue Heritage
Fingerling*	Garden - CFIA list	Suncrisp	Garden - CFIA list
Fortyfold*	Blue Garden - CFIA list	Trent	Garden - CFIA list
French Fingerling	Garden - CFIA list	Waseca	Garden - CFIA list
Garnet Chili	Garden - CFIA list	Wauseon	Garden - CFIA list
German Butterball	Garden - CFIA list	Yellow Fin*	Garden - CFIA list

[1]Name of potato varieties genotyped. * = material supplied by CPGR, Bold = variety morphologically described within this project. [2] Characteristics of the variety relative to being on the CFIA garden potato variety list D-98-04 or heritage as defined by CPGR. Varieties considered blue are indicated as well.

Within the varieties that have been described morphologically (Table 1, variety names in bold), “All Red”, “Azul”, “French Fingerling”, “German butterball”, “Rode Eersteling” and “Seiglinde” present a unique SSR profile, therefore, the 6 varieties can now be registered (Figure 1). However, genetically, it has been demonstrated in Canada and internationally that synonyms are current as older and popular varieties have been renamed over the years[7,9]. Typically one of the causes would be that garden or heritage potato varieties have been grown before or independently from the CFIA Variety Registration. Within the varieties for which a morphological description was prepared, we identified 3 clusters of varieties sharing the same genotype (Figure 1). “Angelina's Mahoney's Blue” shares a SSR profile with “Purple Chief”; “Elmer's Blue” shares the same genotype as “Purple Peruvian” and the same profile is shared by “All Blue”, “Congo”, “River John Blue” and “Russian Blue”. This last cluster has also been observed and discussed in several studies[7,9,10,11]. Although varieties sharing a microsatellite profile may vary morphologically, it would be advisable to register one variety from the cluster to ease the application of Seed Potato Certification Program standards. As the morphological variation within a genetic cluster is likely to be minimal, the difficulty in varietal verification during inspection is likely to increase and genotyping will not be of use to definitively differentiate the varieties. The criteria to help with a decision may be by selecting the line grown at the largest number of hectares as it would be an indicator of the popularity of the variety. As a selection of a variety for each of the 3 clusters is reached, these varieties will be ready for Variety Registration as well.

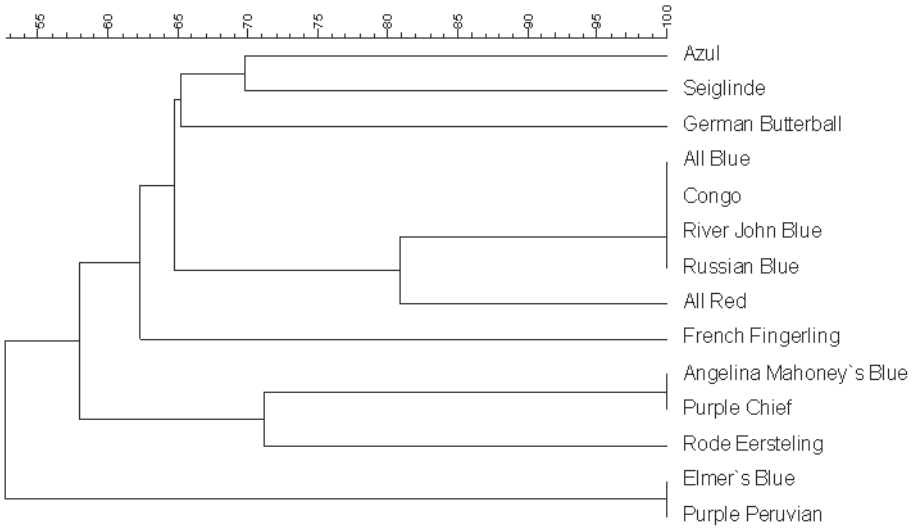

Figure 1. UPGMA dendogram obtained using 9 microsatellite markers on the 14 garden potato varieties described. The Dice correlation similarity index is indicated at the top in percentage. Vertical bars represent a cluster of varieties sharing the same genotype (100%)

As for the remainder of the garden varieties listed on Directive 98-04, most are no longer grown or grown on less than 1.5 Ha, and therefore, not subject to Variety Registration (CFIA directive D-98-04: Seed Potato Program - Certification of Garden Potato Varieties in Canada). The CFIA laboratory has included the reference genetic profiles of all garden potato varieties available in their database (Table 1). The genotypes will be used as a reference in support of the Canadian Seed Potato Certification Program when high level of variations in a registered variety is suspected to be caused by rogue varieties, or the crop is of a totally different variety. In such cases, molecular identification will be possible for confirmation of variety.

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[10] Fu, Y.-B. 2008. Molecular characterization of the potato clones at the Potato Gene Resources Repository. *Potato Gene Resources Newsletter* 15: 2–8

[11] Fu, Y.-B., G.W. Peterson, K.W. Richards, T.R. Tarn, and J.E. Percy. 2009. Genetic diversity of Canadian and exotic potato germplasm revealed by Simple Sequence Repeat markers. *American Journal of Potato Research* 86: 38–48.

Related Resources

CFIA directive 98-04:
http://www.inspection.gc.ca/plants/plant-pests-invasive- species/directives/potatoes/d-98-04/eng/1313254129245/1313299983815

CFIA Notifications 2012:
http://www.inspection.gc.ca/active/netapp/regvar/regvar_resultse.aspx?lang=e&Reg=7200&Kind=&SubKind=&Name=&PNTRadio=All&Rep=&Status=&startDate=&endDate=&btn_submit=Submit

CFIA Variety Registration Procedures:
http://www.inspection.gc.ca/plants/variety-registration/registration-procedures/guidance-document/eng/1411564219182/1411564268800?chap=2#s17c2

Forty Years of growing Potatoes in Carmanville, Newfoundland

George Brinson
Carmanville, Newfoundland

A Quest Begins

My interest in the potato goes back fifty years to the days of my youth in rural Newfoundland. My parents grew most of their vegetables for home consumption and potatoes were a traditional mainstay in our diet. In the late 1800s and early 1900s, several commonly grown varieties were brought to this island with immigrants from the British Isles and Ireland. As well, in the later part of the 1900s, varieties commonly grown in mainland Canada and northern United States made their way through commerce into the province. Investigating how many of these varieties might still remain in different parts of the island became my focus.

What began as a search for an old Irish potato variety developed into a quest for other early 1800s potato varieties brought to North America from Europe. These have withstood the test of time and continue to be grown in isolated garden plots across Canada. Unfortunately, with the shift in population after the mid-1900s from rural to urban, much of this material disappeared from garden circulation and some were lost permanently.

Black Minion

The potato that I sought first in the late 1970s was an old Irish variety local gardeners called "Minion", "Black Minion/Mignion/Cups" and "Rough Minion/Mignion" (Figure 1). An elderly uncle who lived to age 103 recalled his father growing it in the 1880s and our family grew it up to the 1950s. My uncle related that this variety was brought to Fogo in the early 1800's by Irish immigrants prior to the potato famine of the 1840s. The community of Tilting on Fogo Island is still 90 percent of Irish descent to this day.

I searched the entire east coast region and miraculously found an elderly man just 25 miles down the coast still maintaining a few tubers of "Black Minion". In fact, he said the original tubers were obtained from my community back in the 1930's, maybe from my grandparents? I was not able to find another source anywhere around the island at the time, making this discovery all the more valuable.

Figure 1. "Black Minion" tubers.

The taste of "Black Minion" when boiled was excellent, best described as an earthy/nutty taste with a floury dry flesh. The flesh stayed very dense throughout the winter storage season with no sprouting until very late the following year. This characteristic is probably the chief reason for its survival through the years. In our climatic conditions, it is late maturing and produces tubers of very irregular shape, not compatible with consumers' preferences today. Yet, for a poor Irish peasant in 1830, this was not a major factor. Unfortunately, it turned out to have low resistance to potato wart disease.

Potato Wart Disease

Synchytrium endobioticum, a fungus commonly known as Potato Wart, was prevalent in soils in the potato growing regions of Europe at the time, and is still found in some regions today. The disease

originated in South America and was brought to Europe after the Irish Potato famine. Potato wart is a soil born fungal gall that attacks the stem base or haulm of the plant and may also infect the tuber, limiting the growth and deforming the tuber (Figure 2). A large gall and a small amount attached to several tubers can be seen on Figure 2. Usually this worsens in succeeding crops until no tubers grow. Unfortunately, in the days before international plant movement regulations, the introduction of potatoes to Newfoundland from the United Kingdom also brought the serious disease first confirmed in Newfoundland in 1909. Potato Wart disease occurs in old garden plots and homesteads. Commercial seed potato growing areas are free from disease. Potato wart disease is subject to quarantine measures worldwide.

Figure 2. Rambling Rose with potato wart.

Wart Resistant Varieties

In an effort to suppress the spread of the disease, a potato breeding program to develop resistant varieties was initiated by Agriculture Canada at the St. John's Research and Development Centre in 1958, and continues today on a reduced scale at the Fredericton Research and Development Centre. Similar programs are practiced throughout Europe. Close to a dozen wart resistant, fresh market varieties have been developed and released in the past 35 years some of which remain available across Canada. The American "Brigus" is one such variety, an all-round potato with light yellow flesh and very good cooking qualities. "Exploits" (Figure 3), a more recent development, may find acceptance across the country. Other wart resistant varieties developed within this program include: "AAC Fortune", "AC Blue Pride", "AC Domino", "AC Madam Blue", "AC Red Island", "Anson", "Blue Mac", "Cupids", "Glenwood Red", "Jemseg", "Mirton Pearl", "Pink Pearl" and others.

Figure 3. Tubers of "Exploits".

Evaluation of Wart resistance at Carmanville

So began my potato collecting project and evaluation of varieties for Potato Wart resistance. Around that time, I befriended Kenneth Proudfoot, a potato breeder with Agriculture Canada in St John's, NL. He headed the potato wart resistance breeding program. His death in 2009 was a great loss to the potato industry in particular, although he was prominent in all of the horticultural and agricultural fields and a well-known resource for gardeners and growers in Newfoundland.

Mr. Proudfoot made annual visits to my potato growing projects and I acquired much information from him on older potato varieties especially of European origin. He was very interested in the "Minion/Cups" variety and secured a sample for disease cleanup at the Canadian Potato Genetic Resources (CPGR). Samples were then deposited at CPGR in Fredericton, New Brunswick, where it is available today as

"Black Mignion/The Cup". Mr. Proudfoot grew the variety and compared its growth habits, flower structure and tuber characteristics to data he acquired from early Irish data on this variety, and informed me that with most certainty that this was the original variety developed between 1790 and 1820. Most interesting that this potato is still around after all those years.

Other Heritage varieties

After acquiring the "Minion/Cups" variety, I collected and evaluated several older varieties that I found in my searches for old or "heirloom" potatoes, originating in the British Isles and Ireland, which were still being maintained in ever smaller collections around the island. Most have now disappeared altogether. As many of these varieties are not resistant to wart disease they are soon replaced by newer improved materials.

- **Red Dutch**

One of my favourites, and a staple in my collection, is "Red Dutch" (Figure 4) also known as "Irene". It came to me as "Red Dutch" in the late 1980s. Ken Proudfoot did a comparative evaluation on it and determined it to be the same as the variety "Irene", a Dutch variety from the Netherlands released in the 1950s, hence the common name "Red Dutch". It is a very productive, wart resistant variety available from the repository as "Red Dutch".

- **White Northern**

Another favourite in my collection is "White Northern" or "Northern White" (Figure 4). It came to me from a collector in Ontario in the 1980s. He believed it to be of Canadian origin, grown in Ontario since the early 1900s. It has a smooth white skin with shallow eyes and white flesh. It is also wart resistant and a very heavy producer of high quality tubers with excellent boiling quality. It is available from the repository as "Northern White".

Figure 4. Tubers of "Red Dutch" and "White Northern"

A Summary of Wart resistance Evaluations

I have grown and evaluated many varieties from the CPGR over the years (Table 1) and continue to grow many of the wart resistant Heritage varieties such as: "Garnet Chile", "Pink Fir Apple", "Mrs. Moerhle's Yellow Flesh" and "Siberian".

Figure 5. Tubers of "Early Ohio".

Table 1. Summary of CPGR varieties evaluated for Potato Wart resistance to Pathotypes occurring in Carmanville, Newfoundland.

Angelia Mahoney's Blue	-	Lenape	+
Austrian Crescent	-	Libertas	+
Banana	+	Lumper	+
Bauer Grun Rote Auge	+	MacIntosh Black	+
Beauty of Hebron	+	Makah	-
Belle de Fontenay	+	Mark Warshaw's Quebec	+
Black Mignion/The Cup	+	Matsuyama	+
Bliss Triumph	+	McIntryre Blue	+
Blue Shetland	+	Mrs Moehrle's Yellow flesh	-
British Columbia Blue	-	Myatt's Ashleaf	+
Cain's Irish Rocks	+	Northern White	-
Calico	+	Nova Scotia Blue	-
Candy Cane	-	Peanut	-
Cariboo	+	Pink Fir Apple	-
Contestoga	+	Poorlander	+
Congo	-*	Purple Chief	+
Corne de Mouton	+	Purple Peruvian	+
Cow Horn	-	Rambling Rose	+
Crotte D'ours	-	Ratte	-
Early Rose	+	Red Acadian	+
Elmer's Blue	+*	Red Dutch	-
Epicure	+	Richter's Jubel	+
Fortyfold	+	River John Blue	+
Garnet Chili	-	Rose Finn Apple	-
German Butterball	-	Royal Kidney	+
Gold Coin	-	Ruby Pulsiver's Bluenoser	-
Green Mountain	-	Sharon's Blue	+
Haida	-	Siberian	-
Heidzel Blue	+	Six Weeks	+
Hindenberg	+	Skerry Blue	+
Irish Cobbler	+	Slovenian Crescent	+*
Jogeva Yellow Estonian	-	Stella's Newfoundland	-
Kerr's Pink	+	Up-to-Date	+
Kifli	+	White Rose	+
Kroop Neber	+	White Rural New Yorker	+
La Ratte	-	Yam	-*
La Veine Rose	+	Yellow Fin	-

"+" indicates positive reaction, "-" negative reaction, and "" indicates further evaluation required.*

Varieties which proved to be susceptible to wart were eventually eliminated from my project except for a few I continue to maintain: "King Edward", "Kerr's Pink", "Beauty of Hebron", "Early Ohio" (Figure 5), "Rambling Rose" (Figure 2, "Stella's Newfoundland" (Figure 6), "Purple Chief" and "Matsuyama" (Figure 7), a very interesting Japanese potato. All but "King Edward" (Figure 8) are available from the repository.

Figure 6. Tubers of "Stella's Newfoundland".


Figure 7. Tubers of "Matsuyama".

Some modern or recent potatoes developed outside Newfoundland which I am growing include the following: "Desiree", "Norland", "Jemseg" and "Goldrush".

Figure 8. Tubers of "King Edward".

Pictures below (Figures 9, 10) are of a minimum sample of each variety I normally grow, and also a picture of my 'underground root cellar' in early January 2016 containing all the fruits of my labour. I look forward to continuing my potato trials for the repository for the foreseeable future.


Figure 9. A typical evaluation plot with CPGR varieties.


Figure 10. My Underground Root Cellar

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Editor's Note: Members of Potato Breeding and the Potato Genetic Resources thank George for his years of work evaluating potato wart resistance of breeding selections and repository varieties.

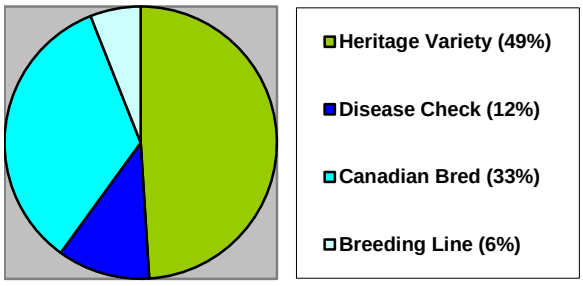
Annual Report 2015

Canadian Potato Genetic Resources
Teresa Molen

The Collection

1. Holdings

• The Canadian Potato Genetic Resources is a node of Plant Gene Resources Canada and holds 171 clones within its genebank. Of this total, 170 are maintained *in vitro*, and 113 clones were grown for tuber production at our Benton Ridge Potato Breeding Substation, Benton, New Brunswick. A full listing of accessions may be found on the attached request form. The following chart illustrates the types of clones in each category.



2. New Accessions

• One heritage variety was accepted into the Genebank in 2015. The addition of "Prince Albert" was suggested by Dr. Jim Clifford of the University of Saskatchewan and tubers were donated by Judy Burns of Maitland, NS. "Prince Albert" has been grown in the Maitland area since the 1830s and its survival is thanks to the preservation efforts of local citizens like Edward Burns, Judy's father-in-law, who continued to grow them solely for the purpose of saving the variety[1]. After his passing, Judy and her husband continue the practice. "Prince Albert" is described as a versatile, dry hard white potato with blue eyes and is often referred locally as "fish potato"[1]. "Prince Albert" is currently available for request as *in vitro* plantlets.

"Prince Albert" Photo by Judy Burns.

• "Likely", donated last year by Richard Hebda of the Crop Climate Project in Trail, BC, continues to undergo virus freeing and is not yet available for request.

References

[1]Personal communication with Judy Burns.

3. Evaluations

• Twenty-three varieties were grown in an evaluation trial at the Fredericton Research and Development Centre. Two replications of fifteen hills of the following varieties: "OAC Ruby Gold", "Hindenburg", "Raritan", "Avon", "Makah", "Superior", "Chinook", "Early Ohio", "Canso", "Cow Horn", "Blue Victor", "Rose Gold", "Grand Falls", "Shepody", "Arran Victory", "Congo", "Ratte", "OAC Temagami", "Poorlander", "Richter's Jubel", "Chieftain", "Rideau" and "K113-1". Samples were also taken for Total Glycoalkaloid (TGA) Analysis, specific gravity measurement, photographs and culinary evaluation.

• Thirty clones were grown in 20 hill plots at the Benton Ridge Potato Breeding Substation, Benton, NB, to provide material for demonstration and cooking quality evaluation throughout the winter and spring.

4. Management

• Passport data for 167 PGR accessions is available online at the Genetic Resources Information Network-Canadian Version (GRIN-CA). GRIN-CA may be accessed through the Plant Gene Resources of Canada web site http://pgrc3.agr.ca/.

• Disease testing was conducted for new *in vitro* accessions and clones which have been maintained *in vitro* for 5 years. Twenty-five clones were grown in the greenhouse and tested twice in 2015. All clones were negative for PVA, PLRV, PotLV, PVS, PVX and PVY. Results for PSTV and BRR are pending. Extra mini tubers from the greenhouse grow out will be offered to genebank clients in the spring of 2016.

• All *in vitro* clones were screened for bacterial and fungal contamination using Potato Dextrose Broth and Richardson's Broth, twice during 2015. All clones currently in the Genebank are negative for these contaminants.

• A total of 1,127 microtubers were harvested from 170 of the PGR clones in 2015. Approximately half of the microtubers were sent to Saskatoon in November 2015 to be stored as back up at Plant Gene Resources of Canada, AAFC. The viability of the collection is protected by this remote location storage arrangement. Dallas Kessler, of Plant Gene Resources Canada, Saskatoon SK, continues to monitor the microtubers. The remaining microtubers are stored at the genebank in Fredericton, NB.

5. Distribution

• Twenty-two requests for 546 clones were received in 2015. Of this number, 186 clones were distributed as *in vitro* plantlets, 306 clones as field grown tubers, and 54 clones as greenhouse grown mini tubers. "Marc Warshaw's Quebec", "Banana", "Newfoundland Elephant" and "Sharon's Blue" were the most requested accessions in 2015.

Distribution of Clones by Purpose – 2015

Purpose of Request	Number of requests	Clones	*In vitro* plantlets	Field tubers	Mini-tubers
Research	14	392	186	173	33
Teaching or Demonstration	1	5	0	5	0
Conservation	7	149	0	128	21
Total	**22**	**546**	**186**	**306**	**54**

Requests by Destination – 2015

Destination	Number of requests
Newfoundland and Labrador	1
New Brunswick	5
Quebec	6
Ontario	2
Alberta	3
Saskatchewan	2
Jamaica	1
USA	2
Total	**22**

Five-Year Compilation of Clone Distribution for Potato Gene Resources 2011–2015

Year	Research	Education	Conservation	Total	Field tubers or mini-tubers	*In vitro* plantlets	Total
2011	6	3	23	32	456	212	668
2012	20	2	7	29	806	172	978
2013	15	2	3	20	422	85	507
2014	13	2	11	26	492	119	611
2015	14	1	7	22	360	186	546
Total	**68**	**10**	**51**	**129**	**2536**	**774**	**3310**

Repository Items of Interest

Communication

• In addition to the requests for clones, many requests for information about the genebank, the availability of clones, clone descriptions and pedigrees, and techniques for handling *in vitro* material were received throughout 2015.

• The annual Potato Gene Resources newsletter has a distribution list of approximately 300 recipients.

• The current newsletter and several back issues may be accessed on the Weekly Checklist of Government of Canada Publications. Browse issues at: http://publications.gc.ca/site/eng/9.504603/publication.html

Meetings and Miscellaneous information

• The 2015 annual Technical Advisory Committee (TAC) meeting of the USDA potato genebank NRSP6 project was held at Sturgeon Bay, WI, June 23-24, 2015. Information on the genebank and minutes of TAC meetings can be found at the genebank website: http://www.ars-grin.gov/nr6/

• Science Days – Biodiversity, Bioresources and Collections was held at the Ottawa Research and Development Centre, Ottawa, ON, December 1-2, 2015 and was attended through videoconference. Dr. Benoit Bizimungu gave a presentation on the Potato Gene Resources.

Visitors

• January 23, 2015 – Robin Browne, K.C. Irving Environmental Science Centre and Harriet Irving Botanical Gardens Acadia University, Wolfville, NS.

• November 5, 2015 – Meaghan Seagrave, Executive Director, BioNB accompanied a visiting delegation from France.

• November 26, 2015 – Will Bonsall, Director, Scatterseed Project, Industry, ME.

Research Scientist/Germplasm Curator, Dr. Benoit Bizimungu (Center) and Meaghan Seagrave, Executive Director, BioNB (Right), accompany a visiting delegation from France through the Repository.

Will Bonsall, Director, Scatterseed Project, tours a display in the Repository.

Fredericton Research and Development Centre Website

• The Fredericton Research and Development Centre is custodian of the Canadian Potato Genetic Resources. http://www.agr.gc.ca/researchcentre/fredericton offers an overview of the mandate, resources and achievements of the Centre. The research studies being conducted at the Centre as well as the staff associated with those studies is highlighted.

Plant Gene Resources of Canada

• Plant Gene Resources of Canada (PGRC), the national Canadian genebank, preserves, characterizes and distributes plant genetic resources for food and agriculture. PGRC is based on collaboration between AAFC

Research Centres and people dedicated to preserving the genetic diversity of crop plants and their wild relatives. PGRC plays a significant part of AAFC's commitment to the Canadian Biodiversity Strategy in response to the Convention on Biological Diversity and the International Treaty on Plant Genetic Resources.

• The Plant Gene Resources of Canada (PGRC) web site located at http://pgrc3.agr.ca/ includes information on the PGRC multi-nodal system of germplasm conservation in Canada and allows searching for germplasm information on the Genetic Resources Information Network-Canadian version (GRIN-CA). Dr. Axel Diederichsen, Research Scientist and Curator at PGRC can be contacted at the Saskatoon Research and Development Centre of AAFC at axel.diederichsen@agr.gc.ca.

The Genebank and the Seed Potato System

• The Canadian Potato Genetic Resources provides *in vitro* plantlets and greenhouse or field tubers for breeding, research and heritage preservation. While extensively tested for freedom from disease, the plantlets and tubers distributed are produced outside the Canadian Seed Certification System and are not eligible for certification.

• The Canadian Seed Potato Certification System operates under the *Seeds Act* and its regulations. Certification begins with tested plantlets established *in vitro* in a facility accredited for this task by the Canadian Food Inspection Agency. The plantlets are used to produce greenhouse tubers which then go to the field in a limited generation system, at each step meeting strict standards specified in the regulations. More information on potato seed certification can be found at the following web site: http://www.inspection.gc.ca/plants/seeds/eng/1299173228771/1299173306579

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The Potato Gene Resources Newsletter is available as an electronic version. If you are still receiving a paper version and wish to receive future Newsletters by e-mail, in pdf (portable document format), please send your e-mail address to: Teresa.Molen@agr.gc.ca. We will continue to send the printed Newsletter to those who do not ask to receive it electronically. Maintaining contact with you is important.

Personnel of the Potato Genetic Resources and Potato Breeding Program, Fredericton Research and Development Centre

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Agnes Murphy – Plant Pathologist
Jiazheng (John) Yuan – Post Doctoral Fellow
Teresa Molen – Potato Gene Resources Technician
Stephen Allaby – Potato Breeding Technician
Deborah Campbell – Potato Breeding Technician
Jean-Louis Deveau – Potato Breeding Technician
Denise LeBlanc – Potato Breeding Technician
Cynthia Murray- Potato Breeding Technician
Lana Nolan – Potato Breeding Technician
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Potato Gene Resources

Également offert en français sous le titre : *Banque de gènes de pommes de terre*

Electronic version available at http://www.publications.gc.ca.

ISSN No. 1496-497X
AAFC No. 12513E

For more information reach us at www.agr.gc.ca or call us toll-free 1-855-773-0241.