Newfoundland and Labrador's Participation in the Accelerated Release Program

2014-2015 Final Report

Project Lead: Ruth-Anne Blanchard, Crop Development Officer
Department of Natural Resources
Production and Marketing Development Division

ACKNOWLEDGEMENTS

Special thanks are extended to the following:

Agnes Murphy, Agriculture and Agrifood Canada

Producers Participating in the Project:
E. Gillam
M. Rideout
D. Eveliegh
C. Lester

Jennifer Haverstock, Department of Natural Resources

TABLE OF CONTENTS

EXECUTIVE SUMMARY

The Accelerated Release Program is a two-phase process to fast track the release of promising potato selections developed at the Potato Research Centre of Agriculture and Agri-Food Canada (AAFC) in Fredericton, New Brunswick. In Phase one, 5-10 new selections are offered to industry each February for two years of non-exclusive field testing. These early favorites are typically at year six (6) of a testing and selection program that traditionally takes about 12 years. In Phase two, following the non-exclusive testing, the Potato Research Centre invites companies to submit cash bids to procure a further three-year period of exclusive testing. At the end of this testing, or sooner at the request of the company, a six-year, renewable license to commercialize a selection may be negotiated.

During the 2014 season, ten (10) selections were chosen for test trials on four (4) on-farm sites throughout the province as part of Phase one and included AR2013-06, AR2013-11, AR2013-12, AR2013-13, AR2013-14, AR20104-01, AR2014-05, AR2014-09, AR2014-12, and AR2014-14. During the winter of 2012, the Department of Natural Resources was successful in the cash bid to further procure a three-year exclusive testing phase for AR2010-12. One large plot was planted in Cormack to mark the final year of the three-year term in evaluating this attractive red selection. Yukon Gold planted as a standard check for all selections. In total, 11 different potato selections were evaluated at four on-farm sites throughout the island. The parameters monitored in this project included pests present and controls used; tuber set; total weight; and yield potential per acre.

INTRODUCTION

Agnes Murphy of Agriculture and Agrifood Canada's Potato Research Centre describes their potato breeding program as one that is "…national in scope and seeks to provide new cultivars to satisfy the changing requirements for Canadian potato production." Disease and pest resistance has been the main goal of the program. Reduced incidence of pests serves to increase both yield and quality and therefore, allow growers to increase their financial return. It is also acknowledged however, that pest resistance must be coupled with favorable horticultural and quality characteristics if it is to sell in the retail market. AAFC's potato breeding efforts can be divided into the three main industry areas: the French fry sector; the chip market; and the fresh table market, with each area having specific traits and qualities important in the development of new varieties.

The Accelerated Release Program is one of two release procedures for new varieties. It is a two-phase process to fast track the release of promising potato selections developed at the Potato Research Centre of Agriculture and Agri-Food Canada (AAFC) in Fredericton, New Brunswick. In Phase one, 5-10 new selections are offered to industry each February for two years of non-exclusive field testing. These early favorites are typically at year six of a testing and selection program that traditionally takes about 12 years. For the price of $100 per selection, participants receive a limited quantity of breeder's selection seed and **non-exclusive** rights to conduct their own field performance and quality evaluation trials for two years. In Phase two, following the non-exclusive testing, the Potato Research Centre invites companies to submit cash bids to procure a further three-year period of exclusive testing. At the end of this testing, or sooner at the request of the company, a six-year, renewable license to commercialize a selection may be negotiated.

As part of Phase one, on-farm trials were established in St. Fintan's, Cormack, Comfort Cove, and St. John's to evaluate yield performance of seven selections, namely AR2013-06, AR2013-11, AR2013-12, AR2013-13, AR2013-14, AR2014-01, AR2014-05, AR2014-09, AR2014-12, and AR2014-14 for AAFC's 2014 Accelerated Release (AR) Program. Most selections were developed for the fresh market, which compromises the primary market for potatoes in Newfoundland and Labrador. The exception is AR2014-01, which was developed for the French Fry market.

AR2013-06 is a round selection with smooth dark red skin and white skin that has resistance to scab. This selection typically sets a high number of tubers, however, the tubers are small to medium in size.

AR2013-11 is an oblong selection with brown russet skin and cream flesh. With Frontier Russet as one of its parents, it has a dry boil and bake texture with few defects and resistance to golden nematode, wart and scab. AR2013-11 is a midseason maturing selection, comparable to Yukon Gold and has shown to have medium to high tuber set.

AR2013-12 is an oval selection with buff skin and cream flesh. It is characterized as having an attractive appearance, low incidence of defects and a dry boil and bake texture.

AR2013-12 has shown extreme resistance to PVX and has also shown some resistance to scab. It matures similar to Superior, making it an option for an early market selection.

AR2013-13 is a round-oval selection with smooth light red skin with white eyes and yellow flesh. It is characterized as a midseason maturity selection that is similar to Chieftan and has shown a low incidence of defects. When grown in a wart-infested field on the Avalon Peninsula, AR2013-13 had three negative reactions to the pathotypes occurring in that field.

AR2013-14 is an oval-oblong selection with pink splashed yellow skin and yellow flesh. It has shown a low incidence of defects and has extreme resistance of PVY, resistance to golden nematode and some indication of wart resistance. It has a medium tuber set and typically producers smaller sized tubers with a dry boil and bake texture.

AR2014-01 is a long selection with light russet skin and cream flesh. It is characterized as a midseason maturing variety that has moderate resistance to foliar late blight in preliminary tests and some indication of moderate resistance to verticillium wilt. However, it should be noted that it is susceptible to scab, PVX and PVY.

AR2014-05 is a round-oval selection with smooth dark red skin and yellow flesh. This selection has shown to have a high tuber set with moderate yield. While there is some indication of resistance to scab, it is susceptible to PVY, PVX, and verticillium wilt.

AR2014-09 is a long-oblong selection with yellow skin splashed with pink and yellow flesh. This selection has a medium to high tuber set with moderate yields. While it has shown resistance to wart and PVY, it is susceptible to PVX.

AR2014-12 is a round selection with purple skin and light yellow flesh. It is characterized as having a moderate tuber set to produce moderate yields. While it has shown resistance to wart, it is susceptible to both PVY and PVX. It has moderate resistance to scab in three years of testing in Fredericton, NB.

AR2014-14 is an oval-oblong selection with smooth red skin and pink flesh. This selection has a moderate tuber set with high yields. It has shown a moderate resistance to scab; however this is based only on one year of testing in Fredericton. Growth cracks, shatter and hollow heart were noted in some trial sites in the Maritimes.

As part of Phase two, the Department of Natural Resources had submitted a cash bid and was successful in securing a further three-year exclusive testing agreement for AR2010-12. AR2010-12 has a smooth red skin with a light yellow flesh and is characterized as a uniform, high yielding selection with creamer potential. It is considered to be a mid- to late-season variety with round-oval tubers of uniform, very small size and average appearance. During the two years of non-exclusive testing which commenced in 2010, this selection had performed very well in Newfoundland and was consistent and uniform in shape and size throughout the four sites on the island.

AR2010-12 was planted on 10 farm locations throughout Newfoundland during the 2012 season, with the majority of the seed being planted at the Glenwood Seed Potato Farm. During the harvest of these plots, initial field observations indicated that the tubers had sized better, resulting in higher yields than the previous two years of non-exclusive testing. Shortly after the trial potatoes were placed in storage, the producer partner had informed me that he had experienced a theft in his storage and an unknown amount of trial potatoes were stolen. Furthermore, the potatoes placed in storage at Glenwood had started to break down shortly after harvest and pink rot was later confirmed. 4,500 lbs of potatoes were destroyed. This, combined with the theft, resulted in an incomplete data set for 2012 and a reduced seed source for 2013.

The 2014 growing season was the final year of testing for AR2010-12. As in 2013, one large plot was planted in Cormack.

Yukon Gold was chosen as a standard check for all selections. A complete description of each selection can be found in Appendix A.

PROJECT PROCEDURE

Soil sampling was completed and a total of 11 selections were evaluated in St. Fintan's, Cormack, Comfort Cove, and St. John's as part of Phase 1 of the program. All selections for Phase 1 were planted by hand with a seed spacing of 9-11 inches. Planting commenced on May 29th and finished on June 24th, with standard production practices being followed throughout the growing season.

As part of Phase two of the program, one large plot was planted of AR2010-12 was planted in Cormack. Best management practices were followed for land preparation and all locations were appropriately fertilized.

Observations were made at each on-farm location throughout the planting, growing and harvesting of the trials. Plots were dug by hand and tubers were graded based on size (with exception to AR2010-12 in Cormack); with large, long marketable tubers being greater than 2 1/8 inches in diameter and large, round tubers being greater than 2 ¼ inches in diameter. Because plants had started to die back early in St. Fintan's, the AR2013-14 was harvested on August 27th to check maturity of the tubers; Yukon Gold planted in Comfort Cove was harvested on September 9th. The full harvest of all sites began on September 16th and was completed on October 6th. All selections from all sites were placed in storage to be graded at a later date. During grading, defects and/or disease were noted where applicable and 10 tubers of each selection were checked for hollow heart.

RESULTS AND DISCUSSION

OVERVIEW OF RESULTS

The soils of the St. Fintan's plot can be described as being a sandy loam. Soil testing revealed that the pH was 5.4, which is considered ideal for potato production. The field containing the AR plot was cropped in potatoes during the 2013 growing season. The producer partner was responsible for preparing the drills and 1100 lbs/acre of 11-22-22 (AN) fertilizer was applied in preparation for planting. All selections were planted by hand on May 29th. No further fertilizer was broadcasted at hilling. Lorox was applied on June 11th as per label directions to provide weed control. Weather conditions had turned dry following planting, however all selections were germinated and doing well by early July. During a site visit on July 3, it was noted that all selections had experienced some insect damage on the leaves; however no insects could be found on the plants.

AR2013-14 was harvested on August 27, as all of the plants in this selection had completely died back. The tubers were noted to be very small and to have had considerable scab. Plants from most of the selections were dying back and there was a high population of lamb's quarters, not just in the trial plot, but in the entire field. The producer partner was harvesting potatoes from the same field and he had stated that the tubers in this particular field were much smaller as compared to other fields. It was discussed on why there was such a high population of lamb's quarters in this particular field, when Lorox had been applied for control on all fields. The producer felt that the herbicide, while it had controlled all other weeds present in the field, had lost its efficacy before the lamb's quarters had actually germinated.

Harvesting of the St. Fintan's plot began on September 16th, as the stalks were completely dead. Yukon Gold, AR2014-01, AR2014-12, AR2013-06, and AR2013-11 were hand dug on September 16th; AR2014-05, AR2013-13, and AR2013-12 were harvested on September 18th. Yields of all harvested selections were noted to be very low. As AR2014-09 and AR2014-14 were characterized as being late maturing selections, these were left in the field and were not harvested until October 8th. All selections were placed in storage to be graded at a later date. Field notes and yield data for all selections can be found in Tables 1 and 2, respectively.

The soils in Cormack tend to be heavier, as there is higher clay content in the soil. Soil reports indicated that the pH of the field containing the trial was 5.6, again ideal for potato production. 600 lbs/acre of 12:24:24 fertilizer was banded as the drills were being prepared and hand planting was completed on June 24th. Wet conditions in this area throughout June had prevented the producer partner from prepping the land earlier in the month. 150 lbs/acre of ammonium nitrate fertilizer was applied at hilling.

The producer partner confirmed that the Cormack area had experienced extreme hot and dry conditions throughout July that was then followed by a wet period. The poor growing conditions resulted in delayed growth of all crops on the farm. It was noted on

August 21st during a site visit that the plot was not thriving. Lesions that resembled late blight were found in some selections and there was a high population of aphids throughout the plot. A high number of lady beetle adults and larvae were also found feeding on the aphids.

Harvesting of the Cormack plot began on September 30th and was completed on October 2nd. All selections were placed in storage to be graded at a later date. Scab was prevalent in most of the selections, resulting in low marketable yields. Field notes and yield data for all selections can be found in Tables 1 and 2, respectively.

The soil pH of the site in Comfort Cove was 6.1, with carrots being cropped in the field during the 2013 growing season. 1100 lbs/acre of 17-17-17 fertilizer was banded as the drills were being prepared and hand planting was completed on June 2nd. Site visits throughout July did not reveal any major field issues. Flowering of AR2013-12, AR2014-05, and AR2014-12 had just started by mid-July and had finished by August 12th, as noted at a site visit conducted on that date. Some early blight was detected throughout the plot at this time as well, and it was noted that some of the selections were looking a little nutrient deficient. The plants of AR2013-06 were stunted and were purpling along the leaf margins and cupping upwards, which is symptomatic of phosphorus deficiency. This selection was planted towards the end of the row; it is questionable if adequate fertilizer was applied at planting.

Yukon Gold was harvested on September 9th to check the maturity of the tubers. It was noted that the plants had not set many tubers and what were present were still small. It had appeared as if some plants had just started to set tubers. All other selections were left to further size up. Hand harvesting of the Comfort Cove plot began on October 3rd and was completed on October 6th. Tubers of most selections were noted to be small in size with a low tuber set, resulting in lower yields. All selections were placed in storage to be graded at a later date. Field notes and yield data for all selections can be found in Tables 1 and 2, respectively.

Soil tests indicated that the pH of the St. John's plot was 5, with lettuce being cropped in the field during the 2013 growing season. 800 lbs/acre of 14-15-20 with calcium-coated nitrogen and 3% boron fertilizer was banded as the drills were being prepared and all selections were hand planted on June 4th. The plot was side dressed with 150 lbs/acre of calcium-coated nitrogen at hilling. By mid-July, roughly half of the selections were either in flower or beginning to flower; while the remaining selections were either just forming flower buds or had buds that hadn't started to open. Overall, this plot looked exceptional throughout the growing season in comparison to the other three sites. Plants were healthy and lush throughout August and the plot was very clean of weeds. It was noted upon hand harvesting on September 22nd and 23rd that the yields from this plot were indeed significantly higher than those from the other sites. The tuber set was consistently higher throughout the selections and the tubers had sized up considerably with adequate moisture. All selections were placed in storage to be graded at a later date. Field notes and yield data for all selections can be found in Tables 1 and 2, respectively.

Table 1: Field notes for each AR selection at each of the four locations.

Location	Selection	% Hollow Heart	Scab Present	Rhizoc Present	Comments
	Y. Gold	0	Yes	No	Heavy scab; raised lesions covering significant surface area. Sunburn as well.
	AR2013-06	0	Yes	Yes	Sun damage and growth cracks. Uniform w/creamer potential.
St. Fintan's	AR2013-11	0	Yes	Yes	Rhizoctonia skin cracking and scurf. Uniform size/shape w/creamer potential. "Hooded" eyes.
	AR2013-12	0	Yes	Yes	Rhizoctonia skin cracking. Some sun damage.
	AR2013-13	0	Yes	Yes	Rhizoctonia skin cracking. Uniform shape/size.
	AR2013-14	0	Yes	Yes	Growth cracks. Rhizoctonia skin cracking.
	AR2014-01	0	Yes	No	Heavy scab; raised lesions covering significant surface area. Uniform size/shape. "Hooded" eyes.
	AR2014-05	0	No	Yes	Nice selection; very uniform shape/size w/creamer potential. Rhizoctonia skin cracking and scurf. Some sunburn and growth cracks.
	AR2014-09	0	Yes	No	Very deep pitted scab covering significant surface area. Few growth cracks and sun damage.
	AR2014-12	0	Yes	Yes	Rhizoctonia skin cracking. Scab not heavy like other selections. Plants did not set well. Uniform size; small tubers w/creamer potential. Attractive tubers.
	AR2014-14	0	Yes	No	Not uniform. Large, deep growth cracks. Dirty tubers. Smaller tubers more attractive.
	Y. Gold	60	No	No	Hollow heart mainly in larger tubers.
St. John's	AR2013-06	70	No	No	Attractive selection; uniform shape/size w/creamer potential. High incidence of hollow heart.
	AR2013-11	0	No	No	Excellent run w/mostly large tubers. Small amount of growth cracks and little sun damage.
	AR2013-12	0	No	Yes	Rhizoctonia skin cracking. Some growth cracks; mainly large tubers.
	AR2013-13	60	No	No	Deep growth cracks. A lot of large tubers. High incidence of hollow heart, mainly in oversized tubers.
	AR2013-14	0	No	No	Very uniform size/shape. Small tubers close to medium size; great for creamers. Some growth cracks; a lot of tubers pinched in the middle.
	AR2014-01	20	Yes	No	Only one tuber with scab. A lot of larger tubers; small tubers have creamer potential. Oversized tubers have potential for hollow heart.
	AR2014-05	0	No	No	Growth cracks. Excellent run; very attractive selection w/clean tubers.

	AR2014-09	0	No	No	Unattractive selection; not uniform in size or shape. Some tubers knobby. Growth cracks and sun damage.
	AR2014-12	0	No	No	Excellent run; mostly large tubers w/some medium size tubers. Very clean and attractive.
	AR2014-14	10	No	No	Uniform size/shape w/creamer potential. Larger tubers w/deep, ugly growth cracks.
	Y. Gold	10	Yes	No	Sun damage.
Comfort Cove	AR2013-06	10	No	No	Market sized tubers medium to small. Small tubers uniform in shape/size; creamer potential.
	AR2013-11	0	No	Yes	Rhizoctonia skin cracking. Small tubers have creamer potential.
	AR2013-12	0	No	No	Deep growth cracks. Nice run w/medium sized tubers. Fairly uniform shape/size.
	AR2013-13	10	No	No	Deep growth cracks. Marketable tubers large in size but not uniform in shape. Small tubers have creamer potential.
	AR2013-14	0	Yes	Yes	Rhizoctonia skin cracking. Uniform shape/size w/creamer potential.
	AR2014-01	10	No	No	Marketable tubers long and attractive. Potential for tubers to be knobby; would be difficult for peeling.
	AR2014-05	0	No	Yes	Rhizoctonia mainly skin cracking with little black scurf. Very attractive tubers w/smaller size; creamer potential.
	AR2014-09	0	Yes	No	Few growth cracks. Clean tubers with smooth skin; very uniform shape/size. Small tubers have creamer potential.
	AR2014-12	0	No	No	Clean tubers fairly uniform in size/shape.
	AR2014-14	0	No	No	Uniform size/shape; small tubers have creamer potential. Deep, large growth cracks.
	Y. Gold	20	Yes	No	Heavy scab covering significant surface area. Deep pitted lesions.
Cormack	AR2013-06	0	Yes	Yes	Market size tubers medium to large. Uniform shape/size. Small tubers have creamer potential.
	AR2013-11	0	Yes	Yes	Fairly uniform shape/size. Creamer potential.
	AR2013-12	10	Yes	Yes	Heaviest scab in larger tubers but medium sized tubers have scab as well. Rhizoctonia skin cracking. Potential for big yields.
	AR2013-13	10	Yes	Yes	Fairly heavy scab. Rhizoctonia cracked skin. Large tubers w/few small. Clean tubers are attractive.
	AR2013-14	10	Yes	No	Heavy scab in larger tubers. Uniform size/shape.

	AR2014-01	0	Yes	Yes	Heavy scab covering significant surface area. Sized well; uniform shape/size.
	AR2014-05	0	No	Yes	Rhizoctonia skin cracking. Small tubers close to medium size; creamer potential. Market tubers medium to large size. Uniform shape/size.
	AR2014-09	0	Yes	Yes	Heavy scab throughout the run covering significant surface area of large tubers. Fairly uniform size/shape.
	AR2014-12	0	Yes	Yes	Rhizoctonia black scurf. Tubers fairly clean; small tubers close to medium size. Nice for creamers.
	AR2014-14	10	No	Yes	Multiple deep growth cracks in larger tubers. Some cracking in medium size tubers. Small tubers clean; creamer potential. Overall uniform shape/size. Rhizoctonia skin cracking.

Table 2: Yield data for each selection at each of the four locations.

Selection	Location	# Seed Planted	Total Yield (lbs)	Yield Potential (lbs/acre)
	St. Fintan's	20	10	2,420
Y.Gold	Cormack	20	41.5	10,043
	C. Cove	20	12.5	3,025
	St. John's	20	65.5	15,851
	St. Fintan's	20	15.5	3,751
AR2013-06	Cormack	20	33.5	8,107
	C. Cove	20	12.5	3,025
	St. John's	20	55.5	13,431
	St. Fintan's	20	12	2,904
AR2013-11	Cormack	20	44.5	10,769
	C. Cove	20	18.5	4,477
	St. John's	20	74	17,908
	St. Fintan's	20	22.5	5,445
AR2013-12	Cormack	20	48	11,616
	C. Cove	20	17.5	4,235
	St. John's	20	67.5	16,335
	St. Fintan's	20	20.5	4,961
AR2013-13	Cormack	20	47	11,374
	C. Cove	20	24	5,808
	St. John's	20	58	14,036

	St. Fintan's	20	10	2,420
AR2013-14	Cormack	20	34	8,568
	C. Cove	20	19	4,598
	St. John's	20	55	13,310
	St. Fintan's	20	17	4,114
AR2014-01	Cormack	20	36.5	8,833
	C. Cove	20	14	3,388
	St. John's	20	53	12,826
	St. Fintan's	20	9.5	2,299
AR2014-05	Cormack	20	23	5,566
	C. Cove	20	16	3,872
	St. John's	20	66.5	16,093
	St. Fintan's	20	23	5,566
AR2014-09	Cormack	20	41	9,922
	C. Cove	20	24	5,808
	St. John's	20	65	15,730
	St. Fintan's	19	5.5	1,320
AR2014-12	Cormack	20	31.5	7,623
	C. Cove	20	17.5	4,235
	St. John's	20	70.5	17,061
	St. Fintan's	20	23	5,566
AR2014-14	Cormack	20	52	12,584
	C. Cove	20	20.5	4,961
	St. John's	20	63.5	16,002

Yields in St. Fintan's and Comfort Cove were considerably lower in comparison to the other two sites. Tuber set was lower at these sites and tuber size was consistently smaller throughout all selections for both sites. Farmers contribute the low yields to hot, dry weather conditions especially in July when the plants were likely trying to set tubers. In a publication released by Alan Efetha of Alberta Agriculture and Rural Development, he states that water use rates for potato begin at about 0.4mm per day when the crop emerges and increases to as high as 7mm per day when the potato canopy completely shades the ground and tubers are bulking. Water demand decreases as the crop achieves full tuber bulking and maturation.

Soil reports had indicated that the organic matter at both sites was also lower as compared to the other sites (3.4% in Comfort Cove and 3.2% in St. Fintan's). This would certainly affect the soil's ability to retain both nutrients and moisture. Depending on the

soil type, water held by organic matter can make all the difference between crop failure and success during a dry year.

With exception of the St. John's location, all sites had experienced high levels of scab in selections that had lower resistance to the pathogen. Again, the hot, dry weather may be the main contributing factor to such a high incidence of scab this season. When soil moisture levels are low during the two to six weeks following tuber initiation, *Streptomyces scabies* can outcompete bacteria that flourish at high moisture levels and infect the tuber surface.

This season marked the final year of non-exclusive testing for AR2013-06, AR2013-11, AR2013-12, AR2013-13, and AR2013-14. Table 3 outlines the two years of data collected at each of the four locations island-wide.

Table 3: Comparison of yield potential per acre of chosen 2013 selections as part of Phase 1 of the Accelerated Release Program.

Selection	Season	St. Fintan's (lbs/acre)	Cormack (lbs/acre)	Comfort Cove (lbs/acre)	St. John's (lbs/acre)
AR3013-06	2013	8,833	5,566	10,164	8,591
	2014	3,751	8,107	3,025	13,431
AR3013-11	2013	8,833	11,858	10,043	11,374
	2014	2,904	10,769	4,477	17,908
AR3013-12	2013	8,107	8,954	11,979	12,826
	2014	5,445	11,616	4,235	16,335
AR3013-13	2013	13,673	11,374	9,438	10,527
	2014	4,961	11,374	5,808	14,036
AR3013-14	2013	11,616	12,947	5,324	9,438
	2014	2,420	8,568	4,598	13,310

Yields in St. Fintan's and Comfort Cove were down considerably in 2014, whereas yields were better in St. John's this season in comparison to 2013. Yields in Cormack are somewhat comparable between the two seasons. Again, low tuber set and size are the main contributing factors to the low yields this past growing season.

In addition to these yields, a total of 3,750 lbs of AR2010-12 were harvested from a 0.75 acre plot. The yields are lower this season compared to past seasons. On a site visit on August 21st, it was noted that there were some germination misses throughout the field. Also, there was some mottling in the plants with yellowing in the leaves with purpling along the leaf margins. Mostly small to medium sized tubers were produced, which is consistent with the yield data from previous years. This being said, this selection has excellent potential for the creamer market, as it is a very attractive selection that is

uniform in both size and shape. As 2014 marked the third and final year of exclusive testing for AR2010-12; the Department is currently negotiating a license to commercialize this red selection as AAC Fortune.

Figure 1: AR2010-12 mottled plants in Cormack on August 21st (left). Harvested tubers from St. Fintan's in 2012 (right).

CONCLUSIONS

Agriculture and Agrifood Canada's Potato Breeding Program is vital in helping the potato industry stay competitive through new and improved introductions. Commercial potato farmers are looking to change their varieties to meet the requirements of the retail industry. With today's consumer being more health-conscience, AAFC supports work in exploring the potential of potatoes as a functional food, allowing growers to tap into additional markets while allowing consumers to make informed decisions regarding the food they eat.

With the end of the Potato Breeding Program in this province, Newfoundland and Labrador has worked closely with AAFC's Potato Research Centre in Fredericton, NB. Potato Wart and Potato Cyst Nematode are two serious pests found in Newfoundland and Labrador and both are subject to control by the Canadian Food Inspection Agency (CFIA) through Quarantine Enforcement and Integrated Pest Management. AAFC has been crucial in helping reduce the incidence of both pests in this province by developing varieties that are resistant to both pests. This reduction of pest pressure has increased potato yields; improved product quality; and greatly added to the marketability of locally grown potato crops. This contributes to greater financial return to producers and the growth of the potato industry in this province.

APPENDIX A

AR SELECTION DESCRIPTIONS

Yukon Gold

General

Origin & Breeding: bred from the cross (Norgleam x W5279-4) at the University of Guelph and selected jointly by Agriculture Canada, the University of Guelph and the Ontario Ministry of Agriculture and Food, Guelph, Ontario (Canada) in 1966.
Year registered in Canada: 1980
Registration number: 2047
Maturity: mid-season

Botanical Features

Plants: medium large, upright with little tendency to spread; lower three-quarters of stems purplish with the upper quarter faintly purple.
Leaves: open, moderately shiny, olive green, stiffly pubescent; nodes not swollen.
Terminal leaflets: obovate, gradually tapered to the base; tip slightly acuminate.
Primary leaflets: ovate; tip acute to slightly acuminate; four pairs.
Secondary leaflets: broadly ovate, varying from two on the lower leaves to six or eight on the upper leaves.
Tertiary leaflets: small, varying from none on the lower leaves to twenty on the mid and upper leaves.
Flowers: light violet; star yellow-green at the base becoming light violet towards the edges; buds light green to purplish green.
Tubers: oval, slightly flattened; finely flaked yellowish white skin; shallow pink eyes; light yellow flesh.
Sprouts: reddish purple.

Agricultural Features

Medium to high yielding variety of attractive appearance. Large tubers are slightly susceptible to hollow heart. Excellent storability; long dormancy period. High specific gravity.

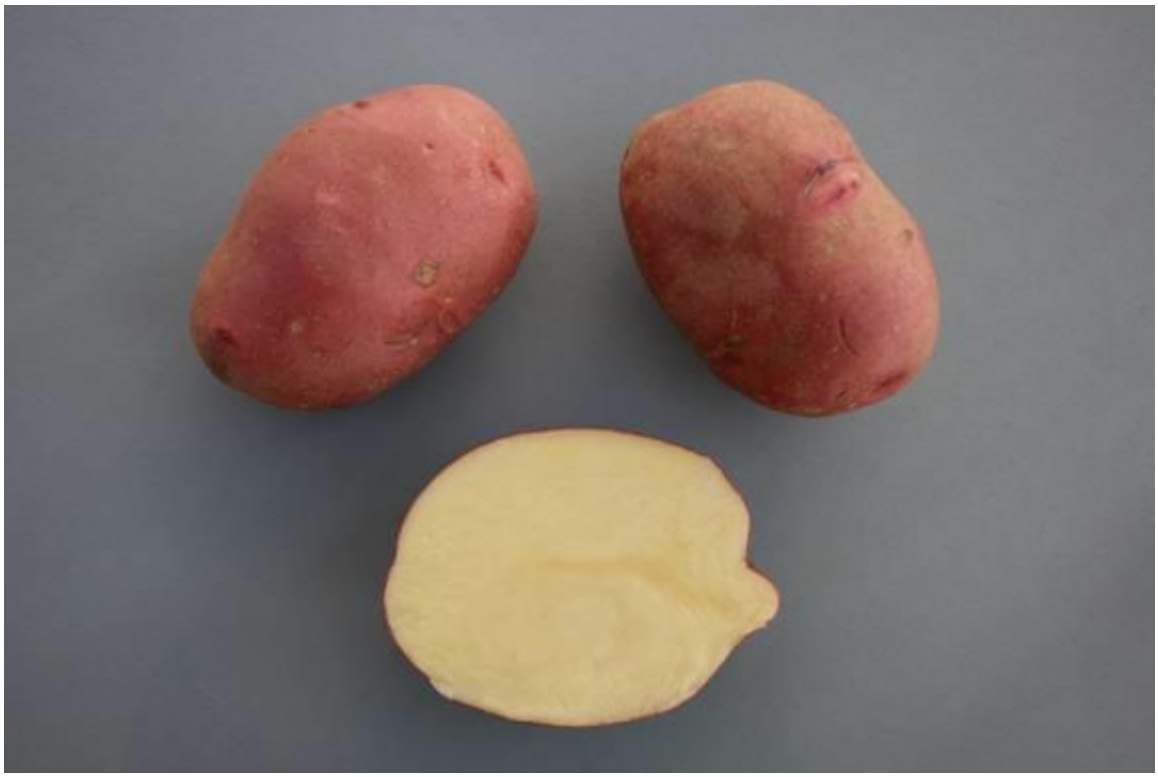
Remark: often sold under its variety name.

Utilization: very good for boiling, baking, and French frying; unsuitable for chipping; retains its yellow flesh color when cooked.
Chief Markets: fresh market and seed export potential.

Reaction to diseases

Highly resistant: PVA
Moderately resistant: leaf roll.
Susceptible: common scab, PVY, air pollution.

AR2010-12 (F05064) (AC Red Island x Chieftain) Fresh Market



Selecting high yield giving a uniform red-skinned tuber that may be suitable to the market for small new potatoes

Plant high vigor, intermediate-late maturity similar to Chieftain.

Tubercle round-oval (length / width = 1.3), uniform, very small and average-looking, smooth-skinned red (RHS 12D =), pale yellow flesh (RHS = 11C), eyes intermediate in depth in numbers slightly below-average duration of short dormancy, similar to Jemseg.

Rate of tuberization medium, good performance, higher than Kennebec, good for boiling and fair for baking.

No case of hollow heart were reported; rate bruising: a controlled trial, 9% of tubers had severe bruising, the rate of bruising Yukon Gold was 18%. Minimal scratches.

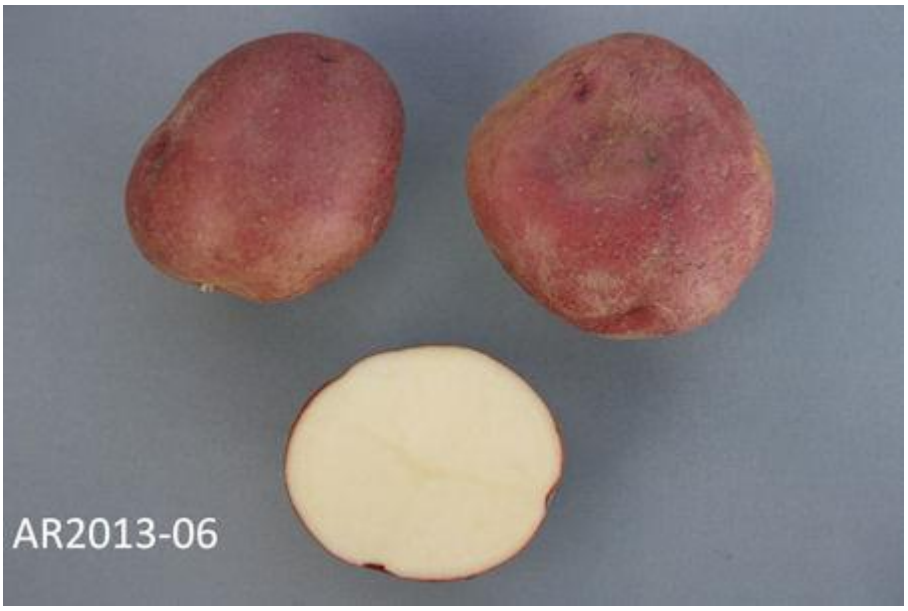
Sensitive to the golden nematode and potato wart.

Susceptible to virus Y and X after mechanical inoculation.

In three years of testing, the composite index of common scab was 3. The maximum area of infection was 10%, whereas in the cultivar with the most sensitive near Green Mountain, it was 60%.

AR2013-06 (CV99256-2)

(NDC5281-2 x CO89097-2) Fresh Market

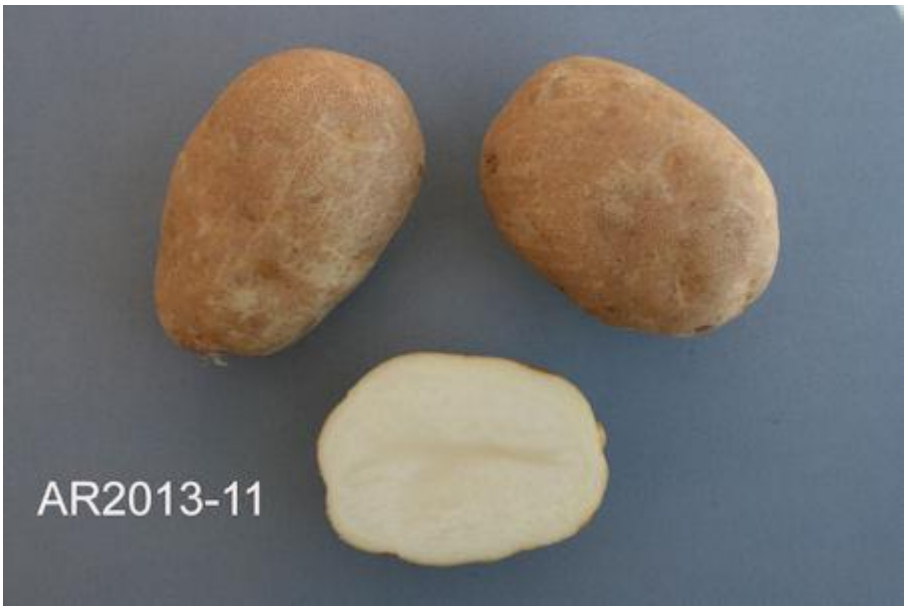


Round selection with smooth dark red skin, white flesh and resistance to scab

- Plant vigour moderate; midseason maturity.
- Tubers round (L:W = 1.1), small to medium size and average appearance; smooth dark red skin (RHS = 58A), white flesh (RHS = 155D); average number shallow eyes; intermediate dormancy.
- High set; higher yields in western Canadian trial sites; good boil and bake.
- Low incidence of hollow heart noted at some sites; bruising: in a preliminary abrasive peeling test it had low black spot bruise score (better than Norland).
- Marker associated with resistance to golden nematode, Ro1 not detected; not tested for wart.
- Susceptible to PVX and to PVY by mechanical inoculations.
- Resistant to scab. In controlled tests at Vauxhall (AB), surface coverage index 6.0%, compared to 5.2% for Russet Burbank and 41.0% for Warba. In one year of scab test at Fredericton (NB), the composite scab index was 2. The maximum diseased area was 5% whereas the maximum coverage for the nearest susceptible check, Green Mountain, was 60%.

AR2013-11 (F08028)

(Frontier Russet x F87070) Fresh Market

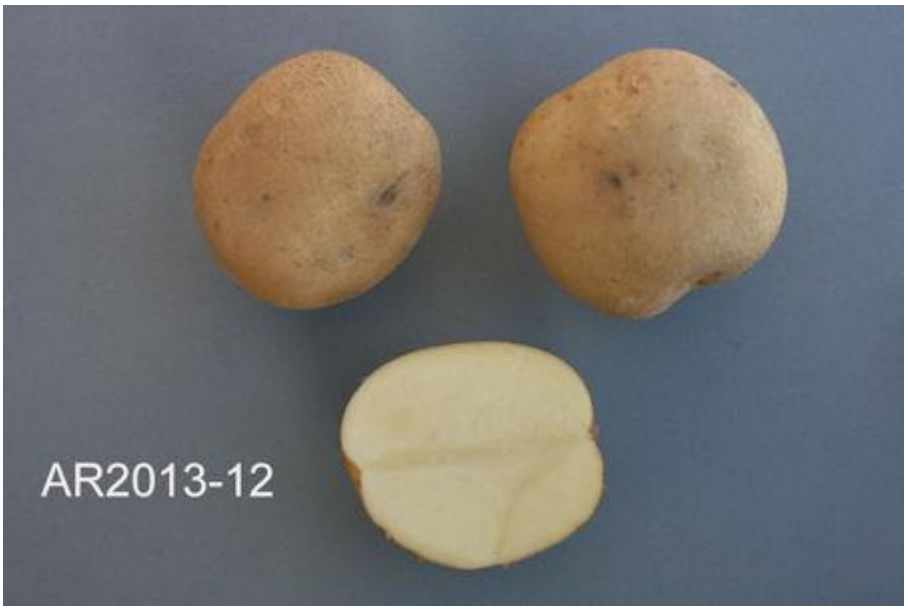


Oblong selection with brown russet skin, cream flesh, dry boil and bake texture, low defects, resistant to golden nematode, wart and scab

- Plant vigour weak to moderate; midseason maturity similar to Yukon Gold.
- Tubers oblong, (L:W= 1.5), average size, uniform shape and above average appearance; russet brown skin (RHS = 164B), cream flesh (RHS =155B); below average number of shallow eyes; moderate dormancy, slightly longer than to Chieftain.
- Medium to high sets; mean total yield below Kennebec with tubers distributed between marketable and small grade; good boil and bake, relatively dry texture.
- Low incidence of hollow heart; bruising: in 3 years of controlled testing it had a low to moderate black spot bruise score of 37% (with Russet Burbank's 4 year average at 41%); low incidence of skinning or shatter noted.
- Carries a marker associated with resistance to golden nematode, Ro1; two negative reactions to the pathotypes of wart occurring in NL.
- Susceptible to PVY and PVX by mechanical inoculation.
- In one year of scab tests, the composite scab index was 2. The maximum diseased area was 4% whereas the maximum coverage for the nearest susceptible check, Green Mountain, was 60%.

AR2013-12 (F08033)

(Andover x F87031) Fresh Market

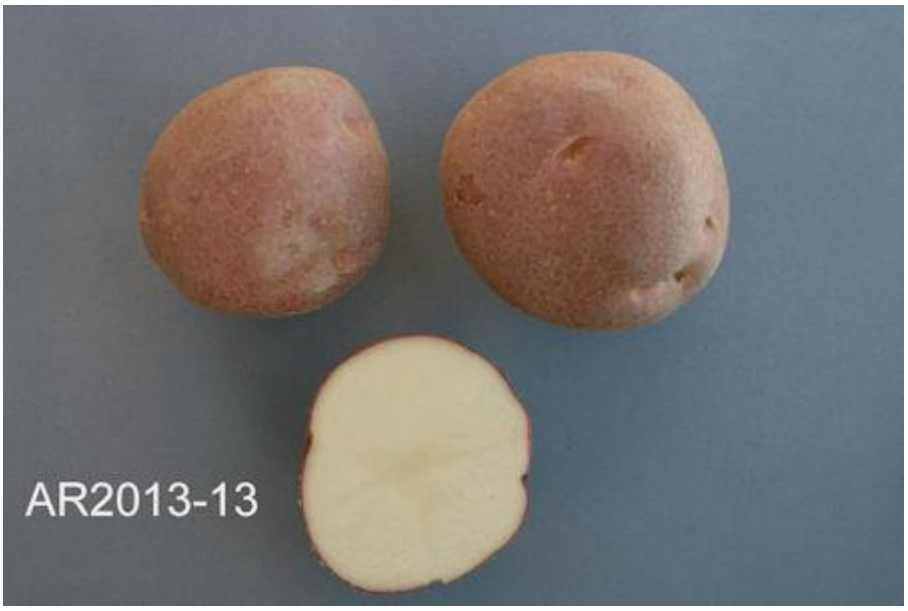


Oval selection with buff skin, cream flesh, uniform tubers, attractive appearance, dry boil and bake texture, low incidence of defects, extreme resistance to PVX with some indication of scab resistance

- Plant vigour moderate; midseason maturity similar to Superior.
- Tubers oval, (long./larg.= 1.1), above average size, uniform shape and attractive, above average appearance; buff skin (RHS = 162C), cream flesh (RHS = 8D); below average number of shallow eyes; moderate dormancy similar to Chieftain.
- Medium set; mean total and marketable similar to Yukon Gold; good boil and bake, relatively dry boil texture.
- Low incidence of hollow heart; bruising: in 3 years of controlled testing it had a moderate black spot bruise score of 43% (with Russet Burbank's 4 year average at 41%); moderate skinning in 2011, low incidence of shatter noted in 2012.
- A marker associated with resistance to golden nematode, Ro1, was not detected.
- Resistant to PVX by mechanical and graft inoculations indicating extreme resistance to PVX; susceptible to PVY by mechanical inoculation.
- In one year of scab tests, the scab index was 3. The maximum diseased area was 27% whereas the maximum coverage for the nearest susceptible check, Green Mountain, was 50%.

AR2013-13 (F08075)

(Brigus x F98026) Fresh Market

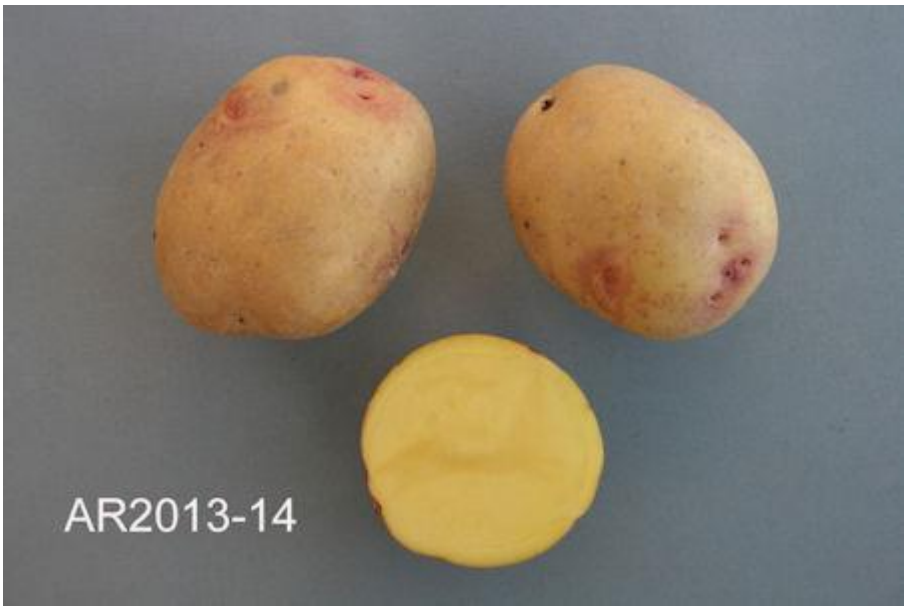


Round-oval selection with smooth light red skin with white eyes, light yellow flesh, dry boil and bake texture, low defects, wart resistance, and some indication of resistance to golden nematode

- Plant vigour moderate; midseason maturity similar to Chieftain.
- Tubers round-oval, (L:W = 1.1), above average size and appearance; smooth light red skin (RHS =182D) with white eyes, light yellow flesh (RHS = 8D); below average number of shallow eyes; relatively short dormancy.
- Medium set, mean total yield similar to Kennebec; good boil and bake, relatively dry boil texture.
- Low incidence of hollow heart; bruising: in 3 years of controlled testing it had a moderate black spot bruise score of 39% (with Russet Burbank's 4 year average at 41%); moderate skinning noted in 2011, low incidence of shatter.
- A marker associated with resistance to golden nematode, Ro1, was not detected although no infection was observed when grown in an infested field in NL; three negative reactions to the pathotypes of wart occurring in NL.
- Susceptible to PVY and PVX by mechanical inoculations.
- In one years of scab test, the scab index was 4. The maximum diseased area was 42% whereas the maximum coverage for the nearest susceptible check, Green Mountain, was 50%.

AR2013-14 (F08087)

(Barbara x Monalisa) Fresh Market



Oval-oblong selection with pink splashed yellow skin and yellow flesh, dry boil and bake texture, low defects, extreme resistance to PVY, resistance to golden nematode and some indication of wart resistance

- Plant vigour moderate; midseason maturity similar to Yukon Gold.
- Tubers oval-oblong, (L:W =1.2), small size and average appearance; smooth pink (RHS =61B) splashed eyes with yellow skin (RHS = 17D), yellow flesh (RHS = 6B); below average number of shallow eyes; moderate dormancy, similar to Chieftain.
- Medium set; mean total yield similar to Yukon Gold with tubers distributed between marketable and small grade; good boil and bake, relatively dry texture.
- Low incidence of hollow heart (1 of three tubers hollow in 2010); bruising: in 3 years of controlled testing it had a low to moderate black spot bruise score of 33% (with Russet Burbank's 4 year average at 41%); moderate skinning noted in 2011, low incidence of shatter noted.
- Carries marker associated with resistance to golden nematode, Ro1. One negative reaction to the pathotypes of wart occurring in NL.
- Resistant to PVY by mechanical and graft inoculations indicating extreme resistance to PVY; susceptible to PVX by mechanical inoculation.
- In two years of scab test, the composite scab index was 4. The maximum diseased area was 20% whereas the maximum coverage for the nearest susceptible check, Green Mountain, was 40%.

AR2014-01 (F09001)

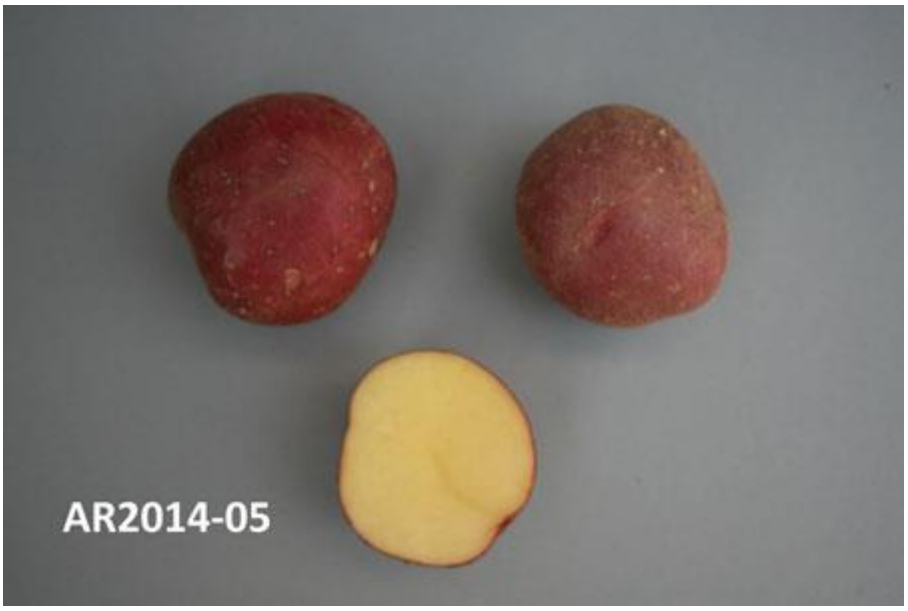
(Frontier Russet x F65089) French Fry

Long selection with light russet skin, cream flesh, good French fry, boil and bake scores

- Plant vigour moderate; mid-season maturity.
- Tubers long (L:W = 1.7), medium size with average appearance; light russet skin (RHS = 161B), cream flesh (RHS = 11D); average number of shallow eyes; intermediate to long dormancy.
- Medium set; moderate yields; good French fry scores, good boil and bake scores.
- Low incidence of hollow heart and greening noted at some sites; bruising: in 3 years of controlled testing it had a moderately high black spot bruise score of 41% (with Russet Burbank's 4-year average at 48%).
- A marker associated with resistance to golden nematode, Ro1, was not detected; 1 of 4 plants infected with wart in one test in NL.
- Susceptible to PVX and to PVY in mechanical inoculations.
- Moderate resistance to foliar late blight in preliminary tests (average score of 6 with susceptible check at 8); some indication of moderate resistance to verticillium wilt.
- Susceptible to scab. In 2 years of scab tests at Fredericton, (NB), the composite scab index was 6. The maximum diseased area was 20% whereas the maximum coverage for the nearest susceptible check, Green Mountain, was 40%.

AR2014-05 (CV07366-2)

(US147-96 x CO00277-2R) Fresh Market

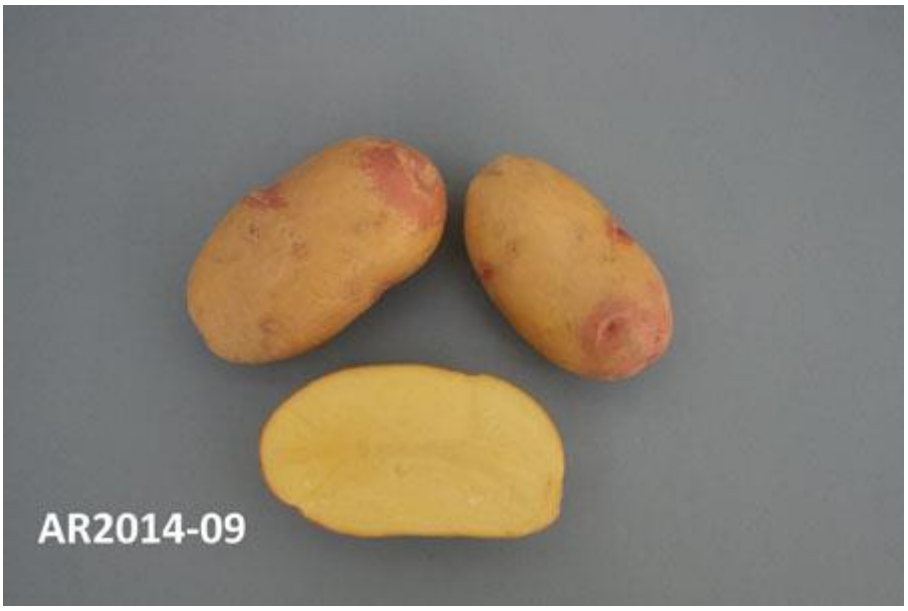


Round-oval selection with smooth dark red skin, yellow flesh, good boil and bake, and some indication of resistance to scab; carries a marker associated with resistance to golden nematode, Ro1

- Plant vigour moderate; late mid-season maturity.
- Tubers round-oval (L:W = 1.2), small to medium size with average appearance; smooth dark red skin (RHS = 60B), yellow flesh (RHS = 10C); average number of shallow eyes; short dormancy.
- High set, moderate yields; good boil and bake.
- No incidence of hollow heart reported; bruising: in a preliminary abrasive peeling test it had low black spot bruise score (similar to Norland).
- Carries a marker associated with resistance to golden nematode, Ro1; not tested for wart.
- Susceptible to PVX and PVY indicated by mechanical inoculations; susceptible to verticillium wilt in a preliminary test.
- Resistant to scab in preliminary tests (1 year) at Fredericton, NB, with the composite scab index of 2. The maximum diseased area was 10% whereas the maximum coverage for the nearest susceptible check, Green Mountain, was 50%.

AR2014-09 (F08086)

(Barbara x Monalisa) Fresh Market

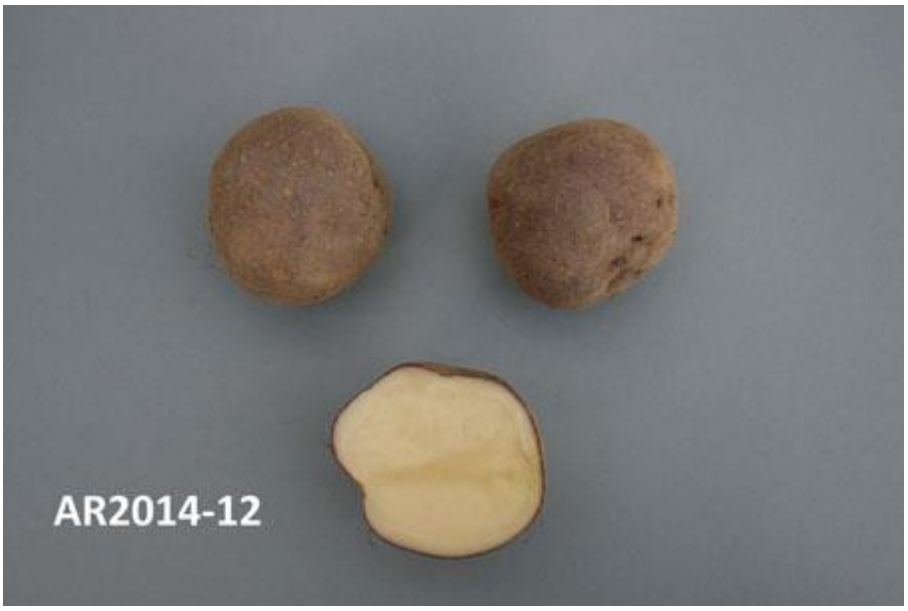


Long-oblong selection with yellow skin splashed with pink, yellow flesh, very good boil and bake scores, extreme resistance to PVY and resistance to wart

- Plant vigour strong; late maturity.
- Tubers long-oblong (L:W = 1.6), medium size with above average appearance; smooth light yellow skin (RHS = 11C), splashed with pink (RHS = 182B); yellow flesh (RHS = 10A) average number of eyes of shallow depth; moderate dormancy similar to Yukon Gold.
- Medium to high set, moderate yields; very good boil and bake scores.
- Bruising: in 4 years of controlled testing it had a moderate black spot bruise score of 43% (with Russet Burbank's 4-year average at 48%).
- A marker associated with resistance to golden nematode, Ro1, was not detected; yet no infection was detected when grown in an infested field in NL; negative reaction to the pathotypes of wart occurring in NL in 3 tests.
- Extreme resistance to PVY indicated by mechanical and graft inoculation; susceptible PVX by mechanical inoculations.
- Moderate resistance to Fusarium dry rot in a controlled test.
- Moderate susceptibility to scab. In 4 years of scab tests at Fredericton, NB, the composite scab index was 5. The maximum diseased area was 40% whereas the maximum coverage for the nearest susceptible check, Green Mountain, was 65%.

AR2014-12 (F09059)

(N1653-07 x AC Chaleur) Fresh Market

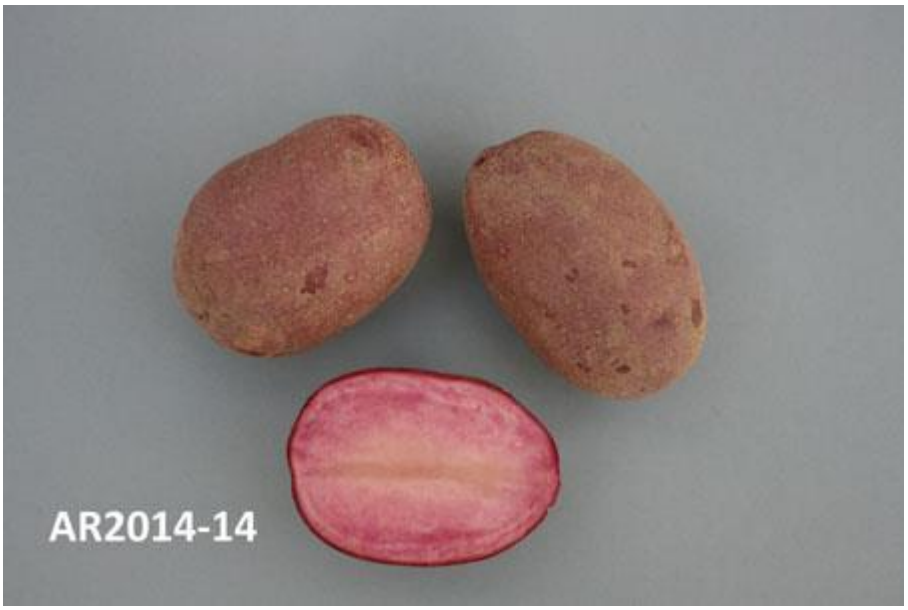


Round selection with purple skin and white eyes, light yellow flesh, good boil and bake scores, resistance to wart; carries a marker associated with resistance to golden nematode, Ro1

- Plant vigour moderate; early to mid-season maturity.
- Tubers round (L:W = 1.1), medium with above average appearance; purple skin (RHS = 71A), white eyes, light yellow flesh (RHS = 11C); average number of eyes of intermediate depth; short to moderate dormancy similar to Snowden.
- Medium set, moderate yield; good boil and bake scores.
- Low incidence of defects; bruising: in 3 years of controlled testing it had a low black spot bruise score of 29% (with Russet Burbank's 4-year average at 48%).
- Carries a marker associated with resistance to golden nematode, Ro1; negative reaction to the pathotypes of wart occurring in NL in two tests.
- Susceptible to PVX and to PVY by mechanical inoculation.
- Moderate resistance to scab. In 3 years of scab tests at Fredericton, NB, the composite scab index was 4. The maximum diseased area was 20% whereas the maximum coverage for the nearest susceptible check, Green Mountain, was 65%.

AR2014-14 (F09084)

(F01065 x PA99P20-2) Fresh Market / Pigmented Flesh



Oval-oblong selection with smooth red skin, pink flesh, good boil score, high yield; carries a marker associated with resistance to golden nematode, Ro1

- Plant vigour strong; very late maturity.
- Tubers oval-oblong (L:W = 1.4), large size with above average appearance; smooth dark red skin (RHS = 187C), pink flesh (RHS = 61B); slightly below average number of eyes of shallow depth; moderate dormancy spread out over 8 weeks.
- Medium set, high yields; good French fry scores, good boil, poor bake scores.
- Growth cracks, shatter and hollow heart noted at some sites; bruising: in 3 years of controlled testing it had a low to moderate high black spot bruise score of 38% (with Russet Burbank's 4-year average at 48%).
- A marker associated with resistance to golden nematode, Ro1, was detected; not tested for wart.
- Resistant to PVX by mechanical inoculation, susceptible to PVY in mechanical inoculations.
- Some indication of moderate resistance to verticillium wilt.
- Moderate resistance to common scab indicated. In 1 year of scab tests at Fredericton, NB, the composite scab index was 3. The maximum diseased area was 10% whereas the maximum coverage for the nearest susceptible check, Green Mountain, was 40%.

REFERENCES

Agriculture and Agrifood Canada. 2010. AR2010-12 (F05064) (AC Red Island x Chieftain) Fresh Market. http://www4.agr.gc.ca/AAFC-AAC/display-afficher.do?id=1265319438372&lang=eng. Acessed: January 2010.

Agriculture and Agrifood Canada. 2013. AR2013-06 (CV99256-2) (NDC5281-2xCO89097-2) Fresh Market. http://www.agr.gc.ca/eng/science-and-innovation/technology-transfer-and-licensing/licensing-opportunities/agriculture-and-agri-food-canada-s-accelerated-release-program-new-potato-selections-for-french-fries-chips-and-the-fresh-market/how-to-participate-in-agriculture-and-agri-food-canada-s-2013-accelerated-release-program/accelerated-release-2013-selections/ar2013-06-cv99256-2/?id=1360083143733. Acessed: January 2013.

Agriculture and Agrifood Canada. 2013. AR2013-11 (F08028) (Frontier Russet x F87070) Fresh Market. http://www.agr.gc.ca/eng/science-and-innovation/technology-transfer-and-licensing/licensing-opportunities/agriculture-and-agri-food-canada-s-accelerated-release-program-new-potato-selections-for-french-fries-chips-and-the-fresh-market/how-to-participate-in-agriculture-and-agri-food-canada-s-2013-accelerated-release-program/accelerated-release-2013-selections/ar2013-11-f08028/?id=1360083211931. Accessed: January 2013.

Agriculture and Agrifood Canada. 2013. AR2013-12 (F08033) (Andover x F87031) Fresh Market. http://www.agr.gc.ca/eng/science-and-innovation/technology-transfer-and-licensing/licensing-opportunities/agriculture-and-agri-food-canada-s-accelerated-release-program-new-potato-selections-for-french-fries-chips-and-the-fresh-market/how-to-participate-in-agriculture-and-agri-food-canada-s-2013-accelerated-release-program/accelerated-release-2013-selections/ar2013-12-f08033/?id=1360083223335. Accessed: January 2013.

Agriculture and Agrifood Canada. 2013. AR2013-13 (F08075) (Brigus x F98026) Fresh Market. http://www.agr.gc.ca/eng/science-and-innovation/technology-transfer-and-licensing/licensing-opportunities/agriculture-and-agri-food-canada-s-accelerated-release-program-new-potato-selections-for-french-fries-chips-and-the-fresh-market/how-to-participate-in-agriculture-and-agri-food-canada-s-2013-accelerated-release-program/accelerated-release-2013-selections/ar2013-13-f08075/?id=1360083237738. Accessed: January 2013.

Agriculture and Agrifood Canada. 2013. AR2013-14 (F08087) (Barbara x Monalisa) Fresh Market. http://www.agr.gc.ca/eng/science-and-innovation/technology-transfer-and-licensing/licensing-opportunities/agriculture-and-agri-food-canada-s-accelerated-release-program-new-potato-selections-for-french-fries-chips-and-the-fresh-market/how-to-participate-in-agriculture-and-agri-food-canada-s-2013-accelerated-release-program/accelerated-release-2013-selections/ar2013-14-f08087/?id=1360083250206. Accessed: January 2013.

Agriculture and Agrifood Canada. 2014. AR2014-01 (F09001) (Frontier Russet x F65089) French Fry. http://www.agr.gc.ca/eng/science-and-innovation/technology-transfer-and-licensing/licensing-opportunities/agriculture-and-agri-food-canada-s-accelerated-release-program-new-potato-selections-for-french-fries-chips-and-the-fresh-market/how-to-participate-in-agriculture-and-agri-food-canada-s-2014-accelerated-release-program/accelerated-release-2014-selections/ar2014-01-f09001/?id=1390856581088. Accessed: February 2014.

Agriculture and Agrifood Canada. 2014. AR2014-05 (CV07366-2) (US147-96 x CO00277-2R) Fresh Market. http://www.agr.gc.ca/eng/science-and-innovation/technology-transfer-and-licensing/licensing-opportunities/agriculture-and-agri-food-canada-s-accelerated-release-program-new-potato-selections-for-french-fries-chips-and-the-fresh-market/how-to-participate-in-agriculture-and-agri-food-canada-s-2014-accelerated-release-program/accelerated-release-2014-selections/ar2014-05-cv07366-2/?id=1390939529364. Accessed: February 2014.

Agriculture and Agrifood Canada. 2014. AR2014-09 (F08086) (Barbara x Monalisa) Fresh Market. http://www.agr.gc.ca/eng/science-and-innovation/technology-transfer-and-licensing/licensing-opportunities/agriculture-and-agri-food-canada-s-accelerated-release-program-new-potato-selections-for-french-fries-chips-and-the-fresh-market/how-to-participate-in-agriculture-and-agri-food-canada-s-2014-accelerated-release-program/accelerated-release-2014-selections/ar2014-09-f08086/?id=1391092032254. Accessed: February 2014.

Agriculture and Agrifood Canada. 2014. AR2014-12 (F09059) (N1653-07 x AC Chaleur) Fresh Market. http://www.agr.gc.ca/eng/science-and-innovation/technology-transfer-and-licensing/licensing-opportunities/agriculture-and-agri-food-canada-s-accelerated-release-program-new-potato-selections-for-french-fries-chips-and-the-fresh-market/how-to-participate-in-agriculture-and-agri-food-canada-s-2014-accelerated-release-program/accelerated-release-2014-selections/ar2014-12-f09059/?id=1391112508534. Accessed: February 2014.

Agriculture and Agrifood Canada. 2014. AR2014-14 (F09084) (F01065 x PA99P20-2) Fresh Market/Pigmented Flesh. http://www.agr.gc.ca/eng/science-and-innovation/technology-transfer-and-licensing/licensing-opportunities/agriculture-and-agri-food-canada-s-accelerated-release-program-new-potato-selections-for-french-fries-chips-and-the-fresh-market/how-to-participate-in-agriculture-and-agri-food-canada-s-2014-accelerated-release-program/accelerated-release-2014-selections/ar2014-14-f09084/?id=1391180480158. Accessed: February 2014.

Banks, Dr. Eugenia, ed. 2004. Potato Field Guide. Insects, Diseases and Defects. Publication 823. Guelph, Ontario, Canada. Ministry of Agriculture and Food. Pp. 75-82.

Canadian Food Inspection Agency. 2009. Yukon Gold. http://www.inspection.gc.ca/english/plaveg/potpom/var/yukongold/yukone.shtml. Accessed: November 29, 2010.

Efetha, A. Date Unknown. Irrigation Scheduling for Potato in Southern Alberta. http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex13571. Accessed: August 29, 2014.

Fluery, D. Date Unknown. New traits for better varieties. Potato breeding research improves industry. Top Crop Manager. http://www.topcropmanager.com/index.php?option=com_content&task=view&id=761&Itemid=182. Accessed: November 29, 2010.

Murphy, A., 2010. Exploring tuber potential. Making potatoes pest-resistant and irresistable. Potato Grower April 2010. Pp. 18-19, 26. http://www.mstand.com/issue/8173/17. Accessed: November 29, 2010.

Tomasiewicz, D., Harland, M., and Moons, B. No date. Commercial potato production – irrigation. Government of Manitoba. http://www.gov.mb.ca/agriculture/crops/potatoes/bda04s05.html. Accessed: January 2012.