



Potato Variety Evaluation in Quebec

Presented to



March 2022



WORK TEAM**PROGEST 2001 INC.**

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1. OBJECTIVES

- Gather information on the agronomic performance of new potato genotypes.
- Collect information on external and internal tuber quality of new potato genotypes.

2. METHODOLOGY

2.1. Sites and plant material description

The trials took place in Ste-Croix near Quebec City and Lanoraie, in Lanaudiere. The plots were established in a sandy loam soil for both sites.

The trial included four (4) potato clones and varieties from Fredericton and Lethbridge research stations of Agriculture and Agri-Food Canada (AAFC), fifteen (15) from the Quebec Potato Research Consortium program, eleven (11) genotypes from the Progest 2001 breeding program and twelve (12) clones and varieties from various additional national and international programs. The varieties and clones were divided in five (5) sub-trials. The five categories were: white round, yellow flesh, long, red skin and specialties. Known varieties (14), chosen for their special characteristics, were used as controls for each category (identified as (C) in Table I).

Clones and varieties included in this trial were chosen for various reasons. Most of QP clones were chosen for their multiple resistances (nematodes, PVY and late blight), while the majority of AG clones were selected to meet the growing consumer's demand for specialties potatoes. We also found a good selection of yellow flesh and red potatoes, also a market trend.

With the control varieties, a total of 61 genotypes were tested in this trial. A list of all the genotypes evaluated is presented at Table I.



Table I. List of genotypes evaluated in each category

Round white	Yellow flesh	Long	Red	Specialities
Alliston	Belmonda	Rickey	QP12058.62	Roselys (C)
QP12056.16	Obama	QP13116.15	AG1534	AG1425.11
Envol (C)	Connect	Campagna (C)	Elmo	QP12145.02
QP13127.14	Confederation	AG1424.11	AG1540	Marispeer
QP13031.01	401-1	QP12115.03	QP12058.45	Ciklamen
QP12058.23	Noblesse	Goldrush (C)	Rosi	AG1405.15
Mystère (C)	Vivaldi (C)	QP13094.03	QP12058.36	
QP13099.04	Keuka Gold (C)	VF14016	AG1533	
FV16324-08	Yukon Gold (C)	Clearwater	Chieftain (C)	
Nougat	QP12081.11	F14021	QP12058.48	
Snowden (C)			Viking (C)	
Superior (C)			Norland (C)	
			QP13071.28	
			F14119	
			AG1404.09	
			Vicky	
			AG1535	
			DR Chieftain (C)	

2.2. Experimental design

The experiment was conducted in a randomized complete block design with three replications. Plots with an area of 4.12 m² consisted of one row of 4.5 m spaced at 0.915 m.

2.3. Cultural operations

Plantation in Ste-Croix was done on May 19th and in Lanoraie on May 17th. Rows were opened and fertilizer was applied using agricultural equipment. In Ste-Croix, 160 units of nitrogen, 160 units of phosphorus and 133 units of potassium was applied and in Lanoraie 204 N, 75 P and 245 K was incorporated. Potato tubers were hand planted at every 30 cm with a ruler (Figure 1). Rows were closed mechanically with disks after a simultaneous spraying of an insecticide and a fungicide on the tubers. The harvesting of experimental plots was done using a tractor and a one row harvester (Checchi & Magli SP 50V) on September 20th in Lanoraie and September 22nd in Ste-Croix (Figure 2).



There was no irrigation at either site (Sainte-Croix and Lanoraie).

All agricultural operations performed on experimental plots were conducted similarly to what is done by commercial growers.



Figure 1. Plantation in Ste-Croix





Figure 2. Harvest in Ste-Croix



2.4. Measured parameters

Throughout the season, plant development was monitored. This included emergence, plant growth, flowering and senescence.

In the post-harvest evaluation, tubers were sized, using a potato-grading machine, into five size categories (Figure 3):

- Creamer: less than 1 ½ in. (38 mm)
- Small: 1 ½ in. to 2 ¼ in. (57 mm)
- Canada No. 1: 2 ¼ in. to 2 ¾ in. (70 mm)
- Chef: 2 ¾ in. to 4 ½ in. (114 mm)
- Jumbo: greater than 4 ½ in

Tubers normally rejected by the industry (green, misshapen, cracked and rotten) were removed manually. The quantity and weight of the rejected tubers were recorded.

For external quality, the index of rhizoctonia and scab was determined using the same evaluation key used by the Canadian Food Inspection Agency (CFIA) (Figure 4). This key includes five categories based on the percentage of disease coverage, 0 (0%) 1 (1%), 2 (1-5%), 3 (5-10%) and 4 (> 10%). For each plot, ten medium-sized tubers were randomly selected and used to determine the index of rhizoctonia and scab. Internal quality, including hollow heart, brown center, as well as vascular ring discoloration, was examined by cutting open a sample of 10 randomly selected tubers.

The appearance and uniformity of the tubers were scored according to predefined scales. For appearance, a rating from 1 to 9 was given, 1 corresponding to very unattractive potatoes and 9 to very attractive potatoes. As for uniformity, it was evaluated using a scale of 1 to 5, with 1 for tubers showing very little uniformity and 5 very uniform.

The specific gravity of all potato plots was measured (Figure 5). To do this, a sample of potatoes was weighed in air and noted. Then, the same sample was weighed in water and noted. The specific gravity was then calculated according to the following formula: weight in air / (weight in air – weight in water).



Statistic analysis, using Statistix 10.0 program, was used for the yield, as well as the internal and external quality for the two sites.



Figure 3. Potato grading





Figure 4. External and internal quality evaluation





Figure 5. Specific gravity evaluation



3. RESULTS

3.1. White round potatoes

3.1.1. Ste-Croix

- Between all the different genotypes, there is no significant difference regarding the total yield (Table II).
- Only Nougat, QP12056.16 and FV16324-08 did not generate tubers with vascular ring among all genotypes (Table III).
- All genotypes had a specific gravity higher than 1,080.

Table II. Yield of genotypes in the “white round potatoes” category in Ste-Croix

Genotype	Total (cwt/a)	Creamer <1½ " (cwt/a)	Small 1½-2¼ " (cwt/a)	Canada No 1 2¼-2¾ " (cwt/a)	Chef 2¾-4½ " (cwt/a)	Downgraded (cwt/a)
Nougat	368,7 a	2,9 a	49,5 cde	225,1 a	89,8 abcd	1,4 a
Envol (C)	360,1 a	3,9 a	32,5 e	138,0 bc	174,4 a	11,2 a
QP12056.16	358,6 a	70,1 a	120,0 ab	119,7 bcd	41,7 bcd	7,1 a
Alliston	325,9 a	6,7 a	38,6 de	146,0 bc	126,1 ab	8,6 a
QP13031.01	323,6 a	7,1 a	47,9 cde	148,4 ab	102,4 abc	17,8 a
QP13127.14	317,1 a	8,8 a	83,6 bcd	175,0 ab	41,9 bcd	7,8 a
Mystère (C)	306,1 a	5,9 a	81,6 bcd	160,0 ab	57,9 bcd	0,7 a
FV16324-08	302,9 a	26,6 a	138,2 a	112,8 bcd	20,2 cd	5,2 a
Superior (C)	281,8 a	5,8 a	52,6 cde	102,2 bcd	104,8 abc	16,3 a
Snowden (C)	242,5 a	7,7 a	64,5 cde	112,6 bcd	56,5 bcd	1,2 a
QP12058.23	229,8 a	33,4 a	143,0 a	52,4 d	0,0 d	1,0 a
QP13099.04	226,0 a	15,9 a	86,9 bc	69,5 cd	36,8 bcd	16,9 a

Data are the means of three replications (one row/replication)

Data followed by a different letter in the same column are significantly different ($P < 0.05$) according to the Tukey test



Table III. Quality of the genotypes in the “white round potatoes” category in Ste-Croix

Genotype	Hollow Heart (%)	Brown Center (%)	Vascular Ring (%)	Scab (index) 0-15	Rhizoctonia (index) 0-15	Appearance (1-9)	Uniformity (1-5)	Specific gravity
Nougat	0,0 a	0,0 a	0,0 a	1,77 a	0,0 a	7,7 a	4,0 a	1,081 de
Envol (C)	0,0 a	0,0 a	6,7 a	0,50 a	0,0 a	5,7 bc	3,3 a	1,081 de
QP12056.16	0,0 a	0,0 a	0,0 a	0,07 a	0,0 a	6,3 abc	3,7 a	1,103 a
Alliston	0,0 a	0,0 a	10,0 a	1,07 a	0,0 a	7,0 ab	4,0 a	1,081 de
QP13031.01	0,0 a	0,0 a	3,3 a	0,77 a	0,0 a	6,0 bc	3,7 a	1,086 cd
QP13127.14	0,0 a	0,0 a	6,7 a	1,43 a	0,0 a	6,7 abc	4,0 a	1,094 abcd
Mystère (C)	0,0 a	0,0 a	13,3 a	0,60 a	0,0 a	6,0 bc	4,0 a	1,097 abc
FV16324-08	0,0 a	0,0 a	0,0 a	1,43 a	0,0 a	6,3 abc	3,7 a	1,087 bcd
Superior (C)	0,0 a	0,0 a	16,7 a	0,40 a	0,0 a	5,7 bc	3,7 a	1,086 bcd
Snowden (C)	0,0 a	0,0 a	10,0 a	0,10 a	0,0 a	6,3 abc	3,7 a	1,101 ab
QP12058.23	0,0 a	0,0 a	3,3 a	0,87 a	0,0 a	6,3 abc	4,0 a	1,086 bcd
QP13099.04	0,0 a	0,0 a	0,0 a	0,37 a	0,0 a	5,3 c	3,0 a	1,069 e

Data are the means of three replications (one row/replication)

Data followed by a different letter in the same column are significantly different ($P < 0.05$) according to the Tukey test

3.1.2. Lanoraie

- For all genotypes, yields are considerably lower in Lanoraie compared to Ste-Croix mostly due to the lack of irrigation in a sandy soil during a season with high temperatures and drought periods (Table IV).
- Except FV16324-08 and Superior (C), all genotypes we're significantly less affected by vascular ring disorder than Snowden (C).
- Alliston generated an important amount of downgraded tubers (9% of it's total yield), mostly because of growth cracks and tuber malformation (Table V).
- The analysis of specific gravity was not possible for the following clones and cultivars (Envol (C), Mystère (C), QP13099.04, FV16324-08, Nougat, Snowden (C) and Superior (C)) because of their extremely low yield (Table V).



Table IV. Yield of genotypes in the “white round potatoes” category in Lanoraie

Genotype	Total (cwt/a)	Creamer <1½ " (cwt/a)	Small 1½-2¼ " (cwt/a)	Canada No 1 2¼-2¾ " (cwt/a)	Chef 2¾-4½ " (cwt/a)	Downgraded (cwt/a)
Alliston	196,4 a	10,8 b	48,7 ab	80,0 a	39,4 a	17,5 a
QP12056.16	154,5 ab	17,3 ab	58,8 a	58,1 ab	19,4 ab	1,1 c
Envol (C)	140,6 abc	16,6 ab	49,4 ab	50,2 abc	17,8 ab	6,6 bc
QP13127.14	131,3 abcd	10,7 b	62,8 a	45,8 abc	0,0 b	12,0 ab
QP13031.01	125,6 abcde	13,0 b	51,7 ab	46,6 abc	10,8 ab	3,4 bc
QP12058.23	117,6 abcde	15,7 ab	63,1 a	36,4 abc	0,0 b	2,5 bc
Mystère (C)	107,8 bcde	16,6 ab	42,9 ab	43,8 abc	4,0 b	0,4 c
QP13099.04	99,8 bcde	11,4 b	48,7 ab	27,3 abc	5,2 b	7,2 bc
FV16324-08	72,7 cde	37,5 a	31,0 ab	0,9 c	0,0 b	3,3 bc
Nougat	71,9 cde	14,0 b	40,9 ab	12,6 bc	2,0 b	2,5 bc
Snowden (C)	53,3 de	30,9 ab	19,6 b	1,7 c	0,0 b	0,9 c
Superior (C)	50,3 e	21,6 ab	25,4 ab	1,6 c	0,0 b	1,7 c

Data are the means of three replications (one row/replication)

Data followed by a different letter in the same column are significantly different ($P < 0.05$) according to the Tukey test

Table V. Quality of the genotypes in the “white round potatoes” category in Lanoraie

Genotype	Hollow Heart (%)	Brown Center (%)	Vascular Ring (%)	Scab (index) 0-15	Rhizoctonia (index) 0-15	Appearance (1-9)	Uniformity (1-5)	Specific gravity
Alliston	0,0 a	0,0 a	0,0 b	1,7 a	0,0 a	6,0 a	3,3 a	1,067 a
QP12056.16	0,0 a	0,0 a	3,3 b	0,4 a	0,0 a	5,3 a	2,7 a	1,086 a
Envol (C)	0,0 a	0,0 a	0,0 b	0,3 a	0,0 a	5,3 a	2,7 a	
QP13127.14	0,0 a	0,0 a	3,3 b	0,0 a	0,0 a	6,0 a	3,3 a	1,071 a
QP13031.01	0,0 a	0,0 a	0,0 b	0,2 a	0,0 a	4,3 a	2,7 a	1,075 a
QP12058.23	0,0 a	0,0 a	0,0 b	1,5 a	0,0 a	6,0 a	3,7 a	1,070 a
Mystère (C)	0,0 a	0,0 a	3,3 b	0,0 a	0,0 a	5,3 a	3,0 a	
QP13099.04	0,0 a	0,0 a	0,0 b	0,4 a	0,0 a	5,7 a	3,0 a	
FV16324-08	0,0 a	0,0 a	13,3 ab	0,4 a	0,0 a	4,7 a	3,3 a	
Nougat	0,0 a	0,0 a	6,7 b	0,4 a	0,0 a	5,7 a	3,0 a	
Snowden(C)	0,0 a	0,0 a	33,3 a	0,0 a	0,0 a	4,7 a	3,3 a	
Superior (C)	0,0 a	0,0 a	16,7 ab	0,0 a	0,0 a	4,7 a	3,0 a	

Data are the means of three replications (one row/replication)

Data followed by a different letter in the same column are significantly different ($P < 0.05$) according to the Tukey test



3.2. Yellow flesh potatoes

3.2.1. Ste-Croix

- Belmonda, Connect and 401-1 generated a significantly higher yield than 2 controls (Yukon gold and Keuka Gold) while being similar to the third control Vivaldi (Table VI).
- All genotypes produced the most tubers in Canada N° 1 grade.
- The specific gravity of the cultivar Belmonda (1,100) is significantly higher than all other genotypes. The cultivar Obama have a specific gravity (1,074) significantly lower in comparison to the other genotypes (Table VII).

Table VI. Yield of genotypes in the “yellow flesh potatoes” category in Ste-Croix

Genotype	Total (cwt/a)	Creamer <1½ " (cwt/a)	Small 1½-2¼ " (cwt/a)	Canada No 1 2¼-2¾ " (cwt/a)	Chef 2¾-4½ " (cwt/a)	Downgraded (cwt/a)
Connect	373,4 a	30,4 a	103,7 ab	110,6 c	101,9 a	26,8 a
Vivaldi (C)	372,6 a	19,0 a	50,3 ab	255,7 a	46,9 ab	0,8 a
401-1	367,9 ab	7,4 a	44,0 b	239,3 ab	65,3 ab	12,0 a
Belmonda	351,1 abc	15,2 a	118,3 a	161,7 bc	50,8 ab	5,1 a
Noblesse	338,9 abcd	9,4 a	117,4 a	178,5 abc	31,0 ab	2,6 a
QP12081.11	292,1 bcde	23,7 a	82,3 ab	152,2 c	12,6 b	21,4 a
Obama	287,2 cde	20,3 a	101,8 ab	146,9 c	8,8 b	9,5 a
Confederation	270,6 de	15,2 a	73,8 ab	116,5 c	48,7 ab	16,4 a
Yukon Gold (C)	262,9 de	5,2 a	40,9 b	100,4 c	91,6 ab	25,0 a
Keuka Gold (C)	257,7 e	12,5 a	66,7 ab	101,9 c	74,5 ab	2,1 a

Data are the means of three replications (one row/replication)

Data followed by a different letter in the same column are significantly different ($P < 0.05$) according to the Tukey test



Table VII. Quality of the genotypes in the “yellow flesh potatoes” category in Ste-Croix

Genotype	Hollow Heart (%)	Brown Center (%)	Vascular Ring (%)	Scab (index) 0-15	Rhizoctonia (index) 0-15	Appearance (1-9)	Uniformity (1-5)	Specific gravity
Connect	0,0 a	0,0 a	0,0 a	1,3 ab	0,0 a	6,0 a	3,3 a	1,086 b
Vivaldi (C)	0,0 a	0,0 a	0,0 a	3,1 ab	0,0 a	6,3 a	4,0 a	1,083 b
401-1	0,0 a	0,0 a	6,7 a	1,3 ab	0,0 a	6,0 a	3,3 a	1,084 b
Belmonda	0,0 a	0,0 a	0,0 a	4,2 a	0,0 a	6,0 a	3,3 a	1,100 a
Noblesse	0,0 a	0,0 a	10,0 a	1,3 ab	0,0 a	6,7 a	4,3 a	1,088 b
QP12081.11	0,0 a	0,0 a	0,0 a	2,4 ab	0,0 a	5,7 a	3,0 a	1,084 b
Obama	0,0 a	0,0 a	0,0 a	1,6 ab	0,0 a	6,0 a	3,0 a	1,074 c
Confederation	0,0 a	3,3 a	3,3 a	4,3 a	0,0 a	7,0 a	4,0 a	1,087 b
Yukon Gold(C)	0,0 a	0,0 a	0,0 a	2,1 ab	0,0 a	5,7 a	3,3 a	1,089 b
Keuka Gold(C)	0,0 a	0,0 a	0,0 a	0,7 b	0,0 a	6,0 a	4,0 a	1,089 b

Data are the means of three replications (one row/replication)

Data followed by a different letter in the same column are significantly different ($P < 0.05$) according to the Tukey test

3.2.2. Lanoraie

- For all genotypes, yields are considerably lower in Lanoraie compared to Ste-Croix (Table VIII).
- Connect generated significantly more downgraded tubers (11% of the total yield) than all other lines apart from Yukon gold (C). These downgraded tubers are mostly malformed.
- The cultivar Connect has a significantly higher percentage of tuber with vascular ring (Table VIII).
- Globally, the external and internal qualities were good for yellow genotypes in Lanoraie.
- For clone QP12081.11 low yield limited its specific gravity analysis.
- Yukon Gold (C) and QP12081.11 have a significant lower appearance grade than all other genotypes except Connect.



Table VIII. Yield of genotypes in the “yellow flesh potatoes” category in Lanoraie

Genotype	Total (cwt/a)	Creamer <1½ " (cwt/a)	Small 1½-2¼ " (cwt/a)	Canada No 1 2¼-2¾ " (cwt/a)	Chef 2¾-4½ " (cwt/a)	Downgraded (cwt/a)
Belmonda	206,5 a	15,6 ab	101,9 a	75,7 ab	12,7 a	0,7 b
Obama	193,5 ab	14,7 ab	49,4 bcd	115,7 a	9,1 a	4,7 b
Connect	187,6 ab	14,9 ab	66,1 abcd	64,4 ab	21,8 a	20,4 a
Confederation	179,0 ab	19,0 ab	78,8 abc	54,0 ab	22,4 a	4,8 b
401-1	151,5 ab	16,4 ab	53,1 bcd	77,3 ab	0,0 a	4,7 b
Noblesse	151,0 ab	15,4 ab	82,9 ab	44,9 ab	7,8 a	0,0 b
Vivaldi (C)	125,2 ab	19,5 ab	36,0 d	65,7 ab	3,2 a	0,9 b
Keuka Gold (C)	123,1 ab	12,7 b	51,0 bcd	46,5 ab	9,4 a	3,5 b
Yukon Gold (C)	109,7 ab	7,2 b	44,9 cd	35,8 ab	15,3 a	6,5 ab
QP12081.11	96,6 b	32,0 a	34,8 d	26,0 b	0,0 a	3,9 b

Data are the means of three replications (one row/replication)

Data followed by a different letter in the same column are significantly different ($P < 0.05$) according to the Tukey test

Table IX. Quality of the genotypes in the “yellow flesh potatoes” category in Lanoraie

Genotype	Hollow Heart (%)	Brown Center (%)	Vascular Ring (%)	Scab (index) 0-15	Rhizoctonia (index) 0-15	Appearance (1-9)	Uniformity (1-5)	Specific gravity
Belmonda	0,0 a	3,3 a	0,0 b	0,13 a	0,0 a	6,7 a	3,3 ab	1,087 a
Obama	0,0 a	0,0 a	0,0 b	0,07 a	0,0 a	6,0 ab	3,0 ab	1,072 a
Connect	0,0 a	0,0 a	13,3 a	0,00 a	0,0 a	5,0 bc	2,7 ab	1,074 a
Confederation	0,0 a	0,0 a	0,0 b	0,47 a	0,0 a	6,0 ab	3,0 ab	1,072 a
401-1	0,0 a	0,0 a	0,0 b	0,73 a	0,0 a	6,0 ab	3,0 ab	1,069 a
Noblesse	0,0 a	0,0 a	0,0 b	0,03 a	0,0 a	6,0 ab	3,7 a	1,078 a
Vivaldi (C)	0,0 a	0,0 a	0,0 b	0,13 a	0,0 a	5,7 ab	3,3 ab	1,075 a
Keuka Gold(C)	0,0 a	0,0 a	0,0 b	0,03 a	0,0 a	6,3 a	3,3 ab	1,080 a
Yukon Gold(C)	3,3 a	0,0 a	0,0 b	0,00 a	0,0 a	4,3 c	3,0 ab	1,075 a
QP12081.11	0,0 a	0,0 a	0,0 b	0,00 a	0,0 a	4,3 c	2,3 b	

Data are the means of three replications (one row/replication)

Data followed by a different letter in the same column are significantly different ($P < 0.05$) according to the Tukey test

3.3. Long potatoes

3.3.1. Ste-Croix

- All genotypes except Rickey and AG1424.11 have significantly less Downgraded tubers compared to the control Goldrush. Most of Goldrush downgraded tubers were malformed (Table X).



- All genotypes had a significantly lower rhizoctonia index than the control Goldrush (Table XI)
- Mostly intended for the processing market, the long-shaped potatoes should present a high specific gravity. Results show that 8 genotypes generated a high specific gravity (≥ 1.086). VF14016 has a significant higher specific gravity (1.103).

Table X. Yield of genotypes in the “long potatoes” category in Ste-Croix

Genotype	Total (cwt/a)	Creamer <1½ " (cwt/a)	Small 1½-2 " (cwt/a)	Canada No 1 2-2¾ " (cwt/a)	Chef 2¾-4½ " (cwt/a)	Downgraded (cwt/a)
Campagna (C)	466,2 a	11,3 b	76,0 abcd	284,9 a	82,0 ab	12,1 b
Rickey	424,9 ab	11,0 b	38,6 d	244,9 ab	110,6 a	19,8 ab
F14021	381,2 abc	11,8 b	56,8 bcd	251,2 ab	51,0 abc	10,4 b
QP12115.03	361,9 abcd	41,7 ab	93,7 abc	193,1 abc	17,6 bc	15,8 b
QP13116.15	355,2 bcd	23,8 ab	109,9 a	185,0 abc	27,0 bc	9,6 b
Goldrush (C)	337,6 bcd	15,0 b	50,4 cd	168,5 bcd	59,8 abc	43,9 a
QP13094.03	293,8 cde	1,9 b	32,2 d	171,4 bc	76,2 abc	12,0 b
AG1424.11	276,2 cde	31,9 ab	100,1 ab	112,5 cd	9,8 bc	21,9 ab
VF14016	255,4 de	13,6 b	52,4 cd	167,6 bcd	15,2 bc	6,5 b
Clearwater	223,1 e	61,7 a	93,6 abc	65,4 d	0,0 c	2,5 b

Data are the means of three replications (one row/replication)

Data followed by a different letter in the same column are significantly different ($P < 0.05$) according to the Tukey test

Table XI. Quality of the genotypes in the “long potatoes” category in Ste-Croix

Genotype	Hollow Heart (%)	Brown Center (%)	Vascular Ring (%)	Scab (index) 0-15	Rhizoctonia (index) 0-15	Appearance (1-9)	Uniformity (1-5)	Specific gravity
Campagna (C)	0,0 a	0,0 a	10,0 a	0,63 a	0,00 b	7,0 a	3,7 a	1,088 bcd
Rickey	0,0 a	0,0 a	0,0 a	0,00 a	0,00 b	6,0 ab	3,3 a	1,085 cd
F14021	0,0 a	0,0 a	20,0 a	2,20 a	0,00 b	6,0 ab	4,0 a	1,089 bcd
QP12115.03	0,0 a	0,0 a	6,7 a	1,50 a	0,00 b	5,7 b	3,3 a	1,088 bcd
QP13116.15	0,0 a	0,0 a	10,0 a	0,83 a	0,00 b	5,7 b	3,7 a	1,089 bcd
Goldrush (C)	0,0 a	0,0 a	0,0 a	0,03 a	0,90 a	5,7 b	3,0 a	1,080 d
QP13094.03	0,0 a	0,0 a	13,3 a	0,37 a	0,00 b	5,7 b	3,0 a	1,094 ab
AG1424.11	0,0 a	0,0 a	3,3 a	0,73 a	0,00 b	5,3 b	3,0 a	1,090 bc
VF14016	0,0 a	0,0 a	6,7 a	0,03 a	0,03 b	5,7 b	3,0 a	1,103 a
Clearwater	0,0 a	0,0 a	0,0 a	0,07 a	0,00 b	6,0 ab	3,7 a	1,088 bcd

Data are the means of three replications (one row/replication)

Data followed by a different letter in the same column are significantly different ($P < 0.05$) according to the Tukey test



3.3.2. Lanoraie

- Yields from all genotypes were lower in Lanoraie as compared to Sainte-Croix (Table XII).
- Rickey and QP13116.15 generated a significant higher yield compared to all controls and other genotypes.
- These two genotypes also generated significantly more downgraded tubers with respectively 33% and 15% of their total yield downgraded for QP13116.15 and Rickey.
- The clone QP13094.03 also generated a high percentage (24%) of downgraded tubers mostly from growth cracks.
- VF14016 generated a high percentage of tubers with vascular ring (20%) (Table XIII).
- Excepting the previous example regarding VF14016, internal and external qualities of the other genotypes were good.
- The analysis of specific gravity was not possible for the following clones et cultivars (AG1424.11, QP12115.03, Goldrush (C), QP13094.03, VF14016, Clearwater and F14021) because of their extremely low yield.

Table XII. Yield of genotypes in the “long potatoes” category in Lanoraie

Genotype	Total (cwt/a)	Creamer <1½ " (cwt/a)	Small 1½-2 " (cwt/a)	Canada No 1 2-2¾ " (cwt/a)	Chef 2¾-4½ " (cwt/a)	Downgraded (cwt/a)
Rickey	201,9 a	9,1 cd	31,6 a	117,4 a	13,9 a	29,9 b
QP13116.15	180,2 a	7,0 d	31,3 a	71,5 b	11,0 ab	59,4 a
Campagna (C)	91,5 b	27,7 abc	38,3 a	23,5 c	0,0 b	2,0 c
AG1424.11	68,3 bc	30,1 ab	34,4 a	1,3 c	0,0 b	2,5 c
QP12115.03	66,8 bc	32,6 ab	25,3 a	8,2 c	0,0 b	0,8 c
Goldrush (C)	66,4 bc	37,1 a	20,6 a	4,8 c	0,0 b	3,9 c
QP13094.03	58,2 bc	8,1 cd	17,5 a	18,6 c	0,0 b	14,0 c
VF14016	47,1 bc	21,0 abcd	17,3 a	5,1 c	0,0 b	3,8 c
Clearwater	46,0 c	23,9 abcd	21,9 a	0,0 c	0,0 b	0,2 c
F14021	40,7 c	15,5 bcd	17,0 a	5,5 c	0,0 b	2,6 c

Data are the means of three replications (one row/replication)

Data followed by a different letter in the same column are significantly different ($P < 0.05$) according to the Tukey test



Table XIII. Quality of the genotypes in the “long potatoes” category in Lanoraie

Genotype	Hollow Heart (%)	Brown Center (%)	Vascular Ring (%)	Scab (index) 0-15	Rhizoctonia (index) 0-15	Appearance (1-9)	Uniformity (1-5)	Specific gravity
Rickey	0,0 a	0,0 a	0,0 b	0,000 a	0,0 a	5,3 a	3,7 a	1,070 a
QP13116.15	0,0 a	0,0 a	6,7 ab	0,033 a	0,0 a	4,7 a	3,0 ab	1,068 a
Campagna (C)	0,0 a	0,0 a	0,0 b	0,000 a	0,0 a	5,7 a	3,0 ab	1,066 a
AG1424.11	0,0 a	0,0 a	0,0 b	0,033 a	0,0 a	5,3 a	2,3 b	
QP12115.03	0,0 a	0,0 a	0,0 b	0,067 a	0,0 a	4,0 a	2,7 ab	
Goldrush (C)	0,0 a	0,0 a	6,7 ab	0,000 a	0,0 a	5,3 a	3,0 ab	
QP13094.03	0,0 a	0,0 a	0,0 b	0,067 a	0,0 a	5,3 a	3,0 ab	
VF14016	0,0 a	0,0 a	20,0 a	0,000 a	0,0 a	5,0 a	2,7 ab	
Clearwater	0,0 a	0,0 a	3,3 ab	0,000 a	0,0 a	5,7 a	2,7 ab	
F14021	0,0 a	0,0 a	0,0 b	0,000 a	0,0 a	5,7 a	3,0 ab	

Data are the means of three replications (one row/replication)

Data followed by a different letter in the same column are significantly different ($P < 0.05$) according to the Tukey test

3.4. Red skin potatoes

3.4.1. Ste-Croix

- All genotypes had significantly less downgraded tubers compared to the control Viking for which 28% of its total yield was downgraded mostly because of growth cracks (Table XIV).
- Eight (8) genotypes (Rosi, AG1533, Elmo, AG1534, QP12058.62, AG1540, AH1404.09 and QP12058.36) generated a higher yield in comparison to the 4 controls (no significant differences).
- AG1535 clone has a significantly higher rhizoctonia index than all other genotypes (Table XV).



Table XIV. Yield of genotypes in the “red skin potatoes” category in Ste-Croix

Genotype	Total (cwt/a)	Creamer <1½ " (cwt/a)	Small 1½-2¼ " (cwt/a)	Canada No 1 2¼-2¾ " (cwt/a)	Chef 2¾-4½ " (cwt/a)	Downgraded (cwt/a)
Rosi	439,2 a	14,9 abcde	53,9 de	264,8 a	92,3 a	13,4 bcd
AG1533	430,1 a	17,0 abcde	116,2 a	187,9 ab	98,8 a	10,3 bcd
Elmo	403,9 a	4,9 e	59,3 bcde	175,3 ab	124,3 a	40,0 bc
AG1534	369,0 a	10,8 bcde	90,8 abcde	145,8 ab	103,0 a	18,5 bcd
QP12058.62	362,5 a	9,9 bcde	97,3 abcd	181,7 ab	71,3 a	2,3 cd
AG1540	351,5 a	20,7 abcd	113,4 abc	166,8 ab	46,4 a	4,3 cd
AG1404.09	351,4 a	13,0 abcde	91,8 abcde	171,4 ab	61,2 a	13,9 bcd
QP12058.36	338,6 a	21,2 abc	68,7 abcde	196,7 ab	52,0 a	0,0 d
Chieftain (C)	316,8 a	15,1 abcde	95,2 abcd	150,5 ab	44,5 a	11,6 bcd
AG1535	316,2 a	12,8 abcde	103,7 abcd	141,5 b	54,9 a	3,4 cd
Norland (C)	315,2 a	7,1 de	53,0 de	114,1 b	94,7 a	46,4 ab
Vicky	314,0 a	23,5 ab	58,6 cde	195,1 ab	32,6 a	4,2 cd
F14119	303,5 a	25,1 a	118,7 a	111,3 b	45,3 a	3,0 cd
DR Chieftain (C)	302,5 a	16,5 abcde	114,8 ab	138,3 b	26,4 a	6,5 cd
Viking (C)	295,9 a	6,2 e	36,2 e	93,7 b	78,4 a	81,4 a
QP12058.45	277,4 a	6,8 de	69,7 abcde	145,7 ab	54,2 a	1,1 cd
QP13071.28	250,0 a	10,6 bcde	94,9 abcd	121,4 b	8,1 a	14,9 bcd
QP12058.48	244,7 a	9,0 cde	84,3 abcde	137,0 b	12,4 a	1,9 cd

Data are the means of three replications (one row/replication)

Data followed by a different letter in the same column are significantly different ($P < 0.05$) according to the Tukey test



Table XV. Quality of the genotypes in the “red skin potatoes” category in Ste-Croix

Genotype	Hollow Heart (%)	Brown Center (%)	Vascular Ring (%)	Scab (index) 0-15	Rhizoctonia (index) 0-15	Appearance (1-9)	Uniformity (1-5)	Specific gravity
Rosi	0,0 a	0,0 a	3,3 a	0,03 a	0,00 b	6,3 abc	3,3 a	1,079 bcdef
AG1533	0,0 a	0,0 a	0,0 a	4,83 a	0,00 b	7,0 ab	4,3 a	1,072 def
Elmo	0,0 a	0,0 a	3,3 a	0,23 a	0,00 b	5,7 abc	3,0 a	1,068 f
AG1534	0,0 a	0,0 a	0,0 a	1,83 a	0,00 b	7,3 ab	3,7 a	1,072 cdef
QP12058.62	0,0 a	0,0 a	3,3 a	1,57 a	0,00 b	6,7 abc	3,7 a	1,085 abc
AG1540	0,0 a	0,0 a	10,0 a	3,80 a	0,00 b	7,0 ab	3,3 a	1,082 abcde
AG1404.09	10,0 a	0,0 a	0,0 a	0,70 a	0,00 b	6,3 abc	3,3 a	1,070 ef
QP12058.36	0,0 a	0,0 a	0,0 a	2,90 a	0,00 b	5,7 abc	3,0 a	1,085 abcd
Chieftain (C)	0,0 a	0,0 a	10,0 a	2,17 a	0,00 b	7,0 ab	4,0 a	1,081 abcdef
AG1535	0,0 a	0,0 a	0,0 a	2,13 a	1,87 a	6,7 abc	3,7 a	1,078 bcdef
Norland (C)	0,0 a	0,0 a	6,7 a	2,43 a	0,00 b	4,3 c	3,0 a	1,076 cdef
Vicky	0,0 a	0,0 a	0,0 a	0,20 a	0,00 b	5,3 abc	3,0 a	1,070 ef
F14119	0,0 a	0,0 a	3,3 a	3,50 a	0,00 b	6,7 abc	3,7 a	1,075 cdef
DR Chieftain(C)	0,0 a	0,0 a	10,0 a	0,03 a	0,00 b	7,7 a	4,7 a	1,076 cdef
Viking (C)	0,0 a	0,0 a	0,0 a	2,20 a	0,00 b	5,0 bc	3,3 a	1,073 cdef
QP12058.45	0,0 a	0,0 a	10,0 a	2,47 a	0,00 b	6,7 abc	4,0 a	1,093 a
QP13071.28	0,0 a	0,0 a	3,3 a	4,67 a	0,00 b	5,7 abc	3,3 a	1,082 abcde
QP12058.48	0,0 a	0,0 a	10,0 a	1,27 a	0,00 b	6,0 abc	3,7 a	1,091 ab

Data are the means of three replications (one row/replication)

Data followed by a different letter in the same column are significantly different ($P < 0.05$) according to the Tukey test

3.4.2. Lanoraie

- Yields from all genotypes were lower in Lanoraie as compared to Sainte-Croix (Table XVI).
- Clone QP12058.62 had a significantly higher yield than the four controls.
- Globally, the external and internal qualities were good for red skin potato genotypes in Lanoraie (Table XVII).
- The analysis of specific gravity was not possible for most of the clones and cultivars because of their extremely low yields.



Table XVI. Yield of genotypes in the “red skin potatoes” category in Lanoraie

Genotype	Total (cwt/a)	Creamer <1½ " (cwt/a)	Small 1½-2¼ " (cwt/a)	Canada No 1 2¼-2¾ " (cwt/a)	Chef 2¾-4½ " (cwt/a)	Downgraded (cwt/a)
QP12058.62	198,1 a	7,4 a	87,4 a	69,6 a	32,5 a	1,3 b
AG1534	158,6 ab	12,6 a	51,7 ab	53,1 ab	33,1 a	8,1 ab
Elmo	140,2 abc	12,4 a	52,1 ab	49,4 abc	2,0 b	24,3 ab
AG1540	126,6 abc	21,9 a	60,2 ab	31,3 abc	0,0 b	13,1 ab
QP12058.45	115,4 abc	9,5 a	37,0 b	37,0 abc	31,5 a	0,4 b
Rosi	113,5 abc	10,1 a	38,8 b	23,8 abc	4,6 b	36,1 a
QP12058.36	99,3 abc	10,7 a	53,3 ab	27,6 abc	7,8 b	0,0 b
AG1533	77,7 bc	22,2 a	34,2 b	9,2 bc	6,8 b	5,3 b
Chieftain (C)	74,3 bc	17,8 a	41,6 ab	12,4 bc	0,0 b	2,5 b
QP12058.48	72,3 bc	11,3 a	46,1 ab	14,4 bc	0,0 b	0,5 b
Viking (C)	69,1 bc	7,7 a	39,1 b	11,7 bc	5,3 b	5,2 b
Norland (C)	69,0 bc	13,8 a	27,7 b	11,1 bc	0,0 b	16,3 ab
QP13071.28	65,7 bc	6,4 a	28,6 b	24,1 abc	0,0 b	6,6 b
F14119	65,0 bc	14,0 a	39,4 b	1,0 c	0,0 b	10,5 ab
AG1404.09	58,8 bc	11,1 a	33,5 b	9,1 bc	0,0 b	5,1 b
Vicky	52,1 c	16,3 a	19,5 b	3,3 bc	0,0 b	12,9 ab
AG1535	42,3 c	6,0 a	22,5 b	1,7 c	0,0 b	12,0 ab
DR Chieftain (C)	39,4 c	13,9 a	22,8 b	0,0 c	0,0 b	2,7 b

Data are the means of three replications (one row/replication)

Data followed by a different letter in the same column are significantly different ($P < 0.05$) according to the Tukey test



Table XVII. Quality of the genotypes in the “red skin potatoes” category in Lanoraie

Genotype	Hollow Heart (%)	Brown Center (%)	Vascular Ring (%)	Scab (index) 0-15	Rhizoctonia (index) 0-15	Appearance (1-9)	Uniformity (1-5)	Specific gravity
QP12058.62	0,0 a	0,0 a	0,0 a	1,40 a	0,0 a	5,7 a	3,3 a	1,074 a
AG1534	0,0 a	0,0 a	0,0 a	0,10 a	0,0 a	6,3 a	3,0 a	1,060 a
Elmo	0,0 a	0,0 a	0,0 a	0,63 a	0,0 a	5,3 a	3,3 a	1,065 a
AG1540	0,0 a	0,0 a	0,0 a	0,47 a	0,0 a	6,4 a	3,5 a	
QP12058.45	0,0 a	0,0 a	0,0 a	1,17 a	0,0 a	6,0 a	3,0 a	1,077 a
Rosi	0,0 a	0,0 a	0,0 a	0,13 a	0,0 a	4,3 a	2,7 a	
QP12058.36	0,0 a	0,0 a	0,0 a	0,17 a	0,0 a	5,7 a	3,3 a	
AG1533	0,0 a	0,0 a	0,0 a	0,00 a	0,0 a	4,7 a	3,0 a	
Chieftain (C)	0,0 a	0,0 a	3,3 a	0,17 a	0,0 a	6,0 a	3,7 a	
QP12058.48	0,0 a	0,0 a	0,0 a	0,83 a	0,0 a	6,0 a	3,7 a	
Viking (C)	0,0 a	0,0 a	3,3 a	0,57 a	0,0 a	5,3 a	3,3 a	
Norland (C)	0,0 a	0,0 a	0,0 a	0,07 a	0,0 a	5,0 a	3,0 a	
QP13071.28	0,0 a	0,0 a	0,0 a	0,70 a	0,0 a	5,7 a	3,0 a	
F14119	0,0 a	0,0 a	0,0 a	0,07 a	0,0 a	6,0 a	3,3 a	
AG1404.09	0,0 a	0,0 a	6,7 a	0,00 a	0,0 a	5,7 a	3,3 a	
Vicky	0,0 a	0,0 a	0,0 a	0,00 a	0,0 a	4,3 a	3,0 a	
AG1535	0,0 a	0,0 a	6,7 a	0,43 a	0,1 a	5,7 a	2,7 a	
DR Chieftain(T)	0,0 a	0,0 a	0,0 a	0,10 a	0,0 a	6,0 a	3,7 a	

Data are the means of three replications (one row/replication)

Data followed by a different letter in the same column are significantly different ($P < 0.05$) according to the Tukey test

3.5. Specialities potatoes

3.5.1. Ste-Croix

- Roselys (C) has significantly more downgraded tubers with 11% of its total, mostly because of growth cracks (Table XVII).
- Globally, most genotypes had a high percentage of tubers with vascular ring (Table XIX).
- Other than the vascular ring, the internal and external qualities of the genotypes were good.



Table XVIII. Yield of genotypes in the “specialties potatoes” category in Ste-Croix

Genotype	Total (cwt/a)	Creamer <1½ " (cwt/a)	Small 1½-2¼ " (cwt/a)	Canada No 1 2¼-2¾ " (cwt/a)	Chef 2¾-4½ " (cwt/a)	Downgraded (cwt/a)
Roselys (C)	311,9 a	9,3 c	56,9 b	116,4 ab	93,6 a	35,7 a
AG1425.11	300,3 a	35,5 b	110,2 a	98,5 abc	46,4 b	9,8 b
QP12145.02	287,1 a	14,3 bc	73,8 ab	157,4 a	37,4 b	4,2 b
Marispeer	263,9 a	35,4 b	60,2 b	144,3 a	15,5 bc	8,6 b
AG1405.15	230,4 a	62,6 a	110,0 a	53,9 bc	0,0 c	3,9 b
Ciklamen	218,3 a	71,9 a	104,1 a	37,0 c	0,0 c	5,3 b

Data are the means of three replications (one row/replication)

Data followed by a different letter in the same column are significantly different ($P < 0.05$) according to the Tukey test

Table XIX. Quality of the genotypes in the “specialties potatoes” category in Ste-Croix

Genotype	Hollow Heart (%)	Brown Center (%)	Vascular Ring (%)	Scab (index) 0-15	Rhizoctonia (index) 0-15	Appearance (1-9)	Uniformity (1-5)	Specific gravity
Roselys (C)	0,0 a	3,3 a	10,0 a	0,20 a	0,0 a	5,3 b	3,0 a	1,086 ab
AG1425.11	0,0 a	0,0 a	13,3 a	0,20 a	0,0 a	6,0 ab	3,3 a	1,083 b
QP12145.02	0,0 a	0,0 a	20,0 a	0,33 a	0,0 a	6,3 a	3,7 a	1,086 ab
Marispeer	0,0 a	0,0 a	6,7 a	0,17 a	0,0 a	5,3 b	2,7 a	1,085 b
AG1405.15	0,0 a	0,0 a	3,3 a	0,60 a	0,0 a	6,3 a	4,0 a	1,092 ab
Ciklamen	0,0 a	0,0 a	13,3 a	0,03 a	0,0 a	5,3 b	2,7 a	1,094 a

Data are the means of three replications (one row/replication)

Data followed by a different letter in the same column are significantly different ($P < 0.05$) according to the Tukey test

3.5.2. Lanoraie

- Roselys (C) has significantly more downgraded tubers with 27% of its total, mostly because of growth cracks (Table XX).
- AG1405.15 and Ciklamen generated significantly lower yields than the control Roselys.
- Cyclamen had a high percentage (23,3%) of tubers with vascular ring (Table XXI).
- The analysis of specific gravity was not possible for Marispeer, Ciklamen and AG1405.15 because of their extremely low yields.



Table XX. Yield of genotypes in the “specialties potatoes” category in Lanoraie

Genotype	Total (cwt/a)	Creamer <1½ " (cwt/a)	Small 1½-2¼ " (cwt/a)	Canada No 1 2¼-2¾ " (cwt/a)	Chef 2¾-4½ " (cwt/a)	Downgraded (cwt/a)
Roselys (C)	115,2 a	4,9 c	33,1 ab	35,5 ab	10,7 a	31,0 a
AG1425.11	105,3 ab	13,0 bc	42,3 a	48,2 a	0,0 a	1,8 a
QP12145.02	93,2 ab	32,7 a	28,3 ab	23,8 bc	0,0 a	8,4 a
Marispeer	76,5 abc	20,8 abc	42,0 a	7,4 cd	0,0 a	6,3 a
Ciklamen	49,1 bc	30,7 ab	18,3 ab	0,0 d	0,0 a	0,1 a
AG1405.15	28,8 c	20,3 abc	5,5 b	0,0 d	0,0 a	3,0 a

Data are the means of three replications (one row/replication)

Data followed by a different letter in the same column are significantly different ($P < 0.05$) according to the Tukey test

Table XXI. Quality of the genotypes in the “specialties potatoes” category in Lanoraie

Genotype	Hollow Heart (%)	Brown Center (%)	Vascular Ring (%)	Scab (index) 0-15	Rhizoctonia (index) 0-15	Appearance (1-9)	Uniformity (1-5)	Specific gravity
Roselys (C)	0,0 a	0,0 a	3,3 a	0,0667 a	0,0 a	5,3 a	3,0 a	1,074 a
AG1425.11	0,0 a	0,0 a	0,0 a	0,0667 a	0,0 a	6,0 a	3,7 a	1,082 a
QP12145.02	0,0 a	0,0 a	0,0 a	0,0333 a	0,0 a	5,3 a	2,7 a	1,068 a
Marispeer	0,0 a	0,0 a	0,0 a	0,0667 a	0,0 a	6,0 a	3,0 a	
Ciklamen	0,0 a	0,0 a	23,3 a	0,0000 a	0,0 a	4,7 a	2,7 a	
AG1405.15	0,0 a	0,0 a	0,0 a	0,0000 a	0,0 a	4,3 a	3,7 a	

Data are the means of three replications (one row/replication)

Data followed by a different letter in the same column are significantly different ($P < 0.05$) according to the Tukey test



4. RESULTS INTERPRETATION

- Total yields for the genotypes evaluated in Lanoraie were lower than Ste-Croix, probably due to the combination of high temperature and the lack of irrigation in a sandy soil.
- Tubers for the majority of the genotypes were more affected by vascular ring and scab in Sainte-Croix.
- Several genotypes presented a good potential regarding yield and the quality, in both category and each site. Pictures of the potential genotypes along with the control varieties are shown in the next pages.
 - White round potatoes
 - QP12056.16 (Figure 6)
 - Alliston (Figure 7)
 - QP13031.01 (Figure 8)
 - QP13127.14 (Figure 9)
 - Envol (C) (Figure 10)
 - Mystère (C) (Figure 11)
 - Snowden (C) (Figure 12)
 - Superior (C) (Figure 13)
 - Yellow flesh potatoes
 - Belmonda (Figure 14)
 - Connect (Figure 15)
 - 401-1 (Figure 16)
 - Vivaldi (C) (Figure 17)
 - Keuka Gold (C) (Figure 18)
 - Yukon Gold (C) (Figure 19)
 - Long potatoes
 - Rickey (Figure 20)
 - QP13116.15 (Figure 21)
 - Campagna (C) (Figure 22)
 - Goldrush (C) (Figure 23)



- Red skin Potatoes
 - QP12058.62 (Figure 24)
 - AG1534 (Figure 25)
 - Elmo (Figure 26)
 - AG1540 (Figure 27)
 - Chieftain (C) (Figure 28)
 - Viking (C) (Figure 29)
 - Norland (C) (Figure 30)
 - DR Chieftain (C) (Figure 31)

- Specialities potatoes
 - AG1425.11 (Figure 32)
 - QP12145.02 (Figure 33)
 - Roselys (C) (Figure 34)





Figure 6. QP12056.16





Figure 7. Alliston





Figure 8. QP12031.01





Figure 9. QP13127.14





Figure 10. Envol (C)





Figure 11. Mystère (C)





Figure 12. Snowden (C)





Figure 13. Superior (C)





Figure 14. Belmonda





Figure 15. Connect





Figure 16. 401-1





Figure 17. Vivaldi (C)





Figure 18. Keuka Gold





Figure 19. Yukon Gold





Figure 20. Rickey





Figure 21. QP13116.15





Figure 22. Campagna (C)





Figure 23. Goldrush (C)





Figure 24. QP12058.62





Figure 25. AG1534





Figure 26. Elmo





Figure 27. AG1540





Figure 28. Chieftain (C)





Figure 29. Viking (C)





Figure 30. Norland (C)





Figure 31. DR Chieftain (C)





Figure 32. AG1425.11





Figure 33. QP12145.02





Figure 34. Roselys (C)

