

# Evaluation of the agronomic and oenological characteristics of promising varieties in Quebec.



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## Introduction

For twenty years, Quebec's viticulture has been in development. Special conditions in Quebec require a specific evaluation of agronomic and oenological parameters for promising varieties. However, few public scientific studies have been conducted. So, the Agricultural Research Center of Mirabel has established a vineyard to assess hardy varieties. Thus, the main objective of this ongoing study is to assess the agronomic and oenological qualities of several rustic varieties in regard to sustainable economic development for a producer. For five years, agronomic characteristics of eighteen varieties have been studied and for two years, the oenological parameters have been considered.

## Methods

The experimental vineyard is located in Québec (Canada) at the Abbaye d'Oka, Laurentian region (45° 30' N, 74° 4.2' W, altitude 91.4 m). The experimental vineyard was established in spring 2008 and 18 hardy varieties were implanted (4 plots of 10 plants with a random distribution) (Tab. I). The soil is a gravelly loam with perfect drainage and training system is the Royal Cord (VSP) 30'. Several agronomic parameters were noted during five years: phenology, winter and spring freezing, vigour, lignification, bunch weight, berry weight, yield and resistance to fungal diseases and insect pests. Oenological characteristics are observed for the last 3 years and recorded parameters are: total acidity, Brix and pH for the monitoring in the field. Since two years, little wine production are carried out and complete laboratory analyzes are performed. Statistical analyses performed were ANOVA, Wilcoxon test and Tukey-Kramer test.

Table I: Varieties evaluated in the experimental vineyard.

Varieties	Rusticity
Frontenac	-37 à -34°C
St-Croix	-32 à -29°C
Marquette	-32 à -29°C
Baltica	-40 à -37°C
Petite Perle	-32 à -29°C
Radisson	-34 à -32°C
Skandia	-34 à -32°C
D.M. 85-21-1	-40 à -37°C
Somerset	-37 à -34°C
Frontenac gris	-37 à -34°C
Frontenac blanc	-37 à -34°C
La Crescent	-32 à -29°C
E.S. 10-18-30	-37 à -34°C
Louise Swenson	-32 à -29°C
E.S. Muscat	-32 à -29°C
E.S. 4-23-60	-32 à -29°C
Adalmina	-34 à -32°C
Osecola Muscat	-32 à -29°C

## Results

Table II: Type of development of the different varieties in Quebec, Canada

Varieties	Bud	Flowering	Fruit development	Berry ripening	Vigour index
Frontenac	intermediate	intermediate	intermediate	intermediate	high
St-Croix	intermediate	late	late	late	high
Marquette	semi hasty	intermediate	intermediate	intermediate	high
Baltica	hasty	hasty	hasty	hasty	medium
Petite Perle	late	late	late	late	medium
E.S. 5-17	intermediate	late	intermediate	late	high
Skandia	semi hasty	intermediate	intermediate	hasty	high
D.M. 85-21-1	semi hasty	hasty	hasty	hasty	medium
Somerset	semi hasty	intermediate	intermediate	hasty	medium
Frontenac gris	late	intermediate	intermediate	intermediate	high
Frontenac blanc	late	intermediate	intermediate	intermediate	high
La Crescent	semi hasty	intermediate	intermediate	intermediate	high
E.S. 10-18-30	intermediate	hasty	intermediate	intermediate	low
Louise Swenson	semi hasty	late	late	late	low
E.S. Muscat	hasty	intermediate	intermediate	intermediate	high
E.S. 4-23-60	intermediate	intermediate	late	intermediate	medium
Adalmina	late	late	intermediate	intermediate	high
Osecola Muscat	hasty	intermediate	intermediate	hasty	high

Table III: Susceptibility to fungal diseases and insects of the different varieties

Varieties	Downy mildew	Powdery mildew *	Grey mold	Black rot	Anthraxnose	Phylloxera
Frontenac	-	+	+	+++	++	-
St-Croix	++	+	na	+	na	++
Marquette	-	+	++	+	+++	+
Baltica	na	++	na	+	++	-
Petite Perle	na	+	+	+	+	-
Radisson	na	++	na	+	na	+
Skandia	na	+	++	+	na	+
D.M. 85-21-1	+	++	na	+	na	-
Somerset	na	++	na	na	na	-
Frontenac blanc	-	+	na	+++	++	+
Frontenac gris	-	+	na	+++	++	-
La Crescent	++	++	na	++	na	-
E.S. 10-18-30	nd	++	na	++	+	+++
Louise Swenson	na	+	+	na	+	-
E.S. Muscat	na	+	na	+	na	++
E.S. 4-23-60	nd	+	+	+	na	++
Adalmina	+	++	++	+	+	-
Osecola Muscat	+++	+++	+	++	++	-

Legend: - on leaf and not on branch; na = unavailable, - = tolerant, + = low susceptibility, ++ = medium susceptibility, +++ = high susceptibility

Table IV: Berry weight, bunch weight and yield of the different varieties

Varieties	Berry weight (g)		Bunch weight (g)		Yield/plant (kg)	
	Mean	SD	Mean	SD	Mean	SD
Frontenac	1,12	fg	92	a	2,4	b
St-Croix	1,81	bc	52	fg	1,3	f
Marquette	1,04	fg	57	fg	1,6	def
Baltica	1,30	d	45	g	1,5	ef
Petite Perle	1,16	ef	86	abc	2,5	ab
Radisson	1,90	b	88	ab	3,0	a
Skandia	1,25	de	19	h	0,6	g
D.M. 85-21-1	0,64	h	54	fg	1,9	cde
Somerset	1,33	d	75	bcd	2,5	ab
Frontenac gris	1,06	fg	93	a	2,5	ab
Frontenac blanc	1,02	fg	94	a	2,4	b
La Crescent	1,30	d	62	def	1,5	ef
E.S. 10-18-30	1,26	de	73	cde	2,1	bcd
Louise Swenson	2,58	a	97	a	2,9	a
E.S. Muscat	1,66	c	62	def	2,2	bc
E.S. 4-23-60	0,71	h	22	h	0,7	g
Adalmina	1,89	bc	60	ef	1,6	def
Osecola Muscat	1,60	d	61	ef	2,2	bc

Table V: Injury caused by winter and spring frost for the different varieties

Varieties	Winter frost		Spring frost 2010	
	Mean	SD	Mean	SD
Frontenac	2,12	ab	24,77	defgh
St-Croix	1,33	b	43,98	bcd
Marquette	4,87	ab	46,53	bc
Baltica	4,07	ab	22,13	efghi
Petite Perle	3,68	ab	2,04	j
Radisson	1,60	ab	40,70	bcd
Skandia	3,37	ab	23,62	defgh
D.M. 85-21-1	5,72	ab	31,49	cdefg
Somerset	6,59	ab	48,01	abc
Frontenac gris	2,47	ab	8,78	hij
Frontenac blanc	2,18	ab	16,07	fg hij
La Crescent	2,90	ab	79,14	a
E.S. 10-18-30	8,56	a	40,72	bcdde
Louise Swenson	5,46	ab	4,67	ij
E.S. Muscat	5,95	ab	43,27	bcd
E.S. 4-23-60	3,33	ab	33,84	bcddef
Adalmina	4,55	ab	14,84	ghij
Osecola Muscat	2,08	ab	55,26	ab

Table VI: Yield date and oenological parameters for the different varieties

Varieties	Date of harvest 2012	Cumulative Degree/day	Brix	Total acidity	pH
Frontenac	5-10-2012	1469	25,27	10,07	3,35
St-Croix	18-09-2012	1426	22,70	5,14	3,39
Marquette	20-09-2012	1427	28,17	8,25	3,38
Baltica	30-08-2012	1252	24,90	6,96	3,05
Petite Perle	18-09-2012	1426	22,88	7,38	3,33
Radisson	7-09-2012	1348	21,29	5,01	3,47
Skandia	30-08-2012	1252	28,97	6,84	3,69
D.M. 85-21-1	14-09-2012	1410	26,25	7,08	3,38
Somerset	7-09-2012	1348	24,7	7,3	3,45
Frontenac gris	25-09-2012	1441	26,75	9,91	3,23
Frontenac blanc	25-09-2012	1441	26,21	9,77	3,27
La Crescent	7-09-2012	1348	22,83	14,20	3
E.S. 10-18-30	7-09-2012	1348	24,98	9,33	3,34
Louise Swenson	04-09-2012	1310	19,30	7,84	3,03
E.S. Muscat	30-08-2012	1252	24,78	7,96	3,08
E.S. 4-23-60	7-09-2012	1348	23,02	10,14	3,3
Adalmina	30-08-2012	1252	19,41	7,56	2,99
Osecola Muscat	30-08-2012	1252	23,54	8,72	3,08

Table VII: Oenological potential of the different varieties

Low potential	Medium potential	High potential
St-Croix	Radisson	Frontenac
Skandia	Petite Perle	Marquette
E.S. 10-18-30	D.M. 85-21-1	Baltica
La Crescent	E.S. Muscat	Frontenac blanc
E.S. 4-23-60	Louise Swenson	Frontenac gris
		Adalmina

Note: The oenological potential was established by laboratory tests, winemaking and wine tasting

## Discussion

The results obtained since the implanting of the vineyard reveal that some varieties have valuable agronomic traits, such as appropriate lignification, tolerance to winter and spring frosts, a well-balanced vigour, and a substantial yield in grapes. In addition, initial assessments of oenological parameters demonstrate the potential of some grape varieties that stand out for their ripening within our seasonal limitations and for their good winemaking characteristics. The annual observation of various agronomic and oenological parameters allows development of a public database on promising hardy varieties. Using this established scientific database, it will be possible for growers to select a variety according to its agronomic characteristics and the different climates and soils found in parts of Quebec. The selection of varieties may be made according to criteria of yield in grapes, for example, and depending on the specifics of each wine grape variety. Moreover, at the end of this project, it will be possible to suggest varieties that will produce good wines according to their oenological characteristics. This data can also be used by other Canadian provinces by adapting the results according to their growing conditions, soils and weather.

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