Impact of grapevine grafting for hybrid varieties grown in Quebec, Canada.

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Introduction

Grapevine production is relatively recent in Quebec, Canada, and several challenges limit quality grape production. Quebec's rigorous climate, short growing season, often too fertile or poorly drained soil conditions are just some of the factors limiting grape variety selection. Grafting on rootstocks is mainly reserved for *Vitis vinifera* scions and there is currently very limited use with cold hardy hybrid cultivars. Some studies reported several advantages in using rootstocks with hybrids such as better vine vigour control, increased grape maturity, increased yield, and modification of berry chemical proprieties, aromas and other organoleptic properties.[1-4] Rootstocks adapted to growing conditions allow producers to plant varieties that are better suited and more efficient in specific soil and climatic conditions. These scion/rootstock combinations then could potentially be better suited to growing conditions in Quebec vineyards and therefore could homogenize vegetative growth of the plant, reduce costs associated with management and allow to reach maturity and optimum berry quality.

The **main objective** of this project was to evaluate the use of grafting as a technique to adapt hardy hybrid cultivars to cold climate growing conditions found in Quebec, Canada.

Methods

Several combinations were produced (Table 1). In 2013, an experimental plot was implanted in a gravely loam soil in the vineyard of the Centre de recherche agroalimentaire de Mirabel at Oka (Laurentian region, Québec, Canada; 45 30'N, 74 4.2'W). Several parameters were observed, such as berry chemistry during grape ripening, yield and berry chemistry at harvest.

Table 1. Tested combinations of vine varieties and rootstocks.

Grape variety	Rootstock
Frontenac	Own root
Frontenac blanc	101-14
Marquette	3309 C
	Riparia Gloire
	SO4

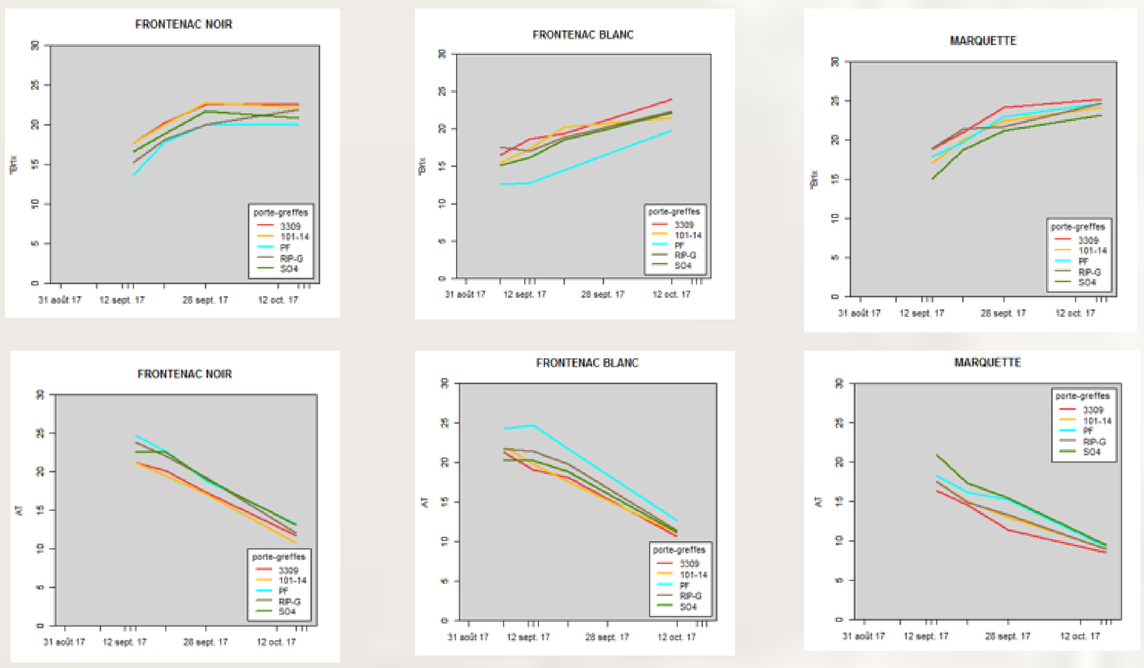

Figure 1. Berry chemistry during grape ripening by hybrid species according to rootstocks.

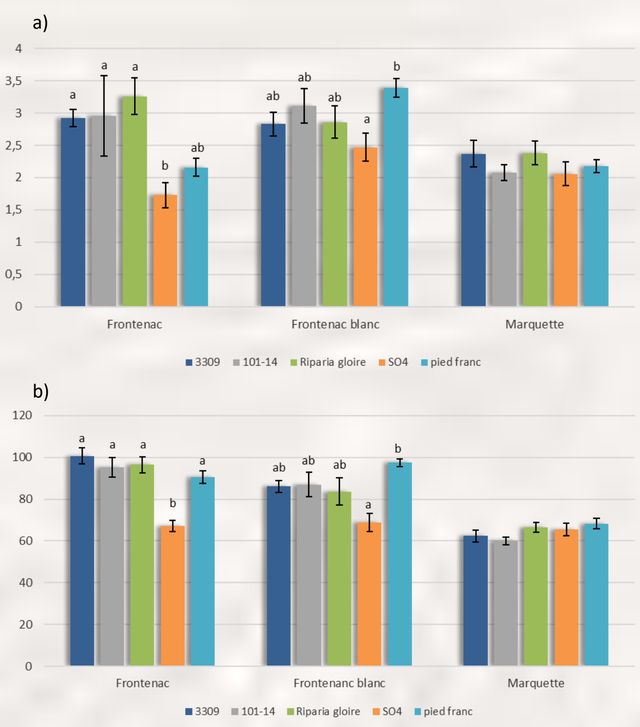

Figure 2. Yield by hybrid species according to rootstocks: a) yield per grapevine (in kg), b) cluster weight (g)).

Table 2. Berry chemistry at harvest by hybrid species according to rootstocks.

	Frontenac	Frontenac blanc	Marquette
	Total solubles solids (°Brix)		
Own root	21,2	19,82 b	24,63 a
101-14	23,2	21,5 ab	24,17 ab
3309	23,7	24 a	25,25 a
Riparia G.	22,75	22,35 ab	24,7 a
SO4	21,5	22,15 ab	23,17 b
	pH		
Own root	3,2 b	3	3,2 ab
101-14	3,2 a	3,1	3,2 a
3309	3,2 ab	3,1	3,2 ab
Riparia G.	3,2 ab	3,1	3,1 ab
SO4	3,2 b	3,1	3,1 b
	Total acidity (g/L tart. ac.)		
Own root	12,8 a	12,65	9,25
101-14	11,6 b	11,15	9,03
3309	12,1 ab	10,73	8,5
Riparia G.	11,9 ab	11,47	8,87
SO4	12,7 a	11,22	9,45

Results and discussion

- Berry chemistry changed differently during grape ripening according to the rootstocks (Fig. 1). Total solubles solids (TSS) was higher for Frontenac and Frontenac blanc when grafted on 3309 C and 101-14 compared to own rooted individuals. Marquette showed lower difference in TSS during grape ripening but higher TSS is also noted for individuals grafted on 3309 C. Total acidity was also affected by rootstock. Lower total acidity was observed on rootstock 3309 C and 101-14 compared to other rootstocks and own rooted individuals.
- Results obtained in 2017 showed that for Frontenac and Frontenac blanc, the rootstock has an effect on the yield per plant (Fig. 2a). Yield by plant was lower for Frontenac grafted on SO4 than on rootstock 3309 C, 101-14 and Riapria Gloire. We observed that the yield of Frontenac blanc was lower on SO4 rootstock than on own rooted individuals. Marquette yields were less affected by grafting. Same tendencies were noted concerning cluster weight (Fig 2b). Lower cluster weight is observed on rootstock SO4 for Frontenac and Frontenac blanc, and no significant effect of rootstock is noted for Marquette.
- Berry chemistry at harvest was affected by rootstock for some varieties (Tab. 2). Total solubles solids was affected differently by rootstock according to grapevine variety. Frontenac (n.s.) and Frontenac blanc showed higher TSS when grafted on 101-14 compared to own rooted individuals. For Marquette, higher TSS was noted in vines grafted on 3309 C and Riparia Gloire, as well as own rooted vines, compared to SO4. Frontenac and Marquette had a higher pH on rootstock 101-14 than on SO4 and own rooted vines. Total acidity was less affected by rootstock, no significant effects were observed for Frontenac blanc and Marquette. However, Frontenac showed higher total acidity on own rooted individuals and vines grafted on SO4 than on rootstock 101-14.
- A significant effect on wine appreciation was noticed for the three varieties, where use of rootstock generally increased wine quality and appreciation compared to wine made with grapes from own rooted ceps.
- Grafting using cold hardy hybrids is not a common practice and occurs mainly in northeastern America. However, this practice could be profitable to the producer when selecting rootstocks adapted to their soil and climate conditions in an effort to improve their vineyard profitability.

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