

Impact of thinning and training mode on the vine and grape quality for four hybrid varieties grown in Quebec, Canada.



Caroline Provost¹, Jérémie d'Hauteville² and Richard Bastien².

¹ Centre de Recherche Agroalimentaire de Mirabel, Mirabel, Québec, Canada
² OenoQuébec, Montréal, Québec, Canada

Correspondence: provost.cram@yahoo.ca



Introduction

In Quebec, the short growing season and the difficulty to reach maturity in some varieties are major concerns for growers. Winemakers perform various operations (pruning, thinning, trimming...) to control the vigor of the vines and allow a good foliage/fruit balance. These operations also allow berries to reach maturity, thus ensuring a better distribution of sugars and increased sun exposure. The thinning technique consists in reducing the number of clusters per plant to allow optimal development of those remaining. The training mode may also affect the development of the vine and grape ripening by providing different exposure to various parts of the vine. The main objective of this project is to measure the impact of thinning on the vine and grapes for three training modes and four hardy grape varieties grown in Quebec.

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. The soil is a gravelly loam with perfect drainage. Four hybrid varieties were studied: Frontenac, Marquette, St-Croix and Louise Swenson. For each variety, a separate plot was established. These varieties are all conducted in three modes: Cordon Royat (VSP) 18", Cordon Royat (VSP) 30", and Top Wire Cordon 60". Three thinning levels were applied: 8, 12 and 16 buds by plant. The distribution of treatment in a plot is based on a randomised block design. The following agronomic parameters were recorded in 2012: lignification, berry weight, cluster weight, number of cluster and yield. The values of sugar content, pH and titratable acidity were also observed at harvest.

Grape varieties were treated as separate experiments for statistical analysis. Two-way analyses of variance were performed to determine the effect of thinning and training mode on the different parameters.

Results

Parameter	Training system								
	T1- TWC 60"			T2- Cordon Royat (VSP) 30"			T3- Cordon Royat (VSP) 18"		
	8 buds	12 buds	16 buds	8 buds	12 buds	16 buds	8 buds	12 buds	16 buds
Lignification (cm)	35.40 a	52.10 a	56.10 a	52.40 a	47.20 a	54.70 a	31.80 b	27.50 b	27.40 b
Berry fresh weight (g/berry)	1.27 A	1.21 ABC	1.07 DE	1.13 CD	1.21 AB	1.10 DE	1.12 DE	1.04 E	1.14 BCD
Yield (kg/plant)	1.09 A	1.66 B	2.62 C	0.81 A	1.92 B	2.61 C	1.06 A	1.83 B	2.54 C
Cluster number (nbr/plant)	14.40 A	21.40 B	30.80 C	12.40 A	20.00 B	29.40 C	12.80 A	22.80 B	31.20 C
Cluster weight (g/cluster)	72.22	76.41	83.56	62.32	94.70	88.48	75.82	77.56	81.58
Total soluble solids (Brix)	28.33 a	27.33 a	27.90 a	27.60 b	27.03 b	27.07 b	26.67 b	27.20 b	26.80 b
Titratable acidity (g/L tartaric acid eg.)	9.07	9.37	9.40	9.07	9.03	9.27	9.23	9.17	9.43
pH	3.30	3.29	3.29	3.30	3.31	3.29	3.31	3.30	3.28

Parameter	Training system								
	T1- TWC 60"			T2- Cordon Royat (VSP) 30"			T3- Cordon Royat (VSP) 18"		
	8 buds	12 buds	16 buds	8 buds	12 buds	16 buds	8 buds	12 buds	16 buds
Lignification (cm)	26.67 a	53.20 a	41.22 a	60.30 b	64.50 b	63.20 b	94.00 b	70.00 b	55.10 b
Berry fresh weight (g/berry)	1.46 A	1.39 AB	1.31 BCD	1.14 E	1.28 BCD	1.35 BC	1.30 BCD	1.25 CD	1.24 DE
Yield (kg/plant)	1.85 BC	2.98 A	2.68 AB	1.10 C	1.64 C	1.67 C	1.08 C	1.09 C	1.84 BC
Cluster number (nbr/plant)	18.75 aA	26.80 aB	31.00 aC	18.40 abA	26.20 abB	26.80 abC	17.60 bA	19.50 bB	28.00 bC
Cluster weight (g/cluster)	99.17 a	110.94 a	87.76 a	60.02 b	64.31 b	61.62 b	61.54 b	55.96 b	65.82 b
Total soluble solids (Brix)	28.57 AB	27.40 C	27.10 C	28.70 A	28.80 A	28.87 A	28.67 A	28.60 A	27.67 BC
Titratable acidity (g/L tartaric acid eg.)	7.20	7.27	7.23	7.37	6.90	7.10	7.17	7.23	7.37
pH	3.48	3.47	3.45	3.47	3.46	3.55	3.48	3.52	3.50

Parameter	Training system								
	T1- TWC 60"			T2- Cordon Royat (VSP) 30"			T3- Cordon Royat (VSP) 18"		
	8 buds	12 buds	16 buds	8 buds	12 buds	16 buds	8 buds	12 buds	16 buds
Lignification (cm)	66.50	61.00	44.10	52.11	60.33	47.00	70.33	61.00	66.33
Berry fresh weight (g/berry)	2.42 ABC	2.34 BC	2.24 C	2.23 C	2.51 AB	2.43 ABC	2.49 AB	2.57 A	2.39 ABC
Yield (kg/plant)	1.72 A	2.69 B	4.47 C	1.39 A	2.79 B	4.63 C	2.00 A	2.75 B	3.87 C
Cluster number (nbr/plant)	15.20 A	23.50 B	39.40 C	17.00 A	23.50 B	40.50 C	19.50 A	26.80 B	37.25 C
Cluster weight (g/cluster)	111.28	114.78	113.52	81.85	117.86	115.18	103.10	102.53	104.36
Total soluble solids (Brix)	21.30 aA	21.63 aA	20.00 aB	20.93 abA	21.33 abA	19.77 abB	19.97 ba	20.20 ba	19.47 bB
Titratable acidity (g/L tartaric acid eg.)	4.93	4.90	5.13	5.07	5.33	5.23	5.07	5.23	5.17
pH	3.30	3.36	3.25	3.30	3.28	3.23	3.32	3.31	3.21

Parameter	Training system								
	T1- TWC 60"			T2- Cordon Royat (VSP) 30"			T3- Cordon Royat (VSP) 18"		
	8 buds	12 buds	16 buds	8 buds	12 buds	16 buds	8 buds	12 buds	16 buds
Lignification (cm)	112.60 A	78.60 B	83.70 B	96.80 AB	112.22 A	111.11 A	113.56 A	96.20 AB	97.80 AB
Berry fresh weight (g/berry)	1.94	1.94 A	1.91 AB	1.66 DE	1.72 CDE	1.82 ABC	1.62 E	1.78 BCD	1.95 A
Yield (kg/plant)	1.27 aA	1.40 aA	2.62 aB	0.75 bA	1.21 bA	2.03 bB	0.66 bA	1.24 bA	1.83 bB
Cluster number (nbr/plant)	14.20 A	18.40 B	30.80 C	12.40 A	18.75 B	27.50 C	12.25 A	17.20 B	25.20 C
Cluster weight (g/cluster)	88.70 a	74.30 a	84.46 a	54.10 b	64.54 b	73.60 b	53.83 b	73.42 b	70.78 b
Total soluble solids (Brix)	22.40 A	22.10 A	22.60 AB	23.20 C	23.47 C	23.13 C	23.10 BC	23.37 C	23.23 C
Titratable acidity (g/L tartaric acid eg.)	5.47	5.10	5.27	5.23	5.03	5.20	5.13	5.67	5.37
pH	3.66	3.70	3.71	3.64	3.68	3.66	3.74	3.64	3.66

Legend: the same letter on a row indicate no significant difference for the ANOVA (P< 0.05). Lowercase letters refer to the training mode treatment; the capital letters refer to the thinning treatment; italic capital letters refer to the interaction between of the training mode and thinning.

Discussion

- Hybrid grape varieties respond differently to training mode and thinning.
- Lignification is generally affected by the training mode, but not by thinning.
- At harvest, berry weight is generally affected by the training mode and thinning, while the clusters weight, the yield and the number of clusters per plant are more affected by thinning. The four varieties are affected differently for these parameters, some being more affected by thinning and other by training mode.
- Some trends are observed for the chemical properties of grapes, the total soluble solids (Brix) of the four varieties were affected by training mode and only Louise Swenson and Marquette were affected by thinning. The acidity and the pH, were not affected by thinning and training mode.
- The evaluation of the effect of thinning and training mode may provide information to help Quebec winemakers to reach grape maturity and to improve the profitability of Quebec wineries.

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Acknowledgement

The authors wish to thank Erik Schulz-Schomburgk, Christophe Etchebar and Matteo Meglioli for their expertise. We also thank Stefano Campagnaro and Nathalie Guerra for their technical support. Funding for this project has been provided in part through the Canadian Agricultural Adaptation Program Agriculture (CAAP) on behalf of Agriculture and Agri-Food Canada. In Quebec, the portion intended for the agricultural-production sector is being managed by the Conseil de développement de l'agriculture du Québec (CDAQ).



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