

# Insights into the stable isotope ratio variability of hybrid grape varieties

Matteo Perini <sup>a\*</sup>, Federica Camin <sup>b</sup>, Simon Lanz <sup>b</sup>, Sergio Moser <sup>a</sup>, Tomas Roman <sup>a</sup>



<sup>a</sup>Fondazione Edmund Mach (FEM), Via E. Mach 1, 38010 San Michele all'Adige, Italy

<sup>b</sup>University of Trento, via Mach 1, 38010 San Michele all'Adige (TN), Italy

\* [matteo.perini@fmach.it](mailto:matteo.perini@fmach.it)



The wine industry faces the growing demand for sustainable and environmentally friendly production. through the use of hybrid varieties resistant to mold - based on crosses of *Vitis vinifera* with other *Vitis spp* - with a high tolerance to attack by pathogens of the vine.



The analysis of the stable isotope ratio is the reference method to combat counterfeiting in the wine sector, also thanks to the establishment of official annual reference databases in which the intervals of isotopic variability are reported.

## There is a varietal variation in the stable isotopic ratio of European *Vitis vinifera* to modern hybrid varieties?

### MATERIALS

Wine samples produced with seven white varieties (*Aromera*, *Bronner*, *Helios*, *Johanniter*, *Muscaris*, *Solaris*, *Souvignier Gris*) and seven red varieties (*Baron*, *Cabernet Cortis*, *Cabernet Cantor*, *Cabernet Carbon*, *Monarch*, *Prior*, *Regent*) grown in two experimental plots sited in the north Italian region of Trentino were analysed for the stable isotopic ratio.

Results were compared to the ratio isotopic ratio of the wines obtained from *Vitis vinifera* varieties of the same production area.

### STABLE ISOTOPE RATIO ANALYSIS (SIRs)

The analyses were carried out by isotopic ratio mass spectrometry (IRMS) and site-specific natural isotopic fractionation by nuclear magnetic resonance (SNIF-NMR), according to the official methods of the International Organisation of Vine and Wine (OIV).



Trentino in the North of Italy

### RESULTS

Chardonnay (white wine) and Marzemino (red wine) constitute as the *Vitis Vinifera* reference varieties.

: Mean isotopic parameters determined in white wine in two vintages (2018-2019) and two plots (Navicello + Telve). Different letters in the same column indicate significant differences at ANOVA and Tukey test (95%)

White Wines	(D/H)	(D/H) <sub>II</sub>	R	δ <sup>13</sup> C ‰ vs. V-PDB	δ <sup>18</sup> O ‰ vs. V-SMOW
Chardonnay (n=2)	101,20 a	126,10 ab	2,5 a	-28,95 c	1,30 a
Aromera (n=2)	102,00 a	129,00 a	2,55 a	-28,60 bc	2,35 a
Bronner (n=4)	102,28 a	125,52 ab	2,45 a	-27,75 b	1,45 a
Helios (n=3)	102,47 a	126,37 ab	2,46 a	-26,77 a	1,80 a
Johanniter (n=3)	102,00 a	124,30 b	2,43 a	-28,50 bc	1,60 a
Muscaris (n=4)	101,83 a	127,37 ab	2,50 a	-28,27 bc	0,90 a
Solaris (n=4)	101,88 a	127,45 ab	2,50 a	-28,57 bc	2,87 a
Souvignier Gris (n=4)	102,53 a	128,77 a	2,50 a	-28,22 bc	2,35 a
Pr > F	0,892	0,016	0,48	<0,0001	0,526
Significativity	No	Yes	No	Yes	No

Hybrid show normally higher (D/H), and δ<sup>13</sup>C of ethanol and δ<sup>18</sup>O values than the reference variety grown on the same plot of land.

None of the wines, which compares the mean values of all varieties regardless their origin, differ significantly from each other.

Warning! In the evaluation it is necessary to keep the harvest years separate.

### CONCLUSIONS

Some hybrid grape varieties have tendencies to deviate from the regional averages in their stable isotope ratios derived from conventional *V. vinifera* varieties: red grape varieties such as **Monarch**, **Cabernet Carbon** and **Cabernet Cantor** and white grape varieties such as **Solaris**, **Helios** and **Souvignier Gris**.

Isotopic parameters determined in white and red wine in two vintages (2018-2019) and two plots (Navicello & Telve). The isotopic ratios are expressed in ‰ relative to V-PDB for δ<sup>13</sup>C of Ethanol, V-SMOW for δ<sup>18</sup>O of wine water. (\*Reference Variety)

	Deviations to the RV <sup>*</sup> :	(D/H) <sub>I</sub>	(D/H) <sub>II</sub>	δ <sup>13</sup> C ‰ vs. V-PDB	δ <sup>18</sup> O ‰ vs. V-SMOW
Navicello 2018	Chardonnay	101,5	124,9	-29,3	1,4
	Solaris	+2,3	+1,2	+1,1	+3,2
	Bronner	+2,4	+0,6	+2,0	+2,1
	Helios	-1,2	-0,5	+2,3	+2,3
	Johanniter	0	+0,3	+0,4	+2,0
	Aromera	-1,1	+3,5	+0,6	+1,1
	Muscaris	+2,5	+1,9	+1,6	0
	Souvignier Gris	+2,7	+3,0	+1,3	+1,8
	Marzemino	103,2	130,6	-27,5	3,5
	Baron	+0,3	-0,3	+0,6	-0,2
Navicello 2019	Chardonnay	100,9	127,3	-28,6	1,2
	Aromera	+0,5	+2,3	+0,1	+1,0
	Bronner	+1,3	+0,7	+0,7	+0,5
	Muscaris	+0,5	-0,6	+0,3	+0,1
	Solaris	+0,6	+3,0	+0,1	+2,3
	Souvignier Gris	-1,1	+2,4	-0,2	+1,1
	Marzemino	101,1	130,4	-28,3	1,4
Baron	+2,4	-0,5	+0,7	+2,4	
Cabernet Cantor	-0,4	-0,2	+0,6	+1,8	
Cabernet Carbon	+1,7	-1,2	+0,5	+1,9	
Cabernet Cortis	+0,5	-0,1	+0,7	+2,0	
Monarch	-0,4	-0,7	+0,4	+2,5	
Prior	+0,6	+0,4	0	+2,5	