

Supplementary Information

Exploratory Analysis of Sparkling Wines Based in the Combined Data of Stable Isotope Analysis with Physicochemical Data and Volatile Profile

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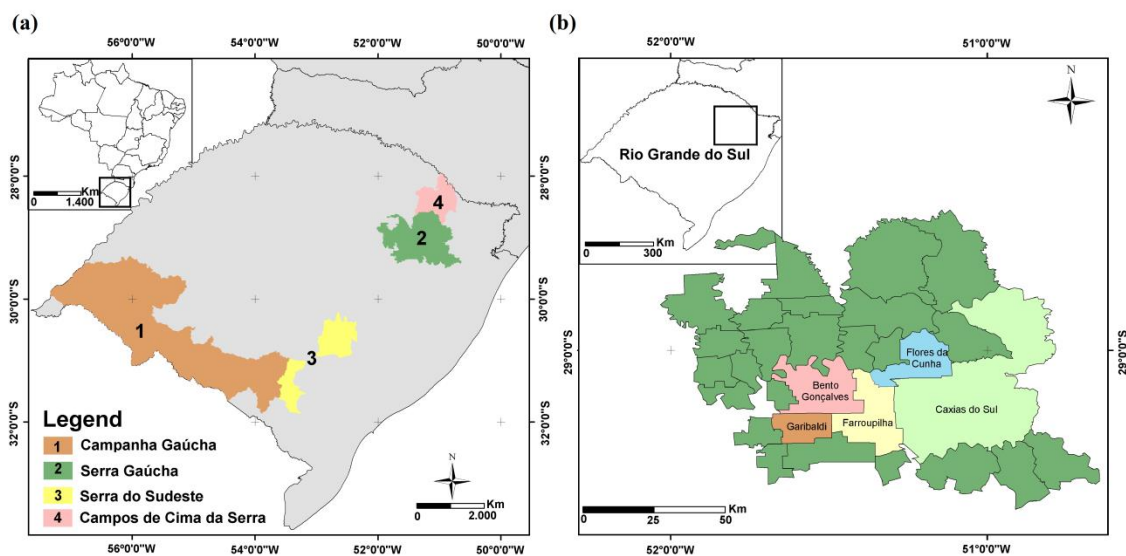


Figure S1. Geographical location: (a) Rio Grande do Sul state and oenological areas; (b) cities from Serra Gaúcha.

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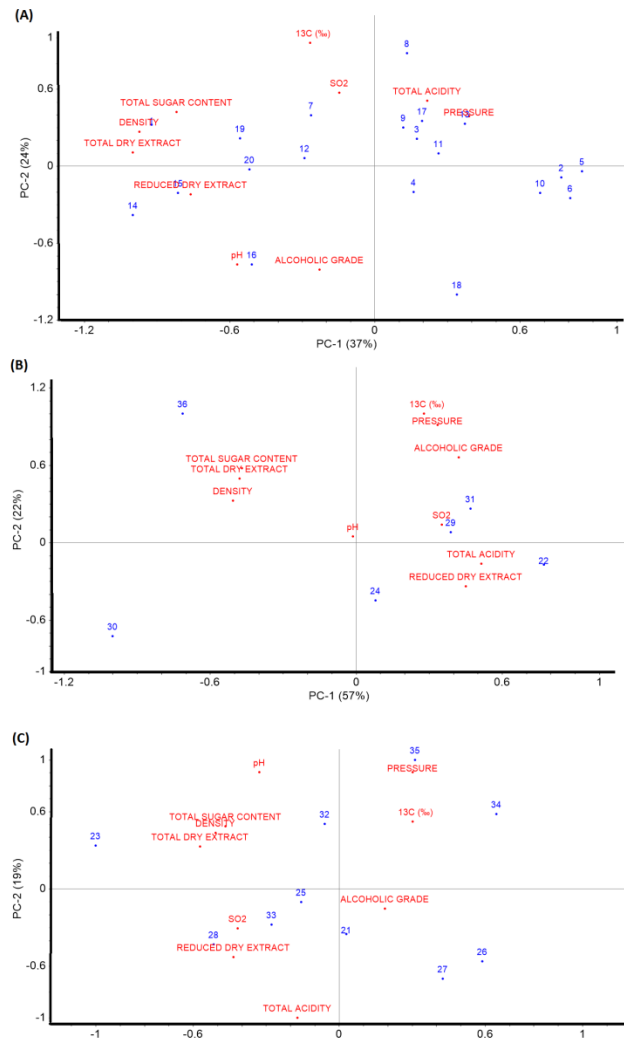


Figure S2. PCA applied to the $\delta^{13}\text{C}\text{-CO}_2$ and the physicochemical parameters: (A) Moscatel; (B) traditional demi-sec; (C) traditional brut.

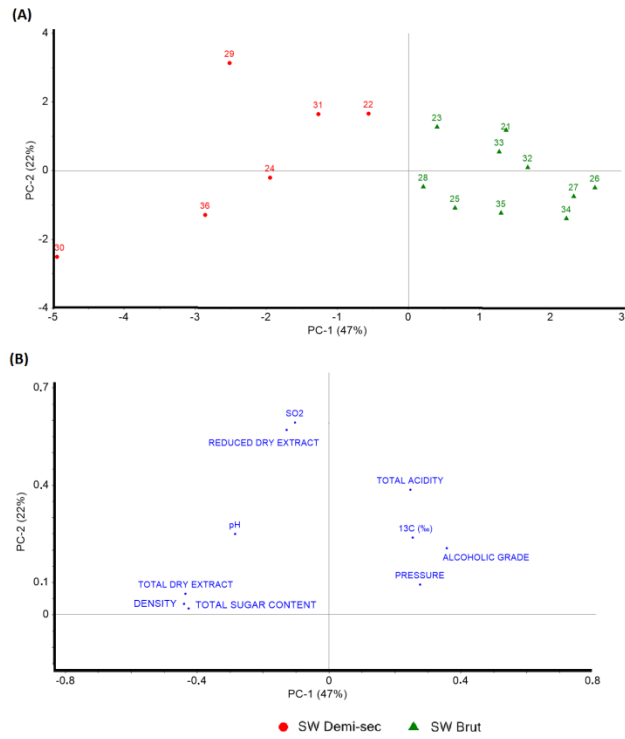


Figure S3. PCA applied to the $\delta^{13}\text{C}\text{-CO}_2$ and the physicochemical parameters of traditional sparkling wine samples: (A) scores and (B) loading.

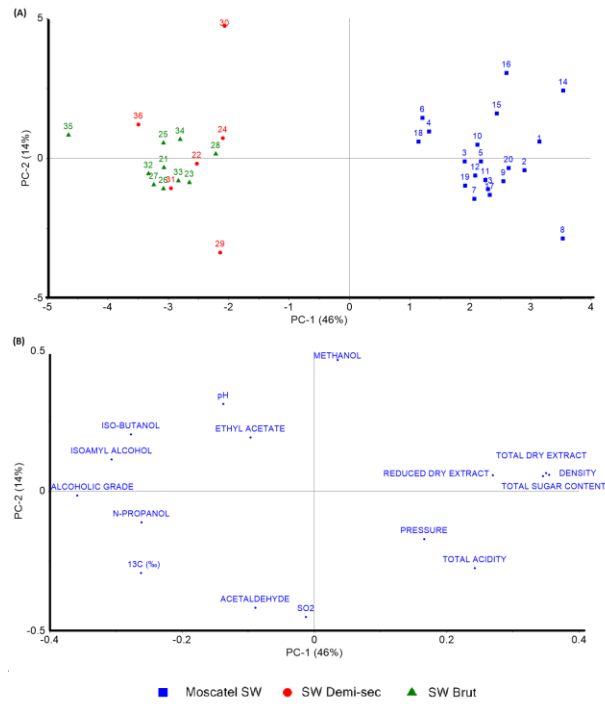


Figure S4. PCA apply to the combined data from $\delta^{13}\text{C}\text{-CO}_2$, physicochemical and chromatography analysis: (A) scores and (B) loading.

Table S1. MAPA limits for the controlled variables

Variable		Sample			Reference
		traditional brut	traditional demi-sec	Moscatel	
Alcoholic grade / (% , v/v)	min	10	10	7	Law 10,970/2004
	max	13	13	10	
Total sugar content / (g L ⁻¹)	min	8,1	20,1	20	Law 10,970/2004
	max	15	60	–	Decree 8,198/2014
Total acidity / (mEq L ⁻¹)	min	55	55	–	Ordinance 229/1988
	max	130	130	–	
Pressure / atm	min	4	4	4	Law 10,970/04 Article 11
SO ₂ / (mg L ⁻¹)	max	350	350	350	Res. CNS/MS 04/1988
Methanol / (mg L ⁻¹)	max	350	350	350	Ordinance 229/1988

Table S2. Stable carbon isotopes ratio $\delta^{13}\text{C}$ of CO₂ from the bottle headspace

Sample (ID)	Class	$\delta^{13}\text{C}$ / ‰	Standard deviation (n = 3)	Sample (ID)	Class	$\delta^{13}\text{C}$ / ‰	Standard deviation (n = 3)
1	Moscatel sparkling wine	-18.080	0.311	19	Moscatel sparkling wine	-17.777	0.183
2	Moscatel sparkling wine	-22.380	0.067	20	Moscatel sparkling wine	-18.139	0.084
3	Moscatel sparkling wine	-18.399	0.189	21	sparkling wine	-12.333	0.047
4	Moscatel sparkling wine	-20.252	0.393	22	sparkling wine	-13.425	0.089
5	Moscatel sparkling wine	-20.659	0.045	23	sparkling wine	-11.884	0.025
6	Moscatel sparkling wine	-20.551	0.067	24	sparkling wine	-18.081	0.077
7	Moscatel sparkling wine	-17.642	0.302	25	sparkling wine	-16.937	0.090
8	Moscatel sparkling wine	-16.664	0.028	26	sparkling wine	-12.158	0.137
9	Moscatel sparkling wine	-18.607	0.096	27	sparkling wine	-9.257	0.142
10	Moscatel sparkling wine	-21.292	0.146	28	sparkling wine	-20.073	0.051
11	Moscatel sparkling wine	-21.665	0.143	29	sparkling wine	-11.288	0.235
12	Moscatel sparkling wine	-20.404	0.146	30	sparkling wine	-26.391	0.055
13	Moscatel sparkling wine	-16.805	0.091	31	sparkling wine	-11.286	0.074
14	Moscatel sparkling wine	-21.408	0.115	32	sparkling wine	-11.170	0.184
15	Moscatel sparkling wine	-19.429	0.263	33	sparkling wine	-11.531	0.323
16	Moscatel sparkling wine	-21.263	0.177	34	sparkling wine	-9.781	0.085
17	Moscatel sparkling wine	-17.387	0.139	35	sparkling wine	-9.431	0.063
18	Moscatel sparkling wine	-23.688	0.037	36	sparkling wine	-9.365	0.092