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Maceration time effect on the mineral composition of Malvazija istarska (*Vitis vinifera* L.) wines


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Introduction

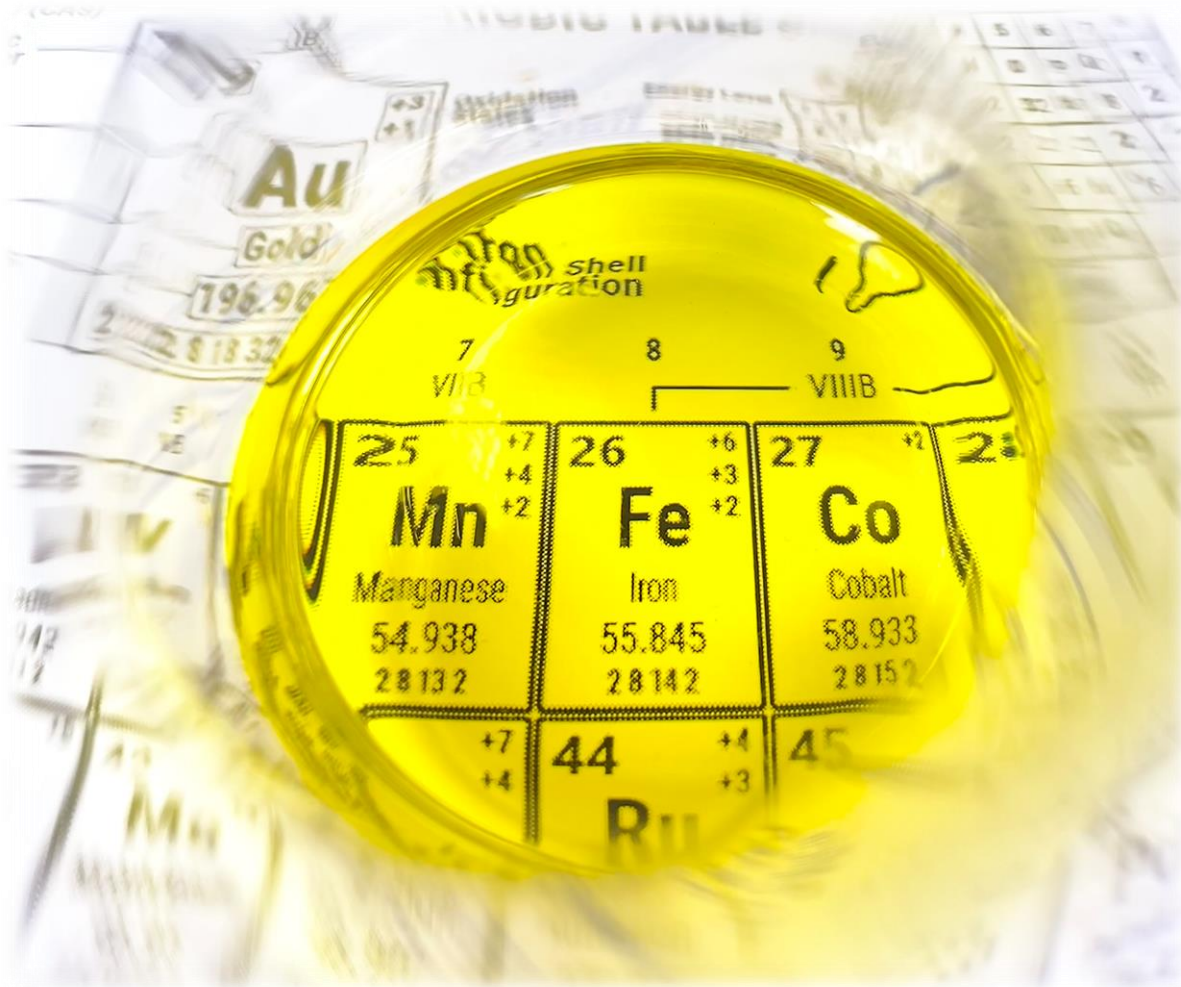
Wine mineral composition:

- affecting wine organoleptic characteristics
- important tool in wine quality control
- characterization of the wines by their authenticity and geographical origin
- health requirements and potential toxicity

Threshold limit values for metals in wine -
International Organization of Vine and Wine (OIV)
and Croatian Regulation on wine production (Official
Gazette, NN 2/2005)



Introduction



- two main sources of metals in wine: soil and external impurities
- increase in mineral content with a **longer maceration** duration (Shimizu et al., 2020; Rossi et al., 2022)
- **lower maceration temperature** causes precipitation of K and Ca tartrates (Pohl, 2007)
- **long macerations at high temperatures** cause a greater extraction of metals from the grape berry (Soto Vázquez et al., 2013).

The aim:

to investigate the effect of applying different maceration techniques on the mineral composition of wines produced from the Malvazija istarska grape variety (*Vitis vinifera* L.)



Materials and methods - grapes

- Institute of Agriculture and Tourism Poreč
- western Istria wine growing region
- **Malvazija istarska** (*Vitis vinifera* L.) white grape variety
- hand-picked grapes
- harvest at technological maturity in 2019





Materials and methods – vinification

Six vinification treatments in 220 L stainless steel fermenters (n = 3):

- A. fast grape processing without maceration – control treatment – **C**
- B. maceration treatments of different duration and temperature:
 - 1. pre-fermentative 2 days at 8 °C - **CRYO**
 - 2. 7 days maceration at 16 °C - **M7**
 - 3. prolonged post-fermentative 14 days at 16 ° - **M14**
 - 4. post-fermentative 21 day at 16 ° - **M21**
 - 5. and post-fermentative 42 days maceration at 16 ° - **M42**

Materials and methods

- wine analysis

- Approximately 6 months after bottling, wines were subjected to analysis of macro- and microelements
- Determination of macro- and microelements was conducted using Optima DV 2000 inductively coupled plasma – optical emission spectrometer - **ICP-OES**
- Statistical analysis was performed using Statistica 10.0. Software - Fischer's least significant difference test (LSD) was performed using a one-way analysis of variance (ANOVA)



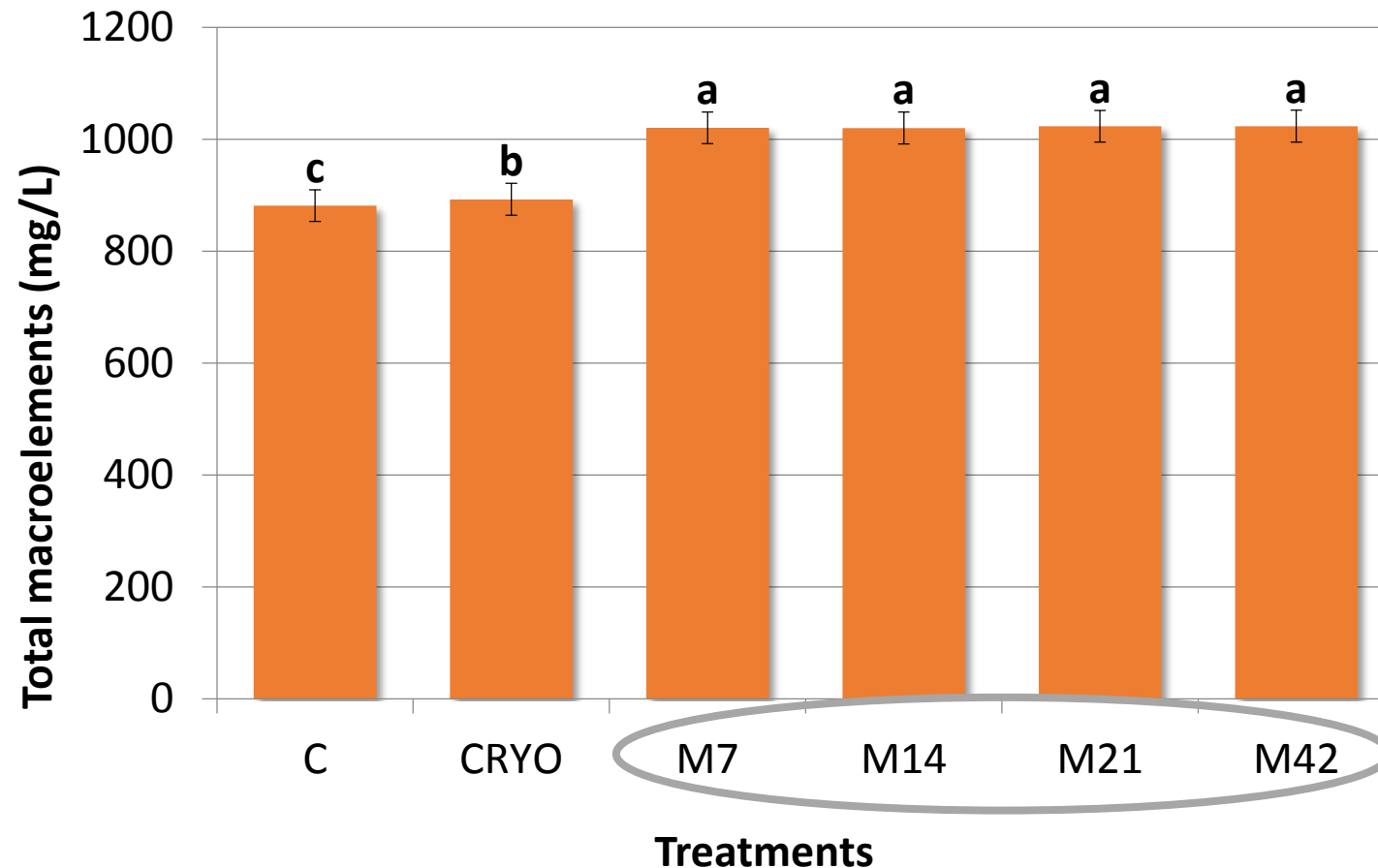
Results

– macro- and microelements concentration in different Malvazija istarska treatments

	Treatments					
	C	CRYO	M7	M14	M21	M42
Macroelements						
K	716.57 ± 1.1 ^d	720.57 ± 1.01 ^c	817.63 ± 0.83 ^b	818.63 ± 0.83 ^b	820.47 ± 1.25^a	821.83 ± 1.07^a
Ca	32.77 ± 1.84 ^d	36.2 ± 0.95 ^c	56.83 ± 0.67 ^b	57.17 ± 0.67 ^b	59.47 ± 0.95^a	59.47 ± 0.95^a
Mg	97.83 ± 0.57 ^e	100.53 ± 0.42 ^d	105.63 ± 0.21 ^c	106.87 ± 0.15 ^b	108.47 ± 0.21^a	109.03 ± 0.21^a
Na	34.33 ± 0.21 ^d	35.37 ± 0.31 ^c	40.53 ± 0.40^a	37.57 ± 0.35 ^b	34.9 ± 0.10 ^c	33.27 ± 0.35 ^e
Microelements						
Al	0.653 ± 0.03 ^d	0.833 ± 0.03 ^c	0.906 ± 0.01 ^b	0.916 ± 0.01 ^b	0.926 ± 0.01^{ab}	0.956 ± 0.01^a
Cu	0.016 ± 0.00 ^f	0.026 ± 0.00 ^e	0.035 ± 0.00 ^d	0.042 ± 0.00 ^c	0.049 ± 0.00 ^b	0.063 ± 0.00^a
Fe	0.52 ± 0.01 ^f	0.65 ± 0.01 ^e	1.1 ± 0.02 ^d	1.3 ± 0.03 ^c	1.54 ± 0.01 ^b	1.76 ± 0.02^a
Mn	0.629 ± 0.00 ^f	0.650 ± 0.00 ^e	0.777 ± 0.00 ^d	0.797 ± 0.00 ^c	0.869 ± 0.00 ^b	0.886 ± 0.00^a

Results

– total **macroelement** content in different Malvazija istarska treatments

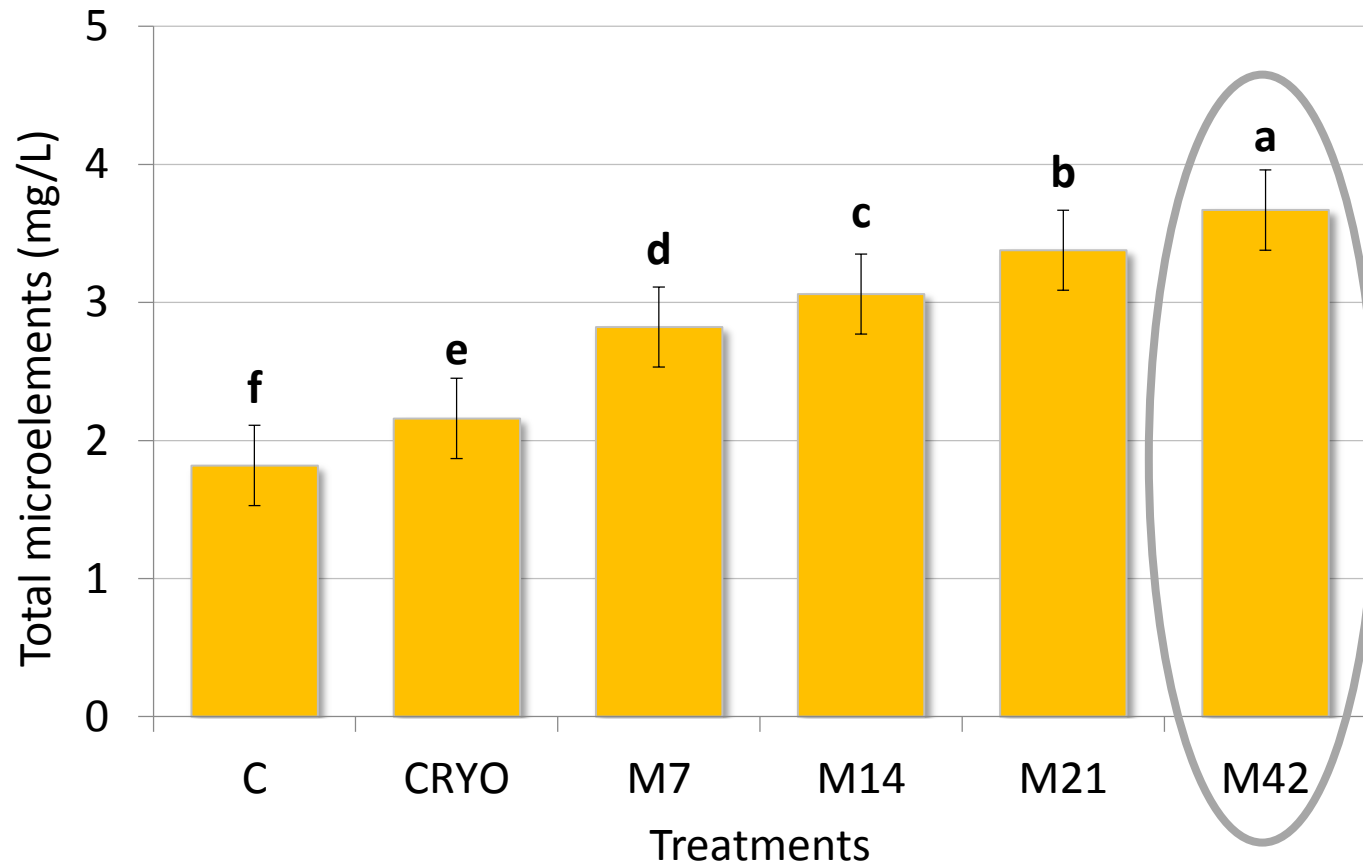


Total **macroelements** content ranged from 881.5 ± 3.66 to $1023.6 \pm 2.02 \text{ mg L}^{-1}$

Significantly the highest concentrations – **M7, M14, M21** and **M42**

Results

– total **microelement** content in different Malvazija istarska treatments



The concentration of total **microelements** (Al, Cu, Fe and Mn) ranged from 1.82 ± 0.02 to $3.67 \pm 0.03 \text{ mg L}^{-1}$

Significantly the highest microelement content in **M42** treatment wine

Conclusion

- wine mineral composition - highly affected by the maceration process
- total macroelements concentration increased with longer maceration time and higher maceration temperature
- total microelement concentration increased proportionally with maceration time



Thank you for your attention!

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