

DISTRIBUTION OF Cu, Fe, Mn AND Zn IN MALVAZIJA ISTRASKA WINES FROM CROATIA

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Malvazija istarska (*Vitis vinifera* L.)

- ❖ Malvazija istarska (*Vitis vinifera* L.), is considered an autochthonous white grape variety grown in Croatian viticulture sub-region of Istria.
- ❖ Represents special Istrian vine variety that has been developed trough centuries within specific Istrian ecological conditions that contributed to development of new biological properties of Malvasia istriana, which makes this Malvazija wines much different from others from different regions around the world.
- ❖ Variety has a great potential to produce high-quality white wines.



Elements in wine

- **Elements in wine can originate from:**
 - **natural (soil on which the vine is grown)**
 - **anthropogenic sources (pollutions from human activity).**
- **The elements might be essential or toxic to the human body.**
- **They can influence the wine making process or they can change the wine taste and quality.**
- **Daily consumption of wine in moderate quantities (250 ml) contributes significantly to the requirements of the human organism for:**
 - ❖ **essential element such as K, Mg, Cu, Co, Fe, Mn, Ni, Se, Zn.**
 - ❖ **while As, Cd and Pb are known to be potentially toxic.**

Elements in wine



Analysis of certain elements in wine is of special interest due to their toxicity in case of excessive intake.

A typical example is copper which is both an essential and a potentially toxic element for humans when in excess.

The analysis of elements in wines is of great importance for wine quality control, authenticity, toxicity, bioavailability.

The aim of work

Limitation of literature data on content of elements in Malvazija istarske wines lead to the aim of this work:

To examine whether Malvazija istarska wines originated from different areas of sub-region of Istria produced in same vintage, vary according to Cu, Fe, Zn and Mn content.

Materials and methods

**Samples: 15 Malvazija istarska wines
(before market)**

Wines originated from:

Viticulture growing zone C2

Region: continental

Sub-region: Istria

**Districts: (western, central,
eastern part of Istria)**



**Harvest
2012**



Wine quality parameters

Physical-chemical parameters	Range	Average
Relative density 20/20°C	0.9898 - 0.9915	0.9907
Alcohol (vol %)	12.5 - 13.7	13.0
Total dry extract (g L ⁻¹)	18.3 - 21.5	19.3
Reducing sugars (g L ⁻¹)	1.6 - 3.8	2.4
Total dry extract without sugars (g L ⁻¹)	17.1 - 20.2	18.6
Ash (g L ⁻¹)	1.5 - 2.6	1.9
pH	3.30 - 3.55	3.30
Total acidity (g L ⁻¹ as tartaric acid)	4.4 - 5.9	5.1

Sample preparation

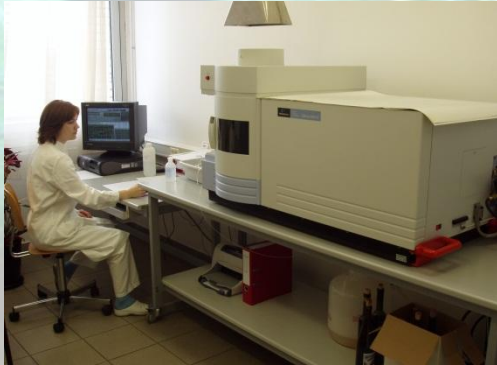
Sample preparation:

4 mL HNO₃ 60 % was added to 50 mL of wine sample and evaporated for approximately 20 % of initial volume on the water-bath (90-95°C) in order to eliminate the ethanol from the matrix. Final volume was adjusted up to 50 mL, with HNO₃ 2 %, which was used as blank.

Standard solutions

ICP-multi element standard solution (Al, Ca, Co, Cu, Fe, K, Mg, Mn, Na, Pb, Zn, Li, Ru and Sr) CertilPUR, Merck (Germany) was used for calibration.

ICP-OES operating conditions



The measurements were performed with inductively coupled plasma-optical emission spectrometer (ICP-OES) Dual View Optima 2000, Perkin Elmer, USA

- The operating conditions for plasma Ar flow, auxiliary Ar flow and nebulizer Ar were 15 L/min, 0.2 L/min and 0.8 L/min respectively.
 - Generator power was set at power of 1300 W.
 - RF frequency was set at 40MHz.
- The sample injection was achieved using a peristaltic pump at 1.5 mL/min flow rate.
- For each sample three replicated reading were made.

Detection wavelengths (nm⁻¹)

Element	λ (nm ⁻¹)
Al	396.153
Ca	317.933
Co	228.616
Cu	327.393
Fe	238.204
K	766.490
Mg	285.213
Mn	257.610
Na	589.592
Pb	220.353
Zn	206.200
Li	670.784
Rb	780.023
Sr	407.771



The content of copper (Cu)

Average: 0,071 mg/L

Range: 0.06 ± 0.0003 – 0.31 ± 0.001 mg/L

It is noteworthy that all wines had the copper content below the internationally established maximum allowed values of 1 mg/L (the value is below toxicological and technological limits).



The content of iron (Fe)

Average: 0,89 mg/L

Range: 0.52 ± 0.037 – 1.68 ± 0.001 mg/L

It should be noted that the range of iron concentration was found to be rather wide.

All wines had the iron content below the internationally established maximum allowed values of 10 mg/L.

At low concentration iron acts in metabolism as an enzyme activator, stabiliser and functional component of proteins.

At the concentration lower than trace level iron altering redox system of the wine.



The content of manganese (Mn)

Average: 1.23 mg/L

Range: 0.78 ± 0.058 – 2.45 ± 0.028 mg/L

Manganese as an essential element has function as an enzyme cofactor and constituent of metalloenzymes.

It should be noted that the range of manganese concentration was found to be rather wide.



The content of zinc (Zn)

Average: 0.48 mg/L

Range: 0.23 ± 0.001 – 1.15 ± 0.005 mg/L

In comparison to the maximum allowed values postulated by wine regulation (5 mg/L), the concentration of zinc in all studied wines were considerably lower.



CONCLUSION

The content of all investigated essential elements Cu, Fe, Mn and Zn of Malvazija istarska wines:

- ✓ **were below maximum allowed values, therefore,**
- ✓ **the wine is a potential nutritional source of these essential elements.**




CONCLUSION

✓ **Toxic and harmful elements:**

✓ **Average content of lead (Pb): 0.04 mg/L (range 0.011 ± 0.003 – 0.118 ± 0.002) was far below of maximum allowed value postulated by OIV (0.15 mg/L),**

✓ **The results indicate good environmental conditions of wine-growing and production of Malvazija wines.**



Thank you for your attention!