

ELECTROTHERMAL ATOMIC ABSORPTION SPECTROMETRY (ETAAS) DETERMINATION OF Pb AND Cd IN MACEDONIAN WHITE WINES

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INTRODUCTION

Mineral composition of wines is an important factor that influences its quality, as well as nutritional value. Determination of the elements in wine is very important from toxicological point of view, since it could contain harmful elements, such as Pb, As and Cd. From nutritional point of view, wine contains essential elements for the human organism, such as Ca, Cr, Co, K, Se and Zn.

The aim of this work was (i) to report a very simple and fast method for determination of Pb and Cd in wine and (ii) to determine the content of Pb and Cd in white wines from different varieties, such as Smederevka, Chardonnay, Riesling and Sauvignon blanc, from Tikveš and Skopje regions, by applying ETAAS method [1].

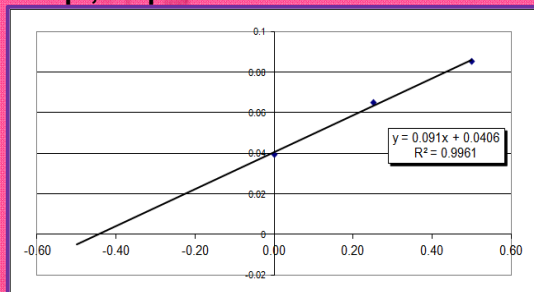
MATERIALS AND METHODS

Wine samples. A total of seven white wines (vintage 2012) were collected from commercial wineries located in Tikveš wine region (two Smederevka wines, two Chardonnay wines and one Riesling wine) and Skopje wine region (one Chardonnay and one Sauvignon Blank).

Instrumentation. Atomic absorption spectrometer AA240Z Varian (Mulgrave Virginia, Australia) with the Zeeman background correction was used, applying electrothermal technique (ETAAS) for determination of total Cd and Pb. Cadmium and lead hollow cathode lamps operated at the wavelengths of 228.8 nm and 283.3 nm, respectively. Atomizing environment was graphite furnace tube (coated partitioned tube with rings for Varian) heated to 2100 °C and 1800°C when lead and cadmium were determined. The floated solution was HNO₃ (1 %) [1].

RESULTS

Intercept, slope and R² of the calibration curve



Accuracy and precision of the method by standard addition method

Sample of wine	I standard addition of Pb [µg/L]	Determined Pb [µg/L]	II standard addition of Pb [µg/L]	Determined Pb [µg/L]
1	20.0	20.0	40.0	40.0
2	20.0	20.3	40.0	39.9
3	20.0	18.1	40.0	40.9
4	20.0	24.2	40.0	37.9
5	20.0	26.2	40.0	36.9
Average		21.7		39.1
sd		3.33		1.67
v %		15.3		4.26

Sample of wine	I standard addition of Cd [µg/L]	Determined Cd [µg/L]	II standard addition of Cd [µg/L]	Determined Cd [µg/L]
1	1.00	1.00	2.00	1.99
2	1.00	1.29	2.00	1.85
3	1.00	0.91	2.00	2.04
4	1.00	0.81	2.00	2.09
5	1.00	1.17	2.00	1.92
Average		1.04		1.98
sd		0.19		0.10
v %		18.7		4.90

Content of Pb and Cd in the analyzed wines

Wine	Wine region	Pb [µg/L]	Cd [µg/L]
Smederevka-1	Tikveš	28.5	0.71
Smederevka-2	Tikveš	9.08	1.07
Riesling-1	Tikveš	24.7	1.43
Riesling-2	Tikveš	2.01	0.40
Chardonnay-1	Tikveš	18.6a	1.50b
Chardonnay	Skopje	18.6a	1.46b
Sauvignon Blank	Skopje	n.d.	5.69

Same letters (a and b) in the columns indicate the values that are not significantly different ($p > 0.05$), determined with one-way ANOVA, Student–Newman Keuls test. 1–Negotino, 2–Disan

CONCLUSIONS

- Wines were directly injected into the ETAAS system without previous sample preparation.
- The accuracy and precision of the method gave satisfactory results.
- All wines presented low concentration of Pb and Cd, lower than the maximal allowed concentration in wine (200 µg/L and 100 µg/L, respectively) according to the Macedonian food safety regulation (Official Gazette of the Republic of Macedonia, 2005). Obtained contents correspond to the maximal allowed threshold recommended by the L'Organisation Internationale de la Vigne et la Vin (OIV).

References:

- [1] Ivanova, V., Jakabová, S., Nedelkovski, D., Pavlík, V., Balážová, Ž., Hegedús, O. (2015) *Food Analytical Methods*, 8 (8), 1947-1952.