

Cherries as a source of macroelements

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Abstract Fruits and vegetables are the main source of minerals for human nutrition. Although the mineral content of the fruit has an important homeostasis, it can be influenced by the soil on which they are grown and by the applied fertilization. In general, fruits obtained from properly fertilized crops contain a higher amount of minerals, especially K and Ca. The mineral content is strongly influenced by the species and variety. The goal of this paper was to determine the contents of Na, K, Ca, and Mg in cherries, using the flame atomic absorption spectroscopy (FAAS) method. The cherry samples used for the study were collected from polluted and unpolluted areas (Caras Severin County) and some of the samples were purchased from the supermarket. The research results show that the dominant macroelements are K, followed by Ca, then Mg and Na (which is found in the lowest amounts). The variation of the macroelements contents is normally reduced, statistically distributed, and in accordance with the data in the literature.

Key words

Cherries, *Prunus avium*, Na, K, Ca, Mg

Fruits and vegetables are the main source of minerals for human nutrition [2]. Although the mineral content of the fruit has an important homeostasis, it can be influenced by the soil on which they are grown and by the applied fertilization. In general, fruits obtained from properly fertilized crops contain a higher amount of minerals, especially potassium and calcium.

The mineral content is strongly influenced by the species and variety [8, 12].

Cherry fruits are an important source of vitamin C and polyphenols [11]. They have received increasing attention in the literature due to their anti-inflammatory and antioxidant capacity [3, 10].

Material and Method

A total number of 21 samples of cherries were collected and analyzed as follows: 15 samples of summer cherries, red, collected from 5 different locations from Caraş Severin County. The following locations: Buchin, Armeniş, Luncaviţa and Mehadica are located in unpolluted areas, along the Timiş Valley, areas recognized for cherry cultivation. The fifth location, Moldova Nouă, is in a heavily polluted area, affected by heavy metal mining, especially Cu [6]. Another 6 samples were purchased from supermarkets (Caransebes), grouped into two categories: 3 samples of Romanian origin and 3 of Spanish origin.

In order to determine the contents of Na, K, Ca, and Mg in cherries we used the flame atomic absorption spectroscopy (FAAS) method, described by Gergen,

2009, Heghedus Ramona, 2014 [4, 9]. For each location are presented the average values of the analyzed samples.

Results and Discussions

The mean value of the water content (%) of $82.8 \pm 4\%$ is in agreement with the data in the literature [13], being slightly lower for directly harvested cherries (80.0%) and higher (88.2%) for cherries in the supermarket. This difference can be attributed to the fact that the directly picked cherries are smaller in size, have a rougher texture that gives them increased firmness. And Cherries in supermarkets have a larger diameter but have a lower firmness texture. The more water they contain, the weaker it is related to the plant tissue. This may be due to early harvesting, long or inadequate storage that allowed the hydrolytic enzymes to begin the biochemical process of destruction of plant tissue.

Figure 1 shows the average values for each location for Na content. The average value of 22.19 ± 5 ppm is in line with the data in the literature [7]. It is observed that the cherries picked directly have slightly higher values with an average value of 24 ppm and the cherries in the supermarket have slightly lower values than the average value. This difference can be explained by the difference in water content, higher in the cherries in the supermarket, the results being related to fresh substance.

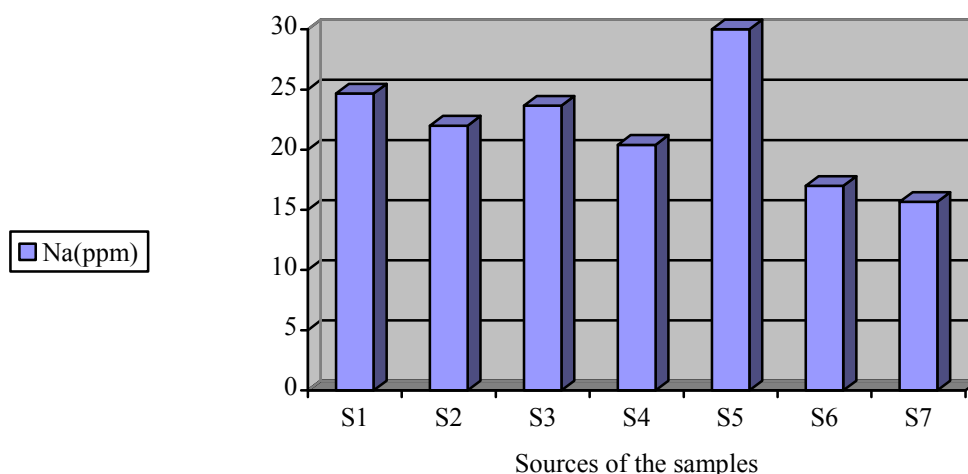


Fig. 1. Distribution of Na content in the analyzed cherry samples (ppm values)
 Legend: S1-Buchin Area; S2-Armeniș Area; S3-Luncavița Area; S4-Mehadica Area; S5-Moldova Nouă Area;
 S6- Romanian cherries from supermarkets; S7- Spanish cherries from supermarkets.

Figure 2 shows the variation of the K content in the samples of harvested cherries. The average value of

1964 ± 63 ppm falls within the limits provided by the literature [7,16].

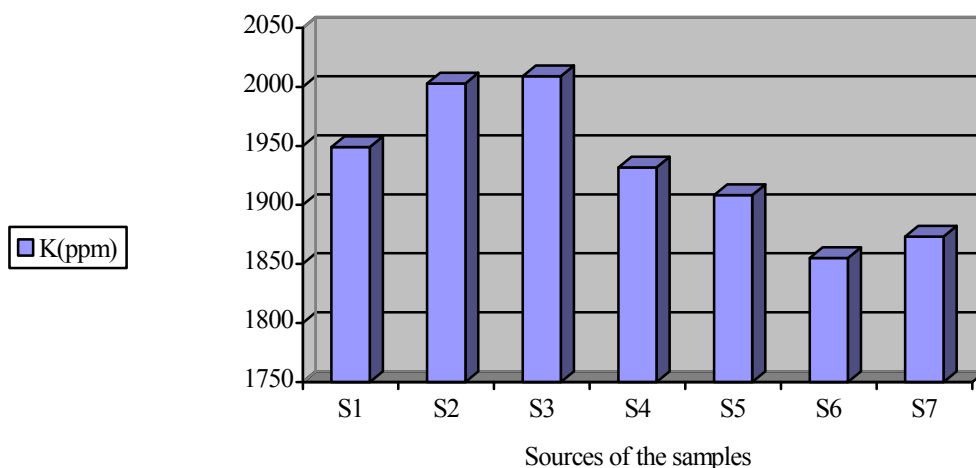


Fig. 2. Distribution of K concentrations in the analyzed cherry samples (ppm values)
 Legend: S1-Buchin Area; S2-Armeniș Area; S3-Luncavița Area; S4-Mehadica Area; S5-Moldova Nouă Area;
 S6- Romanian cherries from supermarkets; S7- Spanish cherries from supermarkets.

Figures 3 and 4 show the data for Ca and Mg content, macroelements particularly important for the human body. The average values obtained of 101 ± 11 ppm for Mg and 212 ± 21 ppm for Ca respectively are included in the data in the literature [8].

For Ca, the highest value was found in the samples of cherries in the area of Moldova Nouă. In addition, the cherries in the supermarket have lower values than those harvested directly.

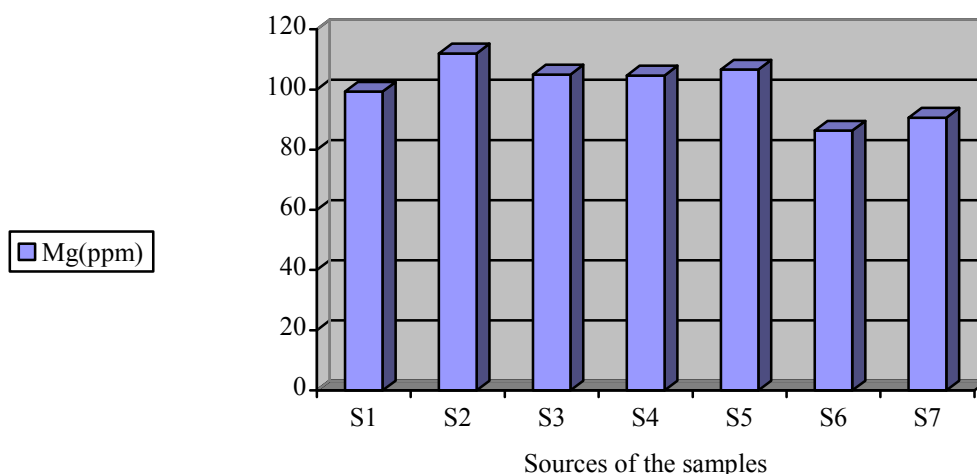


Fig. 3. Distribution of Mg concentrations in the analyzed cherry samples (ppm values)
 Legend: S1-Buchin Area; S2-Armeniș Area; S3-Luncavița Area; S4-Mehadica Area; S5-Moldova Nouă Area;
 S6- Romanian cherries from supermarkets; S7- Spanish cherries from supermarkets.

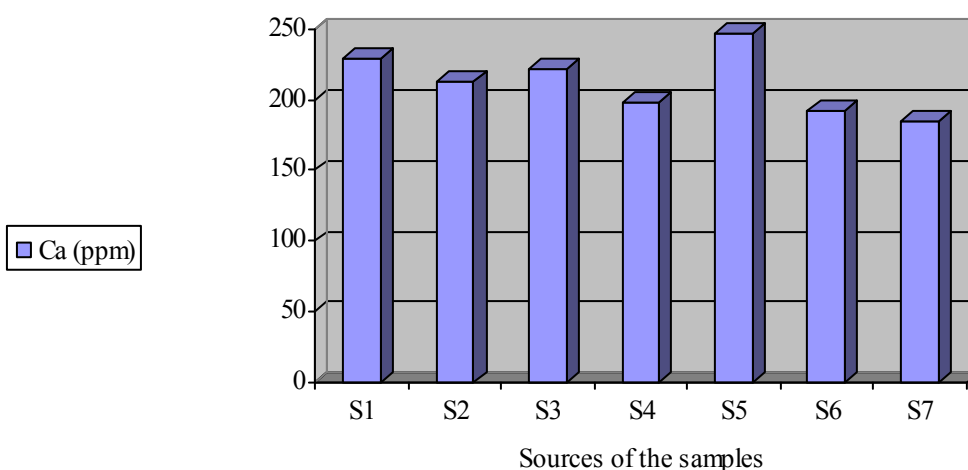


Fig. 4. Distribution of Ca concentrations in the analyzed cherry samples (ppm values)
 Legend: S1-Buchin Area; S2-Armeniș Area; S3-Luncavița Area; S4-Mehadica Area; S5-Moldova Nouă Area;
 S6- Romanian cherries from supermarkets; S7- Spanish cherries from supermarkets.

In order to capitalize on the data obtained, for nutritional purposes, we calculated the intake of mineral nutrients following the consumption of 500 g of cherries daily. For the calculation we used the average values obtained for each macroelements. This

contribution is considered reasonable especially in the summer, when ripening these fruits [14]. In the conditions of our average data obtained, a consumption of 500 grams of cherries would represent the following nutritional intakes (Table 1).

Table 1

Nutritional intake of a portion of 500 g of cherries	
Element	Nutritional intake (mg)
K	9820
Ca	1060
Mg	505
Na	110.95

Taking into account the daily nutritional requirement recommended by the literature, by sex and age groups [5,13], it is possible to calculate as a percentage the

intake brought by the consumption of 500 g of cherries, daily, presented in Table 2.

Table 2

Mineral insurance (%), in the recommended daily diet, for a consumption of 500 g cherries (average values)

Minerals/Age	Mg	Ca	K	Na
Men				
31-50 years	15.78	10.60	28.06	0.56
51-70 years	12.02	8.83	28.06	0.56
Women				
31-50 years	15.78	10.60	28.06	0.56
51-70 years	15.78	8.83	28.06	0.56

Conclusions

From these data, it is observed that the dominant macroelements is K, followed by Ca, then Mg and Na, which is found in the lowest amounts. The variation of the contents is reduced and in accordance with the data from the literature [1,8].

Considering the average values obtained, it can be seen that the introduction of 500 grams of cherries in consumption, covers a large part of the daily requirement of macroelements (K, Mg, Ca). Of the macroelements, only Na has coverage below 1%, the other macroelements having coverage between 8 and 28%. The best intake is potassium, followed by Mg and Ca.

In general, in the samples of cherries of local origin or imported from supermarkets, lower values of mineral content were identified, but very close to average and the water content of samples in supermarkets is higher than in native cherries, harvested from orchards.

References

- Anke M.A., 2004- Potassium. In: Elements and their compounds in the environment, Meriam, E., Anke, M., Ihnat, M., Stoeppler, M., (Eds.), Wiley-VCH Verlag, Weinheim;
- Bandi A. R. Thiesz L. Ferencz and M. J. Bandi, 2010-Some physical and biochemical compositions of the sweet cherry fruit, Acta Universitatis Sapientiae Agriculture and Environment, 2, 5–16;
- Bell P. G., M. P. McHugh, E. Stevenson¹, G. Howatson, Review, 2013-The role of cherries in exercise and health, Scandinavian Journal of Medicine and Science in Sports · January, DOI: 10.1111/sms.12085;
- Gergen I., 2009- Metode spectroscopice de investigare și control a compoziției alimentelor, Ed. Agroprint, Timișoara;
- Gogoasă I., Liana Maria Alda, Drăghici G. A., Despina-Maria Bordean, Adina Negrea, Gheorghita Jigoria, Ariana Velciov, Maria Rada, Antonela Cozma, Gergen I., 2015- Bio-Minerals Contribution of Seasonal Fruits to the Recommended Dietary Allowances, Proceedings of the 21st International Symposium on Analytical and Environmental Problems, Szeged, Hungary, Publisher University of Szeged, ISBN 978-963-306-411-5, pg105-108;
- Gogoasa I., Gergen I., Gabriela Oprea, Despina Bordean, Liana Alda, Diana Moigrădean, Maria Rada, Mihaela Bragea, 2011- Preliminary research concerning the distribution of copper in the soil and vegetables in historical anthropic pollution(Caras-Severin County, Romania), Journal of Agroalimentary Processes and Technologies, vol XVII(4), p. 371-374;
- Gogoasă Ioan, 2005- Cercetări privind poluarea (contaminarea) cu metale grele a unor legume și fructe din zona de vest a României”, Teză de doctorat, USAMVB, Timișoara;
- Gozlekci S., Esringu A., Ercisli S., Eyduran S. P., Akin M., Bozovic D., Sagbas H. I., 2017- Mineral content of cornelian cherry (Cornus mas L.) fruits. Oxid Commun, 40(1), 301-308;
- Hegheduș Mîndru Ramona Cristina, Hegheduș-Mîndru G., Negrea P., Șumălan R., Negrea Adina, Ștef D., 2014- The monitoring of mineral elements content in fruit purchased in supermarkets and food markets in Timisoara, Romania, Annals of Agr. and Environmental Medicine, Vol 21(1) 98– 105;
- Jaroszewska A., Kowalewska R., 2016- Chemical composition of cherry fruit from the cultivars Kelleris 16 and Łutówka depending on different water conditions and fertilization. J. Elem., 21(1): 43-52.;
- Kelley Darshan S., Yuriko Adkins and Kevin D. Laugero, 2018- A Review of the Health Benefits of Cherries, Nutrients, 10, 368;
- Mucete Daniela, 2005-Chimia produselor agroalimentare, Ed. Eurobit, Timișoara;
- Sen F., Oksar R. E., Golkarian Mina, Yaldiz S., 2014-Quality Changes of Different Sweet Cherry Cultivars at Various Stages of the Supply Chain, Not Bot Horti Agrobo, , 42(2):501-506;
- Serradilla M.J. et al., 2017- Nutritional Benefits and Social Aspects of Cherries, Chapter 17 Fruit Chemistry, CAB International, Cherries: Botany, Production and Uses, Edited by J. Quero-García, A. Iezzoni, J. Puławska and G. Lang, p.420 – 441;
- <https://www.projectwellnessnow.com/vitamin-mineral-content-cherries;>
- <https://scinews.ro/potasiu-doza-zilnica-recomandata;>
- <https://pe-harta.ro/caras-severin.>