Journal of Food Chemistry & Nanotechnology

https://doi.org/10.17756/jfcn.2021-105

Research Article

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Mineral Composition of Bluish-Black and Yellowish-White *Myrtus communis* L. Berries and *Arbutus unedo* L. Fruits

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Received: October 26, 2020
Accepted: January 21, 2021
Published: January 23, 2021

Citation: Mezni F, Mahdi M, Hachicha M, Khaldi A. 2021. Mineral Composition of Bluish-Black and Yellowish-White *Myrtus communis* L. Berries and *Arbutus unedo* L. Fruits. *J Food Chem Nanotechnol* 7(1): 1-3.

Published by United Scientific Group

Abstract

The aim of this research is to acquire valuable information about the mineral content of Bluish-Black and Yellowish-White *Myrtus communis* berries and *Arbutus unedo* fruits. The analysis of minerals was conducted by atomic absorption spectrophotometry. The results showed that there were significant ($p < 0.5$) differences between species for the following elements: Phosphorus (P), Magnesium (Mg), Iron (Fe), Manganese (Mn), cobalt (Co), Calcium (Ca) and Chromium (Cr). The highest values of P, Ca, Mg, Mn, Co and Fe were recorded by Yellowish-White fruits with respective rate of 0.38, 12942.5, 4586.67, 130.58, 5, 510.25 mg/g DM. No significant differences were recorded for Potassium (K), Lead (Pb), Copper (Cu), Sodium (Na), Nickel (Ni) and Zinc (Zn).

Keywords

Myrtus communis L., *Arbutus unedo* L., Fruits, Mineral composition

Introduction

Myrtus communis L. (*Myrtaceae*) is an evergreen scrub, widely distributed in the Mediterranean region. This plant is known by its therapeutic uses. It is recommended, in folk medicine, as an antibacterial, antifungal and hypoglycemic agent [1]. The leaves and fruits of the plant are commonly used in the food industry, especially, for flavoring meat. It is also introduced in the cosmetic sector [2].

Arbutus unedo L. (Strawberry-tree) is an evergreen shrub in the flowering plant family *Ericaceae*. It is distributed in the Mediterranean region and Western Europe North to Western France and Ireland. The leaves of *A. unedo* are known to be used, in traditional medicine, as antiseptic, diuretic, antidiarrheal, depurative and as antihypertensive [3, 4].

Despite their wide uses, fruits of these two Mediterranean species remain poorly exploited. Hence there is a need of valorization of these No Wood Forest Products through highlighting their nutritional values.

The aim of our research, conducted for the first time in Tunisia, is to provide information about the mineral content of the two bluish-black and yellowish-white-colored fruits of *Myrtus comm*unis and the *Arbutus unedo* fruits.

Material and Methods

Plant material and sample preparation

Arbutus unedo fruits and Bluish-Black and Yellowish-White *Myrtuscommunis*

berries were harvested from wild plants growing in North West of Tunisia. The plant name corresponds to "The Plant List" (www.theplantlist.org). Fruits were dried, blended into a fine powder and then stored at 4 °C until use for the experiments.

Mineral composition

To determine mineral content of Ca, P, Mg, K, Na, Zn and Cr, 1 g of fruits powder were calcined in an oven at 450 °C for 6 h. The cinder was then weighed and mixed with 5 ml of a mixture nitric acid/perchloric acid (2/1)). The solution was then filtered, added with pure nitric acid (to 250ml), heated and diluted. An atomic absorption spectrophotometry was used to analyses the minerals. The colorimetric method using molybdovanadate reagent was conducted to analyze P content. To determine Fe, Mn, Ni, Cu, Cd, Pb and Co contents, 0.5 g of the samples were added with 5 ml of solution hydrochloric acid/nitric acid (3/1) and boiled for 2 h. The solution was then filtered, and the minerals were analyzed by atomic absorption spectrophotometer.

Statistical analysis

Relationships between mineral contents were tested with the GLM procedure (General Linear Models) of the SAS (9.0) program. All values are the mean of three replications.

Results

Results of mineral composition of *A.unedo* fruits and Bluish-Black and Yellowish-White *M.communis* berries are summarized in table 1. According to the obtained results, the elements P, K, Ca, Mg, Mn, Fe, Cu, Zn, Na, Pb, Ni and Cr were detected in all three samples, whereas Cd was absent in all fruits.

Table 1: Mineral content of *Arbutus unedo* fruits and Bluish-Black and Yellowish-White *Myrtus communis* berries (mg/g dry matter).

Mineral elements (mg/g DM)	*A. unedo*	White *M. communis*	Black *M. communis*
K	16.3 ± 1.1	20.59 ± 0.7	17.80 ± 3.9
Na	7.65 ± 0.8	7.47 ± 1.18	7.84 ± 1.4
P	0.26 ± 0.02	0.38 ± 0.0	0.31 ± 0.05
Ca	7044.17 ± 475.09	12942.50 ± 323.2	9567.5 ± 1701.2
Mg	2954.17 ± 166.15	4586.67 ± 91.7	3960.83 ± 618.6
Mn	18.67 ± 1.8	130.58 ± 6.6	60.25 ± 18.2
Cu	20.75 ± 3.3	27.42 ± 4.2	20.42 ± 6.9
Cd	0.00 ± 0.0	0.00 ± 0.0	0.00 ± 0.0
Pb	12.08 ± 3.01	7.33 ± 1.1	7.00 ± 2.1
Co	0.25 ± 0.0	5.00 ± 1.08	2.25 ± 0.4
Ni	6.58 ± 2.5	6.08 ± 1.8	7.58 ± 3.1
Fe	164.00 ± 35.02	510.25 ± 19.9	345.33 ± 107.3
Zn	43.25 ± 8.9	56.25 ± 5.4	54.25 ± 22.5
Cr	34.50 ± 5.2	22.67 ± 2.4	9.08 ± 2.8

The results of the analyses demonstrated that there were significant ($p<0.5$) differences between species for the following elements: Phosphorus (P), Calcium (Ca), Magnesium (Mg), Manganese (Mn), Cobalt (Co), Iron (Fe) and Chromium (Cr). The highest values of P, Ca, Mg, Mn, Co and Fe were recorded by Yellowish-White fruits with respective rate of 0.38, 12942.5, 4586.67, 130.58, 5, 510.25 mg/g DM. Nevertheless, the lowest amounts of these elements were reached by *A. unedo* fruits. The latest showed the most important amount of Cr with 34.5 mg/g.

No significant differences were recorded for Potassium (K), Sodium (Na), Copper (Cu), Lead (Pb), Nickel (Ni) and Zinc (Zn).

Discussion

Globally, the mineral profile content obtained for the fruits is comparable to that obtained for other plants by Glew et al. Cook et al. and Boukari et al. [5-7]. Among the fruits evaluated, the Yellowish-White *M. communis* berries appear as outstanding mineral sources presenting the highest contents in P, Ca, Mg, Fe, Mn and Co. These findings are in accordance with those reported by Yildirim et al. [8]. Their Ca content (12942.50mg Ca/g DM on average) is higher than the amount reported by several studies [8-10].

Fruits contained several heavy metals such as Co, Cu, Zn, Pb, Ni and Cr. The maximum limit of all metals in both *M. communis* berries and *A. unedo* fruits are acceptable and their amounts are in accordance with those recommended by WHO/FAO [11].

The differences between black and white berries of *M. communis* observed in this investigation have also been reported by other authors [8, 10].

Studied *A. unedo* fruits showed similar mineral profile for that determined by Asmaa et al. [12] for Algerian *A. unedo*. Tunisian *A. unedo* fruits seem to be richer in both macro and micro-elements. This could be related to differences in growth conditions, such as soil acidity and richness, water availability, climatic conditions and seasonal variations [13, 14].

Both *A. unedo* and *M. communis* fruits are valuable sources of minerals, particularly, Ca and Mg. Many studies suggest that lack of calcium or magnesium in nutrition is associated with a risk of developing hypertension and cardiovascular illness [15-17]. Hence, *A. unedo* and *M. communis* fruits can be considered a natural source of macro and micro-elements.

Conclusion

This study showed the great presence of mineral elements in both *A. unedo*and *M. communis* fruits. Significant differences were revealed between the two species and also between the two varieties of Myrtle. Based on the results of our study, *M. communis* berries are a potent source of macro and micro elements. This reflects the high nutritional value of this natural product. These properties would enable the use of these berries by the food industry.

Conflict of Interest

There is no conflict of interest.

Acknowledgments

This project is carried out under the MOBIDOC scheme, funded by the EU through the EMORI program and managed by the ANPR.

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