

Preliminary research regarding the use of some berries (blueberries, blackberries and raspberries) as supplementary sources of bio minerals

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Abstract The paper presents experimental results regarding the measurement of some essential minerals such as Ca, Mg, Fe, Mn, Zn and Cu in three fresh forest berries – blueberries, blackberries and raspberries – to be used as supplementary sources of minerals. Preliminary data point out that the daily supply of minerals by these berries per genders varies within wide limits because of both the nature of the mineral and the type of berry. In general, the supply of minerals in the two genders follows, in our experiment, the following descending trends: Mn > Cu > Fe > Zn \cong Mg > Ca in men and Mn > Cu > Fe \cong Mg \cong Zn > Ca in women.

Key words

berries, minerals, supplementary sources of bio minerals

Forrest berries are a special category of fruit that have important therapeutic effects on the human body [12, 15]. These berries can both prevent diseases (prophylactic action) and heal diseases (therapeutic action). They can also contribute to the healing of some diseases as adjuvants together with allopathic medicines or alternative therapies.

Nutritional and therapeutic features are due to both their content of basic food principles (proteins, lipids and sugars) and to the increased amounts of diverse therapeutic substances they contain: vitamins (particularly vitamins C, B, E, A), mineral bio elements (macro- and micro-elements), enzymes, organic acids, vegetal hormones, volatile oils, easily assailable sugars, essential amino acids, fibres, etc. [1, 2, 3, 7, 9].

In addition, these berries are important sources of food anti-oxidants that can inactivate the effects of free radicals and can prevent early ageing of the body and that can help protect the human body from several health conditions such as cardio-vascular diseases, diabetes, weak immune system, some types of cancer, etc. [4, 6, 10, 11, 13, 14].

All these qualities recommend these berries to be introduced in human nutrition fresh or prepared as healthy foods: infusions, syrups, jams, etc.

Among forest berries considered the healthiest and having numerous proprieties beneficial for the human body are blueberries, blackberries and raspberries.

Blueberries are considered food-medicines since the list of their therapeutic actions is impressive: regeneration of the blood vessels, normalisation of glycaemia in diabetes, neutralisation of intestine infections, slight dilatation of coronaries, protection

against radioactivity, adjuvant in urinary infections, improvement of conditions specific to the third age (lost of sight, cardiovascular diseases, senility). Blueberries are an important source of minerals and vitamins – manganese, vitamin A, iron, calcium, vitamin K, vitamin E, zinc, phosphorus, and selenium – but they are also rich in antioxidants, fibbers, organic acids, etc. [1, 7, and 9].

Blackberries are the forest berries with the richest content of antioxidants among which resveratrol. They also contain important amounts of vitamins and minerals, oligo-elements and substances with anti-inflammatory, anti-bacterial, anti-ageing, and anti-cancer role. Among the main bioactive substances found in blackberries are vitamins C and E and the complex B (B1, B2, B3, B5), vitamin B6, resveratrol, folic acid, minerals (Fe, Mg, Ca, K, Cu, Mn, Na, P, Se), tannins, high quality sugars, proteins and very few vegetal oils [14, 18]. Due to their supply of vitamins and of active and mineral substances, these berries are important in human therapy: they are used as a remedy in preventing colon and stomach cancer, they help regulating intestinal transit, they help the nervous system function well, they strengthen the bones, they detoxify the liver, they strengthen the immune system, they protect the eyes, they prevent anaemia, they calm throat sores, they help wounds heal and they are also good for diabetics, etc. [20].

Raspberries are the forest berries with the lowest content of sugars but with an important, diversified content of easily available minerals (calcium, magnesium, zinc, manganese, potassium, phosphorus, etc.) and vitamins (A, B1, B2, D, C and P). [9 and 17]. Eaten shortly after harvesting,

contribute efficiently to ensure the necessary nutrients to the human body and they can also be used therapeutically as a remedy to conditions related to the digestive tract, to the pancreas and to the respiratory system, as well as in gastric burns, diabetes, obesity, febrile and infectious conditions, etc. [8].

The organoleptic (attractive aspect, colour, savour and flavour), nutritive and therapeutic qualities of forest berries are also due to their increased content in minerals, some of which are essential to the normal functioning of the human body: Ca, Mg, K, P, Fe, Mn, Zn, Cu, Cr, I, Se, etc. From this point of view, these berries could be considered a natural, successful, handy variant of mineral supplements for both healthy and diseased humans.

This is our starting point in considering forest berries as essential mineral complements of human diet. In this paper, the authors aimed at determining the distribution of some essential minerals in three forest berries – blueberries, blackberries and raspberries – from the spontaneous flora to assess their mineral supply in daily diet.

Material and Methods

To carry out the experiment, we harvested three forest berries – blueberries, blackberries and raspberries – from the spontaneous flora of the hill and mountain areas of the Caras-Severin County, Romania. To determine the elements of interest, we sampled 5 g of each of the three fresh berries.

Aqueous standard solution for, Ca, Mg, Fe, Mn, Zn and Cu were prepared by appropriate dilution of 1,000 gL⁻¹ stock solutions (Merck Darmstad, Germany). To disaggregate the samples, we used HNO₃ 0.5 N obtained from 65% HNO₃ (Suprapur, Merck) and bidistilled water. Measurements were carried out using a Varian Atomic Absorption Spectrometer Instruments of the AA 240 FS type. As working parameters, we chose optimum parameters according to the apparatus specifications. To calcinate the samples, we used a calcination oven of the Nabertherm Model Le 6/11.

Determining the elements of interest required two working steps: mineralisation through calcination, followed by the solubilisation of the inorganic matter in azotic acid 0.5 N and by the spectro-photometric measurement of element absorbance [5].

In the first step, the samples measuring 5±0.0002 g were calcinated at a temperature of 550^oC in two sessions of 4 h each. After cooling, the ashes were processed with 25 mL of HNO₃ 0.5 N, then evaporated close to dry; the last operation was replicated twice. After complete solubilisation, the sample solution was filtered and made up to 50 mL with bidistilled water and was submitted for analysis.

The determination of elements in fresh fruit was performed by atomic absorption spectrometry in air-acetylene flame (FAAS)

Results and Discussions

Experimental results regarding the minerals Ca, Mg, Fe, Mn, Cu and Zn in blueberries, blackberries and raspberries are shown in Table 1.

Table 1

Berries	Mineral content – mean values (mg/kg fresh fruit)					
	Ca	Mg	Fe	Mn	Zn	Cu
Blueberries	82.9	73.8	8.46	3.64	2.34	1.24
Blackberries	248	217	7.72	6.18	5.52	1.64
Raspberries	219	199	7.28	7.12	4.54	1.16

Table 2

Berries	Quantum of minerals in 250 g of fresh fruit					
	Ca	Mg	Fe	Mn	Zn	Cu
Blueberries	20.725	18.25	2.115	0.91	0.585	0.31
Blackberries	62.00	54.25	1.93	1.545	1.38	0.41
Raspberries	54.75	49.75	1.82	1.78	1.135	0.29

Table 1 shows that the distribution of the elements in the samples analysed is uneven, which is also confirmed by literature, i.e. the distribution of minerals in different vegetal products is determined by the assortment of fruit and by the nature of the elements analysed, as well as by the cultivation conditions.

Among the elements analysed, macro-elements are best represented with values ranging between 82.9 and 248 mg/kg in calcium and 73.8-217 mg/kg in magnesium.

The micro-elements analysed were identified in much smaller amounts; their concentrations were relatively close in the three assortments of forest

berries: 7.28-8.46 mg/kg in iron, 3.64-7.12 mg/kg in manganese, 2.34-5.52 mg/kg in zinc, and 1.16-1.64 mg/kg in copper.

It is obvious that the distribution of the elements analysed follows a descending trend: Ca > Mg >> Fe > Mn > Zn > Cu.

Analysing experimental data after the assessment of the quantity of Ca, Mg, Fe, Mn, Zn and Cu in blueberries, blackberries and raspberries, the

authors tried to estimate the measure in which these forest berries could be used as supplementary sources of minerals. Thus, if we take into account the daily amounts recommended by the international specialised organisations (the average daily dietary intake – ADDIs) [21], we can calculate the supply (contribution, %) of minerals per daily consumption of fruit.

Table 3

Dietary Reference Intakes (DRI): Recommended intakes for individual elements

Mineral	Dietary reference intake	
	Men	Women
Calcium (mg/day)	1,000	1,000
Magnesium (mg/day)	420	320
Iron (mg/day)	8	18
Manganese (mg/day)	2.3	1.8
Zinc (mg/day)	11	8
Copper (µg/day)	900	900

Table 4

Contribution of some forest berries to the daily intake recommended for a daily intake of 250 g of fresh fruit

Berries	Specification	Mineral supply, %					
		Ca	Mg	Fe	Mn	Zn	Cu
Blueberries	Men	2.73	4.35	26.44	39.57	5.32	34.44
	Women	2.73	5.70	11.75	50.55	7.31	34.44
Blackberries	Men	6.2	12.92	24.13	67.17	12.55	45.56
	Women	6.2	16.95	10.16	85.83	17.25	45.50
Raspberries	Men	5.48	11.85	22.75	77.32	10.32	32.22
	Women	5.48	15.55	10.11	98.89	14.19	32.22

Results regarding the daily intake of 250 g of one of the three forest berries under study are shown in Table 4.

Data presented in Table 4 show that, in this case, for an intake of 250 g of fresh forest berries, the supply of minerals in the daily diet per gender varies within broad limits depending on both the nature of the mineral and on the fruit assortment.

As shown in Figures 1 and 2, in general, for the two genders (aged 30-50), the mineral supply flows, in the conditions of this experiment, the

following descending trends: Mn > Cu > Fe > Zn ≅ Mg > Ca in men and Mn > Cu > Fe ≅ Mg ≅ Zn > Ca in women.

To mention that, when using systematically forest berries to supplement minerals, we need to take into account the recommended daily amounts. Improper (excess) intake can lead to amounts of minerals above the recommended limits that can produce side-effects and hinder the proper functioning of the body.

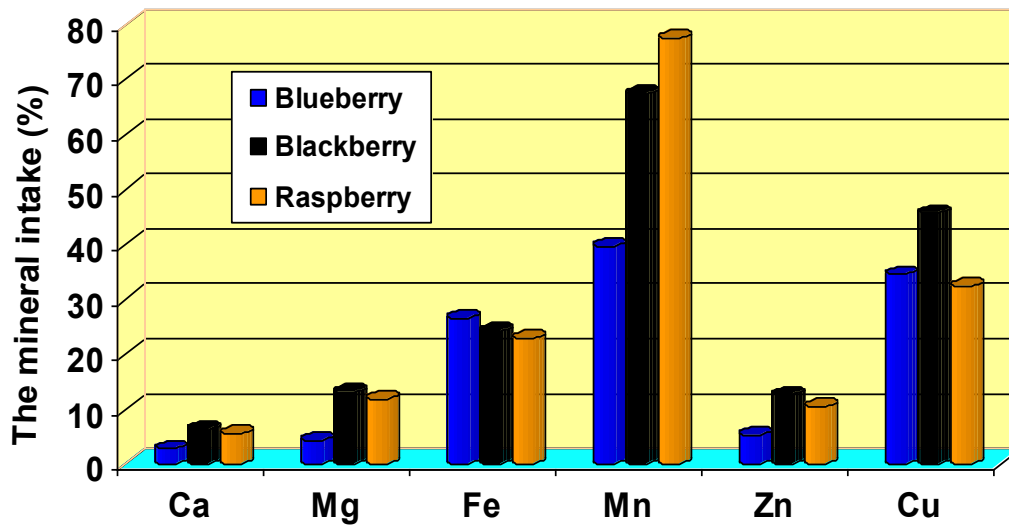


Fig. 1. Contribution of some forest berries to the daily recommended diet in men for a daily intake of 250 g of fresh fruit

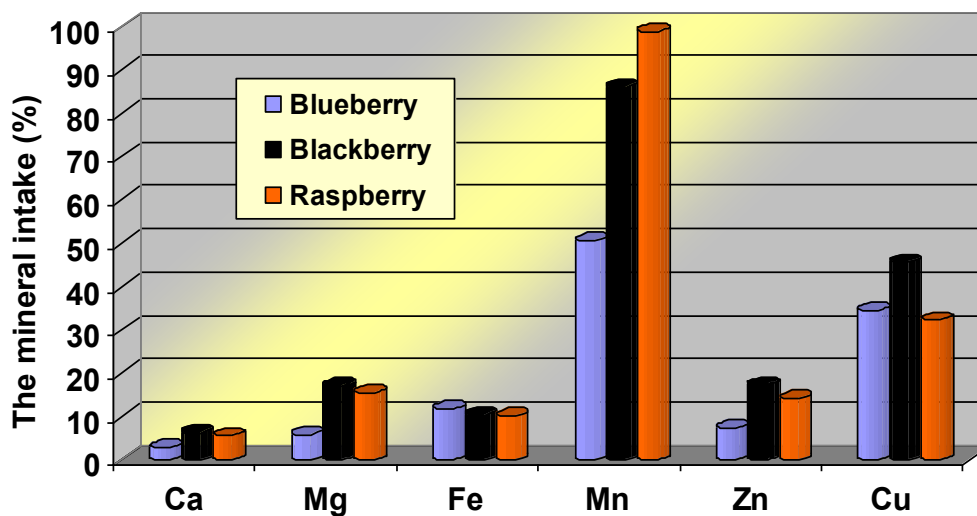


Fig. 2. Contribution of some forest berries to the daily recommended diet in women for a daily intake of 250 g of fresh fruit

As shown in Figures 1 and 2, in general, for the two genders (aged 30-50), the mineral supply follows, in the conditions of this experiment, the following descending trends: Mn > Cu > Fe > Zn \cong Mg > Ca in men and Mn > Cu > Fe \cong Mg \cong Zn > Ca in women.

To mention that, when using systematically forest berries to supplement minerals, we need to take into account the recommended daily amounts.

Improper (excess) intake can lead to amounts of minerals above the recommended limits that can produce side-effects and hinder the proper functioning of the body.

Conclusions

Forest berries are true sources of health. Eaten fresh or dried, as infusions or in different preparations,

they contribute to maintaining a general state of health or to the healing of some diseases. The remarkable nutritional and therapeutic qualities of forest fruits are also determined by the increased content of minerals among which Ca, Mg, Fe, Mn, Zn and Cu.

Preliminary data in the determination of the amounts of Ca, Mg, Fe, Mn, Zn and Cu in fresh blueberries, blackberries and raspberries point out the fact that they can be used as an alternative source of minerals in the daily diet of humans.

We determined experimentally that, when eating 250 g of blueberries, blackberries or raspberries, the supply of minerals in the daily diet recommended per gender (men and women aged 30-50) varies largely depending on both the nature of the mineral and on the assortment of fruit.

In general, in the two genders, mineral supply in experimental conditions follows two descending trends: Mn > Cu > Fe > Zn \cong Mg > Ca in men and Mn > Cu > Fe \cong Mg \cong Zn > Ca in women.

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