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Mineral Content of Some Medicinal Herbs

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Abstract This paper is a study on the distribution of trace minerals in different native plants used in the preparation of medicinal teas: *Cynara scolymus*, *Achillea millefolium*, *Calendula officinalis*, *Mentha piperita, Hypericum perforatum* and *Matricaria chamomilla*. Were determined by flame atomic absorption spectrometry (FAAS), the following microelements: Fe, Mn, Zn, Cu, Ni, Co, Cr, Pb and Cd. The experimental results show appreciable content of bio-micro-elements, especially Fe, Mn, Cu, Zn and very low concentrations, insignificants, of toxic elements: Pb and Cd.
We can conclude that the analysed herbal teas are of interest not only for their pharmaco-dynamic properties, but also for their micro-elements content, which makes herbal teas both foods and medicines. It is nutritionists who should recommend the type of herbal tea depending on the micro-elements contents.

Key words

micro-elements, *Cynara scolymus*, *Achillea millefolium*, *Calendula officinalis*, *Mentha piperita, Hypericum perforatum, Matricaria chamomilla*

The notion of herbal tea has two meanings – a scientific one, which defines plants, mixtures of plants, or dried plant parts properly chopped, and another one, which currently defines aqueous solutions obtained through their infusion, decoction, or maceration. In the present paper, the notion of herbal tea is used to characterise some dried plants used to prepare medicinal teas as infusions, decoctions, and macerations.
Medicinal plants are frequently used to prepare infusions, decoctions, macerations, etc. to prevent or heal certain diseases. Besides their beneficial properties, such teas are also consumed for their pleasant taste and flavour[6].
Herbal teas are a never-ending, important source of minerals necessary to balance the metabolism: therefore, they can be also used as nutritious supplements of micro-elements.
On the other hand, medicinal plants can be accidentally contaminated with some toxic elements from various man-made pollution sources or from the processing operations [7]. As such, herbal teas used in phytotherapy should be seen as both supplementary sources of micro-elements and carriers of food contaminants.
Literature contains numerous data on the distribution of minerals in plants from spontaneous flora or cultivated in different geographical areas, as well as a series of mineral analysis techniques [1,3,7,11].
This paper is a study on the distribution of trace minerals (Fe, Mn, Zn, Cu, Ni, Co, Cr, Pb and Cd) in different native plants used in the preparation of medicinal teas: *Cynara scolymus, Achillea millefolium, Calendula officinalis, Mentha piperita, Hypericum perforatum* and *Matricaria chamomilla*. Knowing the content in micro-elements that make plants healing or hazardous is very important and necessary when using such herbal teas as medicine-foods. To know mineral content, we need modern, high-sensitivity and precision analysis techniques [2,9,10,12].

Material and Methods

The plants used for analytical determinations are native plants dried and used for medical purposes, from Timisoara stores.
Analysis of Fe, Mn, Zn, Cu, Ni, Co, Cr, Pb and Cd content was made with ContrAA-300, Analytik-Jena device, by flame atomic absorption spectrometry (FASS) in air/acetylene flame [12,17]. The device working parameters (air, acetylene, optics and electronics) were adjusted for maximum absorption for each element. The standard solutions (1000 mg/L) were analytical grade from Riedel de-Haen (Germany) The nitric acid 65% solution used was of ultra pure grade (Merck, Germany). All solutions were prepared using deionised water.
The medicinal plants samples were made of the average of three samples for each primary product and were analyzed after drying at 105°C to constant weight, followed by dry burning of 10 ± 0.0002 g at 650°C for 4 hours. After complete burning, a nitric acid 0.5 N solution was added.
The solutions obtained were used for total metals contents determination by flame atomic absorption spectrometry (F-AAS) with high-resolution continuum source.

Results and Discussions

The experimental results obtained in the determination of trace elements Fe, Mn, Zn, Cu, Ni, Cr, Co, Pb and Cd, in *Cynara scolymus, Achillea millefolium, Calendula officinalis, Mentha piperita, Hypericum perforatum* and *Matricaria chamomilla* are shown in Table 1.

Table 1

Total micro-elements content in herbs

Description	**Micro-elements content average values** [mg/kg dry weight]								
	Fe	Mn	Zn	Cu	Ni	Cr	Co	Pb	Cd
Cynara scolymus	888	157	42.9	10.24	10.4	6.82	< 0.10	< 0.10	< 0.10
Achillea millefolium	179	84.3	40.2	9.88	5.54	0.26	< 0.10	< 0.10	< 0.10
Calendula officinalis	533	85.9	49.9	15.51	5.68	4.75	< 0.10	< 0.10	< 0.10
Mentha piperita	519	107	35.6	8.20	2.08	0.40	< 0.10	< 0.10	< 0.10
Hypericum perforatum	178	171	54.9	7.86	3.45	1.05	< 0.10	< 0.10	< 0.10
Matricaria chamomilla	1440	135	45.6	10.23	4.39	1.25	< 0.10	< 0.10	< 0.10

The Fe content shows great variations between the different plant species. Fe concentration limits are ranging from 178 ppm (*Hypericum perforatum)* and 1.440 ppm(*Matricaria chamomilla)*.

Mn was determined in smaller quantities than iron, but higher than other elements analyzed. Its concentration limit ranging from 84.3 ppm (*Achillea millefolium)* and 171 ppm(*Hypericum perforatum*).

There were little variations of Zn content between different species, ranging from 35.6 ppm (*Mentha piperita)* and 54.9ppm(*Hypericum perforatum)*.

The highest value of Cu content was 15.51 ppm in *Calendula officinalis* and the lowest (7.86 ppm) in (*Hypericum perforatum).*

Nickel was determined in small concentrations, lower than the first micro-elements analyzed except *Cynara scolymus*, where the Ni content registered a value of 10.4 ppm. The Ni concentrations are in the range: 2.08 ppm (*Mentha piperita)* to 5.68 ppm (*Calendula officinalis)*.

Regarding chromium content, *Cynara scolymus (*6.82 ppm) and *Calendula officinalis* (4.75 ppm) are the richest herbs in chromium. *Achillea millefolium* registered the lowest value of this parameter.

Cobalt, lead and cadmium were found in very low quantities in all analyzed medicinal herbs, values below the detection limit of the equipment.

As far as the maximum admitted limits of potentially toxic micro-elements (Zn, Cu) or very toxic micro-elements (Pb, C) is concerned, they are not stipulated in Order no. 975/1998 regarding maximum admitted limits of arsenic and heavy metals in foods. If we consider herbal teas as foods, maximum admitted concentration limits are 50 ppm in Zn ad Cu, and 5 ppm in Pb and 0.5 ppm in Cd [15]. In this case, Cu concentration in *Hypericum perforatum* herbal tea is slightly above maximum admitted limits. The other micro-elements that are slightly toxic (Pb, Cd) can be found in small amounts in all analysed herbal teas and are below the apparatus detection potential, which makes them undetectable.

Conclusions

The experimental results obtained in the determination of trace minerals from six types of herbal teas used in the preparation of teas: *Cynara scolymus, Achillea millefolium, Calendula officinalis, Mentha piperita, Hypericum perforatum* and *Matricaria chamomilla* show appreciable quantities of Fe, Mn, Cu, and Zn and very small, insignificant concentrations of toxic elements: Pb and Cd.

Comparing the experimental values obtained with the data presented in the literature, we observe no major differences [4,8,13,14].

We can conclude that the herbal teas we analysed are of interest not only for their pharmaco-dynamic properties, but also for their micro-elements content, which makes herbal teas both foods and medicines. It is nutritionists who should recommend the type of herbal tea depending on the micro-elements contents.

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