CHEMICAL COMPOSITIONS AND MINERAL CONTENTS OF HERBS ADDED TO DAIRY PRODUCTS IN EAST ANATOLIA REGION OF TURKEY

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ABSTRACT

In this study, a total of 120 herb samples from six different species – *Allium* sp. “sirmo”, *Chaerophyllum* sp. “mendi”, *Prangos* sp. “helis”, *Anethum graveolens* “dill”, *Mentha* sp. “mint” and *Petroselinum crispum* “parsley” – added to dairy products in Van from the East Anatolia region of Turkey were examined for some chemical compositions and mineral contents. The herbs were collected from Van cheese-shopping district in May and June. The obtained values were based on dry weight. The dry matter contents of herb samples were determined from 12.49 (*Prangos* sp.) to 17.68 (*Anethum graveolens*). The cobalt content of *Prangos* sp.; calcium, phosphorus, nickel and cadmium contents of *Anethum graveolens*;

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magnesium, zinc, iron, manganese and chromium contents of *Mentha* sp.; sodium and copper contents of *Petroselinum crispum* were higher than those of other herbs. Sodium content was found to be high, above 1384.90 mg/100g, in *Petroselinum crispum*, and therefore most mineral contents were found in small amounts in this species.

Keywords: Herb, chemical composition, mineral content, dairy products

INTRODUCTION

Herbs are important food additives for the traditional dairy products particularly in the East and Southeast Anatolia regions of Turkey and they are a significant source of dairy products in these regions.

Some of the herbs, however, may be rich in minerals but, because of lack of information about them, their uses as food supplements are limited. Dill (*Anethum graveolens*), mint (*Mentha* sp.) and parsley (*Petroselinum crispum*) are consumed in large quantities worldwide while sirimo (*Allium* sp.), mendi (*Chaerophyllum* sp.) and helis (*Prangos* sp.) are consumed only traditionally. It is important to have adequate information on the nutritive value of these foods.

The herbs, which are known by names as follows: sirimo (*Allium* sp.), mendi (*Chaerophyllum* sp.), helis (*Prangos* sp.), dill (*Anethum graveolens*), mint (*Mentha* sp.) and parsley (*Petroselinum crispum*), commonly used in the production of cheese, lor (a type of whey curd) and cacik (a type of yoghurt), are generally added in ratios of 1-15% /1, 2, 3/.

Cheese, lor and cacik with added herbs are traditionally manufactured only in the above-mentioned regions. The herbs are added with different taste, smell and flavor to products. Herby lor and cacik are used as filling between of pieces of herby cheese in containers and especially consumed in breakfast saloons.

Herby cheese, a semi-hard cheese with added herbs, is manufactured in small family businesses for their needs and commercial purposes from raw sheep and cow's milk. Herby lor is a food specially produced from whey and small amount of ayran (buttermilk), and as cacik is produced from mixer ayran and small amounts of whey. The whey and ayran used in the manufacture of Herby lor and cacik are coagulated with heat and added with

different herbs in curd. Cow or sheep's milk are used for lor and cacik production and they are manufactured between May and June in the East and Southeast Anatolia region of Turkey.

The herbs are commonly used in cacik manufacture as follows; *Allium* sp., *Chaerophyllum* sp., *Ferula* sp., *Prangos* sp., *Silene vulgaris*, *Tymus* sp., *Mentha* sp. and sometimes cucumber, green pepper and other additives; they are added to cacik at different levels /1, 2/.

Although several studies have been made on microbiological, chemical, physico-chemical and sensory properties of Herby cheese, lor, and cacik /2 - 11/, researches were limited about herbs added to dairy products /12, 13/. There is no knowledge about mineral contents of sirmo, mendi and helis. Thus, the aim of this study was to determine and compare some chemical compositions and mineral contents of herbs, wild (sirmo, mendi, helis) and cultured (dill, mint, parsley), added to dairy products.

MATERIALS AND METHODS

Collection of herb samples

Twenty samples of each species of the wild herbs, *Allium* sp. "sirmo", *Chaerophyllum* sp. "mendi", *Prangos* sp. "helis" and cultured herbs, *Anethum graveolens* "dill", *Mentha* sp. "mint", and *Petroselinum crispum* "parsley", were collected from the Van cheese shopping district in May and June. Before analyses, the herbs were washed, first with running water and then with distilled water, and residual moisture was evaporated at room temperature.

Chemical analyses

The dry matter, nitrogen and ash contents of herb samples were determined according to the methods described by AOAC (2000) /14/.

The minerals were made in dry ash samples. The ash contents in porcelain crucibles were solved with 10 ml of 6N HCl, filtered then quantitatively transferred into 50 ml volumetric flasks, and diluted to volume with double-deionized water /14/. While phosphorus content was quantified by UV spectrophotometer (Shimadzu, UV-1201 V, Kyoto, Japan), other minerals were quantified by flame atomic absorption spectrophotometer (Unicam, 929, Cambridge, UK).

Analyses were performed in duplicate. Mean values and standard deviation were calculated for each sample using the values obtained from twenty different herb samples.

Statistical analysis

Statistical analysis of data for six different herbs was performed by ANOVA procedures using SAS® PROC GLM/STAT /15/. Differences among means were identified using the Duncan multiple range test.

RESULTS AND DISCUSSION

Species, family, traditional name and some chemical compositions of herbs added to dairy products are presented in Table 1.

The dry matter contents of herb samples were between 12.49-17.68% and there were significant differences in the contents ($P<0.05$). The lowest dry matter content was found in *Prangos* sp. The dry matter contents of herb samples in this study are lower than those found by Wallace *et al.* (1998) /16/ for leafy vegetable *E. hirta* and by Aletor *et al.* (2002) /17/ for four leafy vegetables, and similar those by Guerrero *et al.* (1998) /18/ for wild plants.

The nitrogen contents of wild herbs were found to be lower than cultured herbs. The lowest nitrogen content was determined in *Prangos* sp. (1.34 g/100g dry wt) and the highest was in *Anethum graveolens* (4.09 g/100g dry wt), and were differences importance between nitrogen contents ($P<0.05$). Glew *et al.* (1997) /19/ found similar results for plants of Burkina Faso, Cook *et al.* (1998) /20/ found higher results for *Maerua crassifolia* plants.

The ash contents of herb samples were between 11.13-14.50% and there were significant differences in the contents ($P<0.05$). The ash contents of cultured herbs (*Mentha* sp. and *Petroselinum crispum*) were found higher than wild herbs. The highest ash content was found in *Petroselinum crispum* and the lowest was found in *Chaerophyllum* sp. These values are lower than those observed by Guerrero *et al.* (1998) /18/ for wild plants, but similar those observed by Aletor *et al.* (2002) /17/ for leafy vegetables and Wallace *et al.* (1998) /16/ for leafy vegetable.

Table 1.
Some Properties of Herbs Added to Dairy Products

Species	Family	Traditional name	n	Dry matter (%)	Nitrogen (% dry wt)	Ash (% dry wt)
<i>Allium</i> sp.	Liliaceae	Sirno	20	14.85±1.09 ^d	2.13±0.08 ^d	13.45±0.37 ^c
<i>Chaerophyllum</i> sp.	Apiaceae	Mendi	20	15.27±0.41 ^c	2.02±0.06 ^e	11.13±0.19 ^f
<i>Prangos</i> sp.	Apiaceae	Helis	20	12.49±0.50 ^f	1.34±0.06 ^f	12.56±0.44 ^e
<i>Anethum graveolens</i>	Umbelliferae	Dereotu (Dill)	20	17.68±0.32 ^a	4.09±0.10 ^a	12.98±0.22 ^d
<i>Mentha</i> sp.	Labiatae	Nane (Mint)	20	13.60±0.49 ^e	3.33±0.12 ^c	13.99±0.36 ^b
<i>Petroselinum crispum</i>	Umbelliferae	Maydanoz (Parsley)	20	17.04±0.55 ^b	3.85±0.08 ^b	14.50±0.28 ^a

^{abcdef} Different letters indicate $P < 0.05$ between herbs

Table 2.
Mineral Contents of Herbs Added to Dairy Products

	<i>Sirmo</i>	<i>Mendi</i>	<i>Halıs</i>	<i>Dill</i>	<i>Mint</i>	<i>Parsley</i>
	<i>Expressed mg/100g</i>					
Ca	1058.27±87.15 ^b	754.36±86.44 ^d	992.10±65.28 ^c	1268.15±30.85 ^a	1013.65±37.29 ^{bc}	1061.10±50.81 ^b
Na	326.04±23.34 ^d	328.81±28.55 ^d	298.64±31.20 ^d	1013.50±57.67 ^b	510.85±33.39 ^c	1384.90±40.39 ^a
P	288.95±21.27 ^d	221.04±10.89 ^c	379.65±26.04 ^c	559.41±56.09 ^a	357.57±28.71 ^c	429.35±41.07 ^b
Mg	366.64±12.52 ^c	288.34±24.64 ^c	249.87±18.68 ^f	325.90±28.83 ^d	491.80±45.29 ^a	407.90±20.06 ^b
	<i>Expressed mg/kg</i>					
Fe	204.52±10.36 ^d	256.24±24.58 ^c	255.71±19.22 ^c	242.69±26.07 ^c	537.10±30.79 ^a	366.70±26.51 ^b
Cu	13.53±1.05 ^c	14.31±1.66 ^c	15.50±1.21 ^c	26.46±3.08 ^b	27.19±2.89 ^b	30.13±1.96 ^a
Zn	24.67±2.17 ^d	20.65±2.31 ^c	29.39±1.49 ^c	46.45±2.68 ^b	57.21±2.54 ^a	48.30±3.65 ^b
Mn	14.63±1.28 ^f	17.67±2.06 ^c	20.53±2.94 ^d	39.38±2.58 ^c	63.95±2.77 ^a	58.45±3.40 ^b
Co	0.15±0.08 ^d	0.27±0.15 ^c	0.61±0.18 ^a	0.44±0.05 ^b	0.46±0.07 ^b	0.08±0.07 ^d
Cr	0.48±0.15 ^b	0.41±0.12 ^{bc}	0.38±0.11 ^{bc}	0.34±0.06 ^{cd}	1.01±0.12 ^a	0.24±0.13 ^d
Ni	0.30±0.18 ^c	0.35±0.18 ^c	0.62±0.17 ^d	2.46±0.11 ^a	1.33±0.17 ^c	1.93±0.08 ^b
Cd	0.19±0.07 ^c	0.28±0.12 ^b	0.25±0.09 ^{bc}	0.49±0.04 ^a	0.44±0.10 ^a	0.31±0.03 ^b

abdef Different letters indicate $P < 0.05$ between herbs

Mineral contents of herbs added to dairy products are presented in Table 2. The calcium (Ca) content of herb samples was obtained around 754.36 (*Chaerophyllum* sp.) to 1268.15 mg/100g (*Anethum graveolens*) and showed importance differences among herbs. The Ca amounts of herbs in the present study are higher than those observed by Guerrero *et al.* (1998) /18/, by Aletor *et al.* (2002) /17/ and by Wallace *et al.* (1998) /16/ except for *E. hirta* vegetable, and similar those found by Dashak *et al.* (2001) /21/ for dadawa basso and dadawa kalwa, by Cook *et al.* (1998) /20/ for *Adansonia digitata* leaves. The sodium (Na) contents of wild herbs were found to be lower than cultured herbs. The Na content in wild herbs was determined around 298.64-328.81 mg/100g ($P<0.05$). Results of Guerrero *et al.* (1998) /18/, Aletor *et al.* (2002) /17/ and Wallace *et al.* (1998) /16/, who studied mineral contents in different wild plants and leafy vegetables, have similar Na contents to those determined in this study. Phosphorus (P) and magnesium (Mg) contents of samples were around 220-550 mg/100g and there were significant differences among these values. P and Mg values determined by Aletor *et al.* (2002) /17/ and Wallace *et al.* (1998) /16/ are different from the present study. Similar results were found in vegetables, wild and leafy plants /18, 19, 20/. Generally, minerals from plant sources are less bioavailable than those from animal sources. The more important minerals involved in the building of rigid structures to support the body, i.e. Ca, P and Mg, were well furnished by the vegetable species studied. These three elements in appreciable amounts are essential for the proper formation of bones and teeth. For example, in Ca, 99% of the total amount (i.e. 1000-1200 g in adult) occurs in bones and teeth while about 600-700 g of P is also present in bones and teeth. The two elements, together with a much smaller quantity of Mg (20-80 g), form a crystal lattice, which is largely responsible for the rigidity and strength of bones and teeth /17, 22, 23/.

Minerals such as magnesium and iron are found in larger quantities in plants rather than animal products /23/. The highest iron (Fe) content was found in *Mentha* sp. with average 537.40 mg/kg dry wt and the lowest was found in *Allium* sp. with average 204.52 mg/kg dry wt and there were significant differences between Fe contents of herb samples ($P<0.05$). These are higher than those found by Glew *et al.* (1997) /19/, lower than those found by Dashak *et al.* (2001) /21/, Cook *et al.* (1998) /20/ and Aletor *et al.* (2002) /17/, and in agreement with those found by Guerrero *et al.* (1998) /18/ and Wallace *et al.* (1998) /16/. Copper (Cu), Zinc (Zn) and Manganese (Mn)

contents of samples were obtained around 13.53-30.13, 20.65-57.21 and 14.63-63.95 mg/kg dry wt, respectively ($P<0.05$). Cu and Zn values are agreement with those found by Wallace *et al.* (1998) /16/ and Cook *et al.* (1998) /20/, and different from those found by Glew *et al.* (1997) /19/, Dashak *et al.* (2001) /21/ and Aletor *et al.* (2002) /17/. Fe and Cu contents of herbs play an important role in the final quality of the products (cheese, lor and cacik) as well as their nutritional and biological role, when certain alternative reactions intervene. The presence of high Fe and Cu concentrations from adventitious contamination are damaging to product quality since in an ionized form, they catalyze oxidation reactions of the lipids with development of unusual flavors /24/.

The lowest and the highest contents of Cobalt (Co), Chromium (Cr) and Nickel (Ni) of herb samples were determined as 0.08-0.61, 0.24-1.01 and 0.30-2.46 mg/kg dry wt, respectively. These amounts are lower than those observed by Cook *et al.* (1998) /20/ and Dashak *et al.* (2001) /21/ for Cr content. Ni content is higher than those found by Wallace *et al.* (1998) /16/. Chromium content of most herb samples was determined below the level of 0.50 mg/kg dry wt, only one sample had chromium value 1.01 mg/kg dry wt (*Mentha* sp.). The lowest cadmium (Cd) content was determined in *Allium* sp. (0.19 mg/kg dry wt) and the highest was determined in *Anethum graveolens* (0.49 mg/kg dry wt). Turkdogan *et al.* (2002) /25/ studied heavy metals of vegetables and fruits grown in this region. Their Cd results were higher than in the present study. The cobalt, chromium, nickel and cadmium were found in similarly small percentages in all the herb samples analyzed.

In this study it was found that nitrogen, ash, Na, P, Cu, Zn, Mn, Ni and Cd contents of wild herbs (*Allium* sp. "sirmo", *Chaerophyllum* sp. "mendi" and *Prangos* sp. "helis") were lower than cultured herbs (*Anethum graveolens* "dill", *Mentha* sp. "mint" and *Petroselinum crispum* "parsley"). It was obvious that chemical compositions and mineral contents of herbs depend on factors such as type of soil, climate and genetic variety, etc.

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