PJN
ISSN 1680-5194

PAKISTAN JOURNAL OF NUTRITION

ANSInet
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan
Mob: +92 300 3008585, Fax: +92 41 8815544
E-mail: editorpjn@gmail.com

Pakistan Journal of Nutrition 11 (10): 916-918, 2012
ISSN 1680-5194

Comparative Studies of the Trace Elements Content of Some Herbal Tea Consumed in Jordan

Sati Y.A. Al-Dalain[1], Mohammad S. Abu-Darwish[2], Ahmad H. Al-Fraihat[3], Fawzi M. AL-Dabbas[2], Hammad K. AL-Dalin[1] and Khawla D. AL-Hamaidah[1]
[1]Department of Medical Support, Al Karak University College, Al-Balqa Applied University, AL-Karak, Jordan
[2]Department of Basic and Applied Sciences, Al-Shouback University College, Al-Balqa` Applied University, Jordan
[3]Department of Applied Science, Ajloun University College, Al-Balqa` Applied University, Ajloun, Jordan

Abstract: Six mineral and trace elements (Cd, Ni, Pb, Cu, Mn and Zn) were determined in the five Samples of herbal teas commercially available in Jordanian Pharmaceutical market, such as Sahha Fennel Tea (SFT), Sahha Chamomile Tea (SCT), Sahha Herbal Tea (SHT), Miltea Herbal Tea (MHT) and Miltea Chamomile Tea (MCT). The mineral and trace elements content of the studied samples showed a wide variability. Mn was not detectable in SFT and SCT. It was ranged from 1.73 ppb in MCT to 5.95 ppb in SHT. The highest Cu content was 1.956 ppb in SCT and the lowest value was 0.939 ppb in SHT. However, it was not detectable in SFT, MHT and MCT. Cd ranged from 6.86 to 26.25 ppb in MCT and SHT respectively. Maximum concentration of Ni was 47.68 ppb in SHT while the minimum was 6.55 ppb in MCT. On the other hand, Zn concentration was not detectable in all studied samples. The results of this study indicated that, the herbal teas that are consumed in Jordan did not contain toxic elements.

Key words: Dietary intake, herbal tea, medicinal herbs, mineral, trace elements

INTRODUCTION

Medicinal herbs and their preparations (hot and cold infusions, decoction, tinctures and teas) are widely used by human beings in the Mediterranean region as well as worldwide (WHO, 2002; Bashar *et al.*, 2006). A World Health Organization survey indicated that about 70-80% of the world population especially in developing countries rely on non-conventional medicine, mainly from herbal sources in their primary healthcare (Akerele, 1993). In Jordan herbal teas are widely used for prevention and treatment of illnesses. Many herbal teas have been habitually used not only for medicinal purposes, but also as beverages and tea such as chamomile, peppermint, hibiscus, oregano, thyme or their mixtures are the most commonly which could be purchased from all markets or offered in cafeterias. Medical doctors are also prescribing herbal teas and herbal extracts as a supplementary type of treatment in everyday problems caused by our modern civilization, for instance against stress or insomnia. The use of medicinal plants in both crude and prepared forms has greatly increased (Eisenberg *et al.*,1998; Yeh *et al.*, 2002).

Although herbal remedies are often perceived as being natural and safe, they are not always free from adverse effects (Ernst, 2000; Ernst, 2002). Therefore, the interest in chemical composition of medicinal herb products is growing (Rodushkin *et al.*, 1999) to evaluate their safety, efficacy and quality (WHO, 1991). Even though the enormous benefit of these herbs it may contain some components could be considered undesirable, dangerous and toxic, such as herbicides, pesticides, fungicides, insects, alfatoxins, micro-organisms, mycotoxins, heavy metals and undeclared constituents. Many of medicinal herbs can present a health risk due to the presence of toxic elements such as Pb, Cd, Al, Hg and Cr (Lekouch *et al.*, 2000; Ernst and Coon, 2001; Garvey *et al.*, 2001). Heavy metals, may contaminate different plants causing serious health hazards such as renal failure, symptoms of chronic toxicity and liver damage (Andrew *et al.*, 2003; Shaw *et al.*, 1997). Moreover, the concentration of heavy metals is one of the criteria that make raw plants admissible to the production of medicines (Lozak *et al.*, 2002). Many studies over the world was undertaken to determine the macro/micro-nutrient contents of medicinal herbs such as, Austria (Chizzola *et al.*, 2003), Egypt (Abou-Arab and Abou Donia, 2000; Abou-Arab *et al.*, 1999), USA and Jordan (El-Rjoob *et al.*, 2008).

The potential contamination of raw herbal products with toxic elements depends on many complex factors like species, cultivation, processing, harvesting time, level and duration of contaminant exposure, topography, geographical origin and their storage.

Growing pressure of regulatory bodies and consumer protection organizations extend the requirements for quality control monitoring of herbal medicines and their preparations. More information is required in order to

Corresponding Author: Sati Y.A. Al-Dalain, Department of Medical Support, Al Karak University College, Al-Balqa` Applied University, Jordan

Table 1: Concentration of elements in some herbal tea consumed in Jordan

Sample ID	Cd**	Ni	Pb	Cu	Mn	Zn
SFT	nd*	10.650±9.475	nd	nd	nd	nd
SCT	nd	nd	0.362±0.080	1.956±0.059	nd	nd
SHT	26.250±1.830	47.683±6.625	6.317±0.451	0.939±0.050	5.953±0.441	nd
MHT	nd	10.200±7.000	3.945±0.050	nd	2.716±0.302	nd
MCT	6.867±1.524	6.550±3.677	1.133±0.098	nd	1.730±0.234	nd
DL (µg/L)*	0.002	0.070	0.030	0.014	0.005	0.020

maximize consumers' safety (Ernst and Pittler, 2002). So, many of studies and researches should be carried out to verify, analyze, identify these herbs. This study was carried out to establish the levels of some trace element, (cadmium (Cd), nickel (Ni), lead (Pb), copper (Cu), manganese (Mn) and zinc (Zn)) in infant herbal teas that are widely and habitually consumed for medical purposes in infant and children nutrition in Jordan.

MATERIALS AND METHODS

The herbal tea samples were commercially available in Jordanian pharmaceutical market as granulated teas prepared from air dried and powdered medicinal herbs, Sahha Fennel Tea (SFT), Sahha Chamomile Tea (SCT), Sahha Herbal Tea (SHT) produced by Jordanian company Nutridar, Miltea Herbal Tea (MHT) and Miltea Chamomile Tea (MCT) are produce Milupa GmbH &CO/Germany. All samples were used as supplied by the manufacturer.

Analytical methods

Determination of heavy metals content: Heavy metals content of teas samples were analyzed using Atomic Absorption-Graphite Furnace (Shimadzu, Japan) (Al-Alawi and Mandiwana, 2007; Naidu *et al*., 1999) using Perkin Elmer Spectrophotometer Model:AAS300 Graphite furnace model:HGA800Autosampler Mode: AS-72. The samples were dried by oven at 70°C for 24 hrs until the dry weight was constant. The dried samples were then grinded and passed through a 0.2 mm plastic sieve. Then, 0.5 g of herbal tea of each sample was wet digested with an Ultra-pure nitric acid (HNO_3 (10-15 ml) in a polyethylene test tube using a heating block digestion unit at 120°C. The final solution was filtered into a 25 ml or 50 ml volumetric flask through a 45-µm filter paper and diluted to the mark with ultra-pure water. All reagents used in this study were of analytical grade. The samples were analyzed in triplicate and all the results obtained were statistically analyzed.

RESULTS AND DISCUSSION

The average results of the studied samples are shown in Table 1. The Relative Standard Deviation (RSD) are given below the mean values. In general, The RSD was less than 10%. In the present work, concentrations of six elements were determined in the herbal tea Samples Such as sahha fennel tea, sahha chamomile tea, sahha herbal tea, Miltea herbal tea and Miltea chamomile tea.

Table 2: Daily dietary intake of elements by a person weighing 70 kg

Elements	ADDIs mg/day
Mn	2.800
Zn	15.000
Cu	2.500
Ni	0.025
Pb	0.415
Cd	0.057

(Powell *et al*., 1998)

The accuracy and precision of the method was also tested in three replicate assays.

The concentrations of six elements determined in each of five herbal tea samples are collectively listed in Table 1. It was observed that all herbal tea samples contain significant values of elements and the element content in the herbal tea presented a wide variability. Mn in the studied samples varied in a wide range of 1.73-5.95 ppb. It was reported by Lozak *et al*. (2002) and Powell *et al*. (1998) that concentration of Mn is 188 mg/kg in mint Leaves. Mn was not detected in sahha fennel tea and sahha chamomile tea. Zn was not detected in all studied samples. The highest Cu content was found in sahha chamomile tea as 1.956 ppb and the lowest value was determined in sahha herbal tea as 0.939 ppb. On the other hand, Cu was not detected in sahha Fennel tea, Miltea herbal tea and Miltea chamomile tea. Cd was not detected in sahha Fennel tea, sahha chamomile tea and Miltea herbal tea samples. The highest Cd content was found in sahha herbal tea (26.25 ppb), while the lowest value was recorded in Miltea chamomile tea (6.867 ppb). Ni in sahha herbal tea was the maximum at 47.683 ppb, while it was the minimum at 6.55 ppb in Miltea chamomile tea. On the other hand, Ni varied from 10.20 ppb (MHT) to 10.65 ppb (SFT). Furthermore, Ni was not detected in SCT. Pb was not detected in sahha Fennel tea. Pb concentration of the herbal tea samples was in the range of 0.362-6.317 ppb, with the highest value of sahha herbal tea (6.317 ppb). The lowest value of Pb. Was in chamomile tea, followed by miltea chamomile tea (1.133 ppb) and miltea herbal tea (3.945 ppb). Fuh *et al*. (2003) determined Pb and Cd concentrations in 13 herbsin Tawan. Average Pb and Cd concentrations were 28.05 ppb and 1.11 ppb, respectively.

In order to discuss the contributions of the different herbal tea on the Average Daily Dietary Intake (ADDIs) for the studied elements Table 2 was given. When the intake values listed in Table 2 were compared with those given in Table 1 and depending on the metal levels of herbal tea, the studied herbal tea may be a good source of essential elements. However, consumption rate of the herbal teas should be under strict control. Toxic elements such as Pb and Cd either were in low concentration or not found in studied samples. From the above results it could be concluded that beverages of the herbal teas that are consumed in Jordan do not contain toxic elements. However, herbal teas may be contaminated easily during growing and processing. It is important to have a good quality control for herbal teas in order to protect consumers from contamination. In addition, purposed method is suitable to determine elements in herbal teas and is useful for routine control analysis of herbal tea samples because of its rapidity, sensitivity and versatility.

ACKNOWLEDGEMENT

I would like to express my deep appreciation for Al-Balqa` Applied University for the advice and support.

REFERENCES

Abou-Arab, A.A.K. and M.A. Abou Donia, 2000. Heavy metals in egyptian spices and medicinal plants and the effect of processing on their levels. J. Agric. Food Chem., 48: 2300-2304.

Abou-Arab, A.A.K., M.S. Kawther, M.E. El-Tantawy, R.I. Badeaa and N. Khayria, 1999. Quantity estimation of some contaminants in commonly used medicinal plants in the egyptian market. Food Chem., 67: 357-363.

Akerele, O., 1993. Nature's medicinal bounty: Don't throw it away, World Health Forum., 14: 390-395.

Al-Alawi, M.M. and K.L. Mandiwana, 2007. The use of aleppo pine needles as a bio-monitor of heavy metals in the atmosphere. J. Hazard. Mater., 148: 43-46.

Andrew, A.S., A.J. Warren, A. Barchowsky, K.A. Temple, L. Klei, N.V. Soucy, K.A.O. Hara and J.W. Hamilton, 2003. Genomic and proteomic profiling of responses to toxic metals in human lung cells. Environ. Health Perspec., 111: 825.

Bashar, S., G.A.H. Abu-Hijleh and O. Said, 2006. Safety of traditional arab herbal medicine. Evid.-Based Complement Alternat. Med., 3: 433-439.

Chizzola, R., H. Michitsch and C.H. Franz, 2003. Monitoring of metallic micronutrients and heavy metals in herbs, species and medicinal plants from Austria. Eur. J. Food Res. Technol., 216: 407-411.

Eisenberg, D.M., R.B. Davis, S.L. Ettner, S. Appel, S. Wilkey, M.V. Rompay and R.C. Kessler, 1998. Trends in alternative medicine use in the United States: Results of a follow-up national survey. J. Am. Med. Assoc., 280: 1569.

El-Rjoob, A.O., A.M. Massadeh and M.N. Omari, 2008. Evaluation of Pb, Cu, Zn, Cd, Ni and Fe levels in *Rosmarinus officinalis* labaiatae (Rosemary) medicinal plant and soils in selected zones in Jordan. Environ. Monit. Assess., 140: 61-68.

Ernst, E., 2000. Heavy metals in traditional Indian remedies. Eur. J. Clin. Pharmacol., 57: 891-896.

Ernst, E., 2002. Toxic Heavy metals and undeclared drugs in Asian herbal medicines. Trends Pharmacol. Sci., 23: 136-139.

Ernst, E. and J.T. Coon, 2001. Heavy metals in traditional Chinese medicines: A systematic review. Clin. Pharmacol. Therap., 70: 497-504.

Ernst, E. and M.H. Pittler, 2002. Risks associated with herbal medicinal products. Wiener Medizinische Wochenschrift, 152: 183-189.

Fuh, C., H. Lin and H. Tsai, 2003. Determination of lead, cadmium, chromium and arsenic in 13 herbs of tocolysis formulation using atomic absorption spectrometry. J. Food Drug Anal., 11: 39-45.

Garvey, G.J., G. Hahn, R.V. Lee and R.D. Harbison, 2001. Heavy metal hazards of asian traditional remedies. Int. J. Environ. Health Res., 11: 63-71.

Lekouch, N., A. Sedk, A. Nejmeddine and S. Gamon, 2000. Lead and traditional moroccan pharmacopoeiu. Sci. Total Environ., 280: 39-43.

Lozak, A., K. Soltyk, P. Ostapczuk and Z. Fijalek, 2002. Determination of selected trace elments in herbs and their infusions. Sci. Total. Environ, 289: 33-40.

Naidu, G.R.K., H.O. Denschalg, E. Mauerhofer, N. Porte and T. Balaj, 1999. Determination of macro, micro nutrient and trace element concentrations in indian medicinal and vegetable leaves using instrumental neutron activation analysis. Food Chem., 50: 947-953.

Powell, J.J., T.J. Burden and R.P.H. Thompson, 1998. *In vitro* mineral availability from digested tea: A rich dietary source of manganese. J. Anal., 123: 1721-1724.

Rodushkin, I., T. Ruth and A. Huhtasaari, 1999. Comparison of two digestion methods for elemental determinations in plant material by ICP techniques. Anal. Chem. Acta., 378: 191-200.

Shaw, D., C. Leon, S. Kolev and V. Murray, 1997. Traditional remedies and food supplements. A 5-year toxicological study (1991-1995). Drug Safety, 17: 342.

WHO, 1991. Guidelines for the assessment of herbal medicines, World Health Organization.

WHO, 2002. Drug information: Herbal medicines, World Health Organization, 16.

Yeh, G.Y., D.M. Eisenberg, R.B. Davis and R.S. Phillips, 2002. Use of complementary and alternative medicine among persons with diabetes mellitus: Results of a national survey. Am. J. Pub. Health, 92: 1648.