REPORT

Nutrient evaluation and elemental analysis of four selected medicinal plants of soon valley Khushab, Punjab, Pakistan

Abdul Ghani, Zulfiqar Ali, Tahir Islam, Samreen Sanaullah and Sadia Saeed
Department of Biological Sciences, University of Sargodha

Abstract: To check the nutritional and mineral contents of four medicinal plants viz., *Peganum hermla, Solanum nigrum, Mentha longifolia, Achryanthus aspera,* which are used as medicine traditionally in Soon Valley Khushab, Pakistan. Proximate analysis of plant sample determined that protein (7.491%) and ash (22.79%) was highest in *Mentha longifolia,* carbohydrate (75.23%) in *Peganum hermla,* fats (12.595%) and moisture (6.82%) was highest in *Achryanthus aspera*. In comparative assessment of the various species, the results showed that *Achryanthus aspera*. is the most significant species having higher concentrations of fat, fibre values compared to the other species. Absorption Spectrometric method was used for the elemental analysis of essential elements such as Fe, Cd, Cu,Mn, Pb, Cr, Ni and Na in medicinal plants in different range.

Keywords: Nutrients, Elemental, Evaluation, Medicinal Plants, Soon valley khushab

INTRODUCTION

For primary health care needs, world 80% population relies mainly on plant based traditional medicines because according to them, medicinal plants are natural or near to nature are always safe. The important values of some plants have long been published but a large number of them remain unexplored as yet. So there is a necessity to explore their uses and to conduct pharmacognostic and pharmacological studies to ascertain their therapeutic properties.

In Pakistan, more than 1,000 medicinal plant species have been reported to have therapeutic properties and medicinal values which are used against many diseases (Latif *et al*., 2004; Mushtaq *et al*., 2009). In Pakistan, 60% of the population, especially in villages is getting health care by Hakims, who use these herbal medicines to cure many diseases (Haq, 1983). Each medicinal plant species has its own nutritional composition. These nutrients include carbohydrates, fats and protein and play an important role in satisfying human needs for energy and life process (Hoffman *et al.,* 1998. Shinwari *et al*., 2006) reported that more than 1000 plants species have medicinal values. These medicinal plants are used by the marginal communities to cure various diseases (Latif *et al*., 2004; Adnan and Holscher, 2010).

For proximate and nutrient analysis, *Peganum hermala, Solanum nigrum, Mentha longifolia* and *Achyranthus aspera* were collected.Important macronutrients such as nitrogen and potassium play an important role in soil with low moisture content. They compensate the effect of drought and increased dry matter production of some fodder species such as maize and sorghum (Mirza *et al*, 1998).

According to the WHO, 80% of the world's people rely on traditional medicine for their primary health care needs. There are considerable benefits in the use of medicinal plants for the treatment of various diseases (Azaizeh *et al*., 2003).

Lovkova *et al*., 2001) examined the chemical features of medicinal plants and reviewed the data on chemical composition related to the synthesis of physiological active substances and to the accumulation of individual elements. Chemical features of medicinal plants serve as determination of their species specificity and pharmacological properties and enable their wide use medicinal practices. *Poganum hermla* belonging to the Family Nitriaceae is a perennial herb frequently woody whose flowers are dioecious (Hussein M. Alwadie, (2005).

Mentha longifolia is a medicinal plant which is used for anti-rheumatic, stomachic, carminative, tonsillitis, diarrhea and dysentery belonging to the family Lamiaceae. The parts of the plant that are mostly used are the leaves, but sometimes the stems and rhizomes are used in traditional potions (van Wyk *et al.,* 1997). Medicinally, milk or water decoctions of wild mint are mainly used for coughs, colds, asthma (Watt and Breyer-Brandwijk, 1962). Decoctions have also been used to treat headaches, fevers, indigestion, flatulence, hysteria, painful menstruation, delayed pregnancy and urinary tract

**Corresponding author:* e-mail: Ghaniuaf8@gmail.com

infections (van Wyk *et al.*, 1997). *Mentha longifolia* is used to treat colds, stomach cramps, asthma, flatulence, indigestion, muscle spasm, whooping cough, hemorrhoids and skin ulcer. It is also used for the cure of rheumatism and other painful infections (Babu *et al*., 2002).

The frequently used parts of *Mentha* spp. are Leaves, flowers and stems in herbal medicines and also used in many foods for its aroma or as in commercial spice (Kothari and Singh, 1995; Moreno *et al.*, 2002). The essential oil extracted from *M. longifolia* showed a strong antimicrobial activity against 30 microorganisms including Gram-positive and Gram-negative bacteria yeast (*Candida albicans*) and fungi Gulluce *et al*. (2007).

Achyranthus aspera is a perennial herb belonging to the family Amaranthaceae. The biological activities such as antiglycation, antiplatelet, cytotoxicity and phytotoxicity was showed by the various crude fractions of this plant (Hussain *et al*., 2010). *Peganum hermla* is diuretic and demulcent, effective in lithiasis, haedache and removes inflammation.

The nutritional significance can be assessed by proximate and nutrient analysis of edible fruit and vegetables which plays a crucial role in assessing their nutritional significance. The worth of these plants species can evaluate their nutritional significance, as many of these medicinal plant species are also used as food along with their medicinal benefits. For this purpose, four medicinal plants species were analyzed to evaluate their nutritional value and mineral contents.

MATERIALS AND METHODS

Plants collection & Sample preparation

Four plant species were collected from soon valley Khushab and its vicinities. Herbarium sheets were prepared of these plants. These plants were identified and classified by a plant taxonomist of Department of Biological Sciences, University of Sargodha. For 10 days these plants were dried in air and then ground into a very fine powder and stored in air tight plastic bags for further analysis.

Proximate analysis

For proximate analysis of the samples for moisture, total ash, crude fiber, crude fats, proteins and carbohydrates AOAC methods were applied (Anonymous 1990). Weight difference method was used for the moisture and ash (Haro *et al*., 1968; Boussama *et al*., 1999 and Das *et al*., 1997). The micro Kjeldahl method was used for determination of proteins in which digestions, distillation and titration of the sample is done (Pearson, 1976). The value of nitrogen was converted to protein by multiplying to a factor of 6.25. The solvent extraction method was used for lipid content of the samples. The petroleum ether (boiling range 40-60ºC) solvent was used (The total carbohydrates were determined by difference method [100-(proteins+ fats+ moisture +ash in percentage)] (Muller *et al*., 1980). All the proximate values were reported in percentage (Hussain *et al*., 2009a, b and 2010a, b).

Macro and micronutrient analysis

Atomic Absorption Spectrometer (Perkin Elmer AA Analyst 700) was used for the elemental contents including Mn, Cu, Pb, Cr, Fe, Cd, Na and Mg of the four selected medicinal plant species. The results were obtained while using a working standard of 1000 ppm for each of the species (Hussain *et al*., 2009a, b and 2010 a, b).

RESULTS

The proximate analysis of these plants shows different concentrations/proportions of biochemical's and other contents. After drying, it was found that the all species had different moisture contents. It was observed that the overall percentage of moisture contents was found highest in *Achyranthus aspera* (6.82) followed by, *Peganum hermala* (6.20%), *Solanum nigrum* (5.97%) and *Mentha longifolia* (2.60%). while in case of ash contents, it was highest in *Mentha longifolia* (12.39%) and *Achyranthus aspera* The lowest value of ash was found in *Peganum hermala* (6.40%) (table 1).

According to the results *Mentha longifolia* and *Solanum nigrum* had highest values of protein (7.491%), (6.20%) *respectively.* while rest of the two plant species had minor values. From carbohydrate analysis, *Peganum hermla* and *Mentha longifolia* had highest levels compared to other species (75.23), (55.12) *respectively* (table 1).

The proximate analysis of the protein contents in the selected four medicinal plant species, showed that *Mentha longifolia and Peganum hermla* had highest concentration of protein (7.491%) and (4.57%) as compared to other species (table During analysis, fat contents was observed highest in (*12.29%)* followed by *Solanum nigrum* (5.34%) and *Mentha longifolia* (2.34%) (table 1)

The results obtained from the fibre analysis showed that, *Peganum hermla had* higher concentration of fibre (16.34%) and *Mentha longifolia had* (11.29%). This was followed by the *Solanum nigrum* in which its value was found (8.49%). The lowest value of fibre was present in *Achyranthus aspera* (7.84%) table 1).

Disscussion

The result of the following study agrees with earlier study of elemental distribution in medicinal plant species as reported by Kim et al. (1994). The result of the present study shows a high level of macro elements accumulation

Table 1: Proximate analysis of four selected medicinal plants species

Species name	Moisture%	Ash %	Protein %	Fat%	Carbohydrates%	Fibre %
Peganum hermala	6.20±0.01	3.68±0.002	4.57±0.02	1.60±0.01	75.23±0.03	16.34±0.02
Mentha longifolia	2.60±0.02	22.39±0.02	7.491±0.02	2.34±0.02	55.12±0.04	11.29±0.03
Solanum nigrum	5.97±0.07	6.40±0.015	6.20±0.03	5.34±0.02	70.29±0.07	8.49±0.02
Acrynthus aspera	6.82±0.06	10.11±0.03	4.19±0.04	12.29±0.03	41.34±0.11	7.84±0.01

Table 2: Elemental analysis of four selected medicinal plants species

Species name	Cu (ppm)	Mn (ppm)	Pb (ppm)	Cd (ppm)	Fe (ppm)	Cr (ppm)	Ni (ppm)	Na (ppm)
Peganum hermala	3±0.002	29±0.003	1.97	0.67±0.002	15.6±0.03	40.0±0.04	23±0.03	71.0±0.05
Mentha longifolia	6±0.004	42±0.001	9±0.03	0.70±0.003	53.4±0.05	39.0±0.05	22±0.005	29.9±0.9
Solanum nigrum	7±0.003	31±0.005	13±0.01	0.35±0.001	42.0±0.03	45.0±0.002	30.0±0.3	32.5±0.06
Achryanthus aspera	8±0.004	43.0±0.002	8±0.02	0.69±0.003	34.5±0.09	51.0±0.2	23.0±0.003	27.6±0.3

in the sampled plants except in very few cases the mean concentration is very low. It is important to emphasize that the best benefit to human health depends some plants species used in homeopathic system has been traced to presence of Ca, Cr, Fe, Mf, Ca , K and Zm in plants (Perman et al. 1993) Elements equally contribute to to neurochemical transmission which are food constituents of biological molecules.

Elemental analysis

The mineral composition results of the four medicinal plants show that these plants contains rich source of mineral elements, this result become so important when the usefulness of such mineral like Ca, Mg, P, K and Na in the body are considered. However, the lower Na content (0.1 g) is an added advantage because of the direct relationship of sodium intake with hypertension in human (Dahl, 1972). The elemental analysis of the medicinal plant species showed significant variation among different elements (table 2). In case of Fe, it was found that the *Mentha longifolia* had the highest Fe contents (53.4ppm), followed by the *Solanum nigrum* (420ppm), *Achryanthus aspera* (34.5 ppm) and *Peganum hermala* (15.6ppm). Higher concentration level of Cu was present in *Achryanthus aspera* (8ppm) and the lowest value was found in *Peganum hermla* (3ppm). The analysis of Cr concentration showed, that *Achryanthus aspera* had the highest value (51.0 ppm) and the lowest value of Cr was found in *Mentha longifolia* (39 ppm). The concentration of Na was highest in *Solanum nigrum* (32.5ppm) and the lowest was present in *Peganum hermla* (71ppm). Mn was higher in *Achryanthus aspera* (43 ppm) and the lowest value was found in *Peganum hermla* (29ppm). It was found that highest amount of Cd was present in *Mentha longifolia* (0.70 ppm) and *Solanum nigrum* had the lowest value of Cd (0.35ppm). In case of Pb concentration, *Solanum nigrum* had the highest level of Pb (13ppm) and *the Peganum hermla* had the lowest value (1.97 ppm). In case of Ni, the maximum value of Ni was observed in *Solanum nigrum* (30ppm) and *Mentha longifolia* had the minimum concentration of Ni (22ppm).

CONCLUSION

In recent years, use of medicinal plants and conservation has taken considerable amount of importance. It was used globally by the indigenous and marginal communities for curing various diseases. These medicinal plant species are mostly used as food supplement along with its oral decoctions. However, little have been done so far to verify the uses in this regard. The present research is an effort in doing so.

Our current study on nutritional evaluation of *Peganum hermala*, *Solanum nigrum*, *Mentha longifolia* and *Achryanthus aspera* have revealed that these plants are good source of nutrients (moisture, ash, proteins, fats, carbohydrates, fiber and minerals) and can be used as substrates deficit in either of these nutrients.

REFERENCES

Azaizeh H, Fulder S, Khali l K and Said O (2003). Ethnomedicinal knowledge of local Arab practionersin the Middle East Region. *Fitoterpia*, **74**: 98-08

Boussama N, Ouariti O, Suzuki A and Ghorbal MH (1999). Cd-stress on nitrogen assimilation. *J. Plant Physiol.*, **155**: 310-317.

Das P, Samantaray S and Rout GR (1997). Studies on cadmium toxicity in plants: A Review, Environ. *Pollut.*, **98**: 29-36.

Gulluce M, Sahin F, Sokmen M, Ozer H, Daferera D, Sokmen A, Polissiou M, Adiguzel A and Ozkan H (2007). Antimicrobial and antioxidant properties of the

essential oils and methanol extract from *Mentha longifolia* L. ssp. *longifolia*. *Food Chemistry,* **103**: 1449-1456.

Haq I (1983). Medicinal plants. Hamdard Foundation Press, Pakistan.

Haro RT, A Furst and HL Falk (1968). Studies on the acute toxicity of nickelocene. *Proc. West. Pharmocol. Soc.,* **11**: 39-42.

Hoffman PC, Combs DK and Casle MD (1998). Performance lactating dairy cows fed Alfalfa silage or perinneal rye grass silage. *J. Dairy Sci.,* **81**: 162-168

Hussain J, Khan AL, Rehman N, Hamayun M, Shah T, Nisar M, Bano T, Shinwari ZK and Lee IJ (2009b). Proximate and nutrient analysis of selected vegetable species: A case study of karak region Pakistan. *African J. Biotechnol*., **8**(12): 2725-2729.

Hussain J, Khan AL, Rehman N, Zainullah ST Hussain, Khan F and Shinwari ZK (2009a). Proximate and nutrient analysis of selected medicinal plant species of Pakistan. *Pakistan J. Nut*., **8**(1): 620 -624.

Hussain J, Rehman N, Khan AL, Hamayun M, Hussain SM and Shinwari ZK (2010b). "Proximate and Nutrients Evaluation of Selected Vegetables Species from Kohat Region Pakistan" Pakistan. *Pak. J. Bot*., **42**(4): 2847-2855.

Hussain J, Riazullah, Rehman N, Khan AL, Z Muhammad, Farmanullah and ST Hussain (2010a). Endogenous transitional metal and proximate analysis of selected medicinal plants from Pakistan. *J. Med. Plant Res.,* **4**(3): 267-270.

Kothari SK and Singh UB (1995). The effect of row spacing and nitrogen fertilization on scotch spearmint (*Mentha gracilis* Sole). *JEOR*, **7**: 287-297.Kim BY,Kim KS,Lee 1S,Yoo SH(1994).Survey on the natural content of heavy metal in medicinal herbs and their cultivated soils in Korea,RDA 1,Agric.Sci.Soil Fen. 36(2):310-320.

Latif A, Ahmead H, Begum S, Adnan M, Hussain S and Waseem M (2004). Medicinal and other economic plants as subtitiutre to forest logging in miandam and Sulatanr valleys, Swat. Proceeding of International Workshop on Conservation and Sustainable Use of Medicinal and Aromatic Plants in Pakistan, WWF-Pak., 101-105.

Moreno L, Bello R, Primo-Yufera E and Esplugues J (2002). Pharmacological properties of the methanol extract from *Mentha suaveolens* Ehrh. *Phytotherapy Research*, **16**: 10-13.

Perman VS,Gupita AK,Jha HN (1993).Metal contents accumulation in some herbal drug. *Pharmaceut. Biol.* **39**(5):384-387.

Pronob Gogoi and Islam M (2012). Ethnomedicinal Study of *Solanum Nigrum* L and *S. Myriacanthus* Dunal used by Tribals and Non-Tribals from Districts of Upper Assam, India. *Asian J. Exp. Biol. Sci.,* 73-81.

Shinwari ZK, Watanabe P, Rehman M and Youshikawa T (2006). A pictorial guide to medicinal plants of Pakistan. (KUST) Kohat University of Science & Technology, Pakistan, p.247.

Mirza Bb, MS Zia, MT Rashid, M Aslam, M Salim and MB Tahir (1998). Sorghum growth and chemical composition as influenced by potassium fertilization and moisture regiumes. *Pak. J. Soil Sci.,* **15**: 48-88

MYa Lovkova, GN Buzuk, SM Sokolova and NI Kliment' eva (2001). Chemical features of medicinal plants. (Appl. Biochem. Microbiol) *Applied Biochemistry and Microbiology,* **37**: 229-237.

Van Wyk B-E, Van Oudtshoorn B and Gericke N (1997). Medicinal plants of South Africa, 1st Ed, Brizza Publications, Pretoria, p 138.

Watt JM and Breyer-Brandwijk MG (1962). The Medicinal and Poisonous Plants of Southern and Eastern Africa, 2nd ed. Livingstone, London, p.6.

Adnan M and Holscher D (2010). Medicinal plant abundance on degraded and reforested sites in North-west Pakistan. *J. Mt. Res. Dev.,* DOI: 10.1659/mrd-journal-d-09-00017.1.