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Nutritional analysis and nutrients composition of various parts of *Sageretia thea* (Osbeck)

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Abstract

Proximate composition and elemental analysis of *Sageretia thea* (Osbeck) M.C.Johnston were carried out to assess the nutrient contents and elemental composition of various parts. Proximate analysis (total protein, fats, carbohydrate, ash, and moisture contents) were carried out following methods of (AOAC). Macronutrients (Ca, Mg, Na, K) and micronutrients (Zn, Cu, Pb, Cd, Ni,Co,) were analyzed using atomic absorption spectrometry. The results revealed high amount of salts were present in all the three parts as compared to heavy metals.

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Introduction

Plants not only provide energy, but at the same also supply nutrients to the consumers including man. Nutrients are essential for normal body functioning (Clemens 2004). Medicinal plants is a rich source of organic and inorganic compounds, and most of medicins contain one or more individual elements, therefore provide therapeutic action of the medicine (Singh, 1996). Each medicinal plant has its own elemental composition and having pharmacologically important phytoconstituents (Hoffman 1998; Dingman, 2002). The screening of the actual bioactive elements of plants origin and assessment of elemental composition of the widely used medicinal plants is highly essentials (Saiki, 1990). In human metabolic reaction macro, micro and trace elements play important role. Trace elements play a combating role in curing of various diseases. In medicinal plants these elements form active compound which responsible for both their medicinal and toxic properties (Rajurkar and Damame. 1998). Some medicinal plant has toxic elements such as Pb, Cd, which are toxic for health (Garcia 2000; Lekouch 2001: Lo´pez 2000).

Proximate and nutritional analysis of medicinal plants plays important role in assessing their nutritional significance. Evaluating the nutritional significant of medicinal plants help to understand the medicinal use of that plants (Pandey 2006). All of these nutrients like carbohydrate, fats, protein, lipids etc are important for physiological function of human body. The quality and quantity of protein in the seed are important factors in the selection of plants for nutritive value and plant improvement programs (Siddique, 1998).The studies related with therapeutic plants aim to characterize the active components of plants for its therapeutic properties (Naidu 1999: Ferreira 2003).

Previous studies have determined some elements in many species of medicinal plants like Obiajunwa (2002) carried out the energy-dispersive X-ray fluorescence (EDXRF) spectroscopy of twenty Nigerian medicinal plants, Zhang (2011) studied the elemental composition of *P. polyphylla* var. *yunnanensis,* Khattak 2011 reported heavy trace metals in various medicinal plants collected from various localities of Pakistan and Khuder (2009) reported that X-ray fluorescence (XRF) and total-reflection X-ray fluorescence (TXRF) techniques for the detection of various heavy metals and trace elements in some Syrian medicinal plant species, Zhang *et al.,* 2011 carried out the elemental analysis of *P. polyphylla* var. *yunnanensis* and conclude that the contents of the most determined elements in *P. polyphylla* var. *yunnanensis* is different from other medicinal species in genus *Paris*, similarly Fatima *et al.*, 2013 carried out elemental analysis of *Anethum gravedlens*, *SismbriumIrio* Linn and *Veronia Anthelmintica* seeds by instrumental neutron activation analysis.

So in the present work was undertaken to evaluate the macro and micro elements concentrations and nutritional analysis of leaf, stem and root of *sageretia thea.*

Materials and methods

Collection of medicinal plant

The studied was carried out on *Sageretia thea* collected from Dir, Pakistan. Surface contamination was removed by washing the plant with distilled water. The leaves, stem and root were separate from the plant and shade dry. All of the three parts were ground by electric grinder and convert it into fine powdered. The powder were then weight and used for atomic absorption spectroscopy and nutritional analysis.

Sampling

Each sample in powdered form were weighed and digested in a 5: 1:0.5 mixtures of nitric acid for 24 hours and then add perchloric acids for three hours. The solution was heated till the appearance of white fumes and then filtered. The entire filtrate was diluted suitably with distilled water by following (khan 2011). The dilute filtrate solution was used for elemental analysis.

Atomic absorption spectroscopy measurements (AAS)

Macro and micronutrients were determined using Perkin Elmer; Analyst 700, single beam atomic absorption spectrometer and the data was obtained in parts per million (ppm), (1ppm=1mg/kg). Calibration curve was established using working standards of 1000 ppm for each element. Laboratory procedures for the determination of macro and micronutrients were used as outlined by Shah (2009) for plant samples.

Proximate analysis

Proximate analysis of the each samples for moisture, total ash, fiber, fats, proteins and carbohydrates were determined by following AOAC methods (Anonymous, 1990). The moisture and ash were determined using weight difference method (Haro 1968; Boussama 1999 and Das 1997). The determination of proteins in terms of nitrogen was done by micro Kjeldahl method involving digestions, distillation and finally titration of the sample (Pearson, 1976). The nitrogen value was converted to protein by multiplying to a factor of 6.25. The lipid content of the samples was done using Soxhlet type of the direct solvent extraction method. The solvent used was petroleum ether (Folch 1957). The fiber was also determined by the method described by (Haro 1968, Boussama 1999). The total carbohydrates were determined by difference method [100 - (proteins + fats + moisture + ash in percentage)] (Muller 1980), while the energy values were determined by using the following formula,

K calories /100 g = 9 (crude fats (%)) + 4 (carbohydrate (%) + protein (%)).

All the proximate values were calculated in percentage (AOCS, 2000: Okwu 2004).

Statistical analysis

Data obtained was statistically analyze using statistical package i.e., Cohort V-6.1 (Co-stat-2003). Each experiment was repeated three times and values expressed are means ± standard deviation.

Results and discussion

Nutritional analysis

In current results the moisture content was 11.9% in leaf, 8.3% in stem and 9.7% in root. Ash was 4.07% in leaf 6.3% in stem and 5.8% in root. Crude fibers were 16.4 % in leaf, 19.8% in stem and 17.1% in root. Fats in leaf were 8.4%, in stem was 3.8% and in root was 7.0%. The protein was 20.0% in leaf, 16.2% in stem and 10.6% in root. Carbohydrate was 55.63% in leaf while 65.35% in stem and 66.87% in root. The highest energy values were recorded in leaf (378.12 Kcal/100 g) which was followed by stem (360.6 Kcal/100 g) and root (373 Kcal/100 g) showed in (table. 1). The results revealed that the plant was good source of carbohydrate and to some extent protein and fibers. The bi-variable correlation co-efficient simply calculated by using the average for a replication of three observations and created a relationship between significance and non significance values. The correlation exhibited that there is a strong correlation between fats and energy level (0.999 Kcal/100 g) and it can observe that a species havening high fats contents will also have high energy value, but a negative correlation also exist between fibers and energy level (-0.995 Kcal/100 g) (table 2). Some other workers also detected proximate analysis of various medicinal plants like Read (1946) reported fat, tannin, sugar, pectin and cellulose in *Persicaria maculosa*, Duke & Ayensu (1985) reported water, protein, fat, carbohydrate, ash and fiber in *Polygonum bistorta,* Irvine (1952) reported carbohydrate, ash and fat in *Polygonum hydropiper,* Khodzhaeva (2002) reported the concentration of lipids, proteins, flavonoids and carbohydrates in the aerial part of the *Rumex confertus*, Gupta (1962) reported protein, fat, carbohydrate, ash and water in *Chenopodium album*. The author stated that root and stem of *S. thea* contained high amount of carbohydrate concentration while leaf contain high amount of protein, fat and moisture. Stem contained high concentration of crude fibers and ash.

Elemental analysis

Deficiency of vital and trace elements in human can occur even under the most practical dietary

conditions and in many diseased statuses. About 40 different types of elements have been detected in plants and animals all of these elements play a combating role against various diseases. In human being the deficiency of Ca cause tooth decay, hypertension, paralysis and increase cholesterol level (Soetan, 2010).

Table 1. Proximate analysis of leaf, stem and root of *Sageretia thea*.

Parts	Carbohydrate %	Protein %	Fats %	Fibers %	Ash %	Moisture%	Energy value (Kcal/100g)
Leaf	55.63	20.00	8.4	16.4	4.07	11.9	378.12
Stem	65.35	16.25	3.8	19.8	6.3	8.3	360.6
Root	66.87	10.63	7.0	17.1	5.8	9.7	373

Table 2. Correlation coefficients among various proximate parameters.

	Carbohydrate	Protein	Fats	Fibers	Ash	Moisture	Energy value
Carbohydrate	1						
Protein	-0.871	1					
Fats	-0.644	0.185	1				
Fibers	0.560	-0.081	-0.994	1			
Ash	0.942	-0.657	-0.862	0.804	1		
Moisture	-0.867	0.511	0.939	-0.898	-0.983	1	
Energy value	-0.634	0.172	0.999*	-0.995	-0.855	0.934	1

Table 3. Elemental analysis of leaf, stem and root of *Sageretia thea*.

Part	Macro-elements								Micro-elements											
	Na		Mg		K		Ca		Zn		Pb		Cu		Cd		Co		Ni	
	Mean (mg/L)	SD	Mean (mg/L)	SD	Mean (mg/L)	SD	Mean (mg/L)	SD	Mean (mg/L)	SD	Mean (mg/L)	SD	Mean (mg/L)	SD	Mean (mg/L)	SD	Mean (mg/L)	SD	Mean (mg/L)	SD
Root	27.19	4.30	16.41	0.73	27.29	1.04	121.41	5.28	0.097	0.0038	0.064	0.004	0.012	0.0014	0.005	0.0035	0.015	0.0187	1.023	0.0487
Stem	34.71	4.19	11.59	0.57	26.51	1.21	109.96	3.26	0.159	0.0022	0.088	0.0103	0.025	0.0011	0.088	0.0103	0.016	0.0027	1.015	0.0204
Leaves	23.44	3.10	12.81	0.83	27.07	1.53	96.57	2.83	0.190	0.0030	0.102	0.0372	0.042	0.0025	0.028	0.0079	0.078	0.0073	1.052	0.0130

The deficiency of Mg causes semi coma, diabetes mellitus and neurological disturbances (Ahmed and Chaudhary, 2009). For protein and carbohydrate metabolism K is an important element. In current results elemental analysis showed that Na was present in all of the three parts, the highest concentration was found in stem which is then followed by root and leaf (table 3). Mg was observed in a range of 16.41mg/L to 11.59mg/L. Leaf and root have the same concentration of K while stem have low concentration. From (figure. 1) it is cleared that the highest concentration of Ca was recorded in root which is then followed by stem and leaf. Similarly (figure. 2) also showed that like macro elements the microelements were also found in low and high concentration in all of these three parts. Zn, Pb and Cu were present in high concentration in leaf which is then followed by stem and root. Cd was higher in stem low in root and moderate in stem while Co and Ni both were higher in leaf while low concentration was found in root and stem respectively as shown in (Table 2). Many other researchers also screened out some medicinal plants for proximate analysis like (Sodipo, 2008) carried out the elemental analysis of *Solanum macrocarpum* Linn and reported the presence of S, Na, K, Fe, Mg, Zn, Ca, Cu, Mn, P, As and Cr in various part of the plant. Adnan 2010 assess the elemental property of humid and sub-humid regions of North-west Pakistan and reported some macro and micro elements in these regions.

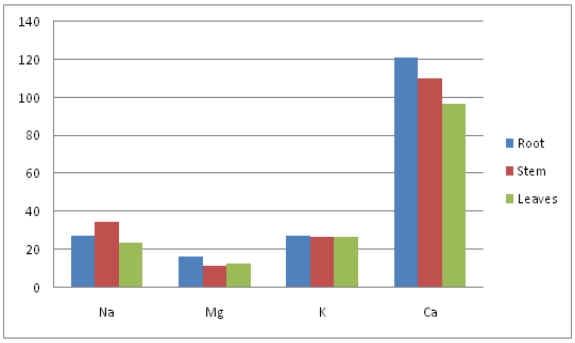

Fig. 1. Macro elemental analysis of leaf, stem and root of *Sageretia thea*.

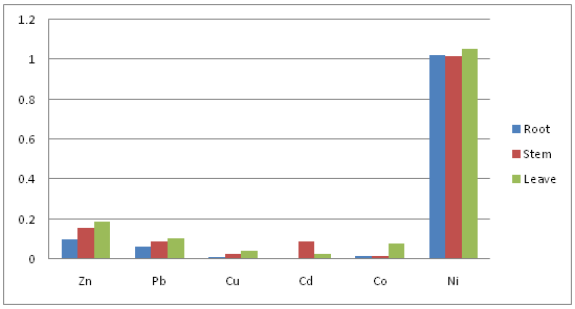

Fig. 2. Microlemental analysis of leaf, stem and root of *Sageretia thea*.

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