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Preliminarily Investigation on Nutritional Properties of *Artemesia maritime* Linn.

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Abstract

Wild plants play a vital role in the health security of Himalayan inhabitants and constitute significantly to their diet. In this report we investigated the nutritional composition of *Artemissia maritime* growing at high altitudes in the Himalayas. Aerial parts of the species showed the maximum amount of Vitamin C (228.09 mg/100g), followed by phenolics (196.70 mg/100g) and total carbohydrate (46.93 mg/100g). The calorific value was approximately 254.91 mg/100g in dry aerial parts of the species. As far as the nutritional composition is concerned, potassium content (1753.53 mg/100g) was highest as compared to nitrogen (1366.24 mg/100g) and calcium (213.9 (mg/100 g) content, respectively.

Key Words: Medicinal plants, Himalaya, mineral composition, *Artemesia maritime*.

Introduction

The Indian Himalayan Region (IHR) is well known for its unique biodiversity which is being utilized by local inhabitants for various purposes, i.e. medicine, fuel, fodder, timber, etc. (Samant and Dhar, 1997; Samant et al, 1998). The harsh climatic conditions at high altitudes in the Himalayan region affects agricultural practices, resulting in low yields. Therefore, local communities have diversified their activities in other sources like collection and sale of medicinal plants, wild edibles, woolen, handicrafts items, etc. (Kala, 1998). Among the latter, medicinal plants have found place in traditional as well as modern healthcare systems. Recent research has highlighted the need for screening of nutritional properties of plants as they contain all the necessary mineral/nutrients which play a vital role in daily human diet. The information about mineral composition of most of the Himalayan plants is fragmentary or completely lacking. This lack of knowledge probably hinders the widespread commercial acceptance of the species.

Artemesia maritime Linn. (Family Asteraceae) is an aromatic perennial herb, distributed in the western Himalaya from Kashmir, Himachal Pradesh and Uttarakhand at an altitude of 2300-3000 m asl (Anonymous 1985). The species is used by Himalayan people in diverse ways. For example, leaves and flowering shoots are used as anthelmintic, antiseptic, antispasmodic, carminative, cholagogue, emmenagogue, febrifuge, stimulant, stomachic, tonic and vermifuge (Grieve 1984; Singh and Kachroo 1976). Dried root powder is used in treatment of epilepsy (Bhattacharjee 2001). The species is also used in indigestion, dermatitis and appetizer (Kala, 2003), vermifuge against ascarides, infantile spasms, eclampsia, neuropathy, whooping cough, anorexia and intermittent fever (Grieve, 1984; Handa, 2004). The aerial part of the species produces artemisinin, a potent source of an anti malaria drug.

Several studies showed the hepatoprotective activity of the aqueous-methanolic extract of *Artemesia maritime* against acetaminophen (paracetamol, 4-hydroxy acetanilide) - and carbon tetrachloride (CCl4)-induced hepatic damage. Pretreatment of rats with the plant extract (500 mg/kg) prevented CCl4-induced prolongation in pentobarbital sleeping time confirming hepatoprotectivity and validates the traditional use of this plant against liver damage (Janbaz and Gilani 1995). The folkloric reputation of the species showed that the species is used in jaundice (Baquar 1989) and in intermittent as well as remittent fever (Kritikar and Basu 1984). In addition, the leaves of the plant are used in the preparations of Dhoop (incense).

Considering the diverse medicinal uses, the species is widely accepted in Himalayan region and can solve the dual purpose if nutritional potential could be investigated. This could play an important role in human diet along with its medicinal properties. The present study is therefore attempted to investigate the mineral and nutrient composition of *A. maritime*. To the best of our knowledge no reports are available on the mineral and nutritional composition of this species.

MATERIALS AND METHODS

The aerial parts of *A. maritime* were collected from Jhelum (3800 m asl) Chamoli district of Uttarakhand Himalaya during the peak-growing season (late September 2005). The plant samples were transported to the laboratory and air dried at room temperature for approximately seven days prior to analysis. For determination of moisture contents fresh weight of plant material was recorded and dried at 80^0 C in an hot air oven for 24 hrs. Dry weight was recorded and moisture percentage was calculated.

The dried materials were powdered separately in an electric mill and made a fine powder of 60 mesh size prior to analysis. Powder was kept in polythene bag at room temperature till the further analysis. Total carbohydrate content in the aerial parts of the species was estimated following the Phenol Sulphuric method (Dubois et al 1962). Total nitrogen was estimated using Micro-Kjeldahl (AOAC 1985). Crude protein was calculated as Kjeldahl N x 6.25 (based on assumption that nitrogen constitutes 16.0% of a protein). The content of crude fat and ash was estimated (AOAC 1971). Insoluble ash content was estimated following the method of Peach and Tracy (1956) and Mishra (1968). Mineral contents were estimated by wet digestion method. Plant material (1 g) was digested with two successive aliquots of conc. HNO_3 (5 ml each) and after burning, the organic matter was slowly digested with 15 ml of triple acid mixture (HNO_3, $HClO_4$ and H_2SO_4, 10:4:1, v/v) at 200 ^{0}C and reduced to about 1 ml. The residue was dissolved in double distilled water, filtered and diluted to 100 ml. This solution was used for the estimation of minerals. Macro minerals viz., Na, K and Ca were estimated by Flame Photometer (SYSTRONICS, T-125). Phosphorous content was estimated according to Allen (1977). The energy content of aerial parts of the plants was determined by multiplying the crude protein, crude lipid and total carbohydrate content by the factor 4, 9 and 4 respectively (Osborne and Voogt 1978).

Total phenolics content was estimated following Singleton et al (1999) with minor modification. The dry powder (0.5 g) was extracted with 10 time volume of 80 % ethanol and the homogenate was centrifuged at 10,000 rpm for 20 min and supernatant was collected. The residue was re-extracted three times with 80% ethanol, centrifuged and the supernatant was evaporated to dryness. The residue was dissolved in 5 ml double distilled water,

pipetted into test tubes (using 1 ml aliquots) and 0.5 ml Folin-Ciocalteau reagent was added. After three minutes, 2 ml of 20% sodium carbonate solution was added to each test tube and the absorbance was read at 650 nm. Ascorbic acid content was estimated by following Ranganna (1976) with minor modification. Two grams of dry (aerial parts) powder was extracted with 4% oxalic acid and centrifuged at 10,000 rpm for 10 minutes. Supernatant of the 5 ml was transferred into a conical flask and 10 ml of 4% oxalic acid was added for titration against a standard dye solution (2.6 dichlorophenol indophenol) until a pink colour appeared. The procedure was repeated with a blank solution.

Results and discussion

The mineral nutrient, vitamins and phenolic content studied in the aerial part of *A. maritime* are summarized in Table 1. The results revealed that dried aerial part of *A. maritime* contained crude protein (8.54 mg/100g), crude fat (3.67 mg/100g), total carbohydrate (46.93 mg/100g), vitamin C (228.09 mg/100g), phenolic (196.70 mg/100g) and ash (7.48 mg/100g). The Food Energy value was recorded 254.91 Kcal/ 100g DM. As such, carbohydrate is the most important source of food energy among the macronutrients, accounting between 40-80% of total energy intake (Burlingame 1999). The protein contains all of essential amino acids and forms the building blocks of bones, teeth, muscles, skin and blood. In addition, it helps to regulate fluid balance and act as enzymes transporters. As an antibody, protein also helps as a defense mechanism of the body against different diseases.Cassileth (1998) suggested that the body can synthesize many of the amino acids required for protein synthesis, but some amino acids must be obtained from the proteins in the diet. This can be obtained from the 100 g dried *A. maritime* aerial part as it contained the reasonable amount of protein and total carbohydrate.

In the present study, the presence of vitamin C (227 mg/100g) reflects the potential of the plant in contribution to nutrition. It is reported that daily requirement of a healthy human being is 60 mg of vitamin C which is sufficient to protect the body from damage and act as an antioxidant (Splittstoesser 1990; Powers and Howley, 2000). Vitamin C is an essential water soluble vitamin and plays a key role in the formation of collagen, a primary component of the connective tissue in the body. Adequate collagen synthesis is essential for strong ligaments, tendons, dentin, skin, blood vessels, bones, wound healing and tissue repairing. In addition, vitamin C is an important aid in the absorption of inorganic iron and has shown its usefulness in the treatment of anemia and stress (Jacques et al 1997; Hearts et al 1998; Fleming et al 1998).

The total dry weight of the ash content was 7.48 mg/100 g, however, the amount of acid insoluble ash 0.98mg/100 g and acid soluble ash was 6.50 mg/100g, respectively. The calorific value of the aerial parts of the plant was 254.91 Kcal/100 g. The presence of ash contents reflects the amount of preserved minerals in the aerial parts of the species. The species contains a moderate amount of fat (3.67 mg/100g), which in tune with that a diet contain 1-2% of its caloric of energy as a fat is said to be sufficient to human beings while excess fat consumption is implicated to certain cardiovascular disorders (Anita et al 2006). The presence of Phenolic compounds in the plant is indicative of various medicinal properties. As such, the species is reported to be used as an effective antiseptic (Grieve 1984; Singh. and Kachroo 1976). Data indicated that aerial parts of the species contained high ash contents (7.48 mg/100g), this probably due to a greater amount of photosynthetic activities. These results are consistent with Shad et al. (2002) who reported high ash content in *Fagonia Arabica*.

Potassium (1753.52 mg/100g) was the most abundant mineral followed by nitrogen (1366.24 mg/100g) in the aerial parts of *A. maritime* (Table 1). However, calcium (213.99mg/100g), phosphorus (147.15 mg/100g) and sodium

(112.39 mg/100g) were present in moderate amounts. Potassium is known to maintain the water and acid balance in the body and as an electrolyte, it plays an important role in transmitting nerve impulses to muscles for contraction and in the maintenance of normal blood pressure. For a healthy human being the standardized daily requirement of potassium is approximately 2000mg (Whitney and Rolfes 1999) which is comparable to potassium contains obtained in present investigation. From the data obtained in present study can be inferred that nutritionally important potassium and calcium are found in significant amounts in the aerial parts of the plant. The high concentration of these minerals could be an advantage while the plant is being utilized for the nutrition purpose.

In conclusion it can be inferred that the aerial parts of *A. maritime* contained reasonable amount of nutrients in addition to protein, fat and carbohydrate. Unfortunately, we could not analyze the nutrients, Fe, Zn, I in this study, but these minerals account for the vast majority of deficiencies according to World Health Organization. Thus, in order to highlight the significance of *A. maritime* as a source of nutrients, comprehensive study is needed with taking into account both the macronutrient and micronutrients in consideration. However, the present findings suggest that *A. maritime* could have great potential in nutritive value together with its medicinal properties. On the other hand, though the species has many uses and grows abundantly in the Himalayan region, its sustainable harvest from nature and cultivation may improve the local economy. Moreover, the xerophytic nature of the species may have advantages in cultivating in dry slopes to protect the soil erosion.

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Table 1. Mineral nutrients, vitamin and phenolic content in aerial parts of Artimisia martimi (The data are means of triplicate determinations).

Parameters	**Estimated amount**	**Range (mg/100g)**
Crude Protein (%)	8.54	8.32 - 8.77
Crude Fat (%)	3.67	3.65 - 3.68
Total Carbohydrate (%)	46.93	46.82 - 47.05
Vitamin C (%)	228.09	227.64 - 228.64
Ash (%)	7.48	7.05 - 7.75
Acid Soluble ash (%)	6.50	6.07 - 6.79
Acid insoluble ash (%)	0.97	0.95 - 0.98
Calorific Value (Kcal/ 100g DM)	254.91	-
Total phenols (mg/100g)	196.70	196.33 - 197.14
Sodium (Na) (mg/100g)	112.39	96.17 - 124.79
Potassium (K) (mg/100g)	1753.52	1722.74 - 1769.21
Calcium (Ca) (mg/100g)	213.99	185.77 - 245.36
Nitrogen (N) (mg/100g)	1366.24	1331.62 - 1403.97
Phosphorus (P) (mg/100g)	147.15	143.95 - 148.75