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Research Article

NUTRITIONAL EVALUATION OF SOME WILD EDIBLE TUBEROUS PLANTS

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ABSTRACT

The wild edible tuberous plants make a significant contribution to diets of rural people. However, there is insufficient study of their nutritional value. The nutritive value of the wild edible tubers was assesed by their nutritional composition. In this paper, three wild edible tuberous plants, *Brachystelma edulis Coll. and Helmsl.*,*Ceropegia bulbosa* var.*bulbosa Roxb*. and *Ceropegia hirsuta Weight & Arn.* belonging to family Asclepiadaceae used as famine food plants in the rural areas of Satara and Kolhapur district(Maharashtra).

The results revealed that the tubers contain moisture in range of (75.82-80.84% fw), dry matter (19.26-24.18% fw),crude protein (3.93-4.82g/100g dw),ash (10.2-11.5%dw),crude fat(0.1-0.12%dw),crude fiber (8.0-9.1%dw) and carbohydrate (3.61-8.65%dw). The tubers also have a high energy value (256.14-302.39kcal/100g dw). Mineral content ranges were (mg/100g dw)were:K(400-440), Na(9.54-12.32), P(143.4-155), Ca(428-464.8), Mg(148.36-186.66), Cu(0.83-0.94), Fe(40.3-49.04), Mn(3.27-3.33) and Zn(1.07-1.5). Comparing the contents were tubers with recommanded dietary allowances (RDA), the results indicated that tubers of three Asclepiadaceae members could be a good supplement for some nutrients such as fiber, protein and carbohydrates.

Keywords: Wild edible tuberous plants, Proximate analysis, Mineral analysis.

INTRODUCTION

In developing nations, numerous types of edible wild plants are exploited as source of food to provide supplementary nutrition to the inhabitants. Recent studies on agro pastoral societies in Africa indicate that these plants resources play a significant role in nutrition, food security and income generation (Edmonds and Chweya, 1995). Furthermore, according to a food and agricultural organization (FAO) report, at least one billion people are thought to use wild food in their diet (Burlingame, 2000). In India, Malaysia and Thailand, about 150 wild plants species have been identified as sources of emergency food (Nesamvuni et al., 2001). It is therefore worthwhile to note that the incorporation of edible wild and semi cultivated plants resources could be beneficial to nutritionally marginal population or to certain vulnerable groups within populations, especially in developing countries where poverty and climatic changes are causing havoc to the rural population.

Proximate and nutrient analysis of wild edible plants plays a crucial role in assessing their nutritional significance (Pandey et al., 2006). The considerable use of wild edible tuberous species by the local people in their diet motivated us to carry out the present nutrients analysis. In spite of their importance as a food source, to the best of our knowledge, there are no published studies on the nutritional composition of wild edible tubers and information on the nutritional composition of these varieties is scarce. The present study was therefore initiated to evaluate the nutritive value of *Brachystelma edulis* Coll. and Helmsl., *Ceropegia bulbosa* var. *bulbosa* Roxb. and *Ceropegia hirsuta* Weight & Arn. The detail of each species is given in table 1.Besides their usage as food item; these wild tuberous plants are also exploited for their medicinal properties. Most of these species are utilized against various diseases by the local communities through their indigenous knowledge. The medicinal properties are given in table1.

Satara and Kolhapur district are located in the western part of Maharashtra. The vegetation cover too varies from typical monsoon forest in the western part to scrub and poor grass in the eastern parts. These districts are rich in its floristic diversity and plant resources. Most of rural people depend on the surrounding forests for their day to day needs. Keeping this point of view, an ethnobotanical survey was done in the villages, to get the information about wild edible tubers in table 1.

These wild edible tuberous species were subjected to proximate and micronutrient analysis. In the present study ash, protein, fat, fiber, moisture and energy were analyzed while essential nutrients analysis like K, Na, P, Ca, Mg, Cu, Fe, Mn and Zn were scrutinized.

MATERIALS AND METHODS

Collection and preparation of samples

The three wild edible tubers used as experimental material were collected from various areas of Satara and Kolhapur district, Maharashtra (India) in August 2009. The collected plant material was placed in a polythene bag to prevent loss of moisture during transportation to the laboratory. Efforts were made to collect these plants in flowering and fruiting conditions for the correct botanical identification. Tubers were washed with distilled water, weighted, cut into small pieces and dried at 40 0C until constant weight was obtained. The dried samples were ground to a fine powder by using an electric grinder (Holloway, Argall, Jealous, Lee and Bradbury, 1989). The samples were packed into airtight sample bottles and stored in the refrigerator.

Proximate analysis

The moisture content, ash, crude fat, crude protein and crude fiber were determined in accordance with the standard methods of the AOAC (1980). Crude fat was determined by exhaustively extracting samples in a soxhlet apparatus using anhydrous diethyl ether as the solvent. Crude protein determination involved the use of routine kjeldhal nitrogen assay (N x 6.25). Crude fiber estimates were obtained from the loss in weight on ignition of dried residue following the digestion of fat free sample with 1.25% each of sulphuric acid and sodium hydroxide solution under specified condition (AOAC, 1980). Carbohydrate content was determined by difference while calorific values were obtained by the summation of multiplied mean values of protein, fat and carbohydrate by their respective Atwater factor 4,9&4 (Udosen, 1995).

Mineral analysis

The minerals, such as K, Na, P, Cu, Mg, Ca, Fe, Mn and Zn were determined by the atomic absorption spectrophotometric method. The samples, which were digested in acid solution of HNO3 and perchloric acid were passed through atomic absorption spectrophotometry (AAS) using different lamps and caliberated or

different micronutrients. Potassium and sodium was determined through flame photometer after acid digestion (AOAC, 1980). Phosphorus was determined spectrophotometrically using the vendates solution (AOAC, 1980).

RESULTS AND DISCUSSION

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The local name, botanical name, consumption practice of the studied tuberous plants is presented in table.

Proximate Composition

The proximate composition of wild edible tubers is presented in table 2. The moisture content of tubers ranged from 75 to 80% moisture of fresh weight. For most of the studies the fiber and protein content are considered as the main determinants of food type and less is known about elemental composition of various wild edible species (Anonymous, 1970-1988).

The range of crude fiber content of tubers was 8 to 9.5% dry weight. The *C.hirsuta* as an excellent source of fiber (9.1±0.02% dry weight) while lowest quantity of fiber was found in tuber of *B.edulis* (8.0±1.02% dry weight). The crude protein of wild edible tubers ranged from 3 to 5g/100g. The higher protein content of *C.hirsuta* indicated its nutritional superiority over the other wild edible species. The ash content of tubers ranged from 10 to 11.5% of dry weight. The high value of ash observed in all the species of tubers

Indicated that it is good sources of minerals when compared to values obtained for cereals and tubers (FAO, 1968). The crude fat content ranged from 0.010 to 0.012% of dry weight. Due to generally low level of crude fat in the tubers, their consumption in large amounts is a good dietary habit and may be recommended to individuals suffering from overweight or obesity. The carbohydrate content of the tubers samples varied considerably, ranging from3.61±0.1% dry weight (*B.edulis*) to 8.65±0.1% dry weight (*C.hirsuta*). The daily energy requirement of 2500 to 3000 Kcal has been reported for adults (WHO/FAO, 1985). The energy value of tubers was estimated within range of 256.14-302.39 kcal/1000g dw, which is an indication that it could be an important source of dietary calories.

Mineral Analysis:

The results of the minerals estimation of the wild edible tubers is presented in table 3. This study shows that copper was the least abundant in all wild edible tubers. The species analyzed in this study contained remarkably high amount of calcium (›500mg/100g dry weight).

CONCLUSION

Wild edible tubers analyzed show more crude fiber, crude protein and carbohydrates. These tubers were also found to be fairly good sources of dietary minerals. These results suggest that these less familiar wild tubers should not be ignored. Rather they can be used as a good alternative source of food to alleviate hunger and malnutrition.

Table 1: of wild edible tuberous plants and its Ethnobotanical nformation

Botanical name	Family	Local name	Part used	Local preparation and consumption practice
Brachystelma edulis *Coll. and Helmsl.*	Asclepiadaceae	Galya	Tuber	Cooked as vegetable, Decoction used for bodily discomfort also used in cough and cold.
Ceropegia bulbosa var. bulbosa *Roxb.*	Asclepiadaceae	Kharpudi	Tuber	Raw tubers eaten for enhancing ladies fertility and vitality, decoction taken to get rid of urinary bladder stone, paste applied on the inflammation of skin.
Ceropegia hirsuta *Weight & Arn.*	Asclepiadaceae	Haaman	Tuber	Eaten raw or to make vegetable, warm tuber paste applied on viral infection, decoction taken in stomachache, dysentery and diarrhoea.

Table 2: Proximate composition of three wild edible tubers.

Parameters	*Brachystelma edulis Coll. and Helmsl.*	*Ceropegia bulbosa var. bulbosa Roxb.*	*Ceropegia hirsuta Weight & Arn.*
Moisture (% fresh weight)	80.84±2.5	78.24±1.9	75.82±1.4
Dry matter (% fresh weight)	19.26±1.0	21.76±2.1	24.18±1.12
Crude protein (g/100g dry weight)	3.93±0.91	4.62±0.81	4.82±1.02
Ash (% dry weight)	11.5±1.0	10.2±1.32	10.6±0.9
Crude fat (% dry weight)	0.12±0.03	0.1±0.01	0.11±0.01
Crude fiber(% dry weight)	8.0±1.02	8.7±0.81	9.1±0.02
Total carbohydrate (% dry weight)	3.61±0.1	6.84±0.1	8.65±0.1
Energy (k cal/100g dry weight)	302.39±27.23	286.40±18.08	256.14±20.25

N.B.1. Values are means of three determinations ±S.D. (n=3)
2. Carbohydrate calculated by difference.
3. Energy calculated by using Atwater factors.

Table 3: Mineral compositions of three wild edible tubers (mg/100g dry weight).

Parameters	***Brachystelma edulis*** *Coll. and Helmsl.*	***Ceropegia bulbosa var. bulbosa*** *Roxb.*	***Ceropegia hirsuta*** *Weight & Arn.*
K	416.3±10.0	400.23±2.5	440.07±10.2
Na	9.54±0.7	12.32±0.9	10.42±0.8
P	143.4±0.31	155.0±0.20	150.4±0.35
Ca	464.8±6.8	437.2±4.5	428.0±3.2
Mg	186.66±2.1	148.36±2.0	152.48±0.8
Cu	0.94±0.03	0.83±0.04	0.89±0.02
Fe	40.3±2.4	49.04±2.6	45.6±2.0
Mn	3.27±0.1	3.31±0.9	3.33±0.8
Zn	1.07±0.1	1.5±0.8	1.22±0.6

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