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PRELIMINARY ASSESSMENT OF NUTRITIONAL VALUE OF POLLY DWARF *(Alocacia indica S.)*: A PLANT FOOD IN INDIA

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The proximate composition and mineral constituents of *Alocacia indica* stem were evaluated. The stem contained ashes (9.1%), crude protein (5.44%), crude lipid (3.25%), crude fiber (22.9%) and carbohydrates (59.31%). The stem also has a high energy value (288.25 kcal/100gdry weight). Minerals range (mg/100g dry weight, DW) was: K (4.63), Na (1.62), Ca (7.37), Fe (5.04), and Zn (3.83). Comparing the tubers mineral contents with recommended dietary allowances (RDA), the results indicated that *Alocacia indica* stem could be a good supplement for some nutrients such as fibre, potassium, zinc, lipid, and carbohydrates. The wild stem could be promoted as a carbohydrate supplement for cereal-based diets in poor rural communities, while its high potassium content could be utilized for the management of hypertension and other cardiovascular conditions.
Keywords: India, *Alocacia indica S.*, micronutrients, proximate and mineral composition, wild stem

INTRODUCTION

In developing nations, numerous types of edible wild plants are exploited as sources of food because these provide an adequate level of nutrition to the inhabitants. Recent studies on agro pastoral societies in Africa indicate that these plant resources play a significant role in nutrition; food security and income generation (Edmonds and Chweya 1995).
Furthermore, Food and Agricultural Organization (FAO) report, at least one billion people are thought to use wild foods in their diet (Burlingame, 2000). In Ghana along, the leaves of over 300 species of wild plants and fruits are consumed. In Swaziland, wild plants provide a greater share of the diet than domesticated cultivars. In India, Malaysia and Thailand, about 150 wild plants species have been identified as sources of emergency food (Burlingame 2000). Similarly, in South Africa about 1400 edible plant species are used, In Sahel region of Africa, over 200 wild foods were identified to be used by the rural communities (Sena *et al.* 1998). In most of these reports, it was emphasized that nutritionally, these unconventional plants foods could be comparable to or even sometimes superior to the introduced cultivars (Edmonds and Chweya 1995). It is, therefore, worthwhile to note that the incorporation of edible wild and semi-cultivated plant resources could be beneficial to nutritionally marginal populations or to certain vulnerable groups within populations, especially in developing countries where poverty and climatic changes are causing havoc to the rural populace. In this context, analyses were carried out to evaluate the nutritional content of *Alocacia indica* stem with hope that it would be incorporated into the food basket of the country.

MATERIALS AND METHODS

Plant material

Alocacia indica stem used as experimental material was collected from farm lands in around Pune, South India, in October 2007. The collected plant material was placed in a polyethylene bag to prevent loss of moisture during transportation to the laboratory.

Preparation of the plant material for chemical analyses

Alocacia indica stem was washed with distilled water and dried at room temperature to remove residual moisture, then placed in paper envelope and oven-dried at 55ºC for 24 hours (Abuye, 2003). The dried stem was ground into powder using pestle and mortar, and sieved through 20-mesh sieve. The stem powder was used for the nutrients analyses.

Proximate analysis

The methods recommended by the Association of Official Analytical Chemists (AOAC) were used to determine ash (#942.05), crude lipid (#920.39), crude fibre (#962.09) and nitrogen content (#984.13) (AOAC.1990).

Determination of crude lipid and crude fibre content

Two grams of dried stem were weighed in a porous thimble of a Soxhlet apparatus, with its mouthed cotton

wool plugged. The thimble was placed in an extraction chamber which was suspended above a pre-weighed receiving flask containing petroleum ether (b.p. 40-60ºC). The flask was heated on a heating mantle for eight hours to extract the crude lipid. After the extraction, the thimble was removed from the Soxhlet apparatus and the solvent distilled off. The flask containing the crude lipid was heated in the oven at 100ºC for 30 minutes to evaporate the solvent, then cooled in a dessicator, and reweighed. The difference in weight was expressed as percentage crude lipid content. Crude fibre was estimated by acid-base digestion with 1.25% H_2SO_4 (prepared by diluting 7.2 ml of 94% conc. acid of specific gravity 1.835 gml^{-1} per 1000 ml distilled water) and 1.25% NaOH (12.5 g per 1000 ml distilled water) solutions. The residue after crude lipid extraction was put into a 600 ml beaker and 200 ml of boiling 1.25% H_2SO_4 added. The contents were boiled for 30 minutes, cooled, filtered through a filter paper and the residue washed three times with 50 ml aliquots of boiling water. The washed residue was returned to the original beaker and further digested by boiling in 200 ml of 1.25% NaOH for 30 minutes. The digest was filtered to obtain the residue. This was washed three times with 50 ml aliquots of boiling water and finally with 25 ml ethanol. The washed residue was dried in an oven at 130ºC to constant weight and cooled in a dessicator. The residue was scraped into a pre–weighed porcelain crucible, weighed, ashed at 550ºC for two hours, cooled in a dessicator and reweighed. Crude fibre content was expressed as percentage loss in weight on ignition (AOAC.1990).

Determination of nitrogen content and estimation of crude protein

Macro–Kjeldahl method was used to determine the nitrogen content of the stem. Two gram of dried stem were digested in a 100 ml Kjeldahl digestion flask by boiling with 10 ml of concentrated tetraoxosulphate (VI) acid and a Kjeldahl digestion tablet (a catalyst) until the mixture was clear. The digest was filtered into a 100 ml volumetric flask and the solution made up to 100 mL with distilled water. Ammonia in the digest was steam distilled from 10 ml of the digest to which had been added 20 ml of 45% sodium hydroxide solution. The ammonia liberated was collected in 50 ml of 20% boric acid solution containing a mixed indicator. Ammonia was estimated by titrating with standard 0.01 mol L^{-1} HCl solution. Blank determination was carried out in a similar manner. Crude protein was estimated by multiplying the value obtained for percentage nitrogen content by a factor of 6.25 (AOAC.1990).

Estimation of carbohydrates and energy values

Available carbohydrate was estimated by difference, by subtracting the total sum of percent crude protein, crude lipid, crude fibre and ash from 100% DW of the fruit The plant calorific value (kJ) was estimated by multiplying the percentages of crude protein, crude lipid and carbohydrate by the factors 16.7, 37.7 and 16.7 respectively (AOAC.1990).

Mineral analysis

The mineral elements like Na, K, Ca, Fe, and Zn were determined on 0.3 g fruits powder by the methods of Funtua (Funtua and Trace 1999; Funtua 2004) using Energy Dispersive X-ray Fluorescence (EDXRF) transmission emission spectrometer carrying an annuar 25 mCi 109Cd isotopic excitation source that emits Ag-K X-ray (22.1 keV) and a Mo X-ray tube (50KV, 5mA) with thick foil of pure Mo used as target material for absorption correction. The system had a Canberra Si (Li) detector with a resolution of 170 eV at 5.9 keV line and was coupled to a computer controlled ADC Card (Trump 8K). Measurements were carried out in duplicate. Na was analyzed after wet digestion of one gramme of the fruits powder with nitric/perchloric/sulphuric acid (9:2:1 v/v/v) mixture. Sodium was analyzed with a Corning 400 flame photometer (AOAC 1990).

RESULTS AND DISCUSSION

Proximate analysis

The results of proximate composition of *Alocacia indica* stem are shown in Table 1. The ash content, which is an index of mineral contents, for *Alocacia indica* stem the value of 7.3% DW was less than to the values reported for other edible leaves such as *Momordica balsamina* leaves (18.00±1.27% DW) (Faruq *et al.* 2002; Asibey-Berko and Tayie 1999; Aletor and Adeogun 1995). It is apparent that *Alocacia indica* stem is a good source of potassium, and zinc. The crude protein contents (19.38%) were higher than that reported for some lesser known wild leafy vegetables such as *Momordica balsamina* (11.29±0.07%), *Moringa oleifera* (20.72%), *Lesianthera africana* leaves (13.10–14.90%) and *Leptadenia hastate* (19.10%) (Pearson 1999; Plessi *et al.* 1999), plant food that provide more than 12% of their calorific value from proteins are a good source of proteins. In that context, *Alocacia indica* stem (19.38%) isa good source of protein. The crude lipid content (4.7%) of the fruits was less than the range (8.3–27% DW) reported for some vegetables consumed in Nigeria and Republic of Niger (Isong and Idiong 1997).

Table 1. Proximate composition of *Alocacia indica S*. stem

Parameters	Concentration (% DW)*
Ash	7.3 ± 0.8*
Crude protein	5.7 ± 0.3*
Crude lipid	3.29 ± 0.5*
Crude fibre	11.05 ± 0.4*
Carbohydrates	72.66 ± 0.7
Calorific value(kcal/100g)	343.05 ± 5.3

*The data are mean values ± deviation (SD) of three replicates
*Values except Calorific value expressed as % DW.

The estimated carbohydrate content (47.9%) in *Alocacia indica* stem was stand to be higher than that for *Senna obtusfolia* leaves (20%) and *Amaranthus incurvatus* leaves (23.7%). On the other hand, *Eulophia ochreata* tubers contain comparable amount of carbohydrate for *Momordica balsamina* (39±21%). The crude fibre content in *Alocacia indica* stem (21.3%) was higher than the reported values (8.5–20.9%) for some Nigeria vegetables (Isong and Idiong, 1997). One discussed drawback to the use of vegetables in human nutrition is their high fibre content, which may cause intestinal irritation and a decrease of nutrient bioavailability. The fibre RDA values for children, adults, pregnant and breast-feeding mothers are 19–25, 21–38, 28 and 29%, respectively. Thus, *Alocacia indica* stem could be a valuable source of dietary fibre in human nutrition. The calorific value of *Alocacia indica* stem was estimated to be 311.5 kcal/100g (DW), which is an indication that it could be an important source of dietary calorie. High calorific content of the fruit could be attributed to high lipid content.

Mineral content

Table 2 shows the results of the mineral contents of *Alocacia indica* stem where nutritional significant of elements is compared with the standard recommended dietary allowance. When compared with standard values as showed in Table 2, *Alocacia indica s*tem less than adequate level of K, Fe, Zn, Ca, and Na, but the plant stem could be good source of K, Na and Zinc.

CONCLUDING REMARKS

The results of the nutritional analysis shown that *Alocacia indica* stem is good sources of plant fibre, potassium, sodium, zinc, lipid and carbohydrates. The results suggests that the plant fruits if consumed in sufficient amount could contribute greatly towards meeting human nutritional requirement for normal growth and adequate protection against diseases arising from malnutrition. Chemical analysis alone however, should not be the exclusive criteria for judging the nutritional significance of a plant parts. Thus, it becomes necessary to consider order aspects such as presence antinutritional/toxicological factors and biological evaluation of nutrient content.

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Table 2. Mineral composition of *Alocacia indica S*. stem

Minerals	Recommended Dietary Allowances (mg/day)**				
	Available quantity in mg/100gDW*	Children 7-10 years	Adult male	Adult female	Pregnant and lactating mothers
Calcium	0.88 ± 0.02	800	800	800	1200
Potassium	3.40 ± 0.15	1600	2000	2000	2000
Sodium	4.40 ± 0.08	400	500	400	500
Iron	0.48 ± 0.01	10	10	15	13
Zinc	1.21 ± 0.07	10	15	12	19

*The data are mean values ± deviation (SD) of three replicates **Sources: Thangadari *et al*. (2001)

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