Journal of Scientific and Innovative Research 2015; 4(3): 138-141
Available online at: www.jsirjournal.com

Research Article

ISSN 2320-4818
JSIR 2015; 4(3): 138-141

Received: 01-06-2015
Accepted: 16-07-2015

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Nutritional consideration of three important emergency food plants studied among Karbi Tribe of North East India

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Abstract

Emergency food plants are wild food plants that substitute staple food and are often referred as famine foods. These are nutritionally very rich and substitute conventionally eaten foods and are capable of fulfilling nutritional demand in many cases. Wild plants constitute major components of food basket of the Karbis. The importance of indigenous food plants from nutritional point of view in Karbi Anglong is often overlooked. This study was to assess nutritional contents in three prominent famine food plant species–*Premna latifolia* Roxb. (Verbenaceae), *Dioscorea puber* Blume (Dioscoreaceae), *Lassia spinosa* (L.) Thaw. (Araceae) that contributes to household food security. Plants specimens are collected processed and analysed their nutritional content as per standard protocol (MCW, DNS, Lowry's and Ninhydrin). The proximate nutritional composition (powder character), ash, moisture, carbohydrate, protein, reducing sugar, amino acid were determined. Nutritional analysis reveals the present of essential nutrient with appropriate quantity. Rhizome of *L. spinosa*, bark of *P. latifolia* and tuber of *D. puber* contain carbohydrate (2.32 ± 0.34 g/100g, 2.39 ± 0.12 g/100g and 2.91 ± 0.56 g/100g), protein (1.85 ± 0.04 g/100g, 2.12 ± 0.04 g/100g and 1.09 ± 0.09 g/100g), reducing sugar (0.0343 ± 0.23 g /1g, 0.033 ± 0.34 g /1g and 0.036 ± 0.36 g/1g) and amino acid (8.29 ± 0.04 mg/g, 7.95 ± 0.04 mg/g and 8.02 ± 1.24 mg/g) respectively. The study shows that the plants are nutritionally very rich and with increase in moisture contents of each samples, pH level also increases and as a result ash contents decreases. Investigation on antinutrient factor would further help in evaluating the permissible toxicity of the antinutrient present in the species.

Keywords: Karbi, Emergency food, Nutrient, Analysis

Introduction

Ethnic people have rich indigenous traditional knowledge system on the use of component of biodiversity for their daily sustenance like food, fodders, shelter and healthcare. Wild plants are used extensively as food by many people around the world; it substitutes and supplements the staple crops and as famine foods during lean period. It has been observed that the indigenous people who still lived in their undisturbed forest areas and having the traditional food habit like consumption of large variety of seasonal food are found to be healthy and free from most of the diseases [1]. Unconventional food plants are nutritionally rich or are more nutritious than conventionally eaten crops and incorporation of edible wild and semi cultivated plants resources could benefit resource poor families or population, especially in developing countries where poverty and climatic changes are causing havoc to the rural populace [2, 3]. The Karbis, an ethnic group in North East India [4, 5] gathered and consumed wild plants as substitute for staple food (i.e., rice) during food shortage and are often referred as famine foods or emergency foods. It constitutes major components of their food basket, and major source of nutrition maintaining health and food security [6]. They primarily depend on arable crops as their source of food. Being agriculturist, rice is the staple food and chief source of carbohydrate. But as food produce is not adequate in many poor families, use of wild plants to supplements food insecurity is common among the people.

Besides, several reports from India and abroad, have authenticated importance of wild edible plants among different cultures [7-9] and as source of nutrition [3]. The importance of indigenous food plants from nutritional point of view, especially during times of food shortage in Karbi Anglong is often overlooked. So, in the light of this, a study was undertaken to assess components of nutritional values

present in three prominent famine food plant species –*Premna latifolia* Roxb. (Verbenaceae), *Dioscorea puber* Blume. (Dioscoreaceae), *Lassia spinosa* (L.) Thaw. (Araceae) utilized among the Karbi tribe of Karbi Anglong district.

Material and Methods

Collection of plant material and identification

The plant species, along with its flowering twigs were collected from *Langrik* forest fringe in Karbi Anglong district and photographed. The collected plant specimens were placed in a polythene bags to prevent loss of moisture during transportation to the laboratory. The plant was identified using authentic books and Flora [10-12] and deposited in the herbarium with voucher specimens in the Department of Life Science, Assam University Diphu campus. Ethnobotanical information on famine foods was gathered through group discussion, semi-structured interview and personal observations.

Botanical description of the species

***Premnalatifolia* Roxb. (Verbenaceae):** Middle sized tree with spreading crown, young shoots pubescent, young stem spinose. Leaves have unpleasant smell, ovate or elliptic, entire, undulate, glabrescent above, shoftly pubescent beneath. Flowers is greenish in compound corymbose vilous cymes. Fruit is small, drupe globose, black when ripened. It is common in road sides, open areas. [13].

***Lassiaspinosa* (L.) Thaw. (Araceae):** A stout, spinous, aquatic or marsh herb root stock branched. Petiole long, prickly; leaf blade hastate, entire or pedately lobed and cut, nerves beneath prickly. Flower hermaphrodite, all fertile. Spathe long, narrow, fleshy, twisted; base convolute, deciduous. Spadix short, cylindric, dense-flowered. Perianth segments 4-6, obovate, tips incurved. Comes out in damp, low laying areas [13]

***Dioscoreapuber* Blume (Dioscoreaceae):** Largeclimber, domesticated, tubers large. Twinner, stem twining to right [14].

Drying and processing

As per the usage of the plant part, it is processed accordingly. Thebark of *Premna latifolia* Roxb., rhizome of *Lassia spinosa* (L.) Thaw.and tuber of *Dioscorea puber* were washed properly with deionised water and dried at room temperature to remove residual moisture. The sample are cut into small pieces, spread on papers and left it open for a week at room temperature. The samples are checked regularly to avoid fungal contamination. The dried samples were grounded into powder, using mortar and pestle and sieved (IS 460 Mic 300). The fresh samples were used for morphological and microscopically studies while the ground powder was used for nutrient analysis.

Macroscopical study

Macroscopical parameter of the three samples like form, colour, odour, solubility and taste were done by mere observation and level of pH is measured (Eutech instrument pH 510). Solubility test was done in cold water, alcohol and boil water.

Total Ash content- 2g of powdered sample was weighed in a silica crucible and heated in muffle furnace for 5 hours at 500^{o}C, till it become white. The ash was cooled in a desiccator for 1hour and weighed (three times). Total ash content is expressed in g/100g of sample weight [15].

Total moisture content- 3g crude powder sample were taken in previously dried and tarred flat weighingevaporating dish and then dried in an oven at 105ºC till constant weight was obtained (upto three consecutive reading). The weight after drying was noted, calculated and values expressed in g/100g of samples [16]

Microscopical Characters

Microscopical character like nature, shape and size of the sieved powder were studied using trinocular compound microscope (Olympus 80326, NWF 10X).

Nutritional Content

Carbohydrate estimation- The sugar is extracted using methanol: chloroform: water (MCW, 12:5:3,V/V/V).50mg of powder in triplicate is taken in 5ml of MCW and left for 10 minutes at room temperature. Samples are then centrifuged at 2500 rpm for 10 minutes; 3ml of deionised water is added to the supernatants and centrifuge at 2500 rpm for 5 minutes. The chloroform phase is discarded and the volume methanol-water phase is recorded and use for sugar estimation. The sugar concentration is determined by the phenol-sulfuric acid method [17].

Reducing sugar- Amount of reducing sugar present in the sample were analysed quantitatively by following standard method, DNS method and expressed in g/g of samples [18].

Protein estimation- Estimation of the amount of protein in the sample was doneby standard Lowry's method and values are expressed in g/100g of samples [19]

Amino Acid estimation- Amount of Amino Acid present in the sample was analysed following standard Ninhydrin method and the value is expressed mg/g of sample [19].

Result

Estimated value of nutritional assessment from three prominent famine food species *Premna latifolia* Roxb., *Lassia spinosa* (L.) Thaw. and *Dioscorea puber* Blume. have been studied and presented in table 1.The macroscopical study reveals ground powder of the rhizome of *Lassiaspinosa*, tuber of *Dioscorea puber* and bark of *Premna latifolia* has different texture. The powder remains insoluble both in cold water and alcohol while in hot water it gives colloidal to mucilaginous solution which indicates alkalinity of the sample. Powder of the tuber of *Dioscoreapuber* when boil are more slippery than bark powder of *Premnalatifolia* followed by powder of the rhizome of *Lassia spinosa*. All the three plant species *Lassia spinosa*, *Premna latifolia* and *Dioscoreapuber*have alkaline pH (6.69 ± 0.08, 7.78± 0.05 and 8.02 ± 0.09respectively**).** The total moisture was highest in *Dioscore apuber* with 37.03g/100g followed by *Premna latifolia* (26.21g/100g) and *Lassia spinosa* (16.80g/100g) while value oftotal ash contents (2.4 ± 0.32g/100g, 7.69 ± 0.38g/100g and 10.69 ± 0.68g/100g) decreases with increase in level of pH and moisture, indicating presence of sufficient amount of minerals [20]. Presence of high amounts ash or minerals in plant signifies good quality of nutritional value because these are involved in human body structure and the edible plants are suitable for consumption by human [21].

Rhizomes of *Lassia spinosa* (L.) Thaw., often consumed by the tribe during normal time but consumed highly during food shortage, contain a good amount of protein (1.85 ± 0.04 g/100g), carbohydrate (2.32±

0.34 g/100g), amino acid being the richest with 8.29 ± 0.4 mg/g and reducing sugar with 0.0343 ± 0.23 g /1g.

Premna latifolia Roxb. is the most exploited wild food plant used during famine among the Karbis since time immemorial. Nutritional analysis reveals that bark of *P. latifolia* contain the richest source of protein (2.12 ±0.04g/100g) and carbohydrate with (2.39 ± 0.12g/100g). It also contains a good amount of Amino acid (7.95 ± 0.4mg/g) and reducing sugar (0.033 ± 0.34 g /1g).

Dioscorea puber Blume. is a nutritious and energetic food plant and data on nutritional ground shows that the tubers is enriched with protein (1.09 ± 0.09g/100g), carbohydrate being the richest (2.91± 0.56 g/100g), amino acid (8.02± 1.24 mg/g) and reducing sugar (0.036 ± 0.36 g/1g).

Discussion

It is noteworthy to mention that the plants discussed in this study are unconventional food plants that substitute rice during food shortage. Some plants which was earlier grown wild (*L. spinosa* (L.) Thaw. and *D. puber*) are now domesticated and used widely as traditional leafy and tuber food in almost whole parts of Karbi Anglong district. Further, *P.latifolia* Roxb. which was earlier most exploited famine food is now ignored as source of food; it is still remain undomesticated. Its fresh moist bark is now popularly used as medicine for relieving from stomach disorder including blood dysentery, painful micturition and also from bruishes, burn and minor cuts among the Karbis. *P. latifolia* Roxb. is a life saving plant that substitute rice during severe food scarcity which is consumed by the local people since time immemorial. *D. puber* is another exploited famine food utilized among the tribe. These tubers are consumed boiled and well known as energetic food plants. Consumption of this tuber is well known among the tribe till today and many of the household now grow this plant in their homestead garden; consumed mostly as breakfast and evening tea item. *D. puber*, on the basis of nutrient content is enough to ensure survival capacity, being immediate source of energy. Yams are valuable source of carbohydrate, fibres and low level fats, which makes them good dietary source [22, 23].In the present context, this plant is wild to semi wild edible vegetables whose tender twigs are consumed but rhizome are ignored.

Conclusion

The nutritional contents of the three plants species have been presented and it encourage as a carbohydrate supplement for cereal-based diet in poor rural communities. On the basis of detail chemical analysis and observation, it can be concluded that the wild plants species, have higher quantity of nutritive value. These have the potential to replace other conventional food and meet nutritional requirement of the body to survive especially during times of food shortage. Investigation on antinutrient factor would further help in evaluating the permissible toxicity of the antinutrient present in the species.

Table 1: Table showing organoleptic characters of grain and nutritional assessment of *Lassia spinosa*, *Premna latifolia, Dioscorea* sp.

Characteristics	***Lassia spinosa* (L.) Thaw.**	***Premna latifolia* Roxb.**	***Dioscorea puber* Blume.**
1. Macroscopical character			
a. Form	Granular powder	Coarse powder	Fine powder
b. Colour	Saw dust	Purplish brown	Brown
c. Odour	Odourless	Aromatic	Odourless
d. Solubility i. cold water ii. Alcohol iii. Boil water	 Insoluble Insoluble Give colloidal solution, mucilaginous	 Insoluble Insoluble Slippery	 Insoluble Insoluble Mucillaginous
e. pH	6.69 ± 0.08	7.8 ± 0.05	8.02 ± 0.09
f. Moisture content	16.80g/100g	26.21g/100g	37.03g/100g
g. Total ash value	10.69 ± 0.68g/100g	7.69 ± 0.38g/100g	2.4 ± 0.32g/100g
2. Microscopical Characters			
a. Nature	Simple	Compound	Simple
b. Shape	Regular/Oval almost rod like	Irregular	Regular/Oval almost round
c. Size	11-55µm	1.6-3.2 µm	3-11 µm
3. Nutritional Content			
a. Carbohydrate	2.32 ± 0.34 g/100g	2.39 ± 0.12 g/100g	2.91 ± 0.56 g/100g
b. Reducing Sugar	0.0343 ± 0.23 g /g	0.033 ± 0.34 g /g	0.036 ± 0.36 g/g
c. Protein	1.8 5 ± 0.0 4g/100g	2.12 ± 0.04 g/100g	1.09 ± 0.09 g/100g
d. Amino Acid	8.290.4 mg/g	7.95 ± 0.4 mg/g	8.02 ± 1.24 mg/g

All the values mentioned are mean ± SD of triplicates determinations of three samples.

Acknowledgement

Authors are grateful to the Department of Life Science and Bioinformatics, Assam University Diphu Campus Diphu, for providing necessary laboratory facilities and also to Institutional Biotech Hub. Authors also extent their gratitude to Mr. Probinson Kro, lab attendant for his help in the laboratory. First author is also thankful to local guide for his help in collecting the plants specimen from the field.

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