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Biochemical Constituents and Nutritive Evaluation of Some Less Known Wild Edible Plants from Senapati District, Manipur, India

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Abstract

Ten lesser known wild edible plants (WEPs) from Senapati District, Manipur, were analyzed for their proximate composition and mineral content. The study revealed that different WEPs have crude fat content that ranged between 0.41 - 21.5%, total sugar was found to be between 2.00 - 59.00%, total soluble protein between 1.40 - 8.0% and total amino acids between 1.50 - 5.25 mg/100 g respectively, whereas the highest and the lowest crude protein contents were recorded in *H. macrocarpa* (27.56%) and *S. suaveolens* (4.37%) respectively. Among the micronutrients, the highest amounts of Fe, Mn, Zn, Cu and Co were recorded in *C. hirsuta* (155.50 mg/100 g), *E. acuminata* (105.50 mg/100 g), *S. suaveolens* (76.50 mg/100 g in Zn and 24.0 mg/100 g in Cu) and *R. ellipticum* (3.0 mg/100 g), while the lowest amounts were recorded in *E. phaseoloides* (61.50 mg/100 g), *O. indicum* (1 mg/100 g), *E. acuminate* (17.50 mg/100 g) and *C. montana* (0.5 mg/100 g) respectively. Higher amounts of Ca and Mg were observed in all the plants studied, ranging from 458 to 765 mg/100 g in Ca and 148.50 to 995.0 mg/100 g in Mg. *E. lineolatum* indicated the highest amount of Ca by containing 765.0 mg/100 g, while *A. ciliata* recorded the highest value of Mg by containing 995.0 mg/100 g. The nutritive values of the ten WEPs were found to be comparable or even higher than the conventional vegetables, with respect to proteins and minerals, especially for Ca, Mg, Fe, Mn and Zn respectively.

Keywords: biochemical, nutritive, Senapati district, traditional, wild edible plants

Introduction

There is a very close association between wild plants and the life of human civilization since time immemorial. People of different countries, different sections, localities and places have their own unique preparations and methods of using them and these have been handed down from generation to generation. The quality of a food depends upon the presence of relative concentration of various nutrients such as proteins, fats, carbohydrates, vitamins and minerals. Carbohydrates, fats and proteins are considered as proximate principles and form the major portion of the diet, while minerals play an important role in the regulation of the metabolic activity in the body (Gopalan *et al*., 2004; Pfoze *et al*., 2012).

As major portion of our diet is obtained from plants, understanding their nutritive values is an important aspect. Nutrition plays a critical role in wellness, by not only providing essential nutrients, but also promoting good health and preventing diseases (Ogle *et al*., 2003). These wild edible plants are collected by the local tribes not only as famine or hunger food, but also have been recognized to have potential to meet household food and income security (Mahapatra *et al*., 2012).

Materials and Methods

Ethno botanical surveys with respect to ethnic food plants were conducted during December 2009 – June 2012 in the Senapati District, Manipur. Ten lesser known wild edible plants (WEPs) were short listed as these are widely consumed by the local tribes for their good taste. Depending on the information provided by the local populations, different edible portions of the plants were collected, washed and dried in the shade. They were grounded and sieved to a fine powder which would be used for various analyses.

Total sugar, total free amino acid, soluble protein content were estimated following the procedures of Dubois *et al*. (1951), Yemm and Cocking (1955) and Lowry *et al*. (1951). Total crude protein, crude fibre and crude lipid were estimated as per the methods described in Chopra and Kanwar (1980). For minerals estimation, plant samples were subjected to wet digestion method of Capar *et al*. (1978). Ca, Mg, Fe, Co, Cu, Zn and Mn were determined in a Parkin Elmer atomic absorption spectrophotometer, Analyst AA-200. Phosphorous was estimated in a spectrophotometer by using Vanado Phosphomolybdate yellow colour method of Gupta (2006).

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Results and Discussion

Wild food plants are important in many indigenous communities around the world (Biswas and Mohammed, 2011). Wild edible plants play a vital role providing nourishment (Jansen, 2004) and variety in the diet and contribute to health maintenance as functional or medicinal foods (Orech *et al*., 2007). There are various reports about the use of such wild plants in Manipur (Dipankar, 2013). Analyses of the nutritional content of plants have been done in a number of studies (Dipankar, 2013; Samancïoglu, 2016). Data in Table 1 indicates the relatively high crude protein content in almost all the plant samples under study. Different WEPs have crude lipid content ranging from 0.41 to 19.82%. The crude lipid content was higher in the seeds of *Oroxylum indicum (*19.82%) and the lowest in the epicarp of *Stixix suaveolens* (0.41%). The total soluble protein varied between 1.40-5.50%, while the highest value was recorded in *Acmella ciliata* (5.50%) and the lowest in the leaves of *Rhynchotechum ellipticum* (1.40%). The highest and the lowest crude protein content were recorded in *Hodgsonia macrocarpa* (27.56%) and *S. suaveolens* (4.37%) respectively. Among the studied plants, a wide variation in total sugar, ranging from 2.5 to 59 mg/100 g, was observed, while a fairly uniform distribution of the total free amino acid, ranging from 1.50 to 5.25 mg/100 g, was recorded.

Table 2 indicates the mineral composition within the ten plants studied. Among the macro elements, high amounts of Ca and Mg were detected in all the plants studied, ranging from 458 to 765 mg/100 g in Ca and 148.50 to 995.0 mg/100 g in Mg, respectively. The highest amount of Ca was detected in *Elatostema lineolatum* (765.00 mg/100 g) and Mg in *Acmella ciliata* (995.0 mg/100 g), while the lowest amounts were recorded in *Oroxylum indicum* (458.5 mg/100 g) and in the epicarp of *S. suaveolens* (148.5 mg/100 g). Phosphorus content in all the plants was very less and ranged from 10 to 180 mg/100 g only.

Micro-element analysis in the ten plants indicated considerably high amounts of Fe, Mn and Zn. Fe content ranged from 61.5 to 155.5 mg/100 g, out of which, significantly high amounts of Fe were recorded in *Cardamine hirsuta* (155.5 mg/100 g*), Rhynchotechum ellipticum* (131.0 mg/100 g) and *Acmella ciliata* (100 mg/100 g). Mn content among the ten plants varied considerably and ranged from 1.0 mg/100 g in the seeds of

Table 1. Proximate composition (%) of ten wild edible plants collected from Senapati District, Manipur (average of two independent readings)

No.	Plant	Local name	Parts used	Total sugar	Total free amino acids	Total soluble protein	Crude lipid	Crude fiber	Crude protein
1	*Acmella ciliata*	Manjareng	Whole aerial part	2.5	2.62	5.50	2.92	14.29	22.49
2	*Cardamine hirsuta*	Uchi-hangam	Whole aerial part	6.25	3.75	4.10	5.54	10.35	22.93
3	*Cucurma montana*	Tekhao-yaikhu	Inflorescence	5.25	1.50	3.50	1.85	8.6	5.43
4	*Elatostema lineolatum*	Ching Sougri	Whole aerial part	2.00	5.25	5.05	2.20	15.4	24.15
5	*Entada phaseoloides*	Khangkhil	Leaves	4.25	2.62	4.50	5.02	11.33	22.51
6	*Eurya acuminata*	Shijou	Leaves	7.5	5.25	3.00	3.88	15.42	7.88
7	*Hodgsonia macrocarpa*	Lam-mairel	Cotyledons	2.50	3.00	3.75	21.5	6.25	27.56
8	*Oroxylum indicum*	Shamba	Seed	7.50	1.87	5.25	19.82	9.14	26.63
9	*Rhynchotechum ellipticum*	Yembum	Leaves	5.25	1.50	1.40	2.15	11.47	10.24
10	*Stixis suaveolens*	Urirei	Fruit pulp	9.75	2.25	2.65	1.20	14.63	4.38
			Epicarp	59.00	4.87	5.00	0.41	9.23	7.53
	Mean			10.16	3.13	3.97	6.04	11.46	16.52
	S.D.			16.38	1.44	1.27	7.40	3.10	9.28
	S.Em			4.94	0.43	0.38	2.23	0.94	2.80
	C.V.			161.20	45.81	31.89	122.38	27.05	56.16

Table 2. Mineral contents (mg/100 g) of ten wild edible plants collected from Senapati District, Manipur (average of two independent readings)

No	Plant	Local name	Parts used	P	Ca	Mg	Fe	Mn	Zn	Cu	Co
1	*Acmella ciliata*	Manjareng	Whole aerial part	90.0	645.0	995.0	100.0	4.5	20.0	3.0	2.5
2	*Cardamine hirsuta*	Uchi-hangam	Whole aerial part	110.0	655.0	483.0	155.5	3.0	27.5	3.0	2.5
3	*Cucurma montana*	Tekhao-yaikhu	Flower and inflorescence	60.0	630.0	471.5	80.5	70.0	36.0	0.5	0.5
4	*Elatostema lineolatum*	Ching Sougri	Whole aerial part	80.0	765.0	760.0	94.5	82.5	27.5	2.0	2.0
5	*Entada phaseoloides*	Khangkhil	Leaves	30.0	555.0	208.5	61.5	10.5	18.5	4.0	2.0
6	*Eurya acuminata*	Shijou	Leaves	30.0	600.0	306.0	88.0	105.5	17.5	0.50	1.0
7	*Hodgsonia macrocarpa*	Lam-mairel	Cotyledons	160.0	555.0	277.5	66.0	2.5	30.0	2.0	1.0
8	*Oroxylum indicum*	Shamba	Seed	180.0	458.5	238.5	63.0	1.0	23.5	11.0	1.5
9	*Rhynchotechum ellipticum*	Yembum	Leaves	40.0	690.0	261.0	131.0	11.0	43.5	2.5	3.0
10	*Stixis suaveolens*	Urirei	Fruit pulp	40.0	487.5	187.0	66.5	2.5	76.5	1.5	1.0
			Epicarp	10.0	486.0	148.5	84.5	2.0	54.5	24.0	2.0
		Mean		75.5	593.4	394.2	90.1	26.8	34.1	4.9	1.7
		S.D.		55.4	95.1	266.4	29.8	39.0	18.0	7.0	0.8
		S. Em±		16.7	28.7	80.3	9.0	11.8	5.4	2.1	0.2
		C.V.		73.4	16.0	67.6	33.1	145.4	52.8	141.6	45.5

Fig. 1. Photographs of wild edible plants: (A) *Acmella ciliata*, (B) *Cardamine hirsuta, (C) Cardamine hirsuta* plant in wild habitat, (D) Inflorescence of *Cucurma montana, (E) Eurya acuminata* leaves, (F) *Oroxylum indicum* plant with pods

Oroxylum indicum, to 105.5 mg/100 g in the leaves of *Eurya acuminata.* Considerably high amounts of Mn were also recorded in *Elatostema lineolatum* (82.5 mg/100 g) and *Cucurma montana* (70.0 mg/100 g). Zn distribution in the ten plants was fairly uniform and ranged from 17.5 to 76.5 mg/100 g. Considerably higher amounts of Zn were recorded in *Stixis suaveolens* (76.5 mg/100 g) and *Rhynchotechum ellipticum* (43.5 mg/100 g). Cu and Co content, though were lesser in extent than the other micro-elements, thus recorded fairly uniform values, ranging from 0.50 to 24.0 mg/100 g in Cu and 0.5 to 3.0 mg/100 g in Co respectively.

Conclusions

The nutritional value of many traditional leafy vegetables is higher than several known common cultivated vegetables. As vegetables are especially considered main suppliers of vitamins and minerals rather than proteins and energy *Acmella ciliata, Cardamine hirsuta, Elatostema lineolatumand* and *Eurya acuminata* may be valuable for human diet, as their mineral content with respect to Ca, Mg, Fe Mn and Zn far exceeds than the dietary allowances recommended, thus represent potential sources of nutrients.

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