

Food Value of Common Edible Wild Plants of Sikkim

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There is a search for novel, high quality, functional and inexpensive foods among the consumers in the global markets. Edible wild plants as rich bioresources of the Sikkim Himalayas can supplement such need in local diet. The ethnic people of Sikkim consume roots, tubers, rhizomes, leaves and fruits of wild plants. Some of them sell the edible wild fruits, vegetables in nearby markets, which are in high demand among the local consumers. Taxonomical description, distribution and ethnical importances of edible wild plants have been well documented (Hara, 1966, Bennet, 1987; Sundriyal and Rai, 1996; Rai *et al.*, 1998; Gurung, 2002; Sundriyal and Sundryal, 2004a). Approximate annual production of edible wild plants in Sikkim was estimated as about 140 tons (Sundriyal and Sundriyal, 2004b). Out of 190 species of edible wild plants reported so far from the various places of Sikkim, more than 70 wild plants are eaten as fruits, more than 50 as vegetables and pickles, rest as condiment, herbal materials, etc. However, information on nutritional value of most of these wild plants of Sikkim is meager, except the study conducted by Sundriyal and Sundryal (2004 a,b). The present paper deals with the analysis of proximate composition and nutritive value of some common edible wild plants sold in local markets of Sikkim.

A survey was conducted on the types of edible wild plants based on the method of the Indian Statistical Institute, Kolkata (unpublished) in four districts of Sikkim. Samples (leaves, twigs and fruits) of fifteen common edible wild plants viz., *Nasturtium officinale*, *Phlogacanthus thyrsoiflorus*, *Hottuynia cordata*, *Urtica dioica*, *Ficus benjamina*, *Aconogonum molle*, *Diplazium esculentum*, *Tupistra nutans*, *Castanopsis hystrix*, *Choerospondias axillaris*, *Docynia indica*, *Machilus fructifera*, *Fragaria nubicola*, *Ficus hookeriana* and *Elaeagnus conferta* were collected from their natural

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habitats in sterile poly-bags and transported to laboratory for analyses.

Moisture content of edible portion of the samples was calculated by drying 3 g of sample (in triplicate) at $135 \pm 1^\circ \text{C}$ for 2 h to constant weight (AOAC, 1990). The ash content of sample was measured by heating at 550°C until the difference between two successive weighing was $\leq 1 \text{ mg}$ (AOAC, 1990). The fat content was determined by ether extraction using glass soxhlet (AOAC, 1990). The protein content of samples was determined by multiplying total nitrogen value, estimated by micro-Kjeldahl method, with 6.25 (AOAC, 1990). The carbohydrate content was calculated by difference: $100 - (\% \text{ protein} + \% \text{ fat} + \% \text{ ash})$ (Standal, 1963). Sodium, potassium and calcium of samples were estimated following the method of Ranganna (1986) in a flame-photometer (CL361, Elico). Nutritive value (Kcal/100 g) was determined by factor = $4 \times \% \text{ protein} + 9 \times \% \text{ fat} + 4 \times \% \text{ carbohydrate}$ (Indrayan *et al.*, 2005).

Nasturtium officinale Brown (water cress) belongs to family Brassicaceae is commonly known as *simrayo* in local language and is found in Sikkim upto 12,000 ft. Young twigs are eaten as vegetable or soup. It is believed to reduce the blood pressure. *Phlogacanthus thyrsoiflorus* (Roxb.) Nees. (family Acanthaceae), known as *titay* or *chua* in local language is found up to 4000 ft. The inflorescence parts are eaten as curry. *Hottuynia cordata* Thunb. belongs to family Saururaceae, known as *hilay jhar* or *gandhay jhar* is found up to 5500 ft. and is common during February to September. The whole plant is eaten as vegetable. *Urtica dioica* Linn. (stinging nettle) belongs to family Urticaceae, commonly known as *sishnu* is found up to 9000 ft. Inflorescence and young leaves are eaten as vegetables as well as soup. *Ficus benjamina* Linn. (family Moraceae) commonly known as *kabra* is distributed up to 3500 ft. Leaf buds are boiled and processed into pickles during March-April.

Table 1. Food value of edible wild plants (vegetable/pickles) of Sikkim

Plants (local name)	%					mg/100 g			Kcal/100 g
	Moisture	Ash	Fat	Protein	Carbohydrate	Sodium	Potassium	Calcium	Nutritive value
<i>Nasturtium officinale</i> (simrayo)	91.1 ± 0.45	1.7 ± 0.1	1.1 ± 0.3	3.1 ± 0.7	3.0 ± 0.8	72.4 ± 3.4	481.7 ± 19.0	60.1 ± 1.3	34.3 ± 3.1
<i>Phlogacanthus thyrsiflorus</i> (titay)	79.1 ± 0.1	2.4 ± 0.7	0.8 ± 0.2	1.5 ± 0.1	16.2 ± 0.4	2.9 ± 0.9	722.9 ± 6.1	105.0 ± 0.8	18.0 ± 1.4
<i>Hottuynia cordata</i> (hilay jhar)	88.3 ± 1.3	1.7 ± 0.3	0.8 ± 0.1	4.1 ± 0.1	5.1 ± 0.2	6.9 ± 0.1	801.4 ± 4.4	11.3 ± 1.0	44.0 ± 2.4
<i>Urtica dioica</i> (sishnu)	84.6 ± 2.2	2.4 ± 0.1	0.7 ± 0.3	4.7 ± 0.1	7.6 ± 0.3	11.7 ± 0.3	911.0 ± 31.5	102.5 ± 2.3	55.5 ± 2.2
<i>Ficus benjamina</i> (kabra)	94.5 ± 0.6	0.4 ± 0.1	1.0 ± 0.1	1.9 ± 0.2	2.1 ± 0.3	9.2 ± 0.3	222.0 ± 4.5	11.7 ± 0.3	25.0 ± 2.1
<i>Aconogonum molle</i> (thotnay)	93.3 ± 0.1	0.8 ± 0.1	0.5 ± 0.1	2.6 ± 0.1	2.8 ± 0.5	8.7 ± 0.2	428.4 ± 3.1	5.0 ± 0.5	16.0 ± 2.4
<i>Diplazium esculentum</i> (ningro)	93.1 ± 0.8	1.3 ± 0.1	2.0 ± 0.2	2.6 ± 0.2	1.0 ± 0.3	8.1 ± 0.5	927.4 ± 48.5	200.5 ± 0.5	32.0 ± 2.1
<i>Tupistra nutans</i> (nakima)	91.5 ± 0.2	1.1 ± 0.1	2.9 ± 0.2	2.4 ± 0.3	2.1 ± 0.2	3.1 ± 0.2	292.1 ± 27.8	200.6 ± 0.3	44.0 ± 2.0

Data represent the means (± SD) of 8 samples of each plant.

Table 2. Food value of edible wild fruits of Sikkim

Plants (local name)	%					mg/100 g			Kcal/100 g
	Moisture	Ash	Fat	Protein	Carbohydrate	Sodium	Potassium	Calcium	Nutritive value
<i>Castanopsis hystrix</i> (katush)	55.2 ± 0.9	0.9 ± 0.1	1.0 ± 0.2	3.6 ± 0.1	39.3 ± 0.5	2.9 ± 0.1	911.6 ± 45.0	199.0 ± 0.3	180.0 ± 1.8
<i>Choerospondias axillaries</i> (lapsi)	84.8 ± 1.2	0.7 ± 0.1	0.9 ± 0.3	2.2 ± 0.4	11.4 ± 0.5	5.0 ± 0.1	639.3 ± 42.8	202.1 ± 0.3	62.5 ± 2.4
<i>Docynia indica</i> (mail)	85.1 ± 0.1	0.6 ± 0.1	1.0 ± 0.2	2.1 ± 0.3	11.2 ± 0.3	15.3 ± 0.5	202.8 ± 6.6	200.5 ± 0.1	62.2 ± 2.4
<i>Machilus fructifera</i> (famphal)	69.0 ± 0.1	0.8 ± 0.1	1.5 ± 0.2	3.1 ± 0.4	25.6 ± 0.4	22.3 ± 1.5	415.6 ± 22.6	11.0 ± 1.2	128.3 ± 1.0
<i>Fragaria nubicola</i> (bhui aisenlu)	93.1 ± 0.6	0.6 ± 0.1	1.1 ± 0.1	1.5 ± 0.3	3.7 ± 0.4	8.2 ± 0.1	160.5 ± 1.8	8.0 ± 0.4	30.7 ± 2.1
<i>Ficus hookeriana</i> (nebara)	89.0 ± 2.7	1.3 ± 0.2	0.9 ± 0.1	2.7 ± 0.1	6.2 ± 0.4	12.8 ± 0.8	736.1 ± 48.5	38.1 ± 0.2	33.7 ± 1.9
<i>Elaeagnus conferta</i> (muslendi)	91.7 ± 2.0	0.7 ± 0.1	0.8 ± 0.2	1.4 ± 0.5	5.3 ± 0.5	6.7 ± 0.3	233.5 ± 2.3	5.8 ± 0.3	34.0 ± 2.5

Data represent the means (± SD) of 8 samples of each plant.

Aconogonum molle (D. Don) Hara (family Polygonaceae) commonly known as *thotnay* is found up to 8000 ft during March to October. Young twigs are eaten as pickle. *Diplazium esculentum* (Retz.) Sw. (fern) belongs to family Athyriaceae commonly known as *ningro* is found up to 8000 ft. during March to December. Young fronds are eaten as vegetables, sometime mixed with *chhurpi*, a traditional cheese-like product (Tamang, 2005). *Tupistra nutans* Wall. (family Liliaceae) locally known as *nakima* is found throughout Sikkim up to 7000 ft. during August to October. The inflorescence is eaten as vegetable and pickle. *Nakima* is highly priced wild vegetables popular among the Bhutias and Lepchas of Sikkim.

Castanopsis hystrix A. DC. (family Fagaceae) commonly known as *katush* is a popular wild fruit found in Sikkim up to 9000 ft during September to November. Fresh nuts are eaten as fruits. *Choerospondias axillaris* (Roxb.) Burtt & Hill. (family Anacardiaceae) known as *lapsi* is found up to 5500ft. during July to December. Raw pulps are eaten or processed into pickle. *Docynia indica* (Wall.) Decaisne (family Rosaceae) known as *mail* is found up to 5000 ft. during September to November. Raw fruits are eaten or made into pickle. *Machilus fructifera* Kostermans (family Lauraceae) known as *famphal* is found up to 8000 ft. during March to April. Raw pulps are eaten as fruits. *Fragaria nubicola* Lindl. (family Rosaceae) known as *bhui aisenlu* is found up to 11000ft. during April to June. It is eaten as fruit. *Ficus hookeriana* Corner. belongs to family Moraceae known as *nebara* is found up to 5000ft. during March to April. Eaten as fresh fruits and also processed into pickles. *Elaeagnus conferta* Roxb. (family Elaeagnaceae) known as *muslendi* is found throughout Sikkim up to 5500 ft. during April to June. It is eaten as fruit and sometime processed into pickles.

Eight edible wild plants used as vegetable/pickles and seven plants as fruits were analysed for nutritive composition, respectively (Table 1 and 2). Data showed that some of these plants have high nutritional value as well as high content of minerals particularly potassium. Leaves and twigs of *hilay jhar* and *sishnu* have high content of protein comparable to other plants. *Ningro* and *nakima* are rich in minerals. *Katush* and *famphal* have high average nutritive value among wild fruits. Comparable to leafy vegetables, fruits have high nutritive value. These findings correspond to the previous data of other leafy vegetables and fruits (Ndossi and Sreeramula, 1991; Longvah, 2002; Sankhala *et al.*, 2005).

Market survey of seasonal edible wild plants was also conducted at local markets of Gangtok, Mangan, Singtam and Melli (data not shown). People usually collect the edible wild plants from their natural habitats and sell in local markets. In most cases, 100% profit is made out of selling the wild plants. However cost includes local transportation and other expenses. Profit is used for livelihood. Though clinical study of edible wild plants has not been carried out, people strongly believe they have

certain therapeutic values. Such foods of Sikkim if studied properly mainly on anti-oxidant properties and other bioactive compounds, may find place in the global markets. The uncultivated edible wild plants, however, supplement the need of cultivate vegetables and contribute in food security of the region.

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