

Diversity of Traditional Leafy Vegetables in Two Villages of ‘Kaptai’ Reserve Forest, ‘Rangamati’, Bangladesh

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Abstract—A field survey was conducted during May 2015 to May 2016 to determine the diversity of the used traditional leafy vegetables (both cultivated and wild) in two tribal villages of Kaptai Reserved forest, Rangamati, Bangladesh. A total of 60 households (more than 45% population) in the two enclaves of the locality were surveyed by semi-structured questionnaire. Plant species were collected and preserved in herbarium sheet and were brought to the laboratory for identification consulting Monograph and Taxonomist. A total of thirty six species belonging to thirty four Genera and twenty four families of foliage vegetables found to be utilized by native tribes. Of these, nine were cultivated and nineteen were wild and rests of the eight species were both from wild and cultivated. Considering growth habit, twelve species were annual and twenty four were grown seasonally. Among the species *Ajuga macrosperma* of Lamiaceae, *Cardiospermum halicacabum* of Sapindaceae, *Chenopodium album* of chenopodiaceae, *Cissus repens* of Vitaceae family were rarely found in the wild. In each of the locations, landless farmer used larger diversity of leafy vegetables. The small farmers of the locality were dependent on the wild vegetables and most of them were available year round. Several leafy vegetables were found to be consumed primarily due to their nutritional values without much concerning health importance. The results of this study showed a remarkable diversity of therapeutically useful foliage vegetables inside the surveyed location. It further indicated the potentials of those plants in enhancing nutrition and health care of average villager’s against the face of harsh condition. It further indicated the demand for concern on the conservation of these leafy vegetables (especially those in wild) is stressed so as to safeguard them for future generation and avoid their genetic erosion.

Keywords: Diversity, Traditional Leafy Vegetables, Conservation, and Kaptai Reserve forest and Bangladesh.

1. INTRODUCTION

Leafy vegetables are referred to leaves of any plants used as vegetables, sometimes accompanied by tender petioles and shoots. Leafy vegetables typically return from ephemeral herbaceous plant like Amaranths and Spinach. Leaves of woody plants consumed as vegetable includes bauhinia, Ficus, Moringa and so on hold a vital place in well-balanced diets

(Singh, 2015). They constitute a major portion of our diet and play a vital part in assuaging deficiency disease. FAO (2012) calculated that about 870 million individuals were inveterately malnourished in the period 2010-12 representing 12.5% of the world population, or one in eight people. In order to arrest the undernourished scenario, much attention has been paid on the exploitation and utilization of uncommon plant materials for food (Kawatra et al., 2001; Diniyet al., 2005). In Bangladesh agriculture produces around ninetieth of its food need together with cereals and vegetables (FAO/WFP CFSAM 2008). There are 141 types of leafy vegetables (commonly called shak) and twenty five varieties of non-leafy vegetables in Bangladesh (Maksuda, 2010). Among the leafy vegetables, 97 items are known as ethnic varieties, and the rest are consumed by each the general and ethnic people. A good range of shaks grow as weeds or throughout cultivation of alternative crops. Many of the poor and landless people rely on these native foods (SANFEC, 2005). Out of 186 leafy vegetables identified by Khatun et al (2013) in Bangladesh, 140 taxa are wild and forty six are cultivated. Among the cultivated ones 16 species are cultivated solely as leafy vegetables and thirty are cultivated for alternative functions, however additionally used as leafy vegetables. Leafy vegetables are principally consumed for his or her nutritional values while not abundant thought for their medicative importance (Scalbert et al. 2005). There are many varieties of these leafy vegetables either within the wild state or beneath cultivation in rural areas. Many thousands of wild species of plant offer necessary sources of protein, fats, vitamins, and minerals. This is very true for both the poorest and the wealth socio-economic groups of the people (Akhtar 2001; ICIMOD 2010; Aryal 2010). In remote rural societies where vegetable cultivation isn't practiced and market is not on the market for native inhabitants, they should be addicted to regionally on the market plants those will used as vegetables. Ethnic people from numerous tribes have been started domesticating wild edible and helpful plants by trial and error technique. That was the base of contemporary

agricultural practices and related analysis (Prescott and prescott, 1990, Scherrer et al., 2005 and Bussmann et al., 2006). Knowledge of these edible plants is an element of their traditional knowledge, which is typically transmitted by elders to younger and by participation of people in assortment of vegetable plants. Now a days, human vegetable consumption is based on rather terribly restricted range of crops, but in several components of the world the employment of wild plants is incredibly common (Bussmann and Sharon, 2006; Kunwar et al., 2006; Cavender, 2006 and Pieroni et al., 2007). Vegetables are thought-about as low cost natural sources of supplementary food and will grow in a very short amount of time. Therefore, the study was taken to investigate diversity of traditional leafy vegetables with ethno botanical uses by the ethnic people of Kaptai Reserve forest.

2. MATERIALS AND METHODS

The diversity of traditional leafy vegetables with ethno botanical inventory of the two villages namely Kalabunia para and Chakua para under Kaptai upazila of Rangamati, Bangladesh was conducted during May 2015 to May 2016. With a semi structured questionnaire the field survey was carried out in two villages those are belongs to Kaptai Reserve Forest under the management of Rangamati South Forest Division. The forests lie between 22°26' and 22°38' North and 92°08' and 92°17'. The configuration of the ground is very irregularly rugged and consists of a series of ridges and valleys running more or less from north to south. The level of valley bottoms ranges from 30 to 90 m above the sea level and maximum elevation is about 500m. The hill soils are mainly yellowish-brown to reddish-brown loams and soil pH varies from 5.5-6.0 (Anonymous, 1960). The dry and cool season is from November to March; Pre-monsoon season (April-May) is hot and sunny; the monsoon season (June to October) is warm, cloudy and wet.

With twelve field visits (each trip contain 5- 7 days) were done to select the village and households by observing the status of leafy vegetables (tree, shrub, herb and climber) and indigenous knowledge of using these species. Firstly, the participatory rural appraisal approach was used, with the particular attention given to gender role. Secondly, the data were collected through the application of PRA tools and techniques such as: direct observation, discussions, field visits, seasonal calendars as well as key individuals' interviews using a checklist. The sample respondents for the study consisted of 60 households, 30 from each village. With the help of Headman and Karbari the respondents were divided into four categories based on farm size that include landless farmer (below 0.5 ac), small farmer (0.5-1.49 ac), medium farmer (1.5-2.49 ac) and large farmer (above 2.5 ac). Identification of the existing leafy vegetables was done in the field while the others that could not be readily identified were brought to the herbarium of department of Crop botany, Bangladesh Agricultural University. Ranking of the priority species of leafy vegetables were done on the basis of the preferences of

the interviewer, which resulted in the identification of twenty major species for the both villages considering the following criteria: Geographical importance linked with the aerial extent where a given species is considered a priority one, plant habit, life cycle (annual, perennial, cultivated and wild), frequency of occurring, and medicinal uses. The collected data were placed on to computer to prepare a database through Microsoft Excel and Microsoft Access database programme.

3. RESULTS AND DISCUSSION

3.1 Status of species, genera and families in the two villages according to their category

The surveyed results specify that landless farmers from Chakuapara consumed the highest number of leafy vegetables which include 36 species, 34 genera and 24 families. A total of 35 species, 21 genera and 22 families were consumed by small farmers and that of 27 species, 25 genera and 20 families were consumed by medium farmers accordingly (Table 1a). On the other hand, the highest number of leafy vegetables consumed by the landless farmers in Kalabunia para, includes 35 species, 21 genera and 24 families. Abdullah et al., 2007 also indicates that landless famers had the highest number of species diversity.

Table 1: Total number of leafy vegetables as recorded from different category families of Chakua para (a) and Kalabunia para (b).

(a)	Total number of			
	Famers type	Species	Genus	Families
Large	0	0	0	0
Medium	27	25	20	20
Small	35	21	22	22
Landless	36	34	24	24
(b)				
Large	0	0	0	0
Medium	0	0	0	0
Small	32	29	24	24
Landless	35	21	24	24

3.2 Species diversity of traditional leafy vegetables in surveyed area

Thirty six plant species belonging to 34 genera and 24 families were identified as leafy vegetables used by the ethnic people from 60 households surveyed in two villages (Table 2). The highest number families represent from Amaranthace (11.11%), Lamiaceae (8.33%), Apiceae (8.33%), Araceae (5.56%), Asteraceae (5.56%), Chenopodiaceae (5.56%), Cucurbitaceae (5.56%) and Malvaceae (5.56%). Ayodele (2005) reported the family Asteraceae contained the highest number of TLVs followed by the Cucurbitaceae, Malvaceae and Solanaceae. The number of TLVs recorded in the present study area indicates its diversity is less as compared to others area (Abdullah et al. 2007)

Table 2: Leafy vegetables commonly found in the villages of KRP

Sl.No	Name	Scientific Name	Family	Habit	Wild/Cultivated	Collection period	Medicinal uses	Frequency of occurring
1.	Malancha (B), Tidi dog (M)	<i>Alternanthera philoxeroides</i>	Amaranthaceae	Herb	W/C	All	No	Frequent
2.	Spleen Amaranth (E), Data shak (B)	<i>Amaranthus dubius</i>	Amaranthaceae	Herb	C	All	No	Frequent
3.	Joseph's Coat(E), Lalshak(B)	<i>Amaranthus gangeticus</i>	Amaranthaceae	Herb	C	All	Yes	Frequent
4.	Notey shak(B), Ahu Mihim Ga(M)	<i>Amaranthus viridis</i>	Amaranthaceae	Herb	W	All	Yes	Intermediate
5.	Mysapagur (C).	<i>Eryngium foetidum</i>	Apiaceae	Herb	W	Winter	Yes	Frequent
6.	Thankuni (B), Murong khoya (M)	<i>Centella asiatica</i>	Apiaceae	Herb	W/C	Winter	Yes	Rare
7.	Corriander(E), Dhane pata(B)	<i>Coriandrum sativum</i>	Apiaceae	Herb	W/C	Winter	Yes	Rare
8.	Chikon shak(B), Sarangkang (M)	<i>Homalomena aromatica</i>	Araceae	Herb	W	Winter	No	Rare
9.	kochu (B), Sung Faoua Sarakan (M)	<i>Colocasia esculenta</i>	Araceae	Herb	W/C	All	Yes	Frequent
10.	Kukur sunga(B), Fawmabopong (M)	<i>Blumea lacera</i>	Asteraceae	Herb	W	All	No	Intermediate
11.	Paracress (E), Hamfol(M)	<i>Spilanthes calva</i>	Asteraceae	Herb	W	All	No	Intermediate
12.	Pui shak(B), Cumbishi	<i>Basella alba</i>	Basellaceae	Climber	W/C	Summer	No	Intermediate

(M)								
13.	Sa Lai Pa (M)	<i>Senna tora</i>	Caesalpiniaceae	Herb	W	Winter	Yes	Intermediate
14.	Palong sag(B), kang miyai (M)	<i>Spinacea oleracea</i>	Chenopodiaceae	Herb	C	Winter	Yes	Frequent
15.	Bathua shak (B), Brotho Aa (M)	<i>Chenopodium album</i>	Chenopodiaceae	Herb	W	Winter	Yes	Rare
16.	Kalmi shak(B), Sadoi Morock (M)	<i>Ipomoea aquatica</i>	Convolvulaceae	Herb	W/C	All	No	Frequent
17.	Mula shak(B), Mala (M)	<i>Raphanus sativus</i>	Cruciferae	Herb	C	Winter	Yes	Intermediate
18.	Lau shak(B), Boomiyai (M)	<i>Lagenaria siceraria</i>	Cucurbitaceae	Climber	C	Winter	No	Frequent
19.	Karalapatata(B), Titkorolla (M)	<i>Momordica charantia</i>	Cucurbitaceae	Climber	C	Winter	Yes	Frequent
20.	Gasalu	<i>Dioscorea alata</i>	Dioscoreaceae	Climber	W/C	All	No	Intermediate
21.	Pudina pata(B)	<i>Mentha viridis</i>	Labiatae	Herb	W	Winter	Yes	Frequent
22.	Tulshi (B)	<i>Ocimum americanum</i>	Lamiaceae	Herb	W	Winter	Yes	Frequent
23.	Jangli tulusi(B), Lendaza (M)	<i>Anisomeles indica</i>	Lamiaceae	Herb	W	Winter	Yes	Intermediate
24.	Sabarang (M).	<i>Ajuga macrosperma</i>	Lamiaceae	Herb	w	Winter	Yes	Rare
25.	Chukhai(B), Amilapatata (M)	<i>Hibiscus sabdariffa</i>	Malvaceae	Shrub	W/C	Winter	Yes	Frequent
26.	Jute(E), Pat shak(B)	<i>Corchorus capsularis</i>	Malvaceae	Herb	C	Summer	Yes	Intermediate
27.	Shajina(B), Dain Tho Rai (M)	<i>Moringa oleifera</i>	Moringaceae	Tree	C	All	Yes	frequent
28.	Amrul Shak (B), Amilapatata (C)	<i>Oxalis corniculata</i>	Oxalidaceae	Climber	W	Summer	No	Frequent
29.	Dhekisha k(B), Miaumakala	<i>Dryopteris filix-mas</i>	Polypodiaceae	Herb	W	Summer	No	Frequent

	(M)							
30	Nunia shak(B), Bat slai (M)	<i>Portulaca oleracea</i>	Portulacaceae	Herb	W	Summer	No	Intermediate
31	Ghanda batali(B), Nuyechhi-baou(M)	<i>Paederia foetida</i>	Rubiaceae	Climber	W	All	Yes	Frequent
32	Phutka(B), Kataboksa Shak (C)	<i>Cardiospermum halicacabum</i>	Sapindaceae	Herb	W	All	No	Rare
33	Alu shak (B), Moroxcy (M)	<i>Solanum tuberosum</i>	Solanaceae	Herb	C	Winter	No	Intermediate
34	Datranga (B)	<i>Sarcochlams pulcherrima</i>	Urticaceae	Shrub	W	All	No	Intermediate
35	Lelompada (M)	<i>Premna esculenta</i>	Verbenaceae	Herb	W	Winter	Yes	Intermediate
36	Tok patha(B), Pongkryangshi(M)	<i>Cissus repens</i>	Vitaceae	Herb	W	Winter	No	Rare

*B (Bangla), M (Marma)

The recorded species were 75 percent herbs, 17 percent climbers, 5 percent shrubs and only 3 percent were trees (Fig. 1). Among herbaceous vegetables, 59 percent were collected from the wild. Of these wild leafy vegetables, most of them were available, three of them collected rarely. Among the species *Ajuga macrosperma* of Lamiaceae, *Cardiospermum halicacabum* of Sapindaceae, *Chenopodium album* of Chenopodiaceae, *Cissus repens* of Vitaceae family were rarely found in the wild.

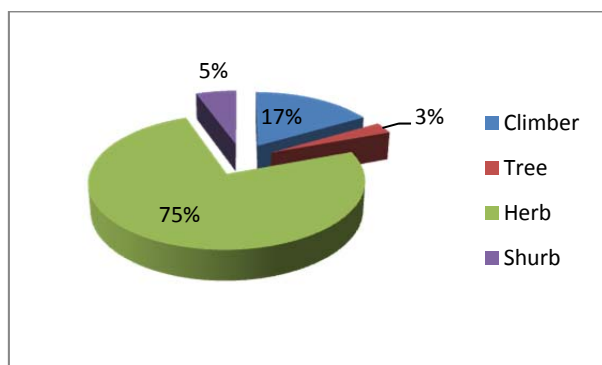


Figure 1. Percentages according to their habitat

Considering the percentage of occurrences of TLVs in Kaptai Reserved forest, 44% were frequently consumed by the natives. 36 % were moderately and only 20% were rarely collected by the natives of two villages under trial.

Considering period of collection, 59% wild TLVs found in winter season and 6 % found in summer and rest found throughout the year.

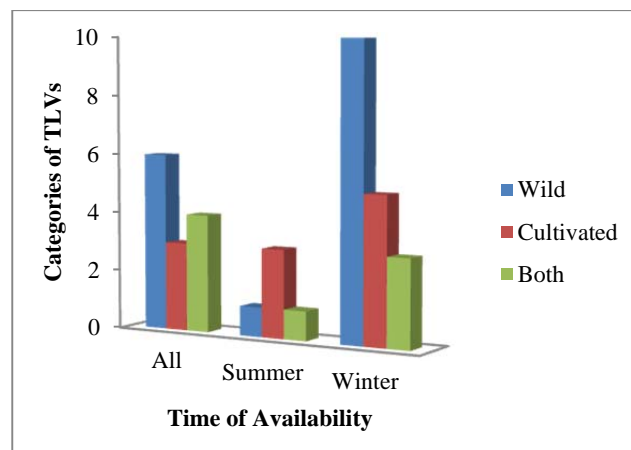


Figure 2. Time of availability of different types of leafy vegetables

3.3 Importance ranking according to farmer categories

Medium farmer: *Basella alba* and *Centella asiatica* were top prior species among the medium farmers (Table 2 & 3).

Small farmer: Top most prior species were *Basella alba*, *Colocasia esculenta*, *Homalomena aromatica* and *Ipomoea aquatica* among the small farmers.. *Homalomena aromatica* is like to be a popular one which is collected from wild (Table 2 & 3).

Landless farmer: The landless farmers used the leafy vegetables mostly from the wild sources for their livelihood. Among them *Dryopteris filix-mas*, *Colocasia esculenta* and *Ipomoea aquatica* were most popular wild leafy vegetable (Table 3).

Table 3. Respective importance's by the farmers of the major traditional leafy vegetables

Botanical name	Medium	Small	Landless
<i>Basella alba</i>	+++	+++	++
<i>Centella asiatica</i>	+++	++	++
<i>Cissus repens</i>	++	+	++
<i>Colocasia esculenta</i>	++	+++	+++
<i>Dryopteris filix-mas</i>	++	++	+++
<i>Homalomena aromatica</i>	+	+++	+++
<i>Ipomoea aquatica</i>	+	+++	+++
<i>Lagenaria siceraria</i>	++	+	++
<i>Moringa oleifera</i>	+	++	++
<i>Paederia foetida</i>	++	+	++

+++ : very important (ranking 1 to 3); ++ : important (ranking from 4 to 7); + : less important than the others (ranking from 8 to 10).

4. CONCLUSION

Traditional leafy vegetables are important food source for resource-poor rural communities within the forest. Adoption and implementation of sustainable biodiversity conservation are essential for sustaining reserved forest. More extensive study on TLVs is needed within hilly region to record new leafy vegetables with their ethno botanical importance. Awareness campaigns are essential to promote the use of traditional vegetables and their importance for conservation.

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