PROCEEDINGS OF THE I[st] INTERNATIONAL CONFERENCE ON INDIGENOUS VEGETABLES AND LEGUMES PROSPECTUS FOR FIGHTING POVERTY, HUNGER AND MALNUTRITION

Conveners

T.A. Lumpkin
J. Hughes

Hyderabad, India

December 12-15, 2006

ISHS Section Vegetables
ISHS Commission Fruits and Vegetables and Health

Acta Horticulturae 752
September 2007

Edible Leaves of Jalpaiguri District of West Bengal, India

V. Arunachalam[1], Arun Kumar Sit[2] and Malay Bhattacharya[2]
[1]Division of Crop Improvement, Central Plantation Crops Research Institute, Kasaragod Kerala 671124 India
[2]Central Plantation Crops Research Institute, Research Center Mohitnagar, 735102 Jalpiaguri West Bengal India

Keywords: Indigenous vegetables, ethnobotany, Sub-Himalayan, marketing

Abstract

Many of the traditional leaf vegetables remain underutilized in India. A comprehensive study in a small geographical area, involved survey of rural weekly markets and interview with local people growing/gathering, selling and or/ using these vegetables. We enumerated the market potential, season of availability, common, vernacular and botanical name of 42 species of plants belonging to 28 families. These are either grown or gathered from wild growth from a range of habits and habitats and commonly marketed and used as leaf, tender shoot or flower vegetable in Jalpaiguri District located in Sub Himalayan Terai region of West Bengal. The report covers details of Ethnobotany especially the consumption during festivals and traditional wisdom on medicinal uses etc. *Cephalandra* leaves for curing diabetes; leaves of water lily for curing piles are few medicinal uses to mention. Use of leaves of Indian Pandan to impart the flavor of aromatic rice to recipes is an interesting finding from the study. Leaves of common weeds such as Gumma (*Leucas aspera*), water spinach and water lily are marketed and consumed here. Leaves of jute, chickpea, pumpkin and ash gourd are sold in the market where hundred tender shoots varied from US $ 0.2 for sweet potato to US $ 2.2 for brahmi (Water Hyssop). The paper concludes with a framework for institutional mechanisms to promote research, development, documentation, marketing and post harvest technology of these plants in order to enhance dietary diversity and nutritional security.

INTRODUCTION

The Himalayan region is one of the hotspots of biodiversity. Local people in the region exploit many wild plants for food (Sundariyal and Sundariyal, 2003) and non-food (Mahanta and Tiwari, 2005) purposes. Knowledge of wild edible plants is essential to enrich our dietary diversity. These plants can come to rescue as food at times of disasters, droughts and famines. About 124 weeds found in rice fields (Datta and Banerjee, 1978) of West Bengal show potential as vegetables, fodder and medicine. Leaf vegetables play an important role in balanced diet and reducing the disorders due to deficiency of minerals and vitamins. Per capita dietary requirements of leaf vegetables range from 120 to 150 g per day as per the Indian Council of Medical Research recommendations. Traditional leaf vegetables (TLV) constitute the major junk of this group of commodities in the local markets. It remains an unorganized sector depending on the seasonal supply.

West Bengal has wide range of plant species whose leaf or flower is used as vegetable (Biswas and Paul, 2002). Nutritional composition of 15 TLVs used in Bangladesh (Islam et al., 2004) reveals the low moisture content and high fibre, carbohydrate and lignin content in jute leaves which are known for ages in Bengal. Plains of Northern Districts of West Bengal have a unique combination of many biophysical and socioeconomic factors. Geographically the region is proximal to other countries like Bhutan, Bangladesh, Nepal and Tibet. Jalpaiguri District is rich in floristic (Sikdar and Samanta, 1983) wealth with many plant species and also has large area under forests. This report is to list the range of leaf vegetables marketed and used in Jalpaiguri District of northern West Bengal with details of market potential, season of availability, common, vernacular and botanical names with brief note on Ethnobotany.

Proc. I[st] IC on Indig. Veg. and Legumes
Eds. M.L. Chadha et al.
Acta Hort. 752, ISHS 2007

MATERIALS AND METHODS

Jalpaiguri District, the study area is located at $26^0$16' to 27^0N latitude, $88^0$25' to $89^0$53'E longitude with a mean altitude of 91.3 m above sea level. It receives an annual rainfall of more than 4000 mm and the maximum rainfall occurs in months April (995 mm) and September (996.5mm). The minimum and maximum temperatures here vary between 5.5^0C and 37^0C. This region is also blessed with people from Bengal, Assam and nearby locations with different culture and traditions.

This study includes comprehensive surveying of markets and interviewing the farmers, consumers and people involved in gathering and selling these vegetables. Market survey was carried out in weekly markets organized in and around Jalpaiguri such as Gouri hut, Berubari, Shikarpur hut, Talma hut market etc. and regular mark[illegible]cated in Jalpaiguri, Mayanaguri and Dhupguri Town of Jalpaiguri district. Market [illegible], were converted to US currency $ using conversion rate Rs.45 (Indian Rupees). We also visited the natural habitats, home gardens and farmlands where these plants are grown or found wild and photo documented the plants.

RESULTS AND DISCUSSION

Ethnobotany and Historical Significance

Gumma (Dandacolas) plant (*Leucas aspera* L.) otherwise a common weed is used as leaf vegetable in Karnataka and known as Tumbe in Kannada language. Abundant occurrence of this plant gave the name of Tummegooru (Tumkur) a district in Karnataka state according to a 10^{th} century inscription (Yoganarasimhan et al., 1982). There is a tradition followed in this place to eat a minimum of 14 species of leaf vegetables during the festival of Kali Puja, and Diwali. Local rural markets are flooded with diverse leaf vegetables during the occasion. This festival also marks the beginning of winter and it is believed that the tradition is practiced to avoid abdominal aches during the winter. Another interesting feature of flowers consumption at this location is the use of male flowers of cucurbits for edible purposes like making delicious dishes by frying in oil. This opens up new opportunities to use the male flowers and harness the natural sex expression system in cucurbits.

Medicinal and Aromatic Uses

There are many medicinal uses of leaf vegetables as believed and used by the people. Sprouts of *Amorphophyllus* and leaf sheath of *Colcocasia* are used as a blood purifier. People used to take leaf sheath of this plant along with *Isha* fish as a delicious preparation. They use the bamboo sprouts as leaf vegetable as The bamboo sprouts are allowed to grow inside a mud pot those results in a compact mass of sprouts resembling cabbage. People suffering from diabetes and headache use the decoction of *Cephalandra.* Bichhuti (*Urtica* sp.) twigs are used as vegetable but they are boiled in water and aqueous extract is eliminated before use. People of Nepal origin especially use this plant. We noticed the people to explain the medicinal uses of wild plants with edible leaf like Neelpadma (*Nymphaea stelalta* Willd.) for piles and dyspepsia and that of Kalmi sag (*Ipomoea aquatica* Forsk.) for nervous disability of women and those of Kulekhara (*Hygrophila auriculata* (Schum.) Heine) are useful for dropsy and rheumatism.

Leaves of Indian pandan (Bhog patta) plant (*Pandanus amaryllifolius*) are used to impart flavor to food with rice and sweet recipes. These delicacies are specifically prepared as a special item in holy occasions for giving to God. Indian pandan (Bhog patta) leaves (*Pandanus amaryllifolius*) are proved to contain the chemical 2 AP (2-Acetyl–1-Pyrroline) the prime chemical responsible for aroma (Buttery et al., 1982) in basmati rice.

Genetic Improvement

About half of the plants found in the study are annual herbs; seven are vines, eight species of geophytes and three each of trees, shrubs (Table 1). Most of the leaf vegetables of the study are (34) dicots; one is a fern and remaining are monocots. Most of the plants

are terrestrial but a few are aquatic plants also. Kalmi sag is one of the important leaf vegetables, which grows in aquatic habitat. Genetic resources of underutilized vegetables (Arora, 2003) especially the geographic distribution is known. Research on germplasm needs to be intensified to tap gene pools of crops whose leaves are edible to identify specific varieties with qualities of palatability, high leaf production, high nutritional composition, suitability for cropping/ agro-forestry systems/ container gardening. Further intensive studies are necessary in crops like chickpea, potato where large gene pools are already available and these needs to be screened for developing suitable varieties, which could be exploited exclusively as leaf vegetable or for dual purpose. Such work is in progress in identifying the promising varieties for use as leaf vegetable in cowpea and edible tips in sweet potato. In India such varieties are released in *Brassica, Amaranthus*, etc. Many of the TLVs are seen as weeds in cropping systems. There is a need to promote in situ conservation of such plants and also to protect them from herbicides. Among the cucurbits, fluted pumpkin is well known in Nigeria for its use as leaf, which is rich in protein (Aletor et al., 2002). Our study emphasizes the need to harness the potential of other cucurbits like ash gourd, pumkin and ribbed gourd for use as leaf vegetables.

Markets, Processing and Nutrition

Results of the study listing the names of plants along with season of availability and price (Table 1.). The price of the leaves sold in the market varies widely and usually for hundred shoots from 20 cents for tips of sweet potato to US $ 2.2 for water hyssop (Brahmi). As the shoots or leaves are not usually weighed and sold in these markets it is difficult to compare the prices. Rather, they are counted in numbers or measured in length (for vines), and bundled by hand at random without proper grading or selection.

Leaves of mint, water hyssop and lettuce are rated as high value crops in these markets. Leaves of water lily, tips of sweet potato, dwarf white clover and gumma plants are affordable by poor people also. Leaves of sweet potato rich in crude protein content (Antia et al., 2006) are known as poor man's vegetable in Nigeria. Its use is again hampered being a forage crop for animal. About half of the crops listed in the study are otherwise commercially cultivated crops like chickpea, potato and jute. Tender laves / twigs are harvested and sold in the market. Remaining species are gathered from weeds or wild growth. Of the 42 species of the study, only one-sixth of the crops are available throughout the year. About 17 of them are available in summer and rainy season alone and 13 are available only in winter season.

Post harvest aspects need special attention, as the TLVs are seasonal in supply and perishable in nature. Simple methods like shade drying (Gupta et al., 2001) can help to preserve and provide products with market acceptability as seen in case of fern vegetable (Dhenki sag). Role of TLVs in improving nutrition of African (Gockowski et al., 2003) poor people is already highlighted. Chickpea / Bengal gram leaves are rich in Vitamins A and C and total iron (Singh et al., 2001) contents. However leaf vegetables are not always rich in nutritional qualities. A study on gathered vegetables at Vietnam revealed that leaves of *Ipomoea aquatica* and stems of water lily and lotus are usually low in nutrient content (Ogle et al., 2001). There could be many antinutritional factors also in these leaf vegetables, which need to be understood before exploiting them on a commercial scale. New products to serve the fast food basket of growing urban population need be developed urgently to promote consumption pattern.

Development and Policy Issues

A holistic approach involving research, development and marketing is necessary to promote the use of TLVs. Research needs are mainly in development of suitable varieties, development of agro-techniques and post harvest technologies. It is important to document the species used in various parts of the country as an online database with common, vernacular and botanical names with photographs and range of uses, recipes reported by people. There is a need to promote markets for such plants. Policies need to be framed with adequate financial incentives to support marketing of TLVs in regular

urban, rural and farmers' markets. Media efforts could be intensified to educate the public on range of leaf vegetables, their availability and health and nutritional benefits. This report is a small step in this giant effort to promote TLVs for human welfare.

Literature Cited

Aletor, O., Oshodi, A.A. and Ipinmoroti, K. 2002. Chemical composition of common leafy vegetables and functional properties of their leaf protein concentrates. Food Chemistry. 78:63-68.

Antia, B.S., Akpan, E.J., Okon, P.A. and Umoren, I.U. 2006. Nutritive and anti-nutritive evaluation of sweet potato leaves. Pakistan J Nutrition. 5: 66-168.

Arora, R.K. 2003. Genetic resources of underutilized vegetables and their regions of diversity. Veg. Sci. 30:1-9.

Biswas, M.C. and Paul, T.K.2002. Survey of leaf and flower vegetables in West Bengal. J. Econ. Taxon. Bot, 26:665-668.

Buttery, R.G., Ling, L.C. and Juliano, B. 1982. 2-Acetyl-1-Pyrroline: an important aroma component of cooked rice. Chem Ind.(Lond.). 24: 958-959.

Datta, S.C. and Banerjee, A.K. 1978.Useful weeds of West Bengal rice fields. Econ. Bot, 32:297-310.

Gockowski, J., Mbazo, O., Mbak, G. and Moulende, T.F. 2003 African traditional leafy vegetables and the urban and peri-urban poor. Food Policy.28:221-235.

Gupta, R., Kalia, M., and Dhaliwal, Y.S. 2001. Himachal J Agri. Res. 25:76-80.

Islam, M.R., Paul, D.K., and Shaha, R.K. 2004. Nutritional importance of some leafy vegetables available in Bangladesh. Pakistan J Biol Sci. 7:1380-1384.

Mahanta, D. and Tiwari, S.C.2005. Natural dye yielding plants and indigenous knowledge on dye preparation in Arunachal Pradesh, Northeast India. Curr. Sci, 88:1474-1480.

Ogle, B.M., Dao, H.T.A., Mulokozi, G. and Hambraeus, L. 2001. Micronutrient composition and nutritional importance of gathered vegetables in Vietnam. International J Food Sci. Nutrition.52: 485-499.

Sikdar, J.K. and Samanta, D.N.1983. Herbaceous flora (excluding Cyperaceae, Poaceaea and Pteridophytes) of Jalpaiguri District West Bengal - A checklist. J. Econ. Taxon. Bot.4:525-538.

Singh, G., Asha, K. and Seghal, S. 2001. Nutritional composition of selected green leafy vegetables, herbs and carrots. Plant Foods Human Nutrition. 56:359-364.

Sundariyal, M. and Sundariyal, R.C. 2003. Underutilized edible plants of the Sikkim Himalaya: need for domestication. Curr. Sci. 85:731-736.

Yoganarasimhan, S.N., Togunsahi, V.S., Keshavamurthy, K.R. and Govindaiah.1982. Medicobotany of Tumkur District of Karnataka. J. Econ. Taxon. Bot, 3:391-406.

Tables

Table 1. Descriptions of plants with edible leaves commercially exploited in North Bengal.

Botanical name	Common name	Bengali name	Habit[1]	Family	Part used[2]	Season[3]	Price (US $/ cents)
Allium cepa L.	Onion	Piyaj koli	Bh	Alliaceae	L &F	W	Flowers- 0.15 to 0.22/kg
Allium sativum L.	Garlic	Rasun	Bh	Alliaceae	L	W	0.18 /kg
Alternanthera philoxeroides(Mart.) Griseb.	Aligator weed	Bagan Note, Sanche	H	Amaranthaceae	L	All	2 to 7 cents/small bundle
Amorphophallus campanulatus Bl.	Elephant foot yam	Baj/Ool	Th	Araceae	L	S& R	2 to 3 cents/small bundle of 3-4 leaves
Azadirachta indica A.Juss.	Neem	Neem	T	Melicaeae	L & T	All /spring	4 to 6 cents/small bundle
Bacopa monnieri L.	Brahmi	Brahmi	H	Scrophulariaceae	L & T	S& R	11 to 22 cents/small bundle
Bambusa arundinacea	Bamboo	Bansh	H	Poaceae	Ys	Spring S	
Benincasa hispida(Thunb.)	Ash gourd	Chalkumra	Th	Cucurbitaceae	Ts & F	S& R	1 cent per 2 ft shoot
Beta vulgaris L.	Indian spinach	Palon	H	Chenpodiaceae	R and L	W	2 to 3 cents/small bundle
Brassica juncea L.	Mustard	Sarson sag	H	Brassicaceae	Tl	W	4 cents for handful
Calamus rotang	Cane	Bet	S	Arecaceae	Ts	W	1 cent/ 2' long shoot
Centella asiatica L.	Centella	Thankuni	H	Apiaceae	L	S& R	9 to 11 cents/ handful
Cephalandra indica	Telakucha	Telapata	C	Cucurbitaceae	L & T	All	

Chenopodium album L.	Lamb's quarters	Bathua	H	Chenpodiaceae	L	W	2 cents/ handful
Cicer arietinum L.	Bengal gram	Chhola	H	Fabaceae	T	W	2 cents/ handful
Colocasia esculenta (L.) Schoot.	Colocasia	Kachu Sag	Tb	Araceae	Tl and F	S& R	2 to 4 cents for handful
Corchorus olitorius L.	Jute	Pat sag	S	Tiliaceae	Tl	S& R	2 to 4 cents/bundle of 30-40 twigs
Coriandrum sativum	Coriander	Dhania	S	Apiaceae	L	W	2 cents/ plant
Cucurbita moschata	Pumpkin	Misti kumra	Th	Cucurbitaceae	Ts and F	S& R , W	1 to 2 cents/shoot
Diplazium esculentum Sev.,	Fern vegetable	Dhenki sag	H	Athyriaceae (Pteridophyte)	Tl (twig)	S& R	2 cents/ handful
Enhydra fluctans Lour.	Marsh herb	Helencha	H	Asteraceae	Tl	S& R	5 cents/ twig
Fagopyrum esculentum	Buckwheat	Dhemsi	H	Polygonaceae	Tl	W	2 cetns/handful
Gmelina arborea	Malay Bush Beech	Geema	T	Verbenaceae	Tl	S& R	5 cent/10 plants
Hygrophila auriculata ; H. spinosa	Gokulakanta	Kulekhara	H	Acanthaceae	Tl	S& R	5 cent/10 twigs
Ipomoea aquatica	Water Spinach	Kalmi Sag	H	Convolvulaceae	Ts	S& R	3 cents/ 100 shoot
Ipomoea batatas	Sweet Potato	Misti alu	C	Convolvulaceae	Ts	S& R	2 cents/10 shoots
Lactuca sativa	Lettuce	letus	H	Compositeae	L	W	13 cents/kg
Lagenaraia siceraria	Bottle gourd	Lau	C	Cucurbitaceae	T	All	2 to 4 cents/ 2 ft twig
Leucas aspera Rees	Gumma	Dandacolus	H	Lamiaceae	Tl	S& R	2 cents/bundle
Luffa acutangula	Ribbed gourd	Jhinga	V/S	Cucurbitaceae	T	S& R	2 cents/bundle
Marsilea minuta L.	Dwarf waterclover	Susuni	Herb	Marcileaceae	L	S& R	2 cents/ handful
Mentha arvensis L.	Mint	Pudina	Herb	Lamiaceae	L	W	11 to 22 cents/bundle
Moringa oleifera	Drumstick	Sajina sag	St	Oleaceae	L&F	S& R	2 to 4 cents/stick,

Lam. *Musa sp.,* L.	Banana	Kola	H	Musaceae	Psm, Mf	Al	1 cent for shoot Two cent/1 foot stem, 4 to 6 cents/inflorescenc e
Nyctanthes arbor-tristis L.	Coral Jasmine	Seulipata	S	Nyctanthaceae	T	All	3 cents/ 10 twigs
Nymphaea nouchali	Water lily	Sapla	H	Nymphaeacea e	S&F	All	2 cents/five stems with flowers
Pandanus amaryllifolius	Indian pandan	Bhog patta	H	Pandanaceae	L	All	
Pisum sativum	Pea	Matar	H	Fabaceae	Tl	W	2 to 4 cents/handful
Raphanus sativus L.	Radish	Mulo	S	Raphanaceae	L	W	2 to 4 cents/handful
Sechium edule Sw.	Chayote/cho w-chow	Chow chow	C	Cucurbitaceae	Tl	S& R	4 cents/ handful
Solanum tuberosum L.	Potato	Alu sag	S	Solonaceae	Tl	W	2 cents for handful
Urtica sp.,	Nettle	Bichhuti	C	Urticaceae	T	R	4 cents for 4-6 twigs

[1] Bh- Bulbous herb, H-Herb, C-V, T- Tree, S- Shrubs, Th-Trailing herb, Tb-Tuberou PSt-Pseudo stem, Mf-male flower

[2] L-leaves, T-twigs, Tl-Tender leaves, Ts- tender stem, S-stalk, F- Flower, Ys-Young sprout, R- root

[3] S-summer, R-rainy, W-winter, All-all over the year, Sp -spring