

## REGULAR ARTICLE

# Ethnobotanical study of wild vegetables used by rural communities of Kannauj district, Uttar Pradesh, India

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## Abstract

An ethnobotanical inventory was conducted in the rural areas of Kannauj districts, Uttar Pradesh during 2007-09 following standard ethnobotanical methods for documentation of underexploited, non-conventional, traditional and indigenous wild vegetables for further studies leading to sustainable utilization of these resources to overcome malnutrition in vegetarian diet. During present study 25 species belonging to 18 families have been documented. *Chenopodium album* is the most common and popularly used wild vegetable followed by *Ipomoea aquatica* and *Coccinea grandis* in the study area. Seven species are reported as wild vegetable for the first time in India. Leaves and young stem are used in majority of the cases. Only 56% wild vegetables used in the study area are easily available, it means 44% wild vegetables are threatened to be lost if not conserved properly. The highly endangered wild vegetables in the study area are *Abrus precatorius*, *Centella asiatica*, *Dioscorea bulbifera*, and *Solanum incanum*.

Keywords: Wild vegetables, Rural communities, Ethnobotany, Uttar Pradesh

## Introduction

Indians are forerunners in utilizing plant resources for their basic necessities and sustenance. Though plants have been used as a source of food, fodder, shelter, clothing, medicine and a verity of useful commodities from ancient time, the value of wild edible vegetables in food security has not been given sufficient attention in India (Reddy et al., 2007). In rural settlements where vegetable cultivation is not practiced and market supplies are not organized, local inhabitants depends on indigenous vegetables either cultivated by themselves or collected from wild (Mishra et al., 2008). The traditional knowledge about indigenous wild vegetables is largely transmitted by oral tradition from generation to generation without any written record. Such practices are still prevalent among rural and tribal communities in many parts of the world (Haridarshan et al., 1990; Samant and

Dhar, 1997; Shackleton et al., 1998; Grivetti and Ogle, 2000; Sundriyal and Sundriyal, 2001, 2003; Ogoye-Ndegwa and Aagard-Hensen, 2003; Kar, 2004; Jansen et al., 2004; Sinha and Lakara, 2005; Angami et al., 2006; Reddy et al., 2007; Kala, 2007; Narayanan and Kumar, 2007; Dovie et al., 2007; Odhav et al., 2007; Orech et al., 2007; Setalaphruk and Price, 2007; Mishra et al., 2008; Binu, 2010; Bhogaonkar et al., 2010). The primitive men, through trial and error, have selected many wild edible plants and subsequently domesticated them (Kar, 2004). However, many wild vegetables traditionally consumed by local communities are underutilized. The nutritional value of these wild vegetables is high in comparison to commonly cultivated vegetables (Nordeid et al., 1996; Sundriyal and Sundriyal, 2001; Orech et al., 2007). The wild vegetables are an important source for the supplementation of micronutrients in vegetarian diets (Nordeid et al., 1996; Agate et al., 2000; Odhav et al., 2007). Due to various natural and anthropogenic reasons natural resources of wild vegetables and habitats from where these resources are collected are depleting rapidly (Maikhuri et al., 2004; Bhogaonkar et al., 2010). Genetic resources of wild vegetables should be conserved for future use to overcome malnutrition in vegetarian diet, food

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security and for crop improvement of cultivated relatives of these wild vegetables (Kala, 2007). Survey of rural and tribal areas for documentation of underutilized wild vegetables is the first step in making suitable strategies for the conservation and sustainable utilization of these resources. Perusal of literatures reveals that Uttar Pradesh is not studied for documenting underutilized wild vegetables. Keeping above views in mind present study was proposed to highlight the wild vegetables used by the rural communities of Kannauj district in Uttar Pradesh, which needs to be documented for further studies leading to sustainable utilization of these resources to overcome malnutrition in vegetarian diet and to fight against hunger.

### Materials and Methods

Kannauj is located between 27° 04' - 27° 07' N and 79° 55' - 79° 52' E geographical limits in 2,093 Km<sup>2</sup> area at an average elevation of 139 M. According to Indian census 2001, population of Kannauj was 71,530. Kannauj has an average literacy rate of 58%, lower than the national average of 59.5%. The name Kannauj is traditionally derived from the term Kanyakubja (maiden's womb). Kannauj is an ancient city, in earlier times it was the capital of a great Hindu kingdom. It is said that Kanyakubja Brahmins are originally from Kannauj. Kannauj is also known for the distilling of scents and is a market centres for tobacco, perfume, and rose water. Kannauj has given a distinct dialect of the Hindi language known as Kanauji.

### Ethnobotanical surveys and collection of data

Survey of rural areas of Kannauj district, Uttar Pradesh was conducted during 2007-2009 to collect information regarding wild vegetables and voucher specimen. Prior to survey, a questionnaire was designed and pre-tested with five informants to find out its suitability for present study and modified according to response of informants. The revised questionnaire was used for gathering data about non-conventional and underutilized wild vegetables of the study area (Appendix A). Field works were conducted in randomly selected ten villages. Total 50 informants having age of 30 to 65 years were interviewed during present study. Information's regarding the local names of plant species, growth forms, part(s) used, availability in natural resources, method of processing and vegetable preparation, method of collection, storage and conservation needs were carefully recorded. Methods of Martin (1995) were followed during the present study. Voucher specimens were collected with the help of informants and reconfirmed by other informant's to ensure their local identity. Specimens were brought

to the laboratory and preserved in the form of herbarium (Jain and Rao, 1967) identified with the help of pertinent literatures (Kanjilal, 1933; Duthie, 1960) and deposited in herbarium maintained at department of Botany for future references. The acquired data were compared with relevant literatures (Haridarshan et al., 1990; Sundriyal and Sundriyal, 2001; Kar, 2004; Sinha and Valeria, 2005; Angami et al., 2006; Kala, 2007; Mishra et al., 2008; Binu, 2010; Bhogaonkar et al., 2010) to identify new claims.

### Data analysis

Ethnobotanical data were analysed and summarized by using Microsoft Excel and statistics to determine relative frequencies of citations so as to identify the most common and popularly used wild vegetable in the study area, to determine proportions of different variables like plant families, growth forms, availability, plant part used, methods of processing and vegetable preparation, and conservation needs. The relative frequency of citation for each species was determined by following formula (Kumar et al., 2013):

$$\text{Relative frequency of citation (\%)} = \frac{\text{Frequency of citation}}{\text{X Frequency of citation of all species}} \times 100$$

$$\text{Frequency of citation (\%)} = \frac{\text{Number of informants who cited the species}}{\text{Total number of informants interviewed}} \times 100$$

### Results and Discussion

Results are given in Table 1. Twenty five wild plant species belonging to 18 families were found to be used as vegetables by the rural community of Kannauj district, Uttar Pradesh, India. Caesalpinaceae and Solanaceae are the highly represented families (Figure-1). Various Parts of *Basella alba*, *Boerhaavia diffusa*, *Chenopodium album*, *Ficus hispida*, *Ipomoea aquatica*, *Polygonum glabrum*, *Rumex dentatus*, and *Solanum incanum* are reported as wild vegetable for the first time in India. *Chenopodium album* is the most common and popularly used (9.83%) wild vegetable followed by *Ipomoea aquatica* and *Coccinea grandis* in the study area (Table 1). Leaves and young stem are used in majority of the cases (68%) followed by fruits (18%), flowers and tubers (7%). Only 56% wild vegetables used in the study area are easily available, whereas, 28% are available with difficulty and 16% are hardly available in natural resources, it means 44% wild vegetables are threatened to be lost if not conserved properly. The highly endangered wild vegetables in the study area are *Abrus precatorius*, *Centella asiatica*, *Dioscorea bulbifera* and *Solanum incanum*. Majority of the wild vegetables of study area are herb (Figure 2) which may be domesticated and cultivated easily in comparison to other growth forms.

Table 1. Underutilized indigenous wild vegetables of Kannauj district, Uttar Pradesh, India.

Botanical name, family, growth forms and voucher number	Vernacular name/ parts used/ availability	Method of processing and vegetable preparation	Relative frequency of citation
<i>Abrus precatorius</i> L., Fabaceae, Climber, AK-36	Ghuguchi/ Leaves/ Hardly available	Young leaves are chopped into small pieces and fried in vegetable oil with potato. Salt and spices are added to taste.	1.31
<i>Amaranthus spinosus</i> L., Amaranthaceae, Herb, AK-50	Katili chaurai/ Young leaves and stem/ Easily available	Young stem and leaves are chopped into small pieces and fried in vegetable oil. Salt and spices are added to taste.	2.73
<i>Amaranthus viridis</i> L., Amaranthaceae, Herb, AK-28	Chaurai/ Young leaves and stem/ Easily available	Young stem and leaves are chopped into small pieces and fried in vegetable oil. Salt and spices are added to taste.	6.12
<i>Amorphophallus companulatus</i> Bl., Araceae, Herb, AK-25	Sooran/ Leaves and Tuber/ Available with difficulty	Young leaves are chopped into small pieces, dipped in wet flour and fried in vegetable oil. Tubers are boiled with <i>Bamboos</i> leaves, peeled, macerated and salt and spices are added to taste.	4.15
* <i>Basella alba</i> L., Basellaceae, Climber, AK-52	Poi/ Young leaves/ Available with difficulty	Young leaves are chopped into small pieces and fried in vegetable oil. Salt and spices are added to taste.	6.44
<i>Bauhinia variegata</i> L., Caesalpinaceae, Tree, AK-33	Kachnar/ Flower bud/ Available with difficulty	Flower buds are chopped into small pieces and fried in vegetable oil. Salt and spices are added to taste.	3.16
* <i>Boerhaavia diffusa</i> L., Nyctaginaceae, Herb, AK-45	Patherchatta/ Young leaves and stem/ Easily available	Young leaves and stem are chopped into small pieces and fried in vegetable oil. Salt and spices are added to taste.	3.82
<i>Cassia fistula</i> Caesalpinaceae, Tree, AK-27	Amaltaas/ Leaf/ Available with difficulty	Young leaves are chopped into small pieces and fried in vegetable oil with chopped potato. Salt and spices are added to taste.	1.96
<i>Cassia tora</i> L., Caesalpinaceae, Herb, AK-15	Chakwad/ Leaf/ Easily available	Young leaves are chopped into small pieces and fried in vegetable oil with chopped potato. Salt and spices are added to taste.	2.62
<i>Centella asiatica</i> (L.) Urban., Apiaceae, Herb, AK-30	Brahmi/ Leaves and young stem/ Hardly Available	Leaves and young stems are chopped into small pieces and fried in vegetable oil. Salt and spices are added to taste.	4.15
* <i>Chenopodium album</i> L., Chenopodeaceae, Herb, AK-12	Bathua/ Young leaves and stem/ easily available	Young leaves are chopped into small pieces and boiled in water with pulses, also mixed in flour to make chapattis.	9.83
<i>Coccinea grandis</i> (L.) Voigt., Cucurbitaceae, Climber, AK-18	Kundru/ Fruits/ Available with difficulty	Unripe fruits are chopped into small pieces and fried in vegetable oil. Salt and spices are added to taste.	8.74
<i>Commelina benghalensis</i> L., Herb, Commelinaceae, AK-44	Bankatwa/ Leaf/ Easily available	Young leaves are chopped into small pieces and fried in vegetable oil with chopped potato. Salt and spices are added to taste.	0.87
<i>Dioscorea bulbifera</i> L., Dioscoraceae, Climber, AK-19	Gainthi / Tuber and bulbils/ Hardly available	Tubers and bulbils are chopped into small pieces and fried in vegetable oil. Salt and spices are added to taste.	1.09
* <i>Ficus hispida</i> L., Moraceae, Tree, AK-32	Goolar/ Fruits/ Easily available	Unripe fruits are chopped into small pieces and fried in vegetable oil with chopped potato. Salt and spices are added to taste. Fruits are also used to make pickle.	4.15
* <i>Ipomoea aquatica</i> Forsk., Convolvulaceae, Herb, AK-38	Karemua/ Leaf and young stem/ Easily available	Young leaves and stem are chopped into small pieces and fried in vegetable oil with chopped potato. Salt and spices are added to taste.	9.28

Table 1. Contd..

Botanical name, family, growth forms and voucher number	Vernacular name/ parts used/ availability	Method of processing and vegetable preparation	Relative frequency of citation
<i>Leucas aspera</i> Spreng., Lamiaceae, Herb, AK-29	Gooma/ Young leaves/ Available with difficulty	Young leaves are chopped into small pieces and fried in vegetable oil. Salt and spices is added to taste.	2.29
<i>Momordica dioca</i> L., Cucurbitaceae, Climber, AK-17	Kheska/ Fruits/ Available with difficulty	Unripe fruits are chopped into small pieces and fried in vegetable oil. Salt and spices are added to taste.	4.15
<i>Moringa oleifera</i> Lam., Moringaceae, Tree, AK-7	Sahijan/ Young leaves, flowers and Fruits/ Easily available	Young leaves and flowers are chopped into small pieces and fried in vegetable oil with chopped potato. Salt and spices are added to taste. Fruits are cut into small pieces and boiled in pulses. Fruits are also used to make pickle.	5.46
<i>Oxalis corniculata</i> L., Oxalidaceae, Herb, AK-9	Khatti buti/ Young leaves and stem/ Easily available	Young leaves stem and are masticated with salt to prepare paste locally known as chutney.	1.63
<i>Physalish minima</i> L., Solanaceae, Herb, AK-21	Rashbhari/ Young leaves/ Easily available	Young leaves are chopped into small pieces and fried in vegetable oil with chopped potato. Salt and spices are added to taste.	3.82
* <i>Polygonum glabrum</i> L., Polygonaceae, Herb, AK-41	Janglei Chaurai / Young leaves/ Easily available	Young leaves are chopped into small pieces and fried in vegetable oil with potato. Salt and spices is added to taste.	2.84
* <i>Rumex dentatus</i> L., Polygonaceae, Herb, AK-14	Panpalak/ Young leaves and stem/ Easily available	Young leaves are chopped into small pieces and fried in vegetable oil with chopped potato. Salt and spices are added to taste.	3.06
* <i>Solanum incanum</i> L., Solanaceae, Shrub, AK-42	Banbhanta/ Fruits/ Hardly available	Unripe fruits are chopped into small pieces and fried in vegetable oil with chopped potato. Salt and spices are added to taste.	1.31
<i>Solanum nigrum</i> L., Solanaceae, Herb, AK-8	Makoi/ Young leaves and stem/ Easily available	Young leaves and stem are chopped into small pieces and fried in vegetable oil with chopped potato. Salt and spices are added to taste.	4.91

\* New reports

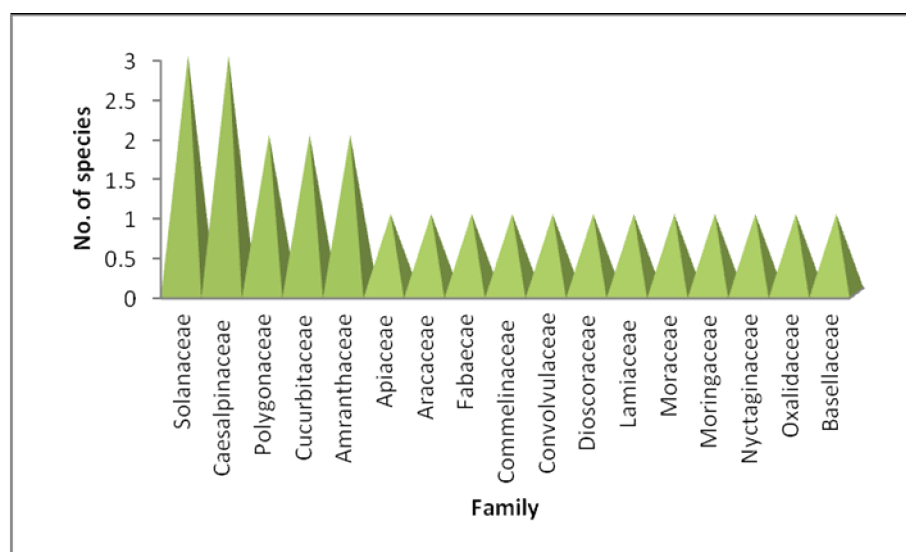


Figure 1. Distribution of wild vegetables under various Botanical families.

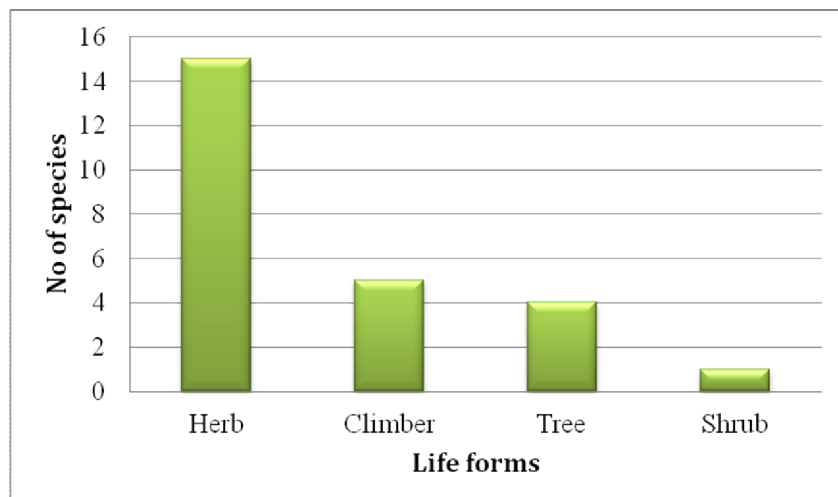


Figure 2. Distribution of wild vegetables under various growth forms.

Generally wild vegetables are used within one or two days after collection except, tubers and bulbils which are stored for longer duration. According to informants vegetables should not be collected from roadsides, near polluted water bodies and should be free from insect pest and diseases. This view of informants can be justified on the basis of studies which show that polluted habitats reduce the quality and quantity of chemical constituents as well as accumulate toxic substances in plant parts used as vegetable (Kamal et al., 2010; Rahman et al., 2010). According to respondents use of green vegetables and tubers and bulbs increases the quantity of blood and make the person healthy; it means they are rich in iron and starch respectively. Nutritional analysis of these vegetables will be an important step for the identification of nutritionally important vegetable species for domestication and cultivation to fully utilize these natural resources. The fact that sixty percent of the respondents were above fifty years old shows that the knowledge about wild vegetables is in danger of being lost and justify the need of documentation. Analysis of data revealed that elder population have more knowledge about the usages of wild vegetables, whereas, the younger generation have very little interest in the wild vegetables. It is necessary to educate the younger generation about the nutritional value and use of the wild vegetables. The consumption of wild plants is one of the strategies, adopted by the local people for sustenance, is intrinsically linked to their strong traditional and cultural system and is inseparable. The indigenous communities continuously include wild edibles to their daily food intake and sales from the surplus add to their income.

Simultaneously, an emphasis on the sustainable harvesting of wild edible plants will help enhance and maintain the region's biodiversity as well (Angami et al., 2006).

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## Appendix - A

Questionnaire	
<b>Respondent's details</b>	
Name.....	
Gender.....	Age..... Years
Occupation.....	
Location (Name of Village).....	
<b>Data about wild vegetable and its use</b>	
Plant (Local name)..... (Tree/ Herb/ Shrub/Climber)	
Availability (Easily available / available with difficulty/ hardly available)	
Conservation needs and efforts.....	
Plant part(s) used as vegetable.....	
Collection and storage.....	
Method of processing and vegetable preparation.....	
.....	
.....	
Benefits of these vegetables.....	
Other information, if any.....	
<b>Respondent's approval agreement</b>	
I..... (Name of respondent) hereby agree to participate in this study with my full consent and conscious. I declare that to the best of my Knowledge the information that I have provided are true, accurate and complete.	
Date.....	(Signature/Thumb impression of respondent)
<b>Remarks</b>	
Plant identified as ..... (Botanical Name and Family)	
Signature of Researcher	