Uitilization of Wild Edible Trees in Fringe Area of Neora-Valley National Park, Darjeeling

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Abstract—*The famous eco-tourism place, Neora-Valley National Park is an important ecological sensitive zone in Darjeeling, West Bengal. The survey regarding wild edible trees was done in the fringe area of this virgin forest. Main objective of the study was to make a detailed report on usefulness of wild edible tree species by local tribal communities for their household purposes and also to account the recent ecological status of those plant species. A semi-structured questionnaire was prepared along with closed and open ended questions to conduct the survey. Household survey, PRA practice, Key informant survey were performed with the local villagers using questionnaire. Forest survey was also carried out by quadrate sampling method throughout the fringe area of this protected forest to check the availability of plant species. Abundance of these wild floras was calculated by ACFOR scale. The information such as vernacular names, life forms, seasonality, families, parts used was congregated from the responses of the local respondents. Total 23 wild edible tree species have been recorded from the study area. Different parts of these phyto-resources are used in different types of edible purposes.*

1. INTRODUCTION

Rural areas are the habitat of the world's three quarter poorest people who are dependent for their livelihoods in one way or another on natural resources [1]. Natural Resources of developing countries not only provide vital food supplies, employment, health care and raw materials for billions of their own population but valuable raw materials, cash crops and timber for the developed world population as well. From the past, edible wild plants species have played a very vital part in supplementing the diet of the people. Many people in tribal areas still use them as a supplement of their basic need of food. Some of them are preserved for use in dry period or sold in rural market. Apart from their traditional use of food, potentially they have many advantages. They are edible and having nutritional food value, which provides the minerals like sodium, potassium, magnesium, iron, calcium, phosphorus etc. They are immune to many diseases and often used in different formulation of 'Ayurveda' in Indian Folk- medicine. They provide fibers which prevent constipation. It is consider that special attention should be paid in order to maintain and improve this important source of food supply.

Most of the ethno botanical reviews and surveys were concentrated around medicinal plants. Comparatively little attention was given to documentation of wild edible till recently. Ethno botanical literature has been reviewed the published till early 1990's [2]. He has listed 616 genera where one or the other species is edible. The list includes cereals, pulses, vegetables, fruits, spices, beverages and also the plants used in local drinks quenching thirst in desert.

Due to its diverse climate, India possesses several wild edible plants species. 'A Status Report' of all India co-ordinated research project on ethno biology conducted by Ministry of Environment and Forests, New Delhi, has recorded about 3900 species of wild flora used as edible [3]. Around 255 pants species have been documented as food and 16 plants species for local drinks from Arunachal Pradesh [4]. Around 78 plants species belonging to 38 genera and 20 families from North-West Himalaya have been enlisted [5]. Total 78 wild plant species have been reported as edible including famine food plants through the ethno botanical study carried out on wild edible plants in Mizoram [6]. Total number of 45 plant species is used by tribal people as edible from Panchmari Bioreserve, Madhya Pradesh [7]. Near about 20 plant species of every day diet of tribals of Dadra, Nagar Haveli, Daman (U.T) are also popular in traditional medicine [8]. From southern Karnataka 38 leafy vegetables have been noted [9]. From Western Ghats at least 171 wild edible species were described [10]. All around 156 wild food plants from Andhra Pradesh have beer reported, out of which fruits of 65 species, leaves of 54, tubers of 11 plants and flowers of 7 plants species are edible [11]. Around 110 wild edible plants have been enlisted from Meghalaya [12].

The Darjeeling Himalayas, a part of Indo-Malayan Biodiversity Hotspot harbours many edible plants grown in wild habitats and indigenously utilized [13]. Darjeeling and the surrounding region have a great potential in the development of herbal enterprise that can be linked with conservation and economic development [14, 15]. Neora-Valley National Park is one of the most important biodiversity protected zone in Darjeeling Himalaya. Unfortunately, no such research work has been done on identification and utilization of wild edible flora in this particular region. Efforts need to be

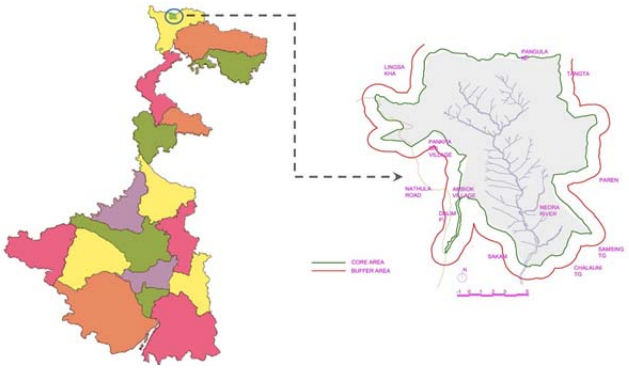
directed towards better maintenance of their resource base, both through ex situ and in situ conservation methods, to ensure their development and sustainable use by present and future generations. Considering the pivotal role of wild plant species in ecological and nutritional security along with sustainable livelihood development of local communities in fringe area of Neora-Valley National Park, the present studies were carried out.

2. MATERIAL AND METHOD

2.1 Study area

Neora-Valley National Park lies in the biogeographic province 2C of the Central Himalayas [16, 17]. The park spreads over 167 km^2, located between latitudes 26°52'03"N-27°7'35"N and longitudes 88°45'E-88°50'E; however, the actual surface area available to the wild denizens is, in fact, much greater owing to its undulating terrain. The highest point is Rechila danda peak (3,170 m) bordering Sikkim. This eco-sensitive zone is considered as West Bengal's crowning glory because of its wide range of environment gradients (183 m – 3,200 m) and climatic conditions, supporting a unique and ecologically important undisturbed patch of late succession forest. This area has been included in one of the 25 Global Hotspots [18]. In May 2009, this protected forest was also been included in the shortlist of World Heritage sites [19].

The total area of fringe of Neora-Valley National Park is around 85 km^2. Several villages are there in the fringe boundary of the forest. The ethnic communities of these villages are Lepcha, Sherpa, Bhutia, Rai, Tamang, Gurung, Viswakarma, Chhetri.



Map of Neora-Valley National Park

2.2 Investigation Method

Several field trips were arranged in entire fringe area of Neora-Valley National Park in 2015. Seasonal surveys were carried out for the investigation.

2.2.1 Household Survey. Total ten villages

were selected in a random pattern in the fringe area of Neora-Valley National Park. Villages were Lingshakha (27^{0}08'10.5" N, 88^{0}42'01.1" E), Kolakham (27^{0}06'03.5" N, 88^{0}40'53.3" E), Syalpokhri (27^{0}04'09" N, 88^{0}39'52" E), Pankhasari (27^{0}03'49.2" N, 88^{0}41'0.5: E), Ambiok (27^{0}01'31.2" N, 88^{0}42'49.8" E), Sakham (26^0 58' 14.9" N, 88^0 45' 27.7" E), Malchar (26^0 57' 59.3" N, 88^0 44' 56.2" E), Bhujel Gaon, Paren (27^0 03' 29.6" N, 88^0 51' 45.9"E), Todey (27^{0}07'32.4" N, 88^{0}46'41.2" E). A semi structured schedule was prepared with a number of close ended and few open ended questions. Villagers were asked regarding socio-economic profile of their villages. Only 10% household survey from each village was done. Villagers were interviewed using semi structured questionnaire to acquire valuable information regarding wild food floras. They were also requested to prepare village resource map. PRA practice was also done with the villagers to make a clear picture about the socio economic profile of their village. Vernacular names, families, seasonality, life forms, part used of wild food plants were collected from those villagers.

2.2.2 Key Informant Survey. Village

Headman, teachers and those people who were involved in collecting wild food plants species were considered as key informant. Basically key informants have firsthand knowledge about the villages and other things related to their villages. The key informants were enquired regarding the wild edible flora and actual information collected.

2.2.3 Field Survey. Forest field survey was

Conducted throughout the whole fringe area of Neora-Valley National Park to take in account the availability of those plants species and also for their identification. Quadrat sampling method was applied for collection of plant species. For trees species 20mX20m quadrat was taken. Wild tree species were collected either with flower or with fruit for exact identification. Photographs of those plants were also taken. Basic information about those plants species like local name, part used, seasonality, life forms were gathered through the interactions with the villagers and local guide. Scientific information such as botanical name, family was collected from with aid of the book "Flowers of the Himalaya" [20]. Abundance of those wild food tree species was estimated by ACFOR scale for ecological purpose.

3. RESULT AND DISCUSSION:

Total 23 wild food tree species belonging to 19 different families were reported from the detailed study in the fringe area of Neora-Valley National Park. These tree species have been enlisted in a table along with their botanical names, families, part used, purpose of use (Table 1). These wild floras play the key role in the livelihood of tribal people for their regular sustenance. Different parts of these tree species are used for various traditional edible purposes by local villagers such as vegetable curry, pickle, beverages, spices and so on.

Table 1: Documentation of wild edible tree from the fringe area of Neora-Valley National Park

 ISBN-978-93-85822-28-5

Sl No	Wild edible plants	Botanical names	Family	Part used	Purpose
1	Phamphal	*Persea fructifera*	Lauraceae	fruit	Raw fruit
2	Ka phal	*Garcinia cowa*	Guttiferae	fruit	Raw fruit
3	Gurpis	*Leucoseptum canum*	Laminaceae	flower	Vegetable
4	Tabha	*Gigantochloa nigrociliata*	Poaceae	Tender shoot	Vegetable curry
5	Sajane	*Moringa oleifera*	Moringaceae	fruit	vegetable
6	Naspati	*Persea Americana*	Rosaceae	fruit	Raw fruit
7	Belasi	*eticaAegeke marmelos*	Rutaceae	fruit	Raw fruit
8	Badrayo	*Elaeocarpus lanceifolius*	Elaeocarpaceae	fruit	Vegetable
9	Fakrey	*Calamus erevtus*	Aracaceae	Ripe fruit	Raw fruit
10	Tej patta	*Cinnamomum tamala*	Lauraceae	leaves	Spice
11	Kali jyamir	*Citrus aurantium*	Rutaceae	fruit	Raw fruit
12	Choya bans	*Dendrocalamus hamiltonii*	Poaceae	Tender shoots	Fermented food
13	Bhalu bans	*Dendrocalamus sikkimensis*	Poaceae	Tender shoots	Vegetable curry
14	Chewri	*Diploknema butyracea*	Sapotaceae	Ripe fruits	Raw fruit
15	Kabra	*Ficus benjamina*	Moraceae	Tender shoots	Pickles
16	Ramgua	*Horsfieldia kingii*	Myristicaceae	fruits	Raw fruit
17	Simal tarul	*Manihot esculenta*	Euphorbiaceae	Swollen fresh tap root	Beverage
18	Okhar	*Juglans regia*	Juglandaceae	Bark, leaves	Vegetable
19	Ghiroula	*Luffa aegyptiaca*	Cucurbitaceae	Immature fruit	vegetable
20	Kalikat	*Miliusa macrocarpa*	Annonaceae	Fruit	Raw fruit
21	Tarika	*Pandanus nepalensis*	Pandanaceae	Ripe fruits	Raw fruit
22	Iskus	*Sechium edule*	Cucurbitaceae	Tender shoots, fruits	Vegetable curry
23	Amara	*Spondias pinnata*	Anacardiaceae	Dry fruit	pickles

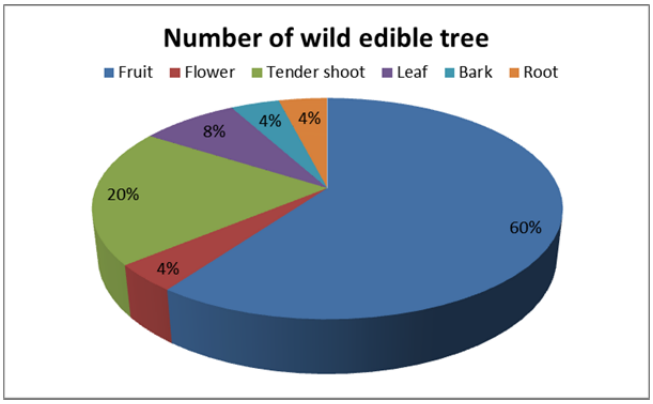


Fig. 1: Percentage distribution of Wild Edible Tree species according to their part used

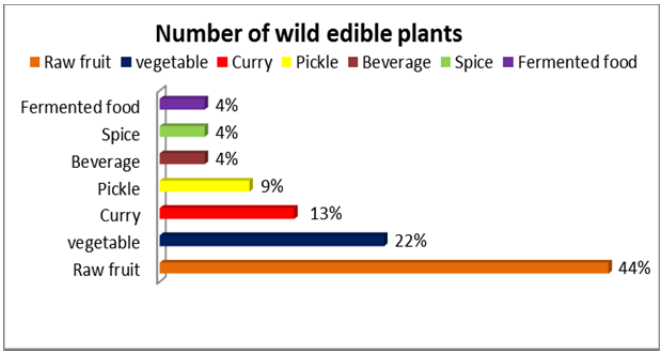


Fig. 2: Distribution of Wild Edible Tree species for different use of edible purposes

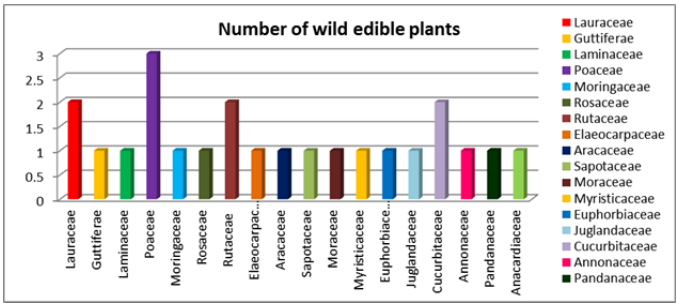


Fig. 3: Distribution of Wild Edible Tree species with different families

Table 2: Abundance of Wild Edible Trees in the study area by ACFOR scale

Abundant (>=30%)	Common (20-29%)	Frequent (10-19%)	Occasional (5-9%)	Rare (1-4%)
	Persea Americana	*Leucoseptum canum*	*Gigantochloa nigrociliata*	*Persea fructifera*
	Aegeke marmelos	*Moringa oleifera*	*Calamus erevtus*	*Garcinia cowa*

	Dendrocalamus hamiltonii	*Elaeocarpus lanceifolius*	*Horsfieldia kingii*	*Diploknema butyracea*
	Dendrocalamus sikkimensis	*Citrus aurantium*	*Manihot esculenta*	*Juglans regia*
		Ficus benjamina	*Miliusa macrocarpa*	
		Luffa aegyptiaca	*Sechium edule*	
		Pandanus nepalensis		
		Spondias pinnata		

Percentage distribution of part used of recorded wild food trees has been reported in this paper. These are fruit (60%), flower (4%), tender shoot (20%), leaf (8%), bark (4%) and root (4%) (Fig. 1). Fig. 2 has clearly shown the percentage distribution of traditional use of these plant species in a number of edible purposes such as raw fruit (44%), vegetable (22%), curry (13%), pickle (9%), beverage (4%), spice (4%) and fermented food (4%). The names of crucial families have also been taken an account these are Lauraceae (2 species), Guttiferae (1 species), Laminaceae (1 species), Poaceae (3 species), Moringaceae (1 species), Rosaceae (1 species), Rutaceae (2 species), Elaeocarpaceae (1 species), Aracaceae (1 species), Sapotaceae (1 species), Moraceae (1 species), Myristicaceae (1 species), Euphorbiaceae (1 species), Juglandaceae (1 species), Cucurbitaceae (2 species), Annonaceae (1 species), Pandanaceae (1 species) and Anacardiaceae (1 species) (Fig. 3). The abundance of these edible phyto-resources has been tabulated using ACFOR scale (Table 2). According to ACFOR scale no species has been found under abundant category, 4 species have been found under common category, 8 species under frequent category, 6 species under occasional category and 4 species under rare category.

Among the total wild edible plants, some species are also utilized in other purposes like medicinal purposes, as fuel wood, fodder, cowshed and handicraft. For example *Persea fructifera* is used to cure liver disorder, *Garcinia cowa* is used for common cold, *Elaeocarpus lanceifolius* for remission of high blood pressure, *Horsfieldia kingii* for dysentery. *Miliusa macrocarpa* and *Pandanus nepalensis* are used as fuel wood. *Dendrocalamus hamiltonii*, *Dendrocalamus sikkimensis* and *Ficus benjamina* are used for cow shed and fodder.

4. CONCLUSION:

This detailed investigation has stated that wild edible trees are distributed throughout the fringe area of Neora-Valley National Park. Tribal people who are residing in the fringe villages are very much efficient in traditional utilization of wild edible species. These plant species are the main natural food resources for poor people. These wild food plants are having a number of utilization aspects. Tribal communities have been using these wild floras since long generation back. According to the villagers' responses, the stock of these tree species has been reduced almost 70% - 90% in comparison to before. Indiscriminate collection and destruction of forest land has triggered the reduction of stock. More exploration and conservation is essential in this regard.

5. ACKNOWLEDGEMENT:

Our special gratitude goes to the DFO of Wild life Division II in West Bengal to conduct the study in fringe area Neora-Valley National Park. Our appreciation goes to the Head of The Department for giving us the opportunity to use laboratory. We are also very thankful to UGC for providing fund and the respondents for their inputs.

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