Ethnobotany of edible fruits used by the *Mishmi* tribes of Lohit District in Arunachal Pradesh, India

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Abstract

This paper discusses ethnobotany of the edible fruit plant species used by the *Mishmi* tribes of Lohit district in Arunachal Pradesh. Ethnobotanical investigation has revealed 37 species of wild fruit species belonging to 28 genera representing 22 angiospermic plant family. Tree represent highest number of 28 species which is followed by shrub and herbs. These commercially importance and some of the lesser known seasonal fruit species harvested mostly from the wild sources from community forest land, and consumed occasionally are actually helping the indigenous *Mishmi* community in supplementing the carbohydrate, proteins, fats, vitamins and mineral elements which is essential for the normal physiological function, alleviation of deficiency diseases, and help in preservation of ethnic food culture in their local biocultural landscape capable of sustaining the rural economy and livelihood.

Key words: Ethnobotany, *Mishmi* tribes, Edible fruit, Lohit District, Arunachal Pradesh.

INTRODUCTION

Edible fruit plants are crucial for maintaining health and wellbeing in humans since the time immemorial. The fresh wild fruits are the major sources of essential nutrients including vitamins, proteins, carbohydrates, fats and secondary metabolites of nutritional and medicinal interests (Prakash *et al.* 2012). The wild fruits of the Himalayas which are major source of antioxidant molecules capable of healing several human ailments including cancer and inflammation are often frequently harvested and consumed among the local tribal communities in different seasons of the year to supplement the nutritional requirement and to sustain their economy and livelihood of the rural household (Brahma *et al.* 2013; Pallabi *et al.* 2014). The state of Arunachal Pradesh with a total geographical area of 83,743 sq km area that falls within a geographical coordinate between 26.28° N and 29.30° N latitude and 91.20° E and 97.30° E longitude is falling within the Himalaya Biodiversity Hotspot endowed with rich biodiversity and ethnocultural heritage, diverse physiography and altitudinal variation (Myers *et al.* 2003; Mittermeier *et al.* 2005). This region which is blessed with 26 major tribes and 110 subtribes have the unique set of indigenous knowledge system on sustainable harvesting and utilization of food plants including wild edible fruits and vegetable plants of ethnobotanical and commercial significance (Tag 2007, 2014; Pallabi *et al.* 2014; Loxmi *et al.* 2017). The varied climatic condition ranging from hot and humid tropical low land to the temperate or

even subalpine landscape with high humidity and rainfall not only favours luxuriant growth of forest vegetation but also support proliferation of edible fruit plants along different altitudinal gradient in the Arunachal Himalayan region of India (Dhar & Nandargi 2004; Singh *et al.* 2007; Rinyo *et al.* 2018). Perusal of literature revealed that no publication is available to date on the edible fruits and vegetable plants used by the *Mishmi* community of Lohit district in Arunachal Pradesh except the first botanical exploration report of Kingdon Ward (1929, 1953). However, some ethnomedicinal publications are available on the Khamti community of Lohit district by Tag (2007) and Tag *et al.* (2007) which fundamentally dealt only on the ethnomedicinal aspects. Therefore, given the significance of edible fruit plants in sustaining economy and livelihood of the rural community, ethnobotanical field survey was conducted during the year 2017 – 2019 in the *Mishmi* localities of Lohit district in eastern Arunachal Pradesh with fundamental aims to enumerate and document the selected edible fruit plants traditionally used by the local community for sustaining the food and nutritional security, economy and livelihood. This paper discusses the scientific merits and scopes of edible fruits in sustaining rural nutritional and livelihood security in local and regional perspectives.

MATERIALS AND METHODS

Study site and ethnocultural profile

The Lohit District of Arunachal Pradesh with a total geographical area of 2402 sq km area falls within a geographical coordinate between 96°13' and 96°15' E longitude and 27°49' and 27°53' N latitude (Figure 1). Forests are all tropical to subtropical evergreen broad-leaved type with altitude ranging from 100 – 2000 m from AMSL and receives heavy rainfall from both northeast and southwest monsoon begins from May – September. The dominant tree species occupying the top storey are *Altingia excelsa*, *Dillenia indica*, *Dipterocarpus retusus*, *Terminalia*

Figure 1. Map showing *Mishmi* inhabited Lohit and neighbouring districts of Arunachal Pradesh visited by the authors for collection of ethnobotanical information on edible fruits during the year 2018 – 2019.

myriocarpa, *Tetramelis nudiflora* and host of epiphytic herbs and climbers. The ground floor is populated with different herbaceous species of Zingiberaceae, Balsaminaceae, Liliaceae, Araceae, Arecaceae and Musaceae members (Tag *et al.* 2007). Of the total population of 1,45,726 souls (Anonymous 2011a), *Mishmi* population represent major chunk of the total population in the Lohit district of Arunachal Pradesh who belongs to mongoloid racial stock and speaks *Midzu* branch of Tibetan-Burman linguistic tone rich in traditional biocultural knowledge system. *Mishmis* of Lohit Valley are the worshipers of natural forces of the entire cosmos and follow reformed indigenous sect of religion called *Nani-Intaya* prevalent in their locality in pristine form. The *Mizo Mishmi* and *Digaru Mishmi* of Lohit celebrates traditional *Tamladu* festival while *Edu Mishmi* celebrates *Reh* festival with ancient ritualistic tradition to pray the almighty benevolent nature for blessings thus marking the arrival of new year and harvesting season with much fanfare (Anonymous 2011b).

Rapid ethnobotanical appraisal

Rapid ethnobotanical appraisal based survey for documentation of edible fruit plants in *Mishmi* dominated localities of Lohit district in Arunachal Pradesh was conducted during the years 2017 – 2019 following the method suggested by Martin (2008). A total of 25 household comprises of 50 local informants covering 15 villages focused on elderly age group, ranging between 40 – 80 years, were contacted and interviewed using semi-structured questionnaire format for recording of ethnobotanical information on edible fruit species available in their local biocultural landscape. Prior Inform Consent (PIC) was taken from the potential informants before start of the work. The parts used, harvesting practices, climate and soil requirements, local uses and marketing scopes of each fruit species were recorded in digital camera and field note book. The voucher specimens were processed into mounted herbarium-sheets of each species recorded following standard methodology (Jain & Rao 1977). The specimens were taxonomically authenticated with the help of standard *Flora of Assam* (Kanjilal *et al.* 1934 – 1940), *The Flora of British India* (Hooker 1872 – 1897), *Materials for the Flora of Arunachal Pradesh* (Hajra *et al.* 1996; Giri *et al.* 2008; Chowdhery *et al.* 2009), and *Flora of Lower Subansiri* (Pal 1993). The accepted scientific names were verified in the website www.theplantlist.org and www.plantsoftheworldonline.org. The authenticated herbarium sheets, each bearing collection and accession numbers, were deposited in the Herbarium of Arunachal University (HAU), for the future reference.

RESULT AND DISCUSSION

Taxonomic diversity, habit and part harvest

The present investigations revealed a total of 37 species of wild edible fruit plants belonging to 28 genera from 22 plant families (Table 1; Plate I) those are reported to be used by the *Mishmi* community of Lohit district of Arunachal Pradesh as food supplements in their local landscape. Majority of the fruit species reported are consumed in raw at ripen stage, while some are consumed as vegetable and as pickle after fermentation. Out of 22 families, Moraceae is represented by highest number of 6 species (Figure 2). Of the total 37 species reported, tree represents highest number of 28 species which were followed by shrubs with 4 species, climbers 3 species and herbs with only 2 species (Figure 3).

Commercially viable fruit species

The commercially viable edible and medicinal tropical and subtropical fruit plants used by the *Mishmi* of Lohit districts commonly sold in markets are: *Artocarpus heterophyllus*, *Averrhoa carambola*, *Baccaurea ramiflora*, *Castanopsis indica*, *Citrus limon*, *Citrus maxima*,

Table 1. List of fruits plant species collected from Lohit District of Arunachal Pradesh

Scientific Name	Habit	Mishmi name	Parts harvested	Mode of consumption
<i>Artocarpus chama</i> Buch.-Ham. [Moraceae]; SM/HT/HAU/1772/2018	Tree	<i>Manlangsit</i>	Fruits	Raw
<i>Artocarpus lacucha</i> Buch.-Ham. [Moraceae]; SM/HT/HAU/1778/2018	Tree	<i>Haabang</i>	Fruits	Raw
<i>Artocarpus heterophyllus</i> Lam. [Moraceae]; SM/HT/HAU/1773/2018	Tree	<i>Dabyum</i>	Fruits, young leaves	Raw
<i>Averrhoa carambola</i> L. [Oxalidaceae]; SM/HT/HAU/1777/2018	Tree	<i>Dablai shai</i>	Fruits	Raw & pickle
<i>Baccaurea ramiflora</i> Lour. [Phyllanthaceae]; SM/HT/HAU/1779/2018	Tree	<i>Soobeey</i>	Fruits	Raw
<i>Calamus tenuis</i> Roxb. [Arecaceae]; SM/HT/HAU/1782/2019	Climber	<i>Lakaa shi/Kanche e</i>	Fruits	Raw
<i>Calamus viminalis</i> Willd. [Arecaceae]; SM/HT/HAU/1781/2019	Climber	<i>Lauraa/Ma itul</i>	Fruits	Raw
<i>Canarium strictum</i> Roxb. [Burseraceae]; SM/HT/HAU/1783/2019	Tree	<i>Ney-klaa</i>	Fruits	Raw
<i>Caryota urens</i> L. [Arecaceae]; SM/HT/HAU/1785/2019	Tree	<i>Deeing or Taksi</i>	Fruits	Raw
<i>Castanopsis hystrix</i> Hook.f. & Thomson ex A.DC. [Fagaceae]; SM/HT/HAU/1788/2019	Tree	<i>Ayaykrong sit or Tapoisit</i>	Seeds	Raw
<i>Castanopsis indica</i> (Roxb. ex Lindl.) A.DC. [Fagaceae]; SM/HT/HAU/1701/2019	Tree	<i>Ayaysit</i>	Seeds	Raw
<i>Citrus limon</i> (L.) Osbeck [Rutaceae]; SM/HT/HAU/1703/2019	Shrub	<i>Pasing tahee</i>	Fruits	Raw & pickle
<i>Citrus maxima</i> (Burm.) Merr. [Rutaceae]; SM/HT/HAU/1702/2019	Tree	<i>Passing- sig/Tikki</i>	Fruits	Raw & pickle
<i>Choerospondias axillaris</i> (Roxb.) B.L.Burtt & A.W.Hill [Anacardiaceae]; SM/HT/HAU/1706/2019	Tree	<i>Mudhu- shei</i>	Fruits	Raw & pickle
<i>Dillenia indica</i> L. [Dilleniaceae]; SM/HT/HAU/1708/2019	Tree	<i>Zoopa-shei</i>	Fruits	Raw & boil
<i>Elaeagnus latifolia</i> L. [Elaeagnaceae]; SM/HT/HAU/1709/2019	Shrub	<i>Sahasit</i>	Fruits	Raw
<i>Ficus auriculata</i> Lour. [Moraceae]; SM/HT/HAU/1707/2019	Tree	<i>Aapo</i>	Fruits	Raw
<i>Ficus semicordata</i> Buch.-Ham. ex Sm. [Moraceae]; SM/HT/HAU/1710/2019	Tree	<i>Beesheii</i>	Fruits	Raw
<i>Garcinia dulcis</i> (Roxb.) Kurz [Clusiaceae]; SM/HT/HAU/1715/2019	Tree	<i>Jawpasit</i>	Fruits	Raw & pickle
<i>Hodgsonia macrocarpa</i> (Blume) Cogn. [Cucurbitaceae]; SM/HT/HAU/1712/2019	Climber	<i>Duwra</i>	Fruits, seeds	Roasted

Scientific Name	Habit	Mishmi name	Parts harvested	Mode of consumption
<i>Livistona jenkinsiana</i> Griff. [Arecaceae]; SM/HT/HAU/1716/2019	Tree	<i>Laaka</i>	Fruits	Raw
<i>Melastoma malabathricum</i> L. [Melastomataceae]; SM/HT/HAU/1720/2019	Shrub	<i>Manchusa yah or Darah</i>	Fruits	Raw
<i>Morus indica</i> L. [Moraceae]; SM/HT/HAU/1735/2019	Shrub	<i>Khrosit</i>	Fruits	Raw
<i>Musa balbisiana</i> Colla [Musaceae]; SM/HT/HAU/1716/2019	Herb	<i>Khamburo o</i>	Fruits	Raw
<i>Neolamarckia cadamba</i> (Roxb.) Bosser [Rubiaceae]; SM/HT/HAU/1709/2019	Tree	<i>Kaa-daam</i>	Fruits	Raw
<i>Nephelium lappaceum</i> L. [Sapindaceae]; SM/HT/HAU/1718/2019	Tree	<i>Ahted seeh or Aathiak</i>	Fruits	Raw
<i>Oroxylum indicum</i> (L.) Kurz. [Bignoniaceae]; SM/HT/HAU/1722/2019	Tree	<i>Tachagam digro</i>	Seed	Raw
<i>Pandanus dubius</i> Spreng. [Pandanaeae]; SM/HT/HAU/1726/2019	Tree	<i>Hangrab</i>	Fruits	Raw
<i>Persicaria chinensis</i> (L.) H. Gross [Polygonaceae]; SM/HT/HAU/1728/2019	Herb	<i>Tah-shee tintim</i>	Fruits	Raw
<i>Phyllanthus emblica</i> L. [Phyllanthaceae]; SM/HT/HAU/1732/2019	Tree	<i>Anlokhi</i>	Fruits	Raw & pickle
<i>Pinanga gracilis</i> Blume [Arecaceae]; SM/HT/HAU/1736/2019	Tree	<i>Laraao</i>	Fruits	Raw
<i>Prunus persica</i> (L.) Batsch [Rosaceae]; SM/HT/HAU/1724/2019	Tree	<i>Aam-toh</i>	Whole fruits except seed	Raw
<i>Pyrus communis</i> L. [Rosaceae]; SM/HT/HAU/1733/2019	Tree	<i>Glung</i>	Whole fruits	Raw
<i>Spondias pinnata</i> (L.f.) Kurz [Anacardiaceae]; SM/HT/HAU/1734/2019	Tree	<i>Dablai</i>	Fruits	Raw
<i>Sterculia monosperma</i> Vent. [Malvaceae]; SM/HT/HAU/1739/2019	Tree	<i>Haa giyoo sai / Lakousit</i>	Yellowish core part	Raw & roasted
<i>Sterculia villosa</i> Roxb. [Malvaceae]; SM/HT/HAU/1745/2019	Tree	<i>Aagyoo</i>	Seeds	Raw
<i>Terminalia chebula</i> Retz. [Combretaceae]; SM/HT/HAU/1742/2019	Tree	<i>Kiangsa ama</i>	Fruits	Raw & dry

Dillenia indica, *Musa balbisiana*, *Phyllanthus emblica*, and *Terminalia chebula*. These species have been observed to be widely harvested and consumed by the local farmers and popularly sold in local markets of Tezu mostly by the women folk and rural marginal farmers to sustain their livelihood.

Conservation and harvesting

The traditional seasonal edible fruit species conserved in the community forest land and harvested for carbohydrates, fat, protein, vitamin and mineral sources are: *Artocarpus chama*,

PLATE - I. Images of some collected edible wild fruits from Lohit district, Arunachal Pradesh: A. *Hodgsonia macrocarpa*; B. *Baccaurea ramiflora*; C. *Morus indica*; D. *Ficus auriculata*; E. *Ficus semicordata*; F. *Artocarpus heterophyllus*; G. *Artocarpus chama*; H. *Artocarpus lacucha*; I. *Sterculia villosa*; J. *Nephelium lappaceum*; K. *Dillenia indica* (spilled fruit); L. *Averrhoa carambola*.

Figure 2. Distribution of fruit plant species within 22 families recorded from Lohit Valley of Arunachal Pradesh.

Figure 3. Habit of the edible fruit plant species (n=37) used by the *Mishmi* tribes of Lohit valley in Arunachal Pradesh

Artocarpus lacucha, *Artocarpus heterophyllus*, *Elaeagnus latifolia*, *Ficus auriculata*, *Ficus semicordata*, and *Hodgsonia macrocarpa*. These are the seasonal fruits collected from the community forest-land periodically by the local villagers - young and old as essential nutrient and herbal supplement to keep their body healthy. Validation studies have suggested these wild fruits species possessing the high amount of anti-oxidant molecule which are potential to treat and prevent cancer and inflammation related ailments caused by the free radicals generated in the cell due to excessive consumption of toxic and corrosive food items (Pallabi *et al.* 2014; Loxmi *et al.* 2017).

CONCLUSION

Present rapid appraisal based ethnobotanical report on the *Mishmi* community of Lohit Valley of Arunachal Pradesh have revealed that the local tribal farmers of the valley are rich in traditional knowledge related to conservation, cultivation, sustainable harvesting and marketing of the wild edible food and medicinal fruit plants available in their local landscape. Majority of the fruits harvested and sold in the local market are derived from the wild sources conserved in the community forest area whereas few species were found to be cultivated in the horticultural plots. The fruits harvested are mostly consumed by the local residents in raw and value added products such as pickle which are good sources of vitamins, essential

minerals, carbohydrate, protein and fats, and anti-oxidant molecules for keeping good health and longevity. Phytochemical, nutritional and pharmacological validation studies on some selected biochemically unexplored species is required to ascertain nutritional and nutraceutical potentials. To improve rural livelihood and nutritional security, prospective local farmers should be encouraged to cultivate commercially significant species in community forest area and waste land for effective conservation and sustainable utilization in the target biocultural landscape.

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