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Wild edible fruit tree resources of Arunachal Pradesh, North East India

N. Lyngdoh[1*], Ng Piloo[2], Tape Gab[3], Mukul Kumar[1] and A.K. Pandey[4]

[1]Department of Tree Improvement, College of Horticulture and Forestry, Central Agricultural University, Pasighat-791102 (Arunachal Pradesh), INDIA
[2] Department of Post Harvest Management, College of Horticulture and Forestry, Central Agricultural University, Pasighat-791102 (Arunachal Pradesh), INDIA
[3]State Horticulture Research and Development Institute, Itanagar-791111 (Arunachal Pradesh), INDIA
[4]Dean's Office, College of Horticulture and Forestry, Central Agricultural University, Pasighat-791102 (Arunachal Pradesh), INDIA
[*]Corresponding author. E-mail: lyngdoh@gmail.com

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Abstract: The paper reports on the survey of wild edible fruit trees covering 49 sites from 17 districts of Arunachal Pradesh, India. A total of 52 wild edible fruits species representing 33 families was reported, out of which 10 had medicinal uses. The highest number of wild edible fruits belonged to family Moraceae (9 spp.) followed by Anacardiaceae (4 spp.) and Actinidiaceae (3 spp.). More than half the fruits (66.67%) are available during the monsoon season, i.e. between June and October. *Dilenia indica, Castanopsis indica, Canarium strictum, Terminalia citrina, Phoebe cooperiana, Phyllanthus emblica* and *Artocarpus intergifolia* are the commonly traded fruits. This is perhaps the only extensive survey which has so far been carried out on wild edible fruit tree resources covering all the districts of Arunachal Pradesh. In the present era where there is global interest on bioresource documentation, this study is significant for securing intellectual property right and preventing biopiracy.

Keywords: Diversity, Medicinal, Traded, Underutilized, Wild fruit tree resources

INTRODUCTION

Arunachal Pradesh (26° 30' and 29° 30' North and 91° 30' and 97° 30' East) is the largest state of North East region of the country covering an rea of 83,743sq km with 80.39% of geographical area under forest cover (Anonymous, 2013). Having an altitudinal range between 150 and 7000 m, it is presented with diverse forest types which harbors rich floral and faunal diversity. The state is also strategically located within the Indo Myanmar biodiversity hotspot (Myers *et al*., 2000) making it one of the prime areas for ethnobotanical studies and bio resource explorations. Further, community diversity in the state which comprises of 26 main tribes and 110 minor/sub tribes with distinct socio-cultural settings and traditional knowhow is a store house of untapped wealth.

Wild edibles are a part of the food habits of people in many societies and intimately connected to virtually all aspects of their socio-cultural, spiritual life and health. Infact, most rural communities in India depend on the wild edible plants to meet their food needs during the food crisis, as well as for additional food supplements. It has been reported that there are 1532 edible wild food species in India, mostly from Western Ghats and Himalayan regions (Arora and Pandey, 1996). Recently wild edibles have captured the interest of many researchers throughout the country and especially in the eastern Himalayan region where human populations live in close association and harmony with nature. Consequently, there is growing number of records on wild edible plants reported from various states of the north east (Kayang, 2007; Jeeva, 2009; Singh *et al.,* 2012; Gangte *et al.,* 2013; Brahma *et al*., 2013; Deb *et al*., 2013). However, most studies provide a generalized approach of documenting wild edible plants by including all categories such as vegetables, medicines, fruits, spices, *etc.* in a single report or the reports were confined to a district, tribe or within a protected area. Nevertheless, these reports highlight the immense wealth of untapped biodiversity and associated traditional knowledge harboured in various parts of the region.

In the present paper we primarily aim to document the diversity, time of availability and the associated traditional uses of wild edible fruit trees species in the entire state of Arunachal Pradesh. Wild edibles fruits play a significant role in human dietary and nutrition requirement. They are known to be excellent source of nutrients such as minerals and vitamins (Nahar *et al.,* 1990). Their importance is even more profound among forest dwellers and marginalized rural communities where conventional fruits are scarce or unaffordable. With changing market demands and under present

climate change scenarios documentation of the edible fruit tree resources of Arunachal Pradesh, North East India is paramount. In addition, the study becomes very pertinent in the present era of securing intellectual property rights and prevention of biopiracy.

MATERIALS AND METHODS

The study areas for the investigation consisted of 49 sites in Arunachal Pradesh surveyed during 2012 to 2014. All 17 districts of Arunachal Pradesh were included in the study with each district represented between 1 and 4 sites as shown in Fig 1. Where ever possible, sites were chosen within each district in such a manner that they broadly represent different agro climatic zones. For obtaining information on wild edible fruit present in the area, a home based approach was adopted. At each site village headman/ progressive farmer/ village elder was identified and meetings were arranged. A semi structured interview was conducted to obtain information on the types and number of resources available, season of harvest, usage pattern, trade information, mode of consumption, medicinal uses and any traditional knowledge associated with the tree species. Visit to the nearby forest area of respective sites was then undertaken for sample collection. Species identification was done following the regional floras and was counter checked with the help of the herbarium of the Botanical Survey of India, Itanagar.

RESULTS AND DISCUSSION

A total of 67 wild edible fruit trees were documented which are commonly consumed by the people of Arunachal Pradesh. However, not all fruits which have been documented could be identified completely. The number of fruit identified up to species level was 52 representing 33 families. Documentation of wild edible fruits in Arunachal Pradesh have been earlier included in broader studies on edible plants such as that of Rawat *et al.* (1998) and Angami *et al.*(2006).More recently, Yumnam *et al.* (2011) who restricted their survey only to East Siang district of Arunachal Pradesh, recorded 26 plant species used as edible fruits. In other parts of North East, Brahma *et al.* (2013) recorded total of 32 wild edible fruits belonging to 23 families that are used by *Bodo* tribe of Kokrajhar district of Assam while Chakraborty and Chaturvedi (2014) reported a total of 61 wild fruit plants in the state of Tripura, out of which 45 species were trees. Considering the size and topographical variation of Arunachal Pradesh, 67 fruit species as reported is less and we agree that the actual number of species should far exceed that value. In our defence, for one, the study was restricted to tree species and that many areas in the state are still inaccessible which make extensive survey a daunting task. Further the period for conducting surveys is restricted to the dry months, which makes sampling of plant sample/reproductive structures incomplete and therefore problems in identification. None the less, this report presents the most extensive survey on commonly available wild edible fruit tree species in the entire state of Arunachal Pradesh.. The list of wild edible fruit trees along with their major distribution and mode of consumption is provided in Table 1. Additional information on the distribution was also obtained from Materials or the Flora of Arunachal Pradesh, Flora of India series 2. The highest number of wild edible fruits belonged to family Moraceae (9 spp.), followed by Anacardiaceae (4 spp.) and Actinidiaceae (3 spp.). The families Phyllanthaceae, Burseraceae, Fagaceae, Lauraceae, Rosaceae and Combretaceae were represented by 2 spp. each and the remaining by one spp. only. Earlier, Chakraborty and Chaturvedi (2014) in their survey on wild edible fruits of Tripura reported highest representation of species from Moraceae family while Dangwal *et al.* (2014) reported 3 tree species of Moraceae family used as wild edible fruits in their survey at Rajouri District of Jammu and Kashmir. Out of the 52 species, 10 species were reported to be used for medicinal purposes by various tribes (Table 2), the knowledge which has been passed for generations among the local community. Among these, *Averrhoea carambola, Canarium strictum, Phyllanthus emblica* and *Terminalia bellirica* are reported to be commoly used for various ailments in other parts of the India as well (Sheth, 2005; Namsa *et al*., 2009; Meena *et al*., 2012; Bajracharya, 1979; Williamson, 2002; Amrithpal, 2011).

Fruits were mainly consumed in raw form with few also roasted such as *Castanopsis hystrix, Castanopsis indica, Illicium griffithi, Litsea citrata, Michelia champaca, Phoebe cooperiana, Pyrus pashia* and *Sterculia hamiltonii*. Fruits which were boiled include *Dellinia indica, Litsea citrata* and *Tevesia palamata.*

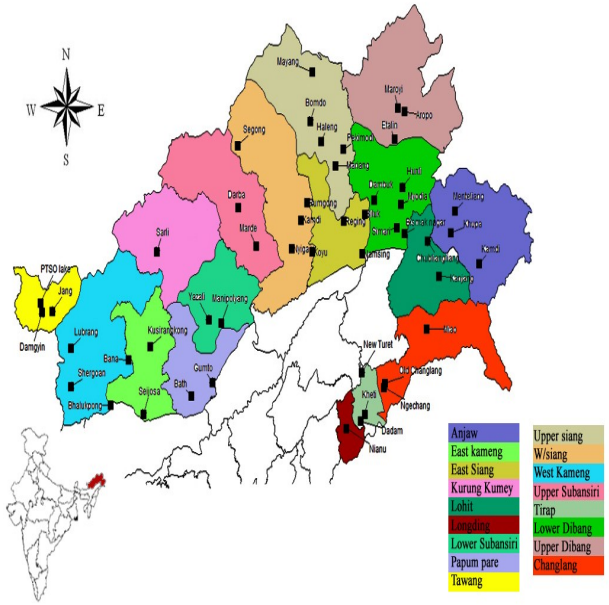

Fig. 1. *Map showing the 49 sites surveyed for wild edible fruit trees in the state of Arunachal Pradesh.*

Table 1. List of wild edible fruit trees along with local names, distribution and mode of consumption found in Arunachal Pradesh.

S. N.	Species name	Local name	Distribution	Mode of consumption	Period of availability
1	*Artocarpus chaplasha* (Moraceae)	Mebayam, Lirang	Bana (East Kameng), Simari (Lower Dibang). Also reported from Chanlang, Lohit, Siang and Subansiri Districts	Raw	Oct-Nov
2	*Artocarpus heterophyllus* (Moraceae)	Belam	Siluk (East Siang) Also reported from Changlang, Kameng, Lohit and other Siang Districts; up to 700 m	Cooked, Raw, Boiled	May-Oct
3	*Averrhoa carambola* (Oxalidaceae)	Kordoi	East Siang, East Kameng, West Kameng; 500-1000 m	Raw	March-June
4	*Baccaurea sapida* (Euphobiaceae)	Bureng	Basar & Kamdi (West Siang), Siluk (East Siang), Gumto (Papum pare), Haleng (Upper Siang). Also reported in Chanlang, Kameng, Lohit and Tirap Districts	Raw	June-Aug
5	*Bischofia javanica* (Phyllanthaceae)	Mob	Yazali (Lower Subansiri). Also reported in Changlang, Lohit, Upper Subansiri and Tirap Districts; 2000-2600 m	Raw	Dec-Jan
6	*Canarium bengalense* (Burseraceae)	Dhuna	Simari (Lower Dibang). Also reported in West Kameng, Lohit, Siang, Lower Subansiri and Tirap Districts; 500-1000 m	Raw	Jan-May
7	*Canarium strictum* (Burseraceae)	Dhuna, Silum, Kara, Hilum, Singtumparlum, Fobojeu	Miao (Changlang), Bana & Seijosa (East Kameng), Siluk, Koyu, Renging, Namsing (East Siang); Bismaknagar, Lohit; Simari, Dambuk, (Lower Dibang); Gumto, Bath Basti, (Papum Pare); Haleng, Mariang (Upper Siang); Darba (Upper Subansiri); Balukpong (West Kameng); 1000-1200 m	Raw	Dec-March
8	*Carallia brachiata* (Rhizophoraceae)	Sibetaneng	Renging (East Siang), Also reported in Kameng, Tirap and Siang Districts; up to 1500 m	Raw	July
9	*Castanopsis histrix* (Fagaceae)	Amke (Taping), Tatinyinpi	Menteliang (Anjaw); Kusirangkong (East Kameng); Siluk, Renging, Namsing (East Siang) ; Simari & Dambuk (Lower Dibang); Gumto & Bath basti, (Papum Pare); Haleng & Bomdo (Upper Siang); Marde (Upper Subansiri); Basar, Kamdi, Segong (West Siang); 500-1500 m	Raw, Roasted, Boiled	June-Nov
10	*Castanopsis indica* (Fagaceae)	Karang, Ekassi, Kora, Korang, Kura rasi,	Khupa (Anjaw); Kusirangkong (East Kameng); Siluk, Renging, Namsing, (East Siang); Bismaknagar (Lohit); Hunli, Simari, Dambuk (Lower Dibang); Yazali (Lower Subansiri); Aropo, Maroyi, Etalin (Upper Dibang); Bomdo (Upper Siang); Darba & Marde (Upper Subansiri); Basar & Kamdi (West Siang). Also reported in Changlang; up to 2000 m	Raw, Roasted, Boil, Cooked	June-Nov
11	*Cordia myxa* (Boraginaceae)	-	Changlang, Kameng and Lohit Districts; 1300-1600 m	Raw	Throughout the year
12	*Cudrania javanensis* (Moraceae)	-	Menteliang (Anjaw). Also reported in Changlang, Kameng, Lohit and Siang Districts; up to 1000 m	Raw	April-Nov

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13	*Daphne composite* (Thymelaeaceae)	Sugu sing	Jang (Tawang); Also reported from Upper Siang District; 1200-1800 m	Raw	May-June
14	*Debregeasia longifolia* (Urticaceae)	Nanjosi	Hunli (Lower Dibang); Maroyi (Upper Dibang). Also reported in Changlang, Kameng, Lohit, Siang and Tirap Districts,; 1000-2000 m	Raw	April-July
15	*Dillenia indica* (Dilleniaceae)	Bau, Joppa asih (Outenga), Ouwtenga, Champa, Aku Tanga	Seijosa (East Kameng); Kanjang, Bismarknagar, Chubliangliang (Lohit); Dambuk (Lower Dibang); Turet (Tirap); Haleng (Upper Siang); Balukpong (West Kameng). Also reported in Changlang, Siang and Subansiri Districts; 1000-600 m	Raw, Boil, Cooked	June-Oct
16	*Elaeagnus umbellate* (Elaeagnaceae)	Ibisi, Ebesi	Aropo & Mayori (Upper Dibang). Also reported in Changlang, Lohit and Kameng Districts, 2600-2900 m	Raw	June-July
17	*Elaeocarpus ganitrus* (Elaeocarpaceae)	Rudhraksha	Changlang District, Subansiri Districts; 200-500 m	Raw	July-Aug
18	*Eugenia jambola* (Myrtaceae)	Jankeng-asing, Jamun	Changlang Lohit and Tirap Districts	Raw	July-Aug
19	*Eurya acuminate* (Theaceae)	Jeem	Kahoo (Anjaw). Also reported in Changlang, Siang and Tirap Districts; 800-1500 m	Raw	Jan-Feb
20	*Ficus auriculata* (Moraceae)	Tao, Phubnu, Taroai, Taw upuulam, Tawk	Sarli (Kurung Kumey); Nianu (Londing); Yazali & Manipolyang (Lower Subansiri); Darba & Marde (Upper Subansiri). Also reported in Changlang, Kameng, Lohit, Siang and Tirap Districts,	Raw	June-Sept
21	*Ficus cyrtophylla* (Moraceae)	Kejik	Bana (East Kameng), Kameng, Siang and Tirap Districts, up to 500m	Raw	June-July
22	*Ficus fistulosa* (Moraceae)	-	Changlang, Kameng, Lohit, Siang, Subansiri and Tirap Districts; 400-1500 m	Raw	Nov-Feb
23	*Ficus hirta* (Moraceae)	Kahoh	Chubliangliang (Lohit). Also reported in Changlang, Siang, Subansiri and Tirap Districts; up to 800 m	Raw	Aug-Sept
24	*Ficus semicordata* (Moraceae)	Chamkoi, Pasa, Satmung, Takuk, Taku, Takuai, Toku, Miram, Myuju	Old changlang, Miao, Ngechang (Changlang); Bana & Kusirangkong, (East Kameng); Renging (East Siang); Sarli (Kurung Kumey); Nianu (Longding); Manipolyang & Yazali (Lower subansiri); Bath (Papum Pare); Dadam (Tirap); Mariang (Upper Siang); Darba & Marde (Upper Subansiri); Balukpong (West Kameng); Basar (West Siang); Lohit; 500-1700 m	Raw	June-Aug
25	*Garcinia paniculata* (Clusiaceae)	Tarak	Renging (East Siang); Turet (Tirap); Bomdo (Upper Siang). Also reported in Kameng Districts; 100-800 m	Raw	July-Aug
26	*Gaultheria fragrantissima* (Ericaceae)	Saksingdev	Siang Districts; 1200-1800 m	Raw	Nov-Jan
27	*Gynocordia odorata* (Flacourtiaceae)	Sibe turpe	Menteliang (Anjaw); Changlang District; 200-1000 m	Raw	Sept-Nov
28	*Illicium grifithii* (Liciaceae)	Dombusing	Dirang (West Kameng); Tawang; 1200-1800 m	Roasted	Sept-Oct
29	*Juglans regia* (Juglandaceae)	Ruhri	Dadam (Tirap). Also reported in Kameng Districts	Raw	July-Aug
30	*Leea indica* (Vitaceae)	Rogang	Chanlang, Kameng, Siang Districts, Subansiri and Tirap Districts; 500-1000 m	Raw	May-Nov
31	*Litsea citrata* (Lauraceae)	Ranjil (Tajil), Rayil, Rail	Gumto & Bath Basti (Papum Pare); Haleng & Pekimodi (Upper Siang); Kamdi & Segong (West Siang); Also reported in Chanlang, Kameng, Lohit, Siang and Tirap Districts; 500-2500 m	Raw, Boiled, Roasted	June-Aug
32	*Maesa chisia* (Primulaceae)	-	Menteliang (Anjaw). Also reported in Chanlang, Lohit and Subansiri Districts	Raw	Feb-Nov

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33	*Mangifera sylvatica* (Anacardiaceae)	Togu, Tegu	Yazali (Lower Subansiri); Marde (Upper Subansiri). Also reported in Chanlang, Kameng and Siang Districts; 1200-1400 m	Raw	June-Aug
34	*Melastoma malabathricum* (Melastomaceae)	Kesirayi	Basar (West Siang). Also reported in Changlang and Siang Districts; 400-1500 m	Raw	May-July
35	*Michelia champaca* (Magnoliaceae)	Siilyo	Yazali (Lower Subansiri). Also reported in Kameng Districts; 800-1800 m	Roasted,	Jan-Feb
36	*Morus alba* (Moraceae)	Nunuguti	Kamdi (West Siang)	Raw, Roasted, Cooked	April-May
37	*Myrica esculenta* (Myricaceae)	Zeen, Bachin	Nianu (Longding); Manipolyang (Lower subansiri), Also reported in Kameng Districts	Raw	May-June
38	*Phoebe cooperiana* (Lauraceae)	Siphele, Tapil, Sangser, Tahir, Tapir, Inusi, Phugrap, Minyi mu	Old Changlang & Miao, (Changlang), Bana & Kusirangkong (East kameng); Siluk, Koyu, Renging, Namsing (East Siang); Sarli (Kurung Kumey); Chubliangliang (Lohit); Hunli, Simari, Dambuk (Lower Dibang); Turet (Tirap); Darba (Upper Siang); Balukpong (West Kameng); Basar (West Siang)	Raw, Roasted, Cooked	Sept-Oct
39	*Phyllathus emblica* (Phyllanthaceae)	Amla, Aonla	Kusirangkong (East Kameng); Siluk (East Siang); Dambuk (Lower Dibang); Gumto (Papum Pare); Kamdi (West Siang). Also reported in Kameng and Subansiri Districts; 500-1200 m	Raw	June-Aug
40	*Prunus persica* (Rosaceae)	Wild peach	Shergoan (West Kameng). Also reported in Siang and Tirap Districts; 800-1500 m	Raw	May-Sept
41	*Pyrus pashia* (Rosaceae)	Piita ai, Monam naspathi (Paus)	Manipolyang (Lower Subansiri); Segong (West Siang). Also reported in Subansiri Districts; 1600-1800 m	Raw, Roasted	Aug-Sept
42	*Rhus semialata* (Anacardiaceae)	Amasi	Aropo (Upper Dibang). Also reported in Changlang, Kameng, Lohit, Siang, Subansiri and Tirap Districts; 100-600 m	Raw	June-July
43	*Saurauia armata* (Actinidiaceae)	Sebenyapik	Kusirangkong (East Kameng); Gumto & Bath (Papum pare). Also reported in Changlang, Kameng, Lohit and Subansiri Districts; 400-1050 m	Raw	June-July
44	*Saurauia napaulensis* (Actinidiaceae)	Sicho ninch	Yazali (Lower Subansiri); Menteliang (Anjaw). Also reported in Di-bang valley, Kameng, Lohit, Siang, Subansiri and Tirap; 1500-2000 m	Raw	June-Oct
45	*Saurauia roxburghii* (Actinidiaceae)	Tan	Haleng, Bomdo, Mariang, Dadam (Tirap); (Upper siang); Basar & Rumgong (West Saing). Also reported in Chanlang, Kameng, Lohit and Subansiri Districts; 200-1500 m	Raw	June-Oct
46	*Spondias axillaris* (Anacardiaceae)	Dorgge, Lopsi	Renging & Namsing (East Siang); Nianu (Londing). Also reported in Siang Districts; 1000-1300 m	Raw	Oct-Dec
47	*Spondias pinnata* (Anacardiaceae)	Sodung Pona, Bhalu-pong	Yazali (Lower Subansiri). Also reported in Changlang, Lohit and Tirap District; 500-800 m	Raw	Dec-Jan
48	*Sterculia hamiltonii* (Sterculiaceae)	Phrang-Se- Shing	Changlang, Kameng, Subansiri and Tirap Districts; 500-130 m	Raw	April-May
49	*Terminalia bellarica* (Combretaceae)	Hilika	Simari (Lower Dibang)	Raw	Nov-Jan
50	*Terminalia citrina* (Combretaceae)	Hilika, Litka	Miao (Changlang); Seijosa (East Kameng); Bismaknagar & Chubli-angliang, (Lohit); Dambuk (Lower Dibang); Turet (Tirap). Also reported in Kameng Districts	Raw	Dec-Jan
51	*Trevesia palmata* (Araliaceae)	Tago, Tagor	Bana & Kusirangkong (West Kameng). Also reported in Subansiri Districts; 500-1000 m	Raw, Boil	Feb- May
52	*Zanthoxylum acanthopodium* (Rutaceae)	-	Menteliang (Anjaw). Also reported in Changlang, Kameng, Siang, Subansiri, Tawang and Tirap Districts,; 1000-2500m	Raw, Cooked	June-July

Table 2. List of wild edible fruits traditionally used as medicines in Arunachal Pradesh along with part used, purpose and method used.

S. N.	Fruit tree name	Part used	Purpose	Method of use
1	*Averrhoea carambola*	Fruit	Jaundice & diarrhoea	Eating
2	*Canarium strictum*	Fruit	Mouth freshner	Eating
3	*Litsea citrata*	Fruit	Stomach ache & ulcer	Grind fruit &decoction is taken
4	*Mangifera sylvatica*	Bark	Jaundice	Juice
5	*Michelia champaca*	Seed	Stomach ache	Eating
6	*Myrica esculenta*	Fruit	Scurvy & mouth ulcer	Eating
7	*Phyllanthus emblica*	Fruit	Digester	Decoction
8	*Terminalia bellarica*	Fruit	Stomach ache	Eating
9	*Terminalia citrina*	Fruit cover	Chest pain, Stomach pain & urinary	Eating
10	*Zanthozyllum acanthopodium*	Fruit	Stomach & head ache	Eating

More than half the fruits (66.67%) are available during the monsoon season, i.e. between June and October (Table 1). During the monsoon remote areas of Arunachal Pradesh are usually cut off due to landslides, which are sometimes for extended periods, creating huge problems for food supplies. While wild edible fruits can available during monsoon thus serve as alternatives to staple food during periods of food deficit the fruits that are available during other seasons creates an all year round availability of nutrient supplement to the local people. Trading of wild edible fruit in the state is mostly restricted to sites near district headquarters where marketing opportunities exist. Commonly marketed fruits include *D. indica, C. indica, C. strictum, Terminalia citrina, P. cooperiana, P. emblica and Artocarpus intergifolia.* . The fruits are always traded in raw form with absolutely no value addition. *P. cooperiana* which is consumed at all developmental stages is the most demanded wild fruit in the entire state and the cost may range between Rs.20 and Rs.30 for 4 fruits at the Itanagar, the state capital.

With rapid land transformation, growing connectivity and eroding cultural values, wild edible fruits are gradually being neglected by rural communities. During the survey, very few wild edible fruit trees were noticed around village areas and neither was planting of edible fruits trees encouraged. Local extinction of a species does not simply mean there is one fruit type less for the locals to consume but may have far reaching implications which includes ecological imbalances in the area. Therefore knowledge on the availability of wild resources and status is crucial. Further, such wild resources may have the potential to become conventional foods of the future, be used as parents in breeding programs, as convenient sources of income and as vehicles for improved nutrition and increased food supply.

Conclusion

This paper documents the diversity of wild edible fruits tree in the entire state of Arunachal Pradesh. It was observed there are 52 common wild edible fruits trees in the study area, out of which 10 were reported to be of medicinal use. The state of Arunachal Pradesh is bountiful in its resources and much more species of wild fruits are yet to be identified, some which may be endemic to this region. Nevertheless, for the first time this reports enlists the common wild edible fruit trees found in all districts of the state. In the present era where there is global interest on bioresource documentation this study is significant for securing intellectual property right and preventing biopiracy.

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REFERENCES

Amrithpal, S.S. (2011). Herbalism phytochemistry and Ethanopharmacology, Science Publishers.

Angami, A., Gajurel, P.R., Rethy, P., Singh, B. and Kalita, S.K. (2006). Status and potential of wild edible plants of Arunachal Pradesh. *Indian Journal of Traditional Botany*, 5(4): 541-550.

Anonymous (2013). State of Forest Report. Forest Survey of India, Dehra Dun.

Arora, R.K. and Pandey, A. (1996). Wild Edible Plants of India: Diversity, Conservation and Use, NBPGR, New Delhi.

Bajracharya, M.B. (1979). Ayurvedic Medicinal Plants. Kathmandu; Piyusavarsi Ausadhalaya.

Brahma, S., Narzary, H. and Basumatary, S. (2013). Wild edible fruits of Kokrajhar district of Assam, North-East India. *Asian Journal of Plant Science and Research*, 3 (6): 95-100.

Chakraborty, S. and Chaturvedi, H.P. (2014). Some Wild Edible Fruits of Tripura- A Survey. *Indian Journal of Applied Research*, 4(9): 42-47

Dangwal, L.R., Singh, T. and Singh, A. (2014). Exploration of wild edible plants used by Gujjar and Bakerwal tribes of District Rajouri (J&K), *India. Journal of Applied and Natural Science*, 6 (1): 164-169

Deb, D., Sarkar, A., Deb Barma, B., Datta, B.K. and Majumdar, K. (2013). Wild edible plants and their utilization in traditional recipes of Tripura, Northeast India. *Advances in Biological Research,* 7(5): 203-211.

Gangte, H.E., Thoudam, N.S. and Ginzamang, T.Z. (2013). Wild edible plants used by the *Zou* tribe in Manipur, India. *International Journal of Scientific and Research*

Publications, 3 (5): 1-8.

Jeeva, S. (2009). Horticultural potential of wild edible fruits used by the *Khasi* tribes of Meghalaya. *Journal of Horticulture and Forestry,* 1 (9):182-192.

Kayang, H. (2007). Tribal knowledge on wild edible plants of Meghalaya, Northeast India. *Indian Journal of Traditional Knowledge,* 8: 177-181.

Meena, D., Nagarajan B. and Jesubalan, D. (2012). Future prospects for the critically endangered medicinally important species, *Canarium strictum* Roxb. A Review, *Int. J. Conser. Sci.,* 3: 231-237.

Myers, N., Mittermeier, R.A., Mittermeier, C.G., Fonseca, G.A.B. and Kent, J. (2000). Biodiversity hotspots for conservation priorities. *Nature*, 403: 853–858.

Nahar, N., Rahaman, S. and Mosiihuzzaman, M. (1990). Analysis of carbohydrates in seven edible fruits of Bangladesh. *J. Sci. Food Agric.*, 5: 185-192

Namsa, N.D., Tag, H., Mandal, M., Kalita, P. and Das, A.K. (2009). An ethnobotanical study of traditional anti-inflammatory plants used by the Lohit community of Arunachal Pradesh, India, *Journal of Ethnopharmaco.,* 125 (2): 235-245.

Rawat, M.S., Rama Shamkar and Singh, V.K. (1998). Wild edible plants of Arunachal Pradesh. *B.M.E.B.R.* Vol XIX: 23-33.

Sheth, K.A. (2005). The Herbs of Ayurveda. Sheth publisher,p.140.

Singh, B., Sinha, B.K., Phukan, S.J., Borthakur, S.K. and Singh, V.N. (2012).Wild edible plants used by *Garo* tribes of Nokrek Biosphere Reserve in Meghalaya, India. *Indian Journal of Traditional Knowledge,* 11 (1): 166-171.

Williamson, E.M. (2002). Major Herbs of Ayurveda, Churchill- Livingstone, London.

Yumnam, J.Y., Bhuyan, S.I., Khan, M.L. and Tripathi, O.P. (2011). Agro-diversity of East Siang-Arunachal Pradesh, Eastern Himalaya. *Asian Journal of Agricultural Sciences,* 3 (4): 317-326.