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## Wild Edible Fruits of Arunachal Pradesh

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**ABSTRACT:** Arunachal Pradesh is the home to a diverse range of fruits. These fruits have been the important part of dietary supplement and at times were used for curing certain diseases and were preserved in sacred places since time immemorial. Some of them are still underutilized and unexplored. This paper tries to highlight the diversity of fruits with their uses in the five districts of Arunachal Pradesh viz. Lower Subansiri, Lower Dibang Valley, Upper Subansiri, Kra Daadi and West Siang. A total of 63 species were identified with the highest species under Rosaceae during the study. Nineteen species were locally very popular with higher market value in comparison to the rest which were lesser known. *Actinidia deliciosa* C.F. Liang & A.R.Ferguson, *Prunus domestica* L., *Prunus cerasoides* D.Don and a *Pyrus* sp. were used for preparing beverage. Candies were also prepared from a *Pyrus* sp. Fruits such as *Mahonia nepalensis* DC., *Dillenia indica* L., *Terminalia chebula* Retz., *Ziziphus mauritiana* Lam., *Pyrus* sp. and *Averrhoa corombola* L. had medicinal value. A certain fruit from Daporijo, known as “Takok” (Moraceae) in Tagin language was known to have contraceptive value. Trees of *Mahonia nepalensis* DC., *Quercus* sp., *Prunus persica* L. and *Prunus domestica* L. are found in the sacred groves and considered sacred by the Apatani tribes; neither the fruits of these groves are allowed to be consumed nor the trees allowed to be felled due to the belief that the deity resides in them.

**KEYWORDS:** Arunachal Pradesh, Fruit Diversity, Major fruits, Preparing beverage, Underutilized

### I. INTRODUCTION

Fruits are the seed-bearing structure of plants which may or may not be edible. Edible fruits have been consumed by humans since time immemorial and are important part of the diet for a healthy living. Some of the wild fruits have even become important part of the culture in some indigenous people's tradition and are known to be effective against certain diseases thus getting popular and commercialized into various products (Prakash *et al.*, 2012). Fruits may be consumed raw or processed into jellies, jams and pickles (Sundriyal and Sundriyal, 2001; Glew *et al.*, 2005). Also, selling of wild fruits act as a source of income for the people living in remote area (Sanjib B *et al.*, 2013). However, with the increasing anthropogenic activities due to population expansion and natural calamities in the state several wild, semi wild, minor and less known fruits have become vulnerable to existence. Therefore, it calls for the urgent need of exploring and popularizing and the awareness for their importance. The following was an attempt to showcase the various wild fruits found in some of the districts of Arunachal Pradesh.

### II. MATERIALS AND METHODS

#### Study area

Eight districts of Arunachal Pradesh, India viz. (Lower Subansiri, Lower Dibang valley, Upper Subansiri, Kra dadi, Papumpare, West Siang, Tawang and Tirap) were covered during the field survey study. Arunachal Pradesh, one of the Northeast states of India is located between 26° 28' to 29°30' N latitudes and 91° 30' to 97°30' E longitudes (Fig. 1). It is the largest North-eastern states covering an area of 83,473 sq Km. with diverse climatic and edaphic conditions making it the 12th mega biodiversity region of the world (DoEF, Arunachal Pradesh, 2005). It is a home to 28 major tribes and 110 sub-tribes (Tag *et al.*, 2005). The state has rich forest cover. Many wild edible food plants and fruits can be found.

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Location Map of the Study area



Figure 1A: Map of India showing Arunachal Pradesh (image source- Google)



Figure 1B: The map of Arunachal Pradesh (Image source- Google; demarcation of districts not un-to-date)

## Field Collection and Identification

For ethical reasons, ethnobotanical data were collected during the months of November 2015-September 2016, with the prior approval and permission of the local administrator (Village Head) and with the permission of each informant for the publication of the research. Good specimens (those bearing flowers and/or fruits) of all the wild edible plants identified by the local guides were collected as voucher specimens during the field walk following guided methodology (Jain SK and Rao RR, 1977). Each specimen was given a collection number and scientific and/or local name when possible. Information was also captured with photographs of the sites, individual plants, the edible parts. Along with collection, the field activities included taking notes on the plants and the associated indigenous knowledge were carried out. A questionnaire containing a prior informed consent (PIC) was signed by the informants before the interview was conducted. The objective of the study was clearly explained to the participants. The signing of the (PIC) was to recognize the contribution whenever, new findings occur during the documentation and protect the local people's Intellectual Property Rights (IPR), who have been using these plants through indigenous knowledge for generations.

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The plant specimens were pressed and herbarium voucher specimens were prepared following chemical sterilization and identification were done referring to literatures and “Flora of British India” and referring to specimens in Botanical Survey of India (BSI, Shillong and Itanagarh) and classified following Bentham and Hooker’s system of classification.

### III. RESULT

A total of 63 fruits were reported belonging to 33 families (Table 1). The family Rosaceae accounted for the highest number (14 species) (Fig. 2). The present collection comprises of fruits in semi-wild and wild conditions. Twelve species are found to be common and popular in the market. Some of the fruits collected during the study which were sold in the local vendors are *Actinidia deliciosa* C.F. Liang & A.R. Ferguson, *Averrhoa carambola* L., *Baccaurea ramiflora* L., *Phyllanthus emblica* L., *Citrus grandis* (L.) Osbeck., *Dillenia indica* L., *Docynia indica* (Wall.) Decne., *Elaeocarpus floribundus* Blume., *Juglans regia* L., *Myrica esculenta* Buch-Ham.ex D. Don., *Prunus nepalensis* Koch., *Dysoxylum excelsum* Blume, *Prunus persica* (L.) Batsch, *Prunus salicina* Lindl., *Pyrus communis* Lin., *Spondias* sp., *Terminalia chebula* Retz., *Zizyphus mauritiana* Lam. The photographs of some of the collection were shown in Fig. 3.

**Table 1.: List of fruits collected from the districts of Arunachal Pradesh**

Sl.no.	Scientific name / Brochure no.	Family	Habit	Edible part	Local name
1.	<i>Actinidia callosa</i> L. / RGU HAVS 021	Actinidiaceae	Climber	Mesocarp	Anti tari (Ap)
2.	<i>Actinidia deliciosa</i> C.F. Liang & A.R.Ferguson / RGUHAVS 023	Actinidiaceae	Climber	Mesocarp	Kiwi
3.	<i>Actinidia</i> sp. / RGU HAVS 025	Actinidiaceae	Climber	Mesocarp	Harkhu (Ap)
4.	<i>Alpinia</i> sp./ RGU HAVS 044	Zingiberaceae			Gumbabara (A)
5.	<i>Amomum</i> sp./ RGU HAVS 045	Zingiberaceae			Lachung paku (N)
6.	<i>Averrhoa carambola</i> L. / RGU HAVS 046	Oxalidaceae	Small tree	Whole fruit	Star fruit
7.	<i>Baccaurea ramiflora</i> L./ RGU HAVS 004	Euphorbiaceae	Small tree	Mesocarp	Khiju (T)
8.	<i>Calamus floribundus</i> Griff. / RGU HAVS 037	Arecaceae	Small tree	Whole fruit	Geying (A)
9.	<i>Citrus grandis</i> (L.) Osbeck / RGU HAVS 047	Rutaceae	Tree	Mesocarp	Rubub ape (N)
10.	<i>Coccinea grandis</i> (L) Voight / RGU HAVS 048	Cucurbitaceae	Climber	Mesocarp	Jojuru (Ap)
11.	<i>Coix lacryma-jobi</i> L RGU HAVS 039	Poaceae	Shrub	Mesocarp	Anayat (A)
12.	<i>Diospyros kaki</i> L.F. / RGU HAVS 013	Ebenaceae	Small tree	Whole fruit	Jenggong (M)
13.	<i>Docynia indica</i> (Wall.)Decne. / RGU HAVS 030	Rosaceae	Tall tree	Whole fruit	Pecha (Ap)
14.	<i>Dysoxylum excelsum</i> Blume/ RGU HAVS 001	Meliaceae	Large tall	Endocarp	Ruuh (Nc)
15.	<i>Elaeocarpus floribundus</i> Blume. / RGU HAVS 038	Elaeocarpaceae	Tree	Pericarp and mesocarp	Jolpai (As)
16.	<i>Eleagnus</i> sp. / RGU HAVS 049	Eleagnaceae	Shrub	Pericarp and mesocarp	Dam mrep (M)
17.	<i>Ficus auriculata</i> Lour. / RGU HAVS 033	Moraceae	Tree	Mesocarp	Taking (A)
18.	<i>Ficus hispida</i> L.F. / RGU HAVS 050	Moraceae	Small tree	Mesocarp	Taku (A)
19.	<i>Ficus semicordata</i> Buch.-Ham ex Smith / RGU HAVS 051	Moraceae	Tree	Mesocarp	Takop (Tg)
20.	<i>Ficus subulata</i> Blume. / RGU HAVS 024	Moraceae	Semi epiphyte	Mesocarp	Siireh maloh (Ap)
21.	<i>Fragaria indica</i> wall. / RGU HAVS 034	Rosaceae	Herb	Whole fruit	Aki tayin (Ap)
22.	<i>Fragaria vesca</i> L. / RGU HAVS 052	Rosaceae	Herb	Whole fruit	Sah mrep (M)
23.	<i>Garcinia lancifolia</i> Roxb. / RGU HAVS 020	Clusiaceae	Small tree	Pericarp and mesocarp	Taktar (G)
24.	<i>Gaultheria fragrantissima</i> Wall. / RGU HAVS 015	Ericaceae	Shrub	Pericarp and mesocarp	Shegshing mrep (M)
25.	<i>Holboellia latifolia</i> Wall. / RGU HAVS 007	Lardizabalaceae	Climber	Mesocarp	Shulumba (M)
26.	<i>Juglans regia</i> L. RGU HAVS 053	Juglandaceae	Tree	Endocarp	Walnut
27.	<i>Lithocarpus</i> sp./ RGU HAVS 054	Fagaceae	Large tree	Endocarp	Sankhe (Ap)
28.	<i>Livistonia jenkinsiana</i> Griff. / RGU HAVS 055	Arecaceae	Tall tree	Mesocarp	Tokopatta (N)
29.	<i>Mahonia nepalensis</i> DC.ex Dippel / RGU HAVS 028	Berberidaceae	Small tree	Whole fruit	Thaming (Ap)
30.	<i>Manikara</i> sp. / RGU HAVS 056	Sapotaceae	Small tree	Mesocarp	Chikoo
31.	<i>Melastoma malabathricum</i> L. / RGU HAVS 040	Melastomataceae	Shrub	Endocarp	Dai dasa (N)
32.	<i>Melodinus</i> sp. / RGU HAVS 010	Apocynaceae	Large tree	endocarp	Miibya (N)
33.	<i>Milusa macrocarpa</i> Hook.f.Thomson / RGU HAVS 008	Annonaceae	Small tree	Mesocarp	Shyam roma (M)
34.	<i>Morus</i> sp. / RGU HAVS 057	Moraceae	Small tree	Whole fruit	Mulberry
35.	<i>Myrica esculenta</i> Buch-Ham.ex D. Don / RGU HAVS 026	Myricaceae	Tree	Mesocarp	Baching (Ap)

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36.	<i>Passiflora edulis</i> Sims / RGU HAVS 002	Passifloraceae	Climber	Endocarp	Bhel rhi (Nc)
37.	<i>Pegia nitida</i> Colebr./ RGU HAVS 036	Anacardiaceae	Shrub	Whole fruit	Eyi dorge (A)
38.	<i>Phyllanthus emblica</i> L. / RGU HAVS 058	Phyllantaceae	Tree	Pericarp and mesocarp	Amla
39.	<i>Pinanga gracilis</i> Blume / RGU HAVS 005	Arecaceae	Small tree	Pericarp and mesocarp	Tachar (N)
40.	<i>Prunus cerasoides</i> Buch-Ham. ex D.Don / RGU HAVS 018	Rosaceae	Tree	Pericarp and mesocarp	Sembo (Ap)
41.	<i>Prunus nepalensis</i> Koch. / RGU HAVS 041	Rosaceae	Tree	Pericarp and mesocarp	Chod rhi (Nc)
42.	<i>Prunus persica</i> (L.) Batsch / RGU HAVS 027	Rosaceae	Tree	Mesocarp	Takung (Ap)
43.	<i>Prunus salicina</i> Lindl. / RGU HAVS 029	Rosaceae	Tree	Pericarp and mesocarp	Plum
44.	<i>Pyrus communis</i> Lin. / RGU HAVS 059	Rosaceae	Tree	Pericarp and mesocarp	Naspati (Ap)
45.	<i>Pyrus pashia</i> Buch.-Ham.ex D.Don / RGU HAVS 014	Rosaceae	Tree	Endocarp	Jaatoh (M)
46.	<i>Quercus lamellosa</i> Sm. / RGU HAVS 060	Fagaceae	Tree	Endocarp	Santih (Ap)
47.	<i>Quercus semecarpifolia</i> Sm. / RGU HAVS 012	Fagaceae	Tree	Endocarp	Pah sheng grabo (M)
48.	<i>Quercus</i> sp. / RGU HAVS 061	Fagaceae	Tree	Endocarp	Kra ahi (Ap)
49.	<i>Quercus spicata</i> Sm. / RGU HAVS 062	Fagaceae	Tree	Endocarp	Tibeh (Ap)
50.	<i>Rhus semialata</i> Murray / RGU HAVS 017	Anacardiaceae	Tree	Whole fruit	Taam ahi (N)
51.	<i>Rosa sericea</i> Lindl./ RGU HAVS 016	Rosaceae	Shrub	Thalamus	Jamkhuy (M)
52.	<i>Rosa suaveolens</i> Roxb. / RGU HAVS 063	Capparidaceae	Small tree	Mesocarp	Rokpu tong (N)
53.	<i>Rubus calycinus</i> Wall.ex D.Don / RGU HAVS 035	Rosaceae	Herb	Whole fruit	Wild strawberry
54.	<i>Rubus ellipticus</i> Sm. / RGU HAVS 041	Rosaceae	Shrub	Whole fruit	Mipya jilyung (Ap)
55.	<i>Rubus fairholmianus</i> Gardn. / RGU HAVS 042	Rosaceae	Shrub	Whole fruit	Mipya yoyu(Ap)
56.	<i>Rubus niveus</i> Thumb. / RGU HAVS 043	Rosaceae	Shrub	Whole fruit	Yikhe jilyung (Ap)
57.	<i>Saurauia armata</i> Kurz./ RGU HAVS 006	Actinidiaceae	Tree	Whole fruit	Pupuru (N)
58.	<i>Saurauia nepaulensis</i> Roxb. / RGU HAVS 011	Actinidiaceae	Tree	Endosperm	Hinchi (N)
59.	<i>Spondias</i> sp. / RGU HAVS 009	Anacardiaceae	Tree	Mesocarp	Biling (Ap)
60.	<i>Sterculia lanceifolia</i> Roxb. / RGU HAVS 031	Sterculiaceae	Small tree	Endocarp	Taklam (G)
61.	<i>Syzygium jambos</i> (L.)Alston / RGU HAVS 032	Myrtaceae	Small tree	Mesocarp	Adi jamun (A)
62.	<i>Terminalia chebula</i> Retz. / RGU HAVS 003	Combretaceae	Tree	Pericarp and mesocarp	Hilika (As)
63.	<i>Zizyphus mauritiana</i> Lam. / RGU HAVS 019	Rhamnaceae	Small tree	Pericarp and mesocarp	Bogori(As)

Note: A= Adi; Ap= Apatani; As= Assamese; G= Galo; N= Nyishi; Nc= Nocte; T= Tangsa; Tg= tagin.

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Figure 3: Photos of some of the collected wild fruits from Arunachal Pradesh

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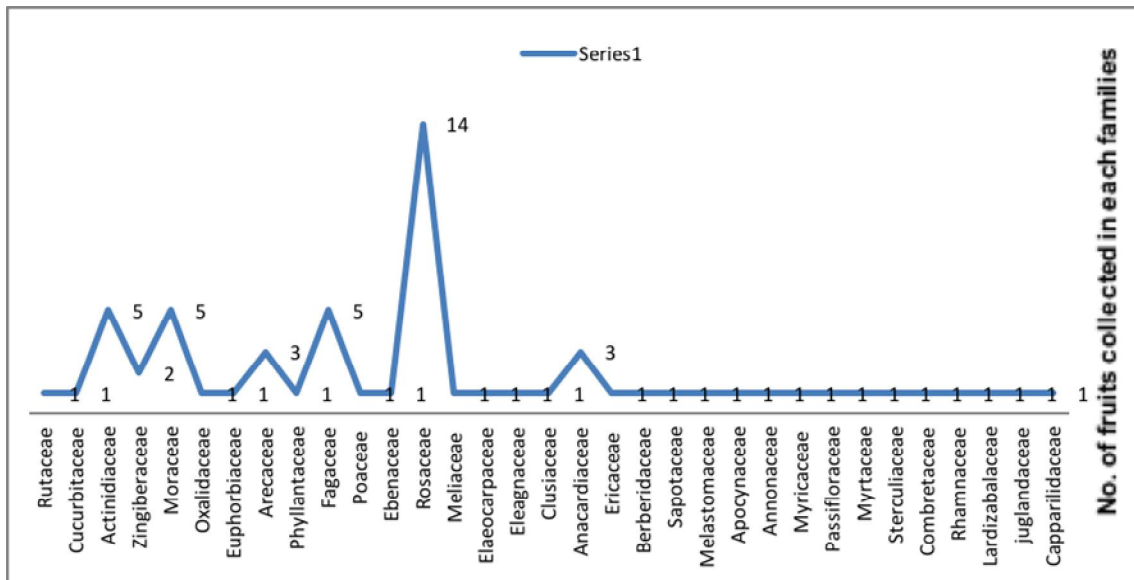


Fig. 2: Graphical representation of fruits collected in each family.

## IV. DISCUSSION

Some popular fruits which have major productions were exported to the neighboring states. Those with lesser productions were found only in local markets vendors. Some of the wild berries though consume by locals were not fully exploited in the local markets. Nuts were consumed only occasionally except for the walnut. Fruits such as *Zizyphus mauritiana* Lam., *Elaeocarpus floribundus* Blume., *Averrhoa crambola* L., *Myrica esculenta* Buch.-Ham ex D. Don etc. were processed and preserved into pickles and were consumed as make appetizer by the locals. Apart from consuming as fruits they have ethnobotanical importance viz., *Docynia indica* (Wall.) Decne fruits were used for making candies by the local ladies. However, these candies were not sold normally in markets but were made on special request. Some of the raw fruit juice were found to be helpful during loose motion and local alcoholic beverages were also prepared from some of these fruits viz., *Pyrus communis* Lin, *Prunus cerasoides* Buch-Ham. ex D. Don, *Prunus salicina* Lindl and *Docynia indica* (Wall.) Decne etc. These beverages could be standardized and introduced in markets. Wine production from *Actinidia deliciosa* C.F. Liang & A.R. Ferguson has recently been considered into larger project as their production is *en mass* and quite popular in Ziro. The raw fruit of *Prunus cerasoides* Buch-Ham ex D. Don when consumed in excess cause numbness of the body. *Diospyros kaki* L.F. fruit has high religious value among the Monpas of Dirang. They form important ingredient of “Prasad” during important pujas like performing the final puja during completion of one’s “Lama course” or during the ritual performance for death ceremony of high ranks Lamas. They are generally served after drying in the sun. According to tradition at Ziro, during a household holy ceremony, the members of the households were not allowed to consume fruits till certain time period. It has also been noted that the trees of *Mahonia nepalensis* DC.ex Dippel, *Prunus persica* (L.) Batsch and *Quercus* sp., constitute important trees of sacred grooves in Ziro. Their fruits were forbidden from consuming due to the belief that deity resides in them. During the days of “Myoko” festival, these grooves are visited by the clans to apply rice powder paste to their stem as an offering and seek to protect them from ill health. According to one informant from Daporijo, “Takop” (*Ficus semicordata* Buch.-Ham ex Smith) has got contraceptive value. Hence women are forbidden to consume these fruits and only men are allowed. Other parts of these plants has got other uses as well, such as the bark of *Mahonia nepalensis* DC.ex Dippel was useful for curing wounds, tender leaves of *Passiflora edulis* Sims. were known to be effective against hypertension and the bark along with root and leaves of *Dysoxylum excelsum* Blume grinded together into paste were used as fish poison, however, the fruits were consumed safe.

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## V. CONCLUSION

Arunachal Pradesh has vast collection of diverse fruits. Each of them has their own specialty either as an important source of nutrition or as having high medicinal value. Antioxidant study was reported from *Zizyphus marutiana* Lam. (Bhuiyan *et al.*, 2009), *Myrica esculenta* Buch-Ham.ex D. Don (Seal, 2011) and *Baccaurea ramiflora* Lour. (Prakash *et al.*, 2012). *Garcinia lancifolia* Roxb. fruits was reported as antimicrobial and useful for treating dysentery and diarrhea (Chowdhury and Handique, 2012). The fruits of *Averrhoa carambola* L., has been reported to be effective against jaundice (Sarmah, 2005). Tag and Das (2006) has reported *Terminalia chebula* Retz. as useful against cough, chest and stomach pain. More study still needs to be done on exploring the lesser known fruits. Some of the wild and semi wild fruits, could be cultivated and commercialized to a larger extent and more awareness of the existing fruit diversity and their importance need to be spread making them understand the potential of these fruits.

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