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VALUABLE INDIGENOUS FRUIT CROPS OF NORTH EASTERN REGION OF INDIA

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ABSTRACT

Several ethnic group such as Khasi, Garo, Monpas, Karbis, Jaintia, Naga, Kuki, Manipuri, Mizo, Chakma, Dufla, Adi, Mishing, Apatani and others are located in the various habits of North –eastern hill region of India habituated to practice "Jhumming" or shifting cultivation. Most of wild fruits are consumed in day to day diet for tribal people of the region and are often disposed off in the local markets and utilized as life sustaining diversified food base and for nutrient security for rural people round the year.

These lesser know fruits are rich in minerals like Ca, Fe, P, Mn, organic acid, vitamins and other nutrients like carbohydrates, proteins, and fats.

Tribal people used to take lesser known fruits either raw or in the form of beverages, pickles or cooked / boiled with some other diets. Some species have therapeutic values while other has commercial values such as production of tannin, timber, dye, phytochemicals, etc.

KEYWORDS: Production of Tannin, Timber, Dye, Phytochemicals

INTRODUCTION

In India, there are about 800 species as food plants chiefly used by the tribal population. Out of these about 300 species are prevalent in the northeastern region.

The North east region represent eight states namely Assam, Arunachal Pradesh, Meghalaya, Manipur, Mizoram, Tripura, Nagaland, Tripura including Sikkim covering an area about of 25.608 mha consisting 7.79% of the national geographical area. The altitude difference (50m-7000m) coupled with varied physio- geographic conditions temperate, sub-tropical and tropical zones in the region. A wide range of agro-climate, varying intensity of rainfall (800-12000mm) and topography harbours various vegetation types of tropical, temperate and alpines zones.

Tribal of various ethnic group like Khasi, Garo, Monpas, Karbis, Jaintia, Naga, Kuki, Manipuri, Mizo, Chakma, Dufla, Adi, Mishing, Apatani and others are predominant in the various habits of hilly region also used to practice "Jhumming" or shifting cultivation. Most of wild fruits are taken place in day to day diet for tribal people of the region and are often sold in the local markets and used as life sustaining diversification of food base and for nutrient security for rural people throughout the year.

These lesser know fruits are rich in minerals like ca, Fe, P, Mn, organic acid, vitamins and other nutrients like carbohydrates, proteins, and fats.

Tribal used to consume minor fruits either raw or in the form of beverages, pickled or cooked / boiled with some other dishes. Some species have medicinal values while other have commercial values like production of tannin, timber,

dye, phytochemicals, etc. Increasing population pressure, short duration of jhum cycle, soil erosion and other development activities need indigenous domestication as well as *ex-situ* and *in-situ* conservation.

GENERA AND THEIR DISTRIBUTION

A huge number of edible local fruits are naturally distributed between humid tropical to temperate altitude of N.E. Region.

Arunachal Pradesh

Actinidia callosa, Baccaurea sapida, Musa velutina, Musa ornata, Castanopsis indica, Sterculia hamiltonii, Nephelium lappaceum, Lithocarpus spp, *Mangifera sylvatica, Pyrus pashia, Rubus niveus, Citrus medica, Livistonia jenkinsiana, Viburnum foetidum, Artocarpus chaplasha, Garcinia lancaefolia, Dillenia indica, Malus baccata, Machilus edulis.*

Mizoram

Phyllanthus acidus, Garcinia lancaefolia, Passiflora edulis, Musa rosea, Mangifera sylvatica.

Assam

Citrus lemon, C.jambhiri, Citrus maxima, Citrus megaloxycarpa, C. marcroptera, C. assamensis, Artocarpus lackoocha, Dillenia indica, Averrhoea carambola, Phyllanthus acidus, Baccaurea saipda, Flacourtica indica, Elaegnus lalifolia, Myrica spp.

Nagaland

Myrica fraquhariana, Garcinia lanceafolia, Passiflora edulis, C. ichangensis, Citrus aurantium, Phyllanthus acidus, Musa magnesium, Juglans regia, Malus baccata.

Sikkim

Docynia indica, Actinidia strigosa, Machilus edulis, Bassia bytyracea, Musa sikkimensis, Spondias axillaries, Baccaurea supida, Elaegnus latiolia.

Tripura

Citrus macroptera, Baccaurea sapida, Averrhoea carambola, Zizyphus funiculisa, Antidesma bunius, A. ghasaembilla, Grewia hirsuta, Grewia sapida, Physalis minima, Psidium guineens, Rubus ellipticus, Elaeocarpus floribundus, Citrus maxima, Dillenia indica, Carrissa carandas.

Table 1: Calendar of Availability of Indigenous Fruits

January - March	April – June	July - September	October - December
Elaegnus pyriformis	*Elaegnus latifolia*	*Docynia indica*	*Castanopsis indica*
Mangifera sylvatica	*Rubus ellipticus*	*Docynia hookeriana*	*Viburnum foetidum*
Citrus medica	*Baccaurea sapida*	*Prunus nepaulensis*	*Emblica officinalis*
Pyrus pashia	*Calamus erectus*	*Artocarpus lakoocha*	*Citrus aurantium*
Machilus edulis	*Myrica esculenta*	*Garcinia lanceafolia*	*Actinidia strigosa*
Phyllanthus acidus	*Diploknema butyracea*	*Passiflora edulis*	*Actinidia callosa*
	Myrica frequhariana	*Lithocarpus spp*	*Dillenia indica*

GENERIC DESCRIPTION

Actinidia Strigosa, A. Callosa

This species is found in East Asia Himalaya to western China region at elevation from 1800 to 3300 m asl belongs to family **a**ctinidiaceae. In NE Region it is mainly found in South Sikkim and A.P. It is a deciduous climber. The flowers are dioecious and are pollinated by bees and insects. It can grow in semi-shade condition but full sun is best for obtaining higher fruit production. This species requires moist soil, preferably loamy neutral soil. Fruits are used as raw or cooked having a pleasant flavour. Fruit contains a number of small seeds, but these are easily eaten with the fruit. Plant can be propagated by both seed and cutting.

Figure 1

Baccaurea Sapida

An underutilzed species locally known as 'Sohmymdong' in Khasi (Meghalaya) found in sub-Himalayan tract mainly on eastern side from Nepal to Sikkim, Darjeeling hills and Arunachal Pradesh to Assam, Tripura and Meghalaya. It shows lucrative, particularly when stem is equipped with flowers and fruits. It is a semi-deciduous tree, small to medium size, 10 m in height. Ripe fruits are yellow and edible and changes into ivory to yellowish or pinkish-buff or sometimes bright red. The pulp is whitish and sometimes deep pink near the seeds; ranges from acid to sweet in taste. Fruits are sold in the market during May- July @ Rs15-20/kg in Shillong market. In fact, the people used to consume the flesh or aril around the seed coat. The rind of fruit is occasionally used in in making chutney. Physico-chemical analysis of fruit revealed that fruit weight varied from 11.02-12.60 g, fruit length 2.63-2.76 cm, fruit diameter 2.64-3.16 cm, pulp weight 6.01 g, Juice 27.37-36.30%, Juice density 0.99g/ml, seed weight 1.90 g/seed, TSS 8.2-14.1%, acidity 1.93%, reducing sugar 5.10% and total sugar 13.69% (Table-2 &3).

Pyrus Pashia

It is a deciduous tree belonging to family Rosaceae, locally called *Sho-shur* in Khasi (Meghalaya) and distributed in NE region. Flowers are white, when fully opened. Fruits are 2.5-4 cm across, globose, depressed at the top, somewhat rough with raised white specks, dark brown at full ripe. Fruits are not edible. Seedlings are utilized as rootstock for grafting in pear. Tree flower during March-April and fruits become mature in December-January.

***Myrica Nagi* Thunb. Syn.: *Myrica Esculenta* Buch. & Ham, *Myrica farquhariana* Wall., *Myrica Sapida* Wall**

Figure 2

It is a sub-temperate evergreen tree distributed throughout the mid-Himalayas, up to an elevation 2,100 m. It is very common in Sibsagar (Dikho valley of Assam), Khasi and Jaintia hills of Meghalaya. The fruit is locally known as 'Soh-phie' in Khasi (Meghalaya). The fruits, unfortunately, are not good keepers and their shelf-life does not exceed 2-3 days. A medium to large woody, evergreen, dioecious tree, 12 to 15 metre high; the male and the female trees have almost similar appearance. Leaves, almost crowded towards the end of branches, lanceolate, ovate nearly entire or serrate, The small fruits of *Myrica nagi* are very much preferred by people for their taste and juicyness. The juice is very attractive sparkling red in colour.. The flowering season starts from the first fortnight of October and continues till the second fortnight of December. Similarly the fruiting season started from the last week of March and continued till the last week of June depending upon the climatic condition and species. These fruits are very much liked by the local people. People eat the fruit with salt as fresh and used for making the pickles. Fruit juice and pulp are used for making jam and jelly, bark of this tree is also stated to have many medicinal properties and is used in different medicinal preparations.

The fruits of small to big size of green to pinkish colour stage were analyzed for their physico-chemical traits. The fruit weight varies 3.63-13.57 g, fruit length 2.16-3.24 cm, fruit diameter 1.71-2.77 cm, juice recovery 30.30 –39.44%, seed weight 0.82-2.02 g and seed size 1.06-1.85x0.79-1.37 cm. The TSS ranged from 5.7-6.2%, reducing sugar 0.83-3.57 and total sugar 2.18-7.68% in green and pinkish colour fruit respectively. Whereas, acidity varies 2.44-4.83% and ascorbic acid 4.03-28.20 mg/100 ml juice in pink to green colour fruit respectively (Table 2&3).

Passion Fruit

This region has a great potential for the production of passion fruit. Recently, it is grown in some areas of North-eastern region like Mizoram, Manipur, and Nagaland & Sikkim. This is locally called 'Soh-brab' in Meghalaya. The purple passion fruit (*P. edulis*) is a woody robust perennial vine. The fruit is ovoid and deep purple at full ripe. The yellow passion fruit (*P. edulis f. flavicarpa*) vine is much like that of the purple variety but is more vigorous. It is distinguished by the characteristic of reddish, pinkish or purplish colour in stems, leaves and tendrils. It is a good source of juice as well as vitamin A and C, and can also be eaten raw, used to aid aroma in ice-cream, making jam and refreshing drinks. Some home-scale products like squash and nectar can be made from its fruits. Besides, an excellent flavour of juice is used to enhance the overall quality of the blended products. It requires tropical to subtropical climate and can be grown up to 1600 m asl. It prefers light sandy loam to heavy loam soil with good drainage having pH 6-7.

Figure 3

Two popular varieties are: Purple (*Passiflora edulis)* and Yellow (*Passiflora edulis* var. *flavicarpa*). Plants are propagated by seed as well as cuttings. For raising seedlings, ripe fruits from vines yielding quality fruits should be collected and extracted seeds should be planted in nursery beds preferably under shade. When two three leaves develop, seedling should be transplanted in polythene bags. Further, seedlings are planted in field when they become 3-4 months

old. For propagation through cuttings, the mature 30-35 cm long cutting having 2-3 internodes of pencil thickness should be planted in nursery beds/polythene bags having suitable potting media. Rooted cuttings are transplanted to the main field after three months at spacing by 2 m row to row and 4.5 m by plant to plant. Two-arm kniffin system is ideal for training. The trellis should always run across the slope or in north-south direction to facilitate proper exposure to the sunlight. Tips should be pinched to facilitate leader formation (branching) when the vines reach the wire. Systematic pruning is important after harvesting the crop in November-December to the nearest active bud. Well rotted F.Y.M @ 15 kg/vine/year should be applied in February-March with 100:50:100 g as N: P_2O_5: K_2O per vine annually should also be given in 2 splits in the month of February-March and in July-August. Major insect pests attacking passion fruits are fruit fly, mealy bugs and aphids. These insect can easily be controlled by the spray of Malathion 50 EC @ 2ml/litre of water. The major diseases observed in this crop are damping off, brown spot, root rot and wilt. Spraying with Dithane M-45 or Bavistin @ 2.5 g /litre of water can control the brown spot disease and to keep root rot under control proper drainage of excess water is necessary.

Plant starts fruiting from 10 months after planting. Optimum bearing occurs at 16-19 months after planting. Two main periods of fruiting viz. March to May in purple type and August to December in yellow type are being observed under mid hill condition of Meghalaya. Change in colour from green to slightly purple and yellow indicates maturity for harvest, in purple and yellow varieties, respectively. An average yield of 8-10 t/ha is recorded. The physico-chemical properties of ripe fruit (purple variety) were analyzed and it was found that passion fruit have the average fruit weight of 43.18g, fruit volume 48.40 ml, specific gravity 0.892, fruit length 4.88 cm, fruit diameter 4.59 cm, juice 31.31%, TSS 14.7% and acidity 4.42% (Table 2&3).

Carambola *(Averrhoea Carambola* L*)*

Figure 4

It belongs to family Oxalidaceae and is locally known as ‘Soh Pyrshong’ in Khasi (Meghalaya). It is grown all over north eastern region. The carambola or "star fruit", an elongate, angular fruit is composed of 5 carpels with a star-shaped cross section. It is popularly called star fruit because of the unique shape of its fruit that resembles a star. The tartness in fruit is due to calcium oxalate crystals in the flesh, which dissolve in the saliva forming oxalic acid. It is a slow-growing, short-trunked evergreen tree with a much-branched, bushy canopy. Mature trees seldom exceed 25-30 feet in height and 20-25 feet in spread. Fruits are ovate to ellipsoid, with 5 to 6 prominent longitudinal ribs. The skin is thin, pale to deep yellow and smooth with a waxy cuticle. The flesh is pale yellow-to- golden yellow, translucent, crispy and very juicy, fibreless. The fruits are more or less oxalic acid in odour and very sour to mildly sweet in flavour. Seeds lose viability in a few days after removal from fruit. Ripen fruits eaten as raw as well as processed product like squash and refreshing drink.

***Dillenia Indica* L**

It is originally from Indonesia belongs to family Dilleniaceae and locally called as Otenga (Assam) found in Assam and other states of North Eastern region. This is commonly called as Elephant apple, a spreading tree arranged with beautiful white fragrant flowers, serrated leaves and globose fruits with small brown seeds. The greenish-yellow fruit is edible; unripe fruits are used in cooking to make pickle and chutney. The juicy pulp is aromatic as well as acidic. The average weight of the fruit was 750 g, fruit length 9.42 cm, fruit diameter 11.4 cm, acidity 1.20% and TSS was recorded 4.8% (Table 2&3).

Figure 5

Garcinia Lancaefolia

Figure 6

It is a lesser known edible fruit of Mizoram belonging to the family Clusiaceae. It is locally known as Chenkek in Mizo and Bhava in hindi, cultivated as a subsidiary crop in the orchard of citrus, banana and arecanut. Full ripe fruit is unique, because it is externally similar to tomato and internally to citrus because of the presence of juice sacs. Mizo tribals are fond of both unripe and full ripe chenkek fruits as it is rich in vit C, sour in taste, nutritious and are used in stomach disorder. Chenkek is a medium sized evergreen plant, 3-5m tall having drooping branches and lanceolate leaves. Plants bloom during February-March. Flowers are yellowish to pinkish, borne axillary, clustered sometimes solitary with long pedicels. Full ripe fruits are pinkish red in color and look similar to tomato. Fleshy, smooth hard rind tightly covers juice sacs. The number of juice sacs ranges from 4-9 and each juice sac contains one seed. Seeds are tightly enclosed inside the juice sac with placenta. Rind and juice sacs with seeds are very sweet in taste and are eaten by the local people. Fruits take about 100-120 days to ripe and are harvested in April-June. The average yield varies 200-250 fruits/plant. Plants commence bearing after 3-4 years of planting. Fruits fetch good price in the local market. Plants are commonly propagated by sucker. One year old suckers are used as propagating materials. The fruit yield varied from 5-10 kg/plant, fruit weight 40-75 g, fruit length 3.5-6 cm, fruit diameter 5-5.73 cm, rind 52-55%, Juice 38-42%, Juice sac 7-8/fruit, rind thickness 0.48 cm and seed weight 0.70-0.75 g/seed. The chemical analysis of juice sac revealed that the TSS was measured 6.8%, pH 3, acidity 2.34%, ascorbic acid 42.3 mg/100 ml juice, reducing sugar 1.01 and total sugar 3.40% were recorded. However, rind data revealed that the Juice was found 64.9%, TSS 5.6%, pH 2.8, acidity 2.37%, and ascorbic acid 21.15 mg/100 ml rind juice (Table 2&3).

Star Aonla *(Phyllanthus Acidus)*

Figure 7

The star gooseberry is one of the few members of the Euphorbiaceae family that has edible fruit. It is found in southern parts and in Northeastern parts particularly in Mizoram. This is a attractive and spectacular shrub or tree, 2-9 m tall, with spreading, dense, bushy crown having rough, main branches. Flowers are dioecious or monoecious, borne in solitary or 2 in axillary fascicles, with many bracts. The fruit is oblate with 6 to 8 ribs; pale-yellow to nearly white when fully ripe; waxy, fleshy, crisp, juicy and highly acidic. The tree often yields fruits twice a year in South India, the first in April and May, and the second in August and September. In other parts, the main crop is obtained in January with scattered fruiting throughout the year. The star gooseberry thrives well in subtropical to tropical climate, being sufficiently hardy to survive. It performs up to an elevation of 914 m sl. The tree grows best in moist soils. The tree is generally propagated by seeds but may also be multiplied by budding, greenwood cuttings or air layering. Seedlings produce a satisfactory crop in 4 years. The average fruit weight 3.39g, fruit length 1.57 cm, fruit diameter 1.94 cm, pulp recovery 95.28 %, seed weight 0.16 g/seed, seed length 0.58 cm, seed diameter 0.62 cm, TSS 4.68%, acidity 2.27% and ascorbic acid 21.15 mg/100 ml juice was recorded (Table 2&3).

Elaegnus Latifolia* Syn: E. *Pyriformis

Figure 8

There are two species of *Elaegnus* viz *E. latifolia* and *E. pyriformis* belong to family Elaegnaceae, locally known as *Soh-shang* naturally grown in NE region. These species are distributed in elevations of 1500 meters in the Himalayan region. In North Eastern states, it is very common in Sibsagar (Dikho valley of Assam), Naga hills (Nagaland), Khasi, Jaintia hills of Meghalaya and Sikkim. It is a large evergreen scandent woody shrub with rusty-shiny thorny scales. The flowers are hermaphrodite and are pollinated by bees. The fruits of *E. latifolia* are oblong with dark pink in colour at full ripew whereas, fruits of *E. pyrifomis* are pyriform with slightly pointed at both ends. Plants flower during September-December and the light pink coloured fruits are harvested in March-April. The fruits are perishable and can be stored for 3-5 days at room temperature. The fruit contains a single large seed having very low viability. The fruits can be eaten raw with salt and utilized for making pickle and also used for making processed product like jam and refreshing drink. The fruits are very rich source of vitamins and minerals, especially in vitamins A, C and E, flavanoids and other bio-active compounds. They are also good source of essential fatty acids, which is fairly unusual for a fruit and are capable

of reducing the incidence of cancer and also as a means of halting or reversing the growth of cancers. The plant prefers well-drained soil and can be grown in poor acid soil. It thrives well in dry or moist soil and can tolerate drought. This species can form a symbiotic relationship with certain nitrogen fixing bacteria. Plants are propagated by both seed and cutting. Fruits are disposed of @ Rs12- 15/kg in market. Physico-chemical properties of fruit showed in Table-2 indicates an average fruit weight of 18.65 g, fruit length 4.07 cm, fruit diameter 2.77 cm, pulp recovery 81.77%, seed weight 3.4 g/seed, seed length 3.31 cm, seed diameter 1.30 cm, TSS 9.10%, acidity 2.16%, ascorbic acid 21.15 mg/100 ml juice, reducing sugar 1.40% and total sugar 6.09% (Table 2&3).

Prunus Nepalensis

Figure 9

It is an important indigenous nutritionally rich lesser known fruit of temperate area. The fruit is locally called as Sohiong in Khasi (Meghalaya). The tree is medium to tall, evergreen grown to a height of 15-20 m. It starts bearing fruits after seven year of planting. Flowers are white, borne in terminal racemes or auxillary. Fruit are drupe, fleshy, dark purple in colour at full ripe and green to pinkish colour in immature stage. Fruit surface is smooth round. Usually fruit shape resembles like black grapes. Stone is hard, round in shape with smooth surface but some other genotypes grown in mid hills having rough stone surface and seed looks just like peach. The stone size varies with genotype. Flowering period varies from November to March and fruit ripen in July to early October depending on the altitudinal variation. It is naturally distributed in East Khasi Hills, West Khasi hill and Jaintia hills district of Meghalaya between 1500 and 2000 m altitude. The highest diversity of Sohiong trees are observed in East Khasi Hills District. It is distributed in Khadar shnong area comprising of villages like Dewlieh, Nongstraw, Wah Sohra, Diengsong, Tyngiar, Mawtuli, Kshaid, Phong Shnongpdei, Kharang, Krohiawhiar, Puhbsein and Nohshut. It is also observed in Mawsynram, Mawkynrew, Mylliem, Mawphlang, Mawklot, Pynursla, Pongkung, Mawryngkneng areas. Some trees are also found in adjoining areas of Shillong in isolated manner. It is mostly grown in homestead yard and as a subsidiary crop in the orchards of pear. Fruit is eaten as fresh by the local people and fruit juice and pulp are used for the preparation of squash, jam, RTS and cheery wine. Analysis of sohiong fruit revealed that the fruit weight varied from 3.85 to 10.31 g, fruit length 1.75-2.43 cm and fruit diameter from 1.70 to 2.48 cm. Stone weight of sohiong ranged from 1.97-2.96g, pulp recovery 48.83 to 75.98%, pulp stone ratio 1.32-2.47 and dry matter recovery varied from 16.02 to 24.19 %. Quality parameters of fruit showed that the TSS of fruit ranged from 16 to 23.20 %, acidity 0.13-0.77%, ascorbic acid 8.81-12.34 mg/100 g pulp weight and sugar 3.53 to 10.37 % (Table 2&3).

Docynia Indica* Syn. *Eriolobus Indica* Schn. D. *Hookeriana

This is the Indian crab apple and belongs to the family rosaceae, locally called soh-pho in Khasi (Meghalaya) is commonly found in the region particularly Sikkim and Meghalaya. It is a tree of the lower temperate zone which grows between 900 to 1900 m asl. This leaf-shedding tree attains a height of up to 9-12 m. Leaves are ovate to oblong, lanceolate,

acuminate, serrate and glabrous. Flowers either solitary or arranged in fascicles of 2-3. The fruits are round, pear shaped and pale green colour when ripe. They are eaten either fresh or processed into pickles as well as used in jelly preparation also. The fruit extract is made into a semi-solid gel locally known as “chuk” in Sikkim, which is considered to be a good medicine for stomach disorder. It is sometimes used as a rootstock for grafting of apple.

Emblica Officinalis

Figure 10

Aonla is one of the most frequently used fruit of the Ayurvedic medicine. The fruit is similar in appearance to the common gooseberry (*Ribes spp*., a type of currant), which is botanically unrelated to aonla. However, due to the similar appearance of the fruit clusters aonla is usually called the "Indian gooseberry." It belongs to the family Euphorbiaceae, a medium-sized tree that is grown in the plains and sub-mountain regions all over the Indian subcontinent from 200 to 2000 m sl. It is also found in NE region. The trees found in this region are tolerant to low temperature. Fruits are available during Dec-January. Fruits are small in size and weight varies 4.72-5.25 g/fruit with fruit length 2.07 cm, fruit diameter 2.23, pulp recovery 81.48% and seed weight 0.87 g (Table 2).

***Spondias Axillaris* Roxb. Syn S. *Accuminata* Gamble, *Choerospondius Axillaris* (Roxb.) Butt. & Hill**

This species belongs to the family anacardiaceae, is distributed throughout India from the Indus eastwards to Malaya and Ceylon ascending between 300 and 1500 m asl in the Himalaya. In North eastern region it is usually found in Sikkim. The mature cylindrical green fruits are used for making the pickle and ripe fruits are eaten raw by the local people. This species has very good market among other wild fruit in Sikkim state.

***Machilus Edulis* King. Syn. *Percea Fructifera* Kost.**

This species belongs to the family Lauraceae, is an evergreen tree of about 15-20 m height, with a straight bowl and spreading branches. It is mainly found in entire NE region particularly in Sikkim and Arunachal Pradesh. It is considered to be one of the forms of avocado (*Persea americana*) in the region. Fruits are commonly available during November - March. In good fruiting years market remain flooded by this fruit. Fruit yield varies 5-75 kg/tree and fruit weight is 31.72 g and diameter is 1.4-3.7 cm. After the fruits are picked they are stored in warm, dark, non-airy enclosures for curing. This increases the flavour before bringing the fruits to the market. The outer fleshy pulp, which comes out attached with the skin, is scooped out and eaten. The fruits are highly nutritious, rich in fat and carbohydrate content.

***Diploknema Butyracea* (Roxb.) Syn. *Bassia Butyracea* Roxb. *Aesandra Butyracea* (Roxb)**

This species belongs to the family Sapotaceae, is found in Sikkim and Arunachal Pradesh in the NE region. The tree grows up to a height of about 15 m, and is commonly known as butter tree throughout the Himalaya. It grows in

hill slopes between 300 and 1300 m asl. All over the Himalaya. Most of trees are found in wasteland near the villages, and inside the thin forest. Fruits are scented and sweet in taste. Fruits are available during April-June in local market in Sikkim. Seeds are rich in butter, edible and are also utilized in soaps, candles and as medicine for the treatment of gout and rheumatic conditions. The leaves are used as good fodder. Fruits are oval to round in shape. The seed is used to make a special type of butter for burning and culinary purpose. Pulp of the fruit is sweet and juicy, but cannot be stored for long duration due to low keeping quality. Fruit pulp may be utilized for preparing the jam and jelly also. Fruits rich in sugar and other nutrients.

Tanyum (Cirtus Medica)

Figure 11: Tanyum

Tanyum plant is abundantly growing in forest, roadside and degraded land. It is a shrub virtually similar to Assam lemon in plant morphology, is tolerant to insect pests and diseases and can be used as a potential dwarf rootstock for mandarin in this zone. Fruits are green in immature stage and yellow during full ripe Unlike Assam lemon, fruits have abrupt tapering towards apical end forming a typical prominent nipple-like shape. Rind is very thick and with less pulp and contains lesser juice percentage.

Elaichi Nimbu *(Citrus* Spp*)*

This *Citrus* species performs well in degraded forest areas. Plant is a shrub, morphologically similar to Assam lemon but vary in fruit shape and size. Fruits are green in unripen stage and yellow at full ripe. Juice is highly acidic. Fruits are slightly tapering at apical end forming a nipple-like shape. There are two variants of this species are observed-as Smooth skin and Rough skin.

Rabab (*Citrus Deumana* Linn. and Syn. *C.grandis*)

Rabab tree grows in stray condition. Fruits are ovoid to roundish, bigger (11.05 x 11.4 cm) and are yellow colour at full ripe stage and green in immature stage. Fruit pulps are white, contain good amount of juice and may be used in squash preparation.

Kodok *(Musa Velutina)*

Figure 12

Kodok plant is naturally distributed in marshy catchement areas and near stream and springs. Plants are dwarf in strature. Sizes of finger and bunch are small. Average number of fingers per hand is 5.33 and average finger per bunch is 26.67.

Ripe fruits are sweet and aromatic. Peduncle grows upright and pulp is more seeded. Therea are two types of Kodok are observed in West Siang district of Arunachal Pradesh namely, Dogli and Dogyo.

Flower bract and fingers of Dogli are pinkish red in colour. Fingers look red in both ripe and unripe stage except brightness and reduced angle at former stage. While bract of Dogyo is brown in colour. Fingers are light green in immature stage and then turn to yellow at ripe. The tribal people like both the strains very much but availability is very scanty.

Kolu *(Musa Ornata)*

Kolu is naturally distributed in marshy, degraded land near stream and springs. Peduncle grows downy and finger grayish-green in colour, which turn into slightly yellow at full ripe stage. Average number of finger per hand accounts 13, finger per bunch 50 and number of hand per bunch 4. Pulp is many seeded, edible and relished by children. It can be used as a feed for pig.

Empe (*Lithocarpus* Spp)

Figure 13: Lithocarpus

Empe is a large tree. The tree usually grows in catchments areas, river basin and degraded land having calcareous soil. Fruits are borne in a bunch and are sold in the market during July-August. Fruits are eaten raw as well as by roasting. It can be preserved as a dry fruit also. Fruits are rich in fat content.

Hisir

Figure 14

Hisir is a tall tree (50 to 70 m), grow in dense virgin forest. Berries are small (as shown in table 1) and are green during unripe stage and it turns into dark brown when ripe. Unripe berries are eaten raw by children whereas over-ripe are used in chutney and pickle preparation. It gives a pungent smell when ripe. In jungle, it serves as a feed for Deer.

Tayek (*Livistonia Jenkinsiana* Griff)

Figure 15: Tayek / Toku

Trees are palms, slow growing, 15m tall with palmate leaves and bluish gray fruits.

Tayek/ Toku plants are cultivated by the Adi-Galo tribe of Arunachal Pradesh for leaves. Leaves of this palm plant are used thatch roof for indigenous house construction, young leaves used for making broom and fruits are consumed raw as well as prepared chutney out of rind. Berry is ash blue in colour when ripe and stone colour is apricot.

Tader (*Nephelium Lappceum* Lamk)

Figure 16

Tader plants are naturally distributed in wild and virgin forest and is considered as wild relative of cultivated Litchi fruit. Fruits are bigger in size having longer spines. Ripe fruit is red in colour but aril and stone is white. Seed is kidney shaped. Ripe fruit is consumed raw and aril is utilized in squash preparation. It can be used in hybridization and as a rootstock for cultivated litchi.

Laxmi Am (*Mangifera Sylvatica*)

This is a large tree, 45 m tall and distributed wild in the eastern Himalayas upto an elevation of 1300m msl. Fruits are elliptic in shape, 8-10 long with thin yellow skin and fibreless flesh. Mature unripe fruits are utilized for pickle and other purposes.

Crab Apple (*Malus Baccata*)

This is a small to medium sized tree, 6m tall with alternate, toothed, small leaves and attractive flowers and fruits. Fruits are considered rich in pectin and juice can be used to make jellies and pickles. Plants are easily propagated by grafting or cuttings. They can be used as pollinizers in apple orchards. Some crab apples are exploited as rootstocks for domestic apple.

Indian Chest Nut (*Castanopsis Indica*)

This is an evergreen tree, 30m tall with broad leaves and monoecious small flowers borne in catkin. It is grown upto an elevation of 2400m msl. Propagated by seeds. Nuts are used for edible purposes.

Jalpai (*Elaeocarpus Floribudus*)

These are evergreen or deciduous trees with highly branched stem. Fruits are oblong in shape, green, fleshy and single seeded**.** Fruit ripen in December and are sour in taste. Ripe fruits are edible and can also be used as pickle.

Wild Fig (*Ficus Auriculata)*

Thesea are trees, 4-10m tall with alternate, petiolate, ovatecordate leaves, sessile male flowers and pistillate or sessile female flowers, achenes with adherent liquid. Fig blooms on spur located on the trunk and main branches. Fruits are edible.

Governor's Plum (*Flacourtica Indica)*

This is a thorny woody, spreading, deciduous shrub or tree, 7.5 to 14.5 m tall with alternate leaves; ebracteate, pedicillate, asexual staminate flowers and pedicillate, downy, ebracteate, pistillate flowers. Fruits are berries, spherical, dark purple to black in colour; plants are hardy and propagated by cuttings or grafting. A full-grown tree yields about 7.5kg of fruits in 4-5 pickings.

Fruits are rich in sugars, pectin, vitamin C and minerals. The whole fruit can be dried only. Fruits have good keeping quality. They can be processed into jam and jellies.

Fruits are considered appetizer and digestive. They are sometimes prescribed in jaundice and enlarged spleen.

Paniala *(Flacaurtia Jangomas*)

These are trees, 10m tall with low branching, sharp shines on the trunk, thin pointed leaves and dioecious, sweet scented flowers. Fruits are round, dark red to black, 7-12 seeded, arid to sweet in taste and can be processed into juice or marmalade.

Bignoy *(Antidesma Bunius*)

These are deciduous trees, 4 to 10m tall, glabrous with oblong shinning, glabrous foliages and sessile male flowers and green female flowers. Fruits are ovoid, fleshy, red, acidic, wrinkled when dry. Fruits mature from May to July. Fruits are rich in calcium and Fe. Ripe fruits are consumed raw and used in the preparation of jam and sauce. Fruits are considered astringent, anti-dysenteric, thirst quenching and salvation inducent.

Table: 1 Physiochemical Characteristics of Lesser-Known Indigenous Fruits of N.E.Region

Local Name	Length (cm)	Diameter (cm)	Fruit wt (g)	Pulp wt (g)	Juice Content (ml/fruit)	TSS Brix	Acidity %
1.Tader	6.00	3.93	47.55	____	___	__	5.4
2.Belam	3.24	2.70	13.87	10.83	___	8.0	___
3.Empe	2.59	2.53 -2.0	7.66	____	___	__	___
4.Hisir	3.27	2.11	8.73	5.61	___	__	___
5.Tayek Ekse	2.40	2.43	10.04	5.13	___	__	___
6.Elaichi Nimbu (Smooth Skin)	8.38	6.95	204.76	120.29	27.27	6.5	5.21
7.Elaichi Nimbu (Rough Skin)	8.95	7.60	252.50	151.00	35.00	6.00	4.86
8.Tanyum	9.03	6.63	173.31	92.444	16.90	6.7	5.60
9.Rabab Tenga	11.05	11.40	575.00	474.55	151.50	10.2	1.73
10.Kodok Dogli	8.4	2.875	36.905	17.54	___	15.5	
11.KodokDogyo	9.05	3.02	36.7	18.125	___	9.6	___
12.Kolu	11.0	2.09	30..37	16.03	___	___	___
							___

Table 2: Physico-Chemical Parameters of Some Lesser Known Fruit of NE Region

Sl. No	Species	Fruit Weight (g)	Fruit Size (cm)		Pulp (%)	Juice (%)	Seed/Stone wt.(g)	Seed Size (cm)	
			Length	Dia				Length	Dia.
13	*Elaeagnus latifolia* Linn.	18.65	4.07	2.77	81.77	-	3.40	3.31	1.30
14	*Phyllanthus acidus*	3.39	1.57	1.94	95.28		0.16	0.58	0.62
15	*Baccaurea sapida* (Roxb.)	11.02-12.60	2.63-2.76	2.64-3.16	6.01	27.37-36.30	1.90		
16	*Emblica officinalis*	4.72-5.25	2.07	2.23	81.48	-	0.87	-	-
17	*Garcinia cowa*	40-75	3.5-6	5-5.73	-	38-42	0.70-0.75		
18	*Myrica sp.* (Big size fruit green colour)	13.57	3.24	2.77	-	37.66	2.02	1.85	1.37
19	*Myrica sp.* (Small size green colour fruit)	7.10	2.57	2.22	-	39.44	1.44	1.65	1.15
20	*Myrica sp.* (Small size pink colour fruit)	3.63	2.16	1.71	-	30.30	0.82	1.06	0.79
21	*Passiflora edulis (Purple type)*	43.18	4.88	4.59	-	31.31	-	-	-
22	*Prunus nepalensis*	3.85- 10.31	1.75-2.43	1.70- 2.48	48.83- 75.98		1.97-2.96	-	-
23	*Dillenia indica*	750	9.42	1.14	-	-	-	-	-

Table 3: Physico-Chemical Parameters of Some Lesser Known Fruits of NE Region

Sl. No	Species	T.S.S. (%)	Acidity (%)	pH	Vit. C (mg/100ml juice/pulp)	Reducing Sugar (%)	Total Sugar (%)
13	*Elaeagnus latifolia* Linn.	9.10	2.16	-	21.15	1.40	6.09
14	*Phyllanthus acidus*	4.68	2.27	4.15	21.15	-	-
15	*Baccaurea sapida* (Roxb.)	8.2-14.1	1.93	-	-	5.10	13.69
16	*Emblica officinalis*	-	-	-	-	-	-
17	*Garcinia cowa* Juice sac Rind	 6.8 5.6	 2.34 2.37	 3.0 2.8	 42.3 21.15	 1.01 -	 3.40 -
18	*Myrica sp.* (Big size fruit green colour)	5.7	4.31	-	17.63	0.97	2.48
19	*Myrica sp.* (Small size green colour fruit)	6.30	4.83	-	28.20	0.83	2.18
20	*Myrica sp.* (Small size pink colour fruit)	6.20	2.44	-	4.03	3.57	7.68
21	*Passiflora edulis* *P. edulis var. flavicarpa*	14.7	4.42	-	-	-	-
22	*Prunus nepalensis*	16- 23.20	0.13-0.77		8.81-12.34	-	3.53- 10.37
23	*Dillenia indica*	4.80	1.20	-	-	-	-

FRUIT CROPS FOR POST HARVEST USE

Unripe Fruits for Pickles

- *Artocarpus heterophyllus*
- *Atlantia monophylla*
- *Ehretia accuminata*
- *Eleagnus umbellata*
- *Elaeocarpus floribundus (Jaipai)*
- *Mangifera sylvatica*
- *Averhoea carambola*
- *Citrus medica*
- *Emblica officinalis*

Fruits for

- **Jam** – Emblica officinaies, Averrhoea carambola
- **Jellies** – *Ficus auriculata*, F. hispida, F. semicordata, Flacourtia jangomas, Garcinia lanceafolia
- **Preserve** – *Citrus medica, Cornus capitata, Corlaria nepaulensis, Docynia hookeriana.*
- **Drinks**: *Aegle marmelos, Dillenia indica, Diospyros lotus, Grewia sapida, Feronia limmonia, Myrica esculenta, Garicinia lanceafolia.*

EDIBLE RIPE FRUITS FOR DESERT

Table 4

Sl. No	Botanical Names	Family	Plant Habits	Edible Part
1	*Actinidia callosa*	Actinidiaceae	shrub	Berry
2	*Aglaia edulis*	Meliaceae	tree	Arid
3	*Alphonsea lutea*	Annonaceae	tree	Pulp
4	*Alphonsea ventricosa*	Annonaceae	tree	Pulp
5	*Vitis barbata*	Vitaceae	climber	Berries
6	*Vitis rugosa*	Vitaceae	climber	Berries
7	*Vitis latifolia*	Vitaceae	climber	Berries
8	*Antidesma bunius*	Euphorbiaceae	Shrub	Pulp
9	*Antidesma diadrum*	Euphorbiaceae	Shrub	Pulp
10	*Antidesma ghasaembilla*	Euphorbiaceae	shrub	Pulp
11	*Andesma khasiamum*	Euphorbiaceae	Shrub	Pulp
12	*Aphania rubra*	Sapindaceae	shrub	Drupe
13	*Aporosa roxburghii*	Euphorbiaceae	Shrub	Arid
14	*Ardisia floribunda*	Myrsinaceae	shrub	Berries
15	*Ardisia polycephala*	Myrsinaceae	shrub	Berries
16	*Artocarpus heterphyllus*	Moraceae	tree	Pulp
17	*A. hirsutA*	Moraceae	tree	Pulp

Table 4: Condt.,				
Sl. No	**Botanical Names**	**Family**	**Plant Habits**	**Edible Part**
18	*A. lakoocha*	Myrsinaceae	tree	Pulp
19	*Baccaurea sapida*	Euphorbiaceae	tree	Pulp
20	*Citrus hytrix*	Rutaceae	tree	Juicy hair
21	*Citrus medica*	Rutaceae	tree	Juicy hair
22.	*Clausena dentata*	Dilleniaceae	tree	Pulp
23	*Dillenia aurea*	Dilleniaceae	tree	Pulp
24	*Dillenia indica*	Dilleniaceae	tree	Pulp
25	*Dyospyros kaki*	Ebenaceae	tree	Pulp
26	*Dyospyros lanceaefolia*	Ebenaceae	tree	Pulp
27	*Dyospyros lotus*	Ebenaceae	tree	Pulp
28	*Dyospyros ramiflora*	Ebenaceae	tree	Pulp
29	*Dyospyros hookeriana*	Rosaceae	tree	Pulp
30	*Dyospyros indica*	Rosaceae	tree	Pulp
31	*Fragaria indica*	Rosaceae	Creeper	Pulp
32	*Ehretia acuminata*	Boraginaceae	Tree	Pulp
33	*Elaegnus pyriformis*	Eleagnaceae	Shrub	Pulp
34	*Elaegnus umbellate*	Eleagnaceae	Shrub	Pulp
35	*Elaecocarpus lanceaefolius*	Eleagnaceae	Tree	Ripe fruit
36	*Elaeocarpus prunifolius*	Elaeocarpaceae	Shrub	Ripe fruit
37	*Embelia sessiflora*	Myrsinaceae	Shrub	Berries
38	*Eriobotrya angustissima*	Rosaceae	Shrub	Berries
39	*Eugenia kurzii*	Myrtaceae	Tree	Pulp
40	*Euphoria longan*	Sapindaceae	Tree	Pulp
41	*Ficus semicordata*	Moraceae	Tree	Pulp
42	*Fissistigma polyanthum*	Annonaceae	Climber	Pulp
43	*F.verrucosa*	Annonaceae	Climber	Pulp
44	*Flacourtia indica*	Flacourtaceae	Shrub	Berries
45	*Fragaria nilgeerensis*	Rosaceae	Creeper	Fruit juice
46	*Garcinia cowa*	Guttiferae	Tree	Pulp
47	*Garcinia lanceafolia*	Guttiferae	Tree	Pulp
48	*Gaultheria fragrantissima*	Ericaceae	Shrub	Pulp
49	*Haematocarpus thompsonii*	Menispermaceae	Shrub	Pulp
50	*Litsea glutinosa*	Lauraceae	Tree	Pulp
51	*Maesa argentea*	Myrsinaceae	Shrub	Pulp
52	*Maesa chisia*	Myrsinaceae	Shrub	Pulp
53	*Mahonia acanthifolia*	Berberidaceae	Shrub	Pulp
54	*Mangifera sylvatica*	Anacardiaceae	Tree	Pulp
55	*Morus indica*	Moraceae	Tree	Pulp
56	*Olax nana*	Olacaceae	tree	Pulp
57	*Pegia nitida*	Anacardiaceae	tree	Pulp
58	*Pinanga serratum*	Palmae	tree	Pulp
59	*Protium serratum*	Burseraceae	tree	Pulp
60	*Prunus cerasoides*	Rosaceae	tree	Pulp
61	*Prunus jenkensii*	Rosaceae	tree	Pulp
62	*Prunus nepaulensis*	Rosaceae	tree	Drupe
63	*Prunus pashia*	Rosaceae	tree	Yellow brown fruits
64	*Rhux chinensis*	Anacardiaceae	Shrub	Pinkish red fruit
65	*Saurauja cerea*	Ternstroemiaceae	Tree	Berries
66	*Saurauja roxburhii*	Ternstroemiaceae	Tree	Berries
67	*Solanum barbisetum*	Solanaceae	Shrub	Pulp
68	*Sorbus aucuparia*	Rosaceae	Tree	Pulp
69	*Syzygium aqueum*	Myrtaceae	Tree	Pulp
70	*Tetrastigma lanceolarum*	Vitaceae	Climber	Berries

Table 4: Condt.,				
Sl. No	**Botanical Names**	**Family**	**Plant Habits**	**Edible Part**
71	*Uraria cordata*	Annonaceae	Climber	Fruits
72	*Vaccinium donianun*	Vacciniaceae	Tree	Berries
73	*Vaccinium griffithianum*	Vacciniaceae	Tree	Berries
74	*Viburnum corylifolium*	Caprifoliaceae	Tree	Berries
75	*Viburnum corylifolium*	Caprifoliaceae	Tree	Berries
76	*Viburnum cotinifolium*	Caprifoliaceae	Shrub	Berries
77	*Viburnun griffthianum*	Caprifoliaceae	Shrub	Drupes
78	*Vitis lanata*	Vitaceae	Climber	Berries
79	*Ximenia americana*	Olacaceae	Shrub	Fruits
80	*Zizyphus apetala*	Rhamnaceae	Shrub	Drupes
81	*Zizyphus foeniculosa*	Rhamnaceae	Shrub	Drupes
82	*Zizyphus incurva*	Rhamnaceae	Small tree	Drupes

FIBRE YIELDING FRUITS PLANTS FOR N.E.H REGION

Table 5

Sl. No	Name	Family	Economic Part	Uses
1	*Artocarpus chaplasa*	Moraceae	Stem & bark	Making blanket
2	*Artocarpus lakoocha*	Moraceae	Stem & bark	Crude cordage
3	*Grewia sapida*	Tiliaceae	Bark	Cordage
4	*Ananas sativus*	Bromeliaceae	Leaf	Rope
5	*Musa paradisiaca*	Musaceae	Stem	Rope, bags

Essential Oil Yielding Fruits Crops of N.E.H. Region

Table 6

Sl. No	Name	Family	Economic Part
1	*Gaultheria fragrantissima*	Ericaceae	Leaves
2	*Juglans regia*	Juglandaceae	Nut
3	*Litsea cubeba*	Lauraceae	Leaves
4	*Madhuca longifolia*	Sapotaceae	Fruits
5	*Messua ferrea*	Guttiferae	Fruits & seeds

Dye Yielding Fruits Plants of N.E.H.Region

Table 7

Sl. No	Name	Family	Economic Parts	Colour of Dye
1	*Aporusca dioica*	Euphorbiaceae	Leaf	Black
2	*Baccaurea sapida*	Euphorbiaceae	Leaf	Chocolate
3	*Garcinia lanceafolia*	Gultiferae	Fruit	Pink
4	*Myrica nagi*	Myricaceae	Fruit	Yellow

Timber Yielding Fruit Trees

- *Aegle marmelos*
- *Diospyros chloroxylon*
- *Diospyros embropteris*
- *Diospyros melanoxylon*

- *Eugenia jambolana*
- *Feronia elephantum*
- *Flacourtia ramontchi*
- *Litsea polyantha*
- *Mangifera sylvatica*
- *Randia dumetorum*
- *Spondias mangifera*

Tannin Yielding Fruit Plants of N.E.H.Region

- *Diospyros peregrina* :- (Ebenaceae) from unripe fruits
- *Emblica officinalis (*Euphorbiaceae*)*: Bark and leaves are
- *Gaercinia lanceafolia* – from Rind of fruits.
- *Spondias pinnata* (Anacardiaceae): from leaves and bark
- *Syzygium cumini* – (Myrtaceae) from bark

Fruit Used in Fish Poison in N.E.H.Region

- *Acacia pinnata* – Mimosaceae.
- *Annamirta occulus* – Menispermaceae.
- *Edgeworthia tomentosa* – Thymelaceaceae.
- *Ficus Silhetensis* – Moraceae.
- *Ficus elastica* – Moraceae.
- *Hydnocarpus kurzii* – Flacouritaceae
- *Randia fasciculata* – Rubiaceae
- *Viburnum corylifolium* – Sambucaceae
- *Viburnum foetidum* – Sambucaceae
- *Vitis himalayana* – Vitaceae.
- *Randia dumentorum* - Rubiaceae

Medicinal Fruits Crops of N.E.H. Region

- *Aegle marmelos* : Unripe fruits are astringent and used in dysentery.
- *Cordia myxa*: Fruit is astringent, anthelmintic, diuretic, and demulcent, expectorant.

- *Emblica officinalis*: Fruits are astringent, cooling, diuretic, and laxative.
- *Eugenia janbolana*: Fruits are anti-diabetic.
- *Feronia elephantum*: Fruits are used as tonic, antiscorbiotic and alexipharmic.
- *Randia duementorum*: Fruit are emetic, expectorant and diapheretic.
- *Citrus indica*: Fruit are tonic for stomach disorder.
- *Musa velutina*: Fruit used against stomach disorders.
- *Garcinia lanceafolia*: stomach disorders.
- *Antidesma brunius*: syphilic ulcers.
- *Hydnocarpus kurzii*: Leprosy
- *Litsea cubeba*: Paralysis.

CONSTRAINTS FOR THE DEVELOPMENT OF UNDERUTILIZED FRUIT CROPS

Though, underutilized fruit crops are in good demand, they are not very popular among the farmers of the region. The reasons for poor popularity of underutilized fruit crops are:

- Lack of awareness about the economic benefits and nutritional and medicinal value of crops.
- Non-availability of good quality planting materials;
- Lack of technology to reduce the gestation period and enhance the fruit production;
- Limited and inadequate marketing support & infrastructure facility for transportation, storage & processing.
- Lack of technology for value addition, through processing.
- Most neglected research on underutilized horticultural crops.
- Lack of application of innovative and novel technologies such as biotechnology, plasticulture to enhance productivity.
- Poor recognition of these crops in horticulture promotion programme.
- Non-attention of the scientists in developing the desired quality of underutilized fruit crops in this area.
- Improper institutional arrangements and limited role played by financial institutions in setting up of agro industrial and horticulture based industrial units.

STRATEGIES

- Food diversification through homestead cultivation of wild fruit species to avoid over exploitation from natural sources. Emphasis on multiplication of planting materials and their distribution besides providing market access through marketing networks of perishables.

- Lesser known horticultural crops are nutritionally rich and can be grown with low input agriculture. More R & D efforts in this sector will add substantially to food security and nutrition vis-à-vis human welfare.
- Limited number of species requires to be prioritized/targeted for detailed research and development in lesser known fruit crops by national programmes focusing on their conservation and sustainable use.
- Lesser known fruit crops are mainly grown under traditional farming systems by diverse ethnic communities. Focus is to be given for documentation of indigenous knowledge through ethobotanical studies. Such efforts will help to tap the value addition for multipurpose uses.
- Strategies need to be developed particularly at national and regional levels to make available promising selections and overcoming constraints of production of good planting materials to boost up the production and meet the local needs promoting domestic markets and thereby to enhance income generation of small farming communities.
- In the country as a whole, horticultural development is moving quite fast and in future there will be a greater technology adoption both in the traditional horticultural enterprises as well as commercial sectors. The underutilized fruit crops development in India cannot be considered in isolation. Some bold initiatives should be taken for upliftment of these crops.
- Rapid expansion of infrastructure facilities with priority on market development, transport and communication.
- The yield and quality of these crops are poor and hampering the productivity. Hence, some criteria need to be developed for commercial exploitation of these crops. The criteria may be high productivity, market demand, freedom from serious insect-pest and diseases, easier post harvest management, high nutritive value and availability of production technology. Hence, special efforts are needed on the part of the research scientists to develop the suitable location specific package of practices of different fruit crops including the development of superior varieties and conservation of genetics resources.
- For proper exploitation and better economic returns from underutilized fruit crops emphasis should be given on developing processing units in this area. It would also provide employment opportunities to the rural folk.
- Genetic erosion is very serious problem in non-traditional fruits and many land races will become extinct if these are not conserved soon. Likewise, efficient production technology and postharvest management are necessary to make the commercial cultivation of non-traditional fruit crops feasible. The availability of non-traditional fruit crops will go a long way in overcoming the malnutrition of the people living in these rural areas.

CONCLUSIONS

The north eastern region is bestowed with the most congenial climatic conditions for the production of under exploited fruit crops. Besides this quality seeds and planting material, varieties of these fruit crops could not be produced and exported. The increase in area and production of these crops not only provide nutritional security and save money on import but export of fresh fruit and other processed product is further expected to boost region economy. These crops may also provide many fold employment opportunities on agro based industries, packaging, storage, preservation, canning, transportation etc.

Most of these under-utilized fruits trees establish through natural regeneration of seeds grow slowly without any nutrition; start bearing fruits after a long gestation period and produce fruits of inferior quality. Hence, these species remain neglected without any commercial importance. As some of these species are tolerant to adverse agro-climatic conditions, they have great potential for establishment on marginal and wastelands throughout the region. However, there is further need to set up field demonstrations to provide first hand exposure to the farmers for popularizing these species.

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