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Genetic diversity of fruits in North East region of India

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Abstract

Identification of Natural tetraploid i.e. Bhat Manohar having ABBB Genome reported 1st time globally from North East India. New natural mutant of *Musa velutina* Intersectional hybrid *M. acuminata* x *M. ornata* have been recorded from Indo- china border of Arunachal Pradesh. Northeast India is known for its diverse nature of soil, climate, and topography. This region is rich in diversity of many cultivated (A large number of diversity in other tropical and subtropical fruits belonging to the genera *Garcinia*, *Artocarpus*, *Phyllanthus*, *Annona*, *Averrhoa*, *Persia*, *Aegle*, *Passiflora* and *Tamarindus* etc.) and wild fruits. Several ethnic group such as Khasi, Garo, Monpas, Karbis, Jaintia, Naga, Kuki, Manipuri, Mizo, Chakma, Dufla, Adi, Mishng, 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 of in the local markets and utilized as life sustaining diversified food base and for nutrient security for rural people round the year. These lesser known 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.

Keywords: Natural tetraploid, genetic diversity, underutilized fruits, North East India

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. North East India comprises of eight states viz., Arunachal Pradesh, Assam, Meghalaya, Manipur, Tripura, Mizoram, Nagaland and Sikkim. The total area of North East occupies 7.7 per cent of India's total geographic area supporting 50 per cent of the biodiversity in the country [1], of which 31.58 per cent is endemic. It is one of the hot spot [2] in India, known for its diverse nature of soil, climate, and topography. Apart from the commercial fruits, most of the indigenous and underutilized fruits are also rich in vitamins, and minerals and they are not properly exploited. 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 harbors various vegetation types of tropical, temperate and alpine zones. Tribal of various ethnic group like Khasi, Garo, Monpas, Karbis, Jaintia, Naga, Kuki, Manipuri, Mizo, Chakma, Dufla, Adi, Mishng, 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. Northeast India is the citrus depository of our country where many citrus species are originated. Khasi mandarin (*Citrus reticulata*) is widely cultivated in Jharnapani, Nagaland Northeast India and Sweet orange (*Citrus sinensis*) is also commercially grown in some of the places in the region. Apart from the most commonly cultivated species *Citrus indica* Tanaka (Indian wild orange), *C. latipes* (Swingle), *C. ichangensis* Swingle (Ichang Papeda), *C. medica*, *Citrus assamensis*, *Citrus macroptera* and *C. hystrix* were reported to occur in the subtropical forests of North-East India and the foot hills of the East Himalayas. Maximum genetic variability of *Musa acuminata* and *M. balbisiana* occurs in NE India. *M. flaviflora* is localized to Manipur and Meghalaya. National Bureau of Plant Genetic Resources (NBPGR) in 1986 collected some of the important land races of banana (Seeded Ladiarit and Ladison, Rigitchi and other elite types, Hatigola, Eboke,

Ginde, Egitchi and Essing) from Meghalaya. There are other species found in Khasi Hills, which need systematic collection and conservation. Rich diversity occurs in *Pyrus*, *Rubus*, *Ribes* and *Prunus*. The Shillong plateau of Khasi hills in Meghalaya have many *Prunus* species such as *P. nepalensis*, *P. undulate* and *P. cerasoides*. *Pyrus pyrifolia* var. *cubha makai* (*P. serotina* Red) and some of them are grown semi commercially in Meghalaya. Two species of *Elaeagnus*, viz., *E. latifolia* and *E. pyriformis* are known to be grown in NE region. It is quite common in Sibsagar (Dikho valley), Naga Hills, Khasi and Jaintia hills. *Docynia indica* and *D. hookeriana* are commonly found in the region. *Pyrus pashia*, a medium sized deciduous fruit tree is also found in NE region. 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 lanceaefolia*, *Dillenia indica*, *Malus baccata*, *Machilus edulis*.

Mizoram

Phyllanthus acidus, *Garcinia lanceaefolia*, *Passiflora edulis*, *Musa rosea*, *Mangifera sylvatica*.

Assam

Citrus lemon, *C. jambhiri*, *Citrus maxima*, *Citrus megaloxycarpa*, *C. macroptera*, *C. assamensis*, *Artocarpus lackoocha*, *Dillenia indica*, *Averrhoa carambola*, *Phyllanthus acidus*, *Baccaurea saipda*, *Flacourtica indica*, *Elaeagnus lalifolia*, *Myrica* spp.

Nagaland

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

Sikkim

Docynia indica, *Actinidia strigosa*, *Machilus edulis*, *Bassia bytracea*, *Musa sikkimensis*, *Spondias axillaries*, *Baccaurea supida*, *Elaeagnus latiolia*.

Tripura

Citrus macroptera, *Baccaurea sapida*, *Averrhoa carambola*, *Zizyphus funiculisa*, *Antidesma bunius*, *A. ghasaembilla*, *Grewia hirsuta*, *Grewia sapida*, *Physalis minima*, *Psidium guineens*, *Rubus elliptic us*, *Elaeocarpus floribundus*, *Citrus maxima*, *Dillenia indica*, *Carrissa canards*.

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-a-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.
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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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