

Genetic Resources Diversity in Horticultural Crops of the North Eastern Region

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The entire North Eastern Region is having a tremendous amount of genetic diversity of many fruits and vegetables. However, these resources are now much threatened. The region has already lost many of the valuable germplasm. Therefore, conservation of this valuable germplasm and collective effort should be made to assess these further for utilizing them in breeding programmes.

Key Words: Genetic diversity, Horticultural crops, Fruits, Vegetable

Introduction

North Eastern Himalayan region has got rich diversity of different fruits and vegetable crops. The region is considered as the centre of origin of several fruits such as mango, banana and citrus. The area is also rich in vegetable crops resources, particularly cucurbits (*Cucumis*, *Momordica*, *Luffa*, *Trichosanthes*, *Lagenaria*) tuberous solanums (brinjal, chilli etc.), bean (*Phaseolus*, *Vigna*, *Dolichos*) okra and many non conventional leafy vegetables. A great diversity is also available here for several tuber crops such as taros/aroids (*Colocasia*, *Alocasia*, *Xanthosoma*), yams, sweet potato, etc. A brief account of these germplasm resources of fruits and vegetables crops and their wild types available in this region is discussed in this paper.

Fruits

Citrus: The entire North Eastern Region is the home of many citrus species. According to Dutta and Bhattacharyya (1951) two species of sub-genus *Eucitrus*, namely *Citrus indica* and *C. assemensis* and three species of sub-genus *Papeda* namely *C. ichangensis*, *C. latipes* and *C. macroptera* are indigenous to this tract. Besides, there are as many as 17 citrus species, their 53 varieties and 7 probable hybrids, which have been

reported to be available from this region (Bhattacharyya & Dutta 1957). However, there are only few indigenous species/genetic resources which have got commercial value. Among these Khasi orange/Khasi mandarin (*Citrus reticulata*) and Assam lemon (*Citrus limon*) are the most important commercial citrus fruits of this region. Among the sweet orange (*Citrus sinensis*) group, important indigenous cultivars are 'Soh-nairing' and 'Soh-bitara' of Meghalaya and 'Tasa' of Arunachal Pradesh. These exhibit vigorous growth even at high altitude (1500 m) and bear acidic/sweet fruits. *Citrus grandis* (Pummelo) is another popular citrus species of this region and exhibits great diversity. Earlier nine different forms or types were described by Bhattacharyya and Dutta (1957), seven more types (out of which three types bearing desirable characters like thin rind, high juiciness and high TSS) were added later (Verma & Ghosh 1979). Indigenous citrus species from north eastern region (Ghosh 1985) including some natural hybrids are given below with their local names.

Indigenous species

1. *Citrus medica* Linn. (Bira Jora, Soh Manong Mitha Jora)
2. *C. limon* Burm (Naya Changney, Assam Lemon, Pati Lebu, Jora Tenga, Gotha Pati Lebu, Mata

- Jamuri, Elachi Lebu, Soh Syntenga, Pani Jamir)
3. *C. jambhiri* Lush. (Soh Myndong, Kata Jamir, Soh Jhalia, Sindhuri Nemu Tenga, Nemu Tenga, Mitha Tulia)
 4. *C. karna* Raf. (Soh Sarkar)
 5. *C. aurantifolia* Swing (Abhayapuri lime, Karimganj lime)
 6. *C. limetta* Risso (Mitha Kaghzi)
 7. *C. reticulata* Blanco (Soh Niamtra, Soh Umkdait, Naga Santra, Soh Siem, Kapura Tenga, Narangi)
 8. *C. nobilis* Lour. (Jeneru Tenga)
 9. *C. indica* Tanaka (Indian Wild orange)
 10. *C. sinensis* Osbeck (Sweet orange)
 11. *C. aurantium* Linn. (Karun jamir, Gondh Huntra)
 12. *C. maxima* Merr. (Dowadi, Nowgong, Jorhat, Khanapara, Kamrup, Khasi, Burni, Zemabawk, Aijal)
 13. *C. megaloxycarpa* Lush. (Bor Tenga, Hukma Tenga, Holong Tenga, Jamir Tenga)
 14. *C. ichangensis* Swing (Ketsa Seupfu)
 15. *C. macroptera* Montr. (Satkara, Tith Kara)
 16. *C. latipes* Tanaka (Soh Shyrkhoit, Soh Shyrkhoit)
 17. *C. assamensis* Dutta & Bhattacharyya

Natural Hybrids

1. *Soh-khyllah* No. 1
2. *Soh-Khyllah* No. 2
3. *Soh-Khyllah* No. 3
4. *Hashkhuli*
5. *Sarbat*
6. *Nicholsroy*
7. *Dewa tenga*

Mango: It is believed that most probable place of origin of *Mangifera indica* is in Assam Burma Zone (De Condolle 1886). Semi-wild varieties of mango are still found to grow near the evergreen forest of Khasi hills and in Tripura bordering the Chittagong hills of Bangladesh. *Mangifera sylvatica* is also found in this region, particularly in Khasi hills of Meghalaya.

Temperate fruits: Large number of wild and semi wild species of temperate fruits particularly of the Rosaceae family occurs in this region. Mukherjee et al. (1969, 1970) reported the distribution of wild relatives of pome and stone fruits in the north eastern region. *Malus baccata* widely used as root stock of apple and *Pyrus pashia* common rootstock of pear could be located in Khasi hills. *Pyrus pyrifolia* is also another temperate fruit

grown considerably in this area and is often used as rootstock of pear in Assam. Besides there are some others native/endemic species such as *Sorbus verrucosa* and *Pyrus polycarpa* found in Khasi hills.

Minor fruits: A large number of minor tropical and sub-tropical fruits occur in this region in wild or semi wild state both in the plains and hills. There is lot of scope for commercialisation of few such minor fruits. Some of the popular minor fruits of this region (Mohan 1987) are *Flacurtia jangomas*, (Poniol), *Baccurea sapida* (Lateku), *Prunus jenkinsii* (Thereju), *Cicca acidus* (Poramlakhi), *Rhus semialata* (Nagatenga), *Ziyphus* spp. (Bogori), *Parameria polyneura* (Mirika tenga), *Spondias magnifera* (Amora), *Averrhoa carambola* (Kordo) and *Dillenia indica* (Ou-tenga). Some of these minor fruits are very rich in their nutritive and medicinal value. Iron content of *Baccurea sapida* is said to be 100 times higher than the commercial orange (Keramasha et al. 1987). *Averrhoa carambola* and *Spondias mangifera* are used for various medicinal purposes (Kirtikar and Basu 1935).

Vegetables

The north eastern region is the centre of origin of many vegetable crops belonging to Cucurbitaceae, Papilionaceae and Solanaceae. Enormous variability in vegetables such as brinjal, chillis, beans and various kinds of cucurbits is usually seen.

Cucurbits: Germplasm diversity includes bottle gourd (*Lagenaria siceraria*) sponge gourd (*Luffa cylindrica*), ridge gourd (*L. acutangula*) pumpkin and squash (*Cucurbita maxima*, *C. moschata* and *C. pepo*), bitter gourd (*Momordica charatia*), kokrol (*M. cochinchinensis*), snake gourd (*Trichosanthes anguina*), pointed gourd (*Trichosanthes dioica*), Water melon (*Citrullus vulgaris*), cucumber (*Cucumis sativus*), longmelon (*Cucumis melon* var. *momordica*), ash gourd (*Benincasa hispida*) and chayote (*Sechium edule*). Besides, a good number of wild relatives of different species are also available. As listed by Swarup (1973) in *Trichosanthes* alone, in addition to two edible species namely *T. dioica* and *T. anguina*, number of wild species such as *T. labota*, *T. cucumerina*, *T. wallichiana*, *T. palmata*, and *T. lepiniana* occurs. The non edible wild relatives of luffa (*L. graveclens* and *L. echinata*) and cucumis (*C. sctosus*, *C. hystrix*, *C. trigonus*) also grow abundantly in the

region. The wild cucumber *C. trigonus* is known for its resistance to various diseases (Singh 1972). A. perennial, black seeded cucurbit (*Cucurbita ficifolia*) has been located in Khasi hills which is used as vegetable in tender stage but mainly as pig feed by the local people. Among the various cultivated cucurbits considerable variability in respect of fruit shape size, colour and fruiting habit is usually seen. A study conducted in the department of Horticulture, Assam Agricultural University revealed a great extent of variation among the different genotypes in pointed gourd (*Trichosanthes dioica*), kakrol (*Momordica cochinchinensis*), pumpkin (*Cucurbita maxima* and *C. moschata*) collected from different places of this region (Shadeque 1987). Similarly much diversity in *Trichosanthes anguina*, *Cucumis sativus*, *Lagenaria siceraria*, *Cyclanthera pedata* and *Benincasa hispida* is also found.

Solanaceous vegetables: Among the various solanaceous vegetables, the most important is the brinjal or egg plant (*Solanum melongena*). The region being the home of brinjal, is rich in germplasm of cultivated types and out of the twenty seven non-uberous *Solanum* species occurring in the entire country (Singh 1972), majority are found in this region. In addition to cultivated brinjal (*Solanum melongena*), other related species include *Solanum gilo* having tomato like fruits and another kind of brinjal with enlarged calyx almost covering the round fruits and intermediate in appearance between tomato and brinjal (Swarup 1973).

Some of the local wild or semi wild species are *Solanum khasianum*, *S. verbasifolium*, *S. ferox*, *S. kurzii*, *S. torvum*, *S. surattense*, *S. barbisetum*, *S. incanum*, *S. sisymbriifolium* etc. semi wild types of brinjal (*S. depressum*) also occurs in Manipur (Kanjilal et al. 1940). Many of these species could be possibly utilized in breeding programme as resistant sources. Species such as *Solanum xanthocarpum*, *S. ineanum* are crossable with eggplant producing fertile or partially fertile hybrids (Singh 1972). The crossability between *S. incanum* and *S. meloagena* variety narki baigan has been reported by Siddique and Khan (1978). The hybrid exhibited field resistance to leaf rot and brinjal shoot and fruit borer. Siddiqui and Khan (1979) also reported that *S. melongena* variety giant of Banaras hybridized freely with *Solanum incanum*. The F₁ hybrid was com-

pletely fertile and exhibited hybrid vigour in earliness, lessening maturity period and fruit and height of the plant. *S. khasianum* and *S. sisymbriifolium* showed resistance to phomopsis blight and also to all the three nematode species of *Meloidogyne*. *S. incanum* with bitter fruits was found to be resistant against the fruit borer of brinjal (Singh 1972)

Besides these, wild relatives, there are large number of diversified form of cultivated brinjal (*S. melongena*) where great variation in morphological characters of plant, flowering and fruiting habit, shape, size and colour of the fruit as well as reaction to various pests and diseases are usually seen. Some of the popular cultivated brinjal germplasm of Assam and neighbouring states are Borbengena, Powal bengena, Khorwa bengena, Kuli, Kuchia, Chagolisingia, Thal bengena, Nal bengena, Lakhimpuria etc

A large number of chilli cultivars (*Capsicum annum* var. *grossum*) are available in Assam and other states of north eastern region. A great variation is usually seen in respect of their size, shape, colour, fruiting habit and also in capsiicin content. Surajmukhi, Krishna jalakia, Dhan jalakia, Konjalakia, Bhoot jalakia, etc., are some of the popular local chilli cultivars of Assam.

Amongst the indigenous leguminous vegetables, *Dolichos purpureus* (*hyacinth bean*), *Canavalia ensiformis* and *vigna umbellata* are common. Considerable variability in respect of fruit size/shape, fruiting habit, colour of fruits, seed size/colour etc. are found in these species. A great diversity is also seen in Okra (*Abelmoschus esculentus*).

The natural vegetation of the North Eastern Region has great variety of herbs, shrubs and trees with edible leaves. Some of the important non-conventional leafy vegetables of this region are *Alternanthera sessilis* (Matikanduri), *Amaranthus* species (Morichan) *Chenopodium album* (jilmil), *Houttuynia cordata* (Masundari), *Eryngium foetidum* (Mandhanian), *Polygonum chinense* (Modhusuleng), *Portulaca oleracea* (Malbhug khutara), *Talinum triangulare* (Pirali paleng), etc. Research investigation revealed that most of these non-conventional leafy vegetables are richer in their nutritive value particularly in respect of minerals and vitamins as compared to many conventional leafy vegetables. In addition, most of them are accredited with

the presence of essential oil and highly valued for their medicinal properties.

Tuber crops: The major tuber crops of this region are cassava, sweet potato, aroids, *Dioscorea* etc. cassava is a common crop grown in the Jhum (Shifting cultivation) cultivation in hills and also in the tribal dominated areas of plains of Assam while *Colocasia* and sweet potato are grown considerably not only in the hills but also in the plains of Assam and Tripura. Large number

of yam cultivars in *Dioscorea alata* and *D. esculenta* namely Kathalu, Kuwarialoo, Moaaloo, Sinaloo etc. are most popular in Assam and other adjoining states. Similarly in aroids (*Colocasia*, *Xanthosoma*, *Amorphophallus*) also great diversity is found in respect of their growth habit, morphological characters, tuber size, shape, quality etc. Panchamukhi, Kani Kachu, Tekelikachu, Ghee, kachu, Naga kachu, Ahinya kachu and Dohi kachu are some of the popular taro types of Assam.

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