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Biodiversity of Horticultural Crops and Its Conservation: A Review

Satendra Kumar Singh, Department of Horticulture,

Baba Raghav Das Post Graduate College, Deoria-274806(UP) India

ABSTRACT

Biodiversity as our heritage makes a key contribution to well-being and sustainable development. Today, it is disturbed by human being self; to feed the burgeoning population in so many ways so it is the prime duty of everyone to keep it well maintained. There are many plant species which have abundance of value-added characters. If these characters are utilized in breeding programme, we would be richer in food availability all across the world. There is a rich diversity in fruits and their wild relatives which make up to 400 fruit plants. The North-Eastern region is richest in wild fruit plants followed by the Western peninsula and the Western Himalayas. Main fruit plants having wide genetic base are mango, citrus, banana. Besides that, bael, aonla, papaya, jackfruit, custard apple, karonda, lasora, phalsa, kokam, ber, strawberry, raspberry etc. is golden example for rich diversity in India. Near 80 plants of lesser-known vegetables make our basket rich. Of these cucurbits, taro, yams, brinjal and okra are rich hot specimen. India has two hot spots-the Western Ghats and the Eastern Himalayas-among 25 biodiversity hot spots (**Som Dutt, 2010**). Genetic diversity is desirable for long term crop improvement. Total plant species are 100000.Of them 8000 are flowering plants from the Himalaya and 5000 in north-eastern region.

Key words: Biodiversity, conservation, horticultural plants

INTRODUCTION

Biodiversity refers to the diversity of organism that includes plants, animals, microbes, insects, birds, fish, mammals etc. Biologists most often define biodiversity as the "totality of genes, species and ecosystem of the region" (**Sahane *et al*., 2010**). Biodiversity includes the following types:1. genetic diversity, 2. species diversity, 3. ecosystem diversity, 4. molecular diversity (**Campbell, 2003**). India has two biodiversity hotspots and stands 12 mega biodiversity centres. India ranks 7th position in the global agricultural biodiversity status. (**Sankaran and Dinesh, 2020**).

Biodiversity is an important for several reason: the intrinsic value of species in the wild, the many varieties of plants and animals use worldwide for farming and other human activities as a genetic resource in health care, agriculture and food production as well as for aesthetic. Conservation means the management for the all life to yield sustainable benefit.

BIODIVERSITY HOT SPOT IN INDIA

The biodiversity hot spot was first named in 1988 by Norman Myers (**Myers, N., 1988**). The biodiversity hotspots is a region with a high level of endemic species. About 4900 species of flowering plants are endemic in India. These are concentrated in the floristically rich areas of north east India, the western ghats, North-West Himalayas and the Andaman and Nicobar Island. These areas constitute two of the 25 hotspots identified in the world. Hot spots are spread all over the world, the majority are forest areas and most are located in tropics (**John Francis, 2008)**.

Table-1: Main centres of diversity for fruits in India

Region	Species
Western Himalayas	*Elaeagnus hortensis, Ficus palmata, Frageria indica, Prunus acuminata, Prunus tomentosa, Pyrus baccata, P. communis, P. pashia, P. kumaoni, Zizyphus vulgaris, Ribes graciale, R. lanatus*
Eastern Himalayas	*Frageria indica, Morus species, Prunus acuminata, Prunus cerasiodes, P. cornuta, P. jenkinsii, Pyrus pashia, Ribes lineatus, R. ellipticus, R. reticulatus, R. moluccanus*
North-eastern region	*Citrus assamensis, C. ichangensis, C. indica, C. jambhiri, C. latipes, C. macroptera, C. medica, Eriobotra angustifolia, Mangifera sylvatica, Musa accuminata, M. bulbiciana, M. manu, M. sikkimensis, M. superba, M. velutina, P. jenkinsii, Ribes graciale, Pyrus pashia, R. ellipticus, R. moluccanus, R. ellipticus, Myrica esculanta*
Gangetic plains	*Aegle marmelos, Cordia myxa, C. rothu, Emblica officinalis, Grewia asiatica, Morus spp., Phoenix spp, Syzygium spp, Zizyphus nummularia and other species and Manilkara hexandra*
Indus plains	*Meagre occurrence of Syzygium, rich variation in Carissa congesta*
Western peninsular tract	*Artocarpus heterophyllus, A. lakoocha, Garcinia indica, Diospyros spp., Ensete superba, Mangifera indica, Spondias pinnata, Vittis spp., Zizyphus oenoplia, Z.rugosa, Rubus ellipticus, R. moluccanus, R. lasiocarpus*

(Arora and Nayar,1984)

Table-2: Main centres of diversity for black pepper in India

Region	Species
Western Ghat	*Piper argyrophyllum, P. attenuatum, P. barberi, P. betle, P. galeatum, P. hopnium, P. hookeri, P. longum, P. mullesua, P. nigrum, P. pseudonigrum, P. schmidtii, P. silentvalleyensis, P. sugandhi, P. trichostachyon, P.wightii*
North-Eastern India	*Piper acutistigmum, P. arunachalensis, P. aurantiacum, P. betle,P. betleodes, P. boemeriaefolium,P.diffusum, P. griffithi, P. hamiltoni,P. haridasoni, P. khasianum, P. longum, P. pedicellatum, P. peepuloides, P. potheforme, P. sylvaticum, P. thomsonii,P. wallichii*

Table-3: Main centres of diversity for ornamental plant in India

Region	Species
Western Himalaya	**Wild Ornamental Trees**: *Aescus indica, Albizia julibrissin, Bauhinia variegata, Benthamidia capitata, Bombax ceiba, Butea monosperma, Cassia fistula, Cedrus deodara, Erythrina variegata, Pistacia integerrima, Llex dipyrena* etc. **Wild Ornamental shrubs:** *Caragana gerardiana, Cotinus coggygria, Deutzia staminea, Euonymous tingers, Murraya koenigii, Myricarea germanica, Rhus javanica* etc. **Wild Ornamental climbers:***Climatis buchananiana, Hedera nepalensis, Jasminum dispermum, Rosa bruninii, Schefera venulose, Vitis himalayana, Abrus pricato, Capparis spinosa, Climatis grata etc*. **Wild Ornamental bulbous plants:** *Anemone obtusiloba, Anemone fetrasepala, Arisaema flavum, Asparagus adscendens, Begonia picta, Iris lacteal, Ranunculus laetus, Tulipa stellata* **Wild Ornamental Ferns**: *Adiantum capillus-veneris, Asplenium dalhousia, Christella dentata, Diplazium polypodioides, Polystichum discretum*

(Janakiram *et al.*, 2010)

Table 4: Wild relatives of some of the fruit crops

SN	Family	Species	Remarks
1.	Anacardiaceae	*1.Mangifera andamanica* *2.Mangifera camptosperma* *3.Mangifera griffithi* *4.Mangifera nicobarica* *4.Semicarpus kurzu* *5.Spondias pinnata* *6.Spondias cytherea* *7.Buchnania splendons*	Possess tolerance to biotic and abiotic stress
2.	Annonaceae	*1.Annona muricata (Soursop)* *2.Annona reticulata (Bullock Heart)* *3.Annona glabra*	*A. glabra* is tolerant to salinity and could be suitably employed as a rootstock for other species of this group
3.	Arecaceae	*1.Areca triandra* *2.Phoenix andamanensis* *3.P. sylvestris* *4.P. rupicola* *5.P. paludosa*	All these five species are habitat of seashoes
4.	Clusiaceae	*1.Garcinia cowa* *2.Garcinia xanthochymus* *3.Garcinia microstigma* *4.Garcinia speciosa* *5.Garcinia dhanikhariensis* *6.Garcinia hombroniaca* *7.Garcinia lancaefolia* *8.Garcinia andamanica* *9.Garcinia brevirostris* *10.Garcinia cadeliana* *11.Garcinia calycina* *12.Garcinia cornea* *13.Garcinia dulcis* *14.Garcinia jelinekii* *15.Garcina kinjii* *16.Garcinia kurzii* *17.Garcinia lanessanii* *18.Garcinia mangostena*	About 36 species of Garcinia are reported.
5.	Dilleniaceae	*1.Dillenia andamanica* *2.Dillenia indica* *3.Dillenia pentagyna*	Edible fruits are produced in all the three species
6.	Ebenaceae	*1.Diospyros blancoi* *2.Diospyros andamanica*	Fruit of *Diospyros blancoi* has velvety surface and fragrant,cream-white flesh
7.	Euphorbiaceae	*1.Baccaurea blancoi (*Velvet apple) 2. *B. ramiflora* (Khatta phal)	Fruit of *B. ramiflora* are rich source in Vitamin C
8.	Moraceae	*1.Ficus carica* *2.Ficus racemosa* *3.Ficus hispida* *4.Artocarpus heterophyllus (Jackfruit)* *5.A. altilis (Bread fruit)* *6. A. lakoocha (Monkey jack)*	*Artocarpus heterophyllus* has 10 diversity centres in India. This is found in all states and it has multiple uses

		7. A. chaplasha (Champedak)	
9.	Musaceae	*1.Musa balbisiana var.andamanica* *2.Musa paradisiaca* *3.Musa indandamanensis* *4.Musa textilis* *5.Musa sabuana*	Wild species of banana are rich in carotenoid content however the presence of seeds prevents the wider adaptability of the fruits
10	Myrsinaceae	*1. Ardisia solanacea (Khari phal)* *2. A. andamanica*	These species are tolerant to salinity
11	Pandanaceae	1.*Pandanus andamanensium* 2.*Pandanus tectorius* 3.*Pendanus lerum var.lerum* 4. *Pendanus lerum var. andamanensium*	Nicobari tribes extract the flour from the fruits and cake is prepared out of the flour
12.	Rhamnaceae	1. *Ziziphus glabrata* 2. *Z. oenoplia var.oenoplia* 3. *Z. oenoplia var.pallens*	
13.	Myrtaceae	1. *Syzygium andamanicum* 2. *S. hookeri* 3. *S. kurzu* 4. *S. sanjappaina* 5. *S. manu* 6. *S. claviflorum* 7. *S. aqueum* 8. *S. samarnagense* 9. *S. jambose* 10. *S. malaccensis*	
14.	Myristicaceae	1.*Myristica andamanica* 2.*M. glabra* 3.*M. glaucescens* 4.*M. irya* 5. *M. prainii* 6. *M. elliptica* 7. *Knema andamanica ssp.Andamanica* 8. *Knema andamanica ssp.nicobarica*	
15.	Menispermiaceae	Haematocarpus Validus	Recorded from North Andaman. This crop has already been domesticated by a farmer in Diglipur area, North Andaman. The farmer has been identified as custodian farmer.
16.	Vitaceae	1.Vitis parviflora 2. Ampelocissus barbata 3. A. helferi 4. A.polystachya	Vitis parviflora is being used in grapes may be used in grape breeding programme as it has got reflexed stamen whereas the Ampelocissus barbata is used as a medicinal plant by the tribes of the Island

(Sankaran *et al.*, 2015)

BENEFITS OF BIODIVERSITY:

Biodiversity supports ecosystem services including air quality, climate, water purification, pollination and prevention of erosion (**Costanza *et al.*, 1997).** Non-material benefits including spiritual and aesthetic values, knowledge system and the value of erosion (**Hassan *et al.*, 2006**). Human beings have already obtained enormous direct economic benefits from biodiversity in the form of food, cloth, medicine etc.

THREATS FOR BIODIVERSITY

Deforestation and increased road building are a significant concern because of increase human encroachment upon wild areas. Habitat destruction played a key role in extinction's especially related to tropical forest destruction (**Pal and Anne,1981**). Factors contributing to habitat loss are over population, deforestation, pollution and global warming or climate change. Endemic species can be threatened with extinction through the process of genetic pollution i.e. uncontrolled hybridization, interrogation and genetic swamping. Genetically modified crop has become a common source genetic pollution. (**Zaid, A.1999**)

CONSERVATION STRATEGIES FOR BIODIVERSITY

Many ways are being suggested for preserving biodiversity. Some of them include the following (i) No undisturbed land be used for development or urbanization (ii) Catalogues of genetic resources and national biological inventories be prepared (iv) Measures should be taken to reduce emission of greenhouse gases and ozone destroying compounds. (v) Gene banks are collections of specimens and genetic materials. Some banks intend to reintroduce species to the ecosystem.

CONCLUSION

Healthy biodiversity offers us ecosystem services such as protection of water resources, soil formations and protection of nutrient storage and recycling, pollution breakdown and contribution to climate stability, maintenance of ecosystem. It provides biological resources, viz., food, medicinal resources and pharmaceutical drugs, wood products, ornamental plants, breeding stocks, population reservoirs, future resource, diversity in genes, species and ecosystems. It gives rewards in terms of scientific and social benefits such as research, education and monitoring, recreation, tourism and cultural values.

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