



## Biodiversity in fruit crops

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### Abstract

Biological diversity' means the variability among living organisms from all sources and the ecological complexes of which includes diversity within species, between species and of ecosystems. The concept of origin of cultivated plants was first developed by A P de Candolle and the geographic centres of diversity were developed by N I Vavilov. The diversity comprises of native land races, local selections, elite cultivars and wild relatives of crop plants. So, we consider plant genetic resources as our heritage, which need conservation for posterity (future generations). In our biosphere great diversity exists not only at the species level but at all levels of biological organisation ranging from macromolecules within cells to biomes. The role of wild species in the fruit improvement programmes is becoming important as they serve as donor source for many of the disease and pest resistance. Conservation of these wild species is very important as many of them are becoming extinct and many others are threatened and endangered.

**Keywords:** Biodiversity in Fruit Crops, types of biodiversity, main centres of diversity for fruits in India

### Introduction

Biological diversity' means the variability among living organisms from all sources and the ecological complexes of which includes diversity within species, between species and of ecosystems. The concept of origin of cultivated plants was first developed by AP de Candolle and the geographic centres of diversity were developed by NI Vavilov. Plant genetic resources are of great importance as they form the basic raw materials to meet the current and future needs of crop improvement programmes. A wider genetic base provides a great opportunity in plant breeding research aimed at developing new plant varieties for increased crop production (Paroda, 1991). The diversity comprises of native land

ances, local selections, elite cultivars and wild relatives of crop plants. So, we consider plant genetic resources as our heritage, which need conservation for posterity (future generations).

## **Types of Biodiversity**

In our biosphere great diversity exists not only at the species level but at all levels of biological organisation ranging from macromolecules within cells to biomes. Biodiversity is the term popularized by the socio-biologist Edward Wilson to describe the combined diversity at all the levels of biological organisation.

## **The most important of them are–**

- (i) Genetic diversity: A single species might show high diversity at the genetic level over its distributional range. India has more than 1,000 varieties of mango.
- (ii) Species diversity
- (iii) Ecological diversity

## **Wild species**

The role of wild species in the fruit improvement programmes is becoming important as they serve as donor source for many of the disease and pest resistance. Conservation of these wild species is very important as many of them are becoming extinct and many others are threatened and endangered. High genetic erosion has been noticed in jack fruit, *Litchi chinensis*, *Citrus sp.* In a survey carried out by the International Union of Underutilized Crops (ICUC) and IPGRI (Haq, 1994).

## **Biodiversity in fruit crops**

- The North East region is the centre of diversity for several important native fruits including mango, jackfruit and citrus.
- The plant genetic resources (PGR) represent a sum total of the diversity which come from genetic material in the form of traditional varieties and modern cultivars grown by farmers as well as wild relatives and other wild plants occurring in nature.
- Over the years, hundreds of different plant species have been domesticated and within each species, human and natural selection have combined to produce thousands of different varieties.
- In developed world, 'primitive cultivars' or 'landraces' have given way to more productive, uniform, modern cultivars.
- Biodiversity can be located either in the wild or in the backyard.

- In the wild mainly this diversity is from spontaneous mutants due to dispersal of seeds and seedling population whereas in the backyard mainly the seedling selections have been the diversity noticed in case of mango, jack fruit etc.

### Main centres of diversity for fruits in India

Western Himalayas	<i>Eleagnus hortensis, Ficus palmate, Fragaria indica, Prunus cornuta, Rubus ellipticus, Rubus lanatus, Zizyphus vulgaris.</i>
Eastern Himalayas	<i>Fragaria indica, Morus spp., Myria esculenta, Rubus elliptica, Rubus lineatus.</i>
North - Eastern Region	<i>Citrus spp., Mangifera sylvatica, Musa spp., Pyrus pyrifolia, Pyrus pashia, Myrica esculenta.</i>
Gangetic plains	<i>Aegle marmelos, Cordia myxa, Morus spp., Phoenix spp, Manilkara hexandra, Syzygium spp.</i>
Indus plains & Western Peninsular Region	<i>Artocarpus heterophyllus, A.lakoocha, Garcinia indica, Zizyphus oenopilia, Zizyphus rugosa, Rubus moluccans.</i>

### Causes of biodiversity losses

- **Habitat loss and fragmentation:** This is the most important cause driving the plants to extinction.
- **Over-exploitation:** Humans have always depended on nature for food and shelter, but when 'need' turns to 'greed', it leads to over-exploitation of natural resources.
- **Alien species invasions:** When alien species are introduced unintentionally or deliberately for whatever purpose, some of them turn invasive, and cause decline or extinction of indigenous species.
- **Co-extinctions:** When a species becomes extinct, the plant species associated with it in an obligatory way also become extinct.

### What's the need to conserve Biodiversity?

- It has taken millions of years of evolution, to accumulate this rich diversity in nature.

- But we could lose all that wealth in less than two centuries if the present rates of species losses continue.
- Biodiversity and its conservation are now vital environmental issues of international concern as more and more people around the world begin to realize the critical importance of biodiversity for our survival and well-being on this planet.

### Conservation of biodiversity

- Tropical regions are rich in fruit diversity and many globally important tropical fruit tree species and their wild relatives, including the rare or neglected species, are of Asian origin.
- Conservation of these tropical fruit species is imperative as they are increasingly threatened.
- For cultivated species the threat is by specialization of production systems restricted to a few varieties and by land use changes, and in the case of wild relatives it is due to habitat loss.
- Conservation efforts are in progress by various countries and agencies in order to save the rich tropical fruit diversity.
- Biodiversity conservation is achieved in two ways :
  - i. In situ conservation and
  - ii. Ex-situ conservation (field gene banks, botanical gardens, in vitro and cryopreservation).
- As the main objective of genetic resource conservation is for utilization in crop improvement, characterization and evaluation of all the accessions are carried out together with the collection and conservation efforts.

### Case Study-1

#### Importance of biodiversity of fruit crops and their wild relatives for food and nutritional security in Azerbaijan.

Musayev, M., Akparov, Z., Huseynova, T. (2014). *Journal of Crop and Weed*, **10**(2):141-146.

The wild relatives of major fruits and nuts like grapevine, apple, pear, quince, medlar, pomegranate, fig, cherry, apricot, almond, hazelnut, walnut, chestnut, pistachio and others are presented along with many genera of the flora of Azerbaijan. The activity of the Genetic Resources Institute (GRI) of the Azerbaijan National Academy of Science (ANAS) is collections, reproduction, studies, documentation and conservation of the gene pool of local resources of landraces of fruit plants, including their crop wild relatives (CWRs). The CWRs in Azerbaijan are conserved in protected areas and botanical gardens, as well as ex situ and on-farm conservation in field collections of the National Gene bank.

Collecting of plant genetic resources (PGR) of fruit-berry crops and grape has been enhanced in the last years. At present 2490 accessions of fruit plants are maintained in field collections of GRI. Nearly 300 grape landraces and about 50 samples of wild grapes have been collected by scientists of GRI through individual trips and local expeditions, and new gene pool gardens were established. GRI also maintains valuable collections of almond, pomegranate, pistachio, sea-buckthorn and other crops. As CWRs are many forms that formed in long phylogenetic development of fruit plants that harbor valuable genes. Their determination and utilization in breeding as donor material is important.

## Case Study-2

### Biodiversity of Date palm in the Sultanate of Oman

Rashid Al-Yahyai and Sulaiman Al-Khanjari (2008)- *African Journal of Agricultural Research.*, 3(6): 389-395.

Date palm (*Phoenix dactylifera* L.) is the primary crop in Oman occupying 49% of cultivated area and 82% of all fruit crops grown in the country. Oman is currently the eighth's largest world producer of dates with a production of 238, 000 metric tones (MT) in 2005. Oman has diverse topographical and climatic eco-regions that allow for cultivation of various types of date palm cultivars, particularly in the northern coastal and the interior region. There are approximately 180 female and 48 male cultivated varieties of the 7.8 million trees of date palm. Despite the great diversity of the cultivars, over 78% of the total production is from only 10 commercial cultivars. These cultivars are dominant because of their marketable high fruit quality or early and late season production. Physical phenotypic diversity index of selected date palm cultivars indicated large biodiversity among the population. Similarity matrix also indicated high similarity among date palm cultivars ranging from 74 to 90%. The study highlighted the need for chemical and molecular analyses to explore the genetic linkage among cultivars.

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Rashid Al-Yahyai and Sulaiman Al-Khanjari (2008)-Biodiversity of Date palm in the Sultanate of Oman. *African Journal of Agricultural Research.*, 3(6): 389-395.