

Conservation of plant genetic resources: role of botanical gardens and herbal gardens

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Introduction

Genetic resources conservation, can be achieved through two basis approaches namely, *in-situ* and *ex-situ* conservation. Firstly *in-situ* approach which means the setting aside of natural reserves, where the species are allowed to remain in their ecosystems within a natural or properly managed ecological continuum. The natural biosphere reserve is a useful solution for species that are endangered and nearly on the point of extinction. However, for species that are more widely distributed, the *in-situ* conservation of their total genetic diversity is difficult. Although species conserved in their natural habitats have the potential for continued evolution of a particular trait within the species and are subject to natural selection, there are indeed many problems in establishing this type of reserve, for example, cost, size and maintenance aspects, political and social issues and the danger of genetic wipe out as a result of natural disasters, fire, etc. In particular, this method of conservation is of significance to the wild relatives of crop plants and a number of other crops, especially tree crops and forest species where there are limitations on the effectiveness of *ex-situ* methods of conservation.

Secondly the *ex-situ* form of conservation which includes, in a broad sense, the botanic gardens and storage of seed or vegetative material in genebanks. The field genebanks where clonal materials are maintained as living collections in a field/orchard or plantation also represent *ex-situ* form of conservation. However, field genebanks have the potential risk of germplasm being lost due to disease, stress or disaster, and large amount of space and labour are required to maintain a small proportion of diversity. Cryogenic preservation of vegetative material is another mode of *ex-situ* conservation and it holds promise, especially for base collections.

Botanical gardens-institutions to facilitate conservation

Botanical gardens are gardens and botanical institution. They play an important role maintaining the ecosystems to enhance the survival of rare and endangered plant species. Although living collections generally consist of only a few individuals of each species and so are of limited use in terms of genetic conservation. They involve a wide variety of plant species grown together under common conditions, and often contain taxonomically and ecologically diverse flora. Medicinal plant conservation through the development of propagation and cultivation protocols, as well as undertaking programs of domestication and variety breeding.

Living plant collections of different varieties of plants, including the ornamental, medicinal, wild and cultivated of economic importance of various geographical regions. They are of value not only to botanist, horticulturists and foresters but also to the millions of tourists. A big botanical garden contains plant species from several corners of the globe. It also includes greenhouses, a

library, a herbarium, research laboratories and several miscellaneous resources including photographs, paintings, illustrations, reprints, note-books and specimens of several types. Modern botanical gardens serve as centres for documentation, research, reference, data storage, education, conservation, and several other biological facilities to mankind. At present there are over 600 botanical gardens in the world.

Thus botanical gardens play a very crucial role as centres for rescue, recovery and rehabilitation of rare, endangered and extinct prone species of plants and other valuable plant genetic resources. Besides, also play important role in education and as a centre of training in areas such as horticulture, gardening, landscaping, ex-situ conservation and environmental awareness.

Botanical garden- functioning

Botanical gardens are often run by organizations, universities or other scientific research organizations, and often have associated herbaria and research programmes in plant taxonomy or some other aspect of botanical science. In principle, their role is to maintain documented collections of living plants for the purposes of scientific research, conservation, display, and education, although this will depend on the resources available and the special interests pursued at each particular garden.

There are other gardens that may be independent institution, a governmental operation, or affiliated to a college or university. It is not merely a landscaped or ornamental garden, although it may be artistic, nor is it an experiment station or yet a park with labels on the plants. The essential element is the intention of the enterprise, which is the acquisition and dissemination of botanical knowledge. They may have documented collections of living plants for the purposes of scientific research, conservation, display and education.

Type of botanical gardens

Depending on the major plant species represented in a botanical garden they are classified as:

1. General botanical gardens: plants from diverse geographical regions, diverse categories (economic use)
2. Arboretum: only trees grown
3. Orchidarium: collection of orchids
4. Pineatum: collection of conifers
5. Bambusatium: bamboo collections
6. Palm house: palm collection

As institutions, botanical gardens are as diverse as the collections they hold. Once, botanical gardens played a key role in plant taxonomic research and in plant introduction from one continent to the other

Role of botanical gardens

1. Botanical gardens- information source on local flora
2. Several gardens supply seeds and material for botanical investigations.
3. They provide information on food plants, ornamental plants, medicinal plants, etc.
4. Modern gardens- supply of plant resources for research
5. They also provide information on the protection of endangered species, and propagation of rare plants.
6. Big botanical gardens- provide training facility to students
7. Provide training on conservation of nature through educational programme includes workshops and training sessions for teachers, students, naturalists, etc
8. Site for home gardening
9. Provide aesthetically pleasing environment and role in providing sound mental health.

Activities associated with botanical gardens:

- Horticulture and cultivation skills allow us to grow plants that might be lost in nature, which means that species diversity can be conserved in the gardens, but also allows us to consider restoration and rehabilitation of degraded habitats.
- Living collections of plants collect species under various groupings, to maintain a living store of genetic diversity that can support many activities in conservation and research.
- Seed banks and collections of living plants allow species to be safeguarded. Plants must be carefully collected stored to ensure maximum genetic diversity is retained, and much research is required to determine the best way of storing each species. This is the conservation of plant diversity *in situ*, and botanic gardens are key to this strategy's capacity and success.
- Research and development into plant taxonomy and genetics, photochemistry, useful properties, informing selection of plants that can withstand degraded and changing environments (especially important in face of the threats posed by climate change).
- Education is a strength of botanic gardens that allows them to communicate the importance of conserving plants, reaching out to diverse audiences, and also to communicate how this may be achieved.
- Linking plants with the well-being of people, and also helping conserve indigenous and local knowledge, to encourage the sustainable use of plant resources for the benefit of all, as part of sustainable development.

Herbal gardens, role in plant genetic resources

Herbal garden helps in popularising the usefulness of commonly available and frequently used medicinal plants among the various stakeholders and sensitize the public about our traditional knowledge. It is also a way of conserving Rare, Endangered and Threatened (RET) species of medicinal plants. Herbal gardens to create awareness about traditional usage of medicinal plants can be through home herbal gardens, school herbal gardens, institutional/ public herbal gardens, and state and national herbal gardens. For example- herbal gardens maintained in the educational

institutions facilitate in generating interest of students towards identification, uses of plants, growing and demonstrating the variation studies.



There are several thousand herbal gardens falling in any of the above categories. Amongst them there is one herbal gardens in Delhi which contain several useful medicinal herbal plants and herbs used in preparing Ayurvedic, Unani and Herbal medicines of several diseases. The Herbal Gardens located in Punjabi Bagh is under the supervision of Department of Horticulture, Municipal Corporation of Delhi (MCD). This body takes care of it, grows and conserves several medicinal plants and useful herbs in this garden. The visitors can visit this garden at free of cost and see vivid varieties of flowers, plants, trees, shrubs and herbs. The gardener of the garden can pioneer you about the characteristics of those plants. Herbal Garden at Punjabi Bagh is often a separate space in the garden, devoted to growing a specific group of plants known as herbs. The gardens have plants, carefully designed, even to the point of arranging and clipping the plants to form specific patterns, as in a knot garden. A blend of functional and ornamental plants, herbs used to flavor food in cooking, aroma plants or serving medicinal purposes (such as a physic garden), make this garden attractive for many students, trainees and plant lovers.

Suggested readings

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