

# Exsitu and insitu conservation of medicinal plants essay sample

[Environment](#), [Plants](#)



India ranks sixth under world's twelve mega bio-diversity zones. Out of these, two of them exist in our country. India possesses tremendous ecological bio-diversity. It contains 5 % of the world's bio-diversity on 2 % of the earth's surface. The biodiversity in our country is unique in nature and its in-situ and ex-situ conservation is very well needed. In recent years, the global demand of herbs has led to a quantum jump in volume of medicinal plants traded within and across the countries. The medicinal plants have been identified as one of the most important plant diversities for rural development. The use of plants as medicine is as old as human civilization itself.

India is home to about 15000 to 18000 of flowering plants of which about 8000 plant species are recognized as medicinal plants and are being used by various traditional systems of medicine. The biodiversity in our country is unique in nature and its in-situ and ex-situ conservation is very well needed. In recent years, the global demand of herbs has led to a quantum jump in volume of medicinal plants traded within and across the countries. The medicinal plants have been identified as one of the most important plant diversities for the rural development.

#### NEED FOR CONSERVATION

According to World Conservation Strategy (IUCN, UNEP and WWF, 1980) conservation is defined as " the management of human use of the biodiversity so that it may yield the greatest sustainable benefit to the present generation while maintaining its potential to meet the needs and aspirates of future generations" The forest areas in the state of Uttar

Pradesh are very rich in variety of medicinal plant species particularly in the Vindhyan region where various medicinal plants grow naturally.

According to Planning Commission Report (2000) the primary goal of biodiversity conservation as envisaged in World Conservation Strategy is summarized below: i) Maintaining of essential ecological process and its life support system. ii) Preservation of genetic diversity

iii) Sustainable Management.

The medicinal plants are basic raw material for the production of Ayurveda and Unani medicine medicines. The bulk of the raw material (about 80% of the demand) is derived from the forests only. Hence, the forest areas have been over exploited in the past to meet the requirement of the pharmaceutical and allied industries. Consequently, many of the important plant species have been threatened and some of them are on the verge of extinction due to unscientific collection by untrained persons. In recent years, medicinal plants have also been gaining immense popularity not only in developing countries but also in developed countries due to various well-known reasons like side effects of synthetic drugs. Therefore, the demand for the basic raw material has been further increased and forest areas are hardly able to meet this increasing demand of industries. In view of the aforesaid reasons, there is an urgent need to conserve and to propagate some important medicinal plants species so as to save them from extinction and also to ensure greater availability of raw material EXSITU

CONSERVATION

Ex-situ conservation means literally, “ off-site conservation”. It is the process of protecting an endangered species of plant or animal outside of its natural habitat; for example, by removing part of the population from a threatened habitat and placing it in a new location, which may be a wild area or within the care of humans. While ex-situ conservation comprises some of the oldest and best known conservation methods, it also involves newer, sometimes controversial laboratory methods. Ex Situ Conservation Methods

Ex-situ conservation is the preservation of components of biological diversity outside their natural habitats. This involves conservation of genetic resources, as well as wild and cultivated or species, and draws on a diverse body of techniques and facilities. Some of these include: •Gene banks, e. g. seed banks, field banks;

- In vitro plant tissue and microbial culture collections;
- artificial propagation of plants, with possible reintroduction into the wild; and
- Collecting living organisms for botanic gardens for research and public awareness. GENE BANK

As part of the National gene bank programme, cryo bank facility for ex-situ conservation of rare and endangered MAP's is being established.

Development of protocols for long-term storage and revival of plant propagules like seeds, shoot tips, embryos etc. will help ensure conservation and future propagation of these plant species. 1. In vitro bank

In vitro bank has been developed as a tool especially for the conservation of vegetatively propagated, recalcitrant or the species that are difficult to

propagate conventionally. Activities under in vitro bank are development of protocols for the establishment and rapid in vitro multiplication of priority species, standardization of minimal growth conditions for the short-to-medium term conservation of in vitro cultures, in vitro conservation, retrieval of plants from conserved material and their field establishment and assessment of genetic uniformity of mericlones by biochemical methods. The in vitro bank now holds 36 accessions belonging to 32 species.

Complete micropropagation protocols were developed for 30 species including such endangered/ endemic species as *Holostemma annulare*, *Adhatoda beddomei*, *Kaempferia rotunda*, *Piper barbei*, *Janakia arayalpathra*, *Trichopus zeylanicus*, *Rauvolfia beddomei*, and *Rotula aquatica*. Significant progress has been made for the in vitro medium-term conservation of a number of species. Shoot cultures of *Holostemma annulare*, *Adhatoda beddomei*, *Piper longum*, *P. hapnium*, *Baliospermum montanum*, *Geophila reniformis*, *Crataeva magna*, *Nervilia prainiana*, *Piper barberi*, *Kaempferia galanga* and *Gloriosa superba* could be maintained for 10-24 months at normal culture conditions at  $25 \pm 30^\circ\text{C}$ . Low temperature incubation ( $15-18^\circ\text{C}$ ) was effective in extending the subculture intervals in almost all the species. Genetic uniformity of the mericlones of *Crataeva magna*, *Geophila reniformis*, *Acorus calamus*, *Heracleum candolleianum*, *Holostemma annulare* and *Mahonia leschenaulti* were confirmed by isozyme analysis. 2. Cryobank

Activities of cryobank include standardization of protocol for preservation of priority medicinal and aromatic plant species in liquid nitrogen and establishment of cryobank for them. As part of the cryobank, protocols were

standardized for the shoot tip cryopreservation of *Holostemma annulare* through an encapsulation-dehydration procedure with 55% direct shoot regeneration after cryopreservation. A cryobank was also initiated preserving encapsulated shoot tips of one accession of *Holostemma annulare* in liquid nitrogen. Seed cryopreservation was succeeded in 20 species belonging to typical orthodox or intermediate category. Seeds of *Embelia ribes* were desiccation tolerant but LN sensitive. Preliminary trials indicate that the seeds of *Baliospermum montanum*, *Piper hymenophyllum*, *Trichopus zeylanicus*, *Rauvolfia beddomei*, *R. densiflora*, *R. serpentina* and *R. tetraphylla* also tolerate LN. The cryobank now holds 20 accessions belonging to 16 species.

Ex-situ conservation measures can be complementary to in-situ methods as they provide an “insurance policy” against extinction. These measures also have a valuable role to play in recovery programmes for endangered species. The Kew Seed Bank in England has 1.5 per cent of the world’s flora – about 4,000 species – on deposit. In agriculture, ex-situ conservation measures maintain domesticated plants which cannot survive in nature unaided. Ex-situ conservation provides excellent research opportunities on the components of biological diversity. Some of these institutions also play a central role in public education and awareness raising by bringing members of the public into contact with plants and animals they may not normally come in contact with. It is estimated that worldwide, over 600 million people visit zoos every year. Ex situ conservation measures should support in-situ

conservation measures (in-situ conservation should be the primary objective). 1 APPROACHES TO EX SITU CONSERVATION,

Plant species can be found away from the sites where they naturally occur in a range of contexts, including in botanic and other types of gardens, nurseries, seedbanks, tissue culture units, etc. In fact, ex situ conservation is not always sharply separated from in situ conservation. There are intermediates between the 'purest' forms of in situ and ex situ conservation, as represented possibly, on the one hand, by the total protection of wild populations of species without any other form of management and, on the other hand, by seedbanks with specialist scientists situated at a far distance from the places where the plants naturally grow. The term *circa situ* conservation has been used for a range of practices commonly associated especially with more traditional (and biodiversity-rich) agricultural systems . They include the deliberate encouragement

of certain species of 'wild' plants (which could include MAPs) in 'natural' habitats, the retention of valued 'wild' plants when land is cleared for agriculture or crops are weeded, the growing of valued 'wild' plants in home gardens, and the selection and storage of seed at household level for later replanting. *Circa situ* conservation grades into both in situ and ex situ conservation.

#### EXAMPLE

ex situ collections of MAPs can be connected to conservation and livelihoods through *circa situ* means, consider the case of the Pepper-bark tree

(*Warburgia salutaris*), the most highly prized medicinal plant in southern Africa (Cunningham, 2001b). This species has been collected to the point of national extinction in Zimbabwe, causing difficulties in obtaining the medicine, a matter of great concern to traditional medical practitioners and patients alike. Dr Tony Cunningham and the Zimbabwean NGO SAFIRE (Southern Alliance for Indigenous Resources) have managed to successfully re-introduce this species from nurseries in South Africa into Zimbabwe. However, reintroduction was not back into its natural forest habitat, from which it would probably again soon disappear since the causes of its over-collection in these largely open-access areas remain. Rather, rooted cuttings were distributed for the home-gardens of local farmers, all of whom knew and valued the species. It is believed that many of these farmers will be prepared to guard the plants with the attention that will certainly be required.

Given that such a large proportion of the world's flora is medicinal, it is not surprising that MAPs are well represented in botanical gardens, even though, in most cases, they will not have been selected for growing because of their medicinal properties. This said, there are many botanical gardens with collections of MAPs and, in some parts of the world, such displays are quite commonly also found attached to schools, museums and other institutions. In general, these living collections consist of only one or a few specimens of each species and, while sometimes of value educationally, they are of limited use from the point of view of genetic conservation. Botanic gardens can play further major roles in medicinal plant conservation through



developing propagation and cultivation protocols, and undertaking programmes of domestication and variety breeding. Such research can benefit from traditional knowledge. For example, the seeds of Paris polyphylla, a medicinal plant in China, have proved difficult to germinate in trials, but much greater success was achieved after following the practice of a farmer in Yunnan who mixed the seeds with those of another species (Pei Shengji, pers. comm.).

Seedbanks offer a more attractive way of storing the genetic diversity of many plants ex situ than botanic gardens, at least in terms of cost (except for species with recalcitrant seeds).

However, medicinal plants are poorly represented in seedbanks (Heywood, 2000). Currently, the International Plant Genetic Resources Institute (IPGRI) is supporting an Economic Crop Protection/Genetic Resources (ECP/GR) Group for MAPs. However, only few members of the group, which convened for the first time in Slovenia in September 2002, have shown an interest in the conservation of threatened species. More concern was expressed at the meeting with gene-banking common culinary herbs with complicated taxonomy (e. g. mint, oregano and thyme – *Mentha*, *Origanum*, *Thymus*).

Unless properly organised, the contribution of ex situ collections to in situ conservation and sustainable development can be limited. In practice, most seedbanks are used mainly as repositories of the genetic diversity of agricultural crops and their main users are agricultural scientists – breeders of ‘improved’ varieties of crops. Seedbanks will remain of limited use for

conservation of MAPs until, and unless, their fundamental purposes and modes of operation are rethought (Richards & Ruivenkamp, 1997). It is not just a question of increasing the stocks of MAPs in genebanks. Nor is there much point in reintroducing endangered species from ex situ collections back into natural habitats, unless the factors that caused their endangerment in the first place are reduced or eliminated.

What is needed to make ex situ collections more useful for conservation is connection with the socio-economic and cultural dimensions of in situ ecosystems (Richards & Ruivenkamp, 1997). This means that ex situ collections must be designed to serve developmental purposes (as locally defined), as well as for crop-breeding and 'strict' biological conservation

#### DRAWBACKS

Ex-situ conservation, while helpful in man's efforts to sustain and protect our environment, is rarely enough to save a species from extinction. It is to be used as a last resort, or as a supplement to in-situ conservation because it cannot recreate the habitat as a whole: the entire genetic variation of a species, its symbiotic counterparts, or those elements which, over time, might help a species adapt to its changing surroundings. Instead, ex-situ conservation removes the species from its natural ecological contexts, preserving it under semi-isolated conditions whereby natural evolution and adaptation processes are either temporarily halted or altered by introducing the specimen to an unnatural habitat. In the case of cryogenic storage methods, the preserved specimen's adaptation processes are frozen altogether. The downside to this is that, when re-released, the species may

lack the genetic adaptations and mutations which would allow it to thrive in its ever-changing natural habitat.

Furthermore, ex-situ conservation techniques are often costly, with cryogenic storage being economically infeasible in most cases since species stored in this manner cannot provide a profit but instead slowly drain the financial resources of the government or organization determined to operate them. Seedbanks are ineffective for certain plant genera with recalcitrant seeds that do not remain fertile for long periods of time. Diseases and pests foreign to the species, to which the species has no natural defense, may also cripple crops of protected plants in ex-situ plantations and in animals living in ex-situ breeding grounds. These factors, combined with the specific environmental needs of many species, some of which are nearly impossible to recreate by man, make ex-situ conservation impossible for a great number of the world's endangered flora and fauna. INSITU CONSERVATION

In-situ conservation is on-site conservation or the conservation of genetic resources in natural populations of plant or animal species, such as forest genetic resources in natural populations of tree species. It is the process of protecting an endangered plant or animal species in its natural habitat, either by protecting or cleaning up the habitat itself, or by defending the species from predators. It is applied to conservation of agricultural biodiversity in agroecosystems by farmers, especially those using unconventional farming practices. ADVANTAGES

- 🌐 It is cheap and convenient way of conserving biological diversity
- 🌐 It ensures the survival of the species
- 🌐 Large no. of plants can be conserved
- 🌐 They not only live , they also multiply and evolve

#### DISVANTAGE

An important disadvantage of insitu conservation is that it requires large areas of earth's surface if we have to preserve the full complement of biotic diversity of a region. This involves minimizing or excluding human activity and interference from that locality which is often difficult in the face of growing demand for space . after all humans also need space to live

#### CONCLUSION

Medicinal plants are endangered and they are ought to be conserved through the different methods available. The best method suitable for different species should be rightly identified by the humans so as to conserve them for future generations