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Present Status and Conservation of Some Important Medicinal Plants in India

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Abstract

Medicinal Plants that possess therapeutic properties or exert beneficial pharmacological effect on human body are generally designated as medicinal plant. The beneficial effect of plants is due to the presence of some active compounds produced during secondary metabolism which are naturally synthesize and accumulate some metabolites like alkaloids, terpenes, sterols, tannins, flavonoids, resins, glycosides etc. which are used throughout the globe for various purposes, including treatment of infectious diseases.A total of 560 plant species of India have been included in the International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened species, out of which 247 species are in the threatened category. On a global basis, the IUCN has estimated that about 12.5% of the world's vascular plants, about 34, 000 species are under varying degrees of threat. 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.

Present status and conservation of some important medicinal plants in India

Introduction:

Among the ancient civilization, India has been known to be a rich repository of medicinal plants. The Rwikveda(5000 years BC) mentioned 67 medicinal plants, Yajurveda(81) and Atharvaveda (4500 -2500 years BC) mentioned 290 medicinal plants. Later, the Charak samhita(700 years BC), Sushrut samhita (200 years BC), have described properties and uses of 1100 and 1270 plant species respectively. In compounding of drug, these are still used in classical formulation, in Ayurvedic system of medicine (Gupta and Chadha, 1995). Assurance of the safety, quality, and efficacy of medicinal plants and herbal products has now become a key issue in industrialized and in developing countries. The demand for medicinal plant based raw materials are growing at the rate of 15

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to 25% annually, and according to an estimation of WHO, the demand for medicinal plants is likely to increase more than US $5 trillion in 2050. In India, the medicinal plant-related trade is estimated to be approximately US $1 billion per year (Kala *et al.,* 2006).

The forest in India is the principal repository of large number of medicinal and aromatic plants, which are largely collected as raw materials for manufacture of drugs and perfumery products. India posses about 2.4% of global area with 8% of global biodiversity and it is one of the 12th mega diversity hotspot countries of the world with a rich diversity of biotic resources. Out of 34 hotspots recognized, India has two major hotspots - the Eastern Himalayas and the Western Ghats (Bapat *et al.,* 2008). India is rich in medicinal plant diversity with all the three levels of biodiversity such as species diversity, genetic diversity, and habitat diversity (Mukherjee and Wahile, 2006). Across the country, the forests are estimated to harbour 90% of India's total medicinal plants diversity. Only about 10% of the known medicinal plants of India are restricted to non-forest habitats (Wakdikar, 2004). Although, 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 extension due to unscientific collection by untrained persons. 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.

Some of these endangered medicinal plantsare

Saussaurea lappa, Picorrhiza kurroa, Ginkgo biloba, Swertia chirata, Gymnema sylvestre, Tinospora cordifolia, Salaca oblonga,Holostemma,Celastrus paniculata, Oroxylum indicum, Glycyrrhiza glabra, Tylophora indica, Bacopa monnieri,Rauwolfia serpentina.

Conservation methods of endangered medicinal plants

The two main strategies are *in situ* (in their natural surroundings) conservation and *ex situ* (protection of species outside their natural habitats) conservation.

Hence, it is imperative that viable strategies to conserve the populations and genetic resources of medicinally important species is a must to avoid further loss. On going efforts in India include both *in situ* and *ex situ* conservation measures *viz,* plant tissue culture, introduction of new crop genetic resources, research in habitat restoration, pollution abatement, seed storage and tissue banking etc.

Conservation methods

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1. In situ methods

In situ or on site conservation involves maintaining genetic resources in their natural habitats i.e., within the ecosystem to which it is adapted, whether as wild or crop cultivar in farmer's field as components of the traditional agricultural systems. The key operational steps for establishing *in-situ* gene banks for conservation of prioritized medicinal plants include: threat assessment, establishment of a network of medicinal plant forest reserves, involving local stakeholders, botanical, ecological, trade and ethno-medical surveys, assessing intraspecific variability of prioritized species, designing species recovery programmes, establishment of a medicinal plant seed center etc. Conclusively, no *in situ* conservation project can succeed without the complete cooperation and involvement of local people Example : Biosphere, reserves, Sacred Groves ,Sancturies, National parks ,Protected areas**.**

2. Ex situ methods

Ex situ conservation, involves conservation of biodiversity outside the native or natural habitat where the genetic variation is maintained away from its original location .The *ex situ* genetic conservation fulfills the requirement of present or future economic, social and environmental needs. Conservation also includes propagation and assessment of molecular diversity. Conservation of medicinal plants include a combination of methods, depending on factors such as geographic sites, biological characteristics of plants, available infrastructure, and network having an access to different geographical areas, human resources and number of accessions in a given collection (Rajasekharan and Ganeshan, 2002). Example: Field gene banks (storage of plant parts or tissues viz., buds, seeds, embryos, meristems, callus, ovule, pollen etc.), Cryo banks and DNA banks.

In vitro regeneration

In vitro regeneration include plant/explant growth, maintenance under disease free condition, retention of regenerative potential, genetic stability, and ensuring that there is no damage to the live material. In an experiment, Junaid *et al.* (2007) studied embryogenesis with different growth regulators in Murashige and Skoog's (MS) medium. They were observed that Embryogenic callus in *Catharanthus roseus* was initiated from hypocotyl on supplemented with 1.0–2.0 mg dm^{-3} of 2,4-dichlorophenoxyacetic acid (2,4-D) or chlorophenoxyacetic acid (CPA) and Embryo proliferation was much faster on medium supplemented with 6-benzylaminopurine (BAP).

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In another study by Liu and Saxena (2003) has described an in vitro propagation system for *Artemisia judaica* L., a traditional Egyptian medicinal plant. Shoot organogenesis was induced by culturing etiolated hypocotyls and intact seedlings on medium supplemented with thidiazuron [N-phenyl-N'-(1,2,3-thidiazol-yl) urea] via callusing at the cotyledonary notch region.

Cryo banks for conservation

Cryopreservation of plant cells and meristems is an important tool for longterm storage of germplasm or experimental material without genetic alteration using a minimum space and maintenance. For longterm preservation, cryogenic storage at ultra low temperatures under liquid nitrogen (- 150 to -196°C) is the method of choice.

In an experiment by Diettrich *et al.*, (1982) had observed that the cryopreservation by cell culture of *Digitalis lanalta.*They were treated with a mixture of sucrose-glycerol solution, cooled slowly and then were transferred to liquid nitrogen. After 7 days of re-growth the cells were suspended in liquid nutrient medium for further cultivation. About 50% of the cells survived freezing and thawing.

Another experiment was conducted by Ray and Bhattacharya (2008) on the cryopreservation of *Rauvolfia serpentina* (L.). They were observed that nodal segments those of 0.31 - 0.39 cm in size were better than other nodal sizes in 0.5 M sucrose solution that had a positive role in survival and subsequent regrowth of the cryopreserved explants.

Low temperature germplasm storage

Preservation by under-cooling has recently been applied to plant tissue cultures. The objective of this approach is to maintain tissues at low temperatures (-10 to -20 °C) but in the absence of ice crystallization. The plant tissues are immersed in immiscible oil and the emulsion thus formed can be under cooled to relatively low temperatures thereby circumventing ice formation, one of the most injurious consequences of low temperature storage. Although good recovery has been reported in certain species, this has only been achieved using a temperature of -10° C and for relatively short storage periods (6-48 hours).

In a study carried out by Sharma andChandel (1992) had observed that nodal cultures of Sarpagandha (Rauvolfia serpentina) could be maintained for nine months at 25° C by replacing cotton plugs with polypropylene caps as enclosures for culture tubes. Low temperature incubation of in vitro cultures appeared highly promising because cultures

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exhibited normal health even after 15 months of storage at 15° C; while 10°C and 5°C were found deleterious to growth of the cultures of *R. serpentinanodal* cultures of Sarpagandha (*Rauvolfia serpentina*) at low temperature. Arora and Sant (1989) had observed that the shoot cultures of *Saussurea lappa* stored at 5°C in the dark for 12 months without an intervening subculture survived with 100% viability. The shoots cold stored for 6 months or more showed higher rates of multiplication under culture room conditions than the untreated shoots.

Seed storage modules

Usually seeds, being natural perennating structures of plants, represent a condition of suspended animation of embryos, and are best suited for storage. By suitably altering their moisture content (5-8%), they can be maintained for relatively long periods at low temperatures (-18 °C or lower). However, in several species, rhizome/bulb or some other vegetative part may be the site of storage of active ingredients, and often, such species do not set seed. If seeds set, they may be sterile or recalcitrant i.e., intolerant of reduction in moisture or temperature, or, otherwise unsuitable for storage. It is now possible to store materials other than seed, such as pollen or clones obtained from elite genotypes/cell lines with special attributes, *in-vitro* raised tissues/organs, or, genetically transformed material.

Conclusion

- The Parks Department should prepare a policy at national level on the conservation and utilization of medicinal plants in protected areas.
- Species that are heavily depleted by over-collection should be re-introduced into areas where they once grew wild.
- Botanic garden should set up seed banks for the medicinal plants.
- To build public support for the conservation of medicinal plants through communication and cooperation.

References:

Arora, R. and Bhojwani, S. S. (1989).In vitro propagation and low temperature storage of *Saussurea lappa*, An endangered medicinal plant.*Plant Cell Reports*.8 (1):44–47.

Bapat, V.A., Yadav, S.R. and Dixit, G.B.(2008). Rescue of endangered plants throughbiotechnological applications. Natl. *Acad. Sci. Lett*.31: 201-10.

Diettrich, B.,Popov, A. S.,Pfeiffer, B.,Neumann, D.,Butenko, R. and Luckner, M.(1982)

Cryopreservation of *Digitalis lanata* Cell Cultures.*Planta Med.*46(10): 82-87.

Gupta, R. and Chadha, K.L. (1995). Medicinal and Aromatic plants research in India.*Advances in Horticulture*.11. 12-13.

Junaid,A., Mujib, A., Bhat, M.A.,Sharma,M.P. and Samaj, J.(2007). Somatic embryogenesis and plant regeneration in *Catharanthus roseus.Biologia Plantarum.* 51 (4): 641-646.

Kala, C. P., Dhyani, P. P, and Sajwan, B. S.(2006). Developing the medicinal plants sector in northern India: challenges and opportunities. *J. Ethnobiology Ethnomedicine.* pp.32.

Liu, C. Z., Murch, S. J., Demerdash, E.L.and Saxena, P. K. (2003),Regeneration of the Egyptian medicinal plant *Artemisia judaica* L.*Plant Cell Reports*. 21 (6) : 525–530.

Mukherjee, P. K. and Wahile, A. (2006). Integrated approaches towards drug development from Ayurveda and other Indian system of medicines.*J. Ethnopharmacology*.103:25–35.

Phartyal, S. S., Thapliyal, R. C., Koedam, N. and Godefroid, S. (2002). *Ex situ* conservation of rare and valuable forest tree species through seed- gene bank. *Curr. Sci.*83: 1351-57.

Rajasekharan, P. and Ganeshan, S. (2002). Consevation of Medicinal plant Biodiversity-An India prospective.*Journal of Medicinal and aromatic plant species* :137- 142.

Ray, Avik., Bhattacharya, Sabita. (2008).Cryopreservation of *In Vitro*Grown Nodal Segments of *Rauvolfia serpentina* by PVS2 Vitrification.*Cryoletters.* 29 (4) : 321-328.

Sharma, Neelam. andChandel, K. P. S.(1992).Low-temperature storage of *Rauvolfia serpentina.* An endangered, endemic medicinal plant.*Plant Cell Reports*. 11 (4) : 200–203.

Singh R. (2015). Medicinal Plants: A Review. *Journal of Plant Sciences.*3 (1): 50-55.

Wakdikar, S. (2004). Global health care challenge: Indian experiences and new prescriptions. *Electronic J. Biotech.***7**: 3.