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Medicinal Plant Biodiversity, Conservation and Health Protection: A Review

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Abstract

Medicinal plants have divine power to treat our physical and mental health. Since a long time in India is known as its traditional medicinal systems based on utilization of various plants, such as Ayurveda, Siddha, Unani, Folk, Homeopathy, Tibetan etc. medical systems are also found in ancient literature. In Vedas many references are available on the plants which are used as medicine to cure common and rare diseases. Medicinal plants have vast biodiversity in India, from Himalayan range in north to kanya kumari in south and from the desert of Rajasthan and Gujrat to assam, west Bengal in east India. Biodiversity is being destroyed due to global environmental changes, such as, changes in atmospheric composition, land degradation, depletion of fisheries, blindly use of water resources, cutting of forests etc. For save this biodiversity of medicinal plants, conservation of plants is very necessary. The Permaculture technology can be effective for conservation of such plants. Many plants have considered sacred in India from historical time by various communities. The most outstanding examples are the Peepal tree (*Ficus religiosa*), Banyan tree (*Ficus benghalensis*). More than a hundred such species of plants in India are considered sacred as well as medicinal values, such as Neem tree (*Azadirachta indica*), Tulsi (*Ocimum sanctum*), Adusa (*Adhatoda vasica*), Arjun (*terminallia arjuna*), bel (*aegle marmelose*), Amla (*Emblica officinalis*), Giloy (*Tinospora cordifolia*), Sarpgandha (*Rauwolfia serpentina*), Ashwagandha (*Withania somniferum*), Chandan (*Santalum album*) and many more. The objectives of this review article to aware the laymen about conservation of biodiversity of these sacred and medicinal plants.

Keywords: Biodiversity, Conservation, Medicinal plants, Sacred plants, Environmental changes.

Introduction

The uses of medicinal plants has figured in several ancient manuscripts like the Rigveda, the Bible, the Illiad, the Odyssey, and the history of Herodotus. As far back as 4000 B.C. the ancient Chinese were using drug plants. The Greek and Romans were also familiar with many of the present day drugs. In India Vedic literature including four Vedas (i.e. Rigveda, Yajurveda, Samveda and Atharvaveda), the Upnishada Samhita, Kalpsutras, Nighantus, Brahmans and epics like Ramayana and Mahabharata have given immense importance to the natural flora. In Ayurveda definite properties of drugs obtained from plants and their uses have been given in some detailes. Charak- Samhita and Susruta- Samhita are two important works dealing with some 700 medicinal plants in India. Most of the drug plants are wild and only a few of them are cultivated. The medicinal importance of a plant is due to the presence of some special substance like alkaloids, glycosides, resins, volatile oils, gums tannins etc. These active principles usually remain concentrated in the storage organs of the plant, such as, roots, seeds bark, leaves etc. With a wide range of climatic conditions, India has a rich and varied vegetation. India is one of the world's Mega diversity zone where almost all the biogeographical zones in the world are represented. Biodiversity is the popular way of describing the diversity of life on the earth. It is of utmost importance in maintain ecosystem functions and as an insurance for rare events or environmental changes that may impair ecosystem functions. Medicinal plants are used to maintain physical, mental, and spiritual health in all cultures and in a variety of capacities and contexts. Such plants include species with one or more organs that produce compounds of clinically established therapeutic value, which

may be utilized directly or as precursors for drug synthesis, and others that have not been vetted as such but are believed to be therapeutically useful (e.g., as medicine, tonic, food, or cultural symbol). Iconic examples include: *Papaver somniferum* L. (opium poppy), from which are derived powerful pain-relieving alkaloids like codeine and morphine; *Cinchona ledgeriana* Wedd. (fever bark) and *Artemisia annua* L. (wormwood), which yield lifesaving antimalarials; *Catharanthus roseus* L. (G. Don) (rosy periwinkle) and *Taxus brevifolia* Nutt. (Pacific yew), from which anticancer treatments like vinblastine/vincristine and paclitaxel, respectively, have been synthesized; and *Dioscorea mexicana* Scheidw. (Mexican yam), the source of diosgenin, a potent steroid for oral contraceptives. As these remedies were discovered, humans greatly facilitated the migration of these medicinal plant species and sought to enhance their diversity. The breadth of such interactions and the numerous benefits that plants provide to humans illustrate why improved knowledge and conservation of medicinal plant species are essential. Medicinal plant biodiversity encompasses over 8,000 species in India alone, with 2,000 used in traditional systems like Ayurveda, forming a critical, yet threatened, natural resource. Nearly 90% of the herbal industry's demand is met through destructive wild collection, endangering species like 427+ identified in Red Data books.

Key Aspects of Medicinal Plant Biodiversity

- **Richness & Diversity:** India is a "treasure house" of biodiversity, with over 8,000 species of medicinal plants. These include 1,100 species frequently used in Indian systems of medicine and over 6,000 used in folk healthcare.
- **Habitat Distribution:** Most medicinal plants (approx. 70%) are found in tropical forests, specifically in the Western Ghats, Himalaya, and other biodiversity hotspots.
- **Significance:** These plants are vital for health care and provide essential, affordable, and accessible treatment, with 60% of the world's medicine originating from plant sources.

Threats to Biodiversity

- **Overexploitation:** Approximately 90% of the raw materials for the herbal industry are collected directly from the wild, putting severe strain on natural resources.
- **Habitat Loss:** Increased demand and environmental degradation are causing many species to become endangered or extinct, with 427 Indian medicinal plant species listed as threatened.
- **Unsustainable Harvesting:** Unregulated collection techniques often lead to the destruction of the plants themselves, rather than just the harvestable parts.

Conservation and Future Prospects

- **Strategies:** Conservation efforts include both in-situ (protecting natural habitats) and ex-situ (cultivation, seed banks) methods to manage threatened, rare, and endangered species.
- **Cultivation:** While most demand is currently met from the wild, there is a push to cultivate the 50+ widely used, high-demand species to reduce pressure on wild populations.
- **Modern Techniques:** Technology like DNA barcoding and digital, online databases are being utilized for better identification, monitoring, and conservation of these resources.

Medicinal plant biodiversity is not just crucial for healthcare but also plays a key role in ecological stability and local livelihoods, making their conservation essential.

Common medicinal plants used by Tribes for Health Protection:

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People especially tribals believe that, children are the gift of God and God has written their fate, which is unchangeable. Children should grow- up with the nature in mud and dust, in sun, rain etc., so that they develop the power to resist all odds to come in life. So, plants are called **natural health healer.** Some important plants are used by tribals and common people are as follows:

1. *Achyranthes aspara* (Amaranthaceae), root paste mixed with a glass of boiled water is given twice daily for two weeks in empty stomach for curing urinary and kidney disorders.
2. *Abrus precatorious* L. (Papilionaceae), about 25gram dried root powder boiled with one glass of cow milk is given before going to bed for 3 days to patients suffering from rheumatism, joints or muscular pain. Fresh root is also chewed with betel leaf in case of abdominal pain. Dried seed powder is used as an antidote for poisonous bite.
3. *Cassia alata* (Caesalpiniaceae), leaves paste mixed spider net common salt (4:1:1) is applied as eczema and scabies.
4. *Albizzia lebbeck* (Mimosaceae), sirish paste of leaf after boiled in mustard oil for 10 minutes is applied regularly on skin before one hour of bath in case of white patches of skin or leukoderma.
5. *Catharanthus roseous* (Apocynaceae), fresh leaf extract mixed with leaf extracts of Momordica charantia is given cup teice daily to the diabetic patients.
6. *Euphorbia hirta* (Euphorbiaceae), leaf paste plant and Achyranthes aspara along with sulphur, copper sulphate and mustard oil (6:2:1:1:2) is applied on the skin one hour before bath for any type skin disease.
7. *Citrus lemon* (Rutaceae), root decoction is reported to be very effective in curing hepatits if taken one cup for one month in empty stomach.
8. *Hedyotis auricularia* (Rubiaceae), sun dried pills made from leaves and black pepper powder (4:1) is given for three days to cure dysentery and other abdominal disorder.
9. *Clerodendrum indicum* (Verbenaceae), root decoction applied orally as dentifrices is useful to prevent tooth decay and wearing.
10. *Clerodendrum viscosum* (Verbenaceae), old roots crushed with black pepper (6:1), made into small pills are given with cold water thrice a day for two weeks to cure blood dysentery.
11. *Ichnocarpus frutescens* (Apocynaceae), root bark extract mixed with the root bark of Zizyphus rogosa (Banbadai) with 1- 2 spoonful sugar is given twice a day in case of urinary diorders.
12. *Nyctanthes arbor-tristis* L. (Oleaceae), young leaf juice along with honey mixed with hot cow milk is given to children twice daily for two weeks in case of bronchitis, asthma and whooping cough.
13. *Murraya paniculata* L. (Rutaceae), leaves are chewing before going to bed in case of tooth decay swollen gums and pyorrhoea.
14. *Phyllanthus acidus* (Euphorbiaceae), leaf paste is applied on skin in case of smallpox.
15. *Ricinus communis* L. (Euphorbiaceae), petiole burnt for 5 min is put into the external auditory canal and the smoke is pumped through mouth into canal in case of aerotitis and barotitis.
16. *Psidium guajava* L. (Myrtaceae), young leaves with salt is applied during serious tooth pain and decay. Leaf juice with Mangifera indica leaf decoction (2:1) is given in case of abdominal pain and bloody dysentery.
17. *Musa acuminata* (Musaceae), root boiled with the bark of Tinospora cordifolia is taken regularly early morning to cure diabetes. Stem juice of mature plant is applied on the skin in case of allergy infection.
18. *Crotolaria albida* (Papilionaceae), one cup root decoction mixed with 2-3 spoonful ginger extract is taken regularly in empty stomach in case swelling of body.
19. *Cuscuta reflexa* (Cuscutaceae), plant juice mixed with coconut water is taken early morning for two weeks in case of sever jaundice. It is also used in cough and diabetes.

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20. *Dillenia indica* (Dilleniaceae), filtrate of bark paste mixed with sugar in a glass of water and kept overnight is taken in the morning regularly in empty stomach for blood cancer.
21. *Hibiscus rosa-sinensis* (Malvaceae), flower bud paste applied regularly one hour before going to bath is useful in excessive hair loss and dandruff problems. Flower bud juice along with clove is given for curing sexual diseases.
22. *Mangifera indica* L. (Anacardiaceae), bark paste boiled in water is used during bath for the patients suffering from jaundice. Young stem is also used as toothbrush to prevent dental diseases.
23. *Smilax zeylanica* L. (Smilacaceae), dried root powder along with Zizyphus rogusa Streblus asper mixed in a ratio of 3:2:1 in warm water taken regularly early morning for two weeks for hepatitis, nephritic disease and bloody dysentery.
24. *Microcos paniculata* L. (Tiliaceae), paste of young tender leaves and dry root powder of Markemia stipulate applied for 2-3 weeks to cure bone fracture.
25. *Pandanus odoratissimus* L. (Pandanaceae), mixture of dried root powder along with one spoonful turmeric juice and upper clean lime water is taken early morning for one week to cure red urine disorders.

Ways of conservation strategies for medicinal plants:

The tribals living in interior forests cultivate numerous vegetable crops. Tribals do this work on many ways, such as-

1.Plants are conserved in natural habitat and is being worshipped by tribals as home of God and Goddess, just like- Bilva (*Aegle marmelose*) for Lord Shiva, Baka (*Sesbania grandiflora*) for Lord Vishnu, Arjun (*Terminalia arjuna*) for Brahma, Tulsi (*Ocimum sanctum*) for Goddess Lakshmi, Karavira (*Nerium indicum*) for Lord Ganesha, Nilpadma (*Nelumbo nucifera*) for Goddess Ambika and so on.

2. Crop plants conserved by tribals as source of food.

3. Diversity of plants conserved by tribals as wild fruits, seeds, bulbs, roots and tubers for edible purpose.

4.Plants are conserved in natural habitat in forest used as antidote of snake bite and scorpion- sting by tribal herbal healers.

5.Plants are conserved in natural habitat and used for setting bone fracture and in orthopedic treatment of tribal herbal healers.

6.Plants conserved by tribals in natural habitat and utilised as medicinal herbs.

7.Plants are conserved in abandoned sites of shifting agriculture by tribals.

8.Plants are conserved in sacred groves of tribals as in- situ conservation of biodiversity.

Many national and international agencies worked on policies and strategies for the conservation of medicinal Plants. The world conservation strategy (IUCN, UNEP & WWF, 1980) defines conservation as “the management of human use of the biodiversity so that it may yield the greatest sustainable benefit to present generation”. The primary goals of biodiversity conservation as envisaged in the world conservation strategy are: 1. Maintenance of essential ecological processes and life support systems on which human survival and economic activities depend, 2. Preservation of species and genetic diversity and 3. Sustainable use of species and ecosystems, which support millions of rural communities as well as major industries.

Future prospects Conservation and sustainable use of biodiversity in Medicinal and Aromatic Plants in India is a very important component towards overall growth. The following steps are important to take this work forward: y Use of GIS will help in Geo-referencing/gap analysis and prediction and distribution of species

using environmental variables to plan future explorations besides mapping of trait-specific germplasms with respect to bioactive compounds. y Use of biotechnological tools like in vitro storage/ cryopreservation including pollen preservation to strengthen the conservation of MAPs. y Use of molecular marker tools like SSR/SNP/GWAS to improve the understanding of extent, nature and distribution of diversity in MAPs; and develop the varieties with high yield and quality for sustainable production.

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