

A review study on Medicinal plants and their conservation for sustainable development

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Abstract:

Plants are essential to human lifestyles and necessary for supporting life on earth. To meet different needs living, all humans are dependent on plants. The world's most valuable sources of herbal goods are medicinal plants, yet they are vanishing quickly. A plant's usage as a medicine, therapeutic agent, or active component of a medicinal preparation is inferred when it is given the designation "medicinal." Therefore, a collection of plants those are used for medicine and have unique qualities that make them suitable as medications and therapeutic agents may be referred to as medicinal plants. Around 21,000 plant species have the potential to be utilised as medicines, and 80% of the world's population relies on herbal plants for primary healthcare, according to the WHO. Medicinal plants will be helpful for treating common illnesses and injuries, endemic infectious diseases, food and nutrition, mental and oral health, as well as for maternal and child health care, as well as for important pharmaceuticals. Animals and humans both rely on different medicinal plants to treat various health problems. For instance, in Madagascar, pregnant lemurs eat tamarind and fig leaves and bark to boost milk production, eliminate parasites, and increase the likelihood of a healthy birth. The rising trend in the demand for herbal products, there is a possibility of an increasing tendency of indiscriminate and unrecorded removal of medicinal plants from forests. Therefore, medicinal plants need to be conserved in places of their natural occurrence. The meticulous preservation and maintenance of medicinal plant habitats through strategic management constitutes the practice of medicinal plant conservation because it provides raw materials for the development of therapeutic drugs.

Introduction:

The term "medicinal plants" refers to any plants that have curative qualities or beneficial pharmacological effects on the human or animal body (Banerjee et al., 2014; Acharya, 2016; Sanyal et al., 2018; Bhattacharjee, 2021, Acharya et al., 2021). Drugs used in traditional medical systems, modern pharmaceuticals, nutraceuticals, food supplements, folk remedies, pharmaceutical intermediates, and chemical entities used in synthetic drugs are all produced most frequently from medicinal plants (Maiti et al., 2010; Maiti et al., 2013; Kar et al., 2022).

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They are also the most abundant bio-resource for these products. A considerable portion of the Indian population benefits from medicinal plants in terms of livelihood and health security in addition to serving as a key resource base for the traditional medicine and herbal industries. Some of the most prominent medicinal herbs include *Aloe vera*, *Bacopa monnieri*, *Embllica officinalis*, *Eclipta alba*, *Azadirachta indica*, *Ocimum sanctum*, *Mentha pipertia*, *Aegle marmelos*, *Cassia fistula*, *Mimusops elengi*, *Asparagus racemosus*, *Cinnamomum tamala*, and many others. For basic healthcare, up to 80% of people in developing nations rely only on herbal remedies, and over 25% of prescribed medications in industrialised nations come from wild plants (Hamilton, 2004; De and Dey, 2021). However, climate change, alien species, and the use of land for intensive farming and development pose severe threats to the genetic variety of plants. Because it provides a livelihood for millions of people globally, biodiversity needs to be protected. In 2011, Krishnan et al. The usage of medicinal plants is expanding quickly all over the world due to the rising demand for herbal medications, natural health products, and secondary metabolites of medicinal plants (Nalawade et al., 2003; Cole et al., 2007; Sarkar et al., 2016; Sarkar, 2017; Sanyal et al., 2016; Erfani, 2021; Kundu, 2022). Numerous recommendations have been made regarding their conservation, including the necessity for integrated conservation methods based on both in situ and ex-situ tactics, the development of systems for species inventorying and status monitoring, and more (Hamilton, 2004).

Secondary metabolites:

Many chemical compounds found in medicinal plants that have a particular physiological impact on the human body are what give them their therapeutic effectiveness. Plant plants' most important bioactive components are alkaloids, tannins, flavonoids, and phenolic chemicals (Dhandapani & Sabna, 2008). The phytochemical properties of some medicinal plants are given in the table below:

Sl no.	Common name	Botanical name	Phytochemical constituents	Reference
1	Kulekhara	<i>Hygrophila auriculata</i> Schumach.	Flavonoids (7-O-glucuronide), Alkaloids (asteracanthine & asteracanthicine), Triterpenes (luteolin-7-O-rutinoside), Aliphatic esters, Sterols, Minerals (Fe, Cu & Co), Essential oils.	Hussain et al., 2010
2	Anantamul	<i>Hemidesmus indicus</i> L.	Salicylaldehyde, Camphor, Pinocarveol, Bornel, 4-Terpenenol, Myrtenal, Dodecanoic acid, Hexadecanoic acid, Isobornyl acetate.	Nagarajan et al., 2001
3	Sarpagandha	<i>Ravolfia serpentina</i> L. Benth. ex Kurz	Alkaloids, Flavonoids, Phenols, Tannins, Ascorbic acid, Riboflavin, Thiamine, Niacin, Saponins, Minerals such as Ca, P, K, Mg, Na, Fe and Zn.	Harisaranra j et all., 2009

4	Tulsi	<i>Ocimum Sanctum</i> L.	Rosmarinic acid, Apigenin, Myretenal, Luteolin, β -sitosterol, Eugenol, Flavanoids, Orintin, Vicenin, Carnosic acid	Baliga et al., 2013
5	Mint	<i>Mentha spicata</i> L.	α -pinene, β -pinene, β -myrcene, DL-limonene, Trans-carveol, d-carvone, Piperitenone (Eucarvone), β -bourbonene, Cis-calamenene, α -copaene, α -cadinol, Essential oil	Alsaraf et al., 2021
6	Neem	<i>Azadirachta Indica</i> A.Juss	Tannins, Saponins, Flavonoids, Alkaloids, Glycosides, Reducing sugars, Polyphenols, Nimbidin, Nimbin, Nimbolide, Gedunin, Azadirachtin, Mahmoodin, Cyclic trisulphide	Eid et al., 2017



Figure 1. *Andrographis paniculata* (Burm.f.) Nees



Figure 2. *Ocimum Sanctum* L.



Figure 3. *Azadirachta Indica* A.Juss



Figure 4. *Curcuma longa* L.

Uses of Medicinal plants:

Herbal medicines are also gaining favour among western populations because they have very few or no negative side effects (Rokaya et al., 2014). In the natural course of daily life, traditional plant knowledge and characteristics have always been passed down from generation

to generation. Around the world, traditional and conventional medical systems are known to use between 50,000 and 70,000 plant species (Schippmann et al., 2006).

Table 1. Some of the medicinal plants and their medicinal uses are in the table below:

Sl no.	Scientific name	Part used	Medicinal uses	Reference
1	<i>Hygrophila auriculata</i> Schumach.	Roots and seeds	Treatment of “rheumatism, tuberculosis, leucorrhoea, anaemia, bodily ache, constipation, skin illness, and as an aphrodisiac”.	Sethiya et al., 2018
2	<i>Hemidesmus indicus</i> L.	Roots	Treatment of “scorpion stings, diabetes, urinary diseases, dyspnea, menorrhagia, oligospermia, anorexia, fever, abdominal colic and pain, dysentery, diarrhea, cough, rheumatism, snakebites, headache, inflammation, pyrosis, skin diseases, leprosy, sexually transmitted diseases and cancer.”	Nandy et al., 2020
3	<i>Ravolfia serpentina</i> L. Benth. ex Kurz	Roots	Treatment for illnesses including but not limited to “venomous insect bites, high blood pressure, inability to sleep, mental issues, gastrointestinal disorders, epilepsy, fever, wounds, and schizophrenia”.	Kaur, 2017

4	<i>Ocimum Sanctum</i> L.	Leaves, stem, flower, root, seeds	Treatment for “earaches, fever, colic pain, sore throat, asthma, hepatic diseases, malaria fever, as an antidote for snake bite and scorpion sting, flatulence, migraine headaches, influenza, fatigue, skin diseases, bronchitis, common cold, wounds, insomnia, arthritis, digestive disorders, headaches, coughs, night blindness, diarrhoea, and influenza.”	Pandey & Madhuri, 2010
5	<i>Mentha spicata</i> L.	Leaves, flower, stem, bark, and seeds	Treatment of “diarrhoea, antidote, indigestion, intestinal weakness, abdominal pain, cold, influenza, sinusitis headache and flatulence”.	Mahendran et al., 2021
6	<i>Azadirachta Indica</i> A.Juss	Leaves, bark, root	Treatment of “heat-rash, boils, wounds, jaundice, leprosy, skin disorders, stomach ulcers, chicken pox”, etc.	Bhoumik et al., 2010
7	<i>Bacopa monnieri</i> (L.) Penne II	Stem & leaves	Enhances memory, treatment of anxiety Alzheimer's disease, attention deficit-hyperactivity disorder, etc.	Sanyal et al., 2022
8	<i>Catharanthus roseus</i> (L.) G.Don	Leaf, root, shoot and stem	Treatment of “fever, malaria, throat infections, chest complaints, diabetes, regulation of menstrual cycles.”	Gajalakshmi et al., 2013
9	<i>Andrographis paniculata</i> (Burm.f.) Nees	Leaves	Treatment of “Pharyngolaryngitis, diarrhoea, dysentery, cough with thick sputum, carbuncle, sores, and snake bites”.	Akbar., 2011

10	<i>Curcuma longa</i> L.	Roots	Treatment of “Alzheimer's disease, Eye inflammation, skin rash, colorectal cancer, prostate cancer, skin wounds, depression, diabetes, joint pain, etc.”	Krup et al., 2013
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Conservation strategies:

The rising trend in demand of herbal products, there is a possibility of an increasing tendency of indiscriminate and unrecorded removal of medicinal plants from forests and therefore the medicinal plants need to be conserved in places of their natural occurrence. IUCN updated the Red list in June 2015 and added 44 Indian medicinal plants in the list of which 18 were categorized as vulnerable, 16 as endangered and 10 as critically endangered. Some of the endangered species are *Lilium polyphyllum*, *Saussurea coatus*, *Tribulus rajasthanensis* etc. As most of their pharmaceutical potential has not yet been explored, medicinal plants have a bright future and should be the subject of current and future research. There are basically four scientific and social actions to conserve medicinal plants:-

Legislation:

Laws already in place governing forestry cover the preservation of medicinal plants. The Forest Act of 1927, the Wildlife (Protection) Act of 1972 and the Wildlife (Protection) Amendment Act of 1991, the Forest (Conservation) Act of 1980, the Environment Protection Act of 1986, the National Forest Policy of 1988, and the National Biodiversity Act of 2002 are the laws developed by the Indian government for forest conservation that either directly or indirectly protect the wild herbal flora (Singh & Kushwaha, 2008).

In-situ conservation:

On-site conservation, also known as augmentation, refers to the preservation of genetic resources found in wild populations of certain plant or animal species, such as the genetic resources found in forests in wild populations of certain tree species. It is the process of preserving a threatened plant or animal species in its native environment by safeguarding the habitat from damage or pollution or defending the species against predators. Farmers, particularly those who use unorthodox farming methods, apply it to preserving agricultural biodiversity in agroecosystems.

It deals with the local preservation of the genetic diversity of the wild in its natural setting. In situ conservation aids in preserving the natural environment and habitat so that species can adapt and evolve in response to climatic changes. The method to keep endangered medicinal plants is through natural parks, wild nurseries, and biosphere reserves.



Figure 5. Indian biosphere reserves,

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Ex-situ conservation:

Ex-situ conservation literally translates to “off-site conservation.” It is the procedure for preserving a threatened plant or animal species outside of its natural habitat. For instance, a portion of the population may be relocated from a threatened habitat and kept in human care or in a wild region. Ex-situ conservation incorporates more modern, somewhat contentious laboratory techniques and some of the oldest and most well-known conservation techniques. When in-situ conservation is too challenging or impracticable, it may be utilised on some or all of the population. Ex situ conservation often overlaps with in situ conservation, but it also often effectively complements it, especially for overexploited and endangered species.

Slow-growing, scarce, and highly susceptible to replanting diseases, medicinal plants aim to cultivate and naturalise endangered species to ensure their survival and occasionally to produce large amounts of plant material used in the production of medicines, and it is frequently an immediate action taken to sustain medicinal plant resources. In addition to maintaining high potency when grown in gardens far from their natural habitats, many species of formerly wild medicinal plants can also have their reproductive components carefully chosen and saved in seed banks for future replanting. The technologies include in vitro preservation (using tissue culture and cryopreservation techniques to preserve germplasm), in vitro propagation (using molecular marker techniques), and others.

Cultivation practice:

The appropriate cultivation of medicinal plants can contribute to both the preservation of wild stocks and the resolution of the global health crisis. To promote the growth of medicinal plants, the Central Institute of Medicinal and Aromatic Plants (CIMAP) has developed a number of high-producing cultivars, agrotechnologies, and processing methods (Kumar &

Jnanasha, 2017). Cultivation encourages both socioeconomic advancement and the protection of plant species from extinction.

Research & development:

Through their useful economic applications in health and medical care, research and development activities aid in the enrichment of flora and fauna, environmental protection, and human assistance. Through its useful economic applications in health and medical care, research and development efforts benefit people by enhancing flora and fauna, protecting the environment, and benefiting from its benefits.

Conclusion:

The most significant plants in prehistoric times were those employed as medicines; many of these plants are being utilised today in the food, cosmetics, and pharmaceutical industries. They can be found all over the world and are widely scattered. Today, the cultivation of medicinal herbs is quite important commercially. Herbal plants are used for various medical purposes, including the topical treatment of burns and the ingestion of substances that help relieve constipation. Cosmetology also makes extensive use of them. These plants may also be used as food flavourings. There are many uses for medicinal plants, and each of the aforementioned sectors has experienced highly positive outcomes. Plants and the knowledge that goes with them are slowly vanishing due to deforestation, environmental degradation, habitat degradation, overexploitation, and acculturation happening worldwide. The conventional formulations and medicines used for the treatment of numerous ailments, including lifestyle disorders like diabetes, hypertension, and asthma, will no longer be available if there is no sustainable supply of these crude drugs.

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