

Review on Ethnobotanical Study of Medicinal Plant and Associated Knowledge used in Ethiopia

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Review Article

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ABSTRACT

Ethnobotany is the study of the relationship between people, plants and the environment relating and explains how people of a particular culture and religion knowledge make use of medicinal plants. The term ethnobotany was the first time mentioned orally by John Hershberger in 1895. From the ancient times, plants have been crucial sources of preventive and curative to human and livestock ailment. Historical accounts of traditionally used medicinal plants were in use as early as 5000 to 4000 BC in China. Traditional medicines are used to maintain health and to prevent, diagnose and treat physical and mental illnesses differently from allopathic medicine. Indigenous knowledge is the accumulation of technical knowledge, cultural practice, traditional knowledge, rule, standards, skills, and mental set result of many years to treat different human and animal ailments. Traditional medicine is the accumulation of knowledge and practices of community which used medicinal plants to diagnosis health problem of livestock and human. The traditional health practitioners are generally categorized into: Herbalists, Bone setters, traditional birth attendants, spiritual healers, diviners and magicians, Traditional psychiatrists and Herb sellers and spiritual healers. Medicinal plants used in Ethiopia constitute 887 plant species and 26 medicinal plant species are indigenous. There is the most effective medicinal plant species were identified and recorded in Ethiopia which used to treated different human ailments and animal. Around 1000 medicinal plant species are identified in the Ethiopian flora, but, many others medicinal plant species are not yet identified. About 90% of livestock population in Ethiopia relies on treatment of medicinal plants for primary health care. Ethnoveterinary medicine provides traditional medicines, which are locally available and refers to traditional animal health care knowledge and practices to prevent and treat diseases encountered by livestock. The wood lands, montane vegetation including grassland, forests and the evergreen scrubs and rocky areas contain more medicinal plants this indicated that traditional medicinal plant species are not uniformly distributed throughout the country. *In-situ* conservation is the methods of conserved medicinal plant species and protecting them in their natural habitat by the conservation of their ecosystem and natural habitats. Some of *in situ* conservation strategies are natural reserves and wild nurseries. *Ex-situ* conservation is the methods of conserved medicinal plant species and protected endangered medicinal plant species without their natural habitats. *Ex-situ* conservation strategies are: Gene banks, botanic gardens, seeds banks, field gene

banks and tissue culture technique. However traditional medicinal plant resources and their associated indigenous knowledge are declining at an alarming rate, due to ecological shifts; deforestation, urbanization, loss of forests and woodlands, urbanization, over harvesting, agricultural expansion, cultivation of marginal lands and lack of awareness among the community are the critical threats to medicinal plants.

INTRODUCTION

Ethnobotany is the study of the relationship between people, plants and the environment relating to wide range of disciplines and explains how people of a particular culture and religion knowledge make use of medicinal plants. Ethnobotany is combination of two words, which means 'ethno' the study of people and 'botany' study of plants and the scope of ethnobotany is the scientific investigation of plants as used in indigenous cultures in food, medicine, magic, rituals, fire wood, pesticides, clothing and shelter. There are more diversified and multidisciplinary subject that requires expert in various fields of academic study such as botany, anthropology, agriculture, and linguistics.

People have long histories on the uses of traditional medicinal plants for medical purposes in the world. Different local communities in Ethiopia as well as across the world have indigenous experience in various medicinal plants where they use their perceptions and experience to categorize plants and plant parts to be used when dealing with different ailments. Traditional healers, and particularly medicinal plant herbalists in Africa have a detailed knowledge of traditional medicine plants. Having different language, beliefs and cultures of the peoples contributed to the high diversity of traditional knowledge, and practices of medicinal plants in Ethiopia [1].

80% of developing country's population used traditional medicine to treat different human being and livestock ailments to meet their health care needs. The world primary means of treating diseases and fighting infections have been based on the use of medicinal plants. Those traditional medicines is used to maintain health and to prevent, diagnose, and treat physical and mental illnesses differently from allopathic medicine based on theories, beliefs, and experiences. Where 70% of human and 90% of livestock population depend on traditional medicine similar to many developing countries particularly that of Sub-Saharan African countries. Ethiopian plants have shown very effective medicinal value for some ailments of human and domestic animals thus medicinal plants and knowledge of their use provide a vital contribution to human and livestock health care needs throughout the country. Such plants include *Phytolacca dodecandra* and many species of *Maytenus*. Medicinal plants are vital in their uses for medication, besides providing ecological, economic, and cultural services [2].

Medicinal plants used in Ethiopia constitute 887 plant species which utilized for traditional medicine treatments among these medicinal plants 26 species are indigenous. Ethiopian plants have shown very effective contributions for some ailments of human and domestic animals, However traditional medicinal plant resources and their associated indigenous knowledge are declining at an alarming rate, due to ecological shifts; deforestation, loss of forests and woodlands, urbanization, over harvesting, agricultural expansion, cultivation of marginal lands and lack of awareness among the community are the critical threats to medicinal plants. *In situ* and *ex-situ* conservations are some conservation strategy to protecting threatened medicinal plants and indigenous knowledge from further devastation. Therefore this review was to conducted ethnobotanical study of medicinal plant, indigenous knowledge of the community and strategies of conservation of medicinal plants [3].

LITERATURE REVIEW

Development of ethnobotanical study and medicine

Historical accounts of traditionally used medicinal plants were in use as early as 5000 to 4000 BC in China and 1600 BC by Syrians, Babylonians, Hebrews and Egyptians. Medicinal plants play a significance role in the development and advancement of modern studies by serving as a starting point for the development of novelties drug. The term ethnobotany was for the first time mentioned orally by John Hershberger in 1895 and work seems to have started with Christopher Columbus in 1492, at a time when he brought tobacco, maize, spices and other useful plants to Europe from Cuba. Others were immigrants from the new world documented food, medicines and other useful plants of the Aztec, Maya and Inca peoples. During this time significant indigenous knowledge systems are linked to the use of various traditional medicine treatments. The relationship between plants and human cultures is not limited to the use of plants for food, clothing and shelter but also used for religious ceremonies, ornamentation and health care. The development of medicinal plants in primary health care not only will save the foreign exchange but also will aid in conserving our national heritage. Pharmaceuticals industries and western researches on plant based drugs have now rediscovered that plants have much to contribute to the discovery of new, effective, safe and profitable therapeutic agents. Most pharmaceutical companies recently have developed mechanisms to involve indigenous people collect plant samples on the recommendations of the traditional practitioners. This approach is reported to be more successful than random collections of sample of medicinal plants. The global value of plant based pharmaceuticals in OECD countries in 2000 was estimated to be USD 500 billion. In the World China is a major source of pharmaceutical products while, India, Chile and Egypt playing a great role. Hong Kong is a leading consumer probably due to majority of the botanical drug being processed in Hong Kong's large pharmaceutical industry. Japan and Korea are also major consumer countries with large manufacturing industries. Both USA and Germany are important importers and exporters as well as consumers with large processing industries [4].

In Ethiopia, research and documentation on medicinal plants have been started but only a little effort has so far been made to record and document the medicinal plants use and associated knowledge. A limited number of ethnobotanical studies conducted on medicinal plants. However, detailed information's on medicinal plants could only be obtained when studies are under taken in various parts of the country where little or no botanical and ethnobotanical studies have been

conducted. Scientific research on medicinal plants provides additional evidence to the present knowledge of medicinal plants which has been handed down from generation to generation. World Health organization established a worldwide program to promote and develop basic and applied research in traditional medicine. The priority interventions for the development of traditional medicine during first and second decades of WHO-AFRO for African traditional medicine are Policy formulation, Capacity building, Research promotion, Support for the local production of traditional medicines and cultivation of medicinal plants [5].

Indigenous Knowledge (IK): Indigenous knowledge of medicinal plant is the accumulation of technical knowledge, cultural practice, traditional environmental knowledge, local knowledge, rule, standards, skills, and mental set result of many years to treat different human and animal ailments. The immediate and intimate dependence of indigenous people on local resources resulted in the accumulation of indigenous knowledge. Those indigenous knowledge is unique to a given culture or society and the base for agriculture, health care, food preparation, education, environmental conservation and a host of other activities. One of the widely used indigenous knowledge system in many countries is the knowledge and application of traditional medicine known as ethnomedicinal knowledge. Ethnomedicinal knowledge involves traditional diagnosis, collection of raw materials, preparation of remedies and its prescriptions to the patients [6].

Indigenous knowledge on remedies in numerous countries passed from one generation to the other generation verbally with great confidentiality. Such secrete and crude transfer makes indigenous knowledge or ethnomedicinal knowledge vulnerable to distortion and lost at each point of transfer and there is a need for systematic documentation and record of such useful knowledge through ethnobotanical research, raise awareness in the community about the value of indigenous knowledge, help communities record and document their local practices providing computers, video equipment and make indigenous knowledge available to the community through newsletters, videos, books and other media [7].

Traditional medicine and practitioner in Ethiopia: Traditional medicine is the accumulation of knowledge and practices of community which used medicinal plants to diagnosis health problem, prevention and elimination of physical, mental or social diseases on practical experience of livestock and human. This knowledge or practice may rely exclusively on past experience and observation handed down orally or in writing from generation to generation. The majority of indigenous traditional medicine has been practiced at the primary health care level. Ethiopia has a long history of using traditional medicines from plants and has developed ways to combat diseases through it. The traditional medicinal systems in Ethiopia has distinctive features like that of Chinese traditional herbal medicine, the Indian ayurvedic medicine, the Japanese traditional medicine system and the African system are recognized among others. Traditional medicine practitioner is a person who is recognized by the community in which he/she has to provide health care by using plant, animal and mineral substances [8]. The traditional health practitioners are generally categorized into:

- Herbalists
- Bone setters
- Traditional birth attendants
- Spiritual healers
- Diviners and magicians
- Traditional psychiatrists,
- Herb sellers and spiritual healers.

Ethiopia's ancient church practices have documented some of the knowledge as inscribed in parchments which characterize the traditional medical system usually described as medico religious written in geez manuscripts of the 15th century. Other ancient written sources include the book of remedy of the 17th century which contains a wide range of medicinal plants prescription. Other cultures in the country have their own written or oral traditions that could be associated with individuals or groups. For instance, Borana Oromo's have two categories of healers system namely Cirressa and Ayana. Cirressa or traditional healers have a knowledge formally passed on and different Cirressa have different specializations, where Cirressa qoorsa specialize on medicinal plant. The healers are descended from two clan of Ali Rees family of Karayoo clan and Oborsa family of Dambitoo clan. These families believe that they received their knowledge from God and passed it on to generations. The healer begins to teach his/her pupil about the various plants when the pupil are at a young age. Once the pupil has picked up the knowledge the healer gives an oral examination to the pupil [9].

Medicinal plant in Ethiopia: Traditional medicine has a long history and it is the sum total of the knowledge, skill and practices based on the theories, beliefs and experiences indigenous to different cultures, whether understandable or not, used in the maintenance of health as well as in the prevention, diagnosis, improvement or treatment of physical and mental illness. Medicinal plants are very important to offer the people with traditional medicines, which are used to treat various human and livestock diseases. As we know 80% Ethiopian people rely on traditional medicine for their health care, and more than 95% of traditional medicinal preparations made from plant origin. Ethiopia has constituted around 65,000 species of higher plants with approximately 12% species were endemism and one of the six plant biodiversity rich countries in Africa. Medicinal plants species are also part of those plant species used as a source of medicine. The

biodiversity richness of Ethiopia was known since 5000 years ago when ancient Egyptians Greeks and Romans used it as a source of unique commodities like Frankincense, Myrrh and other plant products and medicine preparation. French, British and Italian travelers, naturalists, pharmacologists and plant collectors who visited Ethiopia between 1830 and 1930 gave lists of plants used medicinally and their conception by the local traditional medicine. Around 1000 medicinal plant species are identified in the Ethiopian Flora, but, many others medicinal plant species are not yet identified. Among these species 300 species are frequently mentioned in many sources. The list those plants are widely used by the local communities in lowlands and highlands for treating human and livestock ailments as well as for prevention of pests and vectors. Traditional medicine is an integral part of the local culture and a major public health system. It is noted that collaboration and integration of the modern health professionals and the traditional health practitioners is crucial especially for those people who have no adequate access for modern health facilities [10].

Distribution and source of medicinal plant: The distribution of medicinal plants is not uniform across the world as well as in Ethiopia. However, China has the highest numbers of medicinal plants used, with 11,146 species, followed by India, Colombia, South Africa and the United States. Ethiopian has a great range of ecological edaphic and climatic conditions with a variety of medicinal plant species. The number of plant species in each corner of the country and the vegetation type is also varied ranging from arid low land to Afroalpine vegetation. The variation in vegetation type of the country is due to the country's significant geographical diversity [11].

In Ethiopia medicinal plants species are grown in the natural ecosystem and most of them are collected from the wild, where some are cultivated and grown in home gardens either purposely for medicinal use or non-medicinal purpose. Medicinal plant species cultivated in Ethiopian home gardens for the purpose of medicine is about 6% but a large number of medicinal plant species that are used by the herbalists are collected from the natural vegetation. The natural ecosystems of the forests, grass lands, wood lands, wet lands, field margins, weeds, garden and fences contain a significant number of medicinal plants species. These are places where traditional healers and other members of the community collect medicinal plant species and use it. The wood lands, montage vegetation including grassland, forests and the evergreen scrubs and rocky areas contain more medicinal plants this indicated that traditional medicinal plant species are not uniformly distributed throughout the country. However the vegetation types found in the wood lands contain more medicinal plant species while the Afro alpine vegetation consists of the least medicinal plants of all the vegetation types. Actually Ethiopia has about 887 medicinal plant species that are currently used by people. The majority of these medicinal plants are herbs, followed by unidentified and shrubs species where, most of the medicinal plant species are found in the wild followed by unidentified and cultivated species (Tables 1 and 2).

Table 1. Distribution of medicinal plants by their growing habits.

No	Growth habit	Number of species	Frequency (%)
1	Herbs	271	30.5
2	Shrubs	168	19
3	Trees	110	12.4
4	Climbers	74	8.3
5	Reed	2	0.2
6	Unidentified	262	29.6

Source: Ethiopian's conservation of biological diversity the fourth national report.

Table 2. Distribution of medicinal plants by their source.

No	plant sources	Number of species	Frequency (%)
1	Wild	357	40.2
2	Cultivated	89	10
3	Weed	52	5.9
4	Unidentified	389	43.9

Generally medicinal plants are distributed in the south and south western Ethiopian following the biological and cultural diversity. The different studies showed that medicinal plants have small fractions from central, north and northwestern part of Ethiopia [12].

Important of medicinal plants in human health: Traditional medicinal plants have the most affordable and easily accessible source of treatment in the primary health care system of resource poor communities for developing countries where modern health care services are insufficient and unaffordable. In the fact 80% of Ethiopia people still rely on plant medicine to prevent and cure various health problems. Without difficulty accessibility, efficacy on treatment and inexpensive cost in getting health services are the main reasons of prefer on traditional medicine than modern medication. Thus in Ethiopia there is a large scale of use and interest in medicinal plant due to socio-cultural

acceptability, ease of access, affordability and biomedical benefits of the traditional medicinal plants to treat different human being disease [13].

The treatments of Ethiopian traditional medicinal plant possess three treatment features that are curative, prophylactic and preventive. From time to time, the treatment could have a curative as well as a prophylactic effect and it is occasionally claimed that the prophylaxis could even be genetically fixed and can protect the offspring. Preventive remedies are usually prepared as ornamental, to be born by the patients against evil spirits or psychosomatic disorders. *Hagenia abyssinica* and *Glinus lotoides* in the treatment of tapeworm, and *Phytolaca dodecondra* as a mollucides in the control of Schistosomiasis has been verified. *Prunus africana* is a tree whose bark is known to be the source of potent medicine internationally. Other therapies of preventive nature are employed against snake bites, intestinal worms, and miscarriages. Regulatory drugs are also commonly used to correct the time and the amount of flow of the menstruation cycle of women. There is most effective medicinal plant species were identified and recorded in Ethiopia which used to treated different human ailments based on local communities' traditional experience reported. Among these species the top ten important medicinal plants widely used for treating various human diseases are: *Ocimum lamiifolium* Hochst. ex Benth (Damakesie), *Vernonia amygdalina* Delile (bitter leaf), *Allium sativum* L. (garlic), *Ruta chalepensis* L. (rue), *Lepidium sativum* L. (garden cress), *Hagenia abyssinica* (Bruccie), *Calpurnia aurea* (Ait.) (Cape laburnum), *Carica papaya* L. (papaya), *Olea europaea* L. (African wild olive tree) and *Croton macrostachyus* Hochst. (Broad leaved croton).

Important of Medicinal Plants in Ethno veterinary: About 90% of livestock population in Ethiopia relies on treatment of medicinal plants for primary health care. Ethiopia as well as in most developing countries, animal diseases are one of the most principal causes of poor livestock performance and products. In Ethiopia traditional medicinal plants are the vital component to treat livestock diseases due to lack of modern medicine to treat livestock diseases. Thus creation of awareness on ethnoveterinary medicine emphasizing on useful plants used for treatment of livestock has chief importance to livestock management. In addition, proper documentation and understanding of farmers knowledge, attitude and practices about the occurrence, cause, treatments, prevention and control of various ailments is important in designing and implementing successful livestock production [14].

Ethnoveterinary medicine provides traditional medicines, which are locally available and usually cheaper than standard treatments. Livestock holders can prepare and use homemade remedies with the lowest expense. Many livestock holders in rural areas have relatively few veterinarians and shortages of other facilities hence, traditional medicinal plants are the only choice to treat many ailments. This refers to traditional animal health care knowledge and practices comprising of traditional surgical and manipulative techniques, traditional immunization, magic religious practices and beliefs, management practices and the use of herbal remedies to prevent and treat a diseases encountered by livestock holders. These indigenous local animal health care beliefs and health care practices constitute an ethno veterinary medicinal plant. In Ethiopian farmers and pastoralists rely on traditional knowledge, practices and locally available materials, plants in particular, to control and manage domestic animal diseases. In some parts of the country occurred livestock diseases are anthrax (quruba), black leg (aba gurba), anaplasmosis (afreera), ascariasis (wosfat), abscess (ebach), leeches (alqt), trypanosomiasis, lymphangitis (gub gub), stomatitis (yaf qusil), and coccidiosis (fengel) have been treated using various natural plant product combinations. Some of known ethnoveterinary uses medicinal plant species were *Monopsis Sellariodes*, *solanium anguivi* Lam, *Vigina spp*, *Nicotiana tabacum* L, *Argemone Mexicana* L, *Platostoma Rotundifolium*, *Caylusea abyssinica*, *Cissampelos mucronata*, *Cissampelos pariera*, *Desmodium dichotomum*, *Ipomoea eriocarpa*, *Justicia diffusa*, *Premna schimperii*, and *Zornia glochidiata* are they are against selected ecto and endo parasites of livestock diseases [15].

Approaches of conservation strategies of medicinal plants

Traditional medicinal plant conservation is defined as the sustainable utilize of medicinal plant resources for present and in the future. Strategy approaches to conserve medicinal plants are *ex-situ* conservation and *in-situ* conservation. Home gardens are crucial methods for *in-situ* and *ex-situ* conservation of traditional medicinal plants [16].

In situ conservation: *In-situ* conservation is the methods of conserved medicinal plant species and protecting them in their natural habitat by the conservation of their ecosystem and natural habitats. *In situ* conservation allows us to protect indigenous plants and maintain natural communities, along with their intricate network of relationships. *In situ* conservation efforts worldwide have focused on establishing protected areas and taking an approach that is ecosystem oriented, rather than species oriented. Successful *in situ* conservation depends on rules, regulations, and potential compliance of medicinal plants within growth habitats. Some of *in situ* conservation strategies are:

Natural reserves: The degradation and destruction of habitats is a major cause of the loss of medicinal plant resources. Natural reserves are protected areas of important wild resources created to preserve and restore biodiversity. Conserving medicinal plants by protecting key natural habitats requires assessing the contributions and ecosystem functions of individual habitats [17-20].

Wild nurseries: The populations of many wild species are under heavy pressure because of over exploitation, habitat degradation and invasive species. Wild nurseries can provide an effective approach for *in situ* conservation of medicinal

plants that are endemic, endangered, and in-demand. A wild nursery is established for species-oriented cultivating and domesticating of endangered medicinal plants in a protected area, natural habitat and a place where the plants naturally grow.

Ex situ conservation: *Ex-situ* conservation is the methods of conserved medicinal plant species and protected endangered medicinal plant species without their natural habitats by introduced new habitat for sustainable conservation and utilizing. *Ex situ* conservation aims to cultivate and naturalize threatened species to ensure their continued survival and sometimes to produce large quantities of planting material used in the creation of drugs, and for immediate action taken to sustain medicinal plant resources. Some of *ex situ* conservation strategies are:

Botanic gardens: Botanic gardens play an important role in *ex situ* conservation and can maintain the ecosystems to improve the survival of rare and endangered plant species. Botanic gardens have multiple unique features and can play a further role in medicinal plant conservation through the development of propagation and cultivation protocols, as well as undertaking programs of domestication and variety breeding.

Seed banks: Seed banks are methods of conservation by storing the genetic diversity of many medicinal plants through *ex situ* rather than botanical gardens and important to preserve the biological and genetic diversity of wild plant species. It allows relatively rapid access to plant samples for the evaluation of their properties, providing helpful information for conserving the remaining natural populations. The challenging tasks of seed banking are how to reintroduce the plant species back into the wild and how to actively assist in the restoration of wild populations.

Cultivation practice: Cultivation practices are designed to provide optimal levels of water, nutrients, optional additives, and environmental factors like temperature, light and humidity to obtain improved yields of target products. Cultivation under controlled growth conditions can improve the yields of active compounds, which are almost invariably secondary metabolites, and ensures production stability. Cultivation provides the opportunity to use new techniques to solve problems encountered in the production of medicinal plants, such as toxic components, pesticide contamination, low contents of active ingredients, and the misidentification of botanical origin. Moreover, increased cultivation contributes to decreases in the harvest volume of medicinal plants, benefits the recovery of their wild resources, and decreases their prices to a more reasonable range.

Good agricultural practices (GAP): Good Agricultural Practices (GAP) for medicinal plants has been formulated to regulate production, ensure quality, and facilitate the standardization of herbal drugs. Organic farming has received increasing attention for its ability to create integrated, humane, environmentally and economically sustainable production systems for medicinal plants. The aims of organic farming of medicinal plants include producing material with better quality, high productivity, and ensuring the conservation and sustainable utilization of those plants. Organic farming is benign to the environment, and relies upon farm derived renewable resources to maintain biological processes of medicinal plants and ecological balance of habitats.

DISCUSSION

Historical accounts of traditionally used medicinal plants were in use as early as 5000 to 4000 BC in China. The term Ethnobotany was for the first time mentioned orally by John Hershberger in 1895 and work seems to have started with Christopher Columbus in 1492. Ethnobotany is the study of the relationship between people, plants and the environment relating to wide range of disciplines and explains how people of a particular culture and religion knowledge make use of medicinal plants. Those Traditional medicines are used to maintain health and to prevent, diagnose, and treat physical and mental illnesses differently from allopathic medicine based on theories, beliefs, and experiences. Pharmaceuticals industries and western researches on plant based drugs have now rediscovered that plants have much to contribute to the discovery of new, effective, safe and profitable therapeutic agents. The global value of plant based pharmaceuticals in OECD countries in 2000 was estimated to be USD 500 billion.

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CONCLUSION

Ethiopia has constituted around 65,000 species of higher plants with approximately 10%-12% species were endemism and one of the six plant biodiversity rich countries of Africa. Around 1000 medicinal plant species are identified in the

Ethiopian Flora, but, many others medicinal plant species are not yet identified. About 90% of livestock population in Ethiopia relies on treatment of medicinal plants for primary health care. Ethnoveterinary medicine provides traditional medicines, which are locally available and usually cheaper than standard treatments. In Ethiopia medicinal plants species are grown in the natural ecosystem and most of them are collected from the wild. The wood lands, montage vegetation including grassland, forests and the evergreen scrubs and rocky areas contain more medicinal plants this indicated that traditional medicinal plant species are not uniformly distributed throughout the country. The different studies showed that medicinal plants have small fractions from central, north and northwestern part of Ethiopia.

In-situ conservation is the methods of conserved medicinal plant species and protecting them in their natural habitat. *In situ* conservation efforts worldwide have focused on establishing protected areas and taking an approach that is ecosystem-oriented, rather than species-oriented. *Ex-situ* conservation is the methods of conserved medicinal plant species and protected endangered medicinal plant species without their natural habitats. *Ex situ* conservation strategies are gene banks, botanic gardens, seeds banks, field gene banks and tissue culture technique. However traditional medicinal plant resources and their associated indigenous knowledge are declining at an alarming rate, due to ecological shifts; deforestation, urbanization, agricultural expansion and lack of awareness among the community are the critical threats to medicinal plants.

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