

Conservation Status and Diversity of Medicinal Plants Used in Indian System of Medicine - A Survey Report from the Munaru Forest Division, Kerala, India

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ABSTRACT

The traditional source of medicinal plants is an important way for daily curative uses in the rural area throughout Kerala. A survey was carried out in the Munaru forest division, Idukki district, Kerala India. The present study identified traditionally using 31 species of medicinal plants distributed in 31 genera belonging to 24 families are used in Indian system of medicine and folklores of study area to treat various diseases. Moreover, among the plant studied habit wise analyzed they are 9 herbs, 5 shrubs 14 trees and 3 Climbing shrubs, are recorded. The status of plants are also analyzed and recorded as 23 are rare, 3 are endangered 2 Critically endangered, each one of Thread, Vulnerable and least concern in the study area. In this communication, the information collected from the study area were compared with the already existing literature of Indian medical flora and RED data book. The medicinal plants are arranged alphabetically followed by Botanical name, Family name, Voucher specimen number, Local name, English name and used in Ayurveda, Siddha and Unani of the Indian system of medicine are discussed. Due to increase of overexploitation, Urbanization, Deforestation and Health care need of herbals etc., there is considerable depletion of plant genetic resources wealth, many of them being in the process of extinction day by day. The conservation efforts are very much needed in the in-situ conservations and ex-situ conservations methods to the study areas.



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INTRODUCTION

India is one of the richest floristic regions of the World and has been a diverse source of plant products and many of these plants species are used for medicinal purposes. The medicinal plants occupy an important position in the social-culture, and therapeutic arena of India [1]. Traditional medicinal plants are an important element of indigenous medical systems in India and rest of the world. Traditional medicine refers to any ancient and culturally based health care practice differing from Modern medicine and is largely transmitted orally by communities of different cultures. Traditional system of medicine is one of the centuries-old practice and long-serving companion to human kind in the fight

against disease and in leading a healthy life.

India, with its diverse agro-climatic conditions and regional topography, has been considered as the treasure house or botanical garden of plant genetic resources. Hence, India is recognized as one of the world's top 12 mega diversity nations. Our herbal wealth constitutes more than 8,000 species and accounts for around 50% of all higher flowering plant species of India; around 70% of the medicinal plants in the country are spread across the tropical forests of Western Ghats. However, available information shows that 1,800 species are used in Classical Indian systems of medicines. Ayurveda uses 1,200, Siddha -900, Unani -700, Amchi -600, Tibetan-450. The emerging field of herbal products industry holds a great potential to the economic development of the Indian region. Usage of herbs as a source of food, medicine, fragrance, flavour, dyes and other items in Indian systems of medicine is in increasing trend. It is estimated that, 95% of the medicinal plants used in Indian herbal industry today are collected from wild. About half a million tones of dry material is collected through destructive means indiscriminately and 1.65 lakh ha. of forest is cleaned and felled each year. With the increase in population, rapid expansion of area under food and commercial crops, deforestation, extension of urban area, establishment of industries in rural areas, etc., there is considerable depletion of plant genetic resources wealth, many of them being in the process of extinction day by day [2, 3].

Kerala is the state on the southern western Malabar Coast of India. Spread over 38,863 km². Kerala is the twenty-first largest Indian state by area. It is bordered by Karnataka to the north and northeast, Tamil Nadu to the east and south, and the Lakshadweep sea to the west. Malayalam is the most widely spoken language and is also the official language of the state. Kerala is a homeland of a number of tribal communities. Majority of them inhabit the western slope of the Western Ghats. Thirty-six communities are listed in the scheduled tribes list of the State and their population according to 1991 census. Among them the Mudhuvan, Mannan, Malaiaraian and Ooralys tribes well knowledgeable in the use of medicinal plants for day to day life and healthcare in Idukki district.

Objective of this study was to interact with local traditional healers, tribals and document their knowledge on medicinal uses of plants. To collect scientific information and identify the medicinal plants used by the tribal and rural people of the study area for correlate with our Indian system used medicinal plants. A large number of plants are still unexplored

regarding their uses as food and medicine. So one of the objectives of the present work was preparation of a report on plants used as non-formal food and medicinal resources by the Mudhuvan, Mannan, Malaiaraian and Ooralys tribal and rural people of Munnar forest division, Idukki district of Western Ghats of Kerala, comparatively used in Ayurveda, Siddha and Unani system of medicine. To provide status and conservation strategies of the plant in order to conserve the plants which are endangered, rare and common in the study area. In Kerala ethnomedical value of plants in possession of various tribals and rural communities for treating various diseases and disorders has been done to some extent [4-6].

A perusal of these reports suggested that the ethnobotanical survey in Munnar forest division, Idukki district of Western Ghats of Kerala is incomplete and documentation of Plants used in Indian system of medicine, diversity, conservations status of medicinal plant are need to documentation. There is no previous report in the records of ethnobotanical knowledge, Plants availability of used in Ayurveda, Siddha and Unani of medicine and their status from Mudhuvan, Mannan, Malaiaraian and Ooralys tribals of Munnar forest division of Idukki district, Kerala. Therefore, the current investigation aims to identify, collect, document the medicinal plants status used in Indian system of medicine and how they are used traditionally for the treatment of various disorders in Munnar forest division. Documentation of traditional ethnomedicinal knowledge, indigenous herbal preparation for various ailments could help in preserving knowledge and creating awareness regarding the need for conservation of biological resources. As well as their uses in Indian system of medicine also referred. Moreover, we must create awareness, education to traditional people about conservation methods of medicinal plants and how to promote the cultivation of some rare plants used in Indian system of Medicinal plants in future.

Present knowledge on local folk medicine

The Knowledge of Ethnobotanical [7, 8] and conservation status has been documented from various parts of Indian subcontinent [9-11]. In Kerala state, ethnomedicinal value of plants in possession of various tribal and rural folk communities for treating various diseases, Their status have been done to some extent [12-14]. A perusal of the literature reveals that several ethnobotanical studies and conservation status among various tribals have been reported from the various district of this state except these pre dominant Mudhuvan, Mannan, Malaiaraian and Ooralys tribes in Munaru for-

est division, Idukki district, which has not yet been studied from ethnobotanical and conservation status point of view.

Study Area

Idukki District

Idukki district is located in the middle part of Kerala in the Idukki District. It is bounded on the East by Madurai District of Tamil Nadu, on the West by Ernakulam and Kottayam Districts of Kerala, on the South by Pathanamthitta District and on the North by Trichur and Coimbatore Districts of Kerala and Tamil Nadu States respectively.



Figure 1: Map of Study Area

It lies between 9° 15' and 10° 21' of North latitude and 76° 37' and 77° 25' of East longitudes with an area of 5,087 sq.km. Idukki ranks first among the districts in the state in respect of area and forming 13 percent of the total area of the state. It extends by 115km. from South to North and 67km. from East to West.

Munnar Forest Division

As far the Munnar forest Division are concern it is located in the middle part of Kerala in Idukki District. It consists of four forest ranges such as Mannar, Devikulam, Adimaly and Neriya Mangalam ranges. The forest areas such as Lakshmi, Rajamalai in Munnar range, ODK, Top station, Silent valley, Poopara and Bodimettu forest areas in Devikulam range, Choorakota, Chinnapara, Thumbipara forest areas in Adimaly Range and Inchapara, Muduvanpara, Mamalaikandam, Valera and audit 4 Mannium forest areas in Neriya Mangalam Range are the demarcated areas of rich floristic diversity. Due to altitudinal variations there is remarkable changes and difference in the climate within this tract.

Climate and Vegetation

Major area of the division falls in the Western slope of the Western Ghats. This area receives rains, from

both monsoons viz., the Southwest and North - East and showers during April – May. The annual average rainfall is about 3000 mm. The regular monsoon commences by June and lasts till the end of August. The climate is more or less temperate in the high altitude areas and the temperature varies from 6° C to 26° C.

Forest and Tribal settlement areas

There are different tribal communities namely Mudhuvan, Mannan, Malaiaraian and Ooralys are settled in different parts of the district. Among them some of them are Elampilacheri, Mamalaikandam and olavanthodu in Valera forest station, Choorakota, Chinnapara, Thumbipara tribal colonies in Machipulav forest station and Sandoz tribal colony in Munnar ranges. The survey team interacted with the tribal and local peoples and collected useful information on the folk medicinal plants and conservation status of medicinal plants in their home gardens with the cooperation of forest department officials of Munnar forest division.

Agricultural Crops

The agricultural crops like Coffee, Tea, Pepper, Coconut, Cardamom, Ginger, Plantain and Paddy etc., are the major agricultural crops found throughout the district. The soil and climate of the Munnar district is very suitable for agricultural crops and it promotes luxuriant growth of the vegetation.

METHODOLOGY

The study was conducted during 2015 (25 days) from 16th November 2015 to 10th December 2015 by the research team of Survey of medicinal plants unit, Regional Research Institute of Unani Medicine under the CCRUM (Ministry of AYUSH) New Delhi, to collect information on medicinal plants used by traditional healers in the the Munaru forest division, Idukki district of Western Ghats of Kerala (Figure 1). The ethnomedicinal information and medicinal plants status was gathered from the indigenous people of the study area called Mudhuvan, Mannan, Malaiaraian and Ooralys, They are oldest groups of the branch of ethnic people in South India. They reside in remote and inaccessible forest areas and practice indigenous phytotherapy to treat common ailments. During the course of exploration of ethnomedicinal plants information has been gathered from the healers inhabiting the forest areas who have sound knowledge of herbal remedies and compared with Indian system of medicine. For many decades, the tribal community has a traditionally self-managed system of folk medicine and primary healthcare mainly based on herbal remedies.

Table 1: Conservation Status and Diversity of Medicinal Plants Used in Indian System of Medicine - A Survey Report from the Munaru Forest Division, Kerala, India

S.No	Botanical Name/ Family Name/ V.Sp No:	Common Name	Local name	Use in Unani system	Use in Siddha system	Use in Ayurveda system	Life Form/ Habit	Conservation Status
1.	<i>Acorus calamus</i> Linn. / Araceae / V.S, NO: 11732	Sweet Flag, Bach	Vasambu	Yes	Yes	Yes	Aromatic marsh herb	Least Con- cern Rare
2.	<i>Aegle marmelos</i> (L.) Correa / Rutaceaea / V.S,NO: 13153	Wood Apple	Vilvam	Yes	Yes	Yes	Tree	Rare
3.	<i>Amorphophallus sylvaticus</i> (Roxb.) Kunth / Araceae / V.S,NO:13665	Kaattu Karunai	kattu- chena	Yes	Yes	Yes	Herb	Rare
4.	<i>Bacopa monnieri</i> (L.) Pennell. / Scrophulariaceae / V.S, NO: 2550	Water hyssop, Brahmi	Neer Brahmi	Yes	Yes	Yes	Herb	Rare
5.	<i>Buchanania cochinchinensis</i> (Lour.) M.R. Almedia. / Anacardiaceae / V.S,NO:13769	Almon- dette Tree, Chi- ronji	Charam	Yes	Yes	Yes	Tree	Rare
6.	<i>Butea monosperma</i> var. Lutea/ Fabaceae / V.S,NO: 13867	Bastard Teak Or Exotic Yellow Palash	Parasa	Yes	Yes	Yes	Tree	Rare
7.	<i>Careya arborea</i> Roxb./ Lecyathi- daceae / V.S, NO: 13213	Wild Guava	Pelai- maram	Yes	Yes	Yes	Tree	Rare
8.	<i>Casearia tomentosa</i> Roxb. / Salicaceae / V.S,NO:12511	Toothed Leaf Chilla	Kottu- kkovai	No	No	Yes	Tree	Rare
9.	<i>Celastrus pan- iculatus</i> Willd./ Celastraceae / V.S,NO: 12988	Black Oil Plant	Valuluvai	Yes	Yes	Yes	Shrub	Rare
10.	<i>Chlorophytum borivilianum</i> San- tapau & R.R. Fern. / Asparagaceae (Liliaceae) / V.S, NO:10059	Borivili	Taniravi thang	Yes	No	Yes	Herb	Critically Endan- gered
11.	<i>Commiphora mukul</i> (Hook. ex Stocks) Engl. / Burseraceae / V.S,NO:13716	Guggul	Mahisaki gug- galu	Yes	Yes	Yes	Tree	Critically Endan- gered

Continued on next page

Table 1 continued

S.No	Botanical Name/ Family Name/ V.Sp No:	Common Name	Local name	Use in Unani system	Use in Siddha system	Use in Ayurveda system	Life Form/ Habit	Conservation Status
12.	<i>Curculigo orchioides</i> Gaertn. / Hypoxidaceae / V.S,NO: 12588	Black Musli	Nilap-pana-ikkilanku	Yes	Yes	Yes	Herb	Rare
13.	<i>Cycas beddomei</i> Dyer. / Cycadaceae / V.S,NO:10013	Beddome's Cycas	Intapanai	Yes	Yes	Yes	Tree	Rare
14.	<i>Decalepis hamiltonii</i> Wight.& Arn./ Asclepiadaceae / V.S, NO: 11898	Mahaali Kizhanku	Peru Nannari	No	Yes	Yes	Climber	Endangered
15.	<i>Gymnema sylvestre</i> (Retz.) Schult. / Apocynaceae (Asclepiadaceae) / V.S, NO: 13526	Small Indian Ipecae	Kogilam	Yes	Yes	Yes	climbing shrub	Rare
16.	<i>Helicteres isora</i> L. / Sterculiaceae / V.S,NO: 13330	East Indian Screwtree	Valampuri	Yes	Yes	Yes	Shrub	Rare
17.	<i>Hemidesmus indicus</i> (L.) R. Br./ Periplocaceae / V.S,NO: 11853	Indian Sarsaparilla	Nannari	Yes	Yes	Yes	A slender twiner	Rare
18.	<i>Mahonia leschenaultii</i> (Wallich ex Wight & Arnott) Takeda / Berberidaceae / V.S, NO: 12011	Toda Plant	Mulluma-njanathi	No	Yes	Yes	Erect Shrub	Rare
19.	<i>Mallotus philippensis</i> (Lam.) Mull.Arg./ Euphorbiaceae / V.S,NO: 13491	Red Berry	Kapila Poti	Yes	Yes	Yes	Tree	Endangered
20.	<i>Mesua ferrea</i> L./ Calophyllaceae / V.S,NO: 11851	Iron Wood Tree.	Tadin-angu	No	No	Yes	Tree	Rare
21.	<i>Mucuna pruriens</i> Linn./ Fabaceae / V.S,NO: 11648	Cow Hage	Puna-ikkali	Yes	Yes	Yes	Climber	Rare
22.	<i>Nothapodytes nimmoniana</i> (Graham.) Mabb./ Icacinaceae / V.S,NO: 10883	Ghanera	Arali	No	Yes	Yes	Shrub	Rare
23.	<i>Oroxylum indicum</i> (L.) Kurz./ Bignoniaceae / V.S,NO:9597	Damocles	Putapuspam	Yes	Yes	Yes	Tree	Rare

Continued on next page

Table 1 continued

S.No	Botanical Name/ Family Name/ V.Sp No:	Common Name	Local name	Use in Unani system	Use in Siddha system	Use in Ayurveda system	Life Form/ Habit	Conservation Status
24.	<i>Pterocarpus marsupium</i> Roxb. / Fabaceae / V.S,NO: 13231	Malabar Kino Tree	Vengai	Yes	Yes	Yes	Tree	Rare
25.	<i>Pterocarpus santalinus</i> L.f. / Fabaceae / V.S,NO: 14103	Red Sanders	Sivappu Sandhanam	Yes	Yes	Yes	Tree	Endangered
26.	<i>Rauvolfia serpentina</i> (L.) Benth. ex Kurz / Apocynaceae / V.S,NO: 9902	Snake-wood	Chevanamalpodu	Yes	Yes	Yes	Herb	Threats
27.	<i>Rubia cordifolia</i> L./ Rubiaceae / V.S,NO: 13552	Indian Madder	Manditti	Yes	Yes	Yes	Herb	Rare
28.	<i>Saraca asoca</i> (Roxb.)Willd./ Fabaceae (Leguminosae) / V.S,NO:11240	Ashok Tree	Asogam	Yes	Yes	Yes	Tree	Vulnerable
29.	<i>Semecarpus anacardium</i> L. f. / Anacardiaceae / V.S,NO: 14000	Marking Nut Tree	Thenkotta	Yes	Yes	Yes	Tree	Rare
30.	<i>Spilanthes acmella</i> Murr. / Asteraceae / V.S, NO: 13052	Toothache Plant	palvali poondu	No	Yes	Yes	Herb	Rare
31.	<i>Swertia chirata</i> Buch.-Ham. ex Wall. / Gentianaceae / V.S,NO:14259	Chirayita	Nilavembu	No	No	Yes	Herb	Rare

The knowledge about medicinal plants is rather specialized and is limited to a few members in the tribal community who are recognized as 'Vaidhyar' (also known as medicine men, informant and traditional healer). Traditional healers commonly begin their training as children or teenagers working as assistants to their mothers, fathers and to other relatives who are recognized healers. After having trained for a number of years, the apprentice will be ceremonially granted the authority to use a given treatment. This individual will be recognized by others in their culture as having mystical power to heal, as well as having the power to train others in the use of medicinal plants. They don't have Knowledge about the degradation of plants and how should protect the rare plants in this regions. The survey teams teach to the tribals how to conserve the medicinal plants in the study areas.

Data collection

The ethnomedicinal information was collected through general conversations with traditional healers and questionnaires were used to gather their knowledge. Details of medicinal plants used, mode of treatment, methods of preparation, types of administration and conservation status were documented by interacting with them as well as through direct observations. The information got from the tribals was recorded in field notebooks, ethnobotanical data collecting proforma sheet [15–17] and compared with the previously reported literatures of Indian system of medicine [14, 18]. The collected medicinal plants species were identified by the local people with their vernacular names, photographed and sample specimens were collected for the preparation of herbarium. The Flora of Presidency of Madras [19] and The Flora of Tamil Nadu Carnatic [20] were used to ascertain the nomenclature. The voucher specimens were deposited in the herbarium at Regional Research Institute of Unani Medicine, Chennai. We recorded the status of medicinal plants in the study area with the help of RED data book.

RESULT AND DISCUSSION

Western Ghats of Munaru forest division has a variety of medicinal plants which are used by tribes and traditional healers for their primary health care. It is consists of four forest ranges such as Mannar, Devikulam, Adimaly and Neriya mangalam ranges. The forest areas such as Lakshmi, Rajamalai in Munnar range, ODK, Top station, Silent valley, Poopara and Bodimettu forest areas in Devikulam range, Choorakota, Chinnapara, Thumbipara forest areas in Adimaly Range and Inchapara, Mudu-

vanpara, Mamalaikandam, Valera and audit 4 Mannium forest areas in Neriya mangalam range are the demarcated areas of rich floristic diversity. Due to altitudinal variations there is remarkable changes and difference in the climate within this tract.

The present study identified 31 no of rare wild medicinal plant species used in the Indian system of medicine like Ayurveda, Siddha, Unani and also folk medicine of the study area. Plants distributed in 31 genera belonging to 24 families, and used for various diseases in Indian system of medicine as well as folk medicine of the study area to treat various diseases such as dry cough, menstrual disorders, piles, viral fever, kidney stone, joint pain, jaundice, skin diseases, contraceptive purpose etc. The result of the survey presented in Table 1, in which the plants are arranged alphabetically by botanical names for each species. The following ethnobotanical information were provided; Botanical names, Voucher specimen numbers, Family name, Local names, Habit, Status of plant according to the informations collected and cross checked with RED data book. Moreover life forms of medicinally used plants are analyzed. They are 14 trees, 09 herbs, 5 shrubs, and 3 Climbing shrub, are recorded and statuses of plants are 23 rare, 3 Endangered, 2 Critically endangered, each one of Threat, Vulnerable and least concern in the study area.

Conservation of medicinal

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 while maintaining its potential to meet the needs and aspirations of future generations".

Strategies and priorities

The primary goals of biodiversity conservation as envisaged in the World Conservation Strategy can be summarized as follows:

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 sustainable use of species and ecosystems which support millions of rural communities as well as major industries.

Strategies for conservation of medicinal plants

The conservation of the wild medicinal plants or any other such threatened species can be tackled by scientific techniques as well as social actions. There are

basically three scientific techniques of conservation of genetic diversity of these plants.

1. Legislation
2. In-situ conservation
3. Ex-situ conservation

Legislation

There are no separate policies or regulations for conserving medicinal plants growing in forests in India. Their conservation is covered under existing laws pertaining to forestry. Following are the laws formulated by government of India for conservation of forests which directly or indirectly protect the wild herbal flora.

1. Forest Act, 1927
2. Wildlife (Protection) Act 1972 and Wildlife (Protection) Amendment Act 1991
3. Forest (Conservation) Act, 1980
4. Environment Protection Act, 1986
5. National forest policy, 1988
6. National biodiversity act, 2002
7. The scheduled tribes and other traditional forest dwellers act, 2006

In-situ conservation

1. Conservation of a given species in its natural habitat or in the area where it grows naturally is known as in-situ conservation.
2. It includes Gene bank/Gene sanction, Biosphere reserves, national parks, sacred sites, Sacred grooves etc.
3. It is only in nature that plant diversity at the genetic, species and eco-system level can be conserved on long-term basis
4. It is necessary to conserve in distinct, representative biogeographic zones inter and intra-specific genetic variation.

It is a cost-effective way of protecting the existing biological and genetic diversity. The 'in-situ' or on-site conservation wherein a wild species or stock of a biological community is protected and preserved in its natural habitat. The prospect of such an 'eco-centric', rather than a species-centred approach is

that it should prevent species from becoming endangered by human activities and reduce the need for human intervention to prevent premature extinctions. Establishment of biosphere reserves, National parks, wild life sanctuaries, sacred groves and other protected areas forms examples of 'in-situ' methods of conservation. The idea of establishing protected area network has taken a central place in all policy decision process related to biodiversity conservation at national, international and global level.

The most commonly referred in situ conservation methods are highlighted below

Biosphere reserves: Sacred groves, the other complementary methods of in-situ conservation are: On-farm conservation, Home gardens, Zero energy input based model forest.

Outlines for in-situ management

1. The Parks Department should prepare a policy at national level on the conservation and utilization of medicinal plants in protected areas.
2. The policy should include: Identifying which of the protected areas are most important for medicinal plants;
3. Targets and techniques for recording and monitoring medicinal plants in protected areas;
4. Techniques and procedures for collection of medicinal plants within protected areas.
5. The Parks Department should assess the extent to which the protected areas system covers the medicinal plants of the country. It should then create new protected areas and extend existing ones to ensure that all the medicinal plants of the country are conserved. The Parks Department should devise economic and social incentives for maintaining natural habitats and wild species.
6. Park managers should ensure that the conservation and exploitation of medicinal plants are incorporated into site management plans.
7. Species that are heavily depleted by over-collection should be re-introduced into areas where they once grew wild.

Ex-situ conservation

Conservation of medicinal plants can be accomplished by the ex-situ i.e. outside natural habitat by cultivating and maintaining plants in botanic gardens, parks, other suitable sites, and through long term preservation of plant propagules in gene banks

(seed bank, pollen bank, DNA libraries, etc.) and in plant tissue culture repositories and by cryopreservation).

Field gene bank (field repository/clonal repository), Seed gene bank, National active germplasm sites, Cryopreservation (in liquid nitrogen at -165°C to -196°C) Which includes Seed preservation, Pollen preservation, Exchange of germplasm.

In vitro (on tissue culture) conservation

The essential prerequisites for an in vitro conservation programme are creation of special facilities (culture rooms with controlled environment, artificial lights, laminar airflow cabinets, autoclave, etc.) and trained scientists and technicians. Information on the in vitro multiplication and/or conservation protocols of those plant species is also desirable. Any in vitro conservation programme primarily comprises two stages:

1. In-vitro multiplication to build up a large number of plants, and
2. In vitro storage. The material stored in vitro may be in the form of meristems, shoot tips, axillary buds, embryos, and even callus and cell suspension. In vitro gene banks are easy to maintain and often inexpensive provided effective storage systems are developed.

Botanical Gardens/Arboreta

A botanical garden is an institution holding documented collection of living plants for the purpose of scientific research, conservation, display and education [21]. They serve as repositories of germplasm collections, specially rare and endangered ones of indigenous and exotic origin [22]. Botanic Garden Conservation International (BGCI), an international organization with its headquarters in London (UK) was established in 1987 for global cooperation and monitoring of the conservation programmes of botanical gardens. The BGCI has 500 member botanical gardens in 113 countries all over the world [21]. There are about 1,846 botanical gardens worldwide as per the BGCI database. India has a network of about 140 botanical gardens which include 33 botanical gardens attached to 33 universities botany departments. But hardly 30 botanical gardens have any active programme on conservation. Tropical Botanical Gardens & Research Institute (TGBRI), located in a degraded forest region of Western Ghat Mountains in Kerala has an excellent example in ex-situ conservation of plant diversity in India.

CONCLUSION

Present research deals with the conservation and importance of the rare and endangered medicinal plants used in Indian system of medicine. It is an effort for their rapid propagation as well as for their ex-situ conservation in Herbal Garden. Current study aimed for the collection/Propagation of the diverse Medicinal plants including underground Medicinal plants. Among the introduced Medicinal plants some are endangered need for urgent protection and conservation. Not only in India also all over in the World Medicinal Plants (MPs) are useful for treatment of various disorders and are prime sources of traditional medicine. Demands of Medicinal Plants (MPs) are increasing day by day due to rich capacity for treatment of certain disorders and also their less or no side effect. And also conservation and cultivation of rare and endangered medicinal crops can be treated as an alternative income generation source for the rural unemployed without hampering their ongoing income generating activities. Compared to other crops, medicinal crops cultivation requires less attention and expenditure and can be successfully adopted by the cultivators. By doing so, we will not only be able to conserve the precious wealth of medicinal plants but also we will achieve the goal of conserving the rare and endangered species, which are threatened, and at the verge of extinction. In this regard, we should take attention to conserving rare and endangered medicinal species. Moreover with the help of modern agro techniques the rare medicinal plants should be cultivated in rural areas and create awareness among farmers.

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Ethics Statement

The study was carried out in accordance with the recommendations of the Code of Ethics of the International Society of Ethnobiology. Ethics approval was not required by the Institutional Ethical Com-

mittee. Verbal informed consent was obtained from each informant prior to all interviews. During this discussion, the research objectives and interview procedure were explained to each informant and confidentiality was assured. Consent for photos was also taken and kept in the Herbarium of Survey of Medicinal Plants Unit, Regional Research Institute of Unani Medicine, No. 1, West Madha Church Road, Royapuram Chennai-13.

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Conflict of Interest

The authors declare that they have no conflict of interest.

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