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Medicinal Plant Diversity In India And Their Future Prospects.

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ABSTRACT

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. Although there are around 8,000 medicinal plant species used by different communities in India across different ecosystems, only around 10% of them are in active trade. There is need to encourage multiplication and cultivation of these plants. The three basic scientific techniques of conservation of genetic diversity of these plants are legislation, in-situ conservations and ex-situ conservations.

Keywords: Biodiversity – overview, How many herbs, Botanical base, Geographic distribution, Rising Demand

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INTRODUCTION

Hence, India is recognized as one of the world's top 12 mega diversity nations 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. 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 [1, 2].

Biodiversity – overview

Although there are around 8,000 medicinal plant species used by different communities in India across different ecosystems, only around 10% of them (880species) are in active trade. Among these, around 48 species are exported in the form of raw drugs and extracts, while around 42species are imported. The wild populations of about 100 of the traded species are known to have declined, thereby making them to be considered threatened. . Biodiversity is not uniformly distributed on the earth and shows prominent latitudinal and altitudinal gradients. At least five major mass extinctions have occurred in the past at geologic-time boundaries. Studies indicate that we have entered into the sixth phase of mass extinctions**.** In all ecosystem types, terrestrial, freshwater and marine, species populations are declining. The current rates of species extinction are 100–1000 times higher than the background rate of 10^{-7} species/species year inferred from fossil record [3, 4].

How many herbs

Habit wise analysis of these 880 medicinal plants, indicates that these are well distributed across different life forms with the majority belonging to the herbaceous category One of the classics of herbal medicine was written over 350 years ago, Culpeper's The Complete Herbal, published in London in 1649. This has proved to be an enduring book, going through 100 editions.

Nicholas Culpeper (1616-1654) was born into a landed gentry family and studied at Cambridge University, but abandoned his studies upon the death of his fiancee who was killed by lightening. He apprenticed with a London apothecary and set up practice among the poor, often charging no fee for his herbal remedies [5, 6].

- Basil
- Cilantro
- Dill
- Mint
- Oregano
- Parsley (Italian)
- Rosemary
- Sage
- Thyme

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Botanical base

It is interesting to note that these 880 traded plants are distributed across 151 families. Description: Clear gel base that can be used as is or diluted with additional plant extracts & active ingredients. Gel is mildly exfoliating, cooling and moisturizing due to the various extracts in it. Can be used as hydrating, mild exfoliating mask or as a ment gel. Vegan. Ingredients: Aloe barbadensis (Aloe) juice, hydroxyethyl cellulose, glycerin, carica papaya (Papaya) extract, carica papaya (Green Papaya) extract, ananas comosus (Pineapple) extract, phenoxyethanol, tetrasodium EDTA, citric acid [6, 7].

Geographic distribution

India is one of the world's top 12 mega diversity countries with 10 bio geographic regions. India alone includes two among the world's eight biodiversity hotspots World Health Organization has listed over 21000 plant species used around the world for medicinal purpose. Geographical distribution of dominant land plant forms is mainly controlled by climate. If climate alters, vegetation cover closely follows the change in the climatic patterns. In turn, changes in spatial distribution and composition of terrestrial vegetation (as well as marine biology) alter the climate through modifications of heat and water fluxes, atmospheric gases, and aerosol composition. The red data book lists 427 Indian Medicinal plant entries on endangered species, of which 28 are considered extinct, 124 endangered, 81 rare and 34 insufficiently known [7, 8].

Endangered medicinal plants

Plant parts like leaves, bark, roots, fruits, seeds or even whole plant is indiscriminately collected from wild sources without taking care of saving the plants. Many of the important useful species are on the verge of extinction due to over-exploitation and habitat destruction. Human beings have been using plants as medicine for as long as we have existed on Earth. However, because there have been many more people that are now using such plants in recent years, there has been a huge increase in demand for them [8, 9].

Loss of biodiversity of medicinal plants

Environmental factor

Rainfall- For the past few years the annual rainfall has decreased resulting in the health of many herbaceous species during summer months.

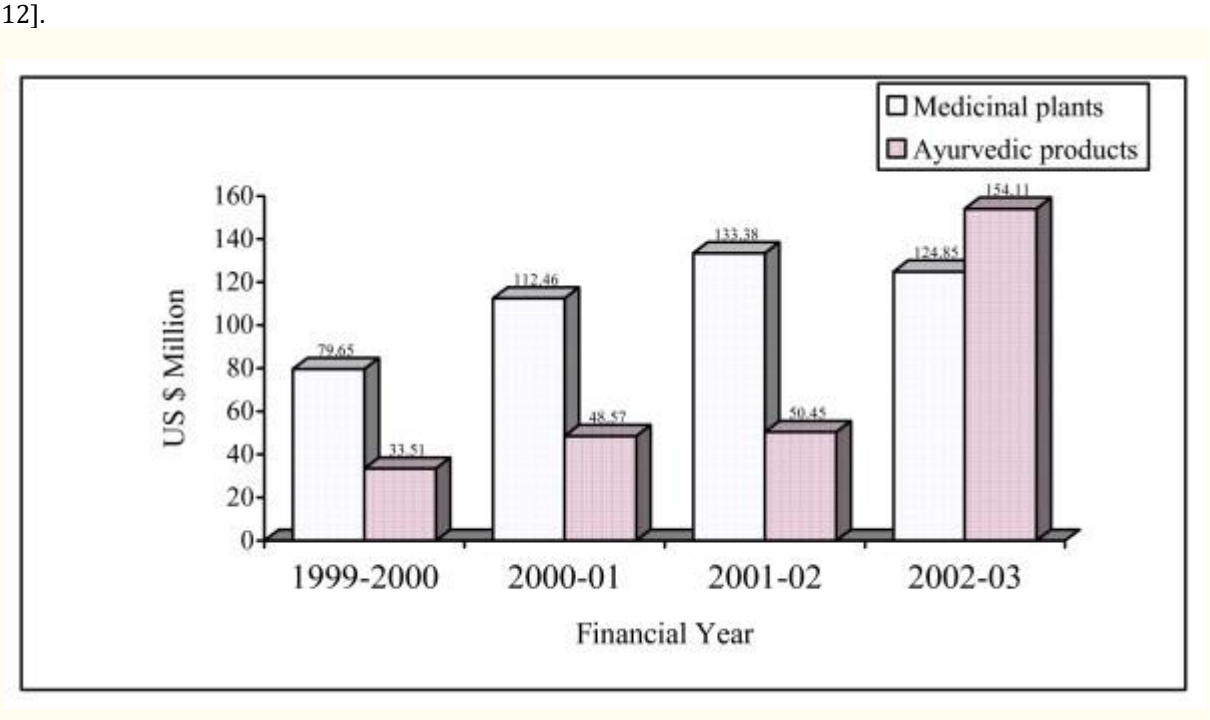
Deforestatins- Deforestation is the purposeful clearing of forested land. Throughout history and into modern times, forests have been razed to make space for agriculture and animal grazing, and to obtain wood for fuel, manufacturing, and construction.

Siltation of water bodies: Siltation of water bodies in the forests has resulted in the reduction of water holding capacity heading to depletion of underground water.

Lack of pollinators: Honey bee colonies have declined in numbers to the extent of 50- 60%, in forests and other areas. Loss of pollinators has resulted in reduced seed set and dispersal of seeds.

Rising demand

The World Health Organization (WHO) has estimated the present demand for medicinal plants is approximately US $14 billion per year. The demand for medicinal plant-based raw materials is growing at the rate of 15 to 25% annually, and according to an estimate of WHO, the demand for medicinal plants is likely to increase more than US $5 trillion in 2050. In India, the medicinal plant-related trade is estimated to be approximately US $1 billion per year According to an estimate, the quantity of export of Ayurvedic products produced in India has tripled between last two financial years (2001–2002 and 2002–2003 [10-12].



Increasing rarity

The continuous exploitation of several medicinal plant species from the wild and substantial loss of their habitats during past 15 years have resulted in population decline of many high value medicinal

plant species over the years. The primary threats to medicinal plants are those that affect any kind of biodiversity used by humans The weakening of customary laws, which have regulated the use of natural resources, are among the causes of threatening the medicinal plant species These customary laws have often proved to be easily diluted by modern socio-economic forces There are many other potential causes of rarity in medicinal plant species, such as habitat specificity, narrow range of distribution, land use disturbances, introduction of non-natives, habitat alteration, climatic changes, heavy livestock grazing, explosion of human population, fragmentation and degradation of population, population bottleneck, and genetic drift. Additionally, natural enemies (i.e., pathogens, herbivores, and seed predators) could substantially limit the abundance of rare medicinal plant species in any given area.

In addition to the consumption of medicinal plants by animals, there are physical ailments in humans, which are cured by different species of the same genera. For example, the malarial fever is treated by many species of Swertia (e.g. Swertia chiraiyta, S. angustifolia, and S. cordata). Similarly, different species of Berberis (e.g. Berberis aristata, B. asiatica, B. lycium, B. chitria and B. jaeschkeana) are used as a source of berberidine to cure certain eye diseases. Furthermore, different species of the same genera contain different proportions of chemical quantity, and there is a preference over their demand; however, the degree of threat for their exploitation is relatively lower than those species, which do not have alternatives [12-14].

An estimated 4,000 to 10,000 species of medicinal plants face potential local, national, regional or global extinction, with subsequent serious consequences for livelihoods, economies and health care systems Although, a few studies exist on the rare and endangered medicinal plant species of the northern India none of these studies have complete data set for even a single species. In 2003, 71 rare and endangered medicinal plant species have been assessed for the northwest Himalaya during the Conservation Assessment and Management Plan workshop, according to the guidelines of the World Conservation Union. In northern India, Aconitum is the rarest genus with 5 species, followed by Rheum with 4 rare species. Out of the 71 rare medicinal plants, 92% are in active trade; 74% are traded nationally and 35% are traded internationally.

The meager availability of data on the population and quantum of rare species in nature, however, has restricted their categorization to a few species on the basis of herbarium collection and by consultation by a few experts The present assessments are also questioned for their validity on the assignment of threat categories to the species, including the number of taxa in danger for specific area. The problems in assessing the species is increased in the mountainous region, especially high altitude areas because of tough and inaccessibility of the terrain, inhospitable climatic conditions, and short life cycle of plants. Most of the available data have been collected from the easily accessible areas in these mountains. Indigenous communities and commercial herb gatherers also raid these same areas for collection of medicinal plants. Therefore, the estimated population density of categorized rare medicinal plants is not precise because it differs the areas that never and hardly undergone any collection of such rare medicinal plant species.

Cultivation of medicinal plants

Information on the propagation of medicinal plants is available for less than 10% and agro-technology is available only for 1% of the total known plants globally This trend shows that developing agro-technology should be one of the thrust areas for research. Furthermore, in order to meet the escalating demand of medicinal plants, farming of these plant species is imperative. Apart from meeting the present demand, farming may conserve the wild genetic diversity of medicinal plants. Farming permits the production of uniform material, from which standardized products can be consistently obtained. Cultivation also permits better species identification, improved quality control, and increased prospects for genetic improvements. Selection of planting material for large-scale farming is also an important task. The planting material therefore should be of good quality, rich in active ingredients, pest- and disease-resistant and environmental tolerant. For the large scale farming, one has to find out whether monoculture is the right way to cultivate all medicinal plants or one has to promote polyculture model for better production of medicinal plants [15, 16].

Studies conducted on the agro-forestry of medicinal plants elsewhere suggest that since many medicinal plant species prefer to grow under forest cover, agroforestry offers a convenient strategy for their cultivation as well as conservation through: 1) integrating shade tolerant medicinal plants as lower

strata species in multistrata system, 2) cultivating short cycle medicinal plants as intercrops in existing stands of tree crops, 3) growing medicinal tree as shade providers and boundary markers, and 4) inter-planting medicinal plants with food crops Notwithstanding, it is understood that the cultivation of medicinal plants is not an easy task as the history of medicinal plants farming reflects. Many farmers in trans-Himalayan region of northern India have replaced the medicinal plants farming with common crops [i.e., peas (Pisum sativum), potatos (Solanum tuberosum) and hops (Humulus lupulus)] due to the lengthy cultivation cycle of medicinal plants like Saussurea costus The cost of many medicinal plants in northern India is lower than many seasonal vegetables which is a cause of scanty farming of medicinal plants.

Attempts are being made by different organizations to cultivate various medicinal plant species, including rare and endangered categories. Agro-technology for about 20 species of rare and endangered medicinal plants of the northern India has been developed by different organizations However, the per hectare cost of cultivation, total annual production and cost benefit ratio fluctuate with different medicinal plant species. Out of 10 selected rare and endangered medicinal plant species, Rheum emodi was calculated as a most beneficial cash crop of the medicinal plant in terms of net income generation in northern India . At present, however, the farming of most of the medicinal plant species is being operated on a small scale and is restricted to a few hectares of land in various states of northern India. There is an uncertainty of obtaining the necessary permits from government agencies for cultivation of medicinal plants. Additionally, many farmers are unaware about the agency responsible for issuing permits. If the farmers are not granted permits needed to cultivate, they are forced to sell their products on the illegal market, which exposes them to action by government agencies and the exploitation by middlemen [17, 18].

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.They serve as repositories of collection Botanic Garden Conservation International (BGCI), an international organisation with its headquarters in London (UK) was established in 1987 for global co-operation and monitoring the conservation programmes of the botanical gardens. The BGCI has 500 member botanical gardens in III countries all over the world.[9] There are about 1,846 botanical gardens worldwide as per the BGCI database. 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 [19, 20].

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