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Study the Environmental Challenges on Medicinal Plants in Vindhya range of Uttar Pradesh, India

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Abstract-

The plant kingdom includes many species producing a diversity of phytochemicals and bioactive molecules. Medicinal plants have long been utilized in traditional medicine and worldwide ethnomedicine. Despite the advancement reached in modern medicine and pharmaceutical industries. Medicinal plants currently are still employed in cosmetics, food, teas, as well as alternative medicine. The growing interest in medicinal plants and their ability to offer economical uses is gaining more attention. This paper review various studies that investigate impacts of environmental challenges on medicinal plants in Vindhya region ofUttar Pradesh in India.This study reviews the emerging importance of medicinal plants and how their production and sustainability is affected by environmental factors. This study concludes that, the growing demand and interest in medicinal plants and their potential to increase the need for increased investment on drug policy, safety research programs and innovative solutions focusing on effectiveness of medicinal plants to preventing, curing, and treating of health-related problems in society.

Keyword- Medicinal plant, Environment al challenges, Uttar Pradesh, Ethnobotany, Plant medicine

Introduction

Medicinal plants are ubiquitous and universally recognized as vital component for human and animal survival and play key role in maintaining the world's environmental balance. Over centuries, cultures around the world have learned how to grow anduse medicinal plants (MP) naturally and traditionally to fight diseases, illness and maintain health and the sale of these plants are important source of livelihood for indigenous and rural populations who are the immense reservoirs of traditional knowledge [1]. In recent decades, world's soil is deteriorating, the world is recognizing that environmental challenges have significant impact development environmental pathways, on human such as displacement, antimicrobial resistance, photochemical smog, unsafe nano-materials, migration, loss of biodiversity, natural disaster, deforestation, climate change, alien invasive species, pollution, etc. The ignorance becomes increasingly dangerous as the rate of loss of medicinal plants, sea creatures, wildlife and habitat, accelerate the potential loss of life-saving cures for diseases and illness [2]. When the loss is not properly monitored and regulated, countless opportunities to strengthen new solutions to pressing health and socio-economic challenges will also be neglected as it is experienced in many parts of the world especially in Africa. Following a statistic proposed by Roberson, in the United State alone, out of 150 drug prescriptions at 74% are based on natural sources; but in Africa the demand is higher. This shows the increase in scientific and commercial attention medicinal species that are found in the wild have been well received [3-4]. Among these uses, medicinal plants have played a major role in meeting demands of distant markets in terms of trade commodities often overlapping fields of condiments, food and cosmetics [5]. Many of the herbs and species used by humans to season food yield beneficial medicinal compounds. The demand for medicinal plants is currently increasing in both developed and developing countries for various purposes. Some of the reasons for this could be the emerging recognition that natural products have fewer or even no side effects; for others, it could be their easy accessibility and affordability that would be of interest to them [6]. Also, for a few, especially in Africa and some part of Asia, it could be a cultural practice of their ancestors. Recent researches in secondary metabolites from medicinal plants should take into consideration the prevalence and curative property each plant. These compounds have provided opportunities for the development of new drugs leads against several diseases. It is a commonplace knowledge that in obtaining compounds from edible medicinal plants as well as that used to prepare infusions, numerous challenges are encountered including the environment and stressing factors to which the plants are submitted [7]. Despite the progress in modern medicine and pharmaceutical industries, the use of medicinal plants has been embraced as an integral part of daily life. For instance, taxol (a plant-derived anti-cancer drug) save at least 30,000 lives per year in the United State. Staranise provides unprecedented chance for combating potential epidemic viral disease like flu and over 5,000 medicinal plants have been utilized by healers in China, while in South Asia over 1.4 billion people rely on traditional medicine [8-10].

Worldwide, between 50,000 and 80,000 flowering medicinal plants have today increased percentages of remitting diseases in many societies, but yet, we know little about many MP that trove our wild places and in some regions of the world less than 40 percent of all tropical plant species had been scientifically utilized for potential pharmaceutical applications

Needs of the Study

To investigate the various medicinal plants which used as a traditional medicine for the treatment of the disease found in Sonbhadra region of Uttar Pradesh.

Examine the change in physical chemical properties of some medicinal plants namely Solanum nigrum, Andrographis paniculata, Abrus precatorius, Syzygiumcumini Linn, Azadirachta indica A. Juss., Aegle marmelos (L.) Correa, Withaniasomnifera Linn.

Identify the impact of harmful pollutant like SO_2on Solanum nigrum, Andrographis paniculata which is emitted through Anapara thermal power plant.

Performed the statistical analysis on the collected samples of Solanum nigrum, Andrographis paniculata and suggest the remedial measures.

Impacts of environmental challenges on medicinal plants

Traditional medicine and complementary/alternative medicine (TM/CAM) have been widely used in South-East Asia for centuries, with many countries having extensive systems within existing health services [11]. In rural areas like India, Indonesia, Nepal, and Sri Lanka, a large proportion of the population uses traditional medicines for primary healthcare. Governments recognize the role of TM and its practitioners, with national policies and regulations implemented. However, there are challenges such as lack of information sharing, safety monitoring of herbal medicines, and methods to evaluate their efficacy [12]. To address these issues, coordinating agencies should adhere to WHO Guidelines on Good Agricultural and Collection Practices for Medicinal Plants, manufacturers should obtain licenses and register products, and quality control systems should be in place.Medicinal plants are essential in primary healthcare practices of tribal communities. The World Health Organization estimates that up to 80% of the world's population relies on locally available plant resources for primary healthcare [13-14].

The crux aspect in the survival of plants in an ever-changing environment are the recognition of the forces of evolution and diversity within the ecosystem, the plant inherent ability to detect these, and the ways in which this biodiversity is maintained and propagated. These characteristics are expected to be controlled internally by the organism's genome which ensures survival. The most common and unavoidable interaction communities environment occurring is the interaction. in plant plant and External factors quantitatively affect the plant's metabolic processes through their effects on plant development, growth rate, and activation of qualitative changes in secondary metabolites [15]. Since plants cannot escape from the extremes of climatic factors like light, temperature, and drought, they have thus developed complex mechanisms to integrate physiology and metabolism in order to adapt to the prevailing conditions in their environment [16]. Overharvesting of medicinal or healing plants, invasive species competition, habitat loss, deforestations, climate change affecting rain fall pattern, overpopulation, global warming, has placed over 15,000 medicinal species at higher risk of extinction and has caused biodiversity loss on the rural populations. One of the reasons for overharvesting of medicinal plants, is as a result of its relevance which is in high demand in modern society as it can be processed to become essential oils (both for economic and other usage) through proper distillation [17]. In Africa and other parts of the world, habitats with medicinal plants capable of fight life-threatening diseases are being destroyed unknown to scientists investigating their potential worth [18]. Due to these anthropogenic effects, experts estimate that the earth loses one potential major drug in every two years[19].

In many countries of the world, there is lot of "bioparacy", the practice of private companies patenting traditional remedies from the wild and selling them at a vast profit, and often allowing little or none of the profit to the benefit of the host country's or indigenous communities of origin) of medicinal plants which has affected the indigenous and local communities who have used this plants for centuries to both cure and prevent disease and illness [1][20]. However, world is heading for some level of calamity due to uncontrolled population growth, industrial expansion, decline of natural resources, scarcity of medicinal foods, and the increasing demand for medicinal products.Wheatgrass, Lavender, Turmeric, Neem, Rosemary, Chamomile, Tulsi, Bergamot, Calendula, and so on, all carry scientific and natural evidence to care for the body, ranging from curing baldness, detoxifying the body from heavy metals, fungi infections and so on. These are some of the commonly used medicinal plants in society for various reasons [21] These medicinal plants have been primarily utilized by pharmaceutical industries, cosmetologists, nutritionists, traditional healers, for both entrepreneurial purposes and other relevant reasons. Below are some of MPs whose relevance have put them at risks of extinction.

Research Methodology

Literature was sourced from internet platforms such as Google Scholar, scienceDirect, Scopus and ResearchGate, while pertinent offline publications were retrieved from the library of the.The precise search phrases study uses selected keyword searches such as "Environment challenges", "medicinal plant", "Plant medicine", "Ethnobotany"etc.The aim was to receive information regarding popular species based on health problems, treatment methods, local name of medicinal plants used, source of collection (wild/cultivated), plant parts used, methods of preparation and application. The collected samples of the plants were identified by the taxonomist. The ethnobotanical information collected were analyzed to obtain the following data: - Number of useful medicinal plants - Most cited species - Parts of plants most frequently used - The process of administration of herbal drugs - Informant consensus factor (ICF) - Fidelity level (FL) Information about importance of each species to the local communities was analyzed for fidelity level as: FL = (Np/N) × 100; where Np is the number of informants who gave information of a given species as being important while N is the total number of all informants mentioning important medicinal plants (Al-qura, 2005).

The ICF is calculated as follows: number of use citations in each category (Nuc) minus the number the number of species used (Nsu), divided by the number of use citations (Nuc) in each category minus one: ICF = Nuc – Nsu/ Nuc – 1

Result and discussion

The present study therefore evaluated the ethnomedicinal uses of selected medicinal plants found in region of Vindhya hill of Sonbhadra and Mirzapur districts in eastern Uttar Pradesh, India (Table 1). Among them mainly were herbs (30%), shrubs (45%), trees (17%) and climbers (8%). These herbal medicines were used to treat stomach disorder, respiratory problems, skin infection, diabetes and wound healing. The proportion of remedies used for treatment of stomach disorder occupies high percentage. Author focused mainly on plant parts used, methods of preparation, administration, dosage and duration in drug preparation. The most commonly used plant parts for herbal preparations in the area were Leaves (42.3%), Root and Leaves (18.2%), Root bark (12.2), Seeds (5%) and fruits (2.5%). The administration routes are oral (58.7%), external (32.5%) and nasal (7.9%). In regard to fidelity levels, among the 12 most frequently utilized species (Table 2), some species have high frequency of citation, some appear to have low fidelity levels. However Aegle marmelos (L.) Correa and Azadirachta indica A. Juss have high frequency and fidelity levels and can be considered the most important medicinal species in the region. The category that has the highest FL value is Aegle marmelos (L.) (100%) followed by Azadirachta indica A. Juss (95.2%). The lowest is Semecarpus anacardium Linn. (41.2%). Obviously, the remedies for frequently reported ailments have the highest FL value and those with low number of reports have lowest FL values. The remedies such as Semecarpus anacardium Linn. have low FL value because the majority of the informants do not know the dosage and the methods of preparation of the remedies.Some plants were reported to be used for very few diseases sometimes even only one disease but can be considered important on basis of consistency of use (i.e., 100% consensus among the respondents. The medicinal plants that are presumed to be effective in treating a certain disease have higher ICF values. Jaundice secured the highest ICF values (0.85). The ICF values of each aliment were represented in Table 3. The diversity of ethnomedicinal plants is rich in Vindhya Region in comparison to the other tribal forest areas of Eastern Uttar Pradesh, India. These medicinal plants are exploited chiefly by the local inhabitants and tribal peoples and to some extent by various pharmaceutical firms of adjoining district. Rapid industrialization and urbanization in this area have imposed a great loss to these medicinal plants. Rauvolfia serpentina a reputed medicinal plant was frequently found in the study area only a few years back but the plant become rare and restricted to some localized areas due to over exploitation and urbanization. Similarly Asparagus racemosus is still found frequently in the study area but day by day it is also become disappear due to overexploitation.

Ethnomedical knowledge opens new avenues to increase the potentiality of herbal medicine and their implications to human health care system. Today, Traditional Medicine (TM) is termed as complementary or alternative medicine due to non sufficient validated scientific approaches. To increase the promotion of TM, there is a need to standardize phytochemical composition and pharmacological significances of herbal medicines [5-8]. Herbal medicine can also be revalued by extensive researches and therapeutic principles to ascertain safety and efficacy of traditional medicines in all over the world. The most frequently claimed medicinal uses were for wound healing, skin and subcutaneous tissue, digestive system, high temperature (as antipyretic), pain (as analgesic) and cardiovascular system. Some toxic plants were also mentioned that are claimed medicinally very important like Datura innoxia Linn. and Solanum nigrum [10-17]. The most cited parts of plants were the leaves and aerial part. The main preparation and administration processes were infusion, decoction and inhalation, Decoction was the main process of preparation, being used in nearly 58% of the reported useful plants. Most plants used as aromatic or condiment also have medicinal uses. This confirms that food and medicinal plant uses are closely related and can be relevant to the development of functional foods, pharma foods and nutraceuticals. Medicinal plants play a vital role in the development of new drugs. The bioactive extract of medicinal plants should be standardized on the basis of active compound. The quality assurance of an herbal raw material can be established by different scientific approaches. Presently the quality parameters of the herbal products are evaluated through latest analytical and computational based technology like chromatographic techniques, TLC, HPLC, GC, HPTLC etc. The marker compounds (pharmacologically active components) and chemical fingerprints are also used as a significant tool for the quality control and authenticity of herbal medicines [17-25]. The application of modern biotechnology has also entered a new era to protect and standardized them by using tissue and cell cultures. Medicinal herbs constitute the major parts of local medicines in the traditional health care system. Practices of TM are declined very rapidly due to disinterest of younger generation and excessive extraction of herbal raw materials in synthesis of western medicine.

Table 1. Plant used in curing different aliments in Vindhya Region of Eastern U.P., India

Scientific Name	Local Name	Family	Parts Used	Troubles treated	Ref
Abrus precatorius	Linn. Gumachi	Fabaceae Root	Leaf Seed	Fever Sciatica Asthma	[22]
Azadirachta indica A. Juss.	Neem	Meliaceae	Leaf Bark	Skin problem, Anticancer, Wound healing, Antidiabetic	[23]
Aegle marmelos (L.) Correa	Bel	Rutaceae	Leaf	Diabetes	[24]
Cuscuta reflexaRoxb.	Amarbel	Convolvulaceae	Leaf root	Dandruff Heart problem	[25]
Ficus benghalensis	Gular	Moraceae	Leaf, Latex	Antidiabetic	[26]

Linn.			Fruit	Urinary disorder Bronchitis	
Gymnemasylvestre R.Br	Gudmar	Asclepiadaceae	Leaf Root	Antidiabetic Liver tonic	[27]
Solanum nigrum Linn.	Makoi	Solanaceae	Leaf	Liver disorder Skin diseases	[28]
Andrographis paniculata (Burm. f.) Wall. ex Nees	Kalmegh	Acanthaceae	Leaf	Blood Purifier Malaria Skin diseases	[29]
Syzygiumcumini Linn.	Jamun	Myrtaceae	Bark	Stomach Problem Diabetes	[30]
Withaniasomnifera Linn.	Ashwagandha	Solanaceae	Leaf	Tuberculosis Fever Rheumatic pain	[31]
Ocimum sanctum Linn.	Tulsi	Lamiaceae	Leaf	Painful tooth	[32]

Table 2. Most commonly used medicinal plants with their fidelity level (0 = The Least, 100 = The Highest Efficiency)

Plant Species	Fidelity Level (FL)
Aegle marmelos (L.) Correa	100%
Azadirachta indica A. Juss	95.2%
Abutilon indicum (Linn.) Sweet	87.6%
Ricinus communis Linn.	79.2%
Terminalia arjuna wight &Arn	76.9%
Bauhinia Variegata 72.3%	72.3%
Catharanthus roseus (Linn.)G. Don	69.8%
Ficus benghalensis Linn.	65.3%
Madhuca latifolia Roxb.	62.4%
Syzygiumcumini Linn.	59.01%
Vernonia cinerea less.	46.8%
Semecarpus anacardium Linn. F.	41.2%

Table 3. ICF value of category of aliments

Category	ICF value
Gastrointestinal disorder	0.58
Kidney disorder	0.77
Cancer	0.84
Jaundice	0.85
Respiratory disease	0.66
Wound healing	0.57
Tuberculosis	0.81
Fever	0.54
Snake bite	0.50
Malaria	0.75

Conclusion

The World Conservation Union's Medicinal Plant Specialist Group warns that at least 15,000 plant species used in herbal products could be threatened due to unsustainable collection practices and overharvesting. The group suggests a bilateral trade agreement to invest in restoring endangered plants by acquiring vast lands for medicinal seed planting in Africa, Eurasia, Europe, and other parts of the world.Governments should establish the necessary institutional and financial support to evaluate and promote the potential role of herbal medicine in modern health care system. These goals can be achieved by following measurements: 1. Documentation of various medicinal plants that are used by the tribal communities to treat the common diseases. 2. To establish a local botanical garden for preserving the medicinal plants in different parts of the country, in order to ensure a sustainable supply of safe, effective and affordable medicinal herbs. 3. Setting up testing laboratories with adequate facilities for the assessment of the efficacy of medicinal herbs. In order to integrate traditional medicine into the health care system, the knowledge and traditional practitioners and their right to benefit from that knowledge needs to be honoured. This

study suggests the need for diverse access agreements for both formal and informal consumption and sale of medicinal plants (MPs) between countries, regular recruitment of researchers for proper protection, and proper management and technical support for agriculturalists, environmentalists, rural farmers, and indigenous citizens.

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