CHAPTER 1

ROLE OF ETHNOBOTANY IN MODERN MEDICINAL PLANTS

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Abstract

Ethnobotany is a subset of ethno-biology, which studies the past and present interactions between human civilizations and the plants, animals, and other species in their surroundings. Ethnobotany, like its parent field, draws attention to the link between human cultural practices and biological sub-disciplines. Ethno-science is a phrase that refers to research that examines how local people interact with their surroundings. This covers, for example, ethno-ecology and ethnobotany. Ethnobotany was created to incorporate studies of algae, lichens, and fungus in addition to plants. Taxonomy, Pharmacognosy, phytochemistry, ecology, and conservation biology are all significantly tied to it. Ethnobotany is, without a doubt, the largest source of money for both orthodox and traditional medicine.

From archaeological investigations into the function of plants in ancient civilizations to the bioengineering of novel crops, ethno-botanical studies span space and time. Ethnobotany isn't just for non-industrialized or non-urbanized communities, though. Plant-human culture co-adaptation has altered and perhaps intensified in the twentieth and twenty-first centuries as a result of urbanization and globalization. Indigenous, non-Westernized cultures, on the other hand, play an important role in ethnobotany because they have a heretofore underestimated knowledge of local ecology gleaned over decades or even millennia of interaction with their biotic (living) environment. Concerns concerning indigenous rights, cultural knowledge, and traditional resources are among them. Third parties

who have no direct ties to indigenous people are frequently the end users of this information. This circumstance highlights the need of socio-ethnobotany, a new branch of ethnobotany concerned with how indigenous people might be compensated for sharing their ethno-botanical knowledge. The purpose of this article is to bring attention to ethnobotany difficulties, as well as existing obstacles and future prospects.

Ethnobotany has a wide range of applications. The study of indigenous food production and local medical knowledge could be useful in promoting sustainable agriculture and discovering new medications. Ethnobotany promotes a nuanced understanding of the reciprocal influence (both helpful and detrimental) of plants and humans, as well as an awareness of the link between biodiversity and cultural variation.

Introduction

The systematic study of the interactions between plants and people is known as ethnobotany. It is the study of a region's plants and their practical usage based on local culture and people's traditional knowledge. As a result, an ethno-botanist works to document local practices including the practical applications of indigenous flora for a variety of purposes, including plants as medicines, meals, intoxicants, and clothes. Ethnobotany is more than just the study of humans' "use" of plants; it also places plants in their cultural contexts in certain civilizations, as well as people in their natural contexts. Without a doubt, ethnobotany is a multidisciplinary study. The increased number of journals such as Journal of Ethno-biology, Journal of Ethno-pharmacology, Ethnobotany, Ethnobotany Research and Applications, and the range of university courses that contain modules associated with different aspects of ethnobotany, especially the medicinal uses of plants, reflect the growing interest in ethnobotany.

Plant selection based on ethnobotany is becoming more prominent as a method of determining whether plants have chemicals that can be exploited. This economic focus of biological prospecting, which includes the utilization of patents and other intellectual property systems, has brought to the fore major concerns of indigenous rights, cultural knowledge, and traditional resources4. As a result of this circumstance, socio-ethnobotany emerged as a new sub-discipline of ethnobotany concerned with how indigenous people may be compensated for sharing their ethno-botanical knowledge. The goal of this article is to bring attention to ethno-botany's contributions, difficulties, and future prospects.

Ethno-botanists examine:

a) The culturally specialized ways in which humans see and identify different types of plants
b) What humans do to plant species, such as eliminating "weeds" or "domesticating" and planting specific types of food and medicinal plants?

c) The ways in which different plant species influence human societies

Leopold Gluck, a German physician working in Sarajevo at the end of the 19th century, was the first to explore the emic perspective of the plant world. His published work on rural people's traditional medical usage of plants in Bosnia (1896) is widely regarded as the first modern ethno-botanical effort.

Ethnobotany was first proposed by botanist John William Harshberger in the early twentieth century. While Harshberger conducted ethno-botanical studies extensively, including in North Africa, Mexico, Scandinavia, and Pennsylvania, ethnobotany did not become a more well-known science until Richard Evans Schultes began his expeditions into the Amazon. However, ethnobotany is supposed to have originated in the first century AD, when a Greek physician named Pedanius Dioscorides published De Materia Medica, an elaborate botanical treatise listing the healing and gastronomic characteristics of "nearly 600 Mediterranean plants." Historians point out that Dioscorides wrote about travelling frequently around the Roman Empire, including places like "Greece, Crete, Egypt, and Petra," and gaining extensive knowledge of the native plants and their qualities. Due to the discovery of the New World, European botanical knowledge grew dramatically. J.M. Harshberger, an American botanist at the University of Pennsylvania, created the word "ethnobotany" in 1895. Richard Evans Schultes, dubbed the "Father of Ethnobotany," described the discipline as follows:

Ethnobotany is defined as the study of plants used by people in different parts of the world.

Since Schultes' time, ethnobotany has progressed from simply obtaining ethno-botanical information to applying it to modern civilization, most notably in the creation of medications. In ethnobotany, intellectual property rights and benefit-sharing mechanisms are crucial.

Today, ethnobotany necessitates a wide range of skills, including botanical training for plant identification and preservation, anthropological training for understanding cultural concepts surrounding plant perception, and linguistic training, at the very least enough to transcribe local terms and comprehend native morphology, syntax, and semantics.

Mark Plotkin, a Harvard University, Yale School of Forestry, and Tufts University graduate, has contributed to a number of ethnobotany books. Tales of a Shaman's Apprentice (1994); The Shaman's Apprentice, a children's book with Lynne Cherry (1998); and Medicine Quest: In Search of Nature's Healing Secrets (2001) were all completed for the Tirio people of Suriname (2000).

Plotkin was interviewed by South American Explorer magazine in 1998, shortly after Tales of a Shaman's Apprentice and the IMAX film Amazonia were released. He noted in the book that he sees wisdom in both traditional and Western medicine: No shaman I've worked with has the equivalent of a polio vaccine, and no dermatologist I've seen could cure a fungal infection as efficiently (and cheaply) as some of my Amazonian teachers. It should not be the case. It should combine the best parts of all medical systems (ayurvedic, herbalism, homoeopathy, and so on) in a way that improves health care effectiveness and affordability for everyone.

Tribal peoples still have a lot of information on how plants were used in the past. Native healers, on the other hand, are frequently hesitant to appropriately share their information with outsiders. Schultes actually served as an apprentice to an Amazonian shaman, which entails a long-term commitment and genuine bond. The visiting acupuncturists in *Garcia et al* book's Wind in the Blood: Mayan Healing & Chinese Medicine were able to access levels of Mayan medicine that anthropologists couldn't since they had something to trade. David Winston, a Cherokee medicine priest, recalls his uncle inventing gibberish to appease visiting anthropologists. In his book Iroquois Medical Ethnobotany (1995), co-authored with Dean R. Snow (editor), professor of Anthropology at Penn State, another scholar, James W. Herrick, who studied under ethnologist William N. Fenton, explains that understanding herbal medicines in traditional Iroquois cultures is rooted in a strong and ancient cosmological belief system. Their work gives impressions and conceptions of illness and imbalances that can emerge physically in a variety of ways, ranging from minor ailments to life-threatening disorders. It also includes a significant collection of over 450 names, uses, and preparations of plants for various diseases based on Herrick's field work with numerous Iroquois authority. Traditional Iroquois healers had (and still have) a comprehensive understanding of plants that contrasts sharply with modern medical research.

Anthropology, botany, archaeology, geography, medicine, linguistics, economics, landscape architecture, and pharmacology are all represented in modern ethnobotany, which is an interdisciplinary field.

Medieval and Renaissance

Ethno-botanical researches were frequently associated with monasticism during the mediaeval period. Hildegard von Bingen was famous at the time. The majority of botanical information, on the other hand, was preserved in gardens, such as physic gardens adjacent to hospitals and religious structures. The anthropological element was not examined as a modern anthropologist may approach ethnobotany today, and it was thought of in terms of practical application for culinary and medical objectives.

Previously, ethnobotany was a more ecologically oriented discipline, focusing on the interrelationships and interactions between components of a small ecological zone. Researchers began to see plants as important aspects of the ecosystem in which they are found from socioeconomic and cultural viewpoints, which shifted this viewpoint to a broader perspective. Botanists, anthropologists, pharmacologists, molecular biologists, and medical practitioners are all enlisted in a team work mission in this contemporary framework of ethnobotany study.

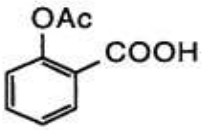
Ethnobotany is currently focused on the identification of novel plant resources, the collection of genetic materials, medicinal development, and product development. Ethnobotany has grown increasingly involved with the hunt for new medicines in recent years. The hunt for herbal medicines and phytonutrients continues to grow fast around the world, with many individuals in both developing and developed countries turning to these items for treatment of various health issues. These natural medicines are now available not just in drug stores, but also in grocery

stores and supermarkets. As a result, many herbal products in Europe, North America, and Australia are transitioning from traditional herbal teas to standardized extracts. The assumption that herbal therapy will promote better living is the most important motivation for seeking it in these industrialized countries, among many others. As a result, herbal medicines are frequently regarded as a balanced and moderate approach to healing, and they now account for a significant share of the global medication market. According to Pan et al., another reason for the increased interest in the herbal medicine sector is that Chinese traditional medicine has been a novel base of medication development in China. China has acquired 3563 extracts, 64715 formulations, and 5000 single compounds from 3000 Chinese plants, as well as around 130 different chemical medications, up to 2007.

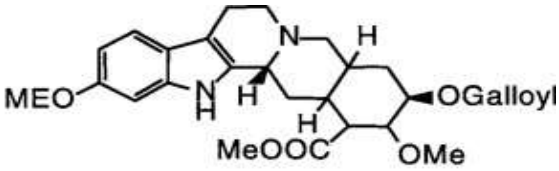
As the global use of herbal medicinal goods expands and more new items enter the market, public health issues and concerns about their safety are becoming more widely recognised. While certain herbal medications have a lot of promise and are frequently utilized, many of their pharmacological qualities are still unknown. As a result, we know very little about their possible toxicity and side effects. It is therefore critical to provide adequate information based on scientific findings to the general public, including healthcare professionals, in order to facilitate a better understanding of the risks associated with the use of these products and to ensure their safety, efficacy, and appropriate quality.

ETHNOBOTANICAL LEADS AND POTENTIAL FOR BIOPROSPECTING

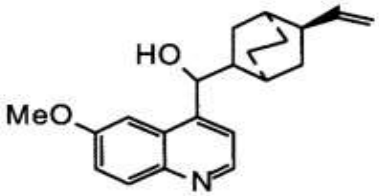
Oils, resins, tannins, rubber, gums, waxes, colours, tastes & scents, insecticides, and medications are just a few of the organic compounds produced by plants. As previously stated, many of the drugs used and/or now in use, such as aspirin, codeine, ipeacac, pilocarpine, pseudoephedrine, quinine, reserpine, scopolamine, theophylline, and vinblastine, were produced from medicinal plants through ethno-botanical study. Only a small percentage of the total blooming plants found in tropical regions of the world have been researched for their medicinal potential, according to estimates. Subramoniam noted that all chlorophyll-a bearing plants have medicinal promise in this direction. This claim was made based on the recently discovered anti-inflammatory properties of chlorophyll-a and its derivatives. Many reputable pharmaceutical businesses have recently developed a number of herbal medications based on ethno-botanical leads for various uses. Few examples of these are given below.



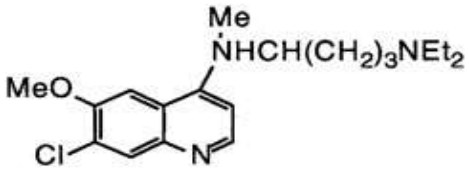
Aspirin



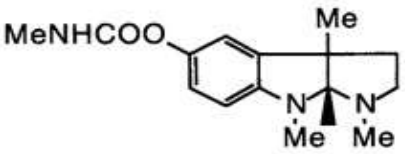
Reserpine



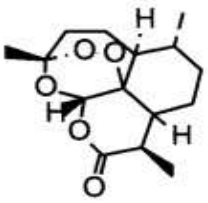
Quinine



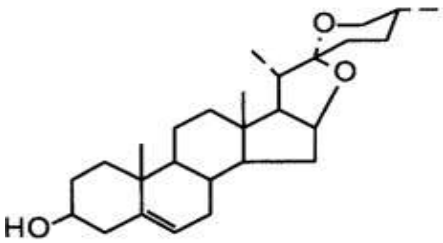
Chloroquine



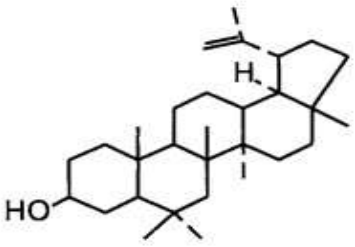
Physostigmine



Artemisinin



Diosgenin



Lupeol

CHALLENGES AND FUTURE PERSPECTIVES OF ETHNOBOTANY AND HERBAL MEDICINE

Issues regarding safety and quality control: The growing interest in plants and ethno-botanical bio-perspectives was largely fueled by the belief that herbal cures or medications are always safe. This is, in fact, an erroneous assumption. Herbs have been demonstrated to cause a wide range of unwanted or adverse reactions, some of which can result in major injuries, life-threatening diseases, or even death. Herbal

medications and associated goods are released into the market in many countries without any mandated safety or toxicological testing. According to Ekor, herbal medicines have accounted for almost 40% of all healthcare services supplied in China over the last decade. In Australia, Canada, the United States, Belgium, and France, the number of persons who have tried herbal medications at least once is believed to be between 48 and 75 percent. This surge in interest in herbal medicine raises serious concerns about the necessity for a thorough scientific assessment of the safety and toxicity of these raw ingredients. Although some products, such as standardized herbal extracts, have undergone extensive clinical research and have been subjected to systematic review/meta-analysis, this does not help much when it comes to large-scale production due to the complex nature of herbal products and the differences in manufacturing methods. Extract-specific efficacy and safety measures should be used for preparations of the same herb with a very comparable ingredient profile. Herbal products have been linked to a number of incidences of severe effects and toxicity. One of these incidents was recorded by Ekor during an examination into Yoyo "Cleanser" bitters, a popular herbal treatment in Nigeria. Over time, the well-known herbal product has garnered widespread popular support and continues to do so. After 30 days of dosing, this herbal compound was found to be capable of raising plasma levels of liver enzymes and producing hypokalemia in rats. More work and attention are urgently required to confirm the safety and efficacy of herbal products, as well as to provide guidelines for their optimal use.

The influence of plants on human culture

Why do you think plants became the material foundation for human culture? Plants are significantly more efficient and reliable sources of building materials and nourishment than animals due to their immobility (terrestrial plants must remain rooted in the soil) and massive cellulose output. Plants' biochemical diversity, which contributes to their wide range of medicinal and food applications, may be due in part to their immobility. Plants create chemicals to interact with other species in their environment, either for mutual benefit, such as enrolling animals in pollen or seed movement, or as a defence mechanism, such as repelling or poisoning predators or parasites. For 25% of prescription medications and practically all recreational chemicals, such as caffeine in coffee, nicotine in tobacco, and theophylline in tea, modern cultures rely on chemical compounds found in plants.

Modern Etno-botany

Beginning in the twentieth century, ethnobotany underwent a paradigm change from raw data collection to a more methodical and conceptual reorientation. Ethnobotany today necessitates a wide range of abilities:

- Botanical instruction in order to identify and preserve plant specimens
- Anthropology training to comprehend cultural notions surrounding plant perception
- Linguistic training to comprehend native morphology, syntax, and semantics and to transcribe local words.

Ethno-botanists are involved in a wide range of research concerns and techniques that are difficult to categories. The following headings, on the other hand, try to describe some of the most important topics of modern research. Ethno-medicine is a branch of medical anthropology that studies traditional medicines, including those with documented sources (such as Traditional Chinese Medicine and Ayurveda) as well as those whose knowledge and practices have been passed down orally through generations.

While the indigenous view and usage of traditional medicines is generally the focus of ethno-medical studies, drug discovery and development are also a driving force behind this sort of research. Digoxin, morphine, and atropine are all medications that have been linked to foxglove, opium, and belladonna, respectively. In this century, ethno-medical research has led to the creation of key medications such as reserpine (a hypertension treatment), podophyllotoxin (the active ingredient in a popular anti-cancer drug), and vinblastine (used in the treatment of certain cancers).

Agriculture

Agriculture is the culturally influenced selection of plants with certain genetic features required by humans in order to produce domesticated plants, or crops.

Ethnobotany contributes to agricultural knowledge in two ways:

1. By showing how to make genetically modified plants for human consumption.
2. By detailing and explaining the various ways in which the same crop might be cultivated, whether for economic advantage, a desire for long-term production, or other culturally unique reasons.

The Irish potato famine of the mid-nineteenth century is one example of the mutual interaction of plants and human cultures. Monoculture, or the practice of planting crops with similar development patterns due to genetic similarities, was used to grow potatoes in Ireland. When a single genetic variety (or cultivar) becomes susceptible to a disease, monoculture can result in large-scale crop failure. The famine was caused by the cultivar's sensitivity to *Phytophthora infestans*, which killed between 500,000 and one million people. The famine prompted a wave of Irish immigration to the United Kingdom, the United States, Canada, and Australia.

In the strictest sense, an entheogen is a psychoactive substance (usually some plant matter with hallucinogenic effects) that induces a spiritual or mystical experience. For millennia, entheogens have played a crucial role in the spiritual traditions of most American societies. Richard Evans Schultes of Harvard University, one of the founders of modern ethnobotany, reported the Kiowa's ritual use of peyote cactus in what is now Oklahoma, United States. Peyote was introduced to North America in the nineteenth century, replacing the deadly entheogen *Sophora secundiflora,* which had been used by many cultures in what is now Mexico (mescal bean). South American indigenous peoples use a wide range of entheogens. Ayahuasca (*Banisteriopsis caapi* plus admixtures) is a well-known example among Peruvian Amazonian indigenous peoples (such as the Urarina). Borrachero (*Brugmansia* spp.), San Pedro (*Trichocereus* spp.), and several tryptamine-containing snuffs

are other well-known entheogens. In South America, the common tobacco plant can be utilized as an entheogen when used uncured in large amounts in shamanic contexts.

Folk classification

The way members of a language community identify and categorise plants and animals is referred to as folk categorization. An emic method is used in this form of ethnobotanical research, which means describing action in words that are significant (consciously or unconsciously) to the actor.

Leopold Glueck, a German physician working in Sarajevo, was the first to explore the plant world from an emic perspective. His 1896 article on rural people's traditional therapeutic usage of plants in Bosnia and Herzegovina is widely regarded as the first modern ethnobotanical work.

The study of ancient ethnobotany is known as archaeo-ethnobotany (or paleoethnobotany). It is intertwined with ethnobotany since it is difficult to comprehend the ecology of present settings without taking into account the environmental history, which frequently includes prehistoric human interventions.

Archaeo-ethnobotanists are particularly interested in the history of the domestication of the cereal grain maize (often known as "corn"). Some believe the process began between 7,500 and 12,000 years ago. Maize domestication is thought to have occurred 9000 years ago in central Mexico, maybe in the highlands between Oaxaca and Jalisco, according to recent genetic findings. Early maize cobs discovered at Guila Naquitz Cave in the Oaxaca Valley date back 6,250 years; the oldest cobs discovered in caverns near Tehuacan, Puebla, have been dated to around 2750 B.C.E.

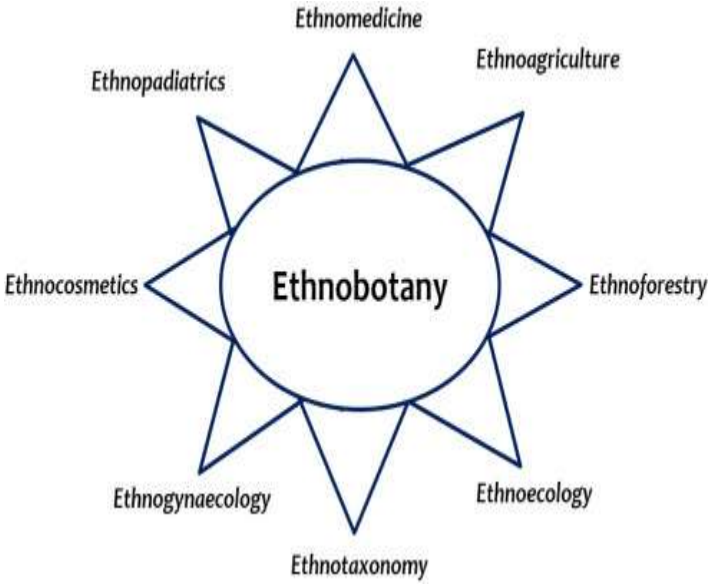
Bio-piracy and intellectual property rights: Interviews of individuals or groups of people are frequently used to acquire information about the usage of specific kinds of plants in a community, and the scope of this information varies depending on the methods used. The commercial focus of biological prospecting based on indigenous knowledge, which includes the utilization of patents and other intellectual property mechanisms, has brought to light major issues relating to indigenous rights, cultural knowledge, and traditional resources. This circumstance raises serious concerns about ethno-botanical research's value to local communities as the primary source of this information. Bio-piracy, or the invasion of unprotected indigenous resources such as traditional knowledge, is one of the most significant problems facing efforts to merge modern and alternative treatment practices.

Patents have been sought in the past for chemicals that have been in use for centuries. The discovery of promising anticancer compounds derived from Guiera senegalensis, a plant abundant in the Sahel and widely used by Mali's Dogon people, is a recent evident illustration of this conflict of interest. As a result, the creation of a guideline for the preservation of cultural knowledge and intellectual property rights might provide a considerable level of control over the ethical use and dissemination of cultural information for both academic and industrial purposes.

Lack of knowledge about herbal medication mechanisms of action and the disease-gene network: Lack of scientific and technological ways to identify pharmaco-dynamic characteristics and mechanism of actions of ethno-botanical-based-herbal medications is another difficulty facing ethnobotany and herbal medicine research. This could be owing to the complexity of herbal substances, undiscovered targets in the human body, and the mechanism of action underpinning the effectiveness of herbal medication. This circumstance encourages the adoption of the poly-pharmacology method as an emerging paradigm for drug development, based on a new drug design philosophy that has shifted from "one drug, one target" to "one drug, several targets." Single drugs operating on multiple targets of a single illness route or single drugs acting on multiple targets of many disease pathways35 are examples of these phenomena. The drug targets and disorders would be revealed by mapping the poly-pharmacology network onto the human disease-gene network. This could explain some of the reported effects of botanical medications on certain disorders. Liu et al. published their findings on the use of a poly-pharmacological method to treat licorice, a well-known Chinese herbal medicine. Oral bioavailability screening, drug similarity evaluation, blood-brain barrier permeability, target identification, and network pharmacology were all used to create a system pharmacology method. The application of this technology to herbal medications used in alternative medicine could lead to new discoveries. Applying this strategy to herbal medications used in alternative medicine could lead to a better understanding of active components' explicit targets and interactions in molecular networks.

CONCLUSION

To provide scientific validation of final products and ensure sustainable management of natural resources, indigenous knowledge and ethno-science must be merged with biotechnological methodologies. Modern and traditional health care often coexist, but rarely collaborate. To offer a better knowledge and justification of mechanism of actions based on the new philosophy of numerous molecules-many targets-multiple diseases, pharmacological screens, including the deployment of poly-pharmacological techniques, are required. The economic focus of biological prospecting includes the use of patents and other intellectual property mechanisms raise issues of bio-piracy concerning indigenous rights, cultural knowledge and traditional resources. There is an urgent need for both global and local legal frameworks to regulate bio-prospecting activities and to eliminate bio-piracy. Socio-ethnobotany is one of the new developments in ethnobotany deals with the question of how indigenous people can be compensated for sharing their ethno-botanical knowledge with the industrialized world. Bio-prospecting based on ethno-botanical approach for **medicinal plant** research could lead to the production and development of useful healthcare products such as phyto-medicines, nutraceuticals and food supplements.



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