

# Medicinal Plants of Ethiopia: Conservation, Traditional Knowledge, and Sustainable Use.

Merera Teso, Mesfin Woldearegay  
Debre Berhan University, [www.dbu.edu.et](http://www.dbu.edu.et)  
[mesfinwa@gmail.com](mailto:mesfinwa@gmail.com)

<https://doi.org/10.59411/721y5z60>

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## ABSTRACT

*Ethiopia, renowned for its remarkable biodiversity, harbors approximately 6, 000 species of higher plants, many of which hold significant medicinal value. Traditional medicine plays a crucial role in healthcare, particularly in rural areas where access to modern healthcare is limited. This reliance underscores the importance of preserving indigenous knowledge related to medicinal plants. Home gardens emerge as vital repositories of these valuable plant species, highlighting the need for sustainable conservation strategies. Both in-situ and ex-situ conservation measures, along with home garden cultivation, are essential in safeguarding these invaluable resources. However, the conservation of medicinal plants faces challenges from both natural causes and human-made threats. This paper emphasizes the urgent need for comprehensive conservation efforts that involve collaborative initiatives among local communities, researchers, policymakers, and conservationists. By documenting and preserving indigenous knowledge, we can not only protect the rich biodiversity of Ethiopia but also contribute to the well-being of its people and potential advancements in drug development. This holistic approach ensures the continued availability and sustainable use of medicinal plants, benefiting both the environment and human health.*

### How to Cite

Merera Teso, Mesfin Woldearegay  
(2023). Medicinal Plants of Ethiopia: Conservation, Traditional Knowledge, and Sustainable Use. *Ecological Insights*, 4(1). <https://doi.org/10.59411/721y5z60>



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Keywords: Conservation, Ethno botany, Biodiversity, Medicinal pant, Species

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### **Introduction**

#### **History of Ethnobotanical Study**

John Hershberger first introduced the term "ethnobotany" in 1895 (Hershberger, 1896; cited in Cotton, 1996). He defined it as "the use of plants by aboriginal people." Martin (1995) provided a broader definition, describing ethnobotany as the study of direct interactions between humans and plants. In essence, ethnobotany encompasses the exploration of the relationship and interactions between humans and plants (Marin, 1995; Balick and Cox, 1996). Black and Cox (1996) similarly defined ethnobotany as the examination of direct interactions between humans and plants. Additionally, Farnsworth (1994, cited in Mengistu Gebrehiwot, 2010) defined ethnobotany as the study of direct interrelations between humans and plants, including their use as food, medicines, and for various economic applications.

Ethnobotany is a multidisciplinary science that centers on the documentation, analysis, and utilization of indigenous knowledge, beliefs, and practices concerning plant resources (Martin, 1995). Its primary focus lies in understanding how plants have been or are currently utilized, managed, and perceived in human societies, encompassing their roles in sustenance, medicine, rituals, social customs, and more (Khan *et al.*, 2007; Eskedar Abebe, 2011).

Beyond its academic pursuit, ethnobotany plays a crucial role in conservation and sustainable development. There is a pressing need for capacity building in Applied Ethnobotany, particularly in developing countries, due to the close ties between rural communities and local plants. This subject is also valuable in industrialized nations, training individuals to uncover the often overlooked economic dependencies on plants and the implications of consumer culture for conservation (Hamilton *et al.*, 2003).

Martin (1995) emphasizes that ethnobotanical studies are essential for documenting, analyzing, and disseminating knowledge regarding the interaction between biodiversity and human society. This dynamic field of study necessitates a systematic approach to data collection, which can be achieved through actual field observations and semi-structured interviews, tailored to the specific objectives of the research.

Ethnobotany delves into how people classify, manage, and utilize the plants in their surroundings (Martin, 1995). It employs an interdisciplinary approach spanning botany, chemistry, pharmacology, and anthropology to ascertain how individuals have traditionally and continue to use plant resources. Ethnomedicine, on the other hand, pertains to the study of traditional medicine practices, encompassing the cultural interpretation of health, diseases, and illness (Zelege Asefa, 2019).

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Since the dawn of humanity, indigenous communities have developed their own region-specific knowledge regarding plant utilization, protection, and management (Cotton, 1996). The study of ethnobotany plays a vital role in establishing direct contact with authentic information about the uses of both wild and cultivated plants. Ethnobotany is a comprehensive term that encapsulates the study of direct interactions and interrelationships between humans and plants (Martin, 1995). It is an interdisciplinary and multidisciplinary science (Jain, 1986; Martin, 1995) focused on compiling, analyzing, documenting, and utilizing indigenous knowledge of plants, as well as implementing effective conservation and management strategies (Martin, 1995).

Cotton (1996) and Black and Cox (1996) further assert that ethnobotany is a valuable science for elucidating the utilitarian plants and associated indigenous knowledge of local communities, as well as their utilization and management. Thus, ethnobotanical research is crucial for understanding how biodiversity is valued and influenced by human activities within diverse human societies (Martin, 1995, cited in Girum, 2018).

In summary, ethnobotany is the scientific investigation of plants as used in indigenous cultures for various purposes, including food, medicine, rituals, building materials, and more. It serves as a means to define local community plant resource needs, utilization, and

management. The application of ethnobotany can lead to the conservation of cultural diversity, greater sustainability in plant resource utilization, and the development of new plant-based products (Hamilton *et al.*, 2003). Additionally, it can contribute to rural development by identifying and promoting the use of valuable plant resources, implementing sound conservation practices, and engaging in biodiversity prospecting (such as selecting plants for drug development). Therefore, the preservation of ethnobotanical knowledge is essential for both cultural heritage and biodiversity conservation (Martin, 1995; Cotton, 1996; Black and Cox, 1996; cited in Fisseha Mesfin, 2007).

## **Indigenous Knowledge**

Indigenous Knowledge (IK) encompasses the wisdom utilized by local communities to thrive in their specific environments (Warren, 1991). In many countries, including Ethiopia, this knowledge on remedies is passed down orally from one generation to the next, often shrouded in secrecy. This secrecy, however, can lead to potential distortions and losses of valuable information along each transfer. Therefore, there is a pressing need for systematic documentation of this invaluable knowledge through ethnobotanical research.

In Ethiopia, the traditional indigenous knowledge regarding medicinal plants is eroding rapidly due to the rise of modern education,

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which has led the younger generation to undervalue its traditional significance. Furthermore, the increasing population growth rate is likely to result in intensified agricultural activities in marginal areas, leading to deforestation and a decrease in the number or loss of medicinal plants in the wild (Pankhurst, 2001).

Indigenous knowledge refers to the unique knowledge systems inherent to specific cultures or societies, distinct from formal institutional knowledge. These knowledge systems, encompassing various facets of life, including the management of natural environments, have been essential for the survival of the communities that developed them. They may represent ongoing experiments or have evolved into established local traditions (Slum, 2006). Indigenous knowledge is the product of generations' worth of experiences, meticulous observations, and trial-and-error experiments (Martin, 1995). As a result, indigenous communities in different locales have cultivated their own specific knowledge regarding the use, management, and conservation of plant resources (Cotton, 1996).

One prominent aspect of indigenous knowledge is the understanding of plants as sources of medicinal remedies. This highlights the deep interdependence of humans on the natural world. This intricate relationship is explored within the field of ethnobotany, focusing on ethnomedicinal knowledge that encompasses

traditional diagnosis, the collection of raw materials, the preparation of remedies, and their prescription to patients. The documentation of traditional knowledge, particularly regarding the medicinal properties of plants, has contributed significantly to the development of many important modern-day pharmaceuticals (Black and Cox, 1996; cited in Bahilu Etana, 2010).

Among the various aspects of indigenous knowledge, the knowledge of using plants as medicines is particularly noteworthy. In the early stages of human civilization, when primitive humans began to select their food from nearby plants, they likely preserved those that they found to have healing properties or believed could treat ailments (Mesfin Tadesse, 1986). Similarly, Fikadu Fullas (2001) reported that throughout history, humans have looked to nature for remedies for their various ailments. This process involved a trial-and-error approach to discern which plants possessed therapeutic properties and which were too toxic for use. Over time, certain plants were successfully utilized in disease treatment, forming the foundation for many modern-day pharmaceuticals.

Today, Indigenous Knowledge is recognized as encompassing the broader cultural knowledge, including social, political, economic, and spiritual aspects, integral to a local way of life.

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### **Traditional Medicinal Plants**

Various medicinal plants are employed in traditional medicine, serving purposes ranging from religious to therapeutic. These plants hold significant importance in preventing, diagnosing, and treating illnesses. Indigenous medicine, also known as traditional or folk medicine, encompasses a knowledge system that evolved over centuries within diverse societies prior to the advent of modern medicine (Dawit Abebe, 1986). The World Health Organization (WHO, 2002) defines traditional medicine as the collective knowledge and practices, whether scientifically explained or not, utilized for the diagnosis, prevention, and correction of physical, mental, or social imbalances. This knowledge is transmitted across generations through practical experience and observation, both orally and in writing.

In most developing countries, at least 80% of the population primarily relies on traditional forms of healthcare (WHO, 2002). Traditional medicine, as per WHO (2003), encompasses practices, approaches, knowledge, and beliefs involving plant, animal, and mineral-based remedies, spiritual therapies, manual techniques, and exercises. These are used individually or in combination for the purpose of treating, diagnosing, and preventing illnesses or maintaining overall wellbeing. Traditional medical practitioners cater to both humans and domestic animals, with a focus on communicable diseases. Various plant parts

including roots, stems, barks, leaves, flowers, and seeds are used in preparing medicines (Wondwosen Teshome, 1999).

In Ethiopia, traditional medicine remains a crucial and accessible source of treatment within the primary healthcare system of communities (WHO, 2001). It plays a vital role in addressing the healthcare needs of both human and livestock populations. The significant reliance on medicinal plants and traditional medicine in Ethiopia is evidenced by the fact that 70% of the human and 90% of the livestock population depend on these practices (Mulugeta Kebebew and Erchafo Mohamed, 2017). This reliance is deeply ingrained in cultural traditions, with both oral and written pharmacopoeias serving as valuable repositories of knowledge.

The traditional medical knowledge of medicinal plants, passed down through indigenous cultures, holds immense value not only for preserving cultural heritage and biodiversity but also for healthcare and drug development in the present and future (Tamiru *et al.*, 2013). Despite the rich cultural diversity and abundant flora of Ethiopia, research on traditional medicinal plants in the country is limited (Mirutes Giday *et al.*, 2009). Traditional knowledge of medicinal plants is essential for treating various diseases and is practiced worldwide, relying on locally available resources and indigenous wisdom (Tesfaye Awas and Sebsebew Demissew, 2009). Traditional medicine, with its holistic approach encompassing oral and written knowledge,

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diagnostic practices, preventive measures, and curative treatments, contributes significantly to overall well-being (Behura, 2003).

### **Traditional Medicinal plants in Africa**

African traditional medicine stands as one of the oldest and most diverse therapeutic systems. Africa, considered the cradle of humanity, boasts a rich biological and cultural tapestry, with distinct regional variations in healing practices (Aone, 2001; Gurib-Fakim, 2006). This holistic approach encompasses both the physical and mental aspects of health. Traditional healers typically delve into the psychological roots of an illness before prescribing remedies, often relying on medicinal plants to address symptoms (Brendler *et al.*, 2010; Gurib Fakim, 2006).

In many parts of Africa, medicinal plants serve as the most readily accessible healthcare resource for communities. Traditional healers play a vital role by providing information, guidance, and treatment in a personalized manner, and by understanding the patient's environment (Aone, 2001; Gurib-Fakim, 2006; Mohamodally and Gurib-Fakim, 2013). Africa boasts an immense biodiversity, estimated to house between 40, 000 and 45, 000 plant species, with approximately 5, 000 of them possessing medicinal potential.

This abundance is not surprising, given Africa's location within tropical and subtropical climates. Plants in this region have evolved to accumulate crucial secondary metabolites as a natural means of survival in a challenging environment (Manach *et al.*, 2004). Africa, with its tropical conditions, receives an intense amount of ultraviolet rays from sunlight, as well as hosting numerous pathogenic microbes. This suggests that African plants may contain more chemopreventive substances compared to those from the northern hemisphere.

The trade of crude indigenous herbal products in Africa currently operates without regulation. A significant number of South Africans consult traditional healers, often alongside medical practitioners. The country is home to an estimated 200, 000 traditional healers. When a health-related claim is made for a finished herbal product, it must undergo a comprehensive drug evaluation by the Medicines Control Council (MCC) before it can be marketed. Established medicines, including well-known herbal remedies like aloe, are already registered by the MCC, adhering to globally accepted standards of efficacy and safety (Zhang, 1998).

### **Medicinal Plant Species Use in Ethiopia**

In Ethiopia, medicinal plants have been used as traditional medicine to treat different human ailments but the local people from time immemorial. These medicinal plants are

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estimated to be over 700 species and most of them are confined to the southwester regions of the country. There is a high expectation of enormous traditional knowledge and use of medicinal plant species in Ethiopia due to the existence of diverse culture, language, and beliefs among the people. However, since cultural systems are dynamic the skills are fragile and easily forgettable as most of the indigenous knowledge transfer in the country is based on oral transmission (Kebebew, *et al.*, 1996). Ethiopian plants have shown very effective medicinal value for some ailments of human and Domestic animals thus medicinal plants and knowledge of their use provide a vital contribution to human and livestock health care needs throughout the country.

### **Sources of medicinal plants**

Ethiopia's diverse climatic and topographic conditions have fostered a rich biological diversity. The country is believed to harbor approximately 6, 000 species of higher plants, with around 10% exhibiting endemism (Vivero *et al.*, 2006). Similarly, the Ethiopian Biodiversity Institute (IBC) reported that Ethiopia's flora comprises an estimated 6, 000 species of higher plants, with 10-12% being endemic (IBC, 2005). Among this plethora of plant species, medicinal plants hold a significant place. As with many other parts of the world, plants serve as a crucial source of medicine in Ethiopia. According to Dawit Abebe (1986), approximately 95% of traditional medicinal

preparations in the country are derived from plants.

Ethiopia is also characterized by its linguistic, religious, and culturally diverse population. This diversity has led communities in different regions of the country to develop their own specific knowledge regarding the use, management, and conservation of plant resources (Pankhurst, 1990). The utilization of traditional medicines from plants has a long history in Ethiopia, and methods for combating diseases through such practices have been developed (Asfaw Debela *et al.*, 1999). A majority of Ethiopians rely on medicinal plants as their primary source of healthcare, particularly in rural areas where access to modern medicine is limited. These plants hold significant medicinal value, sourced from various areas including wild habitats, home gardens, and cultivated fields. In Ethiopia, the collection of medicinal plants primarily occurs in the wild, while some are intentionally grown in home gardens for either medicinal or non-medicinal purposes (Fisseha Mesfin *et al.*, 2009; Tesfaye Awas and Sebsbe Demissew, 2009). Zemedede Asfaw (1997) notes that around 6% of plant species in Ethiopian home gardens are cultivated specifically for medicinal purposes. Natural ecosystems such as forests, grasslands, woodlands, wetlands, and field margins house a significant number of medicinal plant species. These are the areas where traditional healers and

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other community members gather and utilize medicinal plants (Endashaw Bekele, 2007).

### **The Importance of Traditional Medicinal Plants**

Plants are universally recognized as a crucial component of the world's biological diversity and a fundamental resource for the planet (SCBD, 2009). Thousands of wild plants hold immense economic and cultural significance, providing sustenance, medicine, energy, clothing, and shelter for people worldwide. Additionally, plants play a vital role in upholding the Earth's environmental equilibrium and the stability of ecosystems. They serve as habitats for a wide array of animal and insect species (SCBD, 2009).

The use of medicinal plants in religious and various cultural contexts is of great importance in traditional medicine. Traditional medicinal plants hold significant value in preventing, diagnosing, and treating illnesses, contributing to overall well-being. In Ethiopia, the practice of traditional medicine continues to thrive. Plant diversity remains indispensable for human health and continues to supply a substantial portion of remedies needed for healthcare. Medicinal plants have played a central role in treating various ailments in Ethiopia (Fekadu Fullas, 2007).

Ethiopia, characterized by diverse climate and ecological conditions, boasts an extensive range

of fauna and flora, including a particularly wide variety of potentially valuable medicinal plants. This diversity surpasses that found in many other regions of the world, as noted by Pankhurst (2001). Dawit Abebe (1986) estimated that a substantial 95% of traditional medical preparations in Ethiopia are derived from plants.

The enduring use of traditional medicinal plants in Ethiopia's history is evidenced by the recent collection of medico-religious manuscripts from the Axumite kingdom (Fassil Kibebew, 2001). Pankhurst (1990) emphasized that the longstanding practice of utilizing medicinal plants in Ethiopia cannot be easily disregarded. This is evident in medical textbooks written in Ge'ez or Arabic during the mid-17th and early 18th centuries (Tewolde Brehan Gebre Egziaber *et al.*, 1979; Dawit Abebe and Ahadu Ayehu, 1993; Asfaw Debela *et al.*, 1999).

While traditional medical practitioners possess valuable knowledge about medicinal plants in Ethiopia, obtaining this information proved challenging due to their inclination to consider their indigenous knowledge as a closely guarded professional secret, typically passed down orally to their eldest sons in their later years (Jansen, 1981).



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### **Threats and Conservation of Traditional Medicinal Plants in Ethiopia**

#### **Conservation of Traditional Medicinal Plants**

Conservation is the responsible utilization of biological resources. The concept of sustainability is now recognized as the fundamental principle for guiding economic and social development, particularly in relation to biological resources. Zemedu Asfaw (2001) highlights various conservation efforts worldwide aimed at safeguarding endangered medicinal plants from further harm (Cunningham, 1996). These initiatives encompass both in-situ and ex-situ conservation measures, focusing on preserving the genetic resources of medicinal plants.

In-situ conservation entails preserving species within their natural habitats. Some traditional medicinal plants are best conserved in their natural environments due to challenges associated with domestication and management (Zemedu Asfaw, 2001). Additionally, medicinal plants can be protected by promoting their growth in specific locations, as has been traditionally practiced. This can be achieved in places of worship (such as churches, mosques, graveyards), sacred groves, farm edges, riverbanks, roadsides, and as living fences in gardens and fields.

Ex-situ conservation involves safeguarding species outside of their natural habitats. Medicinal plants can also be preserved by encouraging their growth in designated locations, consistent with traditional practices, including places of worship (such as churches, mosques, graveyards). As suggested by Zemedu Asfaw (2001), medicinal plants can be conserved through appropriate conservation methods implemented in gene banks and botanical gardens.

#### **Conservation of medicinal plants in home gardens**

A significant concentration of valuable plants in Ethiopia is found within home gardens. These gardens are agricultural spaces characterized by a wide diversity of plants, including crops with excellent micronutrient properties. Typically situated in close proximity to households, home gardens can accommodate women's food production and household responsibilities (FAO, 2005). In Ethiopia, the home garden agro-ecosystem sustains a diverse range of perennial and annual crop plants. Zemedu Asfaw (2001) suggests that medicinal plants can be conserved through appropriate conservation methods implemented in gene banks and botanical gardens. Additionally, home gardens serve as a strategic and ideal farming system for conserving, producing, and enhancing medicinal plants. For economically disadvantaged rural communities, medicinal plants serve as

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affordable and locally accessible resources for addressing various diseases and health issues.

In the tropics, two types of home gardens are recognized based on their contributions to household benefits. The first type involves small-scale supplementary food production systems located around the house, particularly in areas where the owners' subsistence depends on their land use. The second category consists of home gardens extending from fields around the house, which constitute the primary livelihood for farming households. This category is particularly prevalent in the highlands of eastern Africa, including Ethiopia (Zemedu Asfaw, 2004). Cultivated medicinal plants are predominantly grown in home gardens for either medicinal or other primary purposes. The knowledge about these medicinal plants is typically open or public (Zemedu Asfaw, 2001).

Ethnobotanical studies can help identify management challenges associated with medicinal plants through interviews and market surveys. Furthermore, they offer solutions by promoting local traditions and customs that have conservation benefits (Gadgil *et al.*, 1993; Turner, 2000, as cited in Mersha Ashager, 2011).

### **Threats to medicinal plants**

Medicinal plants face threats from two primary sources: human-made and natural causes. Human-made threats, such as rapid population

growth, urbanization, timber production, over-harvesting, destructive harvesting, invasive species, commercialization, honey harvesting, degradation, agricultural expansion, and habitat destruction, contribute to the endangerment of medicinal plants. Similarly, natural causes like recurrent droughts, bushfires, disease outbreaks, and pest infestations pose risks to these plants (Ensermu Kelbessa *et al.*, 1992). The decline in medicinal plants and associated indigenous knowledge in Ethiopia can be attributed to both natural and anthropogenic factors (Giday Yirga, 2010b; Ermias Lulekal *et al.*, 2008).

Several medicinal plant species in Ethiopia face threats due to excessive harvesting for commercial medicinal use. Among the many medicinal plants in Ethiopia, approximately 26 species are endemic and are becoming increasingly rare, nearing the point of extinction (Tesfaye Awas and Sebsebe Demissew, 2009).

The erosion of knowledge concerning medicinal plants is particularly evident in forested areas. This decline in knowledge can be attributed to factors such as the reluctance of practitioners to share their knowledge, the proliferation of modern health centers, and the disinclination of younger generations to learn about traditional practices. In many countries, including Ethiopia, indigenous knowledge of remedies is passed down verbally from one generation to the next, often shrouded in secrecy (Jansen, 1981). This is also the case in the North Achefer district. Such secretive and informal transmission of

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knowledge makes indigenous and ethnomedicinal knowledge susceptible to distortion (Girum Misalie, 2018).

According to Pankhurst (1990), knowledge about medicinal plants and their application is primarily circulated among practitioners and the beneficiaries of such practices. The impact of modern education, increased access to healthcare, and urbanization have contributed to the rapid loss of indigenous knowledge and the utilization of medicinal plants on a global scale (WHO, 2002).

## **Conclusions**

In conclusion, Ethiopia boasts a rich biological diversity, with approximately 6,000 species of higher plants, making it a critical reservoir of medicinal plant resources. These plants play a vital role in traditional medicine, offering affordable and locally accessible remedies for a wide range of ailments. The reliance on traditional medicine, especially in rural areas, underscores the importance of preserving indigenous knowledge and conserving medicinal plant species.

Home gardens emerge as key repositories of valuable medicinal plants, emphasizing the need for sustainable conservation efforts. In-situ and ex-situ conservation methods, along with home garden cultivation, serve as pivotal strategies to safeguard these invaluable resources. However, both natural causes and human-made threats

pose significant risks to medicinal plants, necessitating concerted conservation efforts.

As the modernization of healthcare continues to influence traditional practices, it is imperative to document and preserve indigenous knowledge related to medicinal plants. This knowledge not only holds cultural significance but also represents a valuable resource for potential drug development.

In light of these considerations, a comprehensive approach is needed to ensure the continued availability and sustainable use of medicinal plants in Ethiopia. This includes collaborative efforts among local communities, researchers, policymakers, and conservationists to promote the conservation, documentation, and responsible utilization of these vital plant resources. By doing so, we can protect not only the rich biodiversity of Ethiopia but also the health and well-being of its people for generations to come.

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