



Protection of medical ethnobotanical knowledge through secrecy: A biodiversity conservation strategy

Sejabaledi A Rankoana *

Department of Sociology and Anthropology, University of Limpopo, Private Bag X1106, Sovenga 0727, South Africa.

Abstract

Medical ethnobotanical knowledge represents an invaluable heritage developed, used, and shared within families for future generations. This knowledge is crucial for preserving indigenous cultural heritage and biodiversity conservation. In South Africa, the use of indigenous plant-derived medicines is still practised discreetly; however, effective protection of traditional knowledge requires not only legal strategies but also suitable cultural and community-based approaches to protect it against biopiracy and extinction. This review emphasises how secrecy surrounding medicinal plant knowledge can serve as an essential mechanism to conserve and manage indigenous plant resources against overexploitation, biopiracy, and the adverse effects of climate change. The review enhances understanding of the role medicinal plant knowledge plays in achieving the United Nations Sustainable Development Goals (SDGs), particularly Objective 15 (Life on Earth).

Keywords: Ethnobotanical Knowledge; Medicinal Plants; Secrecy; Biopiracy; Climate Change

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* Corresponding author. E-mail address: sejabaledi.rankoana@ul.ac.za

1. Introduction

Humans developed traditional ecological knowledge as they perceived, used, and managed natural resources to satisfy their basic needs, such as food and healthcare. They learned which resources were most useful and created mechanisms to manage them for future use. A key aspect is the human dependency on plant biodiversity, which is culturally determined (Teixidor-Toneu et al., 2018). Knowledge about healing plants represents the most significant heritage that was developed, used, and shared within families for future use. This medical ethnobotanical knowledge was acquired through personal experience, curiosity, and trial and error about disease treatment (Pedrollo et al., 2016). It enabled the growth of low-cost, alternative sources of primary healthcare, and their use is part of the cultural traditional knowledge passed down orally through generations, forming a community heritage (Pedrollo et al., 2016; World Health Organization [WHO], 2019).

Medical ethnobotanical knowledge encompasses the understanding of healing plants developed and utilized by their originators. This knowledge evolved alongside traditional ecological knowledge, developed through trial and error until a repository of healing plants formed in the minds of the knowledge holders (Berkes et al., 2000). Many populations in developing countries depend on this knowledge, as it offers culturally accepted and affordable treatments to address their healthcare needs (Finn et al., 2017). The knowledge of medicinal plant uses is transmitted from one generation to the next, influenced by the secretive nature of the medical ethnobotanical knowledge held by medicinal plant users (Rankoana, 2022). This knowledge is vital for preserving indigenous cultural heritage and environmental management. The contemporary therapeutic use of medicinal plants is primarily attributed to indigenous knowledge, a system that has been successively passed down through generations (Alum, 2024).

The demand for medicinal plants and fungi has threatened certain species that are important for human health and contributed to the loss of biodiversity and depletion of natural resources (Howes et al., 2020). The United Nations has recognised the priority of the protection and promotion of traditional practices in the Convention on Biological Diversity, and the Rio and Johannesburg Declarations of the World Summit on Sustainable Development (Ghimire et al., 2025). The need to protect traditional knowledge is increasingly being realised, as traditional knowledge and associated practices are recognised for their role in environmental management and the promotion of sustainable development (Berkes et al., 2000). Developed and developing countries alike have engaged in debate and concluded agreements that include the protection of indigenous knowledge. Intergovernmental organisations such as the World Trade Organization (WTO) have opened debates on the possible protection of indigenous knowledge using intellectual property systems (Coleman, 2013; Khanyile et al., 2024). The WTO has established an Intergovernmental Committee (IGC) to initiate discussion on the protection of traditional knowledge, genetic and biological resources, and folklore using intellectual property systems. In South Africa, the Indigenous Knowledge Systems (IKS) Policy, adopted in November 2004, was the result of an interdepartmental effort to create a guide for the recognition, understanding, integration, and promotion of South Africa's wealth of indigenous knowledge resources (Seile et al., 2022; Prinsloo et al., 2023; Khanyile et al., 2024). One of the areas of action identified by the policy is the protection of indigenous knowledge and the holders of such knowledge against exploitation. Although treaties that can protect these issues are under discussion, many developed nations are opposed to the formulation of such treaties, and negotiations are on the verge of collapse (Kindie and Mengistu, 2022). However, the argument among scientists is that sustainable management and conservation efforts must include local communities and the owners of medical ethnobotanical knowledge (Rankoana, 2022; Ghimire et al., 2025).

Interest in this conservation approach has been growing partly due to a recognition that such knowledge can contribute to the conservation of biodiversity, rare species, ecological processes, to sustainable resource use in general (Berkes et al., 2000). Conservation biologists, ecological anthropologists, ethnobiologists, other scholars, and the pharmaceutical industry all share an interest in indigenous conservation practices for scientific, social, or economic reasons (Berkes et al., 2000).

In South Africa, fewer ethnobotanical studies have been conducted on medicinal plants, and little effort has been carried out to record and document the indigenous mechanisms in place to protect the medical ethnobotanical knowledge against exploitation and the sustainable use of biodiversity. In this paper, the emphasis is on the extent to which secrecy about ethnobotanical knowledge of medicinal plant uses can be an essential mechanism to conserve and manage indigenous plant resources from which they harvest medicinal plants, thus sustaining the indigenous plant biodiversity against anthropogenic factors for overexploitation, and against the negative impacts of rising temperature patterns and erratic rainfall as a result of climate change,

2. Methodology

This review employed medical ethnobotanical and anthropological methodologies and principles to elucidate the use of secrecy as one of the cultural mechanisms cultural to protect medical ethnobotanical knowledge held by community members to produce medicines administered for preventive, promotive, and curative care of primary health care. The review draws its data from multiple literature sources. The search was conducted through key electronic scientific databases, such as PubMed, Scopus, Google Scholar, SpringerLink, ResearchGate, EBSCOhost, ProQuest, Science Direct, Elsevier, and BioMed Central. Additional literature sources comprised scientific papers, book chapters, dissertations, theses, and websites. Secondary data sources have been searched, categorised, and analysed critically to generate themes and arguments. Common themes have been identified and extracted to provide insights into the protection of medical ethnobotanical knowledge. Only articles reviewed by peer reviewers between 2000 and 2025, books and technical reports available in English, and whose main topics were medical ethnobotanical knowledge and the protection of indigenous knowledge systems, were sampled for review.

3. Origin of medical ethnobotanical knowledge

Medicinal plants are integral to the daily health and wellness of these communities, providing remedies that are often more accessible, affordable, and culturally relevant than modern pharmaceuticals (Semenya and Potgieter, 2014). These plants are used in various forms, including decoctions, infusions, poultices, and ointments, each prepared according to traditional methods that maximize their therapeutic properties. The knowledge of how to identify, harvest, prepare, and use these plants is a testament to the deep understanding of nature and health possessed by traditional healers and community elders (Seile et al., 2022). Kokwaro (2013) attests that the African continent has a rich diversity of plant species, most of which are sources of medicine for human and animal ailments. In South Africa, indigenous plant medicine plays a central role in the daily lives of many rural communities (Pedrollo et al., 2016). Despite the establishment of modern medical facilities in Africa, many people still rely on indigenous herbal remedies. medicines and prefer consultation with traditional health practitioners for their health care (Pedrollo et al., 2016). This knowledge of medicinal

plant use originates from local communities and was transmitted throughout generations by word of mouth, and it is still useful today (Fakchich and Elachouri, 2014; Teso and Woldearegay, 2023). Knowledge of plant-derived medicine is learned and shared within families, with friends, and during apprenticeships.

Medical ethnobotanical knowledge is developed through several ways and passed from generation to generation, usually by word of mouth and cultural rituals. The knowledge has been the basis for health care at the household level and the help for local experts, either an elderly man or woman, and a traditional health practitioner (Howes et al., 2020). Knowledge of traditional medicine is founded on personal, practical experiences and observations handed down from one generation to another (Kokwaro, 2013). In ethnomedical practice, the source of knowledge of the practices is derived from a supernatural source (Ngulube, 2012). The normal practice is that the healer becomes possessed by the spirits that inform him or her of what to do, which medicine to use, where to find the medicine, and how to prepare and prescribe it (Fakchich and Elachouri, 2014). Medical ethnobotanical knowledge is acquired during apprenticeship (Ngulube, 2012). This type of knowledge is a combination of experience with an understanding of the acquired information of the event. Application of this experience can later be used to yield the desired outcome. For Rankoana (2022), knowledge of healing plants is acquired from their originators and owners, where the knowledge is the main ingredient in curative and preventive health care.

4. Protection of medical ethnobotanical knowledge

Much of ethnobotanical knowledge is common knowledge among its holders. Scientists in the humanities and natural sciences suggest that there is a clear need to document the current traditional knowledge on medicinal plants that are known to different cultural groups, as it is evident that this knowledge could be lost if the transfer of the knowledge to the youth is disrupted (Prinsloo et al., 2018; Rankoana, 2022; Prinsloo et al., 2023). Cultural knowledge has a long history, is often unique, and may hold merit in promoting certain plant species as medical remedies (Prinsloo et al., 2020). In addition to documenting this knowledge, there may be merit in introducing the value and importance of indigenous knowledge into the education curriculum in schools, as it would contribute to the provision of cultural values, promote people's heritage, and stress the importance of natural ecosystems and the role these systems may have in local communities (Seile et al., 2022; Prinsloo et al., 2023). These recommendations are provided even though much of this knowledge is already known and practised by a limited number of individuals.

In this case, this scarce knowledge can be shrouded in mystery to be known only to its holders, who would pass it through to their offspring to perpetuate its special value. Keeping the knowledge secret (Secrecy mechanisms in Table 1) implies that the information is known only to a closed circle and must have been treated as confidential. Since the knowledge is orally shared within the families, obtained through apprenticeship, and revealed by one's ancestors, the knowledge can never be shared or documented. It is held in the memories of its owners. This mystery of traditional medical practice is a common practice that preserves knowledge. Krige and Krige (1980) support that there are community members with special knowledge of healing plants, which they inherited from their parents, and this knowledge is kept secret because it lends some recognition and prestige within the community.

A secret about the name, location, and use of medicinal plants is recognised as a form of protection to ensure that confidential technical and commercial information is not disclosed to other people (Ranil et al., 2021).

Regassa and Woldearegay (2022) acknowledge that knowledge, protected by secrecy, will remain protected for as long as it is not disclosed. Secrecy is used to stop the unauthorised flow of information from the traditional knowledge holders to outsiders (Kumar, 2024). Secrecy provides a form of protection that may either already be part of an existing custom, for example, where certain sacred rites or practices are known only to certain members of the community, or it may be an external protective mechanism in response to the threat of misappropriation by non-members (Nikhat, 2022). Secrecy ensures a cost-effective, formality-free way of preventing the misappropriation of traditional knowledge. It is a tendency to retain anonymity to control/regulate access to such resources, featured as an alternative traditional method for conserving medicinal plants (Msuya and Kideghesho, 2009).

Community members with knowledge of medicinal plant uses sustained this knowledge from generation to generation as personal memories (Ranil et al., 2021). The use of indigenous plant-derived medicines is still secretly practised; however, effective protection of traditional knowledge requires not only legal strategies but also suitable cultural and community-based approaches to ensure its preservation and prevent misuse (Pemunta and Tabenyang, 2022). For Houghton and Osibogun (1993), this form of protection is a social control mechanism that forbids practitioners of herbal medicine from disclosing and sharing their trade secrets. The holders of medical ethnobotanical knowledge share the knowledge within a small circle of traditional experts, their close relatives, and dependents as a local means of regulation. Secretive collection expeditions are most cited as a way of protecting the medicinal plants from over-exploitation or misuse (Dapar et al., 2020). Additionally, medicinal plants are collected during specific periods to conceal their nature and habits by collecting them at night, dawn, or even at dusk to prevent unnecessary exposure of the medicinal plant species. This situation places the holders of medical ethnobotanical knowledge at the centre of the biodiversity conservation approach as the principal custodians of rich indigenous knowledge (Nemog'a et al., 2022). Conversely, Andarge et al. (2015) argue that indigenous knowledge of medicinal plants is gradually disappearing due to secrecy, as the holders of this knowledge kept it to themselves until the end of their lives. Kim et al. (2006) argue that since the knowledge is orally transmitted, and only possessed by certain members of the community, and is kept secret and confidential, most of it can disappear drastically following their deaths. Lack of formal records and the manner of obtaining the knowledge, which is mainly verbal, render the knowledge at risk of eroding (Dapar et al., 2020). For Misalie (2018), passing medical ethnobotanical knowledge down verbally from one generation to the next, and shrouding it in secrecy, makes this knowledge susceptible to distortion. Despite the significant benefits of secrecy about knowledge of medicinal plant uses, including biodiversity conservation and biopiracy, Kumur et al. (2021) believe that the lack of proper documentation of medical ethnobotanical knowledge may have resulted in the loss of this knowledge in many areas. These arguments are supported by Ghimire et al. (2025) study in Central Nepal, which found a substantial risk of loss of traditional knowledge on the use of medicinal plants among the younger generation.

Medical ethnobotanical knowledge, although protected through secrecy, which is aligned with Article 39.2(a) of the Trade Related Aspects of Intellectual Property Rights (TRIPS) Agreement and the World Intellectual Property Organisation (WIPO), may not necessarily be protected by Copyright Law. This potential protection is corroborated by indigenous health experts in mental health, reproductive health, and preventive care (Dapar et al., 2020). The practitioners use medicinal plant-derived medicines for preventive, protective, rehabilitative, and cure of medical conditions (Nikhat, 2022; Khanyile et al., 2024).

Table 1. Secrecy mechanisms

Secret	Practice
Knowledge not commonly shared	Knowledge is shared with families and trainees. Not documented but orally transmitted.
Plant names not disclosed	Medicines are dispensed without disclosing the plants from which they are made
Medicinal plant uses not disclosed	Medicinal uses of plants not disclosed
Location of harvest not disclosed	Secretive collection expeditions

5. Prospects of medical ethnobotanical knowledge protection

Keeping the medical ethnobotanical knowledge, a secret is essential for the sustainable (Kumar, 2024). The secretive nature of the medical ethnobotanical knowledge protects important medicinal plants from unfair competition over the species in their original habitats, covert bioprospecting, and biopiracy (Chebii et al., 2020). Secrecy in the use of indigenous plant resources contributed to biodiversity sustenance against overharvesting, and the negative impacts of climatic variability that affect plant phenology, alter habitat, floral distribution, change individual species populations, and disrupt collection periods of some medicinal plant species (Seile et al., 2022).

Protection of medical ethnobotanical knowledge through secrecy attests to the adaptive capacity of humankind to changing environmental conditions in diverse biocultural contexts (Nemog'a et al., 2022). Knowledge and practices of Indigenous Peoples and Like-Minded Local Communities (IPLMLC) are valued as critical assets for biodiversity conservation, for the sustainable management of natural resources, co-management of natural areas, water conservation, and climate change resilience (Nemog'a et al., 2022). Protection of indigenous knowledge can help to meet the broader objectives of society, for instance, conserving the environment, developing sustainable agriculture and ensuring food security, while its protection encourages the maintenance of traditional practices and lifestyles. As global biodiversity faces unprecedented threats from climate change, habitat loss, and pollution, the integration of indigenous perspectives with contemporary conservation strategies is increasingly recognised as essential for effective environmental stewardship (Kumar et al, 2021). Martin (1995) and Cotton (1996) indicate that protection of this knowledge is possible because indigenous people developed it at the same time as local management and conservation in the sustainable use and management of indigenous plant materials since time immemorial (Hoagland, 2017). Many of the holders of medical ethnobotanical knowledge trust and rely on secrecy to enhance conservation of medicinal plants and their habitats (Msuya and Kideghesho, 2009). Prinsloo et al. (2023) acknowledge that medical ethnobotanical knowledge would contribute to the promotion of cultural values, promote people's heritage, and, most importantly, conserve the natural ecosystems. The secretiveness of medical ethnobotanical knowledge defies common knowledge that most of the traditional medicines are gathered from the wild, and the common documented threats include but are not limited to overharvesting, unsustainable exploitation of medicinal plants for other uses (Nikhat, 2022). Protection of traditional knowledge prevents the loss of cultural heritage, such as medical ethnobotanical knowledge. Thus, it makes a way for the indigenous people's valuable

knowledge and contributions. Studies on traditional knowledge contribute to understanding biodiversity and to generating conservation and resource management strategies (Rankoana, 2022).

6. Conclusion

The knowledge of medicinal plant uses is transmitted from one generation to the next, influenced by the secretive nature of the medical ethnobotanical knowledge held by medicinal plant users. The review shows that the acquisition and transfer of medical ethnobotanical knowledge are done verbally as top secret between the knowledge holder and the person with whom the knowledge is shared. Secrecy is the primary indigenous method used by the holders of medical ethnobotanical knowledge to protect the knowledge from biopiracy and competitors. Medical ethnobotanical knowledge, protected through secrecy, is essential in biodiversity conservation, particularly medicinal plants. Medicinal plant species are protected against exploitation and the negative impacts of climate change. The study expands the knowledge base about medicinal plants contribution toward the achievement of the United Nations Sustainable Development Goals (UN SDGs), in this case, Goal 15 (Life on Land).

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