

Ethics in Ethnobotanical Research: Intersection of Indigenous and Scientific Knowledge Systems

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Abstract: This study examines the state of research ethics and professional conduct in ethnobotanical studies. In this study, "ethnobotany" is defined as the study of the knowledge, skills and daily uses of plants in a particular area that enable the people of the local community to get the most out of their environment. Ethnobotanical research impinges on local peoples' lives, sources of livelihoods, their environment and cultures, and this raises many ethical issues in the process. This paper documented information on important ethical considerations when engaging in ethnobotanical research and discusses the importance of a written agreement with local people specifying the elements of research collaboration, the responsibilities of each party, potential benefits to be derived from the research project, intellectual property agreements and disposition of the research results.

Keywords: Ethics, ethnobotany, indigenous knowledge system, scientific knowledge system, voucher specimens.

INTRODUCTION

Research by Rosenthal [1] showed that research ethics and scientific quality are directly correlated as scientific research that is of higher quality is likely to be more ethically defensible. Similarly, Smith *et al.* [2] argued that an ethical review process should be implemented to minimize both physical and social harm to research participants as it protects research participants' rights to their privacy and to choose freely whether to participate in a research project or not. The ethical review process also serves as a safety net for researchers as both research institutions and sponsors usually request an ethical approval before research funds are released from sponsors [2]. Hyder *et al.* [3] outlined key pertinent ethical issues associated with research involving humans as participants and such protocol include outlining the nature of proposed research intervention, types of research subjects to be used, signed informed consent forms, details of prior risk assessment and benefits to be derived from the research project. Such research protocol is particularly important for ethnobotanical researchers who are concerned with understanding the importance of plant resources to a local community, region, country or culture.

Ethnobotany is defined by de Beer and Van Wyk [4] as the study of the knowledge, skills and daily uses of plant resources in a particular community that enable the local people to get the most out of their natural environment. Ethnobotany has also been defined by

other researchers as the study of the relationships between people and plants [5,6]. Since ethnobotany focuses on inter-relationships between humankind and plants, usually involving indigenous knowledge systems regarding use of plant resources for food, medicines, construction materials, timber, firewood, hedge, ornamentals, rituals and other religious uses, local culture and environment; how this knowledge is transmitted prompted researchers such as Gilmore and Eshbaugh [7], Hardison and Bannister [8] and Salick *et al.* [9] to propose the following five critical questions concerning ethnobotanical research:

1. Have you received permission from participants, institutions and sponsors to carry out and publish your ethnobotanical research?
2. Have you considered and included local needs and challenges the local community is facing in your ethnobotanical research project?
3. Who are the beneficiaries of the intended ethnobotanical research and how is the local community going to be compensated?
4. How are the results from the ethnobotanical research going to be disseminated?
5. Is the input of the local community being acknowledged and protected when disseminating the ethnobotanical research results?

Ethnobotanical research impinges on indigenous peoples' lives, sources of livelihoods, their environment and culture, and this raises many ethical issues in the

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process. A well-known context of raising ethical issues in ethnobotany is through the practice of bioprospecting based on indigenous knowledge of local communities [8]. These authors argued that indigenous knowledge on biodiversity has been utilized by governments, academics and industrial researchers to identify leads for the potential development of pharmaceutical drugs and food products or supplements. Lack of bioprospecting legislation and associated regulations in the past have allowed unrestricted access to biodiversity resources and commercial exploitation of these resources and associated indigenous knowledge for research and development of value addition products without due compensation to the traditional knowledge holding communities. Therefore, this paper will shed some light on the important ethical issues to be considered when conducting ethnobotanical research and discusses among other issues the importance of a written agreement with local people describing the elements of research collaboration such as responsibilities of each party, benefits to be derived from the research project, intellectual property agreements and disposition of the research results.

MATERIALS AND METHODS

An extensive survey of literature related to research ethics and ethnobotanical research was conducted using Science Direct, Pubmed, Google scholar, Springer, Elsevier, NCBI, Taylor and Francis imprints. Pre-electronic sources such as book chapters, books, journal articles and scientific publications focusing on research ethics and ethnobotanical research were obtained from the University library. In selecting the research articles, several pre-determined criteria were taken into consideration. Firstly, only articles that focused on the fundamental basis of ethnobotanical research ethics, bioprospecting, indigenous knowledge systems, intellectual property rights, how indigenous people are protected from exploitation and other forms of harm were included in this review. The data was generated from research articles written in English and published between 1980 and 2020. The research articles that were published as abstract, letters and data that could not be extracted or overlapped with data from other articles were excluded.

RESULTS AND DISCUSSION

Growing Importance of Ethnobotanical Research Involving Medicinal Plants

Publishing of ethnobotanical research findings involving medicinal plants is now used as a tool or

means of pre-screening medicinal plants for phytochemistry or pharmacological properties of such plants, aimed at producing healthcare products and pharmaceutical drugs. Figure 1 provides contextual details essential to understanding and meeting the local community's expectations for research and also as part of establishing a broader, contextual framework necessary to understand the complex relationships between plants and people (www.culturalsurvival.org). Such strategies of acquiring and disseminating ethnobotanical knowledge is important in understanding the traditional values and uses of plant species to the local community.

It is estimated that a quarter of prescription drugs and 11% of drugs considered essential by the World Health Organization (WHO) are derived from plant species and a large number of synthetic drugs are obtained from precursor compounds originating from plant species [10]. According to Mugabe [11], of the 119 drugs developed from higher plants and on the world market today, about 74% of these were discovered from herbal medicines. But other researchers and indigenous rights proponents argue that information in Figure 1 and other ethnobotanical literature in journal articles and databases serves as a major source of scientific information for researchers and industries with commercial objectives (www.culturalsurvival.org). These authors argue that access to such scientific information is typically unrestricted and unconditional, scientific researchers are not legally required to ask permission, recognize indigenous rights to intellectual property or provide compensation for use of this indigenous or cultural knowledge. There are concerns among indigenous communities, particularly holders of traditional medicine knowledge that publication of medicinal uses and properties of plant species of medicinal value that have been used by local communities for generations will lead to commercialization of such species without due compensation to local communities. Research findings by Greary *et al.* [12] revealed that previous studies on indigenous Aboriginal peoples in northern Canada have historically benefited academia with little consideration for the local people being researched or the integration of indigenous knowledge. This exploitative research approach has negative ethical implications on the researchers that need due redress in order to compensate indigenous communities from which such knowledge is derived.

Documenting indigenous knowledge systems can improve other people's understanding of how

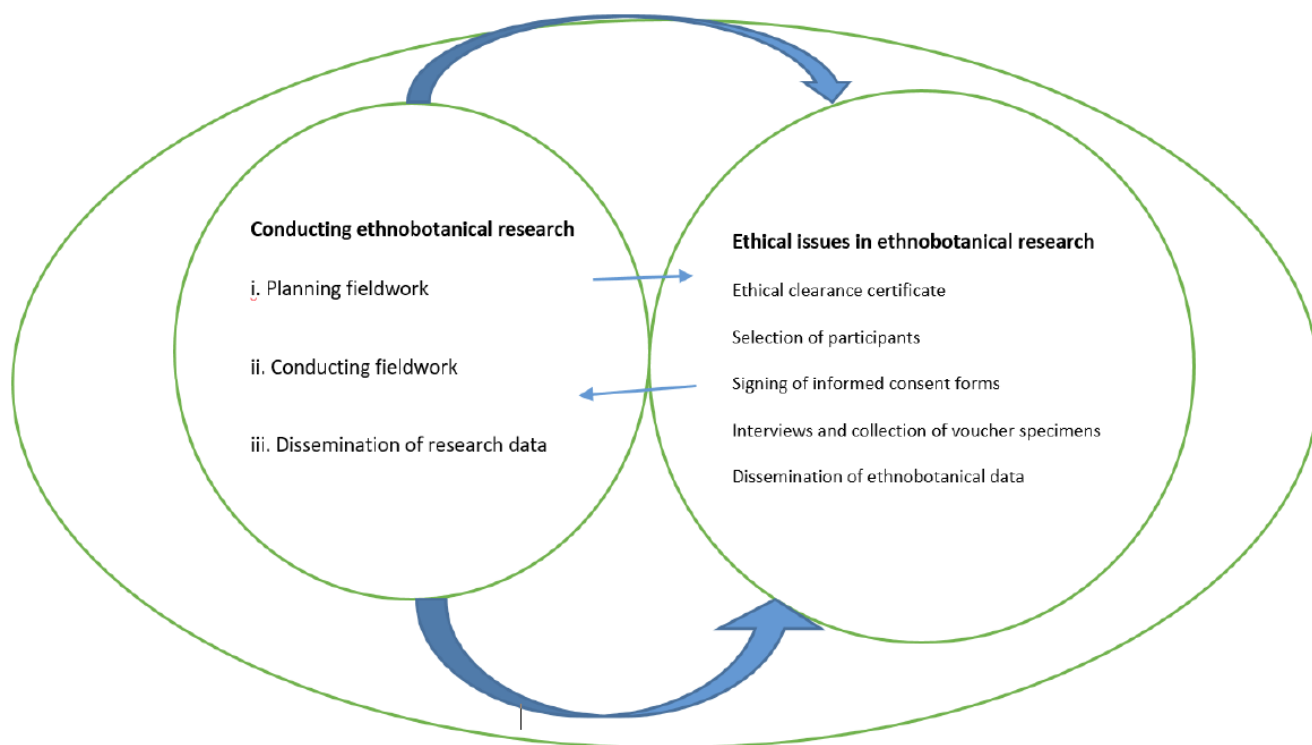


Figure 1: Ethical issues associated with ethnobotanical research identified from literature.

ethnobotanical knowledge is distributed in community and society, who benefits from it; and at the same time enhancing people's understanding of social and economic values of plant resources within different societies, countries and regions. The global Convention on Biological Diversity (CBD), ratified by 196 countries, agreed on a comprehensive strategy aimed at recognizing ownership of indigenous or traditional knowledge and the biological diversity to which the knowledge is attached and the sharing of the benefits that may arise as a result of the utilization of that biological diversity. The CBD adopted three major objectives, namely (<https://www.cbd.in>):

1. the conservation of biological diversity,
2. the sustainable use of biodiversity, and
3. the fair and equitable sharing of benefits arising out of the utilization of biodiversity.

When doing ethnobotanical research, there is need to collaborate with local people as partners, acknowledge indigenous knowledge held by the participants or local communities in the identification and development of utilized plant species into new products and environmental services; and also have mechanisms in place for equitable sharing of benefits that will arise as a result of the collaboration. Several steps need to be taken by researchers involved in

ethnobotanical research aimed at addressing the ethics of research and the relationships with local people involved in these studies and the communities' perceptions of ethnobotanical research aimed at documenting their indigenous knowledge. Based on CBD resolutions, it is the responsibility of countries to take appropriate measures that protect indigenous people and emphasize the importance of sharing benefits that arise from utilization of biological diversity in a fair and equitable manner.

The fundamental basis of ethnobotanical research ethics is about ensuring that vulnerable indigenous people are protected from exploitation and other forms of harm [2,13]. In order to ensure that individual's right to voluntarily decide to participate in the ethnobotanical research, a written or verbal informed consent is required, in which the researcher is expected to fully explain his or her research and potential risks and benefits to each research participant prior to the interviews. It must be in the language of the research participant; and there is also need to adhere to local laws, customs and national requirements.

Guidelines for Ethical Conduct of Ethnobotanical Research

Ethnobotanical research usually impinges on local people with whom ethnobotanical researchers work with and therefore, there is need to develop a written

agreement with local people describing the elements of the research collaboration such as responsibilities of each party, potential benefits of the research project, intellectual property agreements and disposition of the research results. The International Society of Ethnobiology has a comprehensive Code of Ethics which can be used as a guideline for ethnobotanical fieldwork and data collection protocols. The ISE objectives are [14]:

1. to optimize the positive outcomes and reduce as much as possible the adverse effects of ethnobotanical research, and
2. to provide a set of principles and practices to govern the conduct of all members of the ISE who are involved in ethnobotanical research in all its forms.

The ISE guidelines comprise 17 principles which can be grouped under the following broad categories [8,14]:

1. need to acknowledge indigenous prior rights and responsibilities,
2. need for negotiation, consultation, agreement and mutual understanding with local communities,
3. active community participation is expected in all stages of ethnobotanical research,
4. ethnobotanical researchers are expected to incorporate reciprocity, mutual benefit, and equitable sharing in ways that are culturally appropriate and consistent with the wishes of the community involved.
5. ethnobotanical research is expected to be conducted in the local language wherever possible, which may involve language fluency or employment of interpreters, and
6. ethnobotanical researchers are expected to have a working understanding of the local context prior to entering into research relationships with a community, which includes knowledge of and willingness to comply with local governance systems, cultural laws and protocols, social customs and etiquette.

Key ethical principles considered to be important when conducting ethnobotanical research include the need to acknowledge indigenous knowledge of the

local community, obtaining prior informed consent and equitable sharing of any benefits that are likely to arise from the ethnobotanical research project.

Importance of Voucher Specimens in Ethnobotanical Research

Eisenman *et al.* [15] defined a voucher specimen as a pressed and dried herbarium specimen with detailed collection data; and serves as a record of an individual plant in time and space. A herbarium specimen should include the following [16,17]:

1. Collector's name, number and date of collection,
2. Provisional name if any or vernacular name,
3. Global Positioning System (GPS) coordinates and altitude reading,
4. Locality and description of the habitat,
5. Provide a detailed description of the plant, in terms of life form (is it a tree/shrub/herb), plant features that will disappear with pressing, e.g., flower colour, describe underground parts, aroma, leaf arrangement and shape, and
6. take a photo of the plant if possible, collect and seeds and fruits to be preserved as spirit material.

The collected plant specimen is pressed in a plant press. Pressing flattens and dries the plant specimen, and makes it possible to mount and preserve it. The aim of mounting is to make the voucher specimen easier to handle and more accessible for study or reference. The plant specimen is displayed on a herbarium sheet in such a manner to allow maximum observation of all characters. The plant specimen is deposited in an officially recognized public herbarium registered with Index Herbariorum [18], where it will receive proper care and become a permanent record available to other researchers [19]. A herbarium specimen will last indefinitely if properly prepared, cared for and protected from water, humidity and pests [19].

What are the reasons of vouchering?

- i. To have a permanent record documenting the plant species used in a particular community or cultural group,
- ii. If a plant specimen is not saved or is not made available to other researchers, particularly plant

taxonomists, then the true identity of such a plant species recorded in a research project may be questioned,

- iii. The lack of proper voucher specimens for some research projects has led to serious problems, such as the inability to reproduce critical results, the association of chemical data with the wrong genus and species, and even the complete rejection of the published research results [15],
- iv. In cases where plant material was initially misidentified and properly prepared voucher specimens were available, the identities of the research material were eventually corrected and the data was subsequently associated with the correct species, retaining the inherent scientific value of the research [15],
- v. Species delimitation and taxonomy can change with additional taxonomic research, so voucher specimens provide a method to update species identifications as new plant classifications are accepted [20].

In this study, it is argued that in order to properly document an ethnobotanical study, it is important to collect voucher plant specimen (see Figure 1), preserve it as a permanent record associated with the identity of the plant under discussion, traditional uses and its ecology. Preserved voucher specimen will allow authenticating the identity of the plant species involved and also available for subsequent research and reproducibility of studies, a fundamental tool in scientific and technological research.

CONCLUSION AND RECOMMENDATIONS

This article addresses ethical issues that should be considered when conducting ethnobotanical research, other ethical procedures and processes aimed at protecting indigenous knowledge held by the participants and local communities, and creation of an atmosphere that will lead to equitable sharing of benefits arising from the use and application of this indigenous knowledge held by the participants. Ideally, the participants should be involved in all aspects of the data collection and dissemination of the information arising from the ethnobotanical research.⁴ Most plants encountered in ethnobotanical fieldwork will already have an identification in the form of a local vernacular name and in terms of the preservation of indigenous knowledge associated with such species, the vernacular names are essential [20]. Identification of a

plant species by botanical name is also essential when doing ethnobotanical research, because this approach enables knowledge of the plant species and its uses to be understood and applied by the wider scientific community through use of standardized and universal botanical names showing phylogenetic relationships with other species and also eliminate the possibility of confusion arising as a result of multiple naming of species in different cultures and regions. A combination of local vernacular names and modern botanical names is important for the preservation of indigenous knowledge on the plant as well as its accurate identification. In order to properly document an ethnobotanical research, it is essential to collect voucher plant specimens and deposit these in a herbarium where they will be available indefinitely to confirm the identity of the plant species under discussion [20]. This paper, therefore, argues that:

- i. when undertaking ethnobotanical research in socio-culturally and economically diverse indigenous communities, it is important to acknowledge indigenous knowledge held by local communities, including protection of their cultural heritage and artefacts, creation of a conducive environment for technology transfer, infrastructure development, capacity building, equitable distribution of benefits arising from the collaboration, and
- ii. it is also important to collect voucher plant specimens, preserve them as permanent records associated with the identity of the plant under discussion, uses, their ecology and overall function in the ecosystem.

Ethnobotany is by definition at the intersection of indigenous, botany and other scientific knowledge systems. Therefore, ethnobotany as a discipline is multidisciplinary in nature, using information originating from multiple knowledge systems aimed at transmitting or disseminating indigenous knowledge on utilization of plant resources by different cultures in accessible forms. Other researchers, for example Bye [21] are of the opinion that the use of voucher specimens in ethnobiology serves as an important link between two knowledge systems, that is Western biological sciences and that of the ethnoscience of the native culture the ethnobiologists seek to document. Ethnobotanical studies have recognized the value of understanding plant and people relationships, traditional uses and management of plant resources by indigenous communities. The plant-people relationships show

remarkable diversity of cultures, beliefs and plant use strategies needed to sustain a broad spectrum of ways of life. Indigenous knowledge provides valid and useful knowledge essential to enhance our understanding of how useful biodiversity is to human well-being. Indigenous knowledge and other scientific knowledge systems complement each other in advancing ethnobotanical knowledge on useful plants. However, there is need for a review on how local people and indigenous knowledge holders are perceived by other scientists and ethnobotanists. The local people are important traditional knowledge holders in their own right with their own ecological understandings of plant resources, plant management, conservation and utilization practices. There is also need to seriously consider some of the ethical principles discussed in this study when documenting biodiversity use in local communities. Protection of indigenous knowledge associated with utilization of biodiversity is within the framework laid down in the principles of the CBD and this should serve as a guideline on ownership and sustainable utilization of biodiversity worldwide.

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