Review Article

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ETHNOMEDICINAL PLANT SURVEYS AS A TOOL FOR TRADITIONAL KNOWLEDGE PRESERVATION AND MEDICINAL PLANT RESEARCH: A REVIEW

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ABSTRACT

Long before pharmacology became a formal science, communities worldwide were already testing, refining, and passing down knowledge about which plants heal and which harm. That accumulated wisdom, carried mostly through memory, oral instruction, and everyday practice rather than written records, is now disappearing faster than most people realise. Ethnomedicinal plant surveys are among the few practical tools that can slow this loss while also feeding new leads into modern drug research. This review examines why these surveys matter, how researchers conduct them in the field, the quantitative methods they use to interpret what they collect, and the tangible contributions this work has made to pharmaceutical discovery. It also takes an honest look at the difficulties of shrinking pools of knowledgeable elders, unresolved questions about intellectual property and benefit-sharing, and the technical challenge of building databases communities can trust and use. The review closes by considering where the field appears to be heading, particularly as digital tools and interdisciplinary collaboration reshape how ethnobotanical knowledge is recorded and applied.

Keywords: ethnomedicine, ethnobotanical survey, traditional knowledge, medicinal plants, drug discovery, quantitative ethnobotany, benefit sharing

INTRODUCTION

Walk into almost any rural community with a long-settled population, and someone, likely an older woman, a traditional healer, or a farmer with decades of experience, can identify which leaf soothes a stomach ache, which root brings down a fever, and which bark is best avoided during pregnancy. This kind of knowledge rarely exists in a textbook. It is learned by watching, by trial, and by being told, generation after generation. Ethnomedicinal plant surveys capture this knowledge before it disappears, and increasingly, they also serve as a starting point for scientific investigation into new therapeutic compounds.

Interest in this area has grown substantially over the last two decades, especially in biodiversity-rich regions where plants still form the backbone of everyday healthcare and where local traditions of plant use remain strong[1]. Fieldwork among forest-dependent communities has repeatedly shown that documenting these plant-use practices is not merely an academic exercise; it is essential to restoring and preserving ethnomedicinal knowledge and conserving the species involved, for the wider benefit of human society[2]. Similar surveys conducted in Haryana, India, found that a striking number of remedies were passed down informally from elders or learned through trial and the experience of others, without ever being written down[3], which is precisely what makes this knowledge so fragile.

This review pulls together what the current literature indicates about how ethnomedicinal surveys are conducted, how researchers analyse the resulting data, what these surveys have contributed to modern medicine, and what obstacles still stand in the way of doing this work responsibly and effectively.

Why this work matters: Knowledge on the verge of disappearing

There is a quiet urgency running through nearly all of the recent ethnobotanical literature. Researchers in the Italian Alps, for instance, set out to counter what they describe as deep erosion in the transmission of plant knowledge between generations, finding a clear lack of intergenerational knowledge transfer even as their project demonstrated ethnobotany's concrete role in safeguarding what heritage remains[4]. This is not an isolated European phenomenon; it recurs across survey after survey, regardless of continent.

Elders in West Bengal expressed a similar worry, describing a disinterestedness among younger people that they feared would cause this wealth of knowledge to vanish entirely within a generation or two. Urbanisation, migration, formal schooling that displaces oral learning, and the simple convenience of pharmacy-bought medicine are usually cited as the main drivers of this decline. Once an elder healer dies without transmitting their knowledge, that specific combination of species, preparation methods, and dosages is often gone for good; there is no backup copy.

This is exactly the gap that ethnomedicinal surveys are designed to fill. By recording, in as much detail as possible, what plants are used, how they are prepared, what ailments they treat, and who is doing the treating, researchers create a written and often photographic or specimen-backed record that can outlast any single generation of practitioners.

How ethnomedicinal surveys are conducted

Most surveys share a broadly similar structure, even though the specific communities and ecosystems vary enormously. Fieldworkers typically combine semi-structured interviews, open-ended questionnaires, guided forest or field walks with local informants, and the collection of voucher specimens for later botanical identification. A study among forest-dependent communities near the Chilapatta Reserve Forest in eastern India worked with roughly 400 respondents, including practising traditional healers, using an open-ended interview schedule covering plant species, the plant parts used, dosage, and method of preparation[2].

Informed consent is treated as a non-negotiable part of the process in well-conducted studies. Researchers working in Jharkhand described obtaining Free and Prior Informed Consent before collecting any information, combining direct interviews and guided tours (an in-situ approach) with photographic documentation of preserved herbal preparations already in use (ex-situ methods)[4]. This dual approach cross-checks informants' reports against what is physically observable, reducing the risk of misreporting.

Sample sizes vary considerably. Some surveys draw on a relatively small, tightly knit group of specialist healers, while others cast a wider net across the general population. A study in the Bandarban district of Bangladesh worked with 174 informants across three indigenous communities and documented 159 distinct plant species[5]. Larger sample sizes generally allow researchers to calculate more statistically meaningful consensus measures, discussed further below. Still, they also require more time, funding, and trust-building within the community, which cannot be rushed.

Once field data are collected, researchers typically press plant materials, dry them, poison them with 0.1% mercuric chloride and 70% ethyl alcohol, and deposit them as voucher specimens in a recognised herbarium. Voucher specimens enable subsequent verification of species identification, an important step that is easy to overlook but difficult to rectify later, as misidentified plants can compromise all downstream analyses.

Making sense of the data: Quantitative ethnobotany

Simply listing plants and their reported uses only goes so far. Over the past three decades, ethnobotanists have developed quantitative indices that help distinguish which species are genuinely important to a community from those mentioned only in passing.

The Use Value (UV) reflects how often and how significantly a species is cited by informants, giving researchers a rough numerical sense of a plant's relative importance within the local pharmacopoeia [6]. The Relative Frequency of Citation (RFC) and Frequency of Citation (FC) work in a related way, tracking how consistently a given species comes up across different informants[5]. The Informant Consensus Factor (ICF), first proposed by Logan and later refined by Heinrich and colleagues, measures how much agreement exists among informants regarding which plants are used to treat a particular category of illness. A high ICF suggests that knowledge about treating that condition is well shared and consistent across the community, while a low value suggests more scattered, idiosyncratic knowledge [6].

Other commonly used measures include the Fidelity Level (FL), which captures how specifically a plant is tied to treating one condition versus being used for many different ailments, and the Family Importance Value (FIV), which looks at importance at the level of plant families rather than individual species[7]. Some studies also apply a Jaccard Index to compare the degree of overlap between their own findings and those of earlier surveys in nearby regions, which is a useful way of checking whether a particular remedy is broadly shared across a wider cultural or ecological zone or is genuinely localised[8].

These indices trace back to foundational work from the late 1980s and early 1990s. Early researchers working in Venezuela calculated the percentage of plants used by informants within fixed forest plots, while later work introduced weighted scoring systems that distinguished "important" from "minor" uses, eventually giving rise to the correction-factor methods still in use today[9]. More recent tools, including dedicated statistical software packages, now allow researchers to calculate these indices automatically once field data has been entered, which has made quantitative analysis far more accessible to smaller research teams working with limited resources [10].

None of these indices replaces the underlying survey work; they simply help organise and interpret it. A high use value or consensus factor for a plant used against, for example, gastrointestinal complaints tells a research team where to look first if they are hunting for pharmacologically active compounds, since consistent, independently corroborated use across many informants is generally a stronger signal of genuine efficacy than an isolated anecdote [11].

From field notes to the laboratory: Contributions to drug discovery

Ethnomedicinal surveys are not just cultural preservation; they have repeatedly proven their worth as a starting point for pharmaceutical research. Several of the most important drugs in modern medicine trace their origins directly back to traditional plant use. Artemisinin, isolated from Artemisia annua L. and now a cornerstone of malaria treatment, was identified through a systematic review of traditional Chinese medical texts. Galantamine, used in the management of Alzheimer's disease, was derived from snowdrop species long used in folk medicine, and paclitaxel, one of the most widely used anticancer agents, came from the Pacific yew tree [12].

Natural products and their derivatives continue to make up a substantial share of newly approved drugs. Recent analyses estimate that they account for roughly 27 per cent of drugs approved between 1981 and 2019, and plant-derived compounds in particular tend to show better clinical translation rates and more favourable safety profiles compared with fully synthetic molecules [13]. This is part of why the ethnobotanical approach to drug discovery, starting with plants already known to have some biological effect on humans rather than screening chemical libraries at random, is considered by many pharmacologists to meaningfully improve the odds of finding a usable lead compound [14].

The process itself is genuinely interdisciplinary. It typically begins with field documentation, moves into phytochemical screening to identify candidate bioactive compounds, and then proceeds through pharmacological testing, isolation of active molecules, and eventually formal drug development and clinical trials [15]. Modern biotechnology has added further tools to this pipeline: plant cell cultures, heterologous biosynthesis in microorganisms, and genome sequencing now allow researchers to reconstruct and scale up the production of compounds that would otherwise be difficult or environmentally costly to harvest directly from wild plant populations [16].

Large-scale computational approaches are also starting to change how this field operates. One recent cross-cultural analysis mined ethnobotanical use records from many different regions simultaneously, looking for patterns such as taxonomic hotspots associated with particular medical indications and shared bioactive phytochemistry among plants that are not closely related but are used for the same purpose [17]. This kind of pattern matching, done at scale, would simply not be possible without the underlying decades of individual field surveys that fed into these datasets in the first place.

Persistent Challenges

Knowledge erosion and the question of who is left to ask

The most immediate challenge is time itself. Traditional knowledge is disproportionately concentrated among older community members, and as they pass away without fully transmitting what they know, that specific knowledge is lost, not archived, not recoverable, simply gone. Researchers studying this problem in Italy specifically involved children and younger family members in their surveys, partly as a documentation strategy and partly as an intervention meant to encourage renewed interest in traditional practices among the next generation [18]. Whether such interventions can meaningfully slow the broader trend remains an open question, but they represent one of the more proactive responses to the erosion problem currently being tested in the field.

Ethics, ownership, and the risk of exploitation

A more uncomfortable issue involves who benefits when traditional knowledge leads to a commercially successful drug. Historically, there have been documented cases where medicinal plant products were developed and commercialised without adequately recognising or compensating the communities whose knowledge made the discovery possible[19]. This practice, sometimes referred to as biopiracy, has been described as the unauthorised commercial use of genetic resources and associated traditional knowledge without sharing the resulting benefits with the community or country of origin [20].

International frameworks have attempted to address this. The Nagoya Protocol, which entered into force in 2014, requires fair and equitable sharing of benefits arising from the use of genetic resources and the traditional knowledge associated with them [21]. Under this framework, researchers and pharmaceutical companies operating in signatory countries are generally expected to obtain prior informed consent from the relevant indigenous or local community and to negotiate a benefit-sharing arrangement before commercialising anything derived from their knowledge [21]. In practice, implementation has been uneven, partly because traditional knowledge is often shared across many communities and even multiple countries, and partly because oral knowledge is inherently difficult to document as “prior art” in the way patent law typically requires [22].

There is also a growing conversation about newer risks; for instance, concerns that artificial intelligence systems trained on large ethnobotanical datasets could extract or repackage traditional knowledge in ways that bypass community consent altogether, which underscores that this is not a settled or historical issue but an ongoing one [23].

Building databases that actually work

Once field data is collected, it needs a place to live that other researchers, and ideally the source communities themselves, can access. This has proven harder than it sounds. Studies of existing ethnobotanical databases have found that many are not sustainably maintained over the long term, and that even well-digitised herbarium collections often fail to capture the ethnobotanical information tied to a specimen, since standard cataloguing formats were not originally designed with traditional use data in mind [24]. A recent survey of digital herbaria found that ethnobotanical information represents only a small though still collectively significant proportion of digitised specimens worldwide, and called for better shared standards so that this information can be located, properly credited, and responsibly shared back with the communities it came from [24].

Digitisation does offer real promise, though. Global tools and platforms are increasingly being used to bridge traditional knowledge with bioinformatics resources, supporting both drug discovery efforts and biodiversity conservation planning [25]. At the same time, researchers working on this problem have flagged genuine concerns around data accuracy, the ethics of who controls access to digitised traditional knowledge, and the risk that communities with limited digital infrastructure could be left out of a system increasingly built around online access [26].

Looking Ahead

The trajectory of this field seems to be heading toward closer integration between traditional fieldwork and modern computational biology. Multi-omics approaches combining genomic, metabolomic, and other large-scale biological datasets with traditional use information are being explored as a way to more efficiently identify which of the thousands of documented ethnomedicinal plants are most likely to contain genuinely novel therapeutic compounds, rather than relying purely on trial-and-error laboratory screening [28]. This matters because the traditional drug discovery pipeline has historically been slow, producing only a limited number of new clinically approved molecules per decade, and there is real pressure to speed this up given the growing global burden of drug-resistant infections and neglected diseases [27].

At the same time, the field is increasingly recognising that scientific validation and technological advancement cannot come at the expense of the communities whose knowledge underpins them. Systematic reviews of the literature have specifically flagged gaps between the volume of documentation being produced and the degree to which that knowledge is being meaningfully integrated into conservation policy or benefit-sharing frameworks [1]. Closing that gap, ensuring documentation efforts translate into both scientific insight and genuine benefit for source communities, looks likely to be one of the defining challenges for this field over the next decade.

CONCLUSION

Ethnomedicinal plant surveys sit at an unusual intersection of anthropology, botany, pharmacology, and cultural preservation. At their core, they are an act of listening, recording what communities already know before that knowledge disappears with the people who hold it. But they are also, increasingly, the first step in a pipeline that has produced some of modern medicine's most important drugs. The methodological toolkit for conducting and analysing these surveys has matured considerably, with well-established quantitative indices now allowing researchers to identify which plants a community uses most consistently and confidently. Less settled, however, is the ethical and institutional framework around this work, ensuring that the people who preserved this knowledge across generations are properly recognised, consulted, and compensated when it eventually contributes to new therapeutics. Getting that balance right will determine not just how much traditional knowledge survives, but whether the relationship between researchers and the communities they work with remains one worth continuing.

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