

Current gaps and approaches for future ethnobotanical research in India

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Abstract

The author has looked at the gaps in current ethnobotanical researches within the Indian subcontinent and has highlighted and discussed about the approaches for future research.

Key Words: Ethnobotany, future, India.

Introduction

When we talk of Ethnobotany, several words cross our minds, such as: 'aboriginal', 'primitive', 'tribe', 'native people', 'local informants', 'folk-lore', 'race', 'mankind' 'plant uses', 'economic botany', 'food plants', 'medicinal plants', 'ethnopharmacology', 'culture', 'tradition', 'edible plants', 'ethnoveterinary', 'plants used for construction purposes', 'paintings', 'basketry', 'thatching', 'toys', 'mats', 'magico-ritual uses', 'love potions', 'plants that appear in dreams' 'bioactive compounds', 'secondary metabolites', 'antibacterial activity', 'drugs' 'field work', 'herbarium specimens', 'healers', ' vaidya', 'cross-cultural ethnobotany', 'diachronic studies, 'inter- disciplinary or multi-disciplinary studies', 'anthropology', 'qualitative ethnobotany', 'quantitative ethnobotany' 'phylogeny' 'biogeography', biodiversity', 'conservation', 'sacred grooves', vertical transmission', 'horizontal transmission' and 'oblique transmission'.

Ethnobotany in its simplest term means inter-relationship between man and plants. In the current era, Ethnobotany is also referred as Ethnobiology which is now called "Biocultural interactions". To understand relationships between people and their biological environment, ethnobotanical research is important.

In India, the organised study of Ethnobotany is just over five decades old (middle of the century) and it was Dr. E.K. Janaki Ammal (b. 04.11.1897 d. 07.02.1984), a 19th century female botanist, who laid its foundation in 1954 as the first Director of the Central Botanical Laboratory of Botanical Survey of India, temporarily located at Chhatar Manzil, Lucknow and was later shifted to Allahabad and finally to Kolkata (Calcutta). In the early sixties, Dr. S.K. Jain (b. 30.06.1926 d. 20.04 2021), also known as 'father of Indian Ethnobotany' (Saklani, 2021), carried intensive field studies

among the various tribes of Central India and published numerous papers. Many institutes have popularised Traditional Knowledge (TK) such as the Botanical Survey of India (BSI), the National Botanical Research Institute (NBRI), National Plant Genetic Resources Centre (NPGRC), AYUSH (Ayurveda, Yoga, Unani, Sidha and Homeopathy) and FRHLT (Foundation for Revitalisation of Local Health Traditions). Besides, certain societies and universities have also popularised Ethnobotany. For example, the Society of Ethnobotanists established in 1980 at Lucknow provides various training courses and organises seminars and publishes the Journal *Ethnobotany*. The Institute of Ethnobiology, established in 1995 by late Dr S.K. Jain, F.N.A., former Director of Botanical Survey of India, initially at Lucknow, was later shifted to Jiwaji University, Gwalior in 2002 and rechristened as 'S.K. Jain Institute of Ethnobiology'. Ethnobotany is also taught as a subject in university curriculum in many universities across India. Despite this, compared to the other sciences, this discipline tends to have a low status.

Over the last two centuries, major progress has been made in finding new compounds to fight diseases like tuberculosis, leprosy and fever. The scientists in this century are now reviving TK to screen various parts of plants scientifically which are used in traditional/folklore medicine in search of new lead compounds which have antibacterial activity. Ethnomedicinal investigations have led to the discovery of important drugs like reserpine (for treating hypertension), podophyllotoxin, vinblastine and taxol used in cancers (Pavid & Knapp, 2020). In 2012, AIMIL Pharmaceuticals in collaboration with Defence Research and Development Organisation (DRDO), Government of India, developed Lukosin ointment /oral liquid for treating Leucoderma. This contains *Ammimajus* and *Psoraleycorylifera* (see <http://www.aimilpharmaceuticals>).



com/index.php?option=com_content&task=view&id=64&Itemid=68).

India is one of the largest producers of medicinal plants in the world. *Indian Herbal Pharmacopoeia* (IDMA, 2002) so far lists only 52 monographs of the most commonly used medicinal plants in India. The monographs also give details about the microscopic characters of the plant, the chemical constituents, adulterants, pharmacology- which has been updated with latest reported activities, therapeutic category, safety aspects and the dosage. This is a good book covering not only all aspects of plants but also provides an authentic source for up-to-date information and lists references for further studies. Still, many more plants are yet to be explored and documented.

Documentation of traditional medicinal plants and the various uses is increasingly becoming important and numerous databases are published by institutes such as Ashoka Trust for Research in Environment and Education (ATREE), Blatter Herbarium (BLAT) and the Botanical Survey of India (BSI). Inventorying of plants and their uses at regional and local level continues from many parts of India and many more are needed. However, a lot of ethnobotanical papers published show caveats about the quality of plant use data.

Some of the important sources for methods in ethnobotanical research on various aspects are by Albuquerque and Hanazaki (2009), Alexiades (1996), Andrade and Heinrich (2011), Balick and Cox (1996), Jain and Mudgal (1999), Martin (1995), McClatchey (2006), McClatchey *et al.*, (2009) and Weckerle *et al.*, (2018). Today, although, globally and regionally, there are lots of studies which lead to a general understanding about plants and their uses (de Medeiros *et al.*, 2013), the availability of appropriate data and research foci are one of the main drivers which pose a limitation to a broad-scale research.

Research areas for future studies

Although India has multiple religions, racial stocks and has a large amount of literature on plant's uses, studies on various cross cultural comparisons are few. Saklani and Jain (1994) produced a cross cultural ethnobotany of North East India; Navaeethan *et al.*, (2011) carried out cross-cultural study amongst tribes of the Nilgiri Hills in the Western Ghats. Gairola *et al.*, (2014) carried out cross-cultural analysis of medicinal plant uses of Jammu, Kashmir and Ladakh and discussed cross-cultural consensus on the use of medicinal plants in these three regions. However, modern tools of Ethnobotany such as phylogenetics (Saslis-Lagoudakis *et al.*, 2011, 2012, and 2014) have not been used for plant uses and comparisons in India. Such studies are needed and will enhance the understanding of plant uses amongst various cultures in India.

Elsewhere in the world, phylogenetic methods have also been used to study languages and cultural artefacts. Material cultural data sets such as Turkmen carpet designs (Tehrani & Collard, 2002), decorative traits on Native Californian baskets (Jordan & Shennan, 2003) and a mixture of artefacts from Coastal New Guinea (Shennan & Collard, 2005) have used these methods. Ranjan (2016) studied a comparative study of Rock Arts and Traditional indigenous art of Jharkhand. I envisage that materials and methods from these studies will be useful for future studies. Studies on interpretation of tribal drawings with the plants drawn and shared knowledge across regions are required in India.

Ethnoveterinary (plants used to treat illnesses in animals) studies need to be explored further apart from mere listing of plants and their uses. A cross-disciplinary study will be beneficial as this provides an opportunity for not only documentation of the plants used for curing ailments in animals, but will also provide an insight as to which animals are used for human ailments. e.g. some tribes use animal mixtures along with plants to treat ailments.

Collections dating back to few centuries are a good source to check the changes in local plant names as well as changes in plant use. Use of herbarium specimens for research is currently a neglected area in India and these provide excellent opportunities not only for ethnobotanical and linguistic studies but also plant uses in time and space including its inter-disciplinary aspects such as with anthropology. For example, Raman (2018), Winterbottom and Prakash (2020) highlighted as to how Samuel Browne's herbarium collections of peninsular India from late 17th century are useful to study temporal changes. Other papers worth looking on history of science of medicine include Pickering (2014, 2017), Marples and Pickering (2016), Sloan and Nyhan (2020), Winterbottom (2016), Van Andel and Barth (2018), Van Andel *et al.*, (2012, 2014, 2018), Veldman *et al.*, (2012), and Nesbitt and Cornish (2016).

Of particular interest for future research are papers by Greenhill *et al.*, (2009), Currie *et al.*, (2010a), Currie *et al.*, (2010b), Currie and Mace (2014), Opie *et al.*, (2014) and Turchin *et al.*, (2015) to name a few. Currie (2013) highlights that the studies introduced in this particular article hold the potential for fruitful collaborations between cultural phylogenetics study and cross-cultural research.

Studies focussed on biomedical categories leading to drug inventions based on Staub *et al.*, (2015) would be useful. Other research areas include the investigation of the *Indian Materia Medica* (Nakarni, 2009) using a generic – level phylogeny, or a taxonomic and phylogenetic study at species level of a medicinally important genus, or studies focussed on island biogeography and speciation, and comparison of *Pharmacopoeias* across the world.

Importance and role of herbaria in Ethnobotanical researches

I further highlight the importance of herbaria and anticipate that there will be more use of herbarium specimens for ethnobotanical research in future. Herbaria (collection of pressed, dried and preserved plants arranged according to a system of classification stored in special cabinets in a climate-controlled room) are important repositories/ custodians of nature in the form of vouchers (originally serving economic botany) (Bridson and Forman, 1998), and increasingly seen primarily as resources for plant taxonomy (Van Andel *et al.*, 2012) and various uses and users of the herbarium such as for historical botany, plant use, conservation, identification, phylogenetics and evolution (Carine *et al.*, 2018). Over 72 uses of the herbaria are mentioned by Funk (2004). *The Collectors* edited by Carine (2020) focused on Sloane Herbarium housed in UK, brought to life the importance of various collections and how useful these are to study specimens in time and space.

Index Herbariorum (Thiers, 2021) lists at least 104 herbaria in India including over a dozen in the Botanical Survey of India itself. Some of the main herbaria include: Central National Herbarium (CAL) of BSI with over 2 million specimens and over 1.5 million in other regional centres of BSI across all over India. There are other herbaria such as the Blatter Herbarium (BLAT), National Botanical Research Institute (LWG), Forest Research Institute (DD), Ashoka Trust for Research in Environment and Education (ATREE), Foundation for Revitalization in Local Health Traditions (FRLHT) having a sponsored programme of Ayurvedic and Integrative Medicine (I-AIM) and Jawaharlal Nehru Tropical Botanical Garden and Research Institute (JNTBGRI). Many other universities and institutions also hold important holdings and in this digital era, efforts to digitise the specimens and make them virtually available are encouraged which will not only increase digital curation but enhance several collaborations and faster access to data and research. All these herbaria are treasure houses to really exploit the potential for multifarious research.

Many studies in India routinely collect and list use of specimens, very few studies use qualitative and quantitative methods. With the new acquisitions of specimens in the herbaria either by field visits, gifts, donations or purchases, the advantage of searching herbaria for novel reports of use will always be there. More studies, including diachronic studies and variation in Traditional Knowledge, such as by Dickinson (2012) and use of phylogeny in Ethnobotany (Souza & Hawkins, 2018) are required.

Bedigian (2004), de la Torre *et al.*, (2012), Fantz (1991), Jenks and Kim (2013), Krishna *et al.*, (2014), Lampe (1986), Lira and Caballero (2002), Lukhoba *et al.*, (2006), McKenna *et al.*, (2011), Prakash (2011), Van Andel *et al.*, (2014), Vickery (1990), Shinde and Prakash (2015) and Souza and Hawkins (2017) reported uses of herbarium vouchers for

ethnobotanical data. All these studies highlight that there are uses reported in herbarium specimens yet not included in published findings, and hence these herbaria are important resources for future studies.

Nesbitt (2014) reported use of herbaria in rich historical data and in documenting change. Ronsted (2017) highlighted the origin of *Aloe vera*, De Natale & Pollio (2012) reported changing species composition of pharmacopeia. Some of the papers worth looking at include: Cornish and Nesbitt (2014), Ernst *et al.*, (2016), and Van Andel *et al.*, (2012, 2018).

The extent to which these herbarium specimens contribute data not fully captured in publications, filling gaps in our knowledge and provide useful data for analyses still remains largely unexplored in India. Studies in the history of science and medicine across various centuries, plant uses across the colonial histories and immigrants are encouraged. Despite growing recognition of the importance and value of herbaria worldwide, there is decline in collection efforts and frequent lack of support for herbaria, which have collections but have not been fully explored. With arduous efforts in getting permissions for field visits and access and benefit sharing issues, increasingly students often turn to herbaria. However, one must never forget the originators of these knowledge and they must all be rightly acknowledged and use of words such as ‘primitive’ are derogatory and should be discouraged.

The plants and people of India are diverse and provide a huge plethora for multidisciplinary studies. The author also acknowledges that several multidisciplinary studies can be undertaken such as: with anthropology, linguistics, plant animal interactions, climate change, crop and food security to address some of the grand challenges of the 21st century. A lot more needs to be researched and the findings widely disseminated to facilitate sustainable use of the Bioresources and its conservation both *in-situ* and *ex-situ*.

Pathak and Bharati (2020) mapped India and its collaborations around the world. We have recently witnessed one of the world’s fastest collaboration amongst various fraternities globally who collaborated and produced the vaccines for COVID-19 in such a short span of time. I urge the academicians, researchers and students of India to collaborate and fill in the gaps in research and hope that in the near future, we will see more manuscripts focussed on areas such as: ‘historical uses of plants’, ‘are plants more homogenous now than then’, ‘diachronic studies’, ‘cross-cultural Ethnobotany’, ‘linguistic studies’, ‘use of phylogenetic studies in ethnobotanical research’ and cross-disciplinary projects. Papers on colonial roots and context of the environment, plants introduced into India and Indian plants introduced outside India are needed (Austin, 2008).

Some of the questions which I would like to ask the readers include, 'how many blood sampling studies on the origin of people of India are conducted and can we really pin-point who are the original people of India and what is the origin of the various tribes in India, how many of them are from same ancestral lineage? Do we do any studies on disjunct genera in India and their uses? Ellen and Puri (2016) developed the concept of 'core medicinal flora' and pointed that if plant uses for a particular genus are similar in one region, they are similar in other regions too. Can we really quantify this in the case of India? Do our studies reflect any variation in TK? How many cross-cultural and cross/multi-disciplinary studies take place? Do the plants drawn in the paintings of tribal art reflect shared knowledge across different areas? Do we have any studies on 'decolonising natural science/natural history collections? India being one of the megadiverse countries where at least four of the world's biodiversity hot-spots occur, do we have studies that look at these hotspots and the various plants and cross-cultural uses? Do we have any studies on island biogeography/speciation studies in India? Do we have any studies in India that look at conspecific specimens and look for variation in TK? This variation in local knowledge may reflect differences in names and uses and may also reflect differences in knowledge between informants either from same site/different sites, a phenomenon well-known in modern ethnobotanical studies and historical collections, which provide a vital source to examine change in plant uses and names through time as shown by some of the papers such as by Van Andel *et al.*, (2012), Van Andel and Barth (2018). Do we have any studies in India that look at the old and new world species, their naturalisation and differences in uses (Austin, 2008). Ronsted *et al.*, (2017) highlighted that the medicinal uses of the globally popular *Aloe vera* have been correlated with the phylogeny and succulence of the leaves, and the origin of this plant now could be traced to the Arabian Peninsula, suggesting a connection with ancient trade routes.

With over 850 languages spoken in India, I hope the readers can explore the unexplored topics in ethnobotanical studies as listed in the paper and seek inspiration in ethnobotanical research. More schemes such as the 'Green Skills' launched by the MoEF&CC (Ministry of Environment, Forest and Climate Change) a few years ago are needed to prepare the future generations in terms of how to database, how to do the field work and how to develop the key skills for future employment such as in eco-tourism, conservation, academia, project assistance, pursue careers in Science, research and many more.

In the last few centuries, humans have tremendously changed the global ecosystems (Lang *et al.*, 2019) and the herbaria provide an important resource of specimens through time and space. A lot of work needs to be done in the field of Ethnobotany and the future holds good promise to Ethnobotanists. Some of the bodies and

disciplines to look at for collaboration on history of science, anthropological aspects and collections based studies include: EASAS (European Association for South Asian Studies, <https://www.easas.eu>), NatSCA (<https://www.natsca.org/>), The Linnaean Society (<https://www.linnaean.org/>), Systematics Association (<https://systass.org/>), and the Bombay Natural History Society (www.bnhs.org).

Various funding bodies in India and abroad for project based studies can be approached such as: INTACH (Indian National Trust for Art and Cultural Heritage), DST (Department for Science and Technology), SERB (Science and Engineering Research Board), CSIR (Council for Scientific and Industrial Research), Linnaean Society, Systematics Association, Darwin Fund, Commonwealth scholarships and other grants available for field work from National Geographic Society and Field Studies Council to name a few. Private donors and funders can also be approached.

Jain (2016), in the felicitative volume for Dr S.K. Jain, summarised emerging trends in Ethnobotany in India and the monumental contribution of Dr S.K. Jain in popularising ethnobotany at national and international level. I hope that the status of "ethnobotany" as a subject on its own will be further elevated and more studies will be taken up in the near future. Only by maintaining transparency, mutual trust, faith, acknowledgement of the originators of TK, reducing the carbon footprint, abiding by the legal framework of countries as per the CBD (Convention on Biological Diversity) and collective efforts can true success be achieved.

Come, let us all collaborate and contribute.

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