Phytochemistry of Medicinal plants, the Ethno Botanical Knowledge

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Abstract

This paper attempts to study how specialized metabolites with **medicinal properties** are non-uniformly distributed in certain families of **plants**, and these **plants** act as natural Phytochemicals. Phytochemicals from medicinal plants are receiving ever greater attention in the scientific literature, in medicine, and in the world economy in general. For example, the global value of plant-derived pharmaceuticals will reach $500 billion in the year 2000 in the OECD countries. In the developing countries, over-the-counter remedies and "ethical phytomedicines," which are standardized toxicologically and clinically defined crude drugs, are seen as a promising low cost alternatives in primary health care. The field also has benefited greatly in recent years from the interaction of the study of traditional ethnobotanical knowledge and the application of modem phytochemical analysis and biological activity studies to medicinal plants.

Vast ethnobotanical knowledge exists in India from ancient time. Since the 1950s the study of ethnobotany has intensified;. Our work over decades, both in the field and literary studies, has resulted in a dictionary of Indian folk-medicine and ethnobotany that includes 2532 plants. India has about 45,000 plant species; medicinal properties have been assigned to several thousand. About 2000 figure frequently in the literature; indigenous systems commonly employ 500. Despite early (4500-1500 BC) origins and a long history of usage, in the last two centuries Ayurveda has received little official support and hence less attention from good medical practitioners and researchers. Much work is now being done on the botany, pharmacognosy, chemistry, pharmacology and biotechnology of herbal drugs. The value of ethnomedicine has been realized; work is being done on psychoactive plants, household remedies and plants sold by street drug vendors. Statistical methods are being used to assess the credibility of claims. Some recent work in drug development relates to species of Commiphora (used as a hypolipidaemic agent), Picrorhiza (which is hepatoprotective), Bacopa (used as a brain tonic), Curcuma (antiinflammatory) and Asclepias (cardiotonic). The information of therapeutic medicinal plants used by ethnic/indigenous communities in the south of India is constrained at best. These ethnomedicinal treatments constitute a critical local healthcare resource and potential for expanding research on phytomedicines of India. The present study aims to document and evaluate the traditional knowledge of medicinal plants as well as compare the distribution of knowledge and examine where research efforts are concentrated in order to gain a glimpse of current needs and future possibilities for research in the region.

Key words: Phytochemistry , indigenous, medicinal plants, ethnicity , ethnobotanical

Introduction

An ethnic/indigenous community or ethnicity is a category of people who identify with each other based on similarities, such as common ancestry, language, social, religion, traditions, and cultural or national experiences (Oxford Dictionaries 2012). There are about 370 million indigenous people spread across the globe (UNHR & APF 2012, United Nations Report 2009) The Anthropological Survey of India under the 'People of India Project' reported 461 ethnic/indigenous communities (tribal communities) in India (Xaxa 1999). These communities, hereafter referred to as indigenous communities, encompass many varied lifestyles and traditions. They are unique because they use plants for medicinal purposes, based on ancestral traditions knowledge of medicinal treatments and therapies springs from a tradition that includes the use of herbs, shrubs, trees, or palms. However, indigenous people with low socioeconomic status are believed to rely more on traditional medicine because of unaffordability and unavailability of healthcare services (Gaitonde et al. 2005). Erosion and deterioration of traditional medical knowledge can be observed in many cultures. The use of indigenous plants in human medicine is well documented [1]. Current knowledge on medicinal plants as a source for relief from illness dates back to the early civilization in China, India, and the Near East [2–5]. Ingredients provided by plants have a wide range of medicinal properties [6–9]. Globally, about 60–80% of the people rely on herbal medicine as for primary healthcare needs [10–12]. Subsequently, the number of plants being recommended for use as herbal medicines has increased [13, 14]. In areas where there is perceived high cost of medical care, especially in Asia and Africa, medicinal plants have gained more recognition [15–18]. This stems from the affordability and accessibility of traditional medicine as a source of treatment in the primary healthcare system of resource-poor communities [19–21]. Therefore, focus on the knowledge of plants used in herbal medicines has been increasing.

It is now clear that knowledge of medicinal plants use as was embedded in indigenous cultures has slowly been eroding with modernization. Thus, over the years, the decline in cultural diversity has witnessed the erosion of human knowledge on medicinal plant species, their distribution, management, and methods of extracting the useful properties of medicinal plants [22]. Knowledge of the use of medicinal plants was derived mainly through traditional scholarly written traditional documentation of knowledge and pharmacopoeias for doctors and institutions, as well as Traditional Medical Knowledge (TMK), among households, communities, and/or ethnic groups. Rather than legislation and/or regulation, it has been suggested that suitable strategies to enhance sustainable utilization and management of medicinal plants are focusing on local approaches involving traditional medicinal knowledge [23, 24].

Most emphasis on the respect and perpetuation of knowledge about the medicinal plants is espoused by traditional medicinal knowledge (TMK). Although there are numerous reports, published work, thesis, dissertations, books, inventories, media reports, and monographs of the diversity of medicinal plants within the tropical environment [25–30], most of these knowledge are still based purely on scientific work that totally excludes the contribution of the local community members and does not reflect TMK. Of interest is that the

majority of the works so far carried out in developing countries largely focus on the inventories, utilization, and conservation of medicinal plants [21, 30–35]. Various sets of recommendations have been compiled relating to the conservation of medicinal plants, such as those associated with international conferences at Chiang Mai, Thailand, in 1988 and Bangalore, India, in 1998 (http://www.frlht-india.org). Regardless, there is little application of TMK on these inventories.

There is enormous knowledge on the use of indigenous medicinal plants in India over the last decades (e.g., [30, 32, 36–42]). In light of this, therefore, there is a high expectation of enormous traditional knowledge of medicinal plant species due to the use of diverse plant species, diversity of cultures, diverse languages, and beliefs among the different ethnic groups in Kenya. To our knowledge, there are no data regarding the traditional medicinal plant knowledge and use by several local communities in India. Moreover, is one of the countries experiencing dynamic changes in cultural norms and system, which renders the traditional and local knowledge of medicinal plants to be easily forgettable as most of the indigenous traditional knowledge is transferred to the local community members orally.

Objective:

This paper intends to explore and analyze **cultivation of medicinal plants** species is an important strategy for conservation and how **ethnobotanical** research provides **phytochemical** information about medicinal plants that can cure fatal diseases

Medicinal plant knowledge between different ethnic communities

The Malayan ethnic communities in Kerala used Adhatoda beddomei C.B. Clarke species for curing rheumatism; however, the Bhil ethnic community used Alstonia scholaris (L.) R. Br species for curing the same disease in Karnataka. Further investigated the geographic distribution of medicinal plants available in south India. This allowed us to use the local flora as a guide to the types of medicines available to and subsequently used by each group. Even though some trends are seen, we are not able to definitively conclude that geographic distribution or region-specific availability of medicinal plants used for various diseases is responsible for varied medicinal knowledge between ethnic communities. About 286 different medicinal plants used to cure skin diseases across the ethnic communities and major diseases with respect to species usage were diabetes and rheumatism.

This leads to a loss in biocultural diversity as well as alternative primary healthcare options and leads for drug discovery (Farnsworth et al. 1985). Several publications have focused on the life of indigenous communities in India (Xaxa 1999).

Amaranthus viridis L.	Herb	Whole plant	Diuretic; purgative enema during stomach troubles; snake bite; stomach ache; flu; cold; Erysipelas; scorpion sting	General	Ignacimuthu *et al.* 2008, Kayani *et al.* 2014
Celosia argentea L.	Herb	Whole plant	Mouth sores; eye diseases; diarrhoea; orally for ovarian and uterus diseases; dysentery; sores; tonic; tuberculosis; stomach ache; skin disease; scorpion bite	General; women	Madhu and Swamy 2010, Gairola *et al.* 2013
Celosia polygonoides Retz.	Herb	Whole plant	Wound healing; cold; heaviness of head; diarrhea; snake-bite;jaundice and reduce body heat	General	Dhivya and Kalaichelvi 2015
Chenopodium album L.	Herb	Whole plant	As purgative; antidote; tuberculosis; edible; insecticidal; wormicidal; aphrodisiac	General	Chopda and Mahajan 2009
Chenopodium murale L.	Herb	Leaves	Fever and body pain due to fever	General	Puravankara and Gopal 2012
Cyathula prostrata (L.) Blume	Herb	Whole plant	Diarrhoea; scabies; gynaecological disorders	General; women	Lingaraju *et al.* 2013
Digera muricata (L.) Mart.	Profusely branched herb	Flower, seed, leaves	Laxative; urinary troubles; boils; vegetable; fever; gas trouble; body swelling	General; women	Jain *et al.* 2009
Dysphania ambrosioides (L.) Mosyakin and Clemants	Herb	Whole plant	To remove the body odour; insecticidal; wormicidal; vegetable; skin swellings; dysmenorrhea; Anthelmintic; skin allergy;	General; 1 month baby	Bhardwaj *et al.* 2011, Dansi *et al.* 2008, Kshirsagar and Singh 2001
Gomphrena celosioides Mart.	Herb	Leaves	Vegetable	General	Sharma *et al.* 2013
Gomphrena serrata L.	Herb	Root	Stomach ulcers	General	Rao *et al.* 2006
Halosarcia indica (Willd.) Paul G. Wilson	Shrub	Leaves	Edible	General	Gavali and Sharma 2004
Iresine herbtii Hook.	Herb	Leaves	Tonic; post-labor tonic	Women	Srithi *et al.* 2009
Pandiaka involucrata (Moq.) B.D. Jacks.	Herb	Leaves	Vegetable	General	Dansi *et al.* 2008
Psilotrichum nudum Wight	Herb	Leaves	Fever; Cold	General	Dhivya and Kalaichelvi 2015
Pupalia lappacea (L.) Juss.	Herb	Leaves	Vegetable; wound	General	Shanmugam *et al.* 2012
Trichuriella monsoniae (L.f.) Bennet	Herb	Leaves	Abdominal pains	General	Rao *et al.* 2006
Amaryllidaceae					
Allium carolinianum DC.	Herb	Whole plant	Flu; cough	General	Kayani *et al.* 2014
Allium cepa L.	Herb	Bulbs	Chicken pox fever; diabetes; to expel poison by vomiting; boils; blisters; cuts; stomachache; bronchitis; Amenorrhoea and Abnormal Menstruation; impotency; contraceptive; snake bite; aphrodisiac; rheumatism	General, Women	Bhat *et al.* 2012, Ignacimuthu *et al.* 2008, Kadhirvel *et al.* 2010, Patel 2010
Allium hookeri Thwaites	Herb	Leaves, rhizome	Skin diseases; Veterinary; bone fracture;	General	Ruba and Mohan 2016
Allium sativum L.	Herb	Bulb, leaves, rhizome, pod	Enhance conception; weight reduction; dysentery; heat diseases and earache; diabetes; epilepsy; tooth deacy; bronchitis; earache; warts; whooping cough; oral health care; Hyperacidity; respiratorty disorders; increase lactation; bone fracture	General	Murty and Venkaiah 2010, Parada *et al.* 2009, Sharma *et al.* 2013
Allium victorialis L.	Herb	Whole plant	Asthma; respiratory problems	General	Kayani *et al.* 2014
Crinum asiaticum L.	Herb	Bark, tuber, leaves	Wounds; snake bite; skin diseases; arthritis; rheumatic pain; eczema	General	Bhuvaneswari *et al.* 2015
Crinum latifolium L.	Herb	Tubers, bulb	Asthma; cough; bronchial congestion; chest complaints and mucous discharge; against dysentery and black motion; ring worm; cures cramps and dryness; swellings	General	Priya and Gopalan 2014

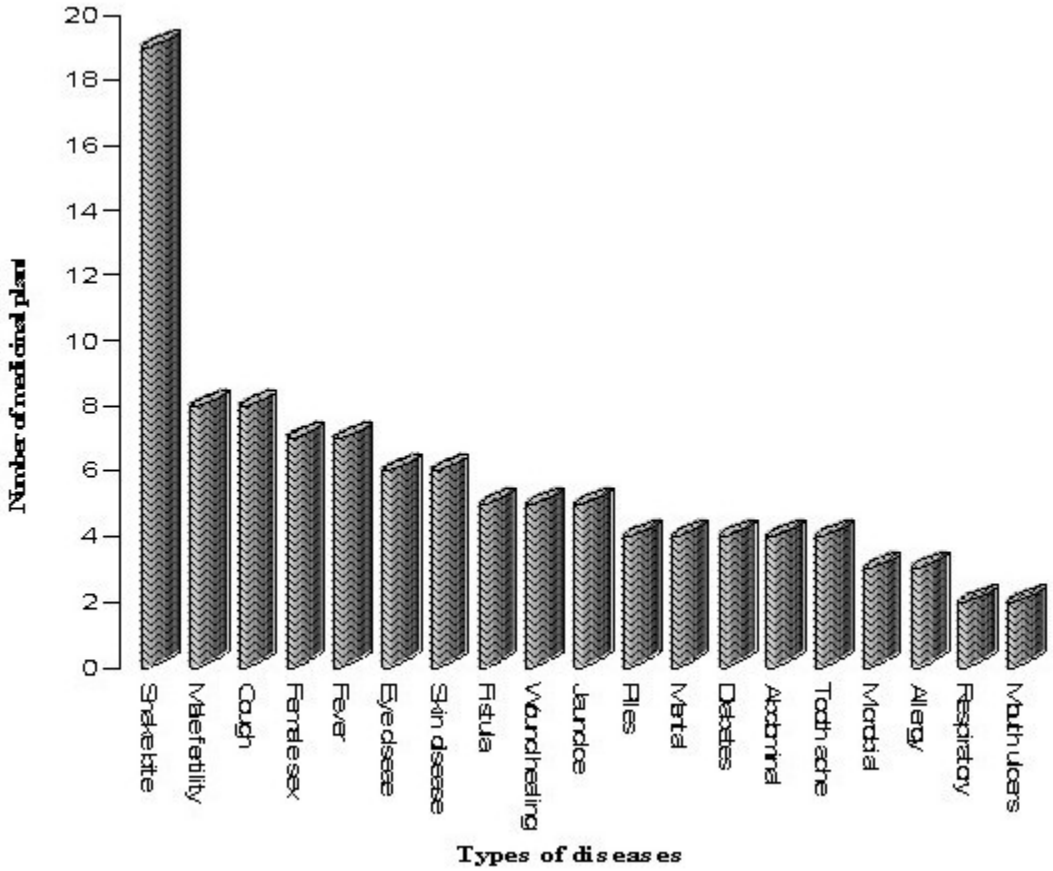
Recently, due to loss of biological resources, an increasingly globalized society, cultural homogenization, and the desire for modernization have resulted in a general decline of the cultural and hence medicinal properties of plants as well as the disappearance of traditions allowing the creation of medicines from plants (Balick 2007, Zent & Zent 2007). Plants have been used since ancient times to cure and heal throughout human history and now. In many parts of the world, people use plant substances to cure diseases. However, medicinal plant knowledge has been identified as particularly vulnerable to loss and degradation worldwide (Case et al. 2005, Phillips & Gentry 1993).

This stems from various possible causes such as increased reliance on biomedical healthcare, devaluation of the occupation of traditional herbal practitioner by younger generations, lack of cultural support and a push by some governmental programs to ‘‘modernize’’ medical practice. Community-based research in public health focuses on social, structural, and physical environmental inequities through active involvement of community members, organizational representatives, and researchers in all aspects of the research process (Israel et al. 1998). This publication reports and analyzes results of an extensive survey with the goal of documenting information on medicinal plants used by South Indian indigenous communities. The data collected include the scientific names of plants used for medicinal therapies and their therapeutic applications. This examination is intended to fill a fast disappearing wellspring of data to disseminate and reinvigorate the tradition of ethnobotanical medicine, and to preserve and awareness of the rich biodiversity associated with ethnobotanical customs.

Phytochemicals known to local communities

Separate communities such as Adiyans, Kurumans, Paniyans and Kurichans used a common plant Alpinia calcarata (Haw.) Roscoe for treating fungal infections which depicts they might have descended from the common place or an exchange of knowledge between their ancestors. The sociolinguistic scope of the vernacular classification implies a typical chronicled and social legacy particular to the nation, and in addition a mutual store of natural learning which rises above environmental, social, and political limits. Also, the presence of a shared view of wellbeing and sickness among ethnically different populations is significant for the exchange, observation and protection of restorative species (Otieno et al. 2012). The present country dataset of India medicinal plants demonstrates the great diversity of botanical knowledge held by local communities and ethnic people, and a significant overlap in terms of health-related applications across the ethnic group. The present investigation highlights the distribution of research on India's medicinal flora by examining various disregarded and underrepresented issues. Firstly, the species documented for the purpose of this study must be conserved and further ethnobotanical research needs to be carried out. Secondly, research on ethnic groups and medicinal flora has to be done more robustly so as to gain even the smallest, but valuable, ethnic knowledge of India. Finally, emphasis must be placed on research towards multi-disciplinary investigation of local perceptions of disease and the population's healthseeking behaviour for a better understanding of the capability of ethnobotanical and phytotherapeutic knowledge as a public health resource.

This explorative survey underscores the need to document indigenous healing methods and practices for common health conditions and urges additional scientific research on the species recorded to determine their efficacy and their safety. The need for regulation of the sector and the benefits of value chains could also assist in promoting bridges and fostering relationships between indigenous medicine and the country's primary health care services, as recommended by the WHO (2012). Most of the species listed are used in two or more disease groups, such as snake bite, scorpion bite, treating malaria, cough and cold, fever, and aches and pains. Major diseases treated included skin diseases, rheumatism and diabetes, which pose the most serious challenge to primary health care in south India.



Most species used to treat these were recently reported in Indian traditional medicine (Ismail & Leelavathi 2011, Manjula et al. 2012, Patel et al. 2012). A few pharmacological studies regarding species used in indigenous medicine have also been carried out (Pandey & Negi 2012). Drawn from traditional knowledge, these extensively used species have been shown to contain active compounds and extracts showing therapeutic effects. A list of these studies is shown below:

• Antimicrobial activity and antifungal activity for Senna multiglandulosa (Jacq.) H.S. Irwin & Barneby (Kanthasamy Kalaichelvi 2012)

• Antiseptic activity for Adenia hondala (Gaertn.) W.J. de Wilde, Atalantia monophylla DC. Barleria acuminata Wight ex Nees, Barleria prionitis L. Arisaema leschenaultii Blume, Bidens biternata (Lour.) Merr. & Sherff (Arjunan et al. 2012, Bhat et al. 2012, Das et al. 2012, Jain et al. 2009, Kumar et al. 2007, Lingaraju et al. 2012, Pradheeps & Poyyamoli 2012)

• Antidiabetic activity for Annona squamosa L. Catharanthus roseus (L.) G. Don, Areca catechu L. Cajanus cajan (L.) Millsp. (Dansi et al. 2008, Kumar & Pullaiah 1999, Lingaraju et al. 2012, Mahishi et al. 2005)

• Anti-inflammatory activity for Cordia africana Lam., Commelina communis L. Anisomeles malabarica (L.) R.Br. ex Sims, Andrographis alata (Vahl) Nees (Chifundera 2001, Kshirsagar & Singh 2001, Suganthi & Libina 2012, Valsaraj et al. 1997)

• Antipyretic activity for Andrographis alata (Vahl) Nees, Justicia adhatoda L. Cereus pterogonus Lem, Cinnamomum verum J. Presl, Corchorus aestuans L. (Bhat et al. 2012, Dansi et al. 2008, Kanthasamy Kalaichelvi 2012, Kshirsagar & Singh 2001)

• Antitumor activity for Calophyllum inophyllum L., Cassia fistula L. Bauhinia purpurea L. Bombax ceiba L. (Bhat et al. 2012, Ignacimuthu et al. 2009, Namsa et al. 2009, Sharma et al.

2012) In a few types of ailments the usage of specific plants varied between ethnic communities.

For example, epilepsy treated by Adiyans using Ipomoea eriocarpa R. Br., whereas Eravallan and Bhil communities used Calotropis procera (Aiton) Dryand. and Vitex negundo L. respectively. Similarly, Adiyan community used Mucuna pruriens (L.) DC., Santalum album L. for blood purification but Irular used Cynodon dactylon (L.) Pers., Senna auriculata (L.) Roxb., Boerhaavia elongata Brandegee; Goud used Woodfordia fruticosa (L.) Kurz and Hakkipikki communities used Ipomoea aquatica Forssk. for the same. Cholera was cured by the Jenu Kuruba community using Alstonia scholaris (L.) R. Br. but Anacardium occidentale L. was used by the Koraga community. Some plants like Jasminum syringifolia Wall.exG.Don and Tabernaemontana crispa Roxb. used as sole medicines to cure malaria, cough and fever. In this study, we found that ethnic group research grants were mainly given by the University Grant Commission (UGC), India (32.5%).

In India, main research funding agencies or government bodies are Department of Biotechnology (DBT), Department of Science and Technology (DST), Council of Scientific and Industrial Research (CSIR), University Grant Commission (UGC) and Indian Council of Medical Research (ICMR). Apart from these, Botanical Survey of India (BSI), Ministry of Environment and Forests, AYUSH (Department of Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homoeopathy), Indian Council of Agricultural Research (ICAR) and others. Others include that Indian National Science Academy, Kerala State Council for Science Technology and Environment (KSCSTE) and State universities and forestry departments (Figure 4). Even with these funding agencies support, some of the ethnic group's research were not exposed, such as Chodhara, Kanivan, Kanyan, Karimpalam, Kudiyam Melekudi, Malai Vedan, Palliayar, Mala Vettuvan, Malapanickar, and Vettakuruman. However ethnic group research increased from 1995 to 2012 (Figure 5). A total of 105 ethnic groups were identified within the southern India population along with an extensive variety of names for therapeutic plant species used by these groups. This showed the centrality they are granted by various groups regarding their flexibility and far reaching dispersion. Even though there is a variation in the vernacular names, this promising knowledge of diverse communities is focussed towards their central ethnomedicinal practices.

Conclusion

The southern part of India observed to be rich in plant species used for a wide range of purposes. Our research showed a clear need for documentation of plants used to develop herbal medicines in indigenous communities. This study will not only serve as a source of information but will also help to make the knowledge accessible for further drug screening and development, and, at the same time, underlines the need for biodiversity conservation of this traditional wealth. The regional overlap of many indigenous species, the consensual nature of disease groups based upon local perceptions of health conditions, and the relevance of local vernacular names which enhance the potential for the circulation and transmission of ethnobotanical and therapeutic knowledge. The ethnic people's understanding and the use of medicinal plants are found to be grounded on traditional background. Knowledge transfer practice among the ethnic communities is reported to be received from generation to generation. The people of ethnic communities often commented that most of the medicinal plants were under threat due to increasing anthropogenic influence on the natural habitat of the plants. Even though these indigenous communities contribute to a very small proportion of the country's population, their knowledge is of a great cultural, social, and potentially economic value. This must be protected and utilized in a conscientious manner and at the same time we have to take steps to make sure there is no disturbance to its ties to the communities.

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