In: Biological Diversity: Current Status and Conservation Policies
Volume 1 (2021)
DOI: 10.26832/aesa-2021-bdcp-02

Chapter
[2]

Ethnobotanical studies: Importance and conservation strategies

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Abstract

Plants have given not only for fundamental human needs but also for medical therapy from the beginning of humanity. Their significance, as well as any potential instrumental implications for phytodiversity conservation and modern medicine development, is well acknowledged. Various diseases are becoming more prevalent in many developing countries, and their financial costs are enormous. The majority of people in traditional communities rely on plant-based medications, and traditional health care workers are the primary source of health care. Ethnobotany has long been important in the development of innovative medications, and it is becoming increasingly important in the development of strategies and measures for residual forest conservation and recovery. This rich plant information had been passed down over the generations by tribal people in many sections of the land through word of mouth. Such research is essential to investigate local plants for emerging pharmaceutical enterprises and to strengthen the plant-people relationship in both cultural and ecological contexts to achieve intergenerational equity. This chapter discusses several such studies that have been conducted around the world, as well as on the Indian continent and various conservation measures that can be used to pass on this knowledge of wealth from generation to generation.

Keywords Invasive pest, Legal restriction, Management and status, Natural enemy

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Introduction

Ethnobotanical studies are as old as human civilization itself. Ethnobotany is becoming more essential in applied conservation programmes that consider both social and environmental factors, such as biodiversity and people. The term itself comes from the Greek word Ethnos, which means "people" and botane which means "herb", and includes the study of plants used by primitive communities for food, medicine, religious ceremonies and their spiritual as well as intellectual cultures. American taxonomist and botanist John W. Harshberger established this phrase in 1895 to describe the study of the utilitarian interaction between humans and flora in the environment, including medical purposes (Harshberger, 1896). An ethnobotanist seeks to document local customs including the practical use of plants for a variety of purposes such as medicine, food, and clothing. Indeed a magnificent feature of this discipline is that it is interdisciplinary and borrows theory as well methods from other branches of science *viz*., Anthropology, Linguistics, Botany, Ecology, Nutrition studies and Phytochemistry. Ethnobotanical knowledge of medicinal plants and their use by indigenous societies is useful not only for preserving traditional cultures but also for community health care and drug development (Farooq *et al.,* 2014). Ethnobotanical studies have led to the discovery of many novel drugs. This practice of ethnomedicine is a prominent tool in understanding indigenous communities and their relationship with nature (Anyinam, 1995; Rai and Lalramnghinglova, 2010).

Asia is a very popular global center due to its ancient written traditional knowledge regarding the use of medicinal plant species for treating various ailments as mentioned in Ayurveda, Unani and Chinese traditional system of medicine (Kala *et al.,* 2004). Up to 70,000 plant species are thought to be employed in folk medicine, with the bulk of these species found in the Asia-Pacific region. The two greatest users of medicinal herbs are India and China. Traditionally, India uses about 7,000 medicinal plants species and China uses over 5,000. World Health Organization (WHO) mentioned that about 25% of modern medicines are developed from plants and used traditionally. India has been referred to as the "Medicinal Garden" of the world. Indian Government has developed Traditional Knowledge Digital Library (TKDL) to preserve all types of traditional knowledge like Ayurveda, Unani, Siddha and Yoga. Medicinal plants have demonstrated their contribution to the treatment of diseases such as malaria, HIV/AIDS, diabetes, sickle-cell anaemia, mental disorders (Elujoba *et al.,* 2005) and microbial infections (Okigbo *et al.,* 2005).

Due to low cost and negligible side effects of the traditional system of medicines as compared to the allopathic medicines; the people in developing countries like Bangladesh (90%), Myanmar (85%), India (80%), Nepal (75%), Srilanka (65%), and Indonesia (60%) have strong belief on the traditional health care system. Medicinal plants used by the indigenous people in their traditional health care system provide sources of many important new pharmaceuticals (Balick and Cox, 1996). Therefore, Indigenous knowledge is recognized worldwide, not only because of its intrinsic value but also because it has a potential instrumental value to science and conservation. The investigation of plants and their use is one of the primary concerns and has been practiced by all cultures. Indigenous people with extensive knowledge of medicinal plants remain the ultimate source for retrieving this information for various

applications, particularly in modern medicine. Govaerts (2001) reported the existence of 4,20,000 flowering plants from the world. A total of about 50,000 species are used for medicinal purposes (Schippmann *et al*., 2002). In many countries, tribal healers frequently use ethnomedical treatment to treat diabetes, cancer, eczema, jaundice, wounds, scabies, asthma, venereal diseases, aging, skin infection, swelling, snakebite and gastric ulcers, providing information to local people on how to prepare medicine from herbal (Pushpangadan and Atal, 1984; Perumal and Ignacimuthu, 1998).

Medicinal plants and ethnomedicine

Medicinal plants have been reported to contain many chemically active components that can be used to develop novel chemotherapeutic agents. Many newly synthesized drugs have been observed to be originated from natural plant products (Vuorelaa *et al*., 2004). The medicinal property of plants is much more beneficial to cure human as well as livestock ailments. The plant part used, preparation and administration of drugs vary from one place to another (Verma *et al*., 2007). All parts of plants such as leaves, fruits, seeds, bark, roots, flowers etc. are used to treat diseases through various methods. In some cases, the fresh or dried leaves are used while in other cases, the juice extracted from them is used as medicine. Sometimes dried fruits, flowers, roots or bark are used as such and sometimes they are utilized in powdered form. Nowadays, there is a consistent need to evaluate more medicinal plants.

Ethnomedicinal studies in the World

The modern approach to the science of ethnobotany evolved in the USA and a prominent center for the ethnobotanical study is the Botanical Museum of the Harvard University in Massachusetts. Works of Timothy Plowman, Schultes, Gordon Wasson, E. Wade Davis are worth mentioning. Ethnomedicinal studies have been done in various parts throughout the world such as Canada (Uprety *et al*., 2012), Nepal (Singh *et al*., 2012) and Pakistan (Qureshi *et al*., 2007). World Health Organization (WHO) in 2000 recorded over 21,000 plant species for their medicinal uses throughout the world. It has been reported that over 80% of Nigerians depend on herbal medicine (Ugbogu, 2005), as modern health care is still beyond the reach of a good proportion of the rural population. The first-line treatment for 60% of the children with malaria is the use of herbal medicine in Nigeria, Ghana and Zambia. An ethnobotanical survey of 17 communities was conducted in Ogun State, Southwest Nigeria to study herbal medicine used for the treatment of malarial fever (Idowu *et al*., 2010). A total of 38 medicinal plant species were reported to be effective against Malaria. The most commonly used plants were *Morinda lucida, Lawsonia inermis, Citrus medica, Morinda morindiodes* and *Sarcocephalus latifolius*. In Southwestern Nigeria, studies have also been carried out to document the utilization of phytomedicines for the treatment of fevers (Ajaiyeoba *et al*., 2003). Bhat *et al*. (1990) reported the ethnomedicinal use of 52 plant species used by ethnic people of Kwara State, Central Nigeria.

As reported by Kiringe (2005), the use of traditional medicine is prevalent among rural communities of

Africa as they have immense knowledge on ethnomedicine, although this use is rapidly diminishing partly as a result of changes in lifestyle and exposure to western culture. In South Africa, about 80% of the population depends on the traditional health care system. Strong attachment to traditional lifestyle, high level of poverty in the community, remoteness of the area coupled with very poor infrastructure which makes access to modern health facilities difficult which is why people are dependent on traditional medicine. Also, most rural communities of Africa do not see any danger associated with the use of herbal remedies. Initial home treatment of sick persons using herbal remedies is a common practice in African communities (Brown, 1995; Iwu *et al.*, 1993).

About 85% of the rural people of Nepal are said to use herbal remedies. Over 1700 species of plants are commonly practiced in the traditional system of medicine in Nepal (Baral and Kurmi, 2006; Ghimire, 2008). Ethnobotanical studies carried out in the Parbat district of Western Nepal (Malla *et al*., 2015) revealed medicinal use of 132 plant species belonging to 67 families and 99 genera; to cure human ailments like rheumatism, bronchitis, urinary disorders, asthma, dysentery, eczema, gastrointestinal disorders and skin diseases. The herbs were a primary source of medicine (66%) followed by shrubs (20%), trees (11%) and climbers (6%). Bhattarai *et al.* (2005) reported 45 species of medicinal plants belonging to 32 families under 44 genera; the species were found to be useful for the treatment of 34 different ailments in the panchase region in the middle hills of the Nepalese Himalaya. Medicinal plants used by the Tharu tribe of Nepal were studied by Dangoi and Gurang (1991). Thirty-six plant species of 27 families have been documented by Bhattarai (1990) from the Kabhrepalan chock district of Central Nepal. Similar studies on medicinal plants have been carried out in different parts of Nepal by several researchers (Koirala and Khaniya, 2009; Upreti *et al*., 2010; Shrestha *et al.*, 2001; Kunwar and Bussmann, 2008; Joshi *et al*., 2011; Acharya and Acharya, 2009; Malla *et al.*, 2014).

Ethnomedicinal studies carried out by Barrett (1994) revealed 152 plant species used by the people of Nicaragua's Atlantic coast for the treatment of various diseases. Vidal (1971) investigated the ethnobotany of South East Asia. Ong *et al*. (2011) reported the ethnomedicinal use of 52 plant species used for general health care by the Malay Villagers in Kampung Tanjung Sabtu, Terengganu, Malaysia. The medicinal flora of the central province of Papua New Guinea was reported by Holdsworth and Lacanienta (1980). The herbal health care system of indigenous people of Northern Ethiopia has been documented which was focused on medicinal plant identification, plant part used, disease treated and preparation methods (Mesfin *et al*., 2013). Ethnomedicinal folk drugs used by Bahirdar zuria district of North-western Ethiopia were documented by Raghunathan and Abhay (2009). Vickery (1990), registered 109 ethnomedicinal plants belonging to the Rubiaceae family from London. An ethnobotanical survey conducted by Anderson (1986), reported 121 species used by Akha tribes of Thailand for various diseases and ailments. Ethno-medico-botanical knowledge among the tribal people of Bangladesh was investigated by Rahman (1999). Eighty-one species of medicinally important plants belonging to 73 genera and 37 families were documented (Solangaraarachchi and Perera, 1993) at the tropical dry mixed evergreen forest in Hurula reserve of Sri Lanka. Bhattacharyya (1999) reported the ethnobotanical wealth of the Druk-Yul tribes of Bhutan. Some of the ethnomedicinal plants reported from various parts of the world are listed in Table 1.

Table 1. Some ethnomedicinal plants documented from different parts of the world.

Scientific name	Vernacular name	Family	Part(s) used	Medicinal use	Reference
Abies spectabilis	Gobre salla, Talish patra	Pinaceae	Leaf needle	Rheumatism, bronchitis, asthma and cold	Malla *et al.* (2015)
Ainsliaea bonatti	Xinyetuer-feng	Asteraceae	Whole plant	Cough, asthma, throat itching	Hong *et al.* (2015)
Annona squamosal	Seetapalam	Annonaceae	Leaf	Tumors	Manjula and Mamidala (2012)
Annona senegalensis	Gwanda, Mufa	Annonaceae	Bark, Root, Leaf	Diarrhoea, constipation, stomach-ache	Adjanohoun *et al.* (1980)
Artemisia afra	Lengana	Asteraceae	Leaves	Prostatitis	Van Wyk and Wink (2004)
Ardisia gigantifolia	Zoumatai	Myrsinaceae	Rhizome, whole plant	Rheumatic arthritis, waist and leg pain, paralysis and traumatic injury	Hong *et al.* (2015)
Asparagus microraphis	Lehonyeli	Asparagaceae	Roots	Period pains	Shale *et al.* (1999)
Cynodon incompletus	Mohloa	Poaceae	Leaves and roots	Labour pains	Watt and Brandwijk (1927)
Desmodium heterocarpon	Bangahat	Fabaceae	Root, leaf	Cough, diarrhoea, skin diseases	Malla *et al.* (2015)
Dichrostachys cinerea	Dundu	Fabaceae	Leaf	Headache	Kankara *et al.* (2015)
Equisetum ramosissimum	Mohlaka-photoane	Equistaceae	Rhizome	Infertility in women	Miller (1997)
Gazania krebsiana	Tsikitlane	Asteraceae	Roots	Sterility in women	Kose *et al.* (2015)
Guiera senegalensis	Sabara	Combretaceae	Leaf	Vomiting, diarrhoea, nausea and general well being	Kankara *et al.* (2015)
Handroanthus impetiginosus	Pau d' arco, lapacho	Bignoniaceae	Bark	Tumor, leukemia	Ochwangi *et al.* (2014)
Helichrysum caespititium	Phate-ea-ngaka	Asteraceae	Whole plant	Increase virility in men	Maliehe (1997)
Lepidagathis incurva	Aaraeuri	Acanthaceae	Leaf, root, bark	Skin cancer	Esha *et al.* (2012)
Lepidium sativum	Zamantaro-ri	Brassicaceae	Leaf	Jaundice	Kankara *et al.* (2015)
Pelargonium sidoides	Khoara	Geraniaceae	Roots	Heartburn in pregnant women	Maliehe (1997)
Polygonatum odoratum	Yu zhu	Asparagaceae	Rhizome	Skin cancers	Wujisguleng *et al.* (2012)

Table 1. Continued...

Scientific name	Vernacular name	Family	Part(s) used	Medicinal use	Reference
Salvia runcinata	Mosisili	Lamiaceae	Whole plant	Breast cancer, infertility	Kose *et al.* (2015)
Searsia erosa	Tsilabelo	Ebenaceae	Leaves	Uterine cancer	Mogomeri *et al.* (2016)
Ximenia americana	Tsada, Kumhu	Olacaceae	Root, Leaf	Haemorrhoids and dysentery	Ikhiri *et al.* (1984)
Ziziphus mauritiana	Magariya	Rhamnaceae	Root, leaf	Dysentery, stomachache, diarrhoea	Adjanohoun *et al.* (1980); Ikhri *et al.* (1984)

Ethnomedicinal studies in India

India offers a diverse range of medicinal plants that grow in a variety of geographical and ecological situations. There is tremendous scope for the study of ethnobotanical knowledge in India due to the vast heritage of Vedic literature dating back to 2000-1000 B.C. In India, out of 18,864 species of higher plants, over 2000 species are documented and 1,100 species are used in various systems of medicine. According to recent studies by the Ministry of Environment and Forests (MoEF), Government of India, under All India Coordinate Research Project on Ethnobiology (AICRPE), more than 10,000 wild plants are used by the ethnic communities in India in various therapies and miscellaneous uses. Among these, 800 plants are used by the tribal people of India for different medicinal purposes (Dixit and Vakshasya, 2013). A large number of medicinal plants were used by ancient Indians than the natives of any other country of the world and it is evident from the ancient Indian treatises like "Materia Medica" and "Koshas". The Indian Materia Medica alone includes about 2000 drugs of natural origin, almost all of which are derived from different traditional systems and folklore practices (Narayana *et al*., 1998). The first book on Indian ethnobotany was "Glimpses of Ethnobotany" (1981). More than 43% of the total flowering plants in India are of medicinal importance (Pushpangdan, 1995). According to reasonable estimates, 70% of inhabitants in India still rely on herbs (Singh and Gautam, 1997). The traditional system of medicine along with folklore systems continue to serve a large portion of the population, particularly in rural areas of India. In India, considerable research work is being done (Kumar *et al.*, 2010; Murthy, 2012) to document indigenous knowledge.

WHO mentioned that about 25% of modern medicines are developed from plants and used traditionally. India has about 27% of the total known medicinal plant species of the world as it represents one of the most important collection centers (Kumar and Katakam, 2000). The traditional phyto-remedies are socially accepted, economically viable, have a considerable extent of effectiveness and are mostly the only available means. Traditional healers in India use over 2,500 species of plants (Utkarsh *et al.*, 1999). Botanical survey of India initiated recording and documenting the ethnobotanical knowledge of all tribes belonging to the states of Uttaranchal, Andhra Pradesh, Sikkim, Himachal Pradesh, West Bengal,

Orissa, Rajasthan, Tripura, Nagaland, Assam, Bihar, Madhya Pradesh, Goa, Arunachal Pradesh, Chhattisgarh, Andaman and Nicobar Island and Jammu and Kashmir.

North-East India posses a rich plant diversity in India and represents one of the biodiversity hotspots of the world (Mao *et al*., 2009). North-East India comprises 8 states representing approximately 8% of the geographical area of the country. The region harbors more than 180 major tribal communities found in India (Sajem *et al*., 2008). Ethnobotany of Miri tribes was reported by Tag and Das (2004) in Arunachal Pradesh. Rethy *et al.* (2010) carried out ethnobotanical studies among the Memba tribe in Dehand-Debang Biosphere Reserve, Arunachal Pradesh. Hynniewta and Kumar (2010) documented hidden traditional knowledge of medicines of the Khasi tribe of Meghalaya. Fifty medicinal plants used by Zealangs were reported by Jamir and Rao (1990). Bhardwaj and Gakhar (2005), studied 17 species of medicinal plants used by tribals of Mizoram. Choudhury *et al.* (2012) reported 53 medicinal plant species used by the Chorei tribe in Assam. Ethnomedicinal studies were carried out by Borah *et al.* (2012) among Mongoloid and Ao-Naga ethnic groups of Disoi Valley forest area of Jorhat district, Northeast Assam and reported 50 species of medicinal plants belonging to 33 families. Traditional Knowledge of the Lotha tribe was documented by Jamir *et al.* (2010) in the Workha district, Nagaland. A total of sixty-six ethnomedicinal plants used by the Phom Naga tribe of Nagaland were reported by Kilangnaron and Jamir (2011). Singh (1990) reported 150 medicinal plants from Manipur. Ashalata *et al*., (2005) studied the medicinal uses of 120 plant species used for the treatment of rheumatism, bronchitis, ulcers and skin diseases. Forty-one medicinal plants were reported from the Meiti community of Manipur (Singh *et al*., 1999) used for the treatment of dog bites traditionally. Debbarma *et al.* (2017) conducted an ethnomedicinal survey among the Tripuri tribe in the Mandai area and reported 51 plant species belonging to 32 families to cure a variety of diseases and ailments such as dysentery, cough, jaundice, chickenpox, diabetes, piles, haemorrages, urinary disorders, smallpox, epilepsy, and asthma.

In Southern India, several ethnobotanical studies have been documented by various workers (Abraham, 1981; Nair and Jayakumar, 2003; Hebber *et al*., 2004; Ayyanar and Ignacimuthu, 2005). Pushpalata *et al.* (1990) studied medicinal plants of Bangalore. Thirty folklore remedies were published by Balu *et al.* (2000) for diabetes in Cauvery Delta. Traditional treatment of leucoderma by Kol tribes of the Vidhyan region of Utter Pradesh was reported by Singh and Narain (2010). Rawat and Pangtey (1987) documented the plants of ethnomedicinal value from the Alpine region of Kumaon, Uttar Pradesh. Ganesan (2004) investigated ethnomedicinal uses of lower plants of Tamil Nadu. In Andhra Pradesh, Vedavathy *et al.* (1991) investigated the medicinal plants used for family planning and birth control. The traditional uses of medicinal plants in the Yanadi tribe were reported by Vedavathy and Mrudula (1996). Bhakshu and Raju (2007) conducted Ethno-medico botanical studies of certain Euphorbiaceous medicinal plants of Eastern Ghats, Andhra Pradesh. Kumar and Pulliah (1998) reported ethnomedicinal uses of some plant species from the Mahbobnagar district of Telangana. The plants used for ethnoveterinary practices by Koyas of Pakhal Wildlife Sanctuary, Warangal district were documented by Murthy *et al*. (2007). Joshi *et al*. (1980) reported folk medicines used by the Dang tribe of Gujrat. The folk medicine used by the Adivasis to treat common women ailments was documented by Ratnam and Raju (2005) in the Eastern Ghats of Andhra Pradesh. Reddy *et al*. (2011)

carried out ethnobotanical studies in the Kadapa district of Andhra Pradesh and provided information on 60 plant species belonging to 33 families. Bhogaonkar and Kadam (2007) reported herbal antidotes used by the Banjara people of the Umerkhed region, Maharastra. Unani uses of some less known folklore plants were reported by Bhogaonkar and Ahmed (2007) in the Amravati district. Kamble *et al.* (2010) studied the plants used traditionally as medicines by the Bhilla tribe of Maharastra. Silja *et al.* (2008) conducted an ethnomedicinal survey in the Wayanad district of Kerala and documented 136 medicinal plant species used by the Mullu kuruma tribe for treatment of bronchial diseases, urinary disorders, kidney stone, anaemia, malaria, tuberculosis, skin disease, inflammation, dandruff, liver diseases, leprosy and burns, epilepsy and leucorrhoea and migraine. Pushpangadan and Atal (1984) carried out ethnobotanical studies in Kerala and reported the uses of 79 plant species by the tribals. Udayan *et al.* (2005) documented 41 plant species belonging to 27 families used by the Kaadar tribe of Sholayar forest of Kerala.

Central India is one of those regions in India where the tribal people and forest dwellers form a considerable part of the population (Jain, 2010; Mishra *et al*., 2010). Samar *et al.* (2015) reported the ethnomedicinal uses of plants among the Bheel tribe of Guna district of Madhya Pradesh. A total of 32 medicinal plant species belonging to 18 families under 26 genera were documented for different therapeutic uses. Ethnomedicinal uses of plants in Betul district of Madhya Pradesh were documented by Jain *et al.* (2010). Medicinal uses of 25 plant species were reported by Pandey *et al.* (1991) among Baiga tribes of Madhya Pradesh. The medicinal values of 32 plant species were investigated by Verma and Pandey (1990) from district Lohardaga of Bihar. The ethnobotanical plants of the Paharia tribe were studied by Singh *et al.* (1992). Plants of ethnopaedriatic importance were documented by Srivastava and Rout (1994) in the Koraput district of Orissa. Prusti (2007) documented ethnomedicines used by the Bondo tribe in district Malkangri. Ethnobotanical uses of some exotic plants were studied by Chakraborty *et al.* (2003) in the Purulia district of West Bengal. Chaudhury *et al.* (1982) enlisted medicinal plants used traditionally by Jalpaiguri tribes. Kandi *et al.* (2013) documented the medicinal uses of 49 angiospermous plants belonging to 29 families under 45 genera used by the tribals of Nuapada district of Orissa.

Herbal folk medicine in the Northern states of India is commonly practised by herbalists, village traditional healers, elderly persons etc. The Nomadic tribal communities living in the North-West and Trans-Himalaya e.g., Jammu and Kashmir are reputed to have mastered their traditional practice and knowledge of medicinal plants used to treat different diseases (Sharma and Singh, 2006). Jain (1984), carried out ethnomedicinal studies and reported 26 species of medicinal plants from Morni and Kabasar hills in Ambala, Haryana. The ethnomedicinal plants used by the primitive tribes of Rajasthan to treat Venereal and Gynaecological diseases were documented by Joshi (1995). Galav *et al.* (2007) reported the medicinal uses of 33 plant species used in Rajasthan against 20 different diseases of domestic animals. Uttarakhand, lying in the western Himalayan region is famous for its rich variety of herbs and medicinal plants. Medicinal plants used by local vaidyas in the Ukhimath block of Uttarakhand were documented by Semwal *et al.* (2010). The medicinal plants used by the Bhat Community in Punjab for regulation of fertility were studied by Lal and Lata (1980). Kapahi (1990),

reported ethnobotanical uses of 50 plant species from Lahaul, Himachal Pradesh. The ethnomedicinal and ecological status of plants in the Garhwal Himalayas were studied by Kumar *et al.* (2011). He studied 57 plants of medicinal importance. Singh (2000), studied plants used by people of Kullu district, North-Western Himalaya.

Kashmir Himalayas, one of the biotic provinces, supports a rich and unique floristic diversity, including a fairly good representation of medicinal plants (Dar *et al.*, 2002). Chaurasia *et al.* (2007) in their book entitled "Ethnobotany and Plants of Trans-Himalaya" had documented ethnomedicinal uses of 329 plant species from trans-Himalaya (Ladakh and Lahul-Spiti). Ethno-medicinal uses of 23 plant species were reported by Iqbal *et al.* (2009) from the Pulwama district of South Kashmir. Of the 23 species reported, 10 plant species of 7 families were used by tribal and rural people for treatment of hair ailments and 13 species belonging to 11 families were used for treating boils. The medicinal flora of Shopian, South Kashmir has been recorded by Tantray *et al.* (2009) and a total of 20 important medicinal plant species were documented during the ethnomedicinal survey of the area. A comparative study in the Bhotiya tribal communities of Central Himalaya revealed 86 plant species as being used for treating 37 common ailments (Phondani *et al.*, 2010). Wani *et al.* (2011) reported 32 medicinal plant species from erstwhile, district Anantnag in Southern region of Kashmir Himalayas used by the local people for different ailments. Malik *et al.* (2011) recorded ethnomedicinal uses of 30 plant species from the Kashmir Himalaya. Rashid (2012) reported 28 species of medicinal plants used by Gujjar-Bakkerwal tribal people and other inhabitants of district Rajouri for treating commonly encountered gastrointestinal disorders like diarrhoea, indigestion, stomach pains, dysentery, dyspepsia and vomiting. Jeelani *et al.* (2013) conducted an ethnobotanical survey and documented 38 medicinal plant species from much higher altitude hilly and tribal areas of Kashmir Himalaya. Most of these medicinal plants were herbs and used by the rural and tribal people for the treatment of various diseases and ailments such as cough, skin diseases, wound healing, gastric disorders etc. Lone *et al.* (2013) surveyed some rural areas of the Bandipora district of Jammu and Kashmir and documented 25 species of medicinal plants used by the local people to cure various human and livestock ailments. Rinchen and Pant (2014) reported the ethnopharmacological significance of 68 plant species used by the inhabitants surrounding Suru and Zanskar Valleys of cold desert, Ladakh. These medicinal species were used for curing various ailments / sexual dysfunctions such as antispasmodic, aphrodisiac, rheumatism, blood purification, pulmonary problems, liver disorders, malaria, kidney stones etc. The ethnomedicinal plants of Shankaracharya Hill in the Srinagar district of Jammu & Kashmir were studied by Kumar *et al.* (2015a) and reported 130 medicinal plant species.

The medicinal plants used by the tribal communities of Bangus Valley of North Kashmir were reported by Ishtiyak and Hussain (2017). Their study revealed ethnomedicinal uses of 75 plant species that were used as traditional medicine by Gujjar communities for curing several diseases in the area. Mir *et al.* (2017) surveyed *Betula utilis* forest in Sind Forest Division (Sonamarg) and Tangmarg Forest Division (Gulmarg) and reported ethnomedicinal utilization of 21 plant species used by rural communities of Northern and Central regions of Kashmir Himalayas. Eighty-three medicinal plant species were recorded by Bhat *et al.* (2018) that were used by tribal and local people of Bandipora for treating

diabetes, cholera, scabies, typhoid, whooping cough, fever, blood purification, respiratory problems, joint pains, urinary disorders, stomach ulcers etc. Recently, Fayaz *et al.* (2019) conducted an ethnobotanical survey in Daksum Forest of Anantnag district of Jammu and Kashmir State reported 108 plant species of ethnomedicinal importance. Various other ethnomedicinal studies in Kashmir were carried out by different researchers such as Khan *et al.* (2004); Ishtiyak *et al.* (2010); and Yousuf *et al.* (2012). Some of the ethnomedicinal plants reported from various parts of India are listed in Table 2.

Table 2. Some ethnomedicinal plants documented from different parts of India

Scientific name	Vernacular name	Family	Part(s) used	Medicinal use	Refrences
Achillea millifolium	Berguer	Asteraceae	Whole herb	Snakebites	Malik *et al.* (2011)
Aconitum heterophyllum	Atis, Paewakh	Ranunculaceae	Root	Arthritis, throat infection, stomach ache, dyspepsia, Skin bites	Kumar *et al.* (2016); Khan *et al.* (2004)
Adiantum capillus-veneris	Guentheer	Pteridaceae	Leaves	Chest congestion, headache	Dar *et al.* (2018)
Ajuga bracteosa	Jan-e-adam	Lamiaceae	Whole plant	Lice killer	Hassan *et al.* (2013)
Angelica gluca	Chohore	Apiaceae	Roots	Gastrointestinal disorders	Ishtiyak and Hussain (2017)
Albizzia lebbek	Kala siris	Fabaceae	Whole plant	Asthma, leucoderma, cough and cold, wounds, snake bites	Samar *et al.* (2015)
Althea rosea	Suzposh	Malvaceae	Whole plant	Jaundice, urinary irritation, swelling, kidney pain, dandruff	Lone *et al.* (2015)
Artemisia maritima	Murin, Moori	Asteraceae	Shoots, leaves, seeds	Intermittent fever, intestinal worms, abscesses	Kumar *et al.* (2015b)
Asparagus racemosus	Sathavari	Liliaceae	Leaf, rhizome	Leucorrhoea, stomach ache, epilepsy	Silja *et al.* (2008)
Bauhinia purpurea	Chingthrou	Caesalpinaceae	Bark	Leucorrhoea, menstrual disorders and poisonous bites	Khumbongmayum *et al.* (2005)
Berberis ulicina	Sinskingnama	Berberidaceae	Fruits	Ringworm	Buth and Navchoo (1988)
Bergenia ciliate	Zakhmihyat/ palpati	Saxifragaceae	Roots and leaves	Headache, diarrhoea, weakness, fever and wounds	Lone *et al.* (2015)
Bidens pilosa	Bhojpatar	Asteraceae	Leaves	Blood clotting of wounds	Akhtar *et al.* (2018)

Table 2. Continued...

Scientific name	Vernacular name	Family	Part(s) used	Medicinal use	Refrences
Brassica oleracea	Haakh	Brassicaceae	Leaves	Corns, constipation	Kanta *et al.* (2018)
Butea monosperma	Palash	Fabaceae	Bark, gum, leaf, flower, seed, resin, stem	Snake bites	Jeetendra and Kumar (2012)
Calotropis procera	Madar	Asclepediaceae	Whole plant, branches, flowers, leaves, latex	Cough	Samar *et al.* (2015)
Cannabis sativa	Bhang	Cannabinaceae	Stem, leaves	Diarrhoea, skin diseases, rehematism, cholera, wormicide	Samar *et al.* (2015)
Cassia fistula	Amaltash	Caesalpinaceae	Seed, stem, roots, fruit, pulp, bark	Snake bites	Jeetendra and Kumar (2012)
Cedrus deodara	Deodar	Pinaceae	Leaves, bark, root	Stomach disease, rheumatism, diabetes	Kumar *et al.* (2019)
Clematis gouriana	Eruvalli	Ranunculaceae	Leaf, root	Rheumatism, cough	Silja *et al.* (2008)
Colchicum luteum	Whirikiumposh	Colchicaceae	Bulb	Spleen, liver disorders	Ishtiyak and Hussain (2017)
Corydalis govaniana	Sangiharb	Fumariaceae	Roots and flowers	Headache	Jeelani *et al.* (2013)
Curcuma longa	Haldi	Zingiberaceae	Rhizome	Skin disease, wounds, fracture	Tiwari and Pandey (2010)
Cydonia oblonga	Bumchuont	Rosaceae	Fruits, seeds and flower	Cough, chest pains, constipation, fever, general body weakness, birth problems	Fayaz *et al.* (2019)
Cyperus rotundus	Sengban	Cyperaceae	Rhizome, tuber	Dyspepsia, fever, cough and bowel irritation	Khumbongmayum *et al.* (2005)
Daucus carota	Moharmunj Ghasa	Apiaceae	Roots	Digestive disorders, fatigue	Lone *et al.* (2015)
Dioscorea bulbifera	Genthi	Dioscoreaceae	Stem, leaf, tuber	Lung bleeding, eye disorder, syphilis, goitre	Ghosh *et al.* (2015)

Table 2. Continued...

Scientific name	Vernacular name	Family	Part(s) used	Medicinal use	Refrences
Euphorbia helioscopia	Gur sotsul, Gursuchel	Euphorbiaceae	Seeds, roots, latex	Diaphoretic, fungal infections, warts, expulsion of intestinal worms	Kumar *et al.* (2015)
Ficus carica	Fig	Moraceae	Fruit	Cough, cardiovascular disorders, loss of apetite, indigestion, bronchial problems,	Mawa *et al.* (2013)
Ficus religiosa	Pipal	Moraceae	Leaf, fruit, root, bark	Gonorrhoea, migraine, diabetes, epilepsy, leucorrhoea, liver diseases	Singh *et al.* (2011)
Gallium aparine	Kanchari	Rubiaceae	Whole herb	Skin redness and allergies	Sarad *et al.* (2017)
Glycine max	Kala bhatt	Paplionaceae	Seed	Diabetes, menstrual disorders	Shah (2014)
Murraya koenigii	Karipatta	Rutaceae	Leaf	Vomiting, inflammation, itching and bites of poisonous animals	Handral *et al.* (2012)
Nelumbo nucifera	Thamara	Nelumbonaceae	Flower	Piles	Silja *et al.* (2008)
Nepata ciliaris	Nueet	Lamiaceae	Whole plant	Fever, cold, respiratory disorders	Gautam *et al.* (2012)
Oxalis corniculata	Bhilmoru	Oxalidaceae	Whole plant	Dysmenorrhoea, hepatitis, diarrhoea, dysentery	Kaur *et al.* (2017)
Perilla frutescens	Bhangjeer	Lamiaceae	Seed, leaf	Asthma, depression, chronic bronchitis	Bachheti *et al.* (2014)
Podophyllum hexandrum	Wunwangun	Podophyllaceae	Fruits, leaves and roots	Skin diseases, gastric problems	Jeelani *et al.* (2013)
Prunella vulgaris	Kulvaeth	Lamiaceae	Whole plant, leaves	Rheumatism, body pains	Hassan *et al.* (2013)
Rosa webbiana	Shal martchwangan	Rosaceae	Flowers and fruits	Stomach pain, cholesterol level, digestive disorders, joint pains	Dar *et al.* (2018)
Ricinus communis	Arandi	Euphorbiaceae	Whole plant	Headache, fever	Samar *et al.* (2015)
Salix disperma	Kankori	Salicaceae	Fruit, bark	Heart problem and eye disorders	Sarad *et al.* (2017)

Table 2. Continued...

Scientific name	Vernacular name	Family	Part(s) used	Medicinal use	Refrences
Salix wallichiana	Danthiveer	Salicaceae	Leaves	Fever and general body pain	Fayaz *et al.* (2019)
Scutellaria discolour	Yenakhat	Lamiaceae	Whole plant	Menstrual disorders, injuries, cuts and wounds	Khumbongmayum *et al.* (2005)
Sorghum halepense	Durham	Poaceae	Seeds	Diuretic	Akhtar *et al.* (2018)
Thespesia populnea	Poovarasu	Malvaceae	Leaf	Abscesses	Silja *et al.* (2008)
Thymus serphyllum	Jawand	Lamiaceae	Seeds and leaves	Skin eruptions, baldness, worm infections	Malik *et al.* (2011)
Urtica dioica	Soii	Urticaceae	Leaves, roots	Rheumatism	Kanta *et al.* (2018)
Viscum album	Aal	Loranthaceae	Whole plant	Fractures, laxative	Khan *et al.* (2004)

The importance of ethnobotanical flora and conservational strategies

Our world has great biological diversity and in some areas, diversity in its natural state will be more valuable than when we use it for timber or grazing. The ethnomedicinally derived compounds show greater potential for the development of products. Despite the ancient nature of traditions, medicinal plants still form the basis of traditional or indigenous health care systems; and are being still used by the majority of populations throughout the world (Dar *et al.,* 2018). About 80% of the world population in the rural areas of developing countries depend on herbal medicine for their health needs (World Health Organization, 2000). Many economic benefits can be provided by the development of indigenous medicines and the use of medicinal plants for the treatment of various diseases (Azaizeh *et al*., 2003).

Socio-economic impacts on ethnobotanically significant plants are very high and deserve more exploration. This also highlights the need to re-evaluate the possible retrieval from pressure exerted on natural vegetation especially due to overgrazing, over-collection, and developmental activities such as urbanization, and industrial oil polluting activities. Special emphasis is required to study the impact oil -polluting activities, have on the natural vegetation and how these activities might be changing the species composition in different areas. Further degeneration of natural vegetation cover can be prevented by effective grazing management plans and it would allow recovery of damaged ecosystems as well. Medicinal preparations derived from natural sources, especially from plants, have been widely used in various cultures for time immemorial. There is a critical need to document precious traditional knowledge owned by the local communities of various parts of our country as well as abroad. Efforts

should not be focussed only on the traditional ethnomedicinal applications, but also on all the ethnobotanical uses, practices and interactions of local inhabitants with the natural ecosystems. Proper documentation of traditional knowledge can ensure sustainability and availability of this knowledge to future generations. Also, we are in pressing need of scientific validation of this knowledge particularly those practices related to health care. Conservation efforts need to be focused on species-rich habitats. There is a need for protecting habitats especially those habitats which harbor rare and very rare species of high conservation value as well as ethnobotanical significance. Special conservation measures are recommended for protecting the populations of the endangered and rare species in the area such as those of the endemic and a near-endemic. Priority should be given to the valuable plant species for conservation initiatives, which will account for both ethnobotanical and conservation importance of species. In addition to this, any direct, human-induced assault on nature resulting in loss of local flora, ethnobotanically significant plants may also face other threats such as global warming and climate change. Future studies need to be focussed on assessing the combined impact of natural changes, particularly climate and human-induced impacts that influence native plants in the region.

Conclusion

The Knowledge of the medicinal uses of plants has been transmitted from one generation to the next orally. It is mandatory to document the knowledge from the local people before the knowledge will drain off. The need to conserve these plants and this traditional knowledge is of utmost importance because if necessary conservation measures are not taken at the earliest, the day will not be far when these God-gifted resources will be depleted completely from their natural habitat. There is an urgent need of conserving medicinal plants so that in future the coming generation could benefit from these precious plants that are a real gift of nature for the mankind.

Acknowledgments

Both the authors are thankful to the Department of Life Sciences, RIMT University, Mandi Gobindgarh, Punjab for providing valuable suggestions and feedback in formulating this chapter.

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Cite this chapter as: Manju and Ahad, T. (2021). Ethnobotanical studies: Importance and conservation strategies. In: Biological Diversity: Current Status and Conservation Policies, Volume 1, Eds. Kumar., V., Kumar, S., Kamboj, N., Payum, T., Kumar, P. and Kumari, S. pp. 24-45, https://doi.org/10.26832/aesa2021-bdcp-02