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Venerated and medicinal aspects of plants used in India: An ethnobotanical review

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Abstract:

Plants have always been the backbone of the entire ecosystem of life. Humans depend upon plants not only for fulfilling their basic needs but also for spiritual activities. Their significance has been attributed to their social importance. However, with modernization, these very traditional cultures and practices are increasingly at risk of extinction. Their associations with faith and religious practices have always been a boon for the conservation of plants and the entire ecosystem depends on it. India is a nation of rich cultural heritage, since ages, it has always emphasized the significance of plants in sacred texts and scriptures. Our ancestors linked divinity with several plants for their conservation and categorized them as sacred plants because of their miraculous medicinal properties. This situation reflects that though the knowledge of the medicinal value of the plants has vanished, it is still practiced in their religious culture. The study attempts to analyze both the religious and medicinal aspects of 21 plants on the basis of their analogous use across the subcontinent with respect to religions and shared beliefs which got incorporated in our culture because of their diverse benefits, making a divine way for the protection of nature and culture. This study shall stress the importance of ethnobotany and help in the constitution of realistic conservation strategies aiding sustainable development. The enlisted medicinal plants reveal ancient practices that have been scientifically accurate in terms of health and holistic lifestyle, promoting the sustainable use of plants for the betterment of the environment.

Keywords:

Conservation, medicinal importance, nature, religious culture, sacred plants, sustainable development, traditional aspects

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Introduction

Nature is the greatest gift to humans, with plants being the fulcrum around which the lever of life sustains. Plants since ancient times have been the backbone of sustenance of life on this planet. The dependence of plants in human life is so rooted that it not only plays a significant role in survival but also in our day-to-day needs and culture. Plants fulfill the basic needs of humans for food, clothing, shelter, and so on. Most anthropologists define culture as the set of learned behaviors, beliefs, attitudes, value, and ideas that are characteristics of a particular society or population.[1] From the very beginning, people have been learning from nature. Due to varied surroundings of environs as a result of migration, there is a diversification in cultural practices of the actual cultural cluster through trial-and-error approach.[2-4] The ideas and practices are influenced by the culture in which they reside. Eventually, the "cultural evolutionism," as a part of the acclimatization event, led to the development of religion. Humans have skillfully adapted to the changing environment through these laden systems passed on across generation through meaningful systems.[5] Indigenous

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knowledge is a broad term that comprises all aspects of life-food, farming, and hunting, medicine preparation and treatment, religious practices, arts, crafts, and technologies used by indigenous cultures around the world. The impact of modern human societies on traditional cultures and practices has adversely affected their authenticity over time. But, their entanglement with their faith and religious practices has been a great way for the protection of this rich culture and plants. The amalgamation of technical experience and understanding of cultural practices is an efficient technique of conservation. The indigenous people can prove to be an effective aid in this regard. People, generally, are exceptionally actuated to try and do things that can be explained in relevance of faith or religion. It is regarded as the use of powerful cultural symbols to help sustain sacred respect for nature. Thus, filtering environmental ethics from religion is a wise strategy for sustainable nature conservation.[6] Recently, it has been found that these ancient practices have been scientifically accurate promoting the sustainable use of plants for betterment of the environment. Our hope is that this review may aware the readers about the importance of ethnobotany; "the science of survival."[7]

Materials and Methods

Extensive survey of literature was carried out; initially, a total of 103 articles were retrieved using popular search engines, relevant science search engines, and database including Google Scholar, Science Direct, PubMed, Web of Science, and Scopus over a period of 11 months. However, only 58 articles were considered based upon the criterion of selection of plants and relevant ethnobotanical and religious data. India is a diverse land in terms of flora, fauna, culture, religion, and landforms; there is a long rich history of versatile use of a variety of plants by different communities, spread across the country. Therefore, brief accounts of 21 plant species were selected based on their analogous use across the subcontinent with respect to religions and shared beliefs. Some important ethnobotanical references (Devi Chand[8]; Griffith[9]; Banerjee[10]; Kochhar[11]; Nadkarni[12]; Kirtikar and Basu[13,14]; Robinson and Cush[15]; Chopra *et al.*[16]; Jain[17]; Dhiman[18]; Pullaiah[19]; Sukh[20]) were consulted to access the geographical coverage of use of these plants, with a detailed description of botanical features. The correct botanical name was followed and confirmed through plant database,[21] by family within parentheses, local name, part used verified from Kirtikar and Basu[13,14] with religious and medicinal uses. The methodology was further elucidated in Figure 1 through flow-diagram.

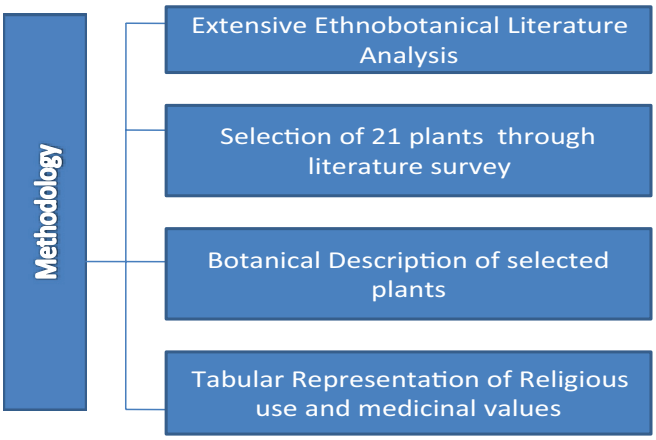

Figure 1: Flow diagram of methodology used in the study

Ethnobotany and India

Ethnobotany is usually defined as the anthropological approach to botany. Ethnobotanical knowledge holistically encircles both wild and domesticated species that nurtures over observation, relationship, needs, and traditional ways of knowing. Thus, ethnobotany is a dynamic contemporary science that changes over time adding new discoveries, ingenuity, and methods for the future.

India, being one of the oldest civilizations with rich cultural heritage and natural diversity, is the hotspot of rich ethnobotanical knowledge. Since ages, plants have been an essential part of the religious customs.[22] India accounts for 7–8% of the recorded species in the world, with documentation of 47,500 species of plants and 91,000 species of animals. India is among world's 17 mega biodiversity country with diverse landforms ranging from high range mountains to desert scrubs.[23] Several religious texts and religions emphasized that humans, animals, and plants should play a supportive and auxiliary role to each other leading to mutual harmony of the ecosystem comprising of these three fundamental entities. The documentation of plants for their miraculous herbal properties has been practiced long ago in ancient Hindu scriptures like *Rigveda* (4500–1600 BCE), *Charak Samhita* (1000–800 BCE), and *Sushrut Samhita* (800–700 BCE).[24] The very practices of tree worship date back to Vedic ages which involve worshipping of sacred groves for a prosperous human life because of the belief of the Gods and Goddesses residing in them.

A large number of plants such as *Ficus religiosa* L., *Azadirachta indica* A. Juss., and *Ocimum tenuiflorum* L. have divine qualities that are considered auspicious and are offered at temples, in several religious activities and marriages including sacred fire ceremony and yajnas.[15] This faith, customs, and taboos have played a significant role in the conservation of forest and valuable plant species.[17] In the past centuries, conservation strategy based on religious belief included customs like plantation of trees as an ode to God, preservation of forest as an important religious site, and introduction

and preservation of new species from pilgrimage into sacred groves.[25] The phenomenon of sacred groves is as old as civilization; the protected areas consist of individual or group of trees protected due to association with deities. They are not only proof of a great heritage but also show evidence of great scientific reason behind their use in daily life. However, this traditional culture is eroding rapidly, threatening the faith and great sustainable conservation techniques associated into vulnerability. Every time a culture is vanished, thousand years of wisdom, data are gone. As humanity is about overlapping human experiences, there will be some extent of similarity between cultures but no one can ignore the fact that the particular culture could be the major influence in future. Evolutionarily diverged plants are found to be chemically diverged creating new way into experimentation, similar in case of diverged cultures. Because of close relations with diverged plants, they develop unique practices, creating biodiversity hotspots.[26,27] Therefore, it is the need of the hour to document the plant species, signifying their religious and scientific perspectives of their uses, for their conservation. Thus, we aim to document and analyze 21 plant species belonging to 18 families, which are widely used in Indian society because of their noble curative properties, through incorporation into their culture. The relevant knowledge on ethnobotanical practices can be essential support on how religious beliefs can contribute toward conservation by dwelling upon their medicinal values associated. The plants listed could be a major disclosure for readers who use it in their daily life but unaware of its religious and thereby medicinal significance, as they find these religious practices as outdated customs.

Botanical features

1. Coconut (Family: Arecaceae)

Cocos nucifera L., also known as "Tree of Heaven" and "Tree of Life," is a single, unbranched stem with aerial growth and crown of 20–30 large paripinnate leaves (fronds) from a single growing point and a swollen base surrounded by a mass of adventitious root. The tall tree can have a height of 35–40 m (115–130 ft) with canopy of diameter of 8–9 m (26–30 ft). The coconut palm is monoecious: flowers; male; consisting of a perianth of six small unequal tepals (outer being smaller), six stamens arranged in two whorls, gynoecium is rudimentary. Female; three-celled ovaries with two whorls of perianth of nearly equal size. Fruits; fibrous drupe, usually ovoid, differentiated into tough (exocarp); green in younger stage and reddish brown later, thicker layer of fibrous husk (mesocarp), hard shell (endocarp), the white endosperm (kernel), and large cavity filled with water.[11,28]

2. Turmeric (Family: Zingiberaceae)

Curcuma longa L. (Syn. *Curcuma domestica* Valeton) is a robust, tropical, perennial herb with a central or main thickened rhizome (bulb) bearing a number of cylindrical primary, secondary, or even tertiary rhizomes. The thick short stem has tufts of large, broad, lanceolate, bright green leaves with long leaf stalk and an acuminate apex. The flowers are borne in dense terminating the stem as short spike, pale yellow in color. Turmeric is a sterile triploid.[11,14,19]

3. Holy basil (Family: Lamiaceae)

Ocimum tenuiflorum L. (Syn. *Ocimum sanctum* L.) also known as "The Mother Medicine of Nature" and "The Queen of Herbs" is an annual plant up to height of 30–60 cm, with branched, purplish, sub-quadrangular, woody stem covered with soft spreading hairs. Acute or obtuse, elliptic-oblong, entire or serrate leaves are green on both sides, which are minutely gland dotted with acute or obtuse base and long, hairy, slender petioles. Flowers are arranged in raceme inflorescence, in close whorls and bracts with broadly ovate and a long slender acumen, ciliate, pedicels longer than the flowering calyx, green, and thin. Long and purplish corolla is 4 mm long and has stretched out stamen with slender filaments. Nutlets; nearly smooth, broadly ellipsoid, yellow color with small black markings.[14]

4. Rice (Family: Poaceae)

Oryza sativa L. is an erect annual grass with shallow root system, up to 1.2 m long with angled, smooth culms, surrounded with smooth, strongly nerved sheaths. Long, flat, and roughly scabrous leaf blades with terminal, narrow, or curved panicle are inclined to one side with ascending branches. Strongly sidewise leveled, patterned pubescent, awned or awnless spikelets. Palea characterized with two nerves near margin. Oblong, sidely flattened, free threshing kernel with long hilum, yellow in color. Rice is autogamous with male and female reproductive organs in the same flower.[29]

5. Banana (Family: Musaceae)

Musa × *paradisiaca* L. (Syn. *Musa* × *sapientum* L.) Kuntze] is a giant perennial herb with an underground rhizome, up to a height of 3.0–9.5 m. The tightly rolled (clasping) spiral leaf bases give rise to the trunk (pseudostem) with light green, attractive, smooth leaves. The lamina is torn into strips, by wind giving ragged appearance to the plant. After producing a number of leaves, the shoot elongates to form a fruiting stalk. This inflorescence is a complex spike, with a stout peduncle, consisting of flowers borne in nodal clusters in two rows. The lower 5–15 nodes produce female flower, followed by sterile flowers, and finally the upper nodes produce male flowers. The perianth is zygomorphic, with five fused segments (3 + 2) and one small free posterior segment.

The gynoecium is represented by inferior, syncarpous, tricarpellary ovary with axile placentation. Fruit is a berry as a result of parthenocarpy and bears large scar at tip, with point of attachment of floral parts. The exocarp is initially green but turns yellow on maturity and encloses edible pulp, within endocarp.[11]

6. Mango (Family: Anacardiaceae)

Mangifera indica L. is a large evergreen tree, with a height ranging from 10 to 45 m, characterized with heavy foliage, heavily branched from the sturdy trunk. Leathery and tapering leaves; elliptical and lanceolate with long petioles. Small whitish red or yellowish green flower occurs in panicles as inflorescence. The fruit is drupe, roughly oval in shape with thick yellow pulp and single seed. The seed is ovoid or oblong and solitary, enclosed in fibrous endocarp.[11,30]

7. Holy fruit tree (Family: Rutaceae)

Aegle marmelos (L.) Corrêa is a small, medium-sized slow-growing tree attaining a height of 12 to 15 m. Thick, soft, flaking, and spreading bark with sometimes spiny branches and bent lower ones. A clear, gummy sap similar to gum Arabic release from wounded branches which eventually solidifies and initially it is sweet in taste but later is exasperating to throat. Leaves are alternate, deciduous, ovate to elliptic, aromatic, pointed, shallow toothed leaflets with long petiole. Flowers are fragrant, occur in clusters of four to seven with young branchlets, have four fleshy petals; green outside and yellow inside, fifty or more greenish yellow stamens. Fruit is globose, hard-shelled, dotted with aromatic oil glands, gray green in color until the fruit is ripe when it is yellow in color. The pulp is fibrous, sweet, thick, pale orange in color and bears numerous seeds which are flattened oblong, bearing woolly hairs and each covered with adhesive mucilage.[31]

8. Hemp (Family: Cannabaceae)

Cannabis sativa L. is an annual, barely branched, smelling, rapidly growing herb with a variable height and can grow 1–5 m tall covered with grayish green hairs. In wild condition, the female grows taller than the male plant. Leaves are palmate, with five to seven leaflets, numerous, on long thin petioles with astute stipules at the base, linear-lanceolate, sharply serrate margins with the tapering end. The flowers are unisexual, male flowers are apetalous, with five yellowish petals and five poricidal stamens located at axillary and terminal panicles. Female flowers with one single ovulate ovary, terminally, germinate on one of the axils. The fruit is small, smooth, light brownish-gray in color, and completely filled with seed.[11,14]

9. Marigold (Family: Asteraceae)

Tagetes erecta L. is an annual, erect, hardy, branched, growing up to 60 cm at a medium rate. Leaves are pinnately divided, strongly scented, segments lanceolate, serrate, and green in color. Flowers are typically yellow-colored but it ranges from light sulfur yellow to deep orange, about 5 cm in size. Rays sometimes are two lipped or quilled in garden varieties.[13]

10. Betel nut (Family: Arecaceae)

Areca catechu L. is a medium-sized, slim, single-trunked, monoecious with a distinguishable crown shaft of six to nine large pinnate leaves. The palm attains a height of 10–20 m. The crown is generally 2.5–3 m in diameter and has 8–12 fronds. Fronds (leaves) are even-pinnately compound 1–1.5 m long, pinnae (leaflets) 30–50, lanceolate 30–70 × 3–7 cm, longest near middle of frond with covering of frond base surrounding trunk and forming green crown shaft of about 55 × 15 cm. Flowers are unisexual, with both male and female flowers within same inflorescence that are crowded, much-branched panicles borne below the leaves. Each terminal branch has female flower at the base with several male flowers drawn out from there to branch tip. Flowers of both sexes are characterized with six stalkless, fragrant, creamy-white tepals; male flowers are deciduous, minute with six stamens, arrowhead anthers, and rudimentary ovary. Female flowers are comparatively larger, three-celled ovary having triangular stigma, with three points at the apex and six small sterile stamens. Fruits; ovoid drupe, fibrous, yellow to orange when ripe. Pericarp is fibrous of about 6 mm thick. Seeds are ovoid or globose with flattened base, ruminant endosperm, and conical embryo at seed base.[11]

11. Bermuda grass (Family: Poaceae)

Cynodon dactylon (L.) Pers. is a hardy, perennial, herb, very variable, rapidly growing with creeping horizontal stolons or runner which are about 20 m long and 2–6 mm broad, flat or convolute, rooting occurs at all nodes forming dense tufts. Leaves are about 2–10 cm × 1.25–3 mm in size, narrow linear or lanceolate, soft or acute, grayish-green in color. Inflorescence on culms with 2–12 spikes giving star-like appearance at stem apex; spikes 2.5–10 cm long with numerous spikelets, arranged in two rows on one side of the spike; flat spikelets; awnless with one floret; glumes unequal, the upper one being longer and one-third to three-fourth length of the floret. It has a deep root system characterized with cylindrical, fibrous, and especially beneficial under drought condition. Minute hair-like roots arise from the main root. The grass reproduces through seeds, runners, and rhizomes. At the stem apex, the seed heads are produced through clusters of two to six spikes together.[32-35]

12. Sandalwood (Family: Santalaceae)

Santalum album L. is a small-to-medium-sized, evergreen, and semi-parasitic tree attaining a height of about 20 m

with slender and bent branches. Sapwood is white and unscented, whereas heartwood is yellowish brown and scented leaves are thin, glabrous, opposite or sub-opposite, elliptic-ovate to ovate lanceolate; petioles are thin and slim. It starts flowering at an early age (at 3–4 years). The flowers are small, bisexual, inodorous, and maroon-colored with axillary or terminal paniculate cymes. Campanulate perianth and four exerted stamens rotating with four rounded obtuse scales. The fruits are purple black in color, globose drupe with sweet pulp adored by birds, and is thereby a good way of seed dispersal and endocarp is hard and ribbed.[11,14]

13. Burflower tree (Family: Rubiaceae)

Neolamarckia cadamba (Roxb.) Bosser is a large tree attaining a height of 45 m. It is distinguishable with umbrella-shaped crown and straight cylindrical bole. It is lightweight heartwood. The bark is smooth, very light, and gray in case of young trees and rough and longitudinally fissured in old trees. The branches are characteristically spread horizontally and drop at the tip. The leaves are bright green, opposite, simple sessile to petiolate, ovate to elliptical. In young fertilized trees, the leaves are comparatively larger, supporting at base and cuspated at apex; the stipules are interpetiolar, deciduous, and narrowly triangular. Somewhat fleshy, numerous fruitlets with upper parts having four hollow or solid structures. The fruit has about 8000 seeds which are not winged but trigonal- or irregular-shaped with fleshy yellow-orange infructescence.[36]

14. Sacred fig tree (Family: Moraceae)

Ficus religiosa L. is a large glabrous epiphytic tree. Leaves are coriaceous, ovate-rotund, tapering upwards and at the top produced into a linear lanceolate tail about one-third as the whole blade, entire base, broad and shortened, sometimes in younger leaves cordate, 5–7 nerved; petioles thin and slim. Acute, ovate, minute stipules. Receptacles are axillary, depressed globose, smooth, sessile and occur in pairs. Dark purple when ripe with broad spreading basal bracts. Male flowers are sessile, less in number, only found near the mouth of some receptacles. Broadly ovate, three sepals. One stamen with single anther, ovate-rotund with short filament. Gall and fertile flowers sessile or pedicellate numerous than fertile females, with many out of perianth. Sepals are lanceolate and five in number with short, lateral style, and rounded stigma.[14]

15. Cedar (Family: Pinaceae)

Cedrus deodara (Roxb. ex D. Don) G. Don is a large evergreen tree, branches not whorled, the major shoot and branches are generally bent. Dark, sometimes almost black, bark, generally very rough on old stems, at times only slightly crinkled. Dimorphic shoots, long shoots with the needles solitary and spirally arranged, and small shoots with the needles arranged in dense whorls. Leaves are needle-like, triquetrous, and sharp-pointed. Flowers are monoecious but some trees usually bear flower of one sex. Male catkins singly at the ends of the branchlets, cylindrical: stamen with two oblong pollen sacs, the connective produced as a leveled, ovate, obtuse, ascending appendage with an irregularly crenulated margin. Female flowers are single and at the end of branchlets; double scales, large placental scale, small carpellary, the placental scale carrying near the base two reversed ovules. Cones are erect, formed of the imbricating, thin, woody, placental scales which break away when ripe leaving stout woody axis. Seeds are brown in color, with wing longer than the seed.[14]

16. Betel pepper (Family: Piperaceae)

Piper betle L. is a tropical plant with articulate, dichotomous stem. Stem sturdy with pinkish stripe along node dilated and rooting. The leaves are simple, spiral, and exstipulate; petiole is channeled and pubescent; blade is of 10 × 6 and 9.5 × 5 cm dimensions, ovate to ovate oblong, and light green in lower side. Blade base is chordate and the apex is acuminate with three pairs of secondary nerves. The inflorescence is in the form of axillary spike. The fruits are in the form of drupes and orange in color.[37]

17. Bamboo-leaved Prickly Ash (Family: Rutaceae)

Zanthoxylum armatum DC. is an evergreen, erect, ascending, thorny, and small shrub, with a height up to 6 m and dense foliage. Leaves are compound, imparipinnate, 3–7 foliolate and pellucid-punctate with strong smell, aromatic and narrowly winged, shiny petiole having two stipular prickles underneath; leaflets are two to six in pair and are glabrous in nature. Flowers occur in sparse axillary panicle and are green to yellow in color; calyx with six to eight subacute lobes; stamens six to eight in number. Ripe follicles or carpels are solitary, with tubercle and pale red. Fruits are small, drupes, red when ripe with rounded and black-colored seeds.[38]

18. Lotus (Family: Nelumbonaceae)

Nelumbo nucifera Gaertn. is a large aquatic, perennial, rhizomatous herb attaining a height of about 150 cm. Stem is thin, elongated, and creeping with nodal roots. Aerial leaves are cup-shaped, glabrous, peltate, orbicular, and dark green in color, whereas floating leaves are pale, flat with a network of microscopic hairs; veins radially extended and long, smooth or minutely prickled petiole above water. Flowers vary in color from white to rosy, solitary, bisexual, and scented and pollinated by insects, are glabrous, ovoid in shape; elliptic or oval sepals, concave and green to pinkish green in color. Petals (of about 25) in case of single form and 110 for double

form, elliptic, obovate to spathulate, obtuse or subacute, concave. Numerous stamens with spongy receptacles. Numerous carpels, embedded loosely in cavities on flattened top of receptacles with single ovule. Fruit is nut–achene like, oblong to ovoid in shape.[39]

19. Thorn apple (Family: Solanaceae)

Datura stramonium L. is a coarse annual, erect, freely branching herb of 0.6–1.2 m high, farinose puberulous or glabrous in nature. Stalked large leaves deeply toothed or sinuate and pale green in color. Solitary pedicels. Flowers are large, erect, or pendulous and purple or white in color. Calyxovate-lanceolate. Corolla, white in color. Five cuspidate lobes. Stamens are attached near the base of tube with filiform apparatus and longitudinally dehiscent linear anthers. Ovary two- or four-celled with numerous ovules and bilobed stigma. Capsule erect, ovoid, four valved, covered with long and short rigid prickles surrounded below by enlarged reflexed base of calyx. Numerous compressed seeds that are embryo peripheric.[14]

20. Henna (Family: Lythraceae)

Lawsonia inermis L. is a deciduous shrub or small tree, with a height of 2.6 m and many branches. Leaves are elliptic-lanceolate. Flowers are scented and are white or rose colored. Pedicels are short, slim, and many in number. Calyxcampanulate; lobes are suborbicular. Eight stamens inserted in pairs on the calyx tube. Calyx is persistent with the tipped style. Capsules are globoid and slightly veined outside. Seeds are brown, numerous, and pyramidal in shape enclosed in pea-shaped and globose seed capsule.[12,20]

21. Camphor tree (Family: Lauraceae)

Cinnamomum camphora (L.) J. is a small glabrous tree attaining a height of 40 m; the bark is vertically fissured and yellow or brown in color. Leaves are alternate, simple with three to many distinct nerves, penninerved with stout dormant buds covered in large, silky orbicular concave indicating caduceus scales with strong scent of camphor, when crushed. Flowers are hermaphrodite, creamy white in color, in lax terminal panicles on the ends of the twigs, actinomorphic; single ovary with locule, single ovule, pendulous, or basal. Stamens definite, free; with open anther guided by valves and minute embryo. The fruit is one-seeded, fleshy drupe, wide, and purple-black on maturity.[40]

Table 1 represents plants with their use in religious ceremonies along with their medicinal values.

Botanical Challenges and Outcomes for Society

The humans' agenda of development has destabilized the ecosystem, as revealed by the climate change.[75] In the name of development, the natural ecosystem is perishing; humans have lost their roots. They are dwelling in this thin layer of uncertainty of a dreadful future, where there is only suffering. The phenomenon of deforestation, habitat loss, wetland loss, fragmentation, and environmental pollution aided by industrialization has become real challenges that constantly hint human for working to save its home Earth, through harmony between human and nature. The importune states biodiversity loss as one of the third biggest risks to the world as human health depends upon health of biodiversity.[76] Although plants have been natural capital of civilization, about 300,000, i.e., 20%, are extensively at risk of extinction due to human activities.

The standard procedure for plant conservation has proven to be of limited success. The conservation process for saving the earth's natural lungs requires an allied social effect, and coordinating it with local communities and the young generation will catalyze the process by multiple folds, ensuring that the concept of green civilization is true with sustainable use of natural resources, and the world is saved from pandemics that could threaten human existence. The breaching of natural ecosystem has put animals, insects, plants lives at increasingly alarming risk as a consequence of "biodiversity dilution effect."[77]

Thus, the contribution of ethnobotanists is not only limited to awareness of the importance of plants to the society but also to preventing and protecting natural resources from over-exploitation and destructive land use practices through innovative ethnobotanical research. Recently, the ethnobotanists' work has become more complex as the chance of finding more new culture has become limited and therefore more realistic, functional models of ecosystem services and management are highly required. Effective policy planning and decision-making which matches with realities of region, recognition, and protection of rights of local communities of their shared knowledge through intellectual property rights, technology transfer, infrastructure development, community-based education, and making them an active part of conservation strategies through the concept of "Benefit Sharing" must be actively practiced.[78]

Conclusion

The importance of plants in terms of food, fiber, cosmetics is always discussed but the religious aspects of plants are not given any attention or much explored by researchers. Therefore, documentation of this valuable traditional knowledge through ethnobotanical studies is highly essential for conservation of natural resources and awareness. With proliferation of interest, though there is an increased awareness recently in

Table 1: List of plants used in religious ceremonies with their medicinal values

S. no.	English/ local name	Botanical name and family	Parts used	Religious uses	Medicinal values
1.	Coconut/ Nariyal	*Cocos nucifera* L.	Seed	The coconut on top of the Kalash is a symbol of Godhead—the three eyes symbolic of the eyes of Lord Shiva.	It is used for its antibacterial, antifungal, antiviral, antiparasitic, antidermatophytic, antioxidant, hypoglycemic, immunostimulant, and hepatoprotective properties.
		Family: Arecaceae		Breaking of a sanctified coconut is done before the initiation of work believing the custom will bring fortune.[41]	High in protein, vitamins, and minerals, it is a source of medication in Ayurveda for the treatment of heart, blood pressure, burns, and restoration of hair growth.[42]
2.	Turmeric/ Haldi	*Curcuma longa* L.	Rhizome	Powder of rhizome is considered good antiseptic. Associated with planet Jupiter,	The powdered rhizome is taken with milk as a cure against cold, cough, and healing injuries.
		Family: Zingiberaceae		its paste is applied on the face and body of the bride and groom for blessing, as an important ritual for marriage.[43]	Turmeric is used as herbal medicine for rheumatoid arthritis, chronic anterior uveitis, conjunctivitis, skin cancer, smallpox, chickenpox, urinary tract infections, and liver ailments.[44]
3.	Holy basil/ Tulsi	*Ocimum tenuiflorum* L.	Leaves	Associated with Lord Vishnu, the creator of the universe according to Hindu mythology. The sacred plant is worshipped daily in the belief of warding off evil spirits.	Herbal tea of ginger or black pepper and Tulsi is effective against cold and cough. The decoction of tulsi with ginger, black pepper, and salt is used against malaria.
		Family: Lamiaceae		"Tulsi vivah" (the ceremonial marriage of Tulsi plant) is performed during Ekadashi of Kartik month in Hindu tradition.[45]	Leaves are effective to improve concentration and memory. Tulsi plant purifies the air with its fragrance and therefore "Jalarpan" (water offering) is performed before sunrise.[46]
4.	Rice/Dhan	*Oryza sativa* L.	Seeds	Rice paste is used for decorating place of worship. The husked seeds are used for various sacred rituals; represent Goddess Lakshmi in Hindu religion.	In Ayurveda, rice is considered to be an acrid, oleaginous, tonic aphrodisiac, fattening, diuretic, and useful in biliousness.
		Family: Poaceae		It is used as a "Tilak" (sacred mark) along with turmeric and sandalwood as a boon for fertility.[46]	Rice water is prescribed by the Pharmacopoeia of India as an ointment to counteract inflamed surface.[47,48]
5.	Banana/Kela	*Musa × paradisiaca* L.	Whole plant	This plant is associated with planet Jupiter, worshipped mainly on Thursday. The trunk is utilized to create welcoming gates in religious rituals, while the leaves are used to serve food.	It is used for treating celiac disease in case of children. Banana also contributes to longevity, curing corns, headaches, warts, and even stage-fright. According to Chinese medicine, it can lower blood pressure and relieve constipation and hemorrhoids. The flowers are used in bronchitis and dysentery, as well as on ulcers; cooked flowers are given to diabetics.[50]
		Family: Musaceae		Fruits are offered to please deities. Plant symbolizes Lord Vishnu. It is used to remove "Mangalik dosha" (mars defect) in Hindu religion.[49]	
6.	Mango/Aam	*Mangifera indica* L.	Whole plant	The tree is considered sacred, represents Lord Prajapati in Hindu tradition. The flowers are offered as offering to Lord Shiva during "Shiv Ratri" (the great night of Lord Shiva).	Plant parts are used to treat diseases such as tympanitis, tumor, datura poisoning, heatstroke, miscarriage, anthrax, blisters, mouth ulcers, colic, diarrhea, etc.

Table 1: Continued

S. no.	English/ local name	Botanical name and family	Parts used	Religious uses	Medicinal values
		Family: Anacardiaceae		The leaves are used as adornments during religious occasions to attract positive energy and fruits are given as gifts and offerings during religious ceremonies. The twigs are used to perform yajnas.[30]	Mangiferin, a compound, is found to have antioxidant and antihealing properties.[51]
7.	Holy fruit tree/Bel	*Aegle marmelos* (L.) Corrêa	Leaves, fruits	The plant is considered representative of "Trimurti" (trinity), leaves and fruits are used as offering to Lord Shiva.	Fruits are used in diarrhea, dysentery, gastric troubles, constipation, laxative, tonic, digestive, brain and heart tonic, ulcer, intestinal parasites, gonorrhea, and epilepsy.
		Family: Rutaceae		It is used in worshipping Lord Shiva during "Shravana" (fifth month of the Hindu calendar).[52]	Extracts of leaves are effective against ulcers, abscess, backache, vomiting, cuts, weakness of heart, acute bronchitis, blood sugars, diarrhea, dropsy, beriberi, injuries caused by animals, etc.[52,53]
8.	Hemp/*Bhang*	*Cannabis sativa* L.	Leaves	Plant leaves along with milk are used as offering to Lord Shiva on the day of "Mahashivratri" (the great night of Shiva).[54]	It shows clinical promise for glaucoma, nausea and vomiting, analgesia, spasticity, multiple sclerosis, and AIDS wasting syndrome.[55]
		Family: Cannabaceae			
9.	Marigold/ Gainda	*Tagetes erecta* L.	Flower	Flower is used to make a garland for deities, honored guests, and used to decorate pyre of the dead.	The plant is known for its various pharmacological effects as antiplasmodial, antioxidant,
		Family: Asteraceae		Cow dung balls are studded with flower and used for decorating rice powder drawings.[56]	antidepressant, antimicrobial, etc. Its florets have been used for the treatment of eye diseases.[57,58]
10.	Betel nut/ Supari	*Areca catechu* L.	Fruit	The nut is considered as symbolic representation of Lord Brahma; the creator, in Hindu tradition. Betel nut along with various fruits is kept in lap of brides or pregnant women to remove bareness and scare evil spirits.	Betel is considered to be hot food, hence aphrodisiac. It prevents foul breath, aids digestion, paste is used as a laxative and along with sandalwood, it is effective against internal hemorrhage. Powdered betel nuts are used for making tooth powders. It is also effective against removal of intestinal parasites and considered astringent.[59]
		Family: Arecaceae		In northern Indian states of Haryana and Punjab, it is tied with kangan on the forehand of wedding couple.[59]	
11.	Bermuda grass/Durva	*Cynodon dactylon* (L.) Pers.	Whole plant	Durva is a Sanskrit word meaning to be cut or eaten by the animal.	The plant is effective against cancer, carbuncles, cough, cramps, cystitis, diarrhea, dysentery, epilepsy, hemorrhoids, leucoderma, headache, hypertension, hysteria, bronchitis, asthma, tumors, measles, urogenital disorders, eye disorders. The expressed juice of plant acts as astringent and is applied to stop bleeding in cuts.[16]
		Family: Poaceae		It is considered sacred next to Tulsi. It is used to worship Lord Ganesha in Hindu tradition.[60]	
12.	Sandalwood/ *Chandana*	*Santalum album* L.	Heartwood	The plant has significant religious importance in Hindu, Buddhism, and Islam Religions. "Vamana Puran" recommends the use of wood for the worship of Lord Shiva.	Sandalwood oil is used as an antiseptic and astringent and against headache, stomach ache, and urinary and genital disorders.

Table 1: Continued

S. no.	English/ local name	Botanical name and family	Parts used	Religious uses	Medicinal values
		Family: Santalaceae		The tree is the symbolic representation of Goddess Lakshmi. In Hindu tradition, the wood is used in funeral. The sandalwood paste is used to make "Tilak" (sacred mark) and applied on the forehead by Lord Krishna devotees and for ceremonial bathing of Hindu Gods.[61]	The essential oil obtained from heartwood is used against inflammatory and skin infections.[61]
13.	Burflower tree/ Cadamba	*Neolamarckia cadamba* (Roxb.) Bosser Family: Rubiaceae	Whole plant	It is believed that God resides inside a Cadamba tree. The Hindu tradition signifies its importance through Sanskrit shloka, "AyiJagadamba Mad-Amba Kadamba Vana-PriyavaasiniHaasa-Rate," that is, Goddess Durga resides in the forest of Cadamba trees.[62]	The Cadamb plant, particularly leaves and bark, is used to cure a variety of diseases. Various secondary metabolites of pharmacological significance such as saponins, indole and quinoline, alkaloids, and triterpenes are obtained from this plant that shows antihelminthic, antifungal, antifilarial, and antimalarial activity.[62]
14.	Sacred fig tree/Peepal	*Ficus religiosa* L. Family: Moraceae	Whole plant	The tree is considered a sign of mortality by Hindus, a symbol of Lord Vishnu. It is believed Mahatma Buddha, founder of Buddhism, found enlightenment under this sacred tree. The root is the symbolic representation of Brahma, trunk for Lord Vishnu, and branches for Lord Shiva.[63]	The leaves are used against bleeding of nose, boils, constipation, earache, heart disease; barks are used against diarrhea, fruits, and seeds against asthma, infertility, urinary troubles, roots against gout and gum disease.[63]
15.	Cedar/ Devdar	*Cedrus deodara* (Roxb. ex D. Don) G. Don Family: Pinaceae	Whole plant	The first plant name Deva literally means divine and second part means tree and true. In Hindu tradition, it is considered a sacred symbol for Lord Shiva.[64]	All parts of the plant are used in treating a variety of diseases such as inflammation, insomnia, cough, fever, urinary discharges, itching, tuberculosis, ophthalmic disorders, mind disorders, diseases of the skin and of the blood. The wood acts as an expectorant and useful against piles, epilepsy, stones in the kidney and bladder, useful in fevers, and in many other disorders. The oil has antiseptic nature and effective in curing skin diseases, wounds, urogenital diseases, diaphoretic as well as insecticide. It may also cure fungal diseases and act as a sedative and cardiotonic too.[65]
16.	Betel pepper/ Pan	*Piper betle* L.	Root, leaves, seeds	Betel leaf is considered symbol of Lord Vishnu; along with betel nuts, they are consideredod-given gift and considered effective means of hospitality, is given as alms to Brahmins to be free from all diseases.	Betel leaves are effective against deranged phlegm, foul ulcers, snake bites, skin infection, obesity, conjunctivitis, cerebral congestions, satyriasis, respiratory catarrh, and diphtheria, eliminate thirst and considered carminative. They show antioxidant action. The stalk with oil used to treat constipation and tympanitis in case of children. The root is used to prevent childbearing and improve the quality of voice.[59]

Table 1: Continued

S. no.	English/ local name	Botanical name and family	Parts used	Religious uses	Medicinal values
		Family: Piperaceae		A betel leaf is used to sprinkle holy water in Hindu rituals. It has significant role related to marriage since ancient times.[59]	
17.	Bamboo Leaved Prickly Ash/ Timura	*Zanthoxylum armatum* DC.	Whole plant	Twigs are used to ward off evil spirits.	Fruits, seeds, and bark are used as an aromatic tonic for dyspepsia and fever, have essential oils with antiseptic properties.
		Family: Rutaceae		The Bhotiya community of Uttarakhand considers the tree to have religious significance and magical properties.[66]	The seeds and twigs are used traditionally to make tooth powder.[67]
18.	Lotus/Kamal	*Nelumbo nucifera* Gaertn.	Whole plant	The lotus flower is considered sacred for the Hindu and Buddhist religions. It has wide use ranging from deities to dead bodies, in marriage as a token of love between couples.	Lotus seeds, leaves, and stamen are classified as astringents, being sweet and neutral, and benefiting the spleen, kidney, and heart. By charcoaling the lotus plant parts, as is sometimes done, a hemostatic effect is assured, as charcoal itself has this effect (it promotes blood coagulation).[69]
		Family: Nelumbonaceae		It is considered a sign of success. Leaves are used as plate in religious mass gatherings.[68]	
19.	Thorn apple/ Datura	*Datura stramonium* L.	Whole plant	It is believed that Datura along with Cannabis is used as smoke by Lord Shiva.	The extract of leaves is taken orally against asthma and sinus infections and stripped barks are applied externally to treat swellings, burns, and ulcers. The plant is used internally to treat madness, brain disease, and depression. Externally, it forms the basis of ointment for burns and rheumatism.[70]
		Family: Solanaceae		The small thorn apple is given as offerings in Shiva icons at temples.[70]	
20.	Henna/ Mehendi	*Lawsonia inermis* L.	Leaves, bark, flowers	Henna is used as a dyeing agent for men and women, both in Hinduism and in Islam. It has special religious significance in Hindu marriage ritual, known as "Mehendi"; a word interchangeably used for marriage. It is also applied during various fasts and vratas such as Karwachauth. It is considered symbol of fertility, good luck, and sensuality in Islam.[71]	Henna is used as an astringent, cardioinhibitory, hypotensive, sedative and employed in the treatment of jaundice, leprosy, smallpox, and skin infection. Henna extracts are found to have antibacterial, antifungal, and ultraviolet light screening activity. It is also known to have tuberculostatic and anticancerous properties.[71,72]
		Family: Lythraceae			
21.	Camphor tree/Kapur	*Cinnamomum camphora* (L.) J. Presl.	Whole plant	Camphor has significant use in Hindu puja rituals, where it is burned with sacred flame and leaves no residues signifying unification with God and warding off evil spirits. It is also used as a constituent in *Tilak*.[73]	The essential oils obtained from camphor plant from the distillation of plant parts have components, particularly monoterpenes with suppressive and antimutagenic effect in the number of human cancer cells including colon cancer, gastric cancer, liver tumor, breast cancer, leukemia, and others.[74]
		Family: Lauraceae			

the field of ethnobotany, especially in India, it still lags behind in exploration and protection, comparing its rich ethnobotanical heritage. The review article analyzes conservational aspects of our traditional wealth of knowledge about medicinal plants signifying their use in context to our religious ceremonies, which in true sense describes the true diversity of India in terms of holistic lifestyle. In the present scenario of environmental degradation, the ultimate purpose of ethnobotany is to value the simplest and important purpose of life, that is, being human, for a better sustainable future.

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Conflicts of interest

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हिन्दी सारांश

भारत में उपयोग किए जाने वाले पादपो का धार्मिक और औषधीय पहलू: एक प्रजातीय वानस्पतिक समीक्षा

पादप हमेशा से ही जीवन के पूरे पारिस्थितिकी तंत्र की रीढ़ रहे हैं। मानव न केवल अपनी बुनियादी जरूरतों को पूरा करने के लिए बल्कि आध्यात्मिक गतिविधियों के लिए भी पादपों पर निर्भर रहता है। उनके महत्व ने उन्हें सामाजिक महत्व के लिए जिम्मेदार ठहराया है। यद्यपि, आधुनिकीकरण के साथ, इन पारंपरिक संस्कृतियों और प्रथाओं के विलुप्त होने का खतरा बढ़ रहा है। आस्था और धार्मिक प्रथाओं के साथ उनका संबंध हमेशा पादपों के संरक्षण के लिए वरदान रहा है और पूरा पारिस्थितिकी तंत्र इस पर निर्भर करता है। भारत वर्षों से एक समृद्ध सांस्कृतिक विरासत का देश है, इसने हमेशा पवित्र ग्रंथों और शास्त्रों में पादपों के महत्व पर जोर दिया है। हमारे पूर्वजों ने उनके संरक्षण के लिए कई पादपों के साथ देवत्व को जोड़ा और उनके चमत्कारी औषधीय गुणों के कारण उन्हें पवित्र पादपों के रूप में वर्गीकृत किया। यह स्थिति दर्शाती है कि यद्यपि पादपों के औषधीय महत्व का ज्ञान लुप्त हो गया है, फिर भी यह उनकी धार्मिक संस्कृति में प्रचलित है। अध्ययन में 21 पादपों के धार्मिक और औषधीय दोनों पहलुओं का विश्लेषण धर्मों और साझा मान्यताओं के संबंध में उपमहाद्वीप में उनके समान उपयोग के आधार पर करने का प्रयास किया गया है, जो हमारे विविध लाभों के कारण हमारी संस्कृति में शामिल हो गए हैं, प्रकृति और संस्कृति के सुरक्षा के लिए एक दिव्य तरीका बनाते हैं। यह अध्ययन मानवजाति वनस्पति विज्ञान के महत्व पर जोर देगा और सतत विकास की सहायता करने वाली यथार्थवादी संरक्षण रणनीतियों के गठन में मदद करेगा। सूचीबद्ध औषधीय पादप प्राचीन प्रथाओं को प्रकट करते हैं जो स्वास्थ्य और समग्र जीवन शैली के संदर्भ में वैज्ञानिक रूप से सटीक हैं, पर्यावरण की बेहतरी के लिए पादपों के स्थायी उपयोग को बढ़ावा देते हैं।

मुख्य शब्द: संरक्षण, प्रकृति, औषधीय महत्व, धार्मिक संस्कृति, पवित्र पादप, पारंपरिक पहलू, संधारणीय विकास।