



Magico-religious plants of Sarkaghat tehsil in Mandi district of Himachal Pradesh (India): An ethnobotanical perspective from the north-western Himalaya

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Research

Abstract

Background: Magico-religious plants form an essential part of traditional knowledge systems in the Himalayan area where local communities use them in rituals, spiritual healing, festivals, and socio-cultural activities. Despite Himachal Pradesh's rich cultural past, precise ethnobotanical knowledge on magico-religious plant activities in Sarkaghat tehsil of Mandi district is poorly documented.

Methods: The present study was carried out during March 2024–October 2025 in Sarkaghat tehsil of Mandi district (Himachal Pradesh). Ethnobotanical data had been collected through field surveys, semi-structured interviews, focused group discussions and several field trips engaging 75 informants, including priests, elderly villagers, farmers and home practitioners. Quantitative ethnobotanical indices including Use Value (UV), Cultural Importance Index (CI), Relative Frequency of Citation (RFC) and Informant Consensus Factor (ICF) were calculated in order to assess the cultural significance of the documented plant species.

Results: A total of 35 plant species from 24 families were recorded for their application in rituals, worship, protection against evil spirits, marriage ceremonies, fire rituals and ancestral rites. Poaceae family was recorded as the predominant family with six species. Whole plant (25.42%) was the most common type of plant usage which was followed by other parts like leaves (18.64%) and stems (16.95%). *Ocimum tenuiflorum* had the most significant Use Value and Cultural Importance Index (0.160 each) whereas *Dendrocalamus strictus* and *Ocimum tenuiflorum* exhibited the highest Relative Frequency of Citation (0.866). The greatest Informant Consensus Factor was recorded for ancestral and death-related rituals (0.93) followed by planetary calming rituals (0.92) and marriage-related rituals (0.91). Gender-based investigation revealed that women had greater awareness of home ritual plants whereas males focused on species related to ceremonies and temples.

Conclusions: The research emphasizes the significant correlation between traditional faiths and biodiversity preservation in the North-Western Himalaya. The strong cultural consensus about ritual plant usage shows the persistent existence of preexisting traditional knowledge systems. A number of culturally significant species identified in the research require conservation efforts due to rising human-induced challenges and decreasing transfer of traditional knowledge. The findings provide valuable baseline information for future ethnobotanical, phytocultural and conservation-related research in the Himalayan region.

Keywords: Magico-religious, Ethnobotany, Sarkaghat, N.W. Himalaya, Traditional knowledge, Biodiversity

Background

Plants, as an integral component of human civilization, serve not only as sources of food, medicine and fodder but also as sacred entities deeply embedded in religious and spiritual traditions. Across India, nearly 468 plant species belonging to 133 families have been reported to possess sacred and magico-religious significance (Sood *et al.*, 2005). Since ancient times, human societies have maintained a close relationship with plants, reflected through worship, ritual practices and symbolic associations with divine powers. Archaeological evidences from the highly developed Harappan civilization suggests that plant worship was prevalent as early as the third or fourth millennium B.C. The famous seals of Mohenjo-daro depict sacred trees such as Peepal (*Ficus religiosa* L.), highlighting the spiritual significance attached to plants during that period. Similarly, tree worship continued throughout the Vedic era, emphasizing the enduring connection between humans and sacred flora (Sood *et al.*, 2013; Pandey & Pandey, 2016).

From the beginning of human existence plants have been utilized in diverse ways for the protection, well-being, and advancement of society. In many traditional cultures, plants are worshipped as symbols of gods and goddesses and are used in rituals intended to ensure prosperity, protection, purification, and spiritual harmony (Ghate, 1998; Dogra *et al.*, 2017). Tribal and indigenous communities especially maintain strong cultural relationships with plants and continue to employ them extensively in ceremonies, festivals, and folk practices. Sacred plants and sacred groves have also played a vital role in biodiversity conservation because religious beliefs and taboos often prevent their destruction or overexploitation. Such practices reflect a complex relationship between ecological sustainability, spirituality, and traditional cultural systems (Gairola *et al.*, 2022). In Hindu traditions, several plants possess strong religious associations; for example, the Bael tree (*Aegle marmelos*) is traditionally linked with Lord Shiva, whereas the Peepal tree (*Ficus religiosa*) is considered sacred to Lord Vishnu (Ramanayya, 1985; Waheed *et al.*, 2023).

The Himalayan region, particularly Himachal Pradesh, is well known for its rich ethnobotanical heritage and deeply rooted cultural traditions. Several ethnobotanical studies conducted in and around Mandi district of Himachal Pradesh have primarily focused on ethnomedicinal plants and their traditional usages (Sharma *et al.*, 2015; Kumar *et al.*, 2013; Kumar, 2016; Kumar & Chander, 2019; Manjulata, 2020; Devi *et al.*, 2022; Guleria *et al.*, 2023). However, comparatively little attention has been given to the magico-religious significance of plants, despite their extensive role in rituals, folk beliefs, and socio-cultural traditions. Sarkaghat tehsil, located in district Mandi, represents a culturally rich region where sacred plants continue to play an important role in fire rituals (*havan*), deity worship, marriage ceremonies, protection against evil spirits, seasonal festivals, and ancestral rites. Despite this strong association between local traditions and sacred flora, no systematic and comprehensive ethnobotanical investigation has yet been undertaken specifically to document the magico-religious plants of the region. The present research underscores the significant biocultural diversity of the study area and identifies several localized ritual practices (e.g., Bujatra, Gantryala, Dayanvansh/Dugyali, and plant-based astrological remedies) that have been previously unreported or inadequately documented in the northwestern Himalaya, thereby affirming the novelty and importance of the current research.

Ethnobotanical documentation of magico-religious plants is essential not only for preserving indigenous cultural heritage but also for understanding their ecological and conservation significance. Traditional belief systems often contribute to the protection and sustainable utilization of culturally important plant species. Furthermore, quantitative ethnobotanical approaches provide valuable insights into the cultural relevance and usage patterns of sacred plants within local communities. Therefore, the present study was undertaken to document the magico-religious plants used by indigenous communities of Sarkaghat tehsil in district Mandi, Himachal Pradesh. The study identifies and records plant species employed in different magico-religious practices and evaluates their cultural significance using quantitative ethnobotanical indices such as Use Value (UV), Relative Frequency of Citation (RFC), Cultural Importance Index (CI), and Informant Consensus Factor (ICF). In addition, the study examines gender-based knowledge distribution and conservation status of the recorded species. By integrating botanical diversity with cultural and spiritual traditions, this study offers a thorough account of the biocultural heritage of the Sarkaghat region and provides essential baseline information for future research in ethnobotany, anthropology and biodiversity conservation. The documentation of localized practices expands knowledge of Himalayan ethnobotany and underscores the urgent need to preserve rapidly disappearing traditional knowledge related to sacred plant use.

Materials and Methods

Study Area

Sarkaghat tehsil is a culturally diverse region located in the North-Western Himalayas, within Mandi district of Himachal Pradesh (Figure 1). The average elevation ranges from 900 to 2200 meters. The climate in this region varies from subtropical to temperate, characterized by warm summers, cold winters and moderate to high monsoon rainfall. The region is recognized for its profound cultural heritage, folk traditions and the strong connection of its inhabitants with the natural environment. Local people utilize various plants as a significant component of their magico-religious practices. The utilization of sacred plants is fundamental to domestic ceremonies, festivals and communal rituals. Individuals often consult 'gur' or 'baji' for guidance on prosperity, health and protection from evil spirits. Various plants are utilized in different rituals such as offerings, fumigation and protective charms. Many trees and groves are regarded as sacred 'devbriksh' and remain untouched as they are thought to serve as the dwelling places of deities and ancestral spirits. Strict protection is enforced for plants adjacent to temples and other sacred sites allowing only sustainable harvesting of fruits, flowers and leaves for traditional ceremonies. This distinctive combination of faith, tradition, and biodiversity conservation underscores the significance of magico-religious plants in preserving cultural identity and ecological equilibrium in Sarkaghat tehsil.

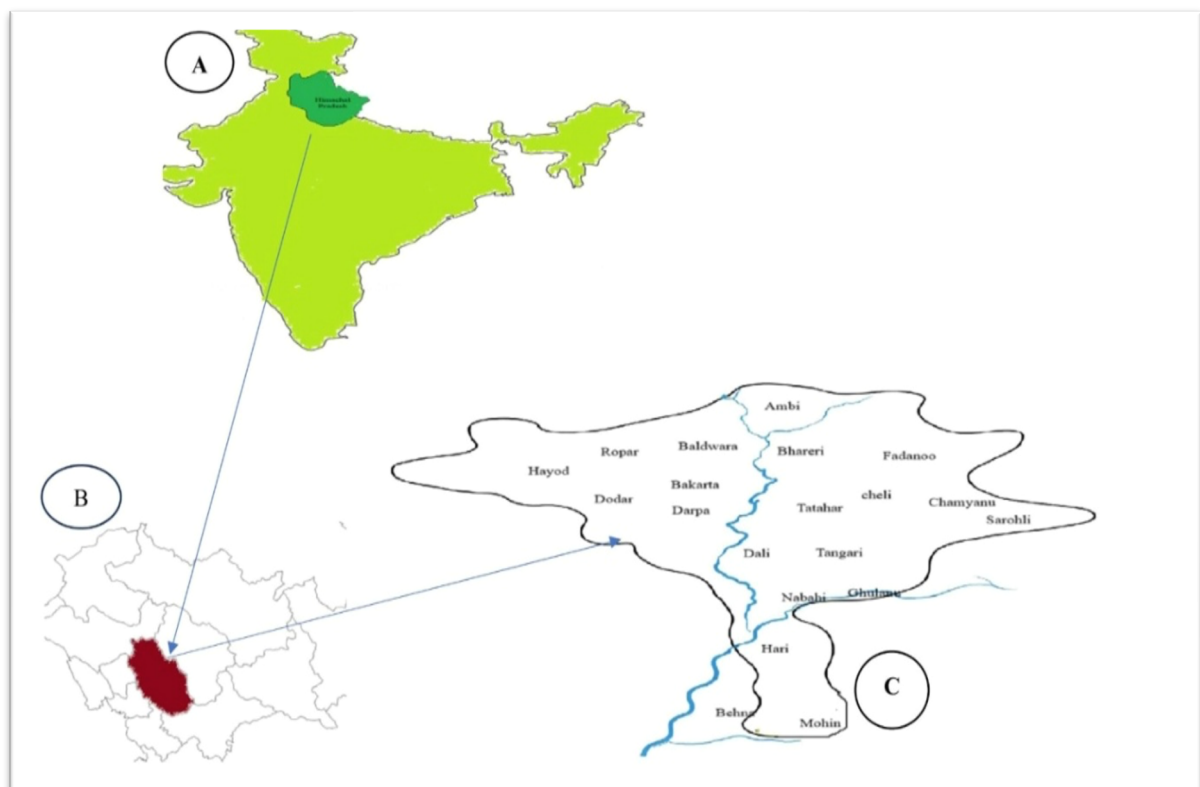


Figure 1. Location map of the study area showing (A) India, (B) Himachal Pradesh with Mandi district highlighted, and (C) Sarkaghat Tehsil. The study area extends approximately between 31°40'–31°52' N latitude and 76°42'–76°58' E longitude.

Data Collection

Field surveys were conducted in 20 villages distributed across Sarkaghat tehsil, covering the geographical extent of approximately 31°40'–31°52' N and 76°42'–76°58' E. The villages surveyed were selected intentionally, considering the prevalence of traditional magico-religious practices, the availability of knowledgeable informants, accessibility for field surveys, and their representation of various geographical areas within Sarkaghat tehsil. A total of 75 informants were selected from villages distributed across Sarkaghat tehsil to ensure adequate representation of the traditional knowledge prevalent in different parts of the study area. A purposive sampling approach was used to identify key informants possessing extensive knowledge of magico-religious plant practices, including priests (gur), elderly villagers, and experienced community members. Subsequently, snowball sampling was employed, whereby identified informants suggested additional knowledgeable individuals within the community for inclusion in the survey. Each interview had a duration of approximately 30 to 60 minutes. During the study period, multiple repeat field visits (3–5 visits per village) were conducted to verify collected information, resolve discrepancies among respondents, and observe seasonal rituals and plant uses. Also ritual uses of plants were categorized according to the primary purposes indicated by informants. Categories encompassed worship and religious

ceremonies, protection from malevolent spirits, festivals and cultural rituals, life-cycle ceremonies (birth, marriage, death), household rituals, and healing or magico-religious practices. Classification relied on the predominant traditional use reported by most informants, corroborated through multiple interviews and existing ethnobotanical literature. Interviews were not audio-recorded; rather, information was captured through comprehensive field notes and semi-structured questionnaires following the acquisition of verbal prior informed consent from all participants. Interviews were conducted in the local Pahari dialect to enhance comprehension and comfort for the respondents. The data focus on the magico-religious uses of plants, the specific parts used, and their regional names. The respondent's demographic information including gender, age, education and occupation was recorded for analysis.

Plant Identification

The provisional identification of plant species was done in the field. In specific situations when it is impossible to do so, the specimens were finally brought to the laboratory and identified by consulting the regional floras (Chauhan, 1999; Chowdhery and Wadhwa, 1984; Collett and Hemsley, 1902; Hooker, 1872-1897; Polunin and Stainton, 1984). They were finally confirmed following consultations with the herbarium of the Department of Biosciences, Himachal Pradesh University, Shimla where the plant specimens were deposited for future reference.

Table 1. Demographic profile of informants

Variable	Category	Number of informants	Percentage (%)
Gender	Male/Female	32/43	42.66/57.33
Age group (years)	21–40 / 41–60 / 61–80	15/25/35	20/33.33/46.66
Occupation	Priest/Farmer/Housewife/Others	5/40/15/10	40/26.66/20/13.33
Education level	Illiterate/Primary/Secondary/Graduate & above	7/28/22/18	9.33/37.33/29.33/24

Qualitative Analysis

Use Value

The significance of the plant species was determined by determining its use value (UV). It is measured by using the following formula:

$$UV = \sum U_i / N$$

In this formula, N is the total number of survey participants and $\sum U_i$ is the cumulative count of all usage occurrences reported by respondents for a certain taxon. High usage ratings indicate that a plant has been used for a wide range of purposes which reflects its cultural relevance. On the other hand, numbers that are close to 0 suggest that the plant is not often discussed and has little social significance (Mhlongo *et al.*, 2019).

Cultural Importance (CI) Index

The Cultural Importance (CI) Index is used to measure the degree to which certain plant species are considered sacred and magical in their respective cultural contexts.

$$CI = \sum_{u=1}^{(unc)} UR u_i / N$$

In this formula, N refers to the total number of participants surveyed and UR represents the aggregate count of all use-reports. This metric is especially useful because it captures both how widely a species is used within the community and the extent of its applications across different use categories (Tardío & Pardo-de-Santayana, 2008).

Relative Frequency of Citation (RFC)

The Relative Frequency of Citation (RFC) is determined by dividing the number of participants who mention a particular plant species as useful (FC-frequency of citation) by the total number of respondents in the study (N).

$$RFC = FC / N = \frac{\sum_{i=1}^{iN} UR_i}{N}$$

RFC value ranges between 0 and 1 where 0 indicates that no informant considered the species useful while 1 signifies that every informant recognized it as useful (Nasab & Khosravi, 2014).

Informant Consensus Factor (ICF)

To evaluate the degree of agreement among informants regarding the magico-religious uses of plant species, the Informant Consensus Factor (ICF) was calculated following the standard formula:

$$ICF = (Nur - Nt) / (Nur - 1)$$

Where *Nur* represents the total number of use-reports recorded for a particular ritual category and *Nt* denotes the number of plant species used in that category. Higher ICF values (approaching 1) indicate strong consensus among informants, suggesting well-established and culturally standardized practices.

For analytical clarity, the documented species were grouped into major magico-religious functional categories, including protection from evil spirits, fire rituals (havan/yajna), marriage and fertility rites, planetary appeasement rituals, and ancestor/death ceremonies (Heinrich *et al.*, 1998).

Results and Discussion

Diversity of the Species

The present study revealed 35 plant species belonging to 34 genera and 24 families that are associated with magico-religious practices in Sarkaghat tehsil of district Mandi, Himachal Pradesh (Table 2).

Table 2. Plant species having magico-religious significance in Sarkaghat tehsil of district Mandi (H.P.)

Botanical name / Voucher no.	Family	Vernacular name	Parts used	Magico-religious uses	Threat status	Other folk uses
<i>Achyranthes aspera</i> L. ETH-MR-23	Amaranthaceae	Puthkanda	Stem	Stem is used in fire ritual (havan) ceremonies. Stem along with two to three sesame leaves (<i>Sesamum indicum</i>), doob grass (<i>Cynodon dactylon</i>) and five grains of split chickpeas (<i>Cicer arietinum</i>) are used in the fasting ritual (chanan chhati vrat).	Least Concern (LC)	Used to treat a variety of conditions including skin diseases, wounds, cough, dental problems, indigestion and snake bite.
<i>Aegle marmelos</i> (L.) Corrêa ETH-MR-28	Rutaceae	Bil patri, Bael patr	Leaves, Fruits, Stem	Leaves (bael patri) are used as special offering to Lord Shiva, particularly during Shivratri festival and monsoon (sawan) month. Leaves are also used for worshipping during fasting ritual (haritalika teej vrat). Fruits are used as offering in the temples and believed to bring good luck and prosperity. Stem and fruits (bil giri) are used in fire ritual ceremonies (havan). It is believed to invoke divine blessings and purify the environment.	Near threatened	It is used to treat respiratory, cardiac, digestive and heart problems.
<i>Aloe vera</i> (L.) Burm.f. ETH-MR-34	Asphodelaceae	Duarya	Whole plant	It is planted near the entrance of homes as a protective charm from malevolent entities and also supposed to provide good health and wealth. It is hung down on the main door of the house during a local festival called dayan vansh/dugyali to seek protection against evil spirits.	Not Evaluated (NE)	Used to treat burns, wounds, skin conditions, constipation, stomach issues, and as a hair conditioner.
<i>Asparagus adscendens</i> Roxb.	Asparagaceae	Sansarpaya	Whole plant, Roots	Roots are occasionally hung in cowsheds or home door as a charm to ward off evil spirits.	Not evaluated	Roots are used as a tonic for weakness,

ETH-MR-56				The groom sits beneath or near the asparagus plant during traditional 'bujatra' ritual in marriage ceremonies which is thought to bring prosperity and good luck to the married couple.		fertility, lactation and also to cure urinary and digestive issues.
<i>Azadirachta indica</i> A. Juss. ETH-MR-87	Meliaceae	Neem	Leaves, Branches, Whole plant	It is associated with local deity (Sheetla mata). Leaves are hung on windows and doors to fend against illnesses and evil spirits. Branches are used in death ceremonies symbolising protection of soul. Bath with neem leaves is traditionally taken to cure the local skin condition known as <i>Mata</i> (Varicella) which provides relief and purification.	Least Concern (LC)	It is used to cure fever, infections, skin conditions and dental issues.
<i>Brassica rapa</i> L. ETH-MR-39	Brassicaceae	Sarsoo	Seeds,	Seeds are circled around newborns or the mother of newborn to ward off an evil eye. Also, ritual fumigation (dhuni) is given for this purpose. Mustard oil is applied to the head of groom and bride during 'tel' ceremony of wedding to promote prosperity. At the end of rainy season (black month or 'bhado') a mustard oil lamp (diya) is lit beneath the tulsi plant to protect the family from evil eye.	Not evaluated	Used as hair tonic and to treat skin conditions, cough, joint discomfort and digestive problems.
<i>Calotropis procera</i> (Aiton) W.T.Aiton ETH-MR-20	Apocynaceae	Aak	Leaves, Twigs, Roots	Dried twigs and leaves are used in fire rituals (havan). Leaves are used in mantra chanting ceremonies for protection from snake venom ('vish'). Mustard oil is poured on the root of <i>Calotropis procera</i> as a spiritual practice to remove ill effects of 'Shani dasha' (period in one's life which brings challenges under the influence of planet Saturn).	Least Concern (LC)	Used for treating skin problems, wounds, dental pain and as an antidote for snake bite and bug stings.
<i>Cannabis sativa</i> L. ETH-MR-4	Cannabaceae	Bhang	Leaves	Leaves are offered to lord Shiva during 'savan' month and Mahashivratri. Preparations made from leaves such as bhaang/gota/thaandai are consumed during Shivratri and Holi festivals.	Not evaluated	Used as a traditional remedy for pain, sleeplessness, anxiety, digestive issues, and skin condition.
<i>Capsicum annum</i> L. ETH-MR-44	Solanaceae	Mirchi	Fruit	The evil eye ('nazar') is removed by rotating red chilies around a person, new born baby or animal and then burning them in fire.	Least Concern (LC)	Used to heal bug bites, increase blood circulation, cure cough as

				Fruits along with lemon ('nimbu-mirchi totka') are hung at doors and in cars to combat bad luck and to bring good fortune.		well as sore throats and to promote digestion.
<i>Curcuma longa</i> L. ETH-MR-59	Zingiberaceae	Haldi	Rhizome	Paste of turmeric is applied to the body of bride and groom during 'haldi' ceremony before marriage to ensure marital bliss. Turmeric is offered to Lord Ganesha, Goddess Lakshmi, and other gods during religious devotion as a sign of good fortune. Turmeric ('haldi') is traditionally grown alongside ginger (adrak) as it is believed to protect the crop from degradation caused by evil shadow ('saya').	Data Deficient (DD)	Used for skin diseases, cough, cold and digestive disorders.
<i>Cynodon dactylon</i> (L.) Pers. ETH-MR-26	Poaceae	Doob	Whole plant	It is offered to Lord Ganesha along with sweets and fruits. It is used in fire rituals and religious worshipping as a sign of prosperity and purity. In 'havan' ceremonies, around 1900 strands of doob grass are tied together with blue thread to ward off negative effects of a planetary period ('Rahu dasha').	Not evaluated	Leaf paste is used to cure wounds.
<i>Cyperus rotundus</i> L. ETH-MR-22	Cyperaceae	Nagarmotha	Tubers, Stem	Dried tubers are burned as incense ('dhoop') during ceremonies for cleansing and for protection from bad spirits. Stem is used in fire rituals ('havan') to remove negative energies.	Least Concern	Used for fever, digestive troubles, as blood purifier and ethnoveterinary medicine.
<i>Datura stramonium</i> L. ETH-MR-15	Solanaceae	Datura	Seeds, Leaves	Leaves, flowers and fruits are offered to Lord Shiva. Leaves and seeds are used in ceremonies to fight against bad energies, spirits and black magic.	Not Evaluated	Used to cure wounds, dysentery and asthma.
<i>Dendrocalamus strictus</i> (Roxb.) Nees ETH-MR-9	Poaceae	Baans, Bainj	Culm	Culms are used as a sign of power and wealth for constructing wedding pavilion ('mandap') and also in other religious ceremonies. For performing death rites, culms are used for making bier ('arthi'), signifying its ceremonial importance in the life-death cycle.	Not evaluated	Culms are used to treat fracture by supporting fractured region.
<i>Desmostachya bipinnata</i> (L.) Stapf ETH-MR-78	Poaceae	Darbha	Leaves	Leaves are used for making traditional ornaments which are specifically worn during religious ceremonies, e.g., 'manjroli' worn over the head by bride and groom during wedding ceremonies and 'pavitra' (rings) are worn	Least Concern (LC)	Used to treat burns and wounds.

				during 'Satyanarayan Katha' and other religious ceremonies. During 'Mahayagya' (a great sacrificial ceremony) around 1900 strands of grass are tied together with blue thread to ward off ill effects of 'Rahu Dasha'.		
<i>Euphorbia royleana</i> Boiss. ETH-MR-74	Euphorbiaceae	Chuein	Stem	Stem is buried in the soil by maternal uncle ('mama') during the newborn's eleventh-day birth ceremony ('gantryala'). To ward off evil spirits, the plant is occasionally placed as a living fence around homes and fields.	Not evaluated	Latex is used to treat joint pain, toothaches and skin conditions.
<i>Ficus racemosa</i> L. ETH-MR-63	Moraceae	Umrai	Stem	Stem is used in fire rituals ('havan') and 'yagya' to repel bad energies and to bring prosperity. The plant is also worshiped by the local people to bring good fortune.	Least Concern	Used to treat liver disorders and skin related problems.
<i>Ficus religiosa</i> L. ETH-MR-52	Moraceae	Peepal	Whole plant	Married couple revolves 4 times around the 'Peepal' tree with a thread ('dori') and worship it for marital bliss. Under the 'peepal' tree, lighting a 'diya' (lamp) is believed to fend off evil and provide health benefits. It is believed that putting water at the base of the 'peepal' tree during 'Shani Dasha' provides relief and lessens the negative effects of Saturn.	Least Concern	Used to cure wounds, diabetes and diarrhea.
<i>Gossypium hirsutum</i> L. ETH-MR-83	Malvaceae	Kapah, rui	Fruit (Cotton boll)	During religious worshipping and festivals, 'dijas' are lit using cotton wick ('bati') soaked in ghee or oil. Cotton threads are used during religious events and weddings for holy fire rituals and sacred rites like tying 'kalava' or 'mauli' on wrist by the family priest ('pandit'). The village women prepare cotton threads while singing and dancing on a special day selected by the family priest ('pandit') as part of pre-wedding. These threads are then used in the wedding ceremonies.	Vulnerable	Used to cure wounds, fever, respiratory troubles and menstrual disorders.
<i>Hordeum vulgare</i> L. ETH-MR-45	Poaceae	Jau	Seeds	Seeds are used in holy fire rituals ('havan') during wedding and 'Satyanarayana katha') as an offering to the deities. Seeds are sown during 'Navratri' and offered to local deities. Also, the sprouted	Least Concern	Used in folk medicine as a diuretic, cooling agent and to treat urinary problems.

				seeds are grown alongside the wedding pavilion ('mandap') as a representation of fertility, wealth and a bountiful harvest. The plant is worshiped during fasting ritual ('haritalika teej vrat').		
<i>Mangifera indica</i> L. ETH-MR-3	Anacardiaceae	Aam	Fruit, Leaves, Wood	Leaves are used to make leaf garland ('toran') which are placed at doors during festivals and ceremonies to bring good fortune. Leaves are placed in sacred pots ('kalash') and used in worshipping during wedding and other religious ceremonies like 'Mahamartyunjaya path'. Wood is used in 'havan' and fruits are offered to the deities during worshipping rituals.	Least concern	Bark is used to treat dental problems and fruits are used to cure gastric issues.
<i>Melia azedarach</i> L. ETH-MR-29	Meliaceae	Dharek	Whole plant	If a person's marriage is delayed and he is born under the defective influence of Mars ('manglik'), the tree is used to perform a symbolic marriage prior to the actual wedding to reduce the adverse planetary effects.	Least Concern (LC)	Used to cure intestinal worms, fever, skin conditions, dental issues and as a blood purifier.
<i>Musa paradisiaca</i> L. ETH-MR-37	Musaceae	Kela	Whole plant, Fruits, Roots	During festivals and marriages, the plant is positioned at the entrance of homes and wedding pavilion ('mandaps') as a sign of prosperity and good luck. Fruits are offered to the deities during worshipping, particularly to Lord Vishnu and Lord Ganesha. The root is tied in a yellow cloth and worn around the neck or on the wrist as a protective charm against the adverse effects of 'Vrahaspati Dasha' (Jupiter's period)".	Not evaluated	Fruits are edible and considered good for nutrition, ulcers and constipation. Flowers are used for diabetes and leaves for burns.
<i>Ocimum tenuiflorum</i> L. ETH-MR-61	Lamiaceae	Tulsi	Whole plant	Tulsi is said to provide wealth, health and protection from bad spirits and therefore, it is commonly planted in the courtyards. During solar or lunar eclipses, pregnant women apply leaf paste to their abdomen because it is said to shield them from harmful rays. The leaves are also dedicated to Lord Krishna as essential component of food ('Bhog') offered to him. A leaf of Tulsi plant is placed in the mouth of dead person, a ritual known as 'Panchgarva'. As per Hindu traditions, burning a deceived person with	Least Concern (LC)	Leaves are used as health tonic and to treat skin conditions, digestive and urinary issues, cough, cold, fever and asthma.

				a stem of Tulsi plant is considered as sacred.		
<i>Oroxylum indicum</i> (L.) Benth. ex Kurz ETH-MR-76	Bignoniaceae	Arlu	Seeds	Seeds are kept at home to attract good fortune. Seeds are used to make garland which is believed to ward off evil spirits.	Vulnerable (VU)	Used to treat cough, diarrhea, dysentery, jaundice and also used in ethnoveterinary medicines.
<i>Oryza sativa</i> L. ETH-MR-11	Poaceae	Dhaan, Chawal	Whole plant, Grains	Mixture of rice and turmeric is laid at the door and worshiped for prosperity during housewarming ('griha pravesh') ceremony of newly married women. Plant is worshiped during sair festival along with the 'maize' (<i>Zea mays</i>) and 'akhrot' (<i>Juglans regia</i>). The bride throws rice behind her during the departure ('bidai') ceremony as a symbol of departing abundance and prosperity in her parents' house. Rice grains are used in fire ritual ('havan') for worshipping during festivals and marriage ceremonies. They are also given as offering ('prasad') in some temples.	Not Evaluated	Used in traditional medicine as a cooling agent, and to cure, indigestion, diarrhea and dysentery.
<i>Phyllanthus emblica</i> L. ETH-MR-41	Phyllanthaceae	Amla	Fruits, Leaves, Stem, Whole plant	Plant is grown near houses and in temple courtyards. Leaves, fruits or twigs are used to fend off bad energies. Fruits and stem are used in fire rituals ('havan').	Least Concern (LC)	Used for boosting immunity, for curing cold, cough, diarrhea and skin conditions. Fruits are used to promote hair growth and to improve eyesight.
<i>Pinus roxburghii</i> Sarg. ETH-MR-49	Pinaceae	Cheel	Whole plant	It is a local belief that burning of chir pine resin expels bad energy and evil eye from homes and cowsheds. Wood ('samad') is used in fire rituals ('havans').	Least Concern	Used for treating skin diseases.
<i>Prosopis cineraria</i> (L.) Druce ETH-MR-66	Fabaceae	Shami	Whole plant	The plant is worshipped during Dushera and Diwali festivals for good fortune. Worshipping the tree by putting water to its roots is said to minimize the negative effects of 'Shani dasha'.	Least Concern (LC)	Used for treating skin diseases.
<i>Prunus cerasoides</i> D. Don ETH-MR-27	Rosaceae	Paja	Stem, Branches, Whole plant	The groom traditionally sits beneath the tree or has its branches wrapped around him during marriage rites ('bujatra'), signifying the	Not evaluated	Bark and flowers are used for the treatment of fever, cough,

				benefits of fertility, wealth and protection. Stem is used as fuelwood to prepare food ('dham') in ceremonial rituals.		and stomach problems.
<i>Saccharum officinarum</i> L. ETH-MR-33	Poaceae	Ganna	Stem, Whole plant	Stem is used in 'havan' rituals. During weddings and other ceremonies, sugarcane is tied to the ceremonial platform as a symbol of prosperity.	Not Evaluated	Used to cure jaundice and urinary tract infection.
<i>Senegalia catechu</i> (L.f.) P.J.H. Hurter & Mabb. ETH-MR-58	Fabaceae	Khair	Wood	Wood is used in 'havan' ceremonies. Wood is occasionally utilized in cremation ceremonies because they are believed to purify the soul. 'Surva' is prepared using the wood of the plant which is used for sacrificial ceremony ('puran aahuti') during 'havan' and 'yajna' rituals.	Least Concern (LC)	Used to cure diarrhea, dysentery, cough, gum bleeding, tooth problems, wounds and inflammation.
<i>Sesamum indicum</i> L. ETH-MR-43	Pedaliaceae	Til	Seeds, Leaves, Whole Plant	Seeds are offered to the ancestors for spiritual peace in 'shraddha' ceremonies, 'yajnas' and other rituals. Seed oil is used to light the 'diya' (oil lamp) during daily worshipping and festivals. During 'makar sakranti', sweets made of sesame seeds ('Ladoo') are offered to God. On the occasion of 'Lohri' festival, seeds are mixed with rice, jaggery and dry fruits to prepare 'til choli' which is offered to fire for prosperity and also distributed to neighbours. Leaves are used in fasting rituals ('Chanan chati vrat') and the plant is also worshiped during ('Haritalika teej vrat').	Not Evaluated	Used to relieve joint pain, cure burn and improve digestion.
<i>Vitex negundo</i> L. ETH-MR-5	Lamiaceae	Sairu	Leaves, Stem	Branches are kept near doorways to repel snakes and evil spirits. Twigs are used in mantra chanting ceremonies for the removal of snake venom ('vish') and also used in chants and rituals for expelling spirits and for curing disease.	Least Concern (LC)	Used to treat fever, cough, wounds, as insect repellent and ethnoveterinary medicine.
<i>Zanthoxylum armatum</i> DC. ETH-MR-81	Rutaceae	Tirmir	Leaves, Stem	Stem is used in fire rituals ('havan') to ward off evil spirits. Twigs are hung on the main door of house by the locals during a seasonal festival called 'dagyal', 'dugansh' or 'dayanvansh' to protect the family from 'dayan' (evil spirit). Stem is used as toothbrush during fast and given to 'brahmans' during 'namaatran' ceremony.	Vulnerable	Fruits, stem and leaves are used to treat stomach issues, fever, cough and toothache.

Analysis of the data indicates that Poaceae is the most dominant family, represented by six species (*Cynodon dactylon*, *Dendrocalamus strictus*, *Desmostachya bipinnata*, *Hordeum vulgare*, *Oryza sativa*, and *Saccharum officinarum*) while Fabaceae, Lamiaceae, Meliaceae, Moraceae, Rutaceae and Solanaceae contributed two species each (Figure 2). All the remaining families including Amaranthaceae, Anacardiaceae, Apocynaceae, Asphodelaceae, Asparagaceae, Bignoniaceae, Brassicaceae, Cannabaceae, Cyperaceae, Euphorbiaceae, Malvaceae, Musaceae, Pedaliaceae, Phyllanthaceae, Pinaceae, Rosaceae and Zingiberaceae are represented by a single species each. These plants played a significant role in traditional magico-religious practices such as ritual offerings, protection from evil eyes, and healing of ailment. The Poaceae family's dominance and the frequent usages of species belonging to Fabaceae, Lamiaceae and Rutaceae are in agreement with past ethnobotanical accounts emphasizing their medicinal and ceremonial significance in traditional belief systems (Negi *et al.*, 2018; Pangging *et al.*, 2021).

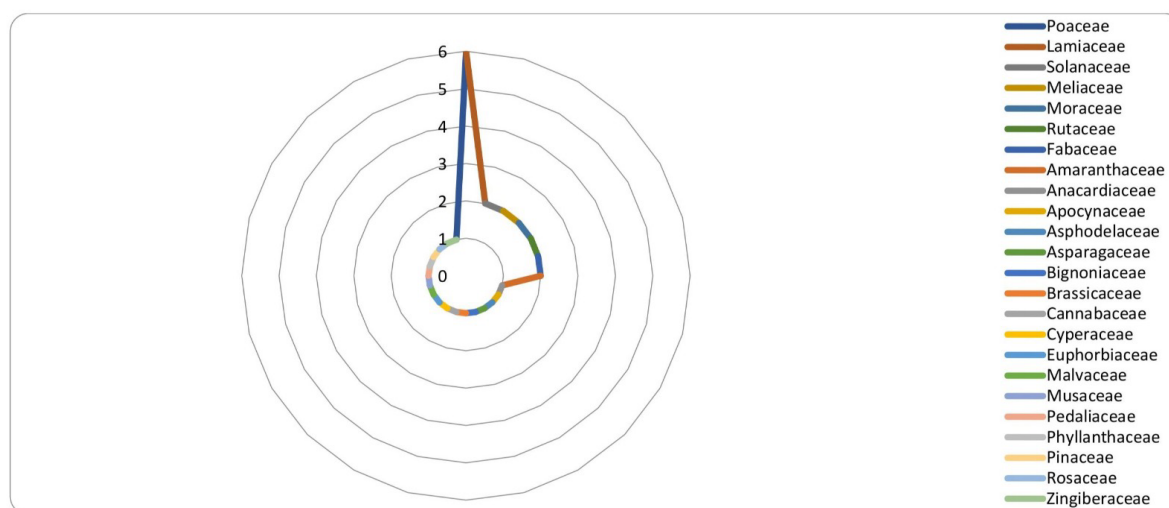


Figure 2. Family-wise distribution of magico-religious plant species: Poaceae is the dominant family with the highest representation (6 species) indicating its major cultural and ritual importance in the study area. Lamiaceae, Solanaceae, Meliaceae, Moraceae, Rutaceae and Fabaceae are represented by two species each, showing moderate contribution to magico-religious practices. The remaining families are represented by a single species each. The dominance of Poaceae and the moderate representation of a few other families reflect their greater ethnobotanical relevance and frequent utilization in traditional rituals, ceremonies and healing practices in the study area.

Plant Part Used

In magico-religious rituals the whole plant is most frequently utilized (25.42%), followed by different plant parts like leaves (18.64%) and stem (16.95%). Fruits (10.17%) and seeds (8.47%) also contributed substantially to traditional ritual practices. Roots (5.08%), branches (3.39%) and wood (3.39%) were comparatively less utilized (Figure 3). Twigs, rhizomes, tubers, culms and grains each accounted for 1.69% of the total use reports indicating their limited but culturally important role in specific ceremonies and traditional healthcare practices. While the entire plant is typically utilized in religious ceremonies and symbolic representations, the leaves, whole plant and stem are primarily used in rites including worship, offerings and cleansing. Fruits and seeds are mostly utilised for prosperity-related ceremonies and as offering. According to earlier ethnobotanical researches from the Indian Himalayas and surrounding areas, aerial portions were the most accessible and ritually relevant plant parts. This is consistent with the preponderance of leaves, stem, fruits, seeds and whole plants in ceremonial contexts (Kala, 2005; Singh *et al.*, 2014).

Quantitative Assessment

Quantitative indices such as the Use Value Index (UV), Cultural Importance Index (CI), Relative Frequency of Citation (RFC) and Informant Consensus Factor (ICF) have been assessed in this study in order to compare and highlight the importance of the reported plant species according to their cultural relevance (Table 3; Figure 4).

Use Value (UV)

The present study revealed that *Ocimum tenuiflorum* exhibited the highest use value (UV = 0.160), indicating its exceptional importance in both magico-religious practices and folk medicinal traditions of the study area. This elevated UV reflects its

widespread use in household worship, ritual protection, eclipse-related beliefs, death rites and a broad range of therapeutic applications.

Senegalia catechu (UV = 0.133), *Aegle marmelos*, *Oryza sativa* and *Phyllanthus emblica* (UV = 0.120 each) also showed high use values demonstrating their multi-functional cultural roles in rituals, offerings, fire ceremonies, and traditional healthcare. Earlier ethnobotanical studies from the Indian Himalayan Region similarly recognize *Aegle marmelos* and *Ocimum tenuiflorum* as culturally prominent species due to their strong association with Hindu religious traditions and ritual symbolism (Samant, 2003; Kala, 2005).

Moderate use values were observed for species including *Achyranthes aspera*, *Aloe vera*, *Azadirachta indica*, *Curcuma longa*, *Vitex negundo* and *Ficus religiosa* (UV = 0.093–0.107). These species are regularly employed in protective rituals, seasonal ceremonies, and folk remedies but are comparatively less dominant than *Ocimum tenuiflorum*.

The lowest use values (UV = 0.040–0.053) were recorded for species such as *Pinus roxburghii*, *Prosopis cineraria*, *Ficus racemosa* and *Saccharum officinarum* indicating restricted and specialized ritual usage. Similar observations have been reported in previous studies where such species were linked mainly to community-specific or event-based ceremonial practices rather than continuous everyday use (Phondani *et al.*, 2010; Uniyal *et al.*, 2006).

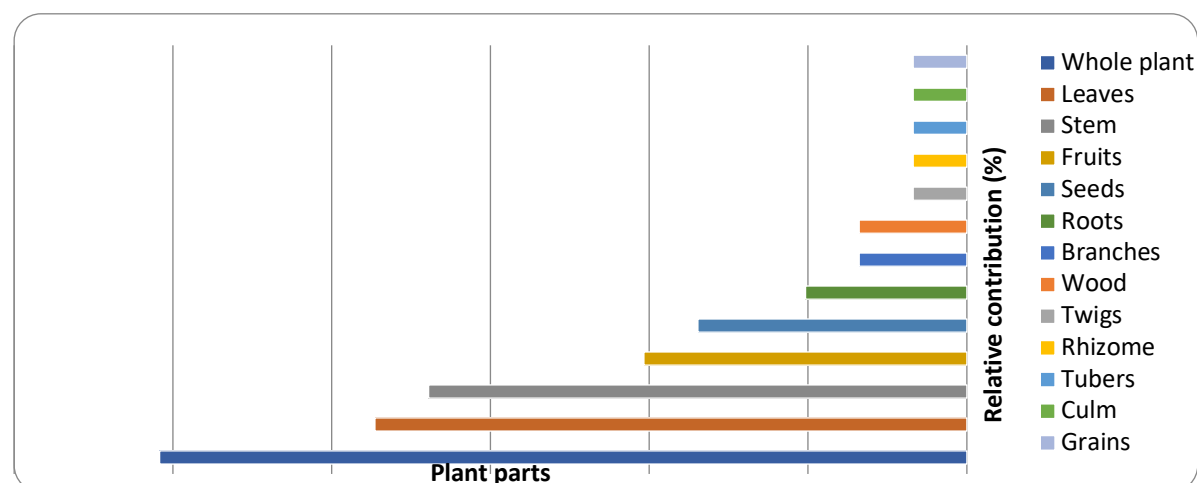


Figure 3. Relative contribution (%) of different plant parts used in the study area for magico-religious purposes. Whole plants constituted the most frequently utilized category, followed by leaves and stem. Fruits and seeds showed moderate usage, whereas roots, branches, wood, twigs, rhizomes, tubers, culms and grains were comparatively less utilized in traditional magico-religious practices.

Table 3. Quantitative analysis of different plant species in the study area

Plant species	Use Value (UV)	Cultural Importance (CI)	Relative Frequency of Citation (RFC)
<i>Achyranthus aspera</i> L.	0.093	1.67	0.533
<i>Aegle marmelos</i> (L.) Corrêa	0.107	2.40	0.733
<i>Aloe vera</i> (L.) Burm.f.	0.107	1.07	0.666
<i>Asparagus adscendens</i> Roxb.	0.080	1.07	0.733
<i>Azadirachta indica</i> A. Juss.	0.107	1.07	0.8
<i>Brassica rapa</i> L.	0.120	1.07	0.6
<i>Calotropis procera</i> (Aiton) W.T.Aiton	0.107	1.63	0.466
<i>Cannabis sativa</i> L.	0.107	1.44	0.373
<i>Capsicum annuum</i> L.	0.093	1.09	0.8
<i>Curcuma longa</i> L.	0.093	1.93	0.773
<i>Cynodon dactylon</i> (L.) Pers.	0.053	1.97	0.560
<i>Cyperus rotundus</i> L.	0.080	1.31	0.400
<i>Datura stramonium</i> L.	0.080	1.71	0.440
<i>Dendrocalamus strictus</i> (Roxb.) Nees	0.053	1.48	0.866
<i>Desmostachya bipinnata</i> (L.) Stapf	0.067	1.43	0.506
<i>Euphorbia royleana</i> Boiss.	0.067	1.23	0.213

<i>Ficus recemosa</i> L.	0.053	1.27	0.346
<i>Ficus religiosa</i> L.	0.093	1.98	0.533
<i>Gossypium hirsutum</i> L.	0.093	1.45	0.293
<i>Hordeum vulgare</i> L.	0.093	1.34	0.373
<i>Mangifera indica</i> L.	0.080	2.15	0.480
<i>Melia azedarach</i> L.	0.067	1.23	0.267
<i>Musa paradisiaca</i> L.	0.107	1.68	0.453
<i>Ocimum tenuiflorum</i> L.	0.160	2.35	0.866
<i>Oroxylum indicum</i> (L.) Benth. ex Kurz	0.080	1.45	0.533
<i>Oryza sativa</i> L.	0.120	2.03	0.733
<i>Phyllanthus emblica</i> L.	0.120	1.98	0.600
<i>Pinus roxburghii</i> Sarg.	0.040	1.13	0.533
<i>Prosopis cineraria</i> (L.) Druce	0.040	1.23	0.426
<i>Prunus cerasoides</i> D. Don	0.067	1.50	0.56
<i>Saccharum officinarum</i> L.	0.053	1.24	0.373
<i>Senegalia catechu</i> (L.f.) P.J.H. Hurter & Mabb.	0.133	1.32	0.333
<i>Sesamum indicum</i> L.	0.107	1.54	0.533
<i>Vitex negundo</i> L.	0.093	1.32	0.506
<i>Zanthoxylum armatum</i> DC.	0.107	1.36	0.266

Cultural Importance Index (CI)

The Cultural Importance Index (CI) showed notable differences among the recorded magico-religious plant species indicating variations in their cultural relevance and the diversity of ritualistic uses within the research area. *Aegle marmelos* had the greatest Cultural Importance (CI) value of 2.40 signifying its remarkable cultural significance due to its extensive utilization in the worship of Lord Shiva, religious sacrifices, and fire ceremonies. *Ocimum tenuiflorum* (CI = 2.35) showed significant cultural value emphasizing its essential role in everyday rituals, safeguarding against malevolent entities, funeral practices, and many religious events. In the same way, *Mangifera indica* (CI = 2.15), *Oryza sativa* (CI = 2.03), *Ficus religiosa* and *Phyllanthus emblica* (CI = 1.98 each), *Cynodon dactylon* (CI = 1.97), and *Curcuma longa* (CI = 1.93) exhibited considerable cultural importance, indicative of their prominent roles in matrimonial events, religious celebrations, ancestral devotion, purification rites, and various socio-cultural activities.

Moderately elevated CI values were recorded for *Musa paradisiaca* (1.68), *Achyranthus aspera* (1.67), *Calotropis procera* (1.63), *Sesamum indicum* (1.54), *Prunus cerasoides* (1.50), *Dendrocalamus strictus* (1.48), *Gossypium hirsutum* and *Oroxylum indicum* (1.45 each), *Cannabis sativa* (1.44), *Desmostachya bipinnata* (1.43), *Zanthoxylum armatum* (1.36), *Hordeum vulgare* (1.34), *Senegalia catechu* and *Vitex negundo* (1.32 each), *Cyperus rotundus* (1.31), and *Ficus racemosa* (1.27) signifying their consistent participation in particular ceremonial traditions, seasonal festivities and ritualistic activities.

Comparatively, lower CI values were noted for *Saccharum officinarum* (1.24), *Euphorbia royleana*, *Melia azedarach*, and *Prosopis cineraria* (1.23 each), *Pinus roxburghii* (1.13), *Capsicum annuum* (1.09), as well as *Aloe vera*, *Asparagus adscendens*, *Azadirachta indica*, and *Brassica rapa* (1.07 each). Despite their somewhat diminished cultural significance, many species remain integral to local rituals, safeguarding against malevolent spirits, cleansing rites, agricultural traditions, and domestic religious observances. The reported fluctuation in CI values suggests that species of cultural significance are defined not just by their broad acknowledgment across local populations but also by their adaptability across various magico-religious applications. Comparable trends in the culturally important use of plants have been documented throughout different Himalayan areas, highlighting the strong link between traditional beliefs, religious customs, and botanical varieties (Kala, 2005; Samant & Pant, 2006; Phondani *et al.*, 2010; Uniyal *et al.*, 2006).

Relative Frequency of Citation (RFC)

The substantial RFC scores for *Ocimum tenuiflorum*, *Azadirachta indica* and *Curcuma longa* indicate their significance to Indian culture overall. In Hindu households, *Ocimum tenuiflorum* ('tulsi') is considered sacred and included in everyday worship ceremony. This aligns with previous studies by Samant & Pant (2006), Kala (2005) and Uniyal *et al.* (2006), all of which identified tulsi as one of the most revered ceremonial plants in the Indian Himalayan Region. *Azadirachta indica* ('neem') possesses considerable cultural significance as a protective and purifying plant whereas *Curcuma longa* ('turmeric') is widely employed in rituals associated with purification, fertility and healing (Phondani *et al.*, 2010; Singh *et al.*, 2017).

The elevated RFC of *Dendrocalamus strictus* (0.866) and *Capsicum annum* (0.800) underscores its significance in community rites. *Dendrocalamus strictus* (bamboo) is frequently employed in rituals and religious festivities, symbolizing its spiritual significance among several Himalayan tribes (Phondani *et al.*, 2010). *Capsicum annum* is frequently positioned at the entrance of residences as a talisman against malevolent spirits, reflecting its magico-religious significance as demonstrated in Central Himalayan studies (Pangging *et al.*, 2021).

Aegle marmelos, *Aloe vera* and *Phyllanthus emblica* are the examples of species with low RFC values utilized in medicinal and ceremonial rituals. The foliage of *Aegle marmelos* holds significant value in the worship of Lord Shiva, whilst *Aloe vera* symbolizes protection and fertility. Moderate-uses of plants have been shown to fulfil analogous functions in North Indian ethnobotanical literature (Singh *et al.*, 2017).

In contrast, plants exhibiting low RFC values (*Euphorbia royleana*, *Zanthoxylum armatum*, *Melia azedarach*) are mostly confined to certain cultural contexts or seasonal practices. These findings correspond with earlier Himalayan research (Phondani *et al.*, 2010; Pangging *et al.*, 2021) which suggested that these species had little ceremonial importance, often recognized only during particular festivals or community-specific traditions.

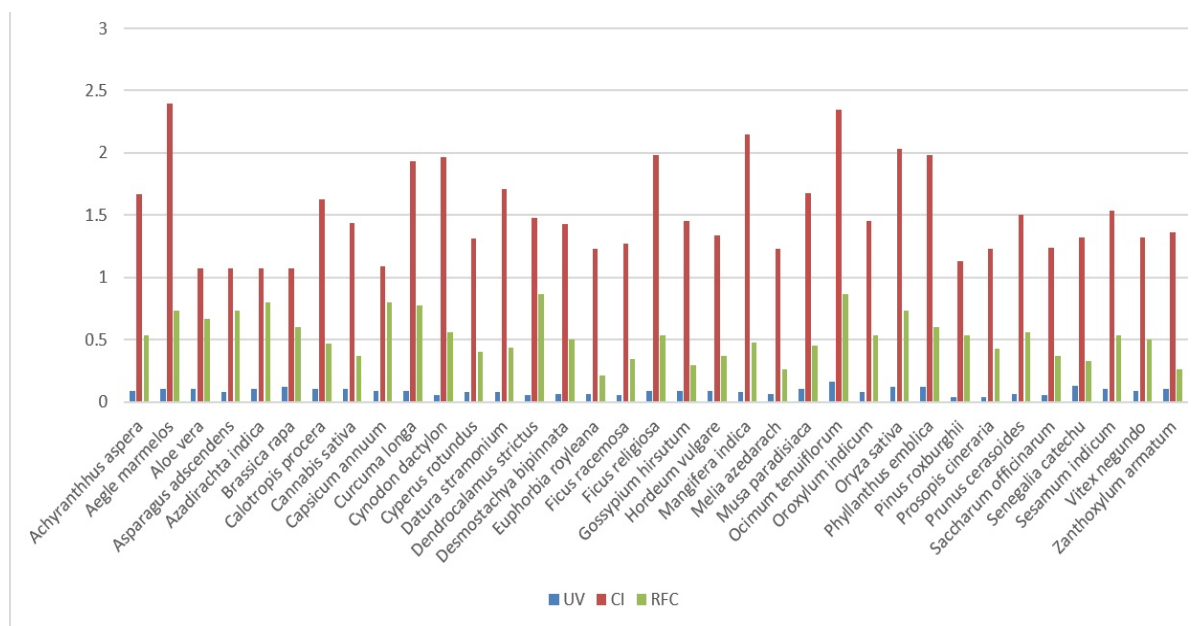


Figure 4. Comparative quantitative analysis of ethnobotanical indices like Use Value (UV), Cultural Importance (CI) and Relative Frequency of Citation (RFC) of the recorded plant species in the study area. The results indicate that some species show higher UV, CI and RFC values reflecting greater traditional importance and frequent use by local communities while others exhibit lower values indicating comparatively lesser ethnobotanical significance

Informant Consensus Factor (ICF)

A single plant species may be classified into multiple ritual categories when informants consistently indicate various independent ritual applications. Consequently, the total of use reports across categories exceeds the overall number of documented species. The highest ICF value has been recorded for ancestral and death-related rituals (ICF = 0.93), indicating that funeral ceremonies and post-cremation rites follow strictly prescribed plant usage patterns. Species such as *Ocimum tenuiflorum*, *Senegalia catechu*, and *Sesamum indicum* are consistently cited for these rituals (Table 4). Similar high consensus in life-cycle ceremonies has been reported from the Central Himalaya, where ritual plant selection remains conservative and resistant to substitution (Phondani *et al.*, 2010).

The planetary appeasement category (ICF=0.92) similarly exhibited strong agreement, particularly for species associated with Shani and Rahu rituals, such as *Calotropis procera* and *Prosopis cineraria*. Ritual standardization linked to astrological belief systems has also been reported in Himalayan traditional ecological knowledge systems (Negi *et al.*, 2018).

High consensus has also been observed in marriage and fertility rituals (ICF = 0.91). Plants such as *Curcuma longa*, *Brassica rapa*, *Musa paradisiaca*, and *Ficus religiosa* are repeatedly mentioned in wedding and fertility ceremonies. Comparable

findings have been documented in Himalayan sacred grove studies, where ceremonial taxa demonstrate strong intergenerational continuity (Singh *et al.*, 2014).

Table 4. Informant Consensus Factor (ICF)

Ritual category	Nt (Number of plant species used in particular category)	Nur (Use reports)	ICF
Protection from evil spirits	7	60	0.90
Fire rituals (havan/yajna)	9	65	0.88
Marriage and fertility rituals	6	55	0.91
Planetary appeasement rituals	5	50	0.92
Ancestral/death ceremonies	4	45	0.93

Protection-related rituals demonstrated high consensus (ICF = 0.90) with species such as *Azadirachta indica*, *Capsicum annuum*, and *Aloe vera* frequently cited for warding off evil spirits and negative energies. Similar patterns of consensus in protective magico-religious plant usage have been documented in Northeast and Central Himalayan communities (Pangging *et al.*, 2021).

Fire ritual categories (ICF = 0.88) also showed strong informant agreement, indicating codified ‘yajna’ traditions with limited species substitution. Structured selection of sacrificial taxa has been widely reported in Himalayan ritual systems (Phondani *et al.*, 2010; Singh *et al.*, 2014).

Overall, the consistently high ICF values across all ritual categories confirm that magico-religious plant knowledge in Sarkaghat tehsil is culturally institutionalized and maintained through strong intergenerational transmission. According to Heinrich *et al.* (1998), such elevated consensus values often reflect plants of high cultural salience and social importance. The findings therefore reinforce the identification of several taxa as culturally central species within the socio-ecological framework of the North-Western Himalaya.

Threat Status of Magico-religious Plants in Sarkaghat

The majority of documented species (53%) have been categorized as Least Concern (LC) indicating that they are not currently at risk in their natural habitats (Figure 5). About (47%) species are classified as Not Evaluated (NE), indicating deficiencies in conservation evaluations and underscoring the necessity for more ecological research. A limited number of species are categorized as Vulnerable (10%), Near Threatened (3%), or Data Deficient (3%), indicating that while the majority of plants utilized in rituals are relatively stable, specific culturally significant taxa such as *Oroxylum indicum*, *Zanthoxylum armatum*, and *Gossypium hirsutum* encounter conservation challenges in the region.

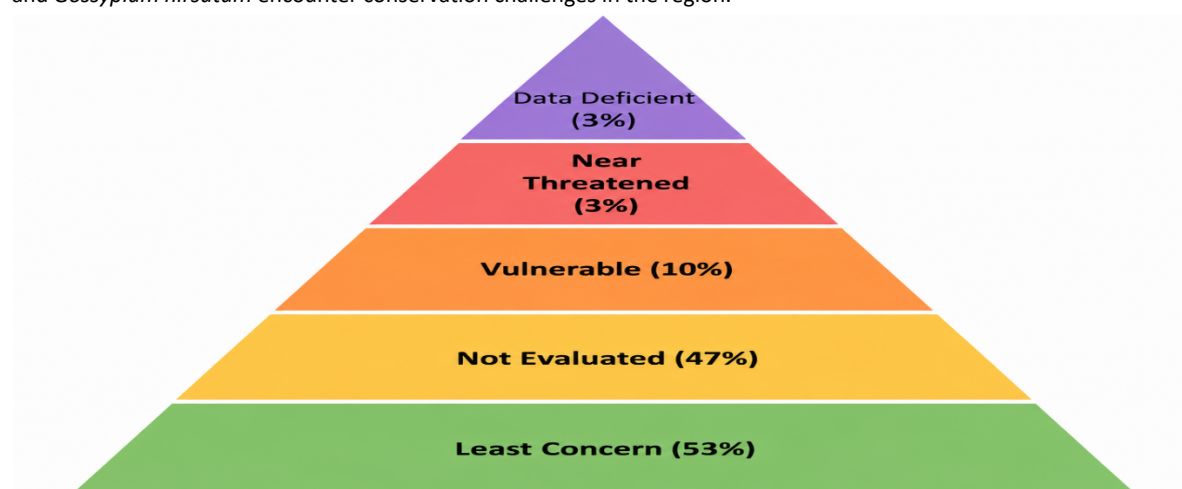


Figure 5. Conservation status of recorded plant species in the study area. Most species fall under Least Concern (LC) followed by Not Evaluated (NE) while a few species are categorized as Vulnerable (VU), Near Threatened (NT) and Data Deficient (DD).

Multiple-use Pattern of Ethnobotanically Important Plant Species

The multiple-use analysis of ethnobotanically important plant species in Sarkaghat tehsil reveals a strong interrelationship between magico-religious practices and traditional healthcare systems. A major proportion of the documented species is used for both magico-religious and medicinal purposes indicating that spiritual beliefs and therapeutic applications are deeply intertwined in the local cultural framework (Figure 6). Such overlap suggests that plants associated with ritual purity and divine protection are also trusted for maintaining physical well-being, reflecting a holistic perception of health among the indigenous communities. Species exhibiting combined magico-religious, medicinal, and ethnoveterinary uses, although fewer in number, represent culturally versatile taxa with high functional importance. The use of these plants in treating both human and livestock ailments highlights their role in sustaining rural livelihoods where animal health is closely linked to economic security. This multifunctionality also suggests a long history of empirical knowledge accumulation, where repeated use across different domains has reinforced the cultural value of these species.

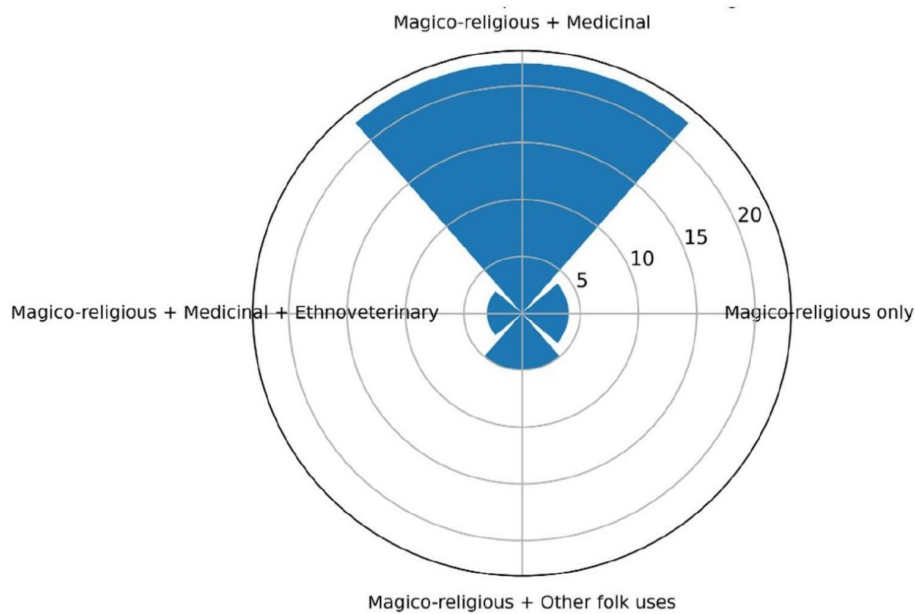


Figure 6. Diagram illustrating the multiple-use pattern of ethnobotanically important plant species recorded in the study area. Each petal represents a use category, and the length of the petal corresponds to the number of plant species associated with that particular use.

Gender-Based Knowledge Distribution of Magico-Religious Plants

Although both genders possessed substantial ethnobotanical knowledge, women demonstrated broader familiarity with multipurpose ritual plants embedded in daily life. The high citation frequency of species such as *Ocimum tenuiflorum* and *Curcuma longa* among women suggests that household-based ritual ecology plays a crucial role in sustaining Cultural Keystone Species.

Conversely, male-dominated knowledge was more specialized and event-specific, particularly in relation to yajna materials, planetary remedies, and death rituals (Table 5). This specialization reflects structured religious authority systems within the region.

Table 5. Gender-based knowledge distribution of magico-religious plants in Sarkaghat region, Himachal Pradesh

Gender	Informants (n = 75)	Percentage (%)	Major knowledge domains	Ritual context	Frequently cited plant species
Female	43	57.33	Household ritual; marriage ceremony; child protection; fertility and prosperity; seasonal fasting rituals	Domestic devotional activities, wedding-associated rites, family welfare rituals, vrata-based observances, household spiritual customs	<i>Ocimum tenuiflorum</i> , <i>Brassica rapa</i> , <i>Curcuma longa</i> , <i>Oryza sativa</i> and <i>Sesamum indicum</i>

Male	32	42.66	Fire rituals; temple-associated plants; sacred trees; planetary appeasement; cremation rituals	Yajna and havan performances, temple liturgical practices, sacred grove worship, planetary remedial ceremonies, last-rites and ancestral rituals	<i>Senegalia catechu</i> , <i>Pinus roxburghii</i> , <i>Dendrocalamus strictus</i> , <i>Ficus religiosa</i> and <i>Calotropis procera</i>
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The gender-based distribution of ethnobotanical knowledge indicated that the differences found were mostly influenced by traditional socio-cultural roles designated to men and women, rather than by differences in knowledge richness. Female informants often cited plant species associated with home rituals, marriage ceremonies, fertility and prosperity rites, child safeguarding, seasonal fasting, and everyday worship activities, emphasizing their pivotal role in maintaining household religious customs. Women, as keepers of domestic spirituality, regularly interact with culturally important plants like *Ocimum tenuiflorum*, *Curcuma longa*, *Brassica rapa*, *Oryza sativa*, and *Sesamum indicum*, so ensuring the ongoing transmission of ritual wisdom within households. Their participation in recurring household rituals guarantees that these culturally significant plant species stay integrated into daily existence.

However, male respondents primarily identified plant species linked to community-oriented religious rites such as yajna, havan, temple worship, sacred grove customs, planetary appeasement ceremonies, and funerary practices. Species such as *Senegalia catechu*, *Pinus roxburghii*, *Dendrocalamus strictus*, *Ficus religiosa*, and *Calotropis procera* were intimately linked to ritual practitioners, religious authorities, and community leaders responsible with performing these rites. This shows the accumulation of ritual expertise associated with public religious entities and ceremonial traditions inside the male domain. The complementary distribution of knowledge identified in this study suggests that the preservation of magico-religious plants relies on the joint efforts of both sexes. Women predominantly maintain domestic ritual customs whereas men protect the information linked to community and temple-oriented events. Collectively, these interrelated knowledge frameworks enhance the permanence of local biocultural historical records by supporting the ongoing utilization, cultivation, and cultural dissemination of ceremonial plant species through generations. These complementary functions contribute in the safeguarding of traditional ecological wisdom as well as the permanent maintenance of culturally important plant diversity in the Himalayan area.

Comparison with other Himalayan Ethnobotanical Studies

The magico-religious plant diversity documented in the present study is consistent with ethnobotanical findings reported across the Himalayan region, highlighting strong cultural continuity in ritual plant usage. In Uttarakhand, Gairola et al. (2022) documented 34 plant species belonging to 25 families used for socio-magico-religious purposes, with culturally important species such as *Ocimum tenuiflorum*, *Ficus religiosa*, *Aegle marmelos*, and *Datura stramonium* playing central roles in ritual purification, protection, and worship, similar to the high Use Value (UV), Cultural Importance Index (CI), and Relative Frequency of Citation (RFC) observed for these species in the present study. Likewise, ethnobotanical investigations in the Nepal Himalaya by Kunwar and Bussmann (2008) reported extensive use of sacred plant species including *Ficus religiosa*, *Ocimum tenuiflorum*, and *Curcuma longa*, emphasizing their importance in spiritual healing, ritual ceremonies, and biodiversity conservation, as sacred beliefs contributed to the protection and sustainable management of these culturally significant taxa. In the Eastern Himalaya, Tag et al. (2012) and Singh et al. (2017) documented widespread use of ritual plant species among indigenous tribal communities of Arunachal Pradesh, reporting high informant consensus values and highlighting species such as *Datura stramonium*, *Cannabis sativa*, and *Ficus religiosa* as important ritual plants used for protection against evil spirits and spiritual purification. Similarly, studies conducted in the Western Himalaya by Uniyal et al. (2006) and Phondani et al. (2010) recorded extensive use of sacred plants in religious ceremonies and traditional healthcare systems, identifying culturally dominant species such as *Ocimum tenuiflorum*, *Aegle marmelos*, and *Ficus religiosa* as cultural keystone species due to their high frequency of citation, symbolic significance, and conservation value.

Somkuwar et al. (2013) identified several multipurpose plant species employed for medicinal, nutritional, domestic and socio-cultural purposes highlighting the significant representation of families such as Moraceae, Rutaceae, Lamiaceae and Zingiberaceae. In this investigation, species such as *Ocimum tenuiflorum*, *Curcuma longa*, *Azadirachta indica*, *Ficus religiosa*, *Phyllanthus emblica*, *Mangifera indica* and *Achyranthus aspera* demonstrated various functions beyond their medicinal uses. The current investigation reveals that these species are significantly embedded within magico-religious traditions. *Ocimum tenuiflorum* is worshiped daily and utilized in Tulsi Vivah, death ceremonies and household purification rituals. *Aegle marmelos* leaves are essential in the worship of Lord Shiva. *Curcuma longa* is integral to marriage ceremonies and purification rituals. *Ficus religiosa* is esteemed as a sacred tree linked to ancestor worship and religious ceremonies. These observations

suggest that while numerous ethnobotanical species are common across various ecological regions of India, their cultural significance is notably heightened in the North-Western Himalaya where religious beliefs significantly impact plant usage. The similarities between these Himalayan studies and the present investigation confirm that magico-religious plant knowledge represents a deeply rooted biocultural system that contributes not only to the preservation of traditional ecological knowledge but also to biodiversity conservation through culturally embedded protection of sacred species.

The current findings have similarities with those of Zade et al. (2016) who reported significant use of forest resources by communities living near Tadoba-Andhari National Park. The study documented the utilization of plant species for medicinal, nutritional, fodder, fuelwood, construction, agricultural and religious purposes highlighting the extensive dependence of rural communities on forest biodiversity. In the current study, a similar multifunctionality was noted with some culturally important species including *Mangifera indica*, *Dendrocalamus strictus*, *Oryza sativa*, *Sesamum indicum* and *Musa paradisiaca* utilized in magico-religious rituals as well as for food, medicinal applications and ethnoveterinary practices. *Dendrocalamus strictus* is a significant construction material in various regions of India and, in this study, is also identified as a crucial ritual plant utilized in religious ceremonies and community festivals. *Oryza sativa* and *Sesamum indicum* recognized as food crops hold significant symbolic value in ancestral offerings, marriage rituals and religious ceremonies in the Himalayan region.

This study also identified a comparable similarity in the use of medicinal and ritualistic plants, aligning with the findings of Somkuwar et al. (2015) which reported various medicinal plants utilized for maintaining cattle health in rural Maharashtra. In this study, *Azadirachta indica*, *Curcuma longa*, *Ocimum tenuiflorum*, *Vitex negundo*, and *Phyllanthus emblica* were utilized for medicinal, ethnoveterinary, and magico-religious applications. Hanging neem leaves at doorways is believed to safeguard families from malevolent spirits. *Azadirachta indica* exhibits notable antibacterial properties. *Ocimum tenuiflorum*, besides its role in healing respiratory and digestive ailments, is regarded as a sacred herb symbolizing purity and divine protection. Such overlapping use indicates that traditional societies perceive spiritual healing, human healthcare, and animal healthcare as components of a unified indigenous knowledge system.

The current study aligns with the findings of Saradar et al. (2022) regarding the interconnection between folk culture, biodiversity, and conservation practices in the Sundarban region of West Bengal. Their research demonstrated that sacred beliefs, religious practices, and folk traditions contribute to the conservation of culturally significant plant species. In this study, *Ficus religiosa*, *Ocimum tenuiflorum*, *Aegle marmelos*, *Cynodon dactylon*, and *Curcuma longa* were preserved primarily for their religious significance rather than their economic value. Community-based biodiversity conservation can be facilitated through ritual worship, temple planting, holy groves, and domestic religious practices. These culturally ingrained conservation practices demonstrate that traditional belief systems persist in safeguarding plant diversity throughout India.

Novelty of the Study

Numerous ethnobotanical investigations have been conducted in Himachal Pradesh and other regions of the Indian Himalayas, mostly focusing on medicinal, wild edible and ethnoveterinary plants. However, the magico-religious aspects of traditional plant knowledge have been comparatively underexplored. Sarkaghat tehsil of Mandi district exhibits biologically and culturally rich landscapes, characterized by diverse vegetation, varied agro-climatic conditions and strong continuity of indigenous traditions. Despite the region's high floristic diversity and the ongoing plant-based ritual practices, a comprehensive documentation of magico-religious plant use has not been previously conducted. This knowledge is largely transmitted orally among local communities and is rapidly declining owing to socio-cultural transformation, urbanization and changing lifestyles making its documentation both timely and significant. The current study fulfils a significant research gap by systematically documenting the magico-religious uses of plant species used by local communities in the northwestern Himalaya. This study not only records commonly known sacred plants but also documents several localized and previously unreported or poorly documented ritual practices that distinguish the cultural heritage of the study area. These practices include the usage of *Asparagus adscendens* in the traditional 'Bujatra' marriage ritual, the burial of *Euphorbia royleana* stems during the 'Gantryala' birth ceremony, the hanging of *Aloe vera* and *Zanthoxylum armatum* during the 'Dayanvansh' ('Dugyali') festival for protection against malevolent spirits, the ritual usage of precisely 1900 strands of *Cynodon dactylon* and *Desmostachya bipinnata* to mitigate the effects of 'Rahu Dasha', the pouring of mustard oil on the roots of *Calotropis procera* to diminish the adverse influence of 'Shani Dasha', the use of *Musa paradisiaca* roots as a protective charm against 'Brihaspati Dasha', symbolic marriage with *Melia azedarach* to alleviate 'Manglik Dasha', and the incorporation of *Achyranthes aspera* in the 'Chanan Chhati Vrat'. The study documents various ritual-specific customs linked to weddings, birth ceremonies, death rituals, seasonal festivals, and astrological beliefs that have been largely overlooked in prior Himalayan ethnobotanical literature. This investigation represents the first comprehensive quantitative ethnobotanical

assessment of magico-religious plants in Sarkaghat tehsil and provides important insights into cultural keystone species, gender-structured knowledge systems, and their implications for biodiversity conservation in the North-Western Himalaya.

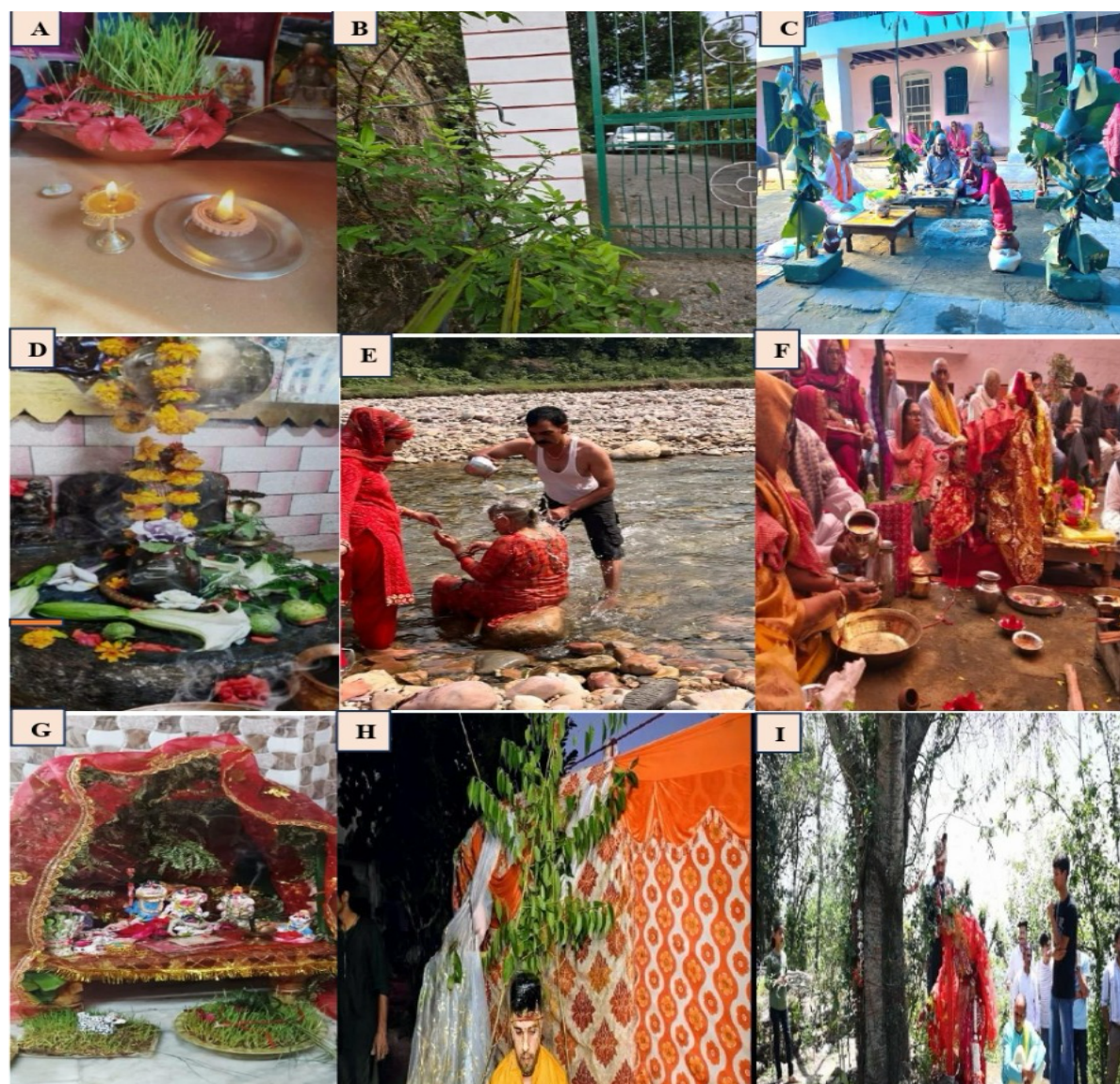


Figure 7. Plant species used in religious rituals and cultural practices in the study area. (A) *Hordeum vulgare* L. placed near oil lamps during Navratri. (B) Tirmir (*Zanthoxylum armatum*) at the entrance of the house as a traditional protective practice believed to ward off evil spirits and negative energies. (C) Performance of a traditional fire ritual ('havan') where plant twigs and leaves are used as ritual offerings. (D) Offerings of flowers, leaves, and fruits placed near the 'Shivling' during worship of Lord Shiva. (E) Performance of the traditional Chana Chhatti Vrat ritual at a riverside, where devotees take a ceremonial bath while holding sacred plant material in the mouth as part of the traditional practice for purification, protection and family well-being. (F) A sacred plant *Ocimum tenuiflorum* L. worshiped during local religious ceremony (Tulsi Vivah) (G) Use of plant leaves (*Phyllanthus emblica* L.) and sacred grass (*Cynodon dactylon* (L.) Pers.) in deity worship and temple decoration. (H) *Prunus cerasoides* D. Don used during wedding event ('Bujatra') where groom sit below the plant. (I) Community members performing rituals at a sacred tree representing traditional spiritual beliefs.

Conclusion

This study provides the first comprehensive quantitative ethnobotanical assessment of magico-religious plant species in Sarkaghat tehsil of the North-Western Himalaya, documenting 35 culturally significant plant species belonging to 24 families and highlighting their integral role in the spiritual, cultural, and ecological framework of the region. Quantitative indices such as Use Value (UV), Cultural Importance Index (CI), Relative Frequency of Citation (RFC), and Informant Consensus Factor (ICF) revealed exceptionally high cultural dependence on several key species, particularly *Ocimum tenuiflorum*, *Senegalia catechu*,

Aegle marmelos, *Oryza sativa*, and *Phyllanthus emblica*, identifying them as cultural keystone species with strong ritual, medicinal, and symbolic importance. The high Informant Consensus Factor values (0.93–0.95) across ritual categories indicate well-structured, culturally standardized plant usage patterns and strong intergenerational transmission of traditional ecological knowledge. The study also revealed significant gender-based differentiation in ethnobotanical knowledge, with women primarily maintaining household ritual plants and men specializing in formal ceremonial and temple-based practices, demonstrating the role of gender-structured knowledge systems in sustaining biocultural heritage. The dominance of multipurpose plant species with combined magico-religious, medicinal and ethnoveterinary applications reflects a holistic indigenous knowledge system that integrates spiritual beliefs with health, livelihood, and environmental management.

Despite their ongoing cultural significance, the existence of vulnerable and near-threatened species such as *Oroxylum indicum*, *Zanthoxylum armatum* and *Gossypium hirsutum* shows the need for urgent conservation initiatives to preserve them. Sacred beliefs and ritual protection practices serve as effective informal conservation mechanisms that contribute to biodiversity preservation, emphasizing the importance of integrating traditional ecological knowledge into formal conservation strategies. Furthermore, comparison with other Himalayan ethnobotanical studies confirms that magico-religious plant knowledge represents a widespread and deeply rooted biocultural phenomenon across the Himalayan region. However, rapid socio-economic changes, modernization and declining knowledge transmission among younger generations pose serious threats to the continuity of this valuable ethnobotanical heritage. Therefore, the documentation, preservation and integration of magico-religious ethnobotanical knowledge into biodiversity conservation policies and sustainable development programs are critically important. Conservation strategies should incorporate community-based approaches, protect culturally important plant species and promote awareness among younger generations to ensure long-term preservation of both cultural identity and ecological sustainability. The findings of this study provide important baseline data for future ethnobotanical research, biodiversity conservation planning and sustainable management of culturally significant plant resources in the Himalayan region.

Declarations

Ethics approval and consent to participate: All participants were informed of the study's objectives and procedures, and verbal informed consent was obtained prior to each interview. Participation was entirely voluntary, and data were collected anonymously and in accordance with the ethical principles of ethnobotanical research.

Consent for publication: All individuals appearing in the photos gave their permission for these to be published.

Availability of data and materials: The data collected and analyzed is within this article and its supplementary files.

Competing interests: Authors declare no conflict of interest.

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Authors' contributions: Arti Devi conducted the field investigations, Writing of the original draft, Data Analysis, Interpretation of Results, Review and editing. Suresh Kumar contributed to the Study design, Methodology, Manuscript Writing, Supervision, Manuscript improving, Review and Editing. All authors read, reviewed and approved the final version of manuscript.

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