Socio-magico-religious plants used by the semi nomadic Gaddi and Sippi tribes in Doda district of Union Territory of J&K, India.

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Research

Abstract

Background: Plants play an important role not only in fulfilling certain basic needs of human beings but have also influenced their cultural and religious life since time immemorial. Most of the socio-magico-religious plants (SMRPs) have medicinal values and some of them are associated with the community based conservation as well. Keeping in view the significant research gap, the present study was conducted to document the plants used in socio-magico-religious practices by the *Gaddi* and *Sippi* tribes living in Doda district of Union Territory of Jammu and Kashmir (UT OF J&K).

Methods: Ethnobotanical data were collected from 90 randomly selected informants through interviews conducted using a semi-structured questionnaire. The uses of each plant species, as reported by the informants, were recorded as use-reports (UR). These UR data were then used to calculate the Cultural importance value (CI) and the Informant Consensus Factor (Fic).

Results: A total of 60 SMRPs belonging to 53 genera and 27 families were documented in the present study. The sacred and religious rites (SRR) was the most represented use category, comprising 40 plant species. *Brassica juncea* (L.) Czern., with CI value 2.2, was the most significant SMRP for the *Gaddi* and *Sippi* communities. Seventy five percent of the reported SMRPs were also used as source of ethnomedicines.

Conclusion: A considerable diversity of indigenous plant species is intricately linked to the cultural and religious practices of the Gaddi and Sippi tribes. Many Socio-magico-religious plants possess medicinal values and some of the Socio-magico-religious practices are associated with community based conservation of local plants. Therefore, conservation of Socio-magico-religious practices of the tribals is strongly recommended.

Keywords: Ethnomedicinal; exorcism; religious rites; sacred grooves; shamanisim.

Background

For centuries, humans have depended on natural resources to fulfill their essential needs such as food, shelter, clothing, and medicine (Pangging *et al.* 2021; Thakur *et al.* 2025). Apart from these basic needs, plants have occupied an important place in traditional sacred rituals, religious prayers, customs, legends, myths, folk tales, folk songs and ceremonial practices throughout the world (Geng *et al.* 2017). E*thnobotanical studies primarily revolve around ethnomedicinal and dietary aspects, while plants of cultural and religious significance remain comparatively underexplored* (Brahma *et al.* 2014). However, it is a well-known fact that the sacred plants also possess dietary and medicinal values making them highly significant (Espin 2019; Samant *et al.* 2020; Akhtar & Bashir, 2021). The taboos, festivals, rites, rituals, and other cultural practices of indigenous communities are closely associated with the conservation of the local vegetation on religious ground (Hasanah *et al.* 2025). For example, sacred grooves are the patches of forests which are regarded as abode of deities by the indigenous communities and are protected by them since ages through local sanctions and taboos (Patel & Patel 2012; Kandari *et al.* 2014; Mehra *et al.* 2014). There is a common belief among the indigenous people that if any such taboo is broken by any community member, the local deity will get annoyed and may bring disaster for the whole community (Rankoana, 2022). There are many other religious and socio-cultural beliefs among the indigenous communities which significantly contribute to the conservation of biodiversity (Baidya & Devi 2018; Mir *et al.* 2018). In Gharwal Himalayas, the local inhabitants harvest the high altitude medicinal plants only during *Nanda Ashtami*, a local religious festival, occurring between the months of September and October. By this time the plants have already set their seeds, which ensure their propagation and conservation (Dhar *et al.* 2002).

India is a diverse country with different religions, beliefs, customs and traditions. Indian culture is related to nature as nature and its various forms are worshipped in one way or the other (Anthwal *et al.* 2010). The worship of plants can be traced back to the beginning of the human civilization (Bobade 2021). The sacred plants like *Ficus religiosa* L. (*Chaitya-vriksha*) and *Adansonia digitata* L. (*Kalpa-vriksha*) find their mention in ancient Indian literatures which substantiates the fact that worshipping of trees in India is an ancient practice (Shrivastava *et al.* 2014). Tribals have the belief that some deities inhabit forests which play a vital role in fostering the overall well-being, prosperity and stability of the community (Ahmed and Dhiman, 2024). Additionally they perceive ailments, diseases and medical disorders as manifestation of curses by the local deities, gods and evil spirits which could be alleviated by worshipping (Sharma & Pegu 2011). They also believe that certain plants possess divine characteristics given by the God and these plants are employed in different religious rites and rituals as well as for the treatment of human illnesses (Suroowan *et al.* 2019). Many sacred plants possess medicinal values and their religious reverence often contributes to their conservation.

Socio-magico-religious plants promote unity, preserve traditions, and strengthen cultural identity by forming the basis of shared community beliefs and customs. The Gaddi tribe, a prominent pastoral and agro-pastoral community inhabiting the hilly terrains of Jammu and Kashmir, possesses a rich repository of traditional knowledge deeply intertwined with their cultural, social, and religious life (Dutt *et al.* 2015). However, new generations have, by and large, dissociated themselves away from the religious rites and rituals due to modernisation, education and urbanization and thus the knowledge of socio-magico-religious plant use faces the risk of disappearing. A systematic study is therefore essential to preserve and understand these practices before they decline further (Menaka *et al.* 2025).

Since no previous studies have investigated the plant-based socio-magico-religious practices of the Gaddi and Sippi communities inhabiting Jammu and Kashmir, the present research work was undertaken to fill this gap by documenting and analyzing the traditional ethnobotanical knowledge associated with their spiritual and ritualistic practices. The study will also test the hypotheses that; (i) women possess greater knowledge of SMRPs than men; (ii) older informants are more knowledgeable about SMRPs compared to younger informants; and (iii) community members with higher levels of formal education tend to have less knowledge of SMRPs than those without formal education.

The present study holds substantial academic, cultural, and conservation value. Documenting the socio-magico-religious plants used by the Gaddi and Sippi tribes will contribute to safeguarding intangible cultural heritage and strengthening the knowledge base within the field of ethnobotany. The findings may support policymakers and conservationists in developing culturally sensitive strategies for biodiversity conservation and community development in the rapidly changing world (Nilsson *et al.* 2016)

Materials and Methods

Study area

Doda district is situated in hilly terrain of the outer Himalayan region of Jammu Kashmir between 32° 53′ N to 34° 21′ N latitude and 75° 1′ E to 76° 47′ E longitude (Fig. 1). Its geographical area is 4500 Km^2 (District profile of district Doda, source online) and its elevation ranges between 1000 and 4500 mamsl (approx.). Because of a wide range of altitude, the climate varies from place to place and three distinct climatic zones namely alpine, temperate and sub-tropical zone could be differentiated along the altitudinal gradient in the study area. The varied physiography and different climatic zones support extensively rich phytodiversity in the district. Evergreen coniferous forests are the most common type of forests growing along the slopes of mountains in temperate region. The district shares its borders with Anantnag, Ramban, Udhampur and Kishtwar districts in its North, West, South-West and North-East respectively. Chamba district of Himachal Pradesh lies along its southern inter-state boundary. The temperature remains moderate during summer (25-30°C), while in winter, it drop below 0°C and the average annual rainfall is recorded 135 mm (Ground water information booklet of Doda district, source online). All parts of the district experience heavy snowfall during winter season. The Chenab is the main river system traversing through the study area.

Gaddi and Sippi tribes

India possesses the second-largest tribal population globally, following Africa and thus can rightly be called as 'land of tribes' (Bhatia *et al.* 2014). Indian Himalayan Region (IHR) is extremely rich in biodiversity (Marpa *et al.* 2020) and also the repository of a large number of sacred plants (Singh & Pusalkar 2020). The Himalayan region is home to about 6% of India's total population, out of which 25.08% is the aboriginal population belonging to diverse ethnic and cultural groups like *Gaddis*, *Gujjars*, *Bakerwals*, *Bhotiyas*, *Buxas*, *Rajees*, *Jaunsarees*, *Tharus*, *Garos*, *Nagas*, and *Khasis* (Nautiyal *et al.* 2000). Different nomadic, semi-nomadic and settled tribes are found in the Himalayas of Union Territory of J&K. *Gaddi* tribe is the semi-nomadic, agro-pastoral tribal community inhabiting the Himalayan regions of Jammu and Kashmir and their economic activities mainly revolve around shepherding, traditional weaving and subsistence agriculture (Dutt *et al.* 2015).

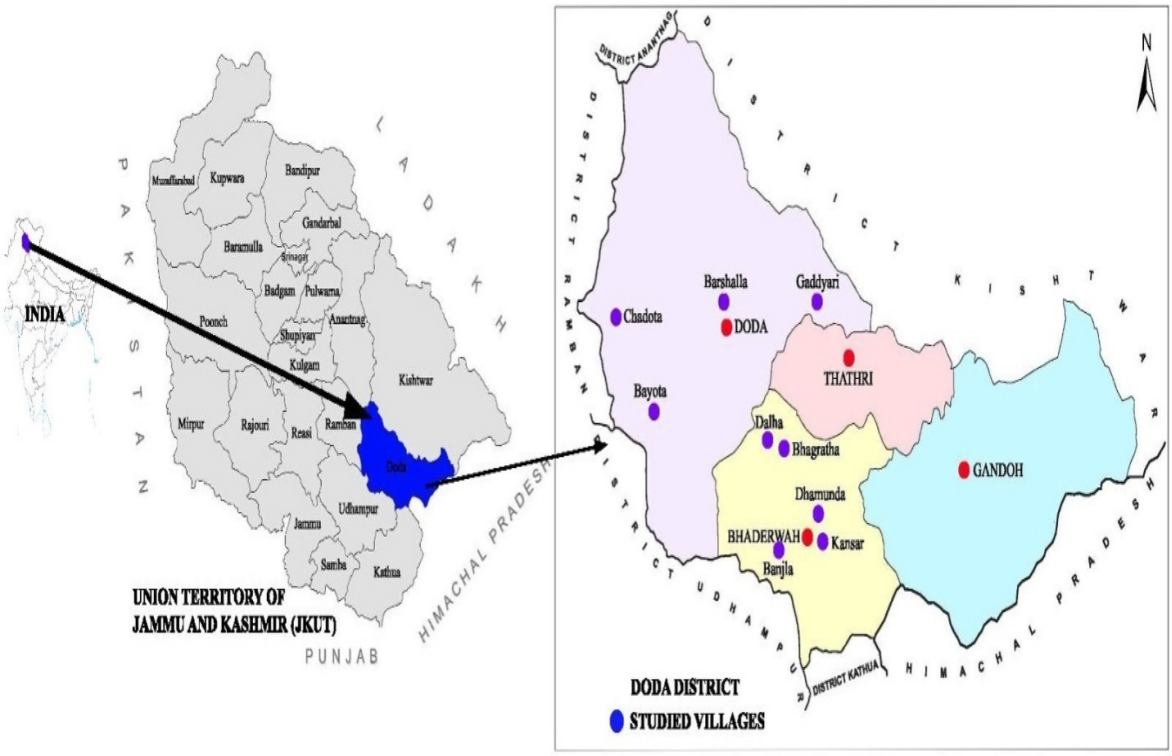

Figure 1. Location Map of the study site showing villages under survey.

The *Gaddis* and *Sippis*, residing in remote and isolated hilly regions, are very well known for their religious life and celebrate various festivals and ceremonies, which differ markedly from those in the rest of India. Within tribal traditions, shamans often occupy the highest position in the spiritual hierarchy (Mene & Miso, 2025). The same is true for the Gaddi and Sippi tribes, who are highly superstitious and believe in black magic, witchcraft and shamanism for exorcism and to find solution to different problems. Hence, they use large number of plants in socio-magico-religious practices. Shamans heal partly by

affecting the person's psychology within a ritual or cultural framework. The person's expectation and belief in the ritual often enhances psychological effects - a concept related to the placebo and nocebo effect (Alling, 2015)**.** Sorcery practices such as voodoo and necromancy involve the use of specific psychomedicinal plants to drive away the influence of evil spirits from an affected person and eliminate negative energies through the chanting of mantras (Dan & Lal, 2023).

Gaddi and Sippi tribes exhibit strong socio-cultural affiliations with each other. The sociocultural profiles of these tribes are largely analogous, reflecting a common tribal cultural framework, traditional costumes, and similar socio-religious practices and prohibitions (Singh *et al.* 2023). Both the *Gaddi* (Bhasin 2011; Wagner 2013; Thakur *et al.* 2016; Simmy 2019; Malhotra *et al.* 2021) and *Sippi* tribes depend on shepherding, traditional handloom weaving and subsistence agriculture for their sustenance. The data from the 2011 Census reveals that Jammu and Kashmir is home to 46,489 Gaddis and 5,966 Sippis, with 5,999 Gaddis and 810 Sippis inhabiting district Doda (Registrar General and Census Commissioner, India; source online). Keeping in view their social, educational and economic backwardness, *Gaddis* and *Sippis* of UT of J&K were notified as scheduled tribes by government of India way back in 1991vide the Constitution (Scheduled Tribes) Order (Amendment) Act, 1991 (The Constitution Scheduled Tribes Order Amendment 1991).

Collection of ethnobotanical data

28 field visits were conducted to nine randomly selected villages in the study area where the *Gaddi* and *Sippi* communities reside for collection of ethnobotanical data from April 2023 to March 2025. These villages are Kansar, Dhamunda, Gaddyari, Chadota, Barshalla, Dalha, Bhagratha, Banjla and Bayota. A random sampling technique was adopted to select informants from the target population for collection of ethnobotanical data about 'sacred and religious rites' (SRR), 'socio-cultural rituals' (SCR) and 'taboos' (TAB) (Singh *et al.* 2024). However, keeping in view the limited number of shamans and priests in the population under investigation and to obtain extensive and detailed information snowball sampling was adopted for obtaining the sample of informants for collection of data on 'magical belief and exorcism' (MBE) (Singh *et al.* 2024). In snowball sampling technique some highly knowledgeable priests and shamans (*chela*) involved in magical healing practices and exorcism were initially identified who were asked to nominate, through their social networks, other such knowledgeable persons who could contribute valuable ethnobotanical knowledge to the study.

A group of 90 informants with 38 females and 52 males, aged 25 to 90 years, were interviewed. The educational qualification of the informants was divided into three classes; 55.3% women and 38.5% of men informants have not taken any formal education, whereas 31.6% women and 38.5% men attained education up to 10th class, and 13.1% women and 23.0% men achieved an education of more than 10th class.

All informants were briefed about the objectives of the study beforehand and their prior informed consent (PIC) was obtained. Data on traditional plant uses was collected through a series of 82 semi-structured interviews and 22 group discussions conducted among informants. The data was recorded in predetermined questionnaire with open ended questions which included the information such as the local name of the plant, its habit, flowering season, flower colour, plant parts used, associated beliefs, and traditional uses. Some data was also obtained by directly observing the socio-magico-religious activities within the community involving use of plants, which were also captured through photography and videography. The accuracy of the collected information was cross checked for authenticity by interviewing more than one informant.

Collection of plants

The plant explorations for collection of plant specimen of socio-magico-religious importance were carried out preferably during flowering seasons. A group of well-informed informants joined the first author during survey in Bhaderwah Forest Division where informants identified plant species by their indigenous names. Images of the plant species and the involvement of community members in plant-based socio-magico-religious practices were captured through photographic means. Images of the plant species and the activities of the community members related to plant based socio-magico-religious practices were captured by the photographic camera. Field data for every plant was recorded in the field book which includes vernacular name, collection date, habit, altitude of the habitat, habitat characteristics and flower colour. The plant specimens were collected following standard procedure.

Identification and preservation of the plants.

After collection, the plant specimens were pressed and dried within folds of newspaper, mounted onto herbarium sheets, submitted to the Herbarium at the University of Jammu and the herbarium accession number was obtained for each plant (Table. 1). Identification of the plant specimens was carried out by using the field guide *Concise Flowers of the Himalaya*

authored by Polunin and Stainton, *1987 (Polunin & Stainton 1987) and by* comparing them with the reference specimen stored in Jammu University herbarium. The identification was confirmed by consulting taxonomic experts affiliated with the University of Jammu. Only accepted names of the plants mentioned in online database 'plants of the world online' (https://powo.science.kew.org/) have been used.

Data Analysis

Cultural importance (CI)

To calculate cultural importance (CI), all use-reports (UR) for a species in every use category were added together, and this sum was then divided by the number of informants (N).

It is calculates as;

$$CI=\sum URi / N$$

Where,

∑URi = the total number of use-reports for a species across all use categories

N = the number of informants (Singh *et al.* 2023).

Factor informant consensus (Fic)

The informant consensus factor (Fic), as proposed by Trotter and Logan (1986), was employed to assess the uniformity of knowledge and information exchange regarding socio-magico-religious (SMR) plants.

Fic was computed using the formula:

$$Fic= Nur-Nt/ Nur-1$$

Where, Nt represents the number of plant species used within a particular use category, and Nur denotes the total number of use citations for that category. Fic values close to zero indicate little to no agreement or knowledge sharing among informants, whereas values approaching one reflect a high level of consensus and information sharing (Bhatia *et al.* 2018).

Jaccard's Index (JI)

Jaccard's Index (JI) is a statistical measure of similarity between two sample sets. In ethnobotany it is commonly used to compare the plant species used by different communities or regions. It helps to understand the ecological relationships and also indicates how knowledge has been shared or isolaoted between cultures.

The method described by Gonzalez-Tejero *et al.* (2008) was employed to determine Jaccard's Index (JI) as follows.

$$JI= (C/A+B-C)x100$$

Where, A= No. of species in population A, B is the No. of species in population B, and C is the No. of species shared between populations A and B.

Statistical analysis

The study employed a one-way ANOVA to examine whether knowledge of SMRPs varied significantly with gender, age, and educational level of the informants. The study examined how age and education level of informants are related to their knowledge of SMRPs using a two-tailed correlation test, with significance set at 0.05.

Results and Discussion

Vegetation characteristics

The research identified 60 different plant species distributed among 53 genera and 27 families (Table 1). These values are well within the range of 16 to 105 species of magico-religious plants reported from Jammu and Kashmir (Ayub *et al.* 2014; Trak *et al.* 2017; Wani *et al.* 2017; Bhushan & Khajuria 2018; Thakur *et al.* 2021a; Thakur *et al.* 2021b; Haq *et al.* 2022; Singh *et al.* 2024), from the Himalayas (Chaudhry & Murtem 2016; Chhetri et al 2020; Thakur *et al.* 2023; Lata & Paul, 2024; Rawat & Kumar 2024.), from other parts of the India (Gupta et al 2022; Bandyopadhyay 2024), from the world (Luximon et al 2019; Jigme & Yangchen, 2022) and used by different tribes of India (Sahu *et al.* 2013; Sharma *et al.* 2014; Pangging *et al.* 2018; Pangging *et al.* 2019; Pagging *et al.* 2021; Atram *et al.* 2024). The dominant families recorded were Poaceae and Rosaceae (10 species each) followed by Fabaceae (5 species) and Pinaceae and Solanaceae (3 spp. each) (Fig. 2). A number of studies (Pangging *et al.* 2021; Jigme & Yangchen, 2022; Pangging *et al.* 2018; Pangging *et al.* 2019) have also reported the maximum usage of Poaceae in socio-magico-religious ceremonies due to the importance of cereals in the religious activities, and the plants like *Cynodon dactylon* (L.) Pers., *Hordeum vulgare* L., *Dendrocalamus strictus* (Roxb.) Nees, and *Themeda anathera*

(Nees ex Steud.) Hack. are used as mark of purity and sanctity during these rituals. Takur *et al.* (2021a) have also reported the Poaceae and Rosaceae as the most used families from Doda district of the UT of J&K (Thakur *et al.* 2021a).

Seeds (23%) were the most used plant-part followed by stem, branches, leaves and bark (11.4% each). (Fig. 3). These results are inconsistent to earlier findings which have reported leaves (Luximon *et al.* 2019; Pangging *et al.* 2018) or tree trunk (Jigme & Yangchen, 2022) or whole plant (Thakur *et al.* 2021a) or flower (Thakuer *et al.* 2023) as the most utilized plant parts. Herbs with 30 species (50%) were the most common life forms followed by trees (20 species), shrubs (8), and climbers (2). These results align with the findings of previous research carried out in J&K UT and other parts of the Himalayan region (Wani *et al.* 2017; Chhetri *et al.* 2020; Thakur *et al.* 2023). However, tree is the most prevailing life-form among the Kampti tribe of Assam (Pangging *et al.* 2018) and in Butan (Jigme & Yangchen, 2022).

Traditional uses of plants in socio-magico-religious practices (Fig. 5)

For the convenience of study, SMRPs were categorized into four use categories viz. sacred and religious rites (SRR), socio-cultural rituals (SCR), magical belief and exorcism (MBE) and taboos (TAB).

Sacred and religious rites (SRR)

In India, many plants are grown within the premises or close vicinity of the temples and are considered to be the sacred plants (Sureshbabu & Ramakrishna 2019). In Hindu religion, it is believed that God resides in plants and some plants are associated with particular Gods and Goddesses e.g., *Aegle marmelos* (L.) Correa (*Bel*) is associated with Lord Shiva, *Azadirachta indica* A. Juss. (*Neem*) with Sheetla Mata-the Goddess of small pox, *Ocimum tenuiflorum* L. (*Tulsi*) with Goddess Lakshmi, *Ficus religiosa* L. (*Peepal*) is considered as a symbol of Brahama, Vishnu, and Mahesh, *Ficus benghalensis* L. (*Bargad*) is associated with Lord Shiva (Agarwal 2014; Pandey & Pandey 2016) and such plants were worshipped to propitiate the deities for harmony, prosperity and good health (Bobade 2021). Hence, magico-religious plants are the essential elements of socio-religious life of the aboriginal communities (Bandyopadhyay, 2024). Largest number (66%) of the documented species was reported to be used in sacred and religious rites (SRR). This trend is consistent with the findings reported among the Kampti and Missing tribes of Assam (Pangging et al., 2018; Pangging et al., 2021), as well

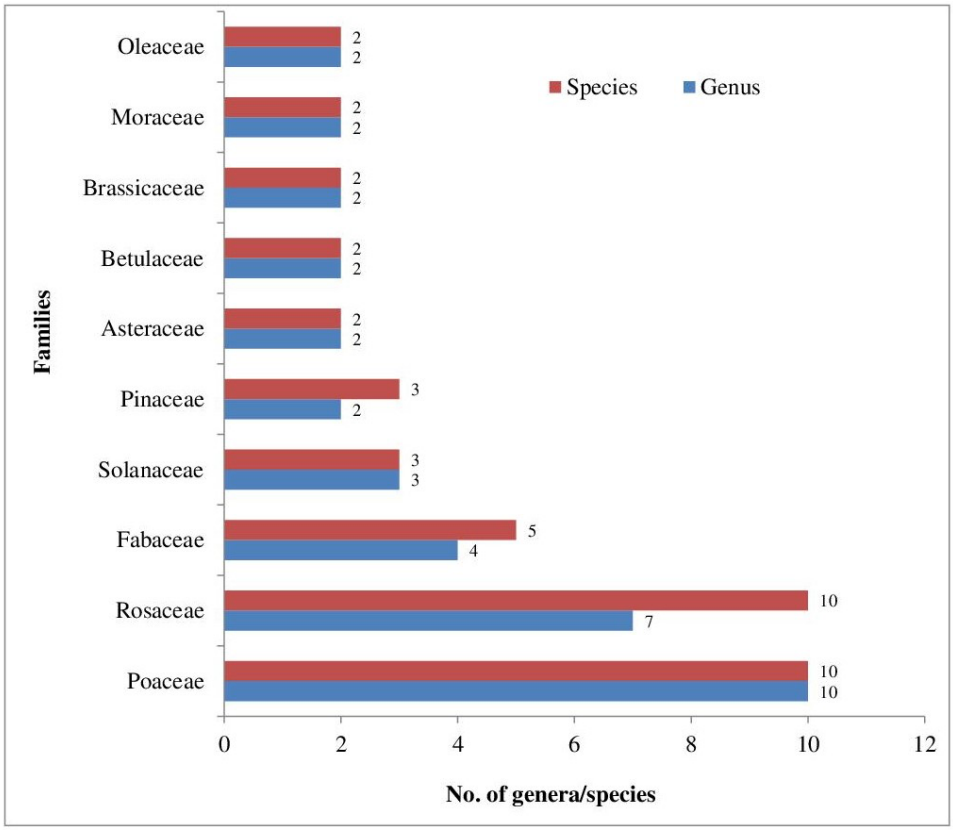

Figure 2.The families with the highest contribution to SMRPs.

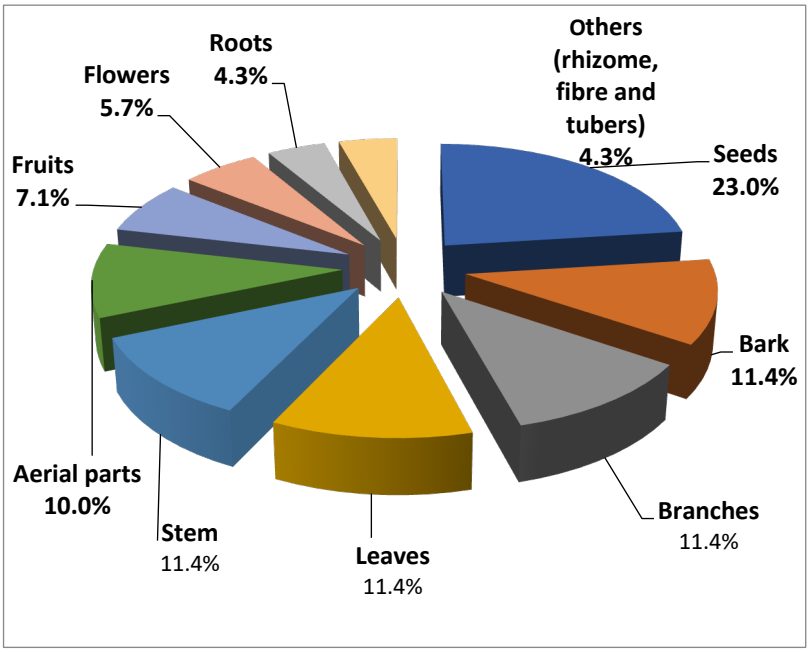

Figure 3. Percentage contribution of plant parts used in socio-magico-religious practices.

as among communities in the district Doda, Jammu and Kashmir (Thakur et al., 2021a) and the ethnic populations of Kullu district, Himachal Pradesh (Thakur *et al.* 2023). The highest usage of plants used in sacred and religious purposes indicates that the *Gaddi* and *Sippi* tribes are highly religious and have staunch faith in God and deities. These plant species were reported by informants to be used in a variety of religious practices (Table 1 and 2). For example, *Cynodon dactylon* (CI, 1.54), *Dolomiaea macrocephala* (0.89), *Tagetes erecta* (0.76), *Desmostachya bipinnata* (L.) Stapf (0.72), *Brassica juncea* (0.70), *Datura stramonium* (0.56), *Hordeum vulgare, Ocimum tenuiflorum* (0.51), *Gossypium hirsutum* (0.50) and *Santalum album* (0.50) are commonly used during prayer rituals, offerings to deities, and the performance of sacred ceremonies such as *yajnas*.

Cynodon dactylon is regarded as a sacred plant by the Gaddis and Sippis, similar to Kampti and Missing tribes of Assam (Pangging *et al.* 2021; Pangging *et al.* 2018), Tharu and Bhoxa tribes of Uttarakhand (Sharma *et al.* 2022) and indigenous people of Doda district (Thakur *et al.* 2021b). However, on the contrary, the Halong community of Assam uses this grass against evil spirits (Sharma *et al.* 2012). This species has numerous medicinal properties (Table 1). *Dolomiaea macrocephala* possesses a strong aromatic fragrance and is traditionally burnt as incense during the worship of local deities. Similar findings have been previously reported from Doda district, J&K (Thakur et al., 2021b). According to Hassan et al., 2021, this species is beneficial for improving eyesight.

Flowers of *Tagetes erecta* are offered to the God or deity while worshipping and the garland of flowers is put around the neck of religious idols. These results align with those previously reported by by Thakur et al., 2021b, whereas in Kullu district (Himachal Pradesh), the species is used to decorate the palanquins of the local deities (Thakur *et al.* 2023). *Tagetes erecta* is aperient and also used in otalgia (Bhatia *et al.* 2014). *Desmostachya bipinnata* is a holy grass and finger ring made from its leaves is worn by the worshipper while performing pooja or *yajana* ceremony as a symbol of purity and sanctity. These findings align with those of Chhetri et al., 2019, and Sharma et al., 2022. *Datura stramonium* is used for worshipping Lord Shiva, a practice also documented in other Himalayan regions of India. (Sharma et al.2022) and Nepal (Gaire & Subedi 2013). The species has immense medicinal value and is used to cure asthma, teeth pain, loss of hairs and dandruff, as anti-septic, narcotic, joint pain (Bhat *et al.* 2014; Singh *et al.* 2021a; Trak & Giri 2017; Dar *et al.* 2018; Wani *et al.* 2021; Mir *et al.* 2021; Khan *et al.* 2022: Farooq *et al.* 2022), poisonous insect bite, body part inflammation and arthralgia (Kumar *et al.* 2015a).

Some others plants like *Amaranthus caudatus* (CI, 0.58), *Amaranthus viridis* (0.57), and *Fagopyrum esculentum* (0.59) are cooked in different forms and eaten by the devotees during religious fasting. These observations corroborate the findings of Chhetri *et al.* (2019) and Thakur *et al.* (2021a, 2021b). During religious fastings, the consumption of cereals is prohibited and hence these pseudocereals are consumed as they are the best supplementary food having high nutrient content. Seeds of *Fagopyrum esculentum* (buckwheat) have high starch content, protein with beneficial amino acids, a low concentration of gliadin, rich in dietary fibre (Dziedzic *et al.* 2012), and is the greatest sources of gluten-free food, rich in calcium, iron,

phosphorus, potassium, rutin and zinc (Dietrych-Szostak & Oleszek, 1999). In addition, buckwheat flour extracts exhibit anti-mutagenic activity, offer defense against oxidative stressors and may lessen the symptoms of diabetes (Kawa *et al.* 2003). *Amaranthus caudatus*is is another gluten-free pseudocereal and nutritionally valuable, offering high levels of protein (especially lysine), along with dietary fibre and numerous bioactive constituents such as tocopherols, phenolics, folate, squalene, phytates and various vitamins (Zambrana *et al.* 2018). *Another pseudocereal, Amaranthus viridis* possess highly nutritious seeds, rich in protein, fibre, antioxidants, and an array of vitamins and minerals such as niacin, riboflavin, folate, and key elements like calcium, magnesium, iron and zinc. The high dietary fibre content of *Amaranthus viridis* seeds improves digestion, contributes to enhanced satiety and may support blood sugar regulation (Soriana-Garcia & Aquirre-Diaz, 2019).

Cannabis sativa (CI, 0.26)*, Cenchrus americanus* (0.64), *Juglans regia* (0.64) and *Centella asiatica* (0.17) are used in making sacraments (*prasad*) which are served to the devotees in temples and during religious ceremonies. Except *Cenchrus americanus* the religious value of all these species is in concurrence with the findings of some other studies from India (Thakur *et al.* 2023) and also from Nepal (Shakya *et al.* 2021). *Gaddi* and *Sippi* tribes are staunch devotees of Lord Shiva and when their wish is fulfilled they prepare a special liquid sacrament from *Cenchrus americanus* and *Triticum aestivum* flour in a thanks giving religious ceremony, devoted to Lord Shiva, known as *gusantan*. Seeds of *Juglans regia* are dipped in sacred water vessel while performing pooja on different occasions and served as sacrament (*prasad*), a ritual very similar to Kashmir Shaivism. The drink made from *Cannabis sativa* leaves by the Gaddis and Sippis, offered to Lord Shiva during Shivratri, reflects a widely observed practice among Hindus throughout India.

Some of the reported species were used in performing religious rites of dead persons e.g., *Cedrus deodara* (CI 1.6), *Sesamum indicum* (0.48), and *Oryza sativa* (0.30). Religious use of *Cedrus deodara* in *yagnas* align with the findings of Thakur et. al., 2021a, 2021b, however some other uses are peculiar to *Gaddi* and *Sippi* tribes e.g., placing of a long wooden log of *Cedrus deodara* with flattened upper surface across a water stream as a foot bridge on the occasion of death anniversary of a person after performing religious rituals by the priest. It is a common belief that this practice helps the departed soul in crossing the rivers on his way to heaven. Similarly, a long hollow wooden trough known as *charh*, carved from *Cedrus deodara* wood, is placed near a water source in the memory of deceased person to hold drinking water. This practice is rooted in the belief that it provides water to the departed soul on its journey to heaven. The usage of seeds of *Sesamum indicum* mixed in water for taking bath for purity of the body after attending funeral ceremony by the tribes under investigation is reported for the first time from UT of J&K. *Sesamum indicum* is considered pious in other communities as well and used in *havan* during pooja (Thakur *et al.* 2023) or Lohri festival (Thakur *et al.* 2021b). The use of *Oryza sativa* during funeral rites is also a new report from UT of J&K. Ropes made from paddy straw are considered pious and used for tying small wooden posts for making bier (*arthi*), on which dead body is carried to the cremation ground.

Magical belief and exorcism (MBE)

Gaddi and *Sippi* tribes are highly superstitious people who believe in black magic and evil powers. They believe that certain plant species have magical healing powers and use 14 species (23.3%) in magical belief and exorcism (MBE) practices for protecting themselves, their cattle and houses against the harmful effects of black magic, ghosts, demons and evil eyes. Sharma et. al., 2022 have reported the plants used for magical usage as the most dominant use category among sub-Himalayan communities of Uttarakhand (Sharma *et al.* 2022). The number of species reported to be used in MBE practices in the present study is lower than that reported among aboriginal populations of the sub-Himalayan areas of Uttarakhand (Sharma *et al.* 2022), who use 20 species, and more than those used by Khampti (6 spp.) and missing (10 spp.) tribes of Assam (Pangging *et al.* 2021; Pangging *et al.* 2018).

Gaddi and *Sippi* tribes consult shamans and priests for exorcism. The species used for protecting the affected persons against black magic and bad evils primarily include *Brassica juncea* (CI, 1.53)*, Rosa brunonii* (0.52), *Quercus floribunda* (0.33)*, Alnus nitida* (0.30)*, Cedrus deodara* (0.30)*, Pyrus pashia* (0.30)*, Glycine max* (0.26) and *Parrotiopsis jacquemontiana* (0.26). *Brassica juncea* is also used in MBE practices in Assam by *Deori* and Missing tribes (Pangging *et al.* 2021; Pangging *et al.* 2019). Earlier reports indicate that *Quercus floribunda* is considered as a taboo tree by the locals of Doda district (Thakur *et al.* 2021a) and *Cedrus deodara* as sacred and religious rites tree in Doda and other parts of Jammu region (Thakur *et al.* 2021b). *Rosa brunonii*, *Alnus nitida*, *Pyrus pashia*, *Glycine max* and *Parrotiopsis jacquemontiana* are new reports from UT of Jammu & Kashmir for being used as MBE species.

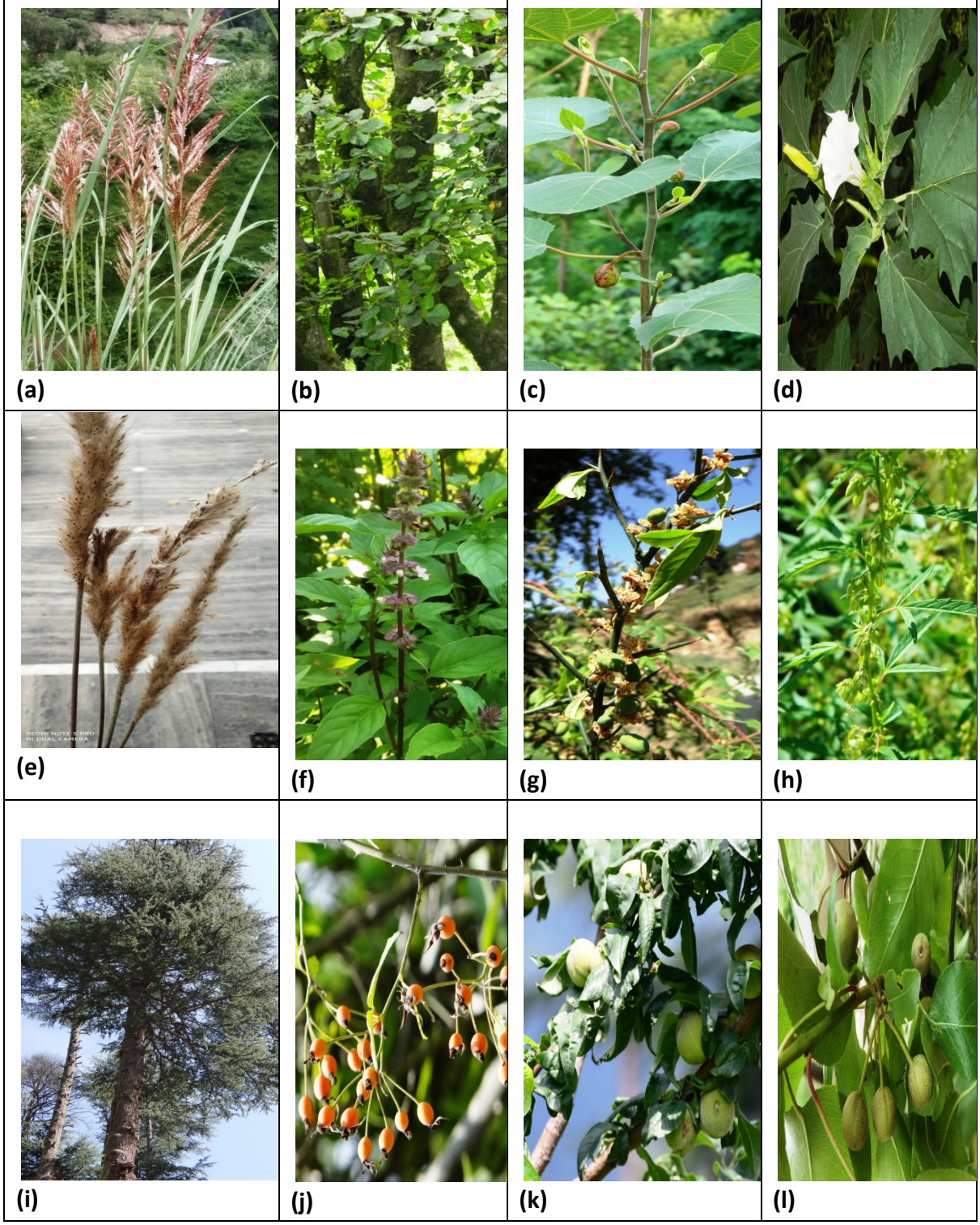

Figure 4 (a-l). Some of the plants used in socio-magico-religious practices: (a) *Tripidium rufipilum* (Steud.) Welker, Voronts. & E.A. Kellogg, (b) *Parrotiopsis jacquemontiana* (Decne.) Rehder. (c) *Ficus palmata* Forssk., (d) *Datura stramonium* L., (e) *Desmostachya bipinnata* (L.) Stapf, (f) *Ocimum basilicum* L., (g) *Prinsepia utilis* Royle., (h) *Cannabis sativa* L., (i) *Cedrus deodara* (Roxb. ex D.Don) G.Don, (j) *Rosa brunonii* Lindl., (k) *Prunus persica* (L.) Batsch., and (l) *Pyrus pashia* Buch.-Ham. ex D.Don.

Table 1. Taxonomic characteristics, use-reports (UR), and ethnomedicinal review of socio-magico-religious plants (SMRPs).

Plant name	Vernacular name	Family	Herbarium accession No.	Plant part used	Socio-magico-religious uses (use reports)	Total UR	Ethnomedicinal uses previously reported from UT of J&K
Alnus nitida (Spach) Endl.	*Champ*	Betulaceae	HBJU-16778	Bark	A sacred divine water prepared by dipping the bark of 7 trees viz. *Quercus floribunda, Fraxinus excelsior, Cedrus deodara, Pyrus pashia, Alnus nitida*, *Pyrus communis* and *Pyrus pyrifolia* in water collected from seven different water springs is used to ward off ghosts and influence of black magic and bad evils from the affected person. The affected person is made to sit in cross legged position, his body is completely covered with a fresh white cotton cloth and the water is sprinkled over his body through a sieve by the shaman (witch doctor) and this process is locally known as *nahaun* (27).	27	Foot and mouth disease in cattle [18].
Amaranthus caudatus L.	*Bajarbhang*	Amaranthaceae	HBJU-17580	Seeds	A sweet milky dessert (*kheer*) is prepared from the seeds of *Amaranthus caudatus* which is eaten by the devotees during religious fasting (52).	52	Expectorant, high fever, galactagouge (increase milk) in cattle [26], energizer [41].
Amaranthus viridis L.	*Chawla*	Amaranthaceae	HBJU-16752	Seeds	Seeds roasted in cauldron, soaked in warm water and then added in milk or curd and eaten by the devotees during religious fasting (51).	51	Alleviates labour pain [6], diabetes [28].
Berberis lycium Royle.	*Kishmay*	Berberidaceae	HBJU-16776	Branches	A large sized basket, locally known as *chabri*, made from the shreds of fresh twigs of *Berberis lycium* with upper margins made from twigs of *Spirea canescens*, is used in one of the wedding rituals known as *shandi* (telai). The basket is filled with maize grains, covered with a small blanket and the bride and groom are made to sit in this basket separately at their respective places throughout the *shandi* ritual (14)*.	14	Eye sores, piles, antiseptic [21], splenic problems, throat and chest troubles, eye diseases, wounds, jaundice & cholera [9,11,37,42,1,33], laxative and gastric tonic [14,10,21,30,32], intermittent fever, weakness [4,22,34], liver ailments [35], wounds and cuts, urinary problems, diabetes [6,8,19], asthma, cough [12], cooling agent and

							eye lotion [5], bone fracture & stomach ache [27].
Betula utilis D.Don.	*Bhuj*	Betulaceae	HBJU-16778	Bark	The paper like bark of *Betula utilis* is used for writing sacred incantations (*mantras*) having healing power which is then placed in an amulet and worn in the arm or neck to ward off evil spirits (3) and bring good luck (2).	5	Gout and rheumatic pains, blood purifier, urinary problems, chanted skin [9].
Brassica juncea (L.) Czern.	*Sharoon*	Brassicaceae	HBJU-17551	Seeds	Seed oil is used for lighting sacred lamp (*diya*) while worshipping (63). Dry seeds are burnt in red hot cinders and the affected person is fumigated to get rid of bad evils and black magic (68). Seeds are placed on the head or kept in the pocket for protection against ghosts, demons and evil spirits (70).	201	Galactagouge [6], leaves given to cow after removal of placenta [26].
Cannabis sativa L.	*Bhang*	Cannabaceae	HBJU-16783	Leaves, aerial parts, stem fibre	Fresh leaves are used for making *pakora* and a sedative milk drink (*shradhai*) that are offered as sacrament to the devotees on the occasion of *Shivratri*, a Hindu festival devoted to Lord Shiva (23). Aerial parts are moved slowly up and down over the body of affected person by the shaman while reciting the sacred incantations in case of snake bite and to alleviate poisonous swellings (12). The rope made from the stem fibres is tied around the neck of the cows after reciting sacred incantations by the shaman in case the cow is not getting conceived (15)*.	50	Diarrhoea, blood purifier, cholera, rheumatism, wormicide, skin disease, narcotic, cuts, antioxidant [6,8,13,42,32,25] dandruff, intoxicant, tonic, analgesic, sedative, antiseptic, loss of appetite, alopecia, piles [6,9,37,41,2,3], backache [12], bee and wasp sting, scorpion bite [19,28,40,36], excessive urination, convulsions, tumors and ulcers [11], nausea, vomiting, snake bite [24], earache, blood purifier, scabies, piles [10].
Capsicum annuum L.	*Pipli*	Solanaceae	HBJU-17018	Fruit	The fruits of *Citrus limon* and *Capsicum annum* are tied together with a piece of charcoal and hanged over the entrance doors of houses to keep away the ghosts, demons and bad evil (9).	9	Appetizer [6].

Cedrus deodara (Roxb. ex D.Don) G.Don.	*Gaid*	Pinaceae	HBJU-16884	Stem, bark	A long wooden log of *Cedrus deodara* with flattened upper surface, locally known as *nahas*, is placed over a water stream in the name of dead person on the occasion of his death anniversary or half death anniversary after performing religious rituals by the priest. It is used by the people and cattle as a small bridge for crossing from one side of the stream to the other. It is a common belief that this practice helps the departed soul in crossing the rivers on his way to heaven (23)*. Similarly, a hollowed out long wooden trough, locally known as *charh*, made from *Cedrus deodara* woodis installed near a source of water for holding drinking water which is used by humans as well as cattle. It is believed that by doing so the departed soul gets water for drinking during his journey to heaven (15)*. Wood of *Cedrus deodara* is used in *yajanas* (16) and in cremation pyre for the final disposition of dead body (19). During wedding ceremony 5 wooden parrots, locally known as *tootey,* made from *Cedrus deodara* wood, are affixed on top of the main entrance of the house. It is believed that the parrots guard the house against ghosts and evil eyes (26)*. A sacred divine water prepared by dipping the bark of 7 trees viz. *Quercus floribunda, Fraxinus excelsior, Cedrus deodara, Pyrus pashia, Alnus nitida, Pyrus communis* and *Pyrus pyrifolia* in water collected from seven different water springs is used to ward off ghosts and influence of black magic and bad evils from the affected person. The affected person is made to sit in cross legged position, his body is completely covered with a fresh white cotton cloth, and the water is sprinkled over his body through a sieve by the shaman (witch doctor) (27)*. Cutting of *Cedrus*	144	Diarrhea, dysentery, fever [3732,30], pulmonary disorders [31], piles, arthritis, skin diseases in cattle [32], wounds [2], skin diseases, external ulcers, arthralgia, headache, itching [5,17,19,22], kill lice [10,1].

					deodara trees in the local sacred grooves is a taboo (18)*.		
Cenchrus americanus (L.) Morrone.	*Kodra*	Poaceae	HBJU-	Seeds	*Gaddi* and *Sippi* tribes are staunch devotees of Lord Shiva and when their wish is fulfilled they solemnize a thanks giving religious ceremony, known as *gusantan*, which is devoted to Lord Shiva. A special liquid sacrament, known as *bagni*, is prepared from *Cenchrus americanus* and *Triticum aestivum* flour. The seeds of *Triticum aestivum* are sprouted by soaking them in water for 2 days. The sprouts are then dried, mixed with the seeds of *Cenchrus americanus* and are ground in the water mill (*gharat*) to make flour. This flour is boiled in water for 3-4 hours with intermittent stirring to from the liquid sacrament (*bagni*) which is served to all the devotees at the culmination of ceremony (58).	58	NR
Centella asiatica (L.) Urb.	*Brahami*	Apiaceae	HBJU-17582	Leaves	Fresh leaves are crushed and mixed with water to form a sacrament, known as *charanamat,* in the temple (15).	15	Memory enhancer, brain tonic, suffocation, restlessness, jaundice, anorexia cold [6,15,28].
Citrus limon (L.) Osbeck	*Nimbu*	Rutaceae	HBJU-17583	Fruit	The fruits of *Citrus limon* and *Capsicum annum* are tied together with a piece of charcoal and hanged over the entrance doors of houses to keep away the ghosts, demons and bad evil (6).	6	Hematuria, dandruff, hairfall [6].
Curcuma longa L.	*Haldar*	Zingiberaceae	HBJU-17584	Rhizome	Powdered rhizomes of *Curcuma longa* are mixed with wheat flour and a semi solid batter with pouring consistency is prepared which is applied on the hands, arms, feet and legs of bride and bridegroom on day of Mehandi (16).	16	Vitiligo [20].
Cydonia oblonga Mill.	*Bahi*	Rosaceae	HBJU-16905	Fruit	Fruits are fixed on the tridents which are offered to local deities (37).	37	Constipation, birth problems, jaundice, cough, cold, fever, dysentry, blood purifier, asthma, chest problems, general body weakness, muscular pains [4,16,17,29],

							chopped skin, itching [38], sore throat, astringent, cardiac stimulant, tonic and expectorant [41].
Cynodon dactylon (L.) Pers.	*Darub*	Poaceae	HBJU-17014	Aerial parts	It is considered as a sacred plant and is used in different social and religious ceremonies (33). On the occasion of 12th day ceremony (locally known as *barola*) of new born baby, the father of baby keeps this sacred grass in his turban as a good omen (33)*. Aerial parts are placed in cooked food items during solar eclipse to protect the food from harmful effect of the eclipse (36). Ganga jal is sprinkled inside the house with aerial parts of this plant to purify the house (37)*. Aerial parts of the plant are tied together with kautuka (*mouli*) thread, dipped in mustard oil and touched three times on the head of bride as well as groom by all relatives one by one while solemnizing an important wedding ceremony locally known as *shandi* (*telai*) (28)*. On *mehandi* day a small quantity of *mehandi* along with this grass and some other articles are gifted by groom's family to bride's family (23)*.	190	Wounds, hyperglycemia [2], muscular pain, cold, fever, kidney and gall stones, dysentery, general body weakness, burning of feet, eye disorders [6, 23], headache [28], blood purifier, hematochezia, dropsy, syphilis, headache, cough, cold, fever, cuts and wounds, warts, inflammation, aphrodisiac, diuretic and aperient [19].
Datura stramonium L.	*Datura*	Solanaceae	HBJU-16873	Flowers	Flowers are offered to Lord Shiva during solemnization of *nuala* (Shiv *pooja*) ceremony (50).	50	Intoxicating, asthma, teeth pain, loss of hairs and dandruff, anti-septic, narcotic, joint pain [5,9,37,41,8,42,27,14,10], urinary infections in cattle [26], dermatitis, boils, dental caries [16,17,38,39,] frost bite, mastitis, piles, athralgia, lumbago [4], urinary infections, toothache [13], anti-inflammatory [21], treat swelling, prevent miscarriage,

							otalgia [6], cough, cold [3,24], poisonous insect bite, body part inflammation, arthralgia [19].
Dendrocalamus strictus (Roxb.) Nees Bambusa arundinacea *Willd*	*Baans*	Poaceae	____	Stem	A sacred bamboo stick bearing 7 nodes, locally known as *khori*, is used to rid a haunted house of the ghosts and evil powers. One person tightly holds the stick with his one hand and the shaman recites sacred incantations in front of stick. The stick starts moving under the influence of incantations and guides the person holding it to the place where evil spirit, locally known as *jadu,* is located (13). It is generally present under the floor in the form of some material substance which is dug out by the shaman and burnt in open.	13	Kidney stones [6].
Desmostachya bipinnata (L.) Stapf	*Darba*	Poaceae	HBJU-17591	Leaves	This is a sacred plant which is considered as manifestation of Brahama, Vishnu and Mahesh. The finger ring made from its leaves is worn by the worshipper while performing *pooja* or *yajana* ceremony as a symbol of purity and sanctity (31). A few leaves are placed on the floor under the mat before starting *pooja* which symbolizes seat (*aasan)*for *pooja*(34).	65	NR
Dolomiaea macrocephala DC. ex Royle.	*Jangli dhoop*	Asteraceae	HBJU-16771	Roots	The dried roots are burnt as incense in the red hot cinder placed in a small bowl like earthen pot with handle, locally known as *daeru*, for worshipping family deity and local deities (80).	80	Eyesight [11].
Fagopyrum esculentum Moench.	*Fulan*	Polygonaceae	HBJU-16836	Seeds	A semi solid batter of *Fagopyrum esculentum* flour with pouring consistency is spread evenly on the griddle to form a thin circular crepe, locally known as *thaplu*, which is eaten by the devotees during religious fasting (53).	53	Hypertension [9].
Ficus palmata Forssk.	*Fagra*	Moraceae	HBJU-16818	Branches	Three small pieces of twigs are tied around a small earthen pot with the help of a piece of thread. The earthen pot is filled with water and used for	19	Lung diseases, bladder disease, wound healing [9,31,32] digestive,

					performing *karma* ritual of a dead person for first 10 days of death. On 10th day this earthen pot is dropped from the head of *karta* (a person who performs *karma* ritual) and is broken down (12)*. *Gaddis* and *Sippis* don't burn the wood of *Ficus palmata* as it is considered inauspicious and bad omen (7)*.		astringent, diuretic [41], white spots [28], styptic, abscess, ooze out thorn [6,40], laxative [37], constipation & bone inflammation [36].
Fraxinus excelsior L.	*Shunu*	Oleaceae	HBJU-16820	Bark	A sacred divine water prepared by dipping the bark of 7 trees viz. *Quercus floribunda, Fraxinus excelsior, Cedrus deodara, Pyrus pashia, Alnus nitida, Pyrus communis* and *Pyrus pyrifolia* in water collected from seven different water springs is used to ward off ghosts and influence of black magic and bad evils from the affected person. The affected person is made to sit in cross legged position, his body is completely covered with a fresh white cotton cloth, and the water is sprinkled over his body through a sieve by the shaman (witch doctor) and this process is locally known as *nahaun* (27).	27	NR
Glycine max (L.) Merr.	*Moth*	Fabaceae	HBJU-17009	Seeds	A mixture of seven cereal grains including *Hordeum vulgare, Oryza sativa, Phaseolus vulgaris, Vigna unguiculata, Triticum aestivum, Zea mays* and *Glycine max*, locally known as *satanna*, is spread inside the house for purification and around the house for protection against ghosts and bad evils (23).	23	NR
Gossypium hirsutum L.	*Rui*	Malvaceae	___	Seeds	Cotton fiber obtained from the seeds of the plant is used for making wick of religious lamp (*diya*) which is burnt during worshipping (45).	45	Hematochezia, galactagouge [6].
Hordeum vulgare L.	*Jao*	Poaceae	HBJU-17031	Seeds	Seeds covered with hull are used as one of the ingredients in *havan samagri* which is burnt in *havan kund* (sacred fire) during *yajnas* (20). Seeds are sown and seedlings are used in pooja and also placed on the turban of priests during *Naag Jagra*, a local religious festival (15)*. A mixture of seven cereal	58	Eye inflammation, blurred vision, asthenia, galactagouge in cattle [6].

					grains including *Hordeum vulgare*, *Oryza sativa*, *Phaseolus vulgaris*, *Vigna unguiculata*, *Triticum aestivum*, *Zea mays* and *Glycine max*, locally known as *satanna,* is spread inside the house for purification and around the house for protection against ghosts and bad evils (23)*.		
Indigofera heterantha Brandis.	*Kathu*	Fabaceae	HBJU-16797	Stems	Tender stems are used for tying together the small pieces of finely split, resinous softwood of *Cedrus deodara*, locally known as *jangni*, which are set on fire to form a wooden fire torch used in *Jagra* in a religious ceremony devoted to *Nag devta* (11)*..	11	Toothache [42,2,19,5,34,35], bronchitis [31], wounds [9], halitosis, styptic, myalgia [19], antimicrobial [37,14], abdominal pain [24].
Jasminum officinale L.	*Suin*	Oleaceae	HBJU-16821	Stems	Tender stems are used for tying together the small pieces of finely split, resinous softwood of *Cedrus deodara*, locally known as *jangni*, which are set on fire to form a wooden fire torch used in *Jagra* (11), a religious ceremony devoted to *Nag devta.*	11	NR
Juglans regia L.	*Akhod*	Juglandaceae	HBJU-16902	Seeds	3-4 seeds of walnut are dipped in sacred water vessel (*kalash*) while performing pooja on different occasions and served as sacrament (*prasad*) (37). Seeds are also used in *Yajna* (sacred fire) (21).	58	Galactagouge in cattle [26], tooth infection, plaque, tongue cleaning, oral hygiene, mouth ulcer, dry cough, hypertension, joint pain, hair fall, chilblain, insect repellent, grey hair [9,41,42,10,17,24,29], internal fever [34], grey hair [38], frost bite [16], alopecia, hypertension, asthma [6], vitiligo [99], tuberculosis, leucorrhoea, memory enhancer, hair dye [19], anti-helminthic [37], cure frost bite [25], headache, giddiness, extreme coldness, diarrhea & severe biliousness [12].

Juniperus communis L.	*Bethal*	Cupressaceae	HBJU-16882	Leaves	Leaves of *Juniperus communis* are burnt over red hot cinders as incense (*deshi dhoop*) while worshipping God (10) and for purifying air (11).	21	Stomachache, intestinal swelling [7], pancreas, prostate, kidney and gall stones, leucorrhoea, dropsy, lumbago, hypoglycemia, hemorrhoids, scurvy [12], rheumatism [10].
Lagenaria sps.	*Bibdi*	Cucurbitaceae	HBJU-17585	Fruits	While solemnizing the *Jogi* or *yagnopavit* (*Janeu*) ceremony in boy's marriage, the dried fruit of *Lagenaria* sps. (locally known as *bibdi*) is tied with a rope on back of groom and covered with a local grass broom (*boukari*) which is held firmly in hand by the grooms assistant (*patmara*). As a part of a ritual the groom is guided by the priest to moves from inside of the house to outside and vice versa 7 times carrying the fruit of *Lagenaria* on his back and during this movement the fruit is broken by his sister-in-laws and brother-in-laws after a scuffle with groom's assistant who tries to protect it (33).	33	NR
Malus domestica (Suckow) Borkh.	*Choo*	Rosaceae	HBJU-17015	Fruits	Fruits are fixed on the trident and also offered to God during worship (54).	54	NR
Morus alba L.	*Toot*	Moraceae	HBJU-16819	Branches	An oblation of the plant is made to the God by offering 108 small pieces of twigs one by one in the *yajna*(30).	30	Dyspepsia [22,30,32], toothache [2], jaundice, aperients [6,19].
Nardostachys jatamansi (D. Don.) DC.	*Murmah*	Caprifoliaceae	HBJU-16785	Roots	Dried roots are crushed and used as an ingredient in *havan samagri*(26)*.	26	NR
Ocimum basilicum L.	*Kudmali*	Lamiaceae	HBJU-16811	Aerial parts	It is considered as a pious plant and offered to the God while worshipping (45)*.	45	Tonic [22], eye flu and allergy [28], cooling effect, digestive [6], vitiligo [20].
Ocimum tenuiflorum L.	*Tulsi*	Lamiaceae	HBJU-17586	Aerial parts, leaves	It is a sacred plant which considered as manifestation of goddess *Lakshmi*. It is grown in the lawns of houses and worshipped to remove negativity from the houses. This plant is also offered to the God while worshipping (22). Fresh leaves are crushed and	46	Bronchitis, respiratory and urinary problems [32], flatulence and pharyngitis, antipyretic [6], vitiligo [20].

					mixed with water to form a sacrament, known as *charanamat*, in the temple (24)*.		
Oryza sativa L.	*Dhaan*	Poaceae	HBJU-16904	Aerial parts, seeds	Ropes made from paddy straw are used for tying small wooden posts for making bier (*arthi*), locally known as *shidh*, on which dead body is carried to the cremation ground (7)*. Paddy grains are used as one of the ingredients in *havan samagri* (5)*. Rice grains and flowers are mixed in water and the goats and sheep are worshipped by sprinkling it in small quantity on their body before sacrifcing them (6)*. This practice is locally known as *patri.* If the animal shakes its body to fling off the water, it is believed that it has been accepted for the sacrifice by the deity and only then the sacrifice is offered. Rice grains are also used by the women for worshipping on the occasion of *Kanchoth*, a local festival (4)*. Straw sleepers (*poola*) made from paddy straw are used as footwear while performing pooja at specified place (*thala*) in the house (5)*. Paddy grains covered with hull are roasted in cauldron and showered by the brother of bride on bride and groom while they circumambulate the sacred fire 7 times exchanging their marital wows when the wedding is solemnized (7). A mixture of seven cereal grains including *Hordeum vulgare, Oryza sativa, Phaseolus vulgaris, Vigna unguiculata, Triticum aestivum, Zea mays* and *Glycine max*, locally known as *satanna*, is spread inside the house for purification and around the house for protection against ghosts and bad evils (23)*.	57	Tonsillitis, expulsion of placenta [6].
Parrotiopsis jacquemontiana (Decne.) Rehder.	*Killar*	Hamamelidaceae	HBJU-16805	Branches	The small pox disease, locally known as *mata*, is regarded as manifestation of goddess *Sitala.* The disease is treated by worshipping and offering prayers to goddess *Sitala.* The patient sleeps over the bedding on the floor and a long sharp edged sickle	23	Skin infection and eruptions, general body pain, wound healing [6,19,25], as antimicrobial applied on wounds [14].

					(*darati*) with wooden handle made from Parrotiopsis *jacquemontiana* or *Quercus floribunda* is kept under his pillow for protection against evil eyes and repelling negative energy (23).		
Phaseolus vulgaris L.	*Rajmash*	Fabaceae	HBJU-16798	Seeds	A mixture of seven cereal grains including *Hordeum vulgare, Oryza sativa, Phaseolus vulgaris, Vigna unguiculata, Triticum aestivum, Zea mays* and *Glycine max*, locally known as *satanna*, is spread inside the house for purification and around the house for protection against ghosts and bad evils (23).	23	NR
Pinus roxburghii Sarg.	*Drab Chil*	Pinaceae	HBJU-16886	Leaves	A tiny broom known as *paroulu*, made from the needles of *Pinus roxburghii*, is swiftly moved to-and-fro repeatedly for blowing air into the burning coal in a small earthen pot, locally known as *daeru*, in which incense (*dhoop*) is burnt while performing pooja (56).	56	Chronic bronchitis [31], kidney disorders [2].
Pinus wallichiana A.B.Jacks.	*Chil*	Pinaceae	HBJU-16887	Branches	The fresh branches of *Pinus wallichiana*, locally known as *champu*, are used for making toran - a decorated gateway to the lawn of wedding house for welcoming the baratis and other guests (10)*.	10	Cracked heels, skin problems, boils, cuts and wounds, anti-phlogistic [37,14,1,12,16,17,19,22,26], cough and cold [31], boils, insect repellent, wormicide, intestinal infections [23].
Prinsepia utilis Royle.	*Jeentay*	Rosaceae	HBJU-16854	Branches, leaves, flowers	*Kanchoth* (Gauri tritya) is a local festival in district Doda which is celebrated on *Tritiya* of *Shukla Paksha* in *Magh* month during winter season. On this day the married Hindu women including those of *Gaddi* and *Sippi* tribe observe fast for the whole day and pray for longevity, prosperity and wellbeing of their husband. On this occasion leaves and flowers of this plant are used for worshipping by the women and are also offered by them to their husbands (31)*. *Gaddis* and *Sippis* believe that the evil powers become most effective and harmful during 7 days period after *Shivratri*- a famous Hindu festival. Fresh twigs of this	73	Abdominal pain, kidney stones, tonsils, allergies [42,7,35], rheumatic pains [9,37], blood purifier, diabetes [15].

					plant are hanged over the doors, windows, ventilators and chimneys of houses on the ocassion of *Shivratri* with the belief that it guards the house (18), keeps the ghosts and demons away (15) and neutralizes the evil powers (9).		
Prunus persica (L.) Batsch.	*Aaron*	Rosaceae	HBJU-16857	Branches	A bow and a walking stick made from fresh twigs of *Prunus persica* are used during *Jogi* ceremony in boy's wedding. During this ceremony the groom dresses like Lord Shiva and walks from inside of the house to outside and vice versa 7 times with the help of this walking stick while carrying the bow slinging over his shoulder (57)*.	57	Insecticidal, wormicidal, wound healing, constipation, menstrual disorders, joint pains, wounds, burns [6,41,19,28,23].
Pyrus communis L.	*Bhagosh*	Rosaceae	HBJU-17016	Bark	A sacred divine water prepared by dipping the bark of 7 trees viz. *Quercus floribunda, Fraxinus excelsior, Cedrus deodara, Pyrus pashia, Alnus nitida*, *Pyrus communis*, and *Pyrus pyrifolia* in water collected from seven different water springs is used to ward off ghosts and influence of black magic and bad evils from the affected person. The affected person is made to sit in cross legged position, his body is completely covered with a fresh white cotton cloth and the water is sprinkled over his body through a sieve by the shaman (witch doctor) and this process is locally known as *nahaun* (27).	27	Tonic and astringent [90], chronic constipation, kidney stones, heart palpitation, urinary problems [23].
Pyrus pashia Buch.-Ham. ex D.Don.	*Kaith*	Rosaceae	HBJU-16858	Bark	Same as above	27	Diarrhoea [2], eye infection, insect repellent [6,36], conjunctivitis [37], hair fall [42].
Pyrus pyrifolia (Burm.f.) Nakai.	*Nakh*	Rosaceae	HBJU-17575	Bark	Same as above	27	NR
Quercus floribunda Lindl. ex A.Camus.	*Maru*	Fagaceae	HBJU-16801	Stem, branches, bark	The fuel wood of *Quercus floribunda* is used for sacred fire (*Jagra*) lit in open during the Amavasya night of Bhadu month on the occasion of a religious festival known as *Jagra* devoted to Nag Devta (7)*. In the morning before sunrise, the red hot cinders of	43	NR

					Quercus floribunda fuelwood are trampled bare feet by the priests while they are in trance. A small rod made from branch of *Q. floribunda* is used for stirring a liquid sacrament prepared from flour of *Cenchrus americanus* and *Triticum aestivum* grains in a religious ceremony viz. *gusantan* devoted to Lord Shiva (6)*. A sacred divine water prepared by dipping the bark of 7 trees viz. *Quercus floribunda, Fraxinus excelsior, Cedrus deodara, Pyrus pashia, Alnus nitida, Pyrus communis* and *Pyrus pyrifolia*in water collected from seven different water springs is used to ward off ghosts and influence of black magic and bad evils from the affected person. The affected person is made to sit in cross legged position, his body is completely covered with a fresh white cotton cloth, and the water is sprinkled over his body through a sieve by the shaman (witch doctor) (27)*. The small pox disease, locally known as *mata*, is regarded by the *Gaddi* and *Sippi* tribes as manifestation of goddess *Sitala*. The disease is treated by worshipping and offering prayers to goddess *Sitala*. The patient sleeps over the bedding on the floor and a long sharp edged sickle (*darati)* with wooden handle made from branches of *Parrotiopsis jacquemontiana* or *Quercus floribunda* is kept under his pillow for protection against evil eyes and repelling negative energy (3)*.		
Raphanus raphanistrum subsp. sativus (L.) Domin	*Mooli*	Brassicaceae	HBJU-16782	Roots	Roots are used while performing pooja during *pindadan* ritual from 1st to 10th day of death of a person and also during *sraddha*rituals (annual homage to dead ancestors) (49).	49	Hairfall, Jaundice, impotency, bleeding piles [17], indigestion, loss of appetitie, chronic constipation, jaundice, urinary problems [23], vitiligo [20].
Rosa brunonii Lindl.	*Kojein*	Rosaceae	HBJU-16859	Stem	A large ring, locally known as *taradh*, is made from fresh stem and three wooden fire torches (*mashal*) are tied to it at 3 different positions. The person	47	Nausea, constipations, eye disease [9].

					suffering from witchcraft and black magic is made to pass through this ring thrice by the Shamanto get rid of evil powers (47).		
Rosa indica L.	*Gulab*	Rosaceae	HBJU-17017	Flowers	The flowers are offered to the God while worshipping (55).	55	Dyspepsia, flatulence, aperient [6].
Santalum album L.	*Chandan*	Santalaceae	_____	Stem	A garland made by tying small pieces of *Santalum album* wood with thread is put around the neck of dead person. At least one small piece of wood is used for cremation of dead person by his close relatives (22)*. The wood is rubbed against a flat stone with water to form a thin paste which is applied on the forehead as a sacred mark (*tilak*) generally after performing pooja (23).	45	NR
Sesamum indicum L.	*Til*	Pedaliaceae	_____	Seeds	Seeds are considered to be holy and are mixed in water which is used for taking bath for purity of the body after attending funeral ceremony (43)*.	43	Vitiligo [20].
Solanum tuberosum L.	*Potato*	Solanaceae	HBJU-16874	Tubers	Tubers are cooked without salt and eaten during religious fasting (50).	50	Blemishes, headache [6,22], fire burns [24].
Spiraea canescens D. Don.	*Pribri*	Rosaceae	HBJU-16864	Stem	*Gaddis* and *Sippis* are staunch worshippers of Lord Shiva and they offer *nuala* (Shiv pooja folllowed by feast) to the God when their wish is fulfilled. During solemnization of *nuala* ceremony, 5 woolen threads are hanged down the ceiling which are attached midway to a ring made from fresh stem of *Spirea canescens.* The wool is twisted around the hanging threads and the attached ring which are together known as *Shiv mala* and worshipped by offering raw sheep wool (57).	57	Nervous system disorders [9].
Tagetes erecta L.	*Gutta*	Asteraceae	HBJU-17587	Flowers	Flowers are offered to the God or deity while worshipping (36) and the garland of flowers is put around the neck of religious idols (32).	68	Aperient, otalgia [6].
Themeda anathera (Nees ex Steud.) Hack.	*Aaloo*	Poaceae	HBJU-16831	Aerial parts	A broom (locally known as *boukri*) made from a local grass *Themeda anathera* is used by groom's assistant in *Jogi* ceremony of Boy's marriage for covering the dried fruit of *Lagenaria*sp. tied on groom's back. The	32	NR

					grass used for making this broom is cut during sharad *navaratris* (autumn *navratris*) (32).		
Tripidium rufipilum (Steud.) Welker, Voronts. & E.A.Kellogg.	*Kash*	Poaceae	HBJU-17570	Leaves	This is a sacred plant and the finger ring made from its leaves is worn by the person while worshipping or performing *yajana* ceremony as a symbol of purity and sanctity (30). *Gaddis* and *Sippis* don't trample or sit on this grass as they believe that God *Rama* used this plant as bedding for sleeping during exile (28).	58	NR
Triticum aestivum L.	*Kanak*	Poaceae	HBJU-16832	Aerial parts, seeds	For 10 days after the death of a person, one of his sons or the brothers who performed funeral rites, sleeps on paddy or wheat straw spread over the floor as bedding material and covered with a woolen blanket (14)*. The *Gaddi* and *Sippi* tribes treat small pox disease by worshipping and offering prayers to goddess Sitala for 3, 5 or 7 days depending upon the severity of disease and then the sacred feast (locally known as *bhoj*) is offered to goddess Sitala. The sacred feast consists of snacks (*pakora*, locally known as *chidwe*) made from crushed *Vigna mungo* seeds, and chapatis (locally known as *luchi*), made from *Triticum aestivum* flour by applying mustard oil (11). During *Jogi* ceremony in boys' marriage, the groom dresses like Lord Shiva and puts on large ear rings, known as *Shiv Ji ri mundra*, made from flour of *Triticum aestivum* mixed with turmeric powder (9)*. A mixture of seven cereal grains including *Hordeum vulgare, Oryza sativa, Phaseolus vulgaris, Vigna unguiculata, Triticum aestivum, Zea mays* and *Glycine max*, locally known as *satanna,* is spread inside the house for purification and around the house for protection against ghosts and bad evils (23)*.	57	NR
Vigna mungo (L.) Hepper	*Maah*	Fabaceae	HBJU-17011	Seeds	The small pox disease, locally known as *mata*, is regarded by the *Gaddi* and *Sippi* tribes as manifestation of goddess *Sitala*. The disease is	44	Conception, eases labour pain in cattle [18], vitiligo [20].

					treated by worshipping and offering prayers to goddess*Sitala* for 3, 5 or 7 days depending upon the severity of disease and then the sacred feast (locally known as *bhoj*) is offered to godess Sitala. The sacred feast consists of snacks (*pakora*, locally known as *chidwe*) made from crushed *Vigna mungo* seeds and wheat flour chapatis (locally known as *luchi*) prepared by applying mustard oil (44)*.		
Vigna unguiculata (L.) Walp.	*Rongi*	Fabaceae	HBJU-17588	Seeds	A mixture of seven cereal grains including *Hordeum vulgare, Oryza sativa, Phaseolus vulgaris, Vigna unguiculata, Triticum aestivum, Zea mays* and *Glycine max,* locally known as *satanna*, is spread inside the house for purification and around the house for protection against ghosts and bad evils (23).	23	NR
Zea mays L.	*Kukdi*	Poaceae	HBJU-16883	Seeds	A mixture of seven cereal grains including *Hordeum vulgare, Oryza sativa, Phaseolus vulgaris, Vigna unguiculata, Triticum aestivum, Zea mays* and *Glycine max*, locally known as *satanna*, is spread inside the house for purification and around the house for protection against ghosts and bad evils (23)*.	56	Dandruff [2], diuretic [6].

Note:- Asterisk [*] sign in the table indicates new use reports.

References used in the Table: 1- Abdullah & Andrabi, 2021; 2-Ahmed & Ajaz 2017; 3-Asif *et al.* 2021; 4-Bano et al.2017; 5-Bhat *et al.* 2014; 6-Bhatia *et al.* 2014; 7-Dangwal & Singh, 2013; 8-Dar *et al.* 2018; 9-Dutt *et al.* 2015; 10-Farooq *et al.* 2022; 11-Hassan *et al.* 2021; 12-Jan & Khare, 2015; 13-Kanta *et al.* 2018; 14-Khan *et al.* 2022; 15-Khan & Wani, 2017; 16-Khanday & Singh, 2017a; 17-Khanday & Singh, 2017b; 18-Khuroo *et al.* 2007; 19-Kumar *et al.* 2015b; 20-Kumar *et al.* 2023; 21-Kumari *et al.* 2013; 22-Lone *et al.* 2012; 23-Lone & Bhardwaj, 2013; 24-Lone & Jain, 2022; 25-Mir 2014a; 26-Mir, 2014b; 27-Mir *et al.* 2021; 28-Nanda *et al.* 2022; 29-Rajoriya *et al.* 2016; 2015; 30-Rashid, 2012; 31-Rashid, 2013; 32-Riaz & Bhandari, 33-Shah *et al.* 2012; 34-Shah *et al.* 2015a; 35-Shah *et al.* 2015b; 36-Singh *et al.* 2020; 37-Singh *et al.* 2021a; 38-Singh & Khanday, 2017a; 39-Singh & Khanday, 2017b; 40-Singhal & Sharma, 2020; 41-Trak & Giri, 2017; 42-Wani *et al.* 2021.

Abbreviations used in the Tabe: NR-Not reported.

The species used for the protection of houses against ghosts and demons are *Prinsepia utilis* (CI, 0.47), *Cedrus deodara, Hordeum vulgare* (0.26), *Dendrocalamus strictus* (0.14) and *Capsicum annuum* (0.10). Thakur et. al., 2021a have also noted the use of *Prinsepia utilis* in MBE practices from Doda district (Thakur *et al.* 2021a). A mixture of seven cereal grains including *Hordeum vulgare*, *Oryza sativa*, *Phaseolus vulgaris*, *Vigna unguiculata*, *Triticum aestivum*, *Zea mays* and *Glycine max,* locally known as *satanna*, is spread inside the house for purification and around the house for protection against ghosts and bad evils by *Gaddis* and *Sippis*. In contrast to this, *Hordeum vulgare* is used as SRR species in Kullu (H.P) India (Thakur *et al.* 2023) and in Doda district of UT of JK (Thakur *et al.* 2021b). *Dendrocalamus strictus* is used to rid a haunted house of the ghosts and evil powers, whereas in other parts of Jammu region it is used for making beir (Thakur *et al.* 2021b). Fruits of *Capsicum annuum* and *Citrus limon*, tied together with a piece of charcoal and hung above the house entrances are believed to keep the ghosts and bad evile away. Similar practice has also been noted in other districts of Jammu region of UT of J&K (Thakur *et al.* 2021b). In Assam, however, the dried fruits of *Capsicum annuum* are burnt for protection against evil forces (Pangging *et al.* 2021; Pangging *et al.* 2018). Gaddis and Sippis have reported a novel ethnobotanical use of *Cannabis sativa* (CI, 0.30), attributing to it mystical properties for treating snakebite victims and promoting conception in cows.

Socio-cultural rituals (SCR)

Since *Gaddi* and *Sippi* tribes live in far flung, isolated places on sloppy terrains of NW Himalayas totally away from the influence of mainstream society, they have a rich and unique cultural heritage and plants form an integral part of their culture. Among the 60 plant species reported in this study, 10 were utilized in socio-cultural rituals. These species were primarily used in the marriage ceremonies. The most prominent of these species are *Prunus persica* (CI, 0.63), *Cynodon dactylon* (0.57)*, Lagernaria* sp. (0.37)*, Themeda anathera* (0.36), and *Cedrus deodara* (0.29). Socio-cultural usage of *Cynodon dactylon* in the marriage ceremonies is also reported from Jammu region of UT of J&K (Thakur *et al.* 2021b), Darjeeling and Sikkim Himalayas (Chhetri *et al.* 2020), Kullu district (Thakur *et al.* 2023) and sub-Himalayan area of Uttarakhand, India (Sharma *et al.* 2022). All other documented species are new reports for the world. In a novel usage, during wedding ceremony 5 wooden parrots *(totey)* made from *Cedrus deodara* wood are affixed on top of the main entrance of the houses to guard the house against ghosts and evil eyes.

person, after performing religious rites, (f) A small broom made from the needles of *Pinus roxburghii* is used to gently blow air onto burning coals in an earthen pot, where incense is burned during the performance of pooja.

Taboos (TAB)

There are certain beliefs and taboos related to magico-religious plants among the tribes under survey. However, a comparatively small number of plants (3 species) belong to this category. Cutting of plants, mainly *Cedrus deodara* in the local sacred grooves *(banis)* is a taboo for *Gaddi* and *Sippi* communities and it helps in the conservation of such plants through local sanctions. In Kullu district also, *Cedrus deodara* holds religious significance as it is believed to be inhabited by Devi Jogani and is often found planted near temples (Thakur *et al.* 2023). *Gaddis* and *Sippis* don't burn the wood of *Ficus palmata* as it is considered inauspicious and bad omen. In contrast to this, the species is used for the funeral rites in Doda, Kishtwar, Poonch and Rajouri areas of UT of J&K (Thakur *et al.* 2021b). In a novel usage, Gaddis and Sippis consider *Tripidium rufipilum* grass as highly sacred and don't trample or sit on it. They believe that Lord Ram used this plant as bedding for sleeping during exile.

The most important SMRPs for *Gaddi* and *Sippi* tribes

The most important socio-magico-religious plant species (Table 2) for *Gaddi* and *Sippi* tribes were *Brassica juncea* (CI. 2.2), *Cynodon dactylon* (2.1), and *Cedrus deodara* (1.6). The Deori (Pangging *et al.* 2019) and Missing tribes (Pangging *et al.* 22021) of Assam have also reported *Brassica juncea* as the most important species used for sacred and religious rites and magical believes and exorcism. The species is employed to ward off unanticipated forces due to its unusual smell. *Cedrus deodara* and *Capsicum annuum* were the most important magico-religious plant species of Doda district (Thakur *et al.* 2021a) and other parts of Jammu region (Thakur *et al.* 2021b). *Datura stramonium* L. was reported to be the culturally significant species in the sub-Himalayan areas of Uttarakhand (Sharma *et al.* 2022). According to Thakur *et al.* (2023), *Ficus religiosa* is the most important plant species used in magico-religious traditions in Kullu district, Himachal Pradesh.

Figure 5 (a-f). Some of the socio-magico-religious practices performed by the *Gaddi* and *Sippi* tribes; (a) Shiv Nuala ceremony: A Shiv Mala consisting of 5 woolen threads hanging down the ceiling and attached midway to a ring made from fresh twig of *Spirea canescens*, (b) Nag Devta Jagra: *Malus domestica* fruits fixed on the trident and young seedlings of *Hordeum vulgare* placed on the turban of priests during, (c) *Jogi* ceremony of bridegroom: A walking stick made from *Prunus persica* twig, a grass broom made from *Themeda anathera*, fruit of *Lagenaria* sps. on the back and ear ring made from flour of *Triticum aestivum* and *Curcuma longa* powder, (d) Nag Devta Jagra ritual: the priest, in a trance, walks barefoot over the hot cinders of *Quercus floribunda* firewood, (e) A long wooden log of *Cedrus deodara* is ceremonially laid across a water stream, in the name of dead person, after performing religious rites, (f) A small broom made from the needles of *Pinus roxburghii* is used to gently blow air onto burning coals in an earthen pot, where incense is burned during the performance of pooja.

Table 2. Cultural importance value (CI) of the socio-magico-religious plants under the various use categories.

Plant name	CI_{MBE}	CI_{SCR}	CI_{SRR}	CI_{TAB}	CI_{Total}
Alnus nitida (Spach) Endl.	0.30				0.3
Amaranthus caudatus L.			0.58		0.6
Amaranthus viridis L.			0.57		0.6
Berberis lycium Royle.		0.16			0.2
Betula utilis D.Don.	0.06				0.1
Brassica juncea (L.) Czern.	1.53		0.70		2.2
Cannabis sativa L.	0.30		0.26		0.6
Capsicum annuum L.	0.10				0.1
Cedrus deodara (Roxb. ex D.Don) G.Don	0.30	0.29	0.81	0.20	1.6
Cenchrus americanus (L.) Morrone.			0.64		0.6
Centella asiatica (L.) Urb.			0.17		0.2
Citrus limon (L.) Osbeck	0.07				0.1
Curcuma longa L.		0.18			0.2
Cydonia oblonga Mill.			0.41		0.4
Cynodon dactylon (L.) Pers.		0.57	1.54		2.1
Datura stramonium L.			0.56		0.6
Dendrocalamus strictus (Roxb.) Nees	0.14				0.1
Desmostachya bipinnata (L.) Stapf			0.72		0.7
Dolomiaea macrocephala DC. ex Royle.			0.89		0.9
Fagopyrum esculentum Moench.			0.59		0.6
Ficus palmata Forssk.			0.13	0.08	0.2
Fraxinus excelsior L.	0.30				0.3
Glycine max (L.) Merr.	0.26				0.3
Gossypium hirsutum L.			0.50		0.5
Hordeum vulgare L.	0.26		0.39		0.6
Indigofera heterantha Brandis.			0.12		0.1
Jasminum officinale L.			0.12		0.1
Juglans regia L.			0.64		0.6
Juniperus communis L.			0.23		0.2
Lagenaria sps.		0.37			0.4
Malus domestica (Suckow) Borkh.			0.60		0.6
Morus alba L.			0.33		0.3
Nardostachys jatamansi (D. Don.) DC.			0.29		0.3
Ocimum basilicum L.			0.50		0.5
Ocimum tenuiflorum L.			0.51		0.5
Oryza sativa L.	0.26	0.08	0.30		0.6
Parrotiopsis jacquemontiana (Decne.) Rehder.	0.26				0.3
Phaseolus vulgaris L.	0.26				0.3
Pinus roxburghii Sarg.			0.62		0.6
Pinus wallichiana A.B.Jacks.		0.11			0.1
Prinsepia utilis Royle.	0.47		0.34		0.8
Prunus persica (L.) Batsch.		0.63			0.6
Pyrus communis L.	0.30				0.3
Pyrus pashia Buch.-Ham. ex D.Don	0.30				0.3
Pyrus pyrifolia (Burm.f.) Nakai.	0.30				0.3
Quercus floribunda Lindl. ex A.Camus.	0.33		0.14		0.5
Raphanus raphanistrum subsp. *sativus* (L.) Domin			0.54		0.5
Rosa brunonii Lindl.	0.52				0.5
Rosa indica L.			0.61		0.6
Santalum album L.			0.50		0.5
Sesamum indicum L.			0.48		0.5

Solanum tuberosum L.			0.56		0.6
Spiraea canescens D. Don.			0.63		0.6
Tagetes erecta L.			0.76		0.8
Themeda anathera (Nees ex Steud.) Hack.		0.36			0.4
Tripidium rufipilum (Steud.) Welker, Voronts. & E.A.Kellogg.			0.33	0.31	0.6
Triticum aestivum L.	0.26	0.10	0.28		0.6
Vigna mungo (L.) Hepper			0.49		0.5
Vigna unguiculata (L.) Walp.	0.26				0.3
Zea mays L.	0.26		0.37		0.6

Informant Consensus Factor (F_{ic})

The Fic values ranged from a minimum of 0.962 in the 'taboos' category to a maximum of 0.978 in sacred and religious rites category (Table 3).

Table 3. Informant consensus factor (F_{ic}) of the various use-categories

Use category	Nur	Nt	FIC
Sacred and religious rites (SRR)	1779	40	0.978
Magical belief and exorcism (MBE)	663	23	0.967
Socio-cultural rituals (SCR)	255	10	0.965
Taboos (TAB)	53	3	0.962

These values are well within the range from 0.88 to 1.0 F_{ic} recorded for magico-religious research conducted across various regions of India (Pangging *et al.* 2021). Pangging et. al., 2021 and Sharma et. al., 2022 have also recorded the maximum F_{ic} values for the species used in 'sacred and religious rites'. In Doda (Thakur *et al.* 2021a) and other districts of Jammu region (Thakur *et al.* 2021b), species used in divine drinks recorded the maximum consensus. The high values of F_{ic} indicate that the *Gaddi*s and *Sippis* have a great deal of agreement over the use of SMRPs and they effectively transmit this valuable information from one generation to another.

Jaccard's Index

In present study, the Jaccard's Index (JI) values, ranged between 0 and 24.1. A low Jaccard's Index (JI) reflects limited overlap in plant species between two regions, suggesting distinct ethnobotanical practices, while a high JI denotes substantial similarity, indicating shared cultural or ecological characteristics. The highest similarity was observed in the Doda district, (UT of J&K), India, with a JI value of 24.1 (Thakur *et al.* 2021a), followed by Paddar valley of Jammu & Kashmir, with a JI of 17.9 (Singh *et al.* 2024). Some of the species viz. *Cannabis sativa, Curcuma longa, Cynodon dactylon, Ocimum tenuiflorum, Santalum album* and *Juglans regia* reported in the present study have been repeatedly identified as the most common plant species in previous similar studies from India. Their repeated appearance in different ethnobotanical studies suggests that they hold a great cultural significance across various parts of India. Judicious use of these plant species is recommended as a means of promoting their conservation. By contrast, the SMRPs reported from Gorakhpur, U.P (JI=0.0), Assam, India (JI=1.1) and Yunnan Province, China (JI=1.1), shared no similarity with those in the present study, reflecting the regions' distinct ecological and cultural landscapes (Mishra, 2016). The variation in traditional plant usage between different regions is not only a reflection of varied phytodiversity but also of deep-rooted socio-cultural and geographical differences.

Table 4. Jaccard's Index

S. No.	Previous study area	No. of species reported	No. of species common to the present study	Jaccard's index	References
1	Doda district, J&K, India	48	21	24.1	Thakur *et al.* 2021a
2	Paddar valley, J&K, India	32	14	17.9	Singh *et al.* 2024
3	Neeru Watershed, district Doda, J&K, India	21	12	17.4	Dutt & Kant, 2008

4	Kathua, J&K, India	35	13	15.9	Kumar, 2014
5	Kullu district, Himachal Pradesh, Inda	75	17	14.4	Thakur *et al.* 2023
6	Rudraprayag, Uttrakhand, India	21	8	11.0	Kumar, 2009
7	Darjeeling & Sikkim Himalayas, India	74	12	9.8	Chhetri *et al.* 2020
8	Kanawar Wildlife Sanctuary, Himachal Pradesh, India	33	7	8.1	Samant *et al.* 2020
9	Bilaspur, Uttar Pradesh, India	22	6	7.9	Verma, 2018
10	Ananthagiri Reserve Forest, Telangana, India	47	7	7.0	Sureshbabu & Ramakrishna, 2019
11	Assam, India	36	6	6.7	Shama *et al.* 2012
12	Fatehpur district, Uttar Pradesh, India	21	5	6.6	Agarwal, 2014
13	Bhutan	24	5	6.3	Jigme & Yangchen, 2022
14	Tripura, India	59	7	6.2	Sharma *et al.* 2014
15	Assam, India	48	6	5.9	Brahma *et al.* 2014
16	Uttrakhand, India	34	5	5.6	Sharma *et al.* 2022
17	Warud tahsil, district Amravati, Maharashta, India	21	4	5.2	Bobade, 2021
18	Dhemaji and Lakhimpur districts, Assam, India	61	6	5.2	Pangging *et al.* 2019
19	Lakhimpur district, Assam, India	48	5	4.9	Pangging *et al.* 2018
20	Wayanad District, Kerala, India	40	4	4.2	Pramod *et al.* 2003
21	Kishtwar district, J&K, India	16	3	4.1	Ayub *et al.* 2014
22	Assam, India	63	4	3.4	Pangging *et al.* 2021
23	Janjgir-champa district, Chhattisgarh, India	36	3	3.2	Gupta *et al.* 2022
24	Boudh district, Odisha, India	48	2	1.9	Sahu *et al.* 2013
25	Assam, India	30	1	1.1	Sharma & Pegu, 2011
26	Yunnan Province, China	32	1	1.1	Geng *et al.* 2017
27	Gorakhpur, Uttar Pradesh, India	11	0	0.0	Mishra, 2016

Knowledge of SMRPs with respect to gender, age and education level

The first hypothesis that the women possess greater knowledge than men was supported, as women (33.7 ± 8.7) demonstrated significantly (*F-value* = 12.6; *P < 0.001*) higher knowledge of SMRPs compared to men (28.3 ± 5.7). This significant difference was observed in the overall knowledge as well as in the SCR (5.0 ± 2.4) and MBE (9.1 ± 3.1) categories. However, no significant difference was found in the use of SMRPs within the SRR and TAB categories. Similar observations were noted by Pangging *et al.* (2021), who reported that women informants contributed more extensively to SMRPs and MBE category. A similar trend has been observed by Bhatia *et al.* (2018), who highlighted the predominant role of women in conservation of indigenous knowledge because they are involved in cattle raring and other household activities (Bhatia *et al.* 2018). Conversely, Pangging *et al.* (2019) reported no notable gender-based differences in magico-religious plant knowledge among the Deori tribe in Assam (Pangging *et al.* 2019).

Ethnomedicinal uses of SMRPs.

A comprehensive review of 42 research articles revealed that, of the 60 SMRP species documented in the present dtudy, 44 species (73.3%) are also utilized for ethnomedicinal purposes in the U.T of J&K, thereby contributing to their economic significance (Table 1). These plants have traditionally been used to treat a range of diseases and ailments like digestive problems, dysentery, diarrhea, jaundice, piles, cholera, diabetes, urological problems, musculoskeletal problems, skin diseases, fever, cold, cough, asthma, dropsy, syphilis, wound healing and as wormicides and antioxidants. Hence, SMRPs play a pivotal role not only in culture and religious life of tribals and rural communities but also in their traditional healthcare system. Thus their conservation will help the rural communities in maintaining good health and living a healthy life.

Table 5.Knowledge of SMRPs with respect to gender, age, and education level of the informants

Attributes	Taboos (TAB)	Socio-cultural rituals (SCR)	Magical belief and exorcism (MBE)	Sacred and religious rites (SRR)	Total SMRPs
Gender					
Women	3.4[a]± 2.5	5.0[a]± 2.4	9.1[a]± 3.1	20.2[a]± 8.0	33.7[a]± 8.7
Men	2.7[a]± 1.3	3.3[b]± 1.1	6.1[b]± 2.2	19.5[a]± 4.9	28.3[b]± 5.7
F- value	0.5	14.4	28.8	0.2	12.6
P-value	0.510[ns]	<0.001**	<0.001**	0.622[ns]	<0.001**
Age					
< 40 yrs	0.0[a]	3.5[b]± 1.3	5.4[c]± 1.8	17.1[a]± 4.3	24.8[c]± 4.4
40-60 yrs	4.0[a]± 2.9	3.4[b]± 1.5	6.9[b]± 2.6	20.6[a] ± 6.5	30.1[b]± 6.3
>60 yrs	2.8[a]± 1.7	5.0[a] ± 2.3	9.5[a]± 3.1	20.5[a]± 7.1	35.6[a]± 8.2
F- value	1.0	5.1	15.4	2.3	15.8
P-value	0.335[ns]	0.009*	< 0.001**	0.097[ns]	< 0.001**
Education					
No formal education	3.3[a]± 2.0	4.4[a]± 2.2	9.3[a]± 2.7	22.0[a]± 7.4	36.1[a]± 6.7
1-8 class	1.0[a]	3.5[a]± 1.8	6.5[b]± 2.3	19.3[b]± 4.7	28.1[b]± 4.1
> 8 class	-	3.5[a]± 1.2	5.2[c]± 1.9	16.9[c]± 4.8	24.1[c]± 4.2
F- value	1.2	1.8	25.6	5.8	41.1
P-value	0.296[ns]	0.174[ns]	<0.001**	0.004*	<0.001**

Values given are mean ± standard deviation. Significant ANOVA at *P < 0.01* and *0.001* is represented by * and **, respectively; ns=non-significant. Fisher's LSD was applied as the Multiple Range Test to find the significantly higher values when ANOVA detected significant difference (*P* <0.05) between the richness and diversity indices of four sites. Values within a column

Community based plant conservation practices

There are some beliefs and taboos among the communities under investigation which are associated with the conservation of local phytodiversity. Many small sacred groves are found in the study area. People have imposed restrictions on cutting of plants and extraction of forest produce from the patches of forests in the close vicinity of forest deities in the study area and such sacred patches of forests with religious significance are locally known as '*bani*' (sacred groves). Some of the banis in the study are *Nagni Mata Bani - Manthla, Buddu Nag Bani - Bamlakhi, Malni Mata Bani - Kansar* and *Nag Bani - Thuba.* Most of the *banis* are associated with serpent God (*Nag Devta*) or serpent Goddess (*Nagni Mata)*. *Gaddi* and *Sippi* tribes are staunch worshippers of Lord *Shiva* and *Nag Devta* and thus worship snakes. It is a common belief among the *Gaddi* and *Sippi* tribes that cutting of trees or other plants within the *bani* of any of the local deities would displease the deity who may punish the offender individually or may bring the disaster for the whole community in the form of floods, drought, famine etc. It is believed that if someone breaks the taboo of cutting trees within the *bani* of *Nag Devta* or *Nagni Mata*, the snakes (*Nag*) would appear in the house of the offender and may cause heavy damage to him or his family in one way or the other. Therefore, cutting plants within any of the *banis* is a strong taboo for the community members. This belief has contributed to the in-situ conservation of various plant species on religious grounds, especially *Pinus wallichiana and Cedrus deodara*, as these species predominantly dominate all the banis in the study area.

Moreover, some of the reported plant species are cultivated and protected by the tribes in question exclusively for their use in socio-magico-religious practices and are thus conserved by means of *ex-situ* conservation, for example, *Amaranthus caudatus, Amaranthus viridis, Cenchrus americanus, Lagenaria sps., Ocimum tenuiflorum* and *Tagetes erecta.* Further, *Gaddi* and *Sippi* tribes consider the grass broom made from *Themeda anathera* as pious and never trample it or touch it with feet. If it so happens accidently to any person it is consider as inauspicious sign and the man bows down to the broom. This broom is used in the *Jogi* ceremony in boys' marriage when the groom's assistant covers the dried fruit of *Lagenaria* sp*.,* tied on groom's back, with this broom. The grass used for making broom is cut during *sharad navaratris* (autumn Navratris) during the month of October on religious grounds.

Desmostachya bipinnata is another highly religious plant for *Gaddi* and *Sippi* tribes, which is harvested only on the day of *Amavasya* in the month of October. Interestingly, these plants set their seeds before their mentioned reaping periods which ensure uninterrupted propagation and thus conservation of these plants under natural conditions. Thus socio-magico-religious practices are directly linked with the conservation of local plants.

Novelty of the study

Survey of the published literature reveals that out of 60 plant species documeneted in the present study, 19 species are the new records in socio-magico-religious practices from UT of Jammu and Kashmir to the best of our knowledge. These species are *Alnus nitida* (Spach) Endl. *Amaranthus viridis* L., *Cenchrus americanus* (L.) Morrone., *Glycine max* (L.) Merr., *Jasminum officinale* L., *Lagenaria sps., Parrotiopsis jacquemontiana* (Decne.) Rehder., *Phaseolus vulgaris* L*, Pinus roxburghii* Sarg., *Pyrus communis* L., *Pyrus pashia* Buch.-Ham. ex D.Don., *Pyrus pyrifolia* (Burm.f.) Nakai, *Raphanus raphanistrum subsp. sativus* (L.) Domin, *Rosa brunonii* Lindl., *Rosa indica* L., *Spiraea canescens* D. Don., *Themeda anathera* (Nees ex Steud.) Hack., *Tripidium rufipilum* (Steud.) Welker, Voronts. & E.A. Kellogg., *Vigna unguiculata* (L.) Walp. Furthermore, this study documented 39 new socio-magico-religious uses for 20 plant species previously reported in these practices from the UT of Jammu and Kashmir. These new use reports have been indicated by the asterisk (*) sign in Table-1.

New records of socio-magico-religious plants are important because they help preserve fading traditional knowledge, deepen our understanding of cultural belief systems, support community-based heritage preservation and enrich ethnobotanical science.

Conclusion

The results of the present study reveal that the Gaddi and Sippi communities maintain strong religious beliefs, hold various superstitions and thus use good number of plants in socio-magico-religious practices. *Gaddis* are Shaivites who worship Lord Shiva and have staunch belief that the blessings of God always provide protection to them and their flock of goat and sheep. They believe in black magic and witchcraft and consult shamans and priests, locally know as *chela*, for exorcism and finding solution to different problems of day to day life. Fumigation (*dhoni*) of the affected person with burning *Brassica juncea* seeds, ritually consecrated with incantation by the shaman or priest, for exorcism is a household practice among the whole community.

Some of the socio-magico-religious practices and taboos of *Gaddi* and *Sippi* tribes are closely linked to the community based conservation of local plants. These tribes form ecosystem communities that are closely connected with nature and maintain a balanced and harmonious relationship with the natural environment. Review of published literature reveals that most of socio-magico-religious plants also possess medicinal potential which adds to their economic values. Hence, conservation of socio-magico-religious practices of the *Gaddi* and *Sippi* tribes of Doda district, UT of J&K, and the associated plant species should be prioritized for the common good of mankind.

Declarations

Ethics approval and consent to participate: All participants gave verbal informed consent prior to taking part in the study.
Consent for publication: Individuals depicted in images provided their permission for their images to be published.
Competing interests: The authors declare that they have no conflicts of interest.
Funding: This study did not receive any external funding and was entirely self-funded.
Availability of data and materials: All data collected or analyzed during the study are included within this published article.
Authors Contribution: BPS, RKM and VS were involved in the design of this investigation. BPS completed the fieldwork, which included collection of ethnobotanical information and plant specimen. BPS, VS and RKM worked on the data analysis. KK and SS reviewed the previously published literature for finding out ethnomedicinal uses of the reported magico-religious plants. BPS, RKM and KK wrote the manuscript and RKM and VS checked it before it was submitted. Each author made a significant contribution to this work and they all approved the final manuscript after reading it.

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