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Diversity, distribution pattern and traditional knowledge of sacred plants in Kanawar Wildlife Sanctuary (KWLS), Himachal Pradesh, Northwestern Himalaya

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Himachal Pradesh, the mountainous part of Indian Himalayan Region, also referred as Dev Bhoomi, is famous for its religious culture and traditions. People from the state are highly religious and believe that the plants which are sacred to the Gods and Goddess also have vast medicinal potential. Hence, the present study has been carried out to investigate diversity, distribution pattern and traditional knowledge of sacred plants by the native communities of Kanawar Wildlife Sanctuary (KWLS), Himachal Pradesh. The study revealed that 33 species (trees 06; shrubs 16; herbs 11) belonging to 29 genera and 22 families were being used in numerous religious ceremonies and also as folk medicine by indigenous people of the KWLS. Of the total, 20 species were native and 01 was endemic to the Himalayan region. It was found that leaves of 17 species, flowers of 11 species and whole plant of 8 species were used, extensive use of which may lead to decrease in their population to a great extent. Therefore, there is an utmost need to develop a proper management plan and appropriate strategy for the conservation and sustainable utilization of such sacred plants, so that their population could be maintained for posterity.

Keywords: Diversity, Distribution, Himachal Pradesh, Kanawar, Nativity, Sacred plants, Traditional knowledge, Wildlife sanctuary

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Plants are the oldest creation of God on earth and the consciousness about them is as old as the human civilization itself and there is no part of the world in which plants have not been regarded with special reverences[1]. The plants have been deeply associated and known to influence the human culture, customs, rituals rites, ethos, legends and myths, folk tales and folk songs, food and medicinal practices[2]. Plant worship is one of the earliest forms of worship in the world. In India, many deities are worshipped all around the country. Different plant parts as leaves, flowers, twigs, barks, seeds and fruits are offered by the people to propitiate the deities. The traditional use of plants for sacred purposes during the auspicious ceremonies such as worship, weddings, festivals, etc. is well known among the native communities of Indian Himalayan Region (IHR)[3]. The inhabitants of IHR believe that the plants which are sacred to the Gods and Goddess also have the medicinal potential and the power of curing a person from a number of diseases. In our country rural people use more than 8,000 plants for their medicinal values[4], whereas the region harbours 1,748 medicinal plants[5]. The indigenous people living in remote areas within sanctuary have significant knowledge about the medicinal properties of the surrounding flora. The inhabitants believe that all the sacred plants have potential for medicinal properties. The objective behind plant worship has always been their utilization and conservation in the most supportable manner. In the IHR, a very few studies on sacred plants with traditional values[6,3,7] have been undertaken. Hence, the present study is an attempt to provide diversity, utilization values of the sacred plants, which are not only being used in sacrificial rituals dealing with cultural heritage, fairs, festivals, and religious ceremonies but also as medicine, particularly in IHR.

Materials and Methods

Study area

The present study was conducted in KWLS, Himachal Pradesh, northwestern Himalaya,

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established in 1954, under section 26 of WPA, 1972 with an area of 61 Km^2. The KWLS lies at $31^0$55' to $32^0$01'N latitudes and $77^0$17' to $77^0$23'E longitudes with an altitudinal range, 1,600 to 4800 m (Fig. 1). The study area supports a large number of diverse biodiversity elements including medicinal, wild edible, rare endangered, native and endemic plants. This valley is very narrow with the mountains rising steep slopes on both sides and allowing less hours of sunlight than in the surrounding areas. The Grahan and Thunjanallahas, which flow through the study area, form the major drainage system and are important tributaries of Parbati river. The vegetation of the area is mainly comprised by sub-tropical, temperate, sub-alpine and alpine types. The climate of the KWLS is typically temperate, sub-alpine and alpine types and mainly consists of three distinct seasons i.e., summer (April-June), rainy (June-September) and winter (November-March). The KWLS receives precipitation both in the form of snowfall and rainfall.

Surveys, collection and identification of sacred plants

Four villages namely Garhan, Thunja, New Kasol and Old Kasol of KWLS were extensively surveyed during 2015-2017 to generate information on sacred plants and their medicinal uses by the inhabitants. During field surveys, elderly knowledgeable people and *Vaidhyas* were interviewed and information on sacred values of the species and parts used was collected. During survey, information on the local name, altitudinal range, life form and part used was gathered. The sample of the sacred species were collected and bought to the institute for identification, and identified with the help of local and regional floras and literature[8,9,10,11,12]. Nativity of the species was identified with the help of available literatures[13,14,15]. Endemism of the species was identified based on their distribution range, and rarity based on habitat preference, population size, distribution range, etc.[12,15]. The family has been arranged alphabetically. Other relevant information such as updated nomenclature of plant species was generated through related websites International plant name index (IPNI)[16], The Plant List[17], Tropics[18] and Global Biodiversity Information Facility (GBIF)[19].

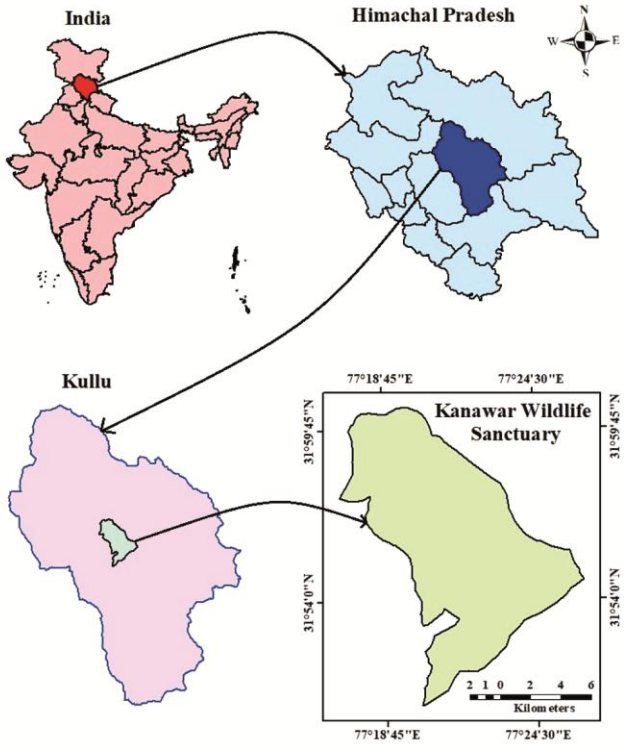

Fig. 1 — Location map of study area

Results

Species diversity and distribution pattern

Total 33 sacred plants were recorded, which were worshipped by the inhabitants in many rituals and religious ceremonies. These identified sacred plants belonging to 29 genera and 22 families, out of which, 06 were trees, 16 shrubs and 11 herbs (Fig. 2). Among the families, Ericaceae, Oleaceae and Rosaceae (3 species, each) and Asteraceae, Buxaceae, Fabaceae, Lamiaceae and Cupressaceae (2 species, each) represented maximum sacred species.

Altitudinal distribution and pattern of utilization

The distribution pattern along the altitudinal gradient in KWLS indicated that the maximum number of sacred species altitude zone 1801-2800 m was represented by maximum number of sacred species (26 spp.), followed by the altitudinal zone >2800 m (22 spp.), and <1800 m (13 spp.). Also, overlapping of the species within the zones was observed.

Various plant parts such as leaves (17 spp.), followed by flowers (11 spp.), whole plant (08 spp.), roots (07 spp.), woods (06 spp.), barks (03 spp.), tuber (02 spp.), rhizome and fruit (01 spp., each) were used in many religious ceremonies and also to cure various ailments (Table 1).

Nativity and Endemism

Out of the total sacred plants, 13 species were native to the Himalayan region whereas 08 species were native to the Himalayan region and neighboring

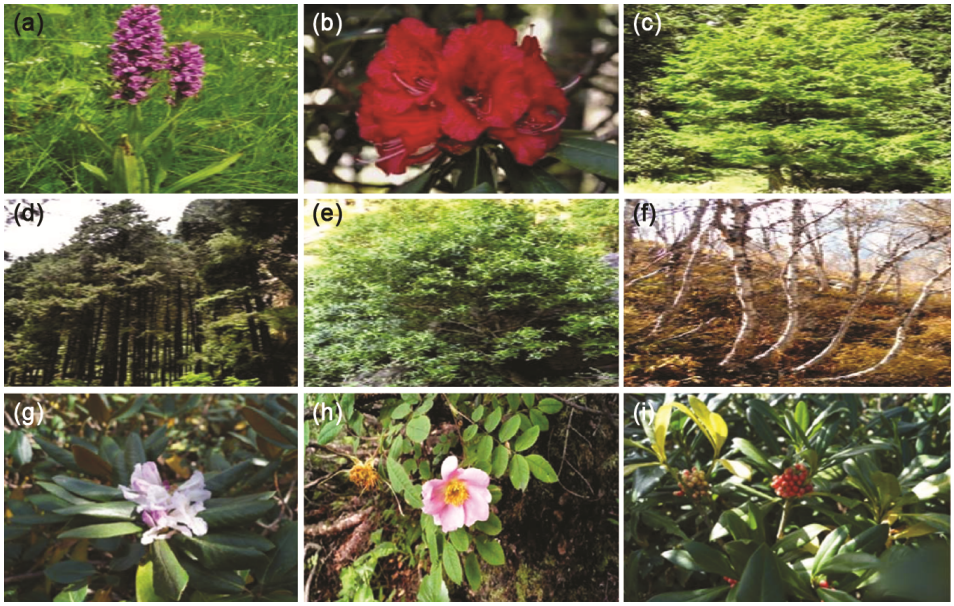

Fig. 2 — Some important sacred plants of KWLS. A) *Dactylorhiza hatagirea;* B) *Rhododendron arboreum;* C) *Taxus wallichiana;* D) *Cupressus torulosa;* E) *Buxuswallichiana;* F) *Betula utilis*; G) *Rhododendron campanulatum*; H) *Rosa macrophylla*; and I) *Skimmia laureola*

Table 1 — Diversity, distribution pattern and traditional knowledge of sacred plants in KWLS, Himachal Pradesh

Family/Taxa	Vernacular name	Altitudinal range (m)	LF	Nativity	Part used	Religious virtue	Ethnobotanical uses
Apiaceae							
Selinum wallichianum (DC.) Raizada & H.O. Saxena*	Matoshal	1700-3000	H	Reg Himal	WP	Dried plant used as incense.	The dry plant is mostly used as insecticide.
Asparagaceae							
Asparagus filicinus Buch.-Ham. ex D. Don	Shatavari	1800-3000	Sh	Reg Himal Burma	WP, Tu	Placed on rooftops to keep evil spirits away. Also used in marriage ceremonies.	The dry tubers are powdered and mixed with honey, and given against urinary infection, twice a week.
Asteraceae							
Artemisia nilagirica (C.B.Cl.) Pamp.	-	2700-3600	Sh	Reg Temp Bor	WP, Lf	These plants are kept in houses to keep away evil spirit. Leaves, mixed with ghee, are used as incense to attract positive energy.	The leaves are dried and its paste is used as dressing for wounds and Swelling. Also used as an insect repellant.
Jurinella macrocephala (Royle) Aswal & Goel	Jugaldhoop	2500-3600	H	Reg Himal	Rt	Dried roots are used in dhoop and agarbattipreparations.	Root powder mixed with boiled water, given twice a day, provides relief from colic pain.

(*Contd*.)

Table 1 — Diversity, distribution pattern and traditional knowledge of sacred plants in KWLS, Himachal Pradesh (*Contd*.)

Family/Taxa	Vernacular name	Altitudinal range (m)	LF	Nativity	Part used	Religious virtue	Ethnobotanical uses
Berberidaceae							
Berberis aristata DC.*	Kshambal	1700-3200	Sh	Ind Or	WP, Rt	The roots are kept in houses to ward off evil spirits.	Roots boiled in water and decoction mixed with local made honey is taken orally for cough, jaundice and cold. Also extract of stem used in skin diseases.
Betulaceae							
Betula utilis D. Don	Bhojpatra	3000-3400	T	Reg Himal Japan	Bk	Bark is used to write talismans by local Gurs.	The dried bark powder with milk used for healing the injuries and swelling.
Buxaceae							
Buxus wallichiana Baill.	Samad	1800-2700	T	Europe Oriens As Temp	Wd, Lf	Local deities are considered to reside on this tree, the tree being considered pious.	Leaves grated to paste, and one third portion of the paste mixed with a glass of boiled water, used to cure rheumatism.
Sarcococca pruniformis Lindl.	Rawal	1600-2800	Sh	Reg Himal	Lf, Fl	Leaves and flowers are used as religious offerings to local deities especially in fairs.	Leaves and flowers grated to paste, used against skin diseases and to cure wounds.
Cannabaceae							
Cannabis sativa L.	Bhang	1600-3200	H	As Centr Reg Himal Bor Occ	Lf, Sd	Leaves are used in worship, especially to lord Shiva.	Leaf juice removes lice and dandruff. Oil extracted from seeds, is warmed and massaged on the parts affected with arthritis. In age-old times, dried leaf paste is used as dressing for wounds and sores.
Caprifoliaceae							
Lonicera quinquelocularis Hard.	Faney	1600-2600	Sh	Reg Himal	Fr, Lf	Flowers are used in religious ceremonies.	Leaves and flowers grated and crushed, paste used against inflammation.

(*Contd*.)

Table 1 — Diversity, distribution pattern and traditional knowledge of sacred plants in KWLS, Himachal Pradesh (*Contd*.)

Family/Taxa	Vernacular name	Altitudinal range (m)	LF	Nativity	Part used	Religious virtue	Ethnobotanical uses
Cupressaceae							
Cupressus torulosa D. Don	Devidayar	1700-2800	T	E Himal (Ind Subcont As Trop)	Wd, Lf	Dhwajstambh (Dhouj) or flag pole, which is an important feature of temples in the area, and installed in front of the temples, is made from this sacred tree.	Green leaves of the plant are burned and the fumes generated work as insecticides.
Juniperus indica Bertol.	Baithar	2700-3400	Sh	Reg Himal Nepal Bhutan Tibet	Tw, Lf	Whole dried plant is used as incense while performing Hawans.	Green wood smoke is useful in vomiting.
Ericaceae							
Rhododendron anthopogon D. Don*	Nachani	3000-3400	Sh	As Bor Reg Himal	Fl	Flowers are used in religious ceremonies.	Paste of fresh flowers used against cold, cough, fever and also to heal the wounds.
R. arboreum Sm.	Brah, Brass	1600-2700	T	Ind Or Reg Himal Zeylan	Fl,	Flowers are used in religious ceremonies	Crushed flowers are snuffed to stop nasal bleeding.
R. campanulatum D. Don*	Shargal	2800-3400	Sh	Reg Himal	Lf, Fl	Flowers are used in religious ceremonies.	Paste made from the flowers is used against skin diseases and paste made from leaves is applied on wounds for quick healing.
Fabaceae							
Desmodium elegans DC.	Kathi	1600-3000	Sh	Reg Himal China	Wd, Bk	Wood is used in Hawansamagri and used as incense to attract positive energy.	Bark of this plant is crushed and juice used for the treatment of ulcers twice a week.
Indigofera heterantha Brandis	Kali Kathi	2000-2600	Sh	Reg Himal	Lf, Wd	Wood is used in Hawansamagri and used as incense to attract positive energy.	Leaves are boiled and given against dysentery and diarrhea.
Juglandaceae							
Juglans regia L.*	Akhrot, Khod	1600-2900	T	As Occ Reg Himal	Fr, Wd, Lf	During Sair (a religious festival), the fruit of the tree is offered to the local deities as mark of respect and thanks giving, for the wellbeing of the people and good harvest of crops and fruits.	The kernel is given for intestinal worms. Also used for gargling in sore throat. Leaves are used against toothache.

(*Contd*.)

Table 1 — Diversity, distribution pattern and traditional knowledge of sacred plants in KWLS, Himachal Pradesh (*Contd*.)

Family/Taxa	Vernacular name	Altitudinal range (m)	LF	Nativity	Part used	Religious virtue	Ethnobotanical uses
Lamiaceae							
Ajuga integrifolia Buch.-Ham.	Neelkanthi	1600-2800	H	Afr Trop Ind Or	Lf	Leaves are offered to Lord Shiva and also to prevent against bad dreams.	Leaves are crushed, boiled and decoction used in the treatment of fever, also acts as blood purifier.
Origanum vulgare L.	Ban tulsi	1600-3400	H	Europe As et Afr Bor	WP, Rt, Lf	This sacred plant is worshipped because of its association with Lord Vishnu.	The powdered root taken for curing tuberculosis. Paste of the leaves applied in cuts, boil and burns.
Oleaceae							
Fraxinus micrantha Linglesh. **	Angu	2000-2700	T	Reg Himal	WP, St, Rt	A ritual tree	Decocted stem and roots considered as digestive, used in stomach ache.
Jasminum humile L.	Juhi	1900-2800	Sh	As Trop	Fl, Lf	Flowers are used as a religious offering to local deities.	Paste of flowers is used for headache. The leaves paste is applied in skin diseases.
J. officinale L.	Juhi	1600-3100	Sh	Ind Bor Occ China	Fl, Lf	Flowers are used as a religious offering to local deities.	Leaves are chewed in toothache. The leaves paste is applied in skin diseases. Paste of flowers used for headache. Leaf juice used in the treatment of diabetes.
Orchidaceae							
Dactylorhiza hatagirea (D. Don) Soó*	Panja	2600-3400	H	Reg Himal Europe Afr Bor Oriens	Tu, Rt	Roots are used as a religious offering to local deities and also to ward off evil spirits.	Root paste of is externally applied as poultice on cuts and wounds and extract is given in intestinal disorders. The juice extracted from tuber is used as tonic and also used for the treatment of pyorrhea.

(*Contd*.)

Table 1 — Diversity, distribution pattern and traditional knowledge of sacred plants in KWLS, Himachal Pradesh (*Contd*.)

Family/Taxa	Vernacular name	Altitudinal range (m)	LF	Nativity	Part used	Religious virtue	Ethnobotanical uses
Poaceae							
Cynodon dactylon (L.) Pers.	DhrubGhas	1600-2200	H	Cosmop	WP, Lf	The plant is used for sprinkling holy water from local deities on the people present in religious ceremonies (weddings, fair, festivals), considered that their sins have been cleaned.	Paste of the leaves consumed with milk is used to cure urinary problems, also leaves paste with water is tied with cloth on eyes to get relief from eye pain.
Primulaceae							
Primula denticulata Sm.	Guna	2200-3400	H	Reg Himal	Fl, Lf	Flowers are used as a religious offering to local deities especially for Joginies (wood fairies).	Leaves crushed and given with boiled water against urinary problems.
Rosaceae							
Prinsepia utilis Royle	Bhekhal	1600-2700	Sh	Reg Himal	Sd, WP, Fl	This sacred plant is used to ward off evil spirits.	Powder of its roots is used in the treatment of menorrhagia. The heatedseeds oil is massaged on the parts affected with arthritis.
Rosa macrophylla Lindl.*	JangliGulab	2000-3300	Sh	Reg Himal China	Fl	Flowers are used as a religious offering to local deities.	The dry flowers are powdered and mixed with boiling water to cure stomachache.
R.moschata Herrm.	Kunjaphool	1600-2300	Sh	Oriens	Fl	Flowers are used as a religious offering to local deities, especially to Lord Shiva.	The dry flowers are powdered and mixed with boiling water to cure stomachache. Paste of fresh flowers used as skin tonner.
Rutaceae							
Skimmia laureola Franch. *	Ner	2200-3100	Sh	Reg Himal	Lf	Garlands from the leaves of this plant are made and offered by the local people, only to Lord Shiva during fairs and festivals.	Paste of the leaves with water is useful for toothache.

(*Contd*.)

Table 1 — Diversity, distribution pattern and traditional knowledge of sacred plants in KWLS, Himachal Pradesh (*Contd*.)

Family/Taxa	Vernacular name	Altitudinal range (m)	LF	Nativity	Part used	Religious virtue	Ethnobotanical uses
Valerianaceae							
Valeriana jatamansi Jones	Mushkbala	1800-3400	H	Reg Himal	Rh, Rt	Rhizomes are dried, powdered and mixed with ghee to make dhoop.	The decoction of dried root with warm water taken orally as *kaadu* (decoction) for stomach pain.
Violaceae							
Viola kunawurensis Royle	Banaksha	3100-3500	H	Reg Himal	Fl	Flowers are used as a religious offering to local deities especially to goddess (*Joginies*).	Applying the powder made from flowers, with mustard oil on gums, cure pyorrhea and toothache.
Taxaceae							
Taxus wallichiana Zucc.	Rakhal	2000-3300	T	Reg Himal	Bk, Wd	Abode as charm to present conceptions, used for making palanquins, drums and other traditional musical instruments.	Dry powder of bark is used in making tea against cold, cough, asthma and stomachache.

Abbreviations Used: LF=Life Form; **H**=Herb; **Sh**=Shrub; **T**=Tree; **Bk**= Bark; **Fl**= Flower; **Fr**= Fruit; **Lf**=Leaf; **Rh**= Rhizome; **Rt**= Root; **Sd**= Seed; **St**= Stem; **Tu**= Tuber; **WP**= Whole plant; **Wd**= Wood; **Amphig**=Amphigaea; **Arab**=Arabia; **As**=Asia; **Austr**=Australia; **Bor**=Boreal; **Caucas**=Caucasus; **Centr**=Central; **Cosmop**=Cosmopolitan; **et**=And; **Himal**=Himalayan; **Ind**=Indian; **Occ**=Occidentalis; **Or**=Oriental; **Reg**=Region; **Subtrop**=Sub-tropical; **Temp**=Temperate; and **Trop**=Tropical.

countries together. Other species were non-natives. One species, i.e., *Fraxinusmicrantha* was restricted to the IHR, hence identified as endemic, whereas 07 species extended their distribution to the neighboring countries, hence identified as near endemic.

Threat status

Using new IUCN criteria, 06 species of sacred plants were categorized as threatened species, out of which *Jurinella macrocephala*, *Betulautilis*, *Dactylorhiza hatagirea*, *Taxuswallichiana* and *Berberisaristata* were categorized as Endangered whereas *Valerianajatamansi* was categorized as Vulnerable.

Religious virtue and traditional knowledge of all identified sacred plants in KWLS are enumerated in Table 1. These plant species were commonly used by the local people in different religious activities and traditional practices.

Discussion

Humans has been using plants for sacred purposes since time immemorial and its importance in human life as fuel, fodder, fibre, food, medicinal, etc. has been discussed from time to time by various workers. But, the religious virtues of plants are not given any consideration and not much has been explored in this field. Dhiman (2003) discussed the sacred plants andtheir medicinal importance. The current study gives comprehensive information on the sacred plants and their local uses, to cure many aliments, of the inhabitants of KWLS, northwestern Himalaya, the sacred plants and their medicinal importance[1]. The current study gives comprehensive information on the sacred plants and their local uses, to cure many aliments, of the inhabitants of KWLS, northwestern Himalaya. Total 33 sacred plant species were recorded. The occurrence of maximum number of sacred plants in 1801-2800 m zone may be due to diverse habitats, a large area, native communities and cold climatic conditions. Hence, this zone was identified as a potential zone. The inhabitants of the study area use these sacred plants to cure many diseases. Dry powder of *Taxus wallichiana* bark is used in making tea against cold, cough, asthma and

stomachache by the native communities of the Sanctuary, also they used oil of seeds *Prinsepia utilis* on the parts affected with arthritis. Regular use of leaves of 17 species, flowers of 11 species and whole plant of 8 species may cause decrease in their population to a great extent. Continued overexploitation of these plants parts may result to their elimination from natural habitats in near future. Hence, there is an urgent need required to develop a proper management plan and appropriate strategy for the conservation and sustainable utilization of such sacred plants, so that their population could be maintained for posterity. The present study is comparable to the previous work done by some workers in IHR[20,21,22]. Samant and Pant (2003)[12] reported 155 sacred plants from the Indian Himalayan Region based on the survey's primary surveys and extensive review of literature. 30 species used as religious as well as treatment of many diseases from Assam[23]. They believe that, all big trees are abodes of Gods and Deities. Therefore, they are sacred and should not be harmed and they try to save these plants by all means. Pandey and Pandey (2016)[13] reported 09 sacred plants from Indo-Gangetic plains, which symbolize a specific God or Goddess because of their medicinal, aesthetic and natural qualities. In Kanyakumari district 38 sacred plant species were regular used by the people for various religious activities and traditional healing system[24]. There were 34 sacred plant species related to the socio-cultural life of the Dimasas (Tibeto-Burman group), North Cachar hills, of northeast India[25]. These plants are associated to the traditional worshipping, naming of villages as well as the male and female clans. The above studies revealed that these are region specific and vary place to place as per the availability of the species.

Conclusion

At the end of the study, it can be concluded that, almost all the plants which are declared as sacred by our ancestors have medicinal values and population of most of them declining day by day. The religious activities also play a role as conserving tool for bio-diversity. Therefore, it is necessary to preserve and encourage these aesthetic values to conserve biodiversity and nature. The indigenous knowledge about sacred plants and their uses have been passed orally from generation to generation and there is an urgent need of proper investigation and documentation.

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