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Traditional wisdom of conserving biodiversity through sacred groves: Ethnobotanical treasure in Garhwal Himalayas

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The present study was conducted to record the ethnomedicinal plants and their uses in sacred groves of Rudraprayag district in Garhwal Himalaya, Uttarakhand. Field surveys were conducted to identify sacred groves and information was collected from local folks using structured questionnaires. Three sacred groves, namely 1) Banjyani, 2) Jakh devta, and 3) Satoli were identified in the region. The survey revealed 31 medicinal plant species representing 26 families and 29 genera. These plant species belong to diverse families and most dominant families in the groves were Lamiaceae, Moraceae, Ranunculaceae and Rosaceae. The medicinal plants used for different ailment in the sacred groves were dominated by herbs, followed by shrubs and trees. To treat different ailments, leaves were used in maximum number of ailments (33.33%), followed by bark (16.67%), root (12.50%), fruit (12.50%), whole plant (10.42%), flowers (6.25%), rhizome (4.17%) and bulb (2.09%). In identified sacred groves plants were used for different medicinal purposes *i.e.,* cough, diarrhea, leprosy, leucorrhoea, jaundice, bronchitis, digestive issues and to improve appetite. The study confirms the dependence of local people on sacred groves for their health care. However, presence of threatened plants highlights the importance of sustainable utilization of medicinal plant resources available in the groves.

Keywords: Conservation, Garhwal Himalaya, Medicinal plant, Sacred groves, Threatened

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Sacred groves are small patches of native vegetation which have been traditionally protected on religious grounds by local communities. The groves are often considered the traditional equivalent of natural sanctuaries where all sort of living creatures is given protection by a deity. The presiding deities not only look after the wellbeing of the people but also protect the groves by punishing the offenders[1]. The practice of oath taking in the groves is fairly wide spread in the country. These groves are ecologically and genetically important and are treasure house of endemic and threatened plant species[2]. Besides, these preserved groves are store houses of valuable medicinal and aromatic plants having high economic value and serve as a refuge to threatened species[3]. The sacred groves are sources of ecological services like clean air and water, cover for wildlife and biodiversity.

Sacred groves have been reported from different part of India[4]. However, they are reported to be more concentrated along the Khasi and Jaintia hills of Northeastern Himalaya, Western Ghats, Aravalli hills and Central India[5]. The sacred groves are known by different names in India *viz., Devarakadu* in Karnataka, *Dev* in Madhya Pradesh, *Kavu* in Kerala, *Kovil kadu*¸ in Tamil Nadu, *Deovari* in Maharashtra, *Sarana* in Bihar, *Oran* in Rajasthan[6] and *Dev van* in Himachal Pradesh. The sacred groves are devoted to religious beliefs and supernatural powers of God, Goddess, spirits, demons, ancestors and serpents etc.

The sacred or protected groves of Uttarakhand are called *Dev bhumi* and mentioned in Kedarkhand of *Skandapuran*. In Uttarakhand most of the family deity (Clan God) is often surrounded by a forest patch considered as sacred or protected grove. Garhwal Himalaya houses many important religious shrines like Badrinath, Kedarnath, Yamunotri and Gangotri, etc.[7], besides the sacred confluence of five tributaries of holy Ganga. It is interesting that many times an entire landscape is represented by a variety of species and ecosystem has been considered sacred or protected and conserved as such in pristine condition by forbidding the use of any resource from it. The protected and sacred groves of Garhwal Himalaya are

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less explored and have not been studied from the taxonomic, ethnobotanic and ecological view point[7]. However, there are few reports from Kumaon Himalaya[8,9]. The present study is conducted to identify unexplored groves of Garhwal Himalaya and document the ethnomedicinal plants of these sacred groves in Rudraprayag district of Uttarakhand.

Methodology

Study area

Present study was conducted in sacred groves of Rudraprayag district of Garhwal Himalaya, Uttarakhand, India. Rudraprayag district is located at 30˚.28' N 78˚.98' E and have a total area of 1984 sq km. The district is bounded by Uttarkashi district in the North, Pauri Garhwal district in the South and Tehri Garhwal district in the West. Mandakini is the main river that flows from Kedarnath Peak and joins the Alaknanda river at Rudraprayag district. The study area has typical monsoon and there are three distinct seasons in a year. Summer season is for three months *i.e.,* April to June, followed by rainy season up to September depends upon climatic variations. October to February constitutes winter season and characterized by rapid dip in temperature. The temperature range varies in different parts of the district from lowest *i.e.,* 0°C to highest to 34°C during summer. The area has diverse altitude range from 800-8000 m asl and holds diverse vegetations. The vegetation of the study area is composed of Anyar (*Lyonia ovalifolia*), Banj (*Quercus leucotrichophora*), Burans (*Rhododendron arboreum*), Kaphal (*Myrica esculenta*), Kharsu (*Quercus semicarpifolia*), Kingor (*Berberis asiatica*). The district has preserved the Hindu religion and culture and is bestowed with internationally renowned shrines *i.e.,* Kedarnath, Tungnath, Madmaheshwar, Kartikswami, Kalimath, Triyuginarayan etc. Three sacred groves *i.e.,* Banjyani, Jakh Devta, Satoli have been selected for the present investigation (Table 1, Fig. 1 & 2).

Field survey

Field survey of Banjyani, Jakh Devta and Satoli sacred groves were conducted during 2006-2008. Periodic visits were conducted to the study sites and a rapport was established with local people. Later plant

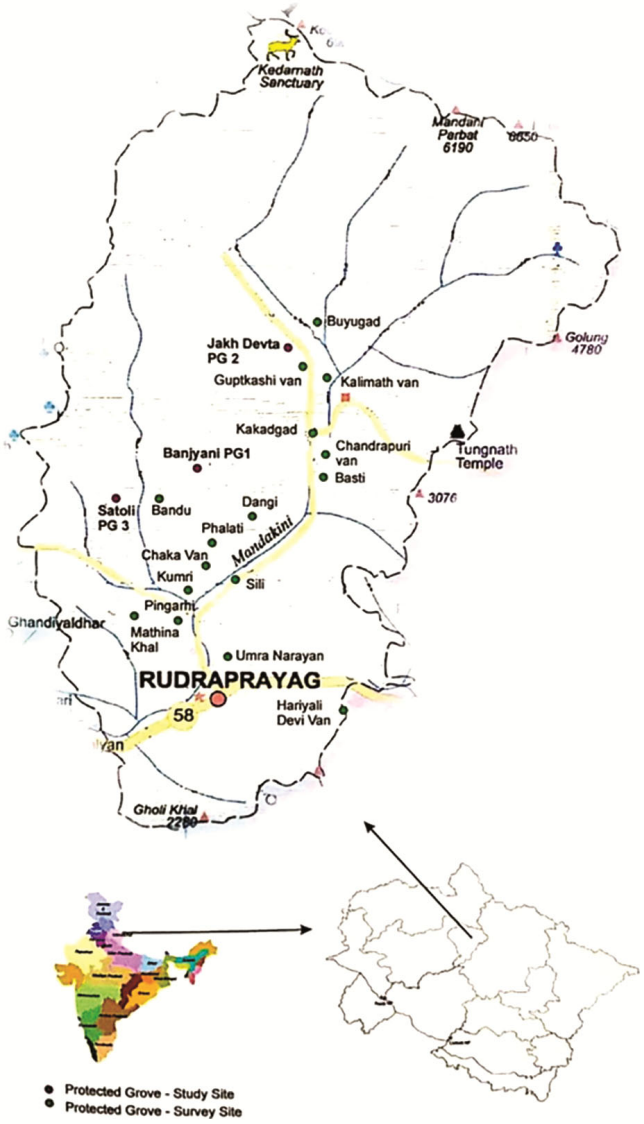

Fig. 1 — Geographical location of district Rudraprayag

Table 1 — Sacred groves in Rudraprayag district

S.No.	Name of sacred grove	Locality	Area Sq. Km.	Elevation range (m asl)	Latitude/Longitude	Forest vegetation
1.	Banjyani	Jakholi	3	1600-1950	30° 23'-30° 25' N 78° 53'-78° 54' E	*Rhododendron arboretum*, *Myrica esculenta*, *Quercus leucotrichophora*
2.	Jakh Devta	Guptkashi	5	1750-2200	30° 31'-30° 33' N 79° 04'-79° 06' E	*Rhododendron arboretum, Quercus leucotrichophora, Berberis asiatica*
3.	Satoli	Chaura	3.5	1600-2000	30° 23'-30° 25' N 78° 53'-78° 54' E	*Quercus leucotrichophora*, *Myrica esculenta*, *Lyonia ovalifolia*

specimens were collected during flowering and fruiting stages by following standard methods of collection, preservation and maintenance of specimen in the herbarium with field notes[10]. The collected specimens were identified with the help of monographs, flora, revisions and relevant literature[11-15]. The indent was validated by comparing them with authentic specimens housed at H.N.B. Garhwal University Herbarium (HNBGU), Srinagar Garhwal, Uttarakhand. To collect ethnobotanical data, questionnaire survey was conducted with the local community and temple committees of the selected sacred groves. The information was collected from the local *Vaidyas* or medicinal practitioners and occasionally from housewives, rural old folk, and grazers of long experience. The interviews were conducted among elderly people near the sacred grove (age 50-75). The identified plants with local names and their uses were noted down in structured questionnaires. All interviews were conducted in Garhwali (local language of Garhwal region) because the first author is well verse with the culture and language of the region.

Results and Discussion

The survey recorded 31 ethnomedicinally important plants representing 26 families and 29 genera from the identified sacred groves of Rudraprayag. Among these, one species is gymnosperm and others are angiosperms. The medicinal plants used for different ailments are dominated by herbs (14 species) followed by shrubs (9) and trees (8) (Fig. 3). This high contribution of herbs is due to presence of relatively active ingredients and easy management as compared to trees and shrubs. Herbs dominance has also been reported in sacred groves of Kumaon Himalaya of Uttarakhand[8]. The plants were represented by diverse families and four dominant families e.g., Lamiaceae, Moraceae, Ranunculaceae, Rosaceae (Table 2) (Fig. 4). Previous study conducted in 13 sacred groves of eight districts *i.e.,* Dehradun, Pithoragarh, Almora, Uttarkashi, Pauri, Rudraprayag, Tehri Garhwal, Bageshwar of Uttarakhand reported Lamiaceae and Rosaceae as dominant families[16].

Local people residing near groves identify these plants by local name *i.e.,* Timla for *Ficus auriculata*, Akhor for *Juglans regia*, Kaphal for *Myrica esculanta*, Banj for *Quercus leucotrichophora*, Basinga for *Adhatoda vasica*, Kingore for *Berberis aristata*. Vernacular names are popular in sacred groves of Assam and other regions of India[17]. The people collect different plant parts to use for

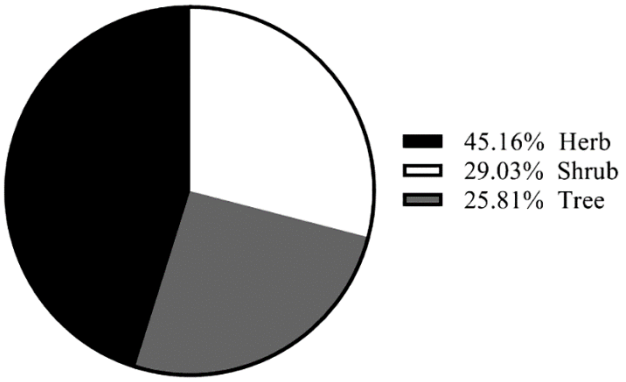

Fig. 3 — Habit of ethnomedicinal plants

Fig. 2 — Sacred groves in Rudraprayag A) Banjyani B) Jakh Devta C) Jakh Devta Temple D) Satoli

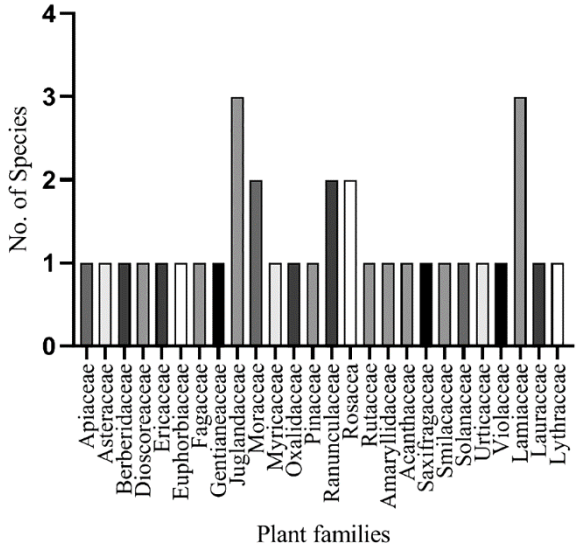

Fig. 4 — Recorded families and their respective species

Table 2 — Plants of ethnobotanical importance of sacred groves of Rudraprayag district

S.No.	Botanical Name	Local Name	Family	Disease cured	Plants part used	Mode of application
				Trees		
1	*Ficus auriculata*	Timla	Moraceae	Visceral obstructions, bladder complaints	Fruit, bark and leaves	Oral
2	*Ficus palmata*	Bedu	Moraceae	Obstructions in visceral and bladder issues	Fruit, bark and leaves	Oral
3	*Juglans regia*	Akhor	Juglandaceae	Eczema, Syphilis and rheumatism	leaves and fruit	Paste of outer rind of fruit is used on skin
4	*Myrica esculanta*	Kaphal	Myricaceae	Headache	Leaf and fruit	Fruit juice taken in orally, paste of applied externally on skin
5	*Pinus wallichiana*	Kail	Pinaceae	Abscess, dislocation of joints, unconsciousness, Ulcer	Resin, bark and leaves	Paste is applied on skin, decoction is taken orally
6	*Prunus cerasoides*	Panya	Rosaceae	Psychomedicine, body swelling and contusions	Bark and leaf paste	Paste is applied on skin
7	*Quercus leucotrichophora*	Banj	Fagaceae	Gonorrhoea, digestive disorders	Bark, leaves gum	Decoction and syrup is taken orally
8	*Rhododendron arboreum*	Burans	Ericaceae	Rheumatism, dysentery, wounds, fever	Leaves, flower	decoction or juice is taken orally; paste is applied on skin
				Shrubs		
9	*Adhatoda vasica*	Basinga	Acanthaceae	Whooping cough, skin diseases, Headache, Dysentery, fever	Leaves, Flowers, root	Infusion of juice is taken orally
10	*Allium consanguineum*	Pharan	Amaryllidaceae	Indigestion	Leaves & Bulbs	Boiled bulbs are taken in flatulence and Pile complaints
11	*Berberis aristata*	Kingore	Berberidaceae	Leucorrhoea, fever, jaundice, skin disease	Root, bark, wood	Boiled wood water is used as eye drop, fruit/root decoction is taken orally
12	*Cinnamomum tamala*	Dalcheeni/ Tejpat	Lauraceae	Stimulants, carminative, rheumatism diarrhoea	Leaves and Bark	Decoction is taken orally
13	*Roylea cinerea*	Karui	Lamiaceae	Malarial fever, jaundice	Leaves	Decoction of leaves
14	*Woodfordia fruticosa*	Dhaula	Lythraceae	Hemorrhoids	Leaves, bark and flowers	Decoction or powder orally
15	*Origanum vulgare*	Bantulsi	Lamiaceae	Whooping cough	Leaves	Extract of leave
16	*Zanthoxylum armatum*	Timru	Rutaceae	Tooth-ache, Tooth decay	Fruit, stem bark	Decoction or powder orally
17	*Euphorbia hirta*	Dudhibari	Euphorbiaceae	Bronchial infection, asthma	Latex	Latex is applied on warts
				Herbs		
18	*Aconitum atrox*	MeethaBish	Ranunculaceae	Rheumatism, paralysis & fever	Rhizomes	Paste of rhizomes fried in ghee externally used
19	*Aconitum heterophyllum*	Ateesh	Ranunculaceae	Fever cough, stomach ache, diarrhoea	Root	Powder mixed with honey is taken orally
20	*Ajuga bracteosa*	Kadwipatti	Lamiaceae	Malaria, astringent and febrifuge	Plant extract	Decoction is given orally
21	*Bergenia ciliata*	Silphara	Saxifragaceae	Kidney stones, sore, swellings	Root, leaves	Decoction is given orally; paste is applied on swelling
22	*Bidens pilosa*	Kumra	Asteraceae	Cough, cuts, diarrhoea, ear & eye complaints, headache, leprosy	Whole plant	Extract is given orally as eye drop, as ear drop, paste on skin
23	*Centella asiatica*	Brahmi	Apiaceae	Mental disorder, blood purifier, skin disease and leprosy	Whole plant and leaf	Decoction is given orally; paste is applied on skin
24	*Oxalis corniculata*	Bhilmora	Oxalidaceae	Appetite, corns, cuts, dysentery, fever jaundice	Whole plant	Oral/Skin

(Contd).

Table 2 — Plants of Ethnobotanical importance of sacred groves of Rudraprayag district — (*Contd.*)

S.No.	Botanical Name	Local Name	Family	Disease cured	Plants part used	Mode of application
25	*Potentilla fulgens*	Bajradanti	Rosacea	Stomatitis and aphthae	Fruit and whole plant	Decoction / Juice is given orally
26	*Dioscorea deltoides*	Tairu	Dioscoreaceae	Spermatonorrhoea	Rhizomes	Boiled tubers are taken
27	*Solanum nigrum*	Kakoi	Solanaceae	Spleen, Diarrhoea, eye ailments & piles	Leaves &Stem	Infusion is given orally/Eye drop
28	*Smilax aspera*	Kukardara	Smilacaceae	Diuretic and rheumatic arthritis	Root	Decoction is given orally
29	*Swertia angustifolia*	Chirata	Gentianaceae	Blood disease and malaria	Plant extract	Decoction is given orally
30	*Viola canescens*	Banafsa	Violaceae	Malarial fever, bronchitis and asthma	Whole plant	Extract or powder of plants, leaves decoction is given orally
31	*Gonostegia hirta*	Atainya	Urticaceae	Fractured bones	Roots	Roots used as paste on fractured bones

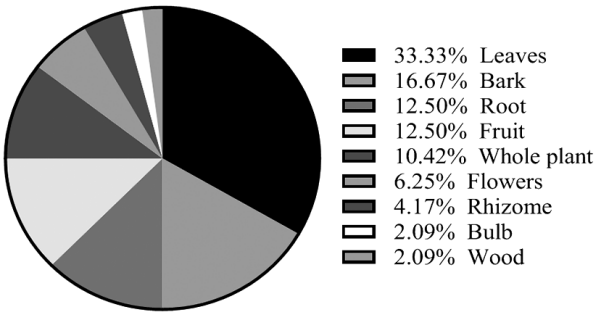

Fig. 5 — Plant parts used in medicines

medicinal purposes. Among these parts leaves were used in maximum number of ailments (33.33%), followed by bark (16.67%), root (12.50%), fruit (12.50%), whole plant (10.42%), flowers (6.25%), rhizome (4.17%), bulb (2.09%), wood (2.09%) (Fig. 5). Use of leaves, root, fruit and whole plant for medicinal purpose is documented from Pithoragarh district of Kumaon Himalaya, Uttarakhand[8]. In the selected sacred groves medicinal plants were used for different purposes *i.e., Bidens pilosa* for cough, cuts, diarrhoea, ear and eye complaints, headache, leprosy; *Berberis aristata* for leucorrhoea, fever, jaundice, skin disease; *Viola canescens* for malarial fever, bronchitis, asthama; *Quercus leucotrichophora* for gonorrhoea, digestive issues; *Oxalis corniculata* for improving appetite and helps to treat dysentery, fever and jaundice. Studies have been conducted to identify medicinal plants and their uses in Uttarakhand[18-22].

Among the identified medicinal plants from the sacred groves 11 plants were categorized in IUCN Red List of Threatened Plants. One species *i.e., Aconitum heterophyllum* is categorized under Endangered status and ten species were identified under Least Concern category *i.e., Ficus auriculata*, *Juglans regia*, *Pinus wallichiana, Prunus cerasoides, Quercus leucotrichophora, Berberis aristata, Origanum vulgare, Zanthoxylum armatum, Centella asiatica, Smilax aspera.* Earlier reports from Kumaon Himalaya confirm presence of threatened medicinal plants in sacred groves *i.e., Valeriana jatamansi*, *Taxus baccata*, *Hedychium spicatum*, *Paris pollyphylla*, *Berberis aristata*, *Thalictrum foliolosum* etc.[23,24]. Conservation of these rare and threatened plants is possible by conserving the sacred groves of the region. These groves are natural store house of rare plants which are protected by local people of the region.

In present scenario, developmental activities, urbanization, industrialization and pressures of increasing population have increased the pressure on sacred groves. The sacred groves have no legal status but are managed and conserved by local communities as common property resources under certain rules and regulations. The local concerning communities always give a faithful protection to these sacred groves and never cause destruction. No felling or extraction of forest produce is allowed in the premises of sacred groves. The wood can be used only for the purpose of the temple or the deity. The self-imposed rules of scared groves are not less than any government policies regarding conservation of forest. They are repository of rare and endemic species and may be considered as the remnant of the forest left untouched by the local inhabitants and guarded by them due to belief that the deities reside in these forests. These groves are also serving as last refuge for arboreal birds and mammals[25]. The local communities have been preserving these heritage sites since centuries. The sacred groves are untouched and are conserved for a longer period, and can be used as demonstration sites for climate change[26].

Conclusion

Ever increasing demand of natural resources, the dependency of local community on forests, changing land use pattern, development activities and social changes have become threat to sacred groves. The unwritten and orally transmitted tradition through religion and belief has played important role in conservation and protection of biodiversity. The *in situ* conservation of floral and faunal species in sacred groves serves as gene pool. There is need of strengthening and reviving of this old tradition of conservation through institutional building of local community. A few steps may be taken for the conservation of the sacred groves in general. Awareness should be created among local people and they should be made to realize that the conservation of groves is crucial for their sustenance. It is equally important to understand tradition and beliefs as well as to have scientific awareness in order to protect and conserve these unique and pristine forest patches. Important sacred groves should be brought under the protected area network with the participation of the local administration bodies to ensure their proper conservation. The local community protecting sacred groves should be considered for PES (Payment for Ecological Services) as an incentive.

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Conflict of Interest

Authors declare that they do not have any conflict of interest.

Authors' Contributions

NB- Collection of data, data interpretation and analysis, Manuscript preparation; ABB- Conceptualisation and editing; VT- Data interpretation and editing

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