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BIODIVERSITY CONSERVATION THROUGH TRADITIONAL BELIEFS SYSTEM: A CASE STUDY FROM KUMAON HIMALAYAS, INDIA

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Abstract

The present study was carried out in Malay Nath sacred grove of Kumaon Himalaya, India, in appreciation of its role in biodiversity conservation. The whole grove is dedicated to the local deity "Malay Nath", and showing semi-temperate type vegetation of the region. Rituals and cultural beliefs of the local peoples of Kumaon are plays significant role in conserving biodiversity. The study aimed at the documentation and inventory of the sacred grove, its phytodiversity, threats and conservation in the Indian Himalayan of Kumaon region, and to this, systematic field surveys were conducted during 2007-2010 covering all four seasons viz., summer, rainy, winter and spring. A total of 64 species in 58 genera under 47 families were identified, of which 35 species are flowering plants and 29 species are non-flowering plants. The dominant family was Parmeliaceae of lichen which recorded the maximum 6 species. 35 plant species under 32 genera and 23 families are used as an ethno-medicinal and the information about the ethno-medicinal plants was gathered from knowledgeable elderly local peoples of the area. Hedychium spicatum, Bergenia ciliata, Origanum vulgare, Berberis asiatica, etc. are highly exploited species and need to be conserved.

Keywords: *Kumaon Himalaya; Malay Nath sacred grove; Ethnobotany; Conservation.*

Introduction

Kumaon Himalayan region is one perhaps the most attractive region from scenic as well as floristic point of view among all the sectors of Indian Himalaya. Sacred groves are the common and ancient practice of conserving biodiversity since time immemorial in the Himalayan region. These are tracts of virgin forest with rich diversity, which have been protected by the local people for centuries for their cultural and religious beliefs and taboos that the deities reside in them and protect the villagers from different calamities [1]. These patches of natural vegetation or even whole forest are dedicating to local deities or ancestors and showing relict climax vegetation of the region [2]. All forms of vegetation in the groves are supposed to be under the protection of reigning deity of that grove, and the removal of even a small twig is a taboo [3]. India has the highest sacred groves in the world; these might be

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100000 and 150000 around the country and still are not inventogories [4]. Sacred groves present an alternative view of conservation that is led by norms and taboos rather than formal legal frameworks. They protect a wide variety of habitats and hold considerable potential for biodiversity conservation. Such sites offer protection to habitats and species that are excluded from formal protected areas, and this approach to conservation has greater acceptance among local peoples. These groves often have associated myths and taboos on the use of natural resource of the area. Name differently in various parts of India as *Kovil Kadu* in Karnataka, *Law lyngdhoh* in Meghalaya, *Sarna* and *Deorai* in Madhya Pradesh, *Oran* in Rajasthan, *Jaherthan* and *Garamthan* in West Bengal, *Ummanglai* in Manipur, and these groves occur in variety of habitats from scrub forests of Thar desert, maintained by Bishnois, to rain forests of Kerala in Western Ghats. Himachal Pradesh, Laddak in the North and of Kerala, etc. It is a tract of usually virgin forests of varying sizes, which are communally protected, and which usually have a significant religious connotation for the protection of community. The sacred groves represent climax vegetation and exhibit diversity in species of trees and other various life forms which are dependent for their existence on trees, huge climbers, epiphytes and others shade loving plants (3). Widely distributed in India, but rapidly dwindling, this traditional method of social fencing of ecosystem types as conservation patches is now being rediscovered, as repositories of germ plasma in an otherwise a highly degraded landscape. Indeed, sacred groves have now been identified as an important pathway for biodiversity conservation. A variety of socially valued species that are also ecologically important keystone species often determine ecosystem level processes – soil moisture regimes, soil fertility and nutrient cycling – thus contributing to the build-up of associated biodiversity. These sancturm of rare, endangered and endemic plants combined with other biotic and abiotic components represent a unique example of the all embracing concept and practice of Indian way of in situ conservation and protection of environment.

Some of the documented sacred groves in Uttarakhand are Bughyals, Hariyali, Debvans etc. [5] and some of the preliminary study was conducted [6]. The sacred groves in the interior places being inaccessible are less known and still untouched. Earlier in Central Himalaya, Thal Kedhar, Haat Kali, Nakuleshwar, Chandika and Vaishneo Devi sacred groves was documented from the Pithoragarh district [7 - 11]. Since then the study on these sacred grove is lacking and little or no literature is available in terms of its phytodiversity, threat and conservation. Thus, keep in this mind the study was carried out in newly reported sacred grove in Pithoragarh district, Central Himalaya i.e., Malay Nath Sacred Grove, in terms of documentation, floristic account of sacred grove, threat and its conservation.

Study Area

Malay Nath sacred grove is situated on Didihat, 53 km from the main Pithoragarh town (Fig. 1) and 2 km by foot in Sherakote village at an altitude of 2000 m (Fig. 2A). From enquiry with local peoples, this grove was found to be 1000 years old, covering an area of about 2.0 ha. Malay Nath is the *devta* (god) of all the peoples of Digtar (Didihat). His temple is situated on the top of Sherakote village in the dense trees of the grove. The view of Panchachuli and Nanda Devi (Himalayan range) peaks are clearly seen from this grove (Fig. 2B). This grove is basically inhabitants by ***Bora, Dasela*** and ***Chuphal*** communities. The whole grove showing semi-temperate type of forest and is covered by trees of *Rhododendron arboreum* and *Quercus leucotricophora* (Fig. 2C). The average temperature of the grove ranging between 30ºC maximum in summer and 0ºC minimum in winter.

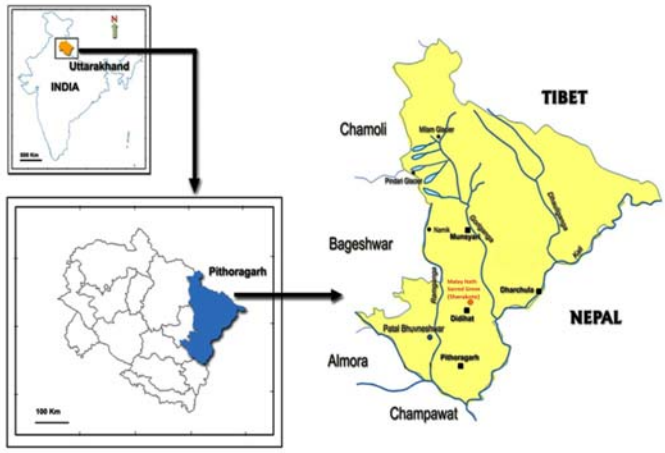

Fig. 1. The study area

Fig. 2. Images from Malay Nath: **A -** Malay Nath sacred grove showing dense population of *Rhododendron arboreum* and *Quercus leucotrisophora* along with Malay Nath (local deity)**;** **B -** View of peak Panchachuli and Nanda Devi cover by snow**; C -** Dense forest in Malay Nath showing diversified life and growth form**; D -** Beautiful *Rhododendron arboreum* – a sacred plant species from Malay Nath sacred groves

Methodology

Existence of this sacred grove came to light through local people of Didihat. The collections were made in all the four seasons of the year i.e., spring, summer, rainy and winter. During 2007-2009, critical field observations on each plant species were made and samples of plant with high medicinal value were collected either in flowering or fruiting stage from the grove. Further specimens were processed as per routine herbarium techniques recommended [12] and were deposited in LWG herbarium, Lucknow. The specimens were identified on the basis of morphological as well as micro-morphological characters and making use of different floras, monographs, revisions and other available literature.

Results and discussions

Phytodiversity of Malay Nath sacred grove is unique with 63 species in 57 genera under 47 families of both flowering and non-flowering plants (Table 1).

Table 1. List of phytodiversity in Malay Nath sacred grove, Didihat

S. No.	Botanical Name	Family
	List of Lichens	
1.	*Bulbothrix isidiza* (Nyl.) Hale	Parmeliaceae
2.	*Bulbothrix setschwanensis* (Zahlbr.) Hale	Parmeliaceae
3.	*Canoparmelia ecaperata* (Mull. Arg.) Elix & Hale	Parmeliaceae
4.	*Chrysothrix chlorina* (Ach.) Laundon	Chrysothricaceae
5.	*Everniastrum cirrhatum* (Fr.) Hale	Parmeliaceae
6.	*Lecanora achora* Nyl.	Lecanoraceae
7.	*Lecanora leproplaca* Zahlbr.	Lecanoraceae
8.	*Parmotrema nilgerrhense* (Nyl.) Hale	Parmeliaceae
9.	*Parmotrema reticulata* (Taylor) Choisy	Parmeliaceae
10.	*Pyxine himalayensis* Awasthi	Physciaceae
11.	*Pyxine subcinera* Stirt.	Physciaceae
12.	*Ramalina sinensis* Jatta	Ramaliaceae
	List of Bryophytes	
1.	*Barbula* species	Pottiaceae
2.	*Cratoneuron filicinum* (Hedw.) Spruc.	Amblystegiaceae
3.	*Entodon flavescens* (Hook.) A. Jaeg.	Entodontaceae
4.	*Erythrodontium julaceum* (Hook. ex Schwagr.) Par.	Entodontaceae
5.	*Herpetineuron toccoe* (Sull. & Lesq.) Card.	Thuidiaceae
6.	*Marchantia paleacea* Bert.	Marchantiaceae
7.	*Ptychanthus striatus* (Lehm & Lindenb) Nees.	Lejeuneaceae
8.	*Rhodobryum roseum* (Hedw.) Limpr.	Bryaceae
9.	*Thuidium assimile* (Mitt.) A. Jaeg.	Thuidiceae
	List of Pteridophytes	
1.	*Adiantum capillus-veneris* L.	Adiantaceae
2.	*Asplenium dalhousiae* Hook.	Aspleniaceae
3.	*Cheilanthus dalhousiae* Hook.	Sinopteridaceae
4.	*Polysctichium nepalense* (Spr.) C. Chr.	Aspidaceae
5.	*Pteris stenophylla* Wall. ex Hook.	Pteridaceae
6.	*Pyrossia stigmosa* (Swartz) Ching	Polypodiaceae
7.	*Selageinella bryopteris* (L.) Bak.	Selaginellaceae
	List of Gymnosperm	
1.	*Cupressus torulosa* D. Don	Cupressaceae
	List of Angiosperm	
1.	*Agrimonia pilosa* Ledeb. var. *nepalensis* (D. Don) Nakai	Asteraceae
2.	*Berberis asiatica* Roxb. ex DC.	Berberidaceae
3.	*Bergenia ciliata* (Haw.) Sternb.	Saxifragaceae
4.	*Boenninghausenia albiflora* Reich. ex Meisn.	Rutaceae
5.	*Bidens pilosa* L.	Asteraceae
6.	*Clematis buchananiana* DC.	Ranunculaceae
7.	*Cnicus wallichii* (DC.) C. B. Clarke	Asteraceae
8.	*Cyathula tomentosa* (Roth) Moq.	Acanthaceae
9.	*Dipsacus inermis* Wall.	Dipsacaceae
10.	*Duchesnea indica* (And.) Focke	Rosaceae
11.	*Eragrostis nigra* Nees ex Steud.	Poaceae
12.	*Hedychium spicatum* Buch.-Ham. ex Smith	Zingiberaceae
13.	*Lindera pulcherrima* (Nees) Benth. ex Hook.	Lauraceae
14.	*Lyonia ovalifolia* (Wall.) Drude	Ericaceae
15.	*Myrsine semiserrata* Wall.	Myrsinaceae
16.	*Origanum vulgare* L.	Lamiaceae
17.	*Oxalis corniculata* L.	Oxalidaceae
18.	*Pepromia tetraphylla* (Forster f.) Hook. & Arn.	Piperaceae
19.	*Persicaria capitata* (Buch.-Ham. ex D. Don) H. Gross	Polygonaceae
20.	*Primula edgeworthii* (Hook. f.) Pax	Primulaceae
21.	*Prinsepia utilis* Royle	Rosaceae
22.	*Pyracantha crenulata* (D. Don) Roem.	Rosaceae
23.	*Quercus leucotricophora* A. Camus	Fagaceae
24.	*Randia tetrasperma* (Roxb.) Benth. & Hook.	Rubiaceae
25.	*Rhododendron arboreum* Smith	Ericaceae
26.	*Rubia manjith* Roxb. ex Fleming	Rubiaceae
27.	*Rubus ellipticus* Smith	Rosaceae
28.	*Rubus foliosus* D. Don	Rosaceae
29.	*Rumex hastatus* D. Don	Polygonaceae
30.	*Sarcococca saligna* (D. Don) Muell.-Arg.	Buxaceae
31.	*Smilax aspera* L.	Smilacaceae
32.	*Solanum nigrum* L.	Solanaceae
33.	*Spermatodictylon sauveolens* Roxb.	Rubiaceae
34.	*Urtica dioca* L.	Urticaceae
35.	*Viburnum cylindricum* Buch.-Ham.	Cappriifoliaceae

Angiosperm represents maximum with 54.68% followed by lichen which represents 18.75%, bryophytes with 14.06 %, pteridophytes with 10.93% and gymnosperm with 1.56% (Fig. 3).

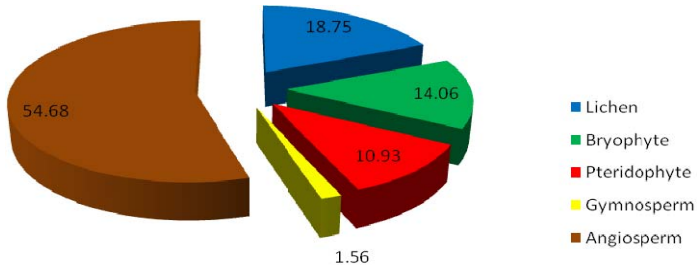

Fig.3. Showing phytodiversity (flowering & non-flowering plants) in Malay Nath sacred grove.

In terms of angiosperm, the grove represents 34 species under 33 genera and 25 families with life form habit showing dominancy of herbaceous plants with 18 species (51.75%) followed by 6 shrubs (17.14%), 4 climbers (11.42%), 6 trees (17.14%) and minimum by epiphytes with 1 species (2.85%) (Fig.4). Keystone species such as *Rhododendron arboreum, Lyonia ovalifolium, Quercus leucotricophora* and *Viburnum cylindrium* play pivotal role in the conservation or sustence of the ecosystem in the grove. Presence of specific (particular species growing at this altitude) and dense trees in the grove (*Myrsine semiserrata, Viburnum cylindrium, Lindera pulcherrima, Rhododendron arboreum, Quercus leucotricophora, Lyonia ovalifolia*) gives shelter and conserve many flora and fauna, therefore showing diversified wild life within the grove. Climbers such as *Clematis buchananiana, Smilax aspera*, and *Rubia cordifolia* are growing luxuriantly in different substratum and gain huge length for their existence in the grove. *Quercus leucotricophora* and *Rhododendron arboreum* are good soil binder and have good water retention capacity [13]. The dense population of these trees shows the characterization that the grove has plenty of water. Sacred trees of Kumaon Himalayas like *Rhododendron arboreum* (Fig. 2D) and *Quercus leucotricophora* are growing frequently in the grove.

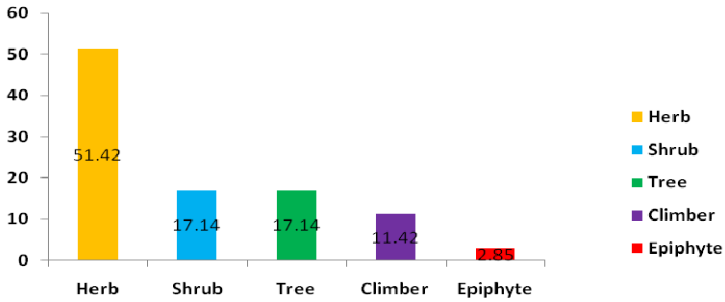

Fig.4. Showing life-form diversity of Angiosperm in Malay Nath sacred grove

Dense forest of *Rhododendron arboreum* and *Quercus leucotricophora* are provides excellent substratum for lichens which represents 12 species under 8 genera and 5 families. These are the important bio-indicators of the ecosystem and represents specified type of forest such as presence of parmeliod lichens viz., *Parmotrema nilgerrehense, Ramelina sinensis, Everniastrum cirrhatum, Canoparmelia ecaperata* showing open forest with sufficient

penetration of sunlight. *Leconara leproplaca* and *L. achroa* species are favored the well illuminated environmental condition mostly in thinned out forest with considerable exposure of light and wind. The leprose and crustose lichens (*Chrysothrix chlorina, Bulbothrix setschwanensis, B. isidiza, Leconora*) are the primary colonizer of an ecosystem and indicate the presence of regenerated young forest trees in sacred grove. Thus, presence of these types of lichen species in the grove showing varied micro-climatic conditions in which is essential for the flourish growth of lichen flora .

Similarly, pteridophytic flora represents 7 species, 7 genera under 7 families out of which *Adiantum capillus-veneris, Selaginella bryopteris, Chelianthus dalhousiae*, are grow epiphytically on rocks while *Pyrossia stigmosa* is growing on truck and branches of *Quercus leucotricophora* trees. *Adiantum* and *Selaginella* species are showing the moist and humus rich soil in the grove.

Bryophyte contributes ground vegetation of the grove represents 9 species under 9 genera and 9 families. *Rhodobryum, Thuidium, Endoton, Barbula, Cratoneuron, Herpetineuron, Erythrodontium* is mosses while *Ptychanthus* and *Marchantia* are Leafy and thalloid liverworts respectively. Presence of *Rhodobryum* in the grove denotes the moist and temperate environmental conditions in the grove.

35 plant species under 32 genera and 23 families are used as an ethno-medicinal and the information about the ethno-medicinal plants was gathered from knowledgeable elderly local peoples of the area (Table 2).

Table 2. List of Ethno-medicinal plants found in the grove

S. No.	Scientific name	Local name	Family	Ethno-medicinal Uses
	List of Lichens			
1.	*Canoparmelia ecaperata* (Mull. Arg.) Elix & Hale	*Jhulla/Chharila*	Parmeliaceae	cough & cold
2.	*Everniastrum cirrhatum* (Fr.) Hale	Jhulla	Parmeliaceae	fever, cold
3.	*Parmotrema nilgerrhense* (Nyl.) Hale	Jhulla	Parmeliaceae	cough & throat problem
4.	*Parmotrema reticulata* (Taylor) Choisy	Jhulla	Parmeliaceae	cough & cold
5.	*Ramalina sinensis* Jatta	Jhulla	Ramaliaceae	cough & cold
	List of Bryophytes			
6.	*Marchantia paleacea* Bert.	-	Marchantiaceae	wound & cut
	List of Pteridophytes			
7.	*Adiantum capillus-veneris* L.	Hansraj	Adiantaceae	fever, cough
8.	*Selageinella bryopteris* (L.) Bak.	Sanjeevani	Selaginellaceae	Tonic
	List of Angiosperm			
9.	*Agrimonia pilosa* Ledebour	-	Asteraceae	Cough, diarrhea
10.	*Berberis asiatica* Roxb. ex DC.	Kilmora	Berberidaceae	Fever, diabetes, tonic, eye problem
11.	*Bergenia ciliata* (Haworth) Sternb.	Patarchur	Saxifragaceae	Kidney stone, gall bladder stone, fever, digestion problem, hair tonic
12.	*Bidens pilosa* L.	Samasa	Asteraceae	Toothache, skin diseases
13.	*Clematis buchananiana* DC.	Lagulia	Ranunculaceae	Skin diseases
14.	*Cyathula tomentosa* (Roth) Moq.	Letkura	Acanthaceae	Skin diseases
15.	*Duchesnea indica* (Andrews) Focke	*Bhiun-kaphal*	Rosaceae	Cut , swelling digestion problem
16.	*Eragrostis nigra* Nees ex Steud.	*Ghas*	Poaceae	Stomach problem
17.	*Hedychium spicatum* Buch.-Ham. ex Smith.	*Van Haldu*	Zingiberaceae	Cough, fever, vomiting, tonic, diarrohoea
18.	*Lindera pulcherrima* (Nees) Benth. ex Hook.	-	Lauraceae	Rheumatism, wound
19.	*Lyonia ovalifolia* (Wall.) Drude	Anyar	Ericaceae	Skin diseases
20.	*Origanum vulgare* L.	Ban tulsi	Lamiaceae	fever, cough, bronchitis
21.	*Oxalis corniculata* L.	Chilmora	Oxalidaceae	Cuts, wounds, skin diseases, gastrointestinal troubles
22.	*Perscaria capitata* (Buch.-Ham. ex D. Don) Gross	-	Polygonaceae	Boils, cooling
23.	*Prinsepia utilis* Royle	Bhekal	Rosaceae	Skin diseases, wounds, Stomach trouble
24.	*Pyracantha crenulata* (D. Don) Roem.	Ghingaru	Rosaceae	Constipation
25.	*Quercus leucotricophora* A. Camus	Banj	Fagaceae	Energy enhancer, stomach problem, diuretic
26.	*Randia tetrasperma* (Roxb.) Benth. & Hook.	-	Rubiaceae	Digestive problem
27.	*Rhododendron arboreum* Smith	Bhuras	Ericaceae	Blood purifier, Dysentery, fever
28.	*Rubia manjith* Roxb.ex. Fleming	Manjith	Rubiaceae	Dysentery, fever, leucoderma
29.	*Rubus ellipticus* Smith	Hisaloo	Rosaceae	Constipation, fever, Vomiting
30.	*Rubus foliosus* D. Don	Kalo Hisaloo	Rosaceae	Stomach problem
31.	*Rumex hastatus* D. Don	Bhilmora	Polygonaceae	Cuts and wounds
32.	*Smilax aspera* L.	Kukurdara	Smilacaceae	Rheumatic-arthritis
33.	*Solanum nigrum L.*	Makoi	Solanaceae	Jaundice, tonic
34.	*Spermatodictylon sauveolens* Roxb.	Padar	Rubiaceae	Diarrohoea
35.	*Urtica dioca* L.	Shinna/Bichughas	Urticaceae	Rheumatic-arthritis, Swelling, boils, skin diseases

Some are critically endangered and threatened medicinal plants i.e., *Hedychium spicatum*, *Origanum vulgare*, *Bergenia ciliata*, etc. found in the grove [14, 15]. 9 species are used in fever and cold, followed by 8 species are stomach related problem, 7 species in skin diseases and while 1 species (minimum) is used as a blood purifier. 3 species are used as timber while 4 species are used to make household goods, 2 species are used in making dye and 4 species are fruit edible. In case of lower plants species, 5 lichens (Parmeliod lichens) are used as a spice and 2 species of pteridophytes are used as medicine. But, now a day this grove faces new threats such as tourism, collection of fodder, fuel, medicinal plants, grazing, etc. Due to grazing, the regeneration of oak (*Quercus leucotricophora*) is affected, as the acorns are consumed by the goats.

There is an urgent need to set forth specific guidelines to safeguard this sacred grove and promote the traditional knowledge of conservation, namely: revitalization and enforcement of traditional education; the delineation of boundaries; the improvement of relevant knowledge and their official recognition through a legal status. It is urgently felt that traditional knowledge-based systems that is, the local belief systems should be made inclusive part of developmental programmes, for the simple reason that the local populace could relate themselves to the same.

Conclusions

The favorable climatic conditions of the Malay Nath sacred grove, enhances the luxuriant growth of important flora of the region including rare and endemic taxa. Therefore, it can be considered as a biodiversity heritage site. Such religiously protected areas provide a comprehensive and rich ecological niche, as repositories of genetic diversity [16]. However, in view of increasing anthropogenic pressure on land and plant resources in the region and erosion in the traditional belief, the sacred groves are being encroachment by the local tribes themselves. Therefore there is an urgent need to protect these groves to conserve regional plant diversity, not only for ecosystem health but also for the benefit of the indigenous tribes who heavily depend on local plant diversity for their day-to-day requirements.

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