Journal of Medicinal Plants Studies
www.PlantsJournal.com

ISSN (E): 2320-3862
ISSN (P): 2394-0530
Impact Factor (RJIF): 5.94
www.plantsjournal.com
JMPS 2025; 13(5): 22-36

Received: 13-08-2025
Accepted: 16-09-2025

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Traditional belief system in biodiversity conservation: A case study of Hurang Narayan sacred grove in Himachal Pradesh (N.W. Himalaya)

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Abstract
Sacred groves are patches of land that are generally protected with religious faith of people. The present paper describes the Hurang Narayan sacred grove located in Chauhar Valley of district Mandi (H.P). The main deity is named as 'Hurang Narayan' and the associated forest is also known as 'Dev Van'. The dense vegetation of sacred grove is protected by the people through local taboos and sanctions imposing strict penalties for use of resources within the grove or even for visiting the deity's forest without permission. Thus, the article aims to document traditional knowledge system as well as religious beliefs and practices governed by local communities of Hurang Narayan valley that have an inherent role in biodiversity conservation. Surveys were conducted in the sacred grove to study its impact on biodiversity conservation. Information pertaining to ethnobotanical properties of plants was collected from the knowledgeable people of the region. The data collected includes information about sacred grove, associated deity, unique floral diversity and traditional beliefs or taboos of local communities. The present study reveals the ethnobotanical applications of 55 species of plants from 52 genera and 37 families found in the Hurang Narayan sacred grove. It has been noted that certain plant species conserved in deity's forest are rarely found in the surrounding regions. The grove is home to several rare, endangered, vulnerable and endemic plant species.

Keywords: Biodiversity conservation, sacred grove, traditional beliefs, hurang Narayan, Himachal Pradesh

Introduction

Background

Religious and traditional beliefs significantly contribute to biodiversity conservation through the norms and practices embraced by indigenous communities all around the world. Sacred groves are areas of land that are generally preserved due to religious beliefs of the people. There are several sacred groves in Himachal Pradesh, the land of gods and deities called as "Dev Bhoomi". The present investigation describes the Hurang Narayan sacred grove located in Chauhar Valley of district Mandi (H.P). The dense vegetation of sacred grove is protected by the people through local taboos and sanctions imposing strict penalties for use of resources within the grove or even for visiting the deity's forest without permission. Surveys were conducted in the sacred grove to study its impact on biodiversity conservation. Information pertaining to ethnobotanical properties of plants was collected from the knowledgeable people of the region. It has been perceived that there are certain plant species conserved in deity's forest which are not commonly found in surrounding areas. Some vulnerable, endangered, critically endangered and endemic species are also found in the grove. The data collected includes information about sacred grove, associated deity, unique floral diversity and traditional beliefs or taboos of local communities. Thus, the article aims to document traditional knowledge system as well as religious beliefs and practices governed by local communities of Hurang Narayan valley that have an inherent role in biodiversity conservation.

India is a land of wonders having different cultures, traditions, religions and belief systems for conserving natural resources or biodiversity. It is the 7th largest country in the world, 2nd largest in population. It is home to the world's highest peak, the Himalayas, which is well known for its rich biodiversity and traditional conservation practices. Natural resource management is the part of traditions of Indian society since prehistoric time encompassing

various practices including the concept of sacred groves. Sacred groves are the ideal centres for protecting biodiversity including flora, fauna and natural resources. These are the patches of forest land which are not disturbed by the local inhabitants and are conserved under the influence of local village deities. Local deities in the Himalayan region are believed to have divine powers and all the rituals are performed by local people to keep the deity happy because they do not want to face the divine wrath of the deity (Rani & Agnimitra, 2021) [73]. The concept of sacred groves is the best practice for maintaining clean environment, preventing soil degradation, for conserving biological resources as well as traditional knowledge. Sacred grove represents an ancient tradition of environment protection based on traditional belief system developed by the tribal and rural communities (Jeeva *et al.*, 2006) [37]. These are the patches of forests which are conserved by local people on the basis of their religious faith. These are also known as deity's forests, sacred forests, church forests and fetish forests (Kandari *et al.*, 2014) [38]. They represent an effective method of habitat preservation through local taboos and community participation (Sambandan and Dhatchanamoorthy, 2012) [77].

In India, the concept of sacred groves has been identified in Himalayan region, eastern and western ghats, central Indian plateau, coastal regions and western deserts (Singh *et al.*, 2017) [85]. There are around 13,270 sacred groves in India (Amirthalingam, 2016) [6]. Among these, the largest number of sacred groves has been reported from Himachal Pradesh followed by Kerala and Chhattisgarh. There are 5000 sacred groves in Himachal Pradesh which are managed by the local communities of the state on the basis of their indigenous knowledge (Kandari *et al.*, 2014) [38]. Traditional knowledge pertaining to the utilization and conservation of plant resources with particular reference to sacred groves in Himachal Pradesh has been documented by several workers (Malhans, 2006; Jaryan *et al.*, 2010; Thaplyal *et al.*, 2012; Kumar *et al.*, 2016; Panchani, 2016; Guleria and Gupta, 2020) [52, 36, 95, 44, 63, 31]. In Himachal Pradesh, Mandi district is popularly known region of North Western Himalaya having distinctiveness of flora and fauna. There are many sacred groves present in Mandi district which serve the purpose of biodiversity conservation. These include sacred grove of Kamrunag, Shikari Devi (Janjehli), Jalpa mata (Padhar), Dev Daint (Thalog), Hurang Narayan (Chauhar valley) and Pashakot dev (Barot). The largest sacred grove is Dev Daint (Thalog) covering an area of about 500 Bigha and the smallest sacred grove is Jalpa mata sacred grove having an area of about 7 Biswa (Gupta *et al.*, 2019) [32]. The Hurang Narayan sacred grove is situated in Chauhar valley of district Mandi (Himachal Pradesh).

In ancient times, local communities were completely dependent on native plants for their daily needs like food, fibre, fuel, fodder and medicines. Therefore, these plant resources were revered and protected by them for the sustenance of future generations through various myths and taboos. Hence, traditional worshipping practices reflect symbiotic relationship of human beings with nature. With the advent of modernization, new technologies have been established to meet the increasing demands of people. These new technologies have several anthropogenic effects on ecosystem which ultimately lead to the depletion of biodiversity (Khan *et al.*, 2008) [41]. Therefore, in the present scenario, conservation of biodiversity has become a global issue. There are several laws, conventions and programmes for conservation of biodiversity. In addition to such rules and practices, there are some traditional aboriginal communities in several parts of the world which conserve their forests by their traditional belief system and contribute for conservation of biodiversity.

Traditional knowledge preserves the valuable information about plant diversity and provides variety of different alternative medicines and plant products having economic significance to the modern world (Radha *et al.*, 2021) [70]. But due to the impact of growing modernization on societies, the faith as well as interest of younger generations in traditional knowledge has been declining and consequently, the effectiveness of indigenous beliefs system on conservation of biological resources is also diminishing rapidly. Therefore, it is necessary to preserve the concept of sacred groves and to spread it globally as these are the treasure house of valuable plant diversity and contain large number of endemic, endangered and rare plant species including several medicinal and other economically important plants.

Materials and Methods

Study Area

Himachal Pradesh, also known as 'Land of Gods', extends from the latitudes $30^0$22'40'' N to $33^0$12'40'' N and longitudes $75^0$45'55'' E to $79^0$04'20'' E. It is the northern state of India forming the part of Western Himalaya. Himachal Pradesh with dense vegetation and attractive landscape represents the green pearl in the crown of Himalaya. Mandi is one of the districts in Himachal Pradesh called as "Chhoti Kashi" or "Varanasi of Himachal" known for its 81 ancient temples in small town and its unique diversity. Hurang Narayan sacred grove is situated in Hurang village of Chauhar valley in Mandi district of Himachal Pradesh (Fig. 1 and Fig. 2). The main deity is named as 'Hurang Narayan' and the associated forest or sacred grove is also known as 'Dev Van'. Villagers are not allowed to cut wood from this forest for their use in daily life. They are not even allowed to enter the forest with pointed arms. Smoking is prohibited in Hurang village and no one can enter this village with tobacco products. Entry in the village with leather materials like shoes, belt, purse, etc. is strictly prohibited. People follows these traditions from centuries and adopt several religious practices to protect the forest of deity.

Soil and Climatic conditions: The soil of the region is very fertile sandy loamy, black soil or called as forest soil. The pH range of soil is 5.2 to 6. There are four climatic conditions or seasons (summers, monsoon, autumn and winter). There is a short summer from mid-April to June, monsoon lies in the month of July to mid-September, autumn lies from the September to October and having long winters from November to April. The winter is long because of heavy snowfall in winters and ice melts in the month of April to May.

Fig 1: View of Hurang Narayan sacred grove and its associated forest

Fig 2: Hurang Narayan Temple

Methodology

Regular field visits were made during the year 2021-2022 to explore the floristic diversity and conservation status of the Hurang Narayan sacred grove in Chauhar valley of Himachal Pradesh. Repeated ethnobotanical surveys were conducted in the study area and ethnobotanical information obtained from the knowledgeable people was recorded as per the questionnaire, interviews and discussion in their local language (Pahadi). The questionnaire was designed to gather information pertaining to vernacular name, part/s used, traditional use/s and various conservation practices adopted by the villagers. The information was collected from 23 informants (both men and women) of different age groups. Among them, 10 informants were in the age group of 70-75 years, 7 informants were 60-65 years old and 6 informants were in the age group of 50-60 years. Some of them visited the sacred grove with us with the permission of temple authorities where they showed us the plants used for different purposes. Plant specimens were collected from the study area and herbarium was prepared for authenticity. Photographs of the plants were also taken. Samples were identified with the help of available literature including regional floras (Hooker, 1872-1897 [34]; Chowdhery and Wadhwa, 1984 [20]; Polunin and Stainton, 1984) [67]. The identified herbarium specimens were deposited in the department of Bio-Sciences, H.P. University, Shimla. The information regarding traditional practices, religious beliefs and participation of local people in conservation of the Hurang Narayan sacred grove was also recorded.

Enumeration of Plant Species

The present exploration pertains to a case study of Hurang Naryan sacred grove in Mandi district of Himachal Pradesh (India). This sacred grove is a reservoir of several medicinal and economically important plants utilized by the villagers for several purposes. A total of 55 plant species have been recorded from the study area with detailed description about their botanical name, family, vernacular name/s, habit, part/s used, folk uses and uses in literature (Table 1; Fig. 3-5).

Table 1: Ethnobotanical Uses of Plant Diversity in Hurang Narayan Sacred Grove

Botanical Name	Family	Vernacular Name	Habit	Part/s Used	Folk Uses	Uses in Literature	References
Abies pindrow (Royle ex D. Don) Royle	Pinaceae	Tosh	Tree	Leaves	Leaves are used for chest infection, cough and cold	It possesses antiulcerogenic, anti-inflammatory, antispasmodic, stomachic and carminative properties. Earlier reported to cure fever, cough, bronchitis, asthma, cold, hypoglycaemia, haemoptysis and fever	Majeed *et al*., 2013 [51]; Sinha, 2019 [86]
Achillea millefolium L.	Asteraceae	Losar	Herb	Leaves and Flowers	Used for healing wounds	Known to be antispasmodic, anti-inflammatory, antimicrobial and antidiarrheal; useful for gastro-intestinal complaints, cold, fever, menstrual disorders, eczema, flu, gastritis and influenza	Benedek and Kopp, 2007 [13]; Thangavelu *et al*., 2011 [94]
Aconitum heterophyllum Wall. ex Royle	Ranunculaceae	Atis	Herb	Whole plant	It is employed for the treatment of diabetes and blood pressure	Reported to be used as diuretic, carminative, antidiarrheal, analgesic, nerve sedative and to cure fever, urinary infections, diarrhoea, inflammation, rheumatism, cough, cold, respiratory problems, reproductive disorders and	Ukani *et al*., 1996 [96]; Paramanick *et al*., 2017 [65]
Acorus calamus L.	Acoraceae	Barae	Herb	Whole plant	It is considered good for cough, fever, asthma and digestive problems	Used against neurological, gastrointestinal, respiratory, metabolic, kidney problems, liver disorders and possesses anti-inflammatory, cardiovascular, acetylcholinesterase inhibitory, antioxidant, antispasmodic,	Mukherjee *et al*., 2007 [57]; Balakumbahan *et al*., 2010 [10]; Sood *et al*., 2012 [89]

						hypolipidemic and immuno-suppressive activities	
Adiantum venustum D. Don	Adiantaceae	Barn, Brahmi	Fern	Whole plant	It is effective against itching and skin problems	It is used to cure jaundice, chest infection, fever, nasal catarrh, blood loss, headache, urinary problems, hair loss, tumour, cuts, scorpion stings, wounds and also as tonic, diuretic, astringent, expectorant and emetic	Mubashir and Shah, 2011 [56]; Mandal, 2017 [53]
Aesculus indica (Wall. ex Cambess.) Hook.	Sapindaceae	Khanor	Tree	Leaves, Seeds	Seed flour is used for making porridge which is good for curing arthritis. Leaf paste is applied for removing leech.	It is effective for leukorrhea, fever, skin problems, wounds, piles, cardiovascular diseases and possesses anti-inflammatory, antioxidant, anti-proliferative, antidiabetic and antiviral activities	Rajasekaran and Singh, 2009 [72]; Yadav *et al*., 2022 [99]
Ajuga parviflora Benth.	Lamiaceae	Neel-kanthi	Herb	Leaves	Used for diabetes, respiratory problems and stomach disorders	Earlier, recorded to be used as blood purifier, tonic, astringent, anti-inflammatory, depurative, diuretic and for the treatment of bronchitis, fever, pneumonia, diarrhoea, typhoid, colic, gout, dysentery and jaundice	Khuroo *et al.*, 2007 [42]; Rahman *et al.*, 2013 [71]
Allium ampeloprasum L.	Amaryllidaceae	Jungli lahsun, Lahsun	Herb	Bulbils	Bulbils are used as immunity booster, flavouring material and for making chutney	It possesses antidiabetic, immune-stimulating, hypolipidaemic, anti-toxic, antimicrobial, free radical scavenging, antioxidative and anti-inflammatory properties	Dey and Khaled, 2013 [23]; Sen, 2021 [79]
Angelica glauca Edgew.	Apiaceae	Chora	Herb	Leaves, Roots	Useful for cough, cold and stomach ache	Reported to be used for typhoid, influenza, indigestion, dysentery, loss of appetite, headache, dyspepsia, stomach disorder, vomiting, post-delivery weakness and also as stimulant, tonic, diuretic and carminative	Butola *et al.*, 2016 [17]; Sen, 2021 [79]
Arisaema serratum (Thunb.) Schott	Araceae	Sanp-ki-makki	Herb	Rhizome	Used as remedy for snake bite and stomach ache	Reported to be used to cure snake bite and tumour	Ali and Yaqoob, 2021 [4]
Berberis asiatica Roxb. ex DC.	Berberidaceae	Kasmal	Shrub	Root	Roots are effective for eye infection and for healing wounds	It is used to cure cough, eye itching, cold, diarrhea, malarial fever, rheumatism, skin disease, jaundice, stomach disorders, diabetes, and also as tonic	Srivastava *et al.*, 2004 [91]; Srivastava *et al.*, 2015 [92]; Singhal and Kumar, 2018 [83]
Bergenia ciliata (Haw.) Sternb.	Saxifragaceae	Pathar chat	Herb	Leaves	Used for kidney stone and pain in ear	Reported to be used for curing muscular disorders, respiratory problems, eye diseases, skin disorders, oral infection, gastrointestinal disorders, wounds, urinary disorders, boils, dysentery, kidney stone, worm infection and gynaecological disorders	Kumar *et al.*, 2013a [46]; Ahmad *et al.*, 2018 [1]; Kumar *et al.*, 2018 [47]
Bergera koenigii L.	Rutaceae	Gandhelu	Tree	Leaves	Leaves are used as flavouring agent and for curing stomach ache and body pain	It is used as analgesic, digestive, antihelminthic, appetizer and for the treatment of inflammation, itching, edema, dysentery, fresh cuts, bruises, anxiety, depression and piles	Balakrishnan *et al.*, 2020 [9]; Sen, 2021 [79]
Bidens pilosa L.	Asteraceae	Gumber	Herb	Whole Plant	It is useful for wounds, cuts and snakebite	It possesses vasodilatory, anti-inflammatory, antitumor, antifungal, antidiabetic, immunomodulatory, antimalarial, antioxidant, antihyperglycemic, antibacterial and antiulcerative activities	Bartolome *et al.*, 2013 [12]
Cannabis sativa L.	Cannabaceae	Bhang	Herb	Leaves	Used to cure constipation	Reported to be useful for neurological diseases, arthritis, epilepsy, Parkinson's disease, insect bite, skin diseases and mental problems	Kumar *et al.*, 2013b [48]; Odieka *et al.*, 2022 [62]
Cedrus deodara (Roxb. ex D.Don) G.Don	Pinaceae	Devdar	Tree	Leaves, Wood	Used for curing skin diseases, diabetes and for fire	It possesses antibacterial, anti-inflammatory, immunomodulatory, analgesic and anti-spasmodic	Chaudhary *et al.*, 2011 [19]; Bisht *et al.*, 2021 [14]

					ritual ('havan')	activities; effective to cure skin diseases, arthritis, neurological disorders, gastric problems, microbial infections, asthma, inflammation and	
Centella asiatica (L.) Urb.	Apiaceae	Brahmi	Herb	Leaves	Good for skin diseases, stomach diseases and as memory enhancer	Reported to possesses anti-inflammatory, antioxidant, antimicrobial, neuroprotective and anti-fungal activities and used to treat leprosy, varicose ulcers, lupus, throat infection, diarrhoea, fever and for enhancing memory and	Gohil *et al*., 2010 [29]; Kumar *et al*., 2013b [48]; Prakash *et al*., 2017 [69]
Citrus jambhiri Lush.	Rutaceae	Gamber	Tree	Fruit	Fruits are used to cure cough, cold and fever. Fruits are also edible	Used as antidiarrheal, to cur tooth diseases and to improve digestion	Sood *et al*., 2012 [89]; Chaudhari *et al*., 2016 [18]
Citrus pseudolimon Tan.	Rutaceae	Khatta	Tree	Fruit	Fruits are effective for cough, cold, cholesterol and are worshipped during 'Sair' festival	Used for the treatment of asthma, common cold, cardiovascular diseases and high blood pressure	Thakur and Kumari, 2022 [93]
Cynodon dactylon (L.) Pers.	Poaceae	Dhrub	Herb	Whole plant	It is used to cure jaundice, and are worshipped during 'Sair' festival. The plant is also used as fodder	It is used against headache, diarrhoea, dysentery, asthma, calculus, cancer, hemorrhage, convulsions, hysteria, cough, epilepsy, hypertension, cramps, cystitis, sores, dropsy, hemorrhoids, leucoderma, bronchitis and snakebite	Nagori and Solanki, 2011 [58]
Dendrocalamus strictus (Roxb.) Nees	Poaceae	Jungli ghaa	Shrub	Culm (Stem)	Culms are used for making baskets and young shoots are edible	Reported to possess antibacterial, anti-oxidative, anti-inflammatory and anti-hyperglycemic properties	Nirala *et al*., 2017 [60]; Wangawar, 2017 [97]
Diplazium esculentum (Retz.) Sw.	Athyriaceae	Lingad	Fern	Whole Plant, Fronds	Used for headache, fever, constipation, wounds and asthma. Young fronds are cooked as vegetable	It is known to be used for treating diarrhea, diabetes, rheumatism, smallpox, asthma, wounds, bone fracture, dysentery, fever, measles, glandular swellings, headache, constipation, oligospermia, high blood pressure and skin disorders	Akter *et al*., 2014 [2]; Semwal *et al*., 2021 [78]
Drepanostachyum falcatum (Nees) Keng f.	Poaceae	Chhota baans	Shrub	Culm, Leaves	Culms are used for making hats and baskets. Leaves are cooked as vegetable	It is used to cure bacterial infection and has antimicrobial, antifungal, antibacterial and antioxidant properties	Nepal *et al*., 2018 [59]
Dryopteris juxtaposita Christ	Dryopteridaceae	Nachan	Fern	Aerial parts, Rhizome	Rhizome is used for digestive problems and aerial parts as bedding for livestock	Used to cure intestinal disorders, weak bones, digestion and also as anti-inflammatory and antidepressant	Singh *et al*., 2021 [84]; Obaidullah *et al*., 2022 [61]
Duchesnea indica (Andrews) Focke	Rosaceae	Kiphaliya	Herb	Root	Used for Insect bite and traumatic injuries	It is effective against snake bites and insect bites	Radha *et al*., 2021 [70]
Fagopyrum dibotrys (D.Don) H. Hara	Polygonaceae	Phafru	Herb	Leaves	Leaves are effective for indigestion and dysentery problem in cattle	It is found to be effective for menstrual irregularities, injuries, snake bite, lumbago and possesses antioedemic, anti-inflammatory, antispasmodic and hypotensive activities	Sen, 2021 [79]
Fagopyrum esculentum Moench	Polygonaceae	Phafra	Herb	Leaves	Used for skin diseases and for making local dishes as well as'chutney'	Used to cure wounds, ulcer, hypertension, haemostasis and diabetes	Al-Snafi, 2017 [5]
Ficus auriculata Lour.	Moraceae	Tariyambal	Tree	Fruit	Useful for dysentery and diarrhoea	Reported to cure inflammation, cancer, parkinson's disease, alzheimer's disease, diabetes, liver disorder, atherosclerosis and cardiovascular diseases	Gaire *et al*., 2011 [26]; Kumar *et al*., 2013b [48]
Galium aparine L.	Rubiaceae	Kuri ghaa	Herb	Leaves	Employed to cure fungal infections	Useful for fever, chronic sores, urinary tract infection, ulcer, skin diseases and as blood purifier, antioxidant and antimicrobial agent	Senio *et al*., 2018 [80]
Hedera helix L.	Araliaceae	Dakri	Climber	Leaves	Good for	It shows antispasmodic,	Kumar *et al*.,

					respiratory problems	antimicrobial, antioxidant, anti-inflammatory, antitumor, analgesic, anthelmintic, antimutagenic, antithrombin activities and used to cure cold and cough	2013a [46]; Lutsenko *et al.*, 2010 [50]
Indigofera heterantha Wall. ex Brandis	Fabaceae	Kali-kathi	Shrub	Flower	Flowers are used to cure stomach disorder and skin diseases	It has antibacterial, antifungal and insecticidal properties	Ghiasuddin, 2011 [28]
Juglans regia L.	Juglandaceae	Akhrot	Tree	Leaves, Bark	Used for skin disorders, as mouth freshener and also worshipped during 'Sair' festival	It possesses antioxidant, hypolipidemic, antidiabetic, antimicrobial, antihypertensive properties and employed to maintain cholesterol level and to cure skin diseases	Sood *et al.*, 2013 [88]; Delaviz *et al.*, 2017 [22]
Justicia adhatoda L.	Acanthaceae	Basuti	Herb	Leaves	Leaves are used for fever, cough, cold and asthma	It is used for diarrhoea, dysentery, asthma, bronchitis, skin infection, pimples, fever, jaundice, lumber pain, joint pain and sprain	Dhankhar, 2011 [24]; Kumar *et al.*, 2013b [48]; Kumar and Kumar, 2014 [45]
Mangifera indica L.	Anacardiaceae	Aam	Tree	Fruits, Wood, Leaves	Fruits are edible and also considered good for the treatment of piles. Leaves are used for decoration and wood for fire ritual ('hawan')	Reported to possess anti-inflammatory, anti-diabetic, anthelmintic, anti-oxidant, anticancer, antibacterial, anti-fungal, anti-viral, anti-parasitic, antispasmodic, antidiarrheal, antipyretic, hypolipidemic and immunomodulatory properties	Parvez, 2016 [66]
Morchella esculenta L.	Morchellaceae	Guchii	Fungus	Fruiting body	Used as immune booster and vegetable	It has immunomodulant, antioxidant, antitumor and anti-inflammatory properties	Sen, 2021 [79]
Myrica esculenta Buch. -Ham. ex D.Don	Myricaceae	Kaphal	Tree	Fruit	Fruits are edible and are good for cold	It is used for the treatment of cough, diarrhoea, asthma, chronic bronchitis, fever, rheumatism and inflammation.	Sood and Shri, 2018 [87]
Origanum vulgare L.	Lamiaceae	Ban tulsi	Herb	Leaves	Useful for curing cough, fever, cold, headache and menstrual disorders	Used to treat diarrhea, nervous system disorders, urinary tract infection, migraine, respiratory disorders, toothache, indigestion, cough, bronchitis and possesses antibacterial, antioxidant, antifungal, antiparasitic, antitumor, and anti-inflammatory properties	Bahmani *et al.*, 2018 [8]; Lombrea *et al.*, 2020 [49]
Oxalis corniculata L.	Oxalidaceae	Khatti mithi	Herb	Whole plant, Leaves	Used to treat skin rashes and for making 'chutney'	It possesses antidiabetic, anti-fungal, anti-ulcer, wound healing, anti-inflammatory activities; useful against chronic diseases, skin diseases, piles, cough and diarrhoea	Srikanth *et al.*, 2012 [90]
Papaver somniferum L.	Papaveraceae	Afeem	Herb	Seed	Seeds are used for headache	Reported to be used as analgesic, narcotic, sedative, stimulant and to cure cough, cardiac asthma, insomnia, headache and biliary colic	Masihuddin *et al.*, 2018 [54]
Paris polyphylla Sm.	Melanthiaceae	Satua	Herb	Rhizome	Good for snake bite and stomach ulcers	It is used for the treatment of Inflammation, traumatic bleeding, microbial infection, cancer, metrorrhagia, metrostaxis, menorrhagia and functional uterine bleeding in female patients	Shah *et al.*, 2012 [81]
Phyllanthus emblica L.	Phyllanthaceae	Amla	Tree	Fruit, Wood	Fruits are used for jaundice, hair growth, for making pickles and wood is used for fire ritual ('hawan')	It is used as carminative, stomachic, digestive, tonic, laxative, alexiteric, antipyretic, aphrodisiac, diuretic and to treat diabetes, gonorrhoea, leprosy, cough, diarrhoea, digestive problems, asthma, bronchitis, ulcer, inflammation, skin diseases, anaemia, jaundice and	Kumar, *et al.*, 2013b [48]; Sen, 2021 [79]
Phytolacca acinosa Roxb.	Phytolaccaceae	Jharka	Herb	Leaves	Used for body pain and as vegetable	It possesses antibacterial, antiasthmatic, laxative, expectorant and antifungal properties	Kirtikar and Basu, 1975; Sood *et al.*, 2013 [88]
Picrorhiza kurroa Royle ex Benth.	Scrophulariaceae	Kadu	Herb	Leaves	Good for jaundice	Used for cough, cold, liver diseases, metabolic disorders, indigestion,	Debnath *et al.*, 2020 [21]

						hepatitis, scorpion bites and skin disease	
Pinus roxburghii Sarg.	Pinaceae	Chir	Tree	Leaves, Root, Wood	Leaves and roots are used for eye infection and fever. Wood is used for decoration purpose and fire ritual ('hawan')	It is used as aromatic, deodorant, digestive, liver tonic, anthelmintic, haemostatic, diaphoretic, stimulant, diuretic and for curing ear, eye, and pharynx diseases, foul ulcer, haemoptysis, haemorrhage, flatulence, worn infection, liver diseases, skin diseases, bronchitis and inflammation	Kaushik *et al*., 2012 [40]; Radha *et al*., 2021 [70]
Prinsepia utilis Royle	Rosaceae	Bhekhal	Shrub	Leaves	Used for skin diseases	Used against rheumatism, headaches, stomach pain, boils, acne, skin infection and muscular pain	Guan *et al*., 2014 [30]
Pyrus pashia Buch.-Ham. ex D.Don	Rosaceae	Kainth	Tree	Fruit	Fruits are edible and used to cure fever	It exhibits astringent, laxative, febrifuge, sedative properties; used for curing constipation, dysentery, abdominal pain, eye problems, leishmaniasis, anemia, sore throat and	Janbaz *et al*., 2015 [35]
Rheum australe D.Don	Polygonaceae	Chukri	Herb	Leaves	Useful for cough, cold and jaundice	Reported to be used for the treatment of blood disorder, bile disorder, cold, cough, boils, fracture or broken bones, bronchitis, cuts, constipation, fever, headache, indigestion, kidney stones and menstrual disorders	Rokaya *et al*., 2012 [75]
Rhododendron arboreum Sm.	Ericaceae	Buras	Tree	Flowers	Flowers are used to cure nose bleeding and liver problems	Used to cure diabetes, hypertension, nose bleeding, jaundice and heart failure	Kumar *et al*., 2013a [46]; Kashyap *et al*., 2017 [39]
Rubus ellipticus Sm.	Rosaceae	Aakhe	Shrub	Roots, Fruit	Roots are used for the treatment of stomach pain. Fruits are edible and considered good for digestion.	It is effective againt cold, fever, cough, chronic diseases, weakness, seminal and vaginal discharge	Saklani *et al*., 2012 [76]
Rubus niveus Thunb.	Rosaceae	Kala aakhe	Shrub	Fruit	Useful for stomach diseases	It is used against diarrhea, dysentery, menstrual disorders and possesses good analgesic, antipyretic and anti-inflammatory properties	George *et al*., 2013 [27]
Rumex hastatus D.Don	Polygonaceae	Khatti buti	Shrub	Leaves, Roots	Used for skin diseases, headache and ear pain	It is used for the treatment of body pain, skin diseases, pimples and as laxative, alternative tonic and antirheumatic	Hameed and Dastagir, 2009 [33]; Kumar *et al*., 2013a [46]
Urtica dioica L.	Urticaceae	Kuksh	Herb	Leaves	Leaves are employed for making soups and curries	Used to treat cardiovascular disorders, hyper-tension, breast cancer and has anti-inflammatory, anti-fungal, antirheumatic, antiviral and immunomodulatory properties	Dhouibi *et al*., 2020 [25]
Verbascum thapsus L.	Scrophulariaceae	Jungli tamaku	Herb	Leaves	Leaves are useful for the treatment of cough, cold and typhoid	Reported to be used for asthma, tuberculosis, whooping cough, migraine, pneumonia, catarrhs, fever, dry cough, bronchitis, hoarseness and exhibits a soothing and anti-inflammatory action on urinary tract	Kumar and Kumar, 2014 [45]; Prakash *et al*, 2016 [68]
Viola pilosa Blume	Violaceae	Banaksha	Herb	Flower	Flowers are used to treat cold, fever and cough	It possesses astringent, diuretic, demulcent, diaphoretic, refrigerant, purgative and emollient activities	Panni and Bakht, 2018 [64]
Zanthoxylum armatum DC.	Rutaceae	Tirmir	Small tree or shrub	Leaves, Stem	Used as mouth freshener, for toothache and earache	Used to treat mouth ulcer, fever, cough, headache, cold and as analgesic, anti-pyretic and anti-inflammatory agent	Kumar *et al*., 2013b [48]; Alam *et al*., 2020 [3]

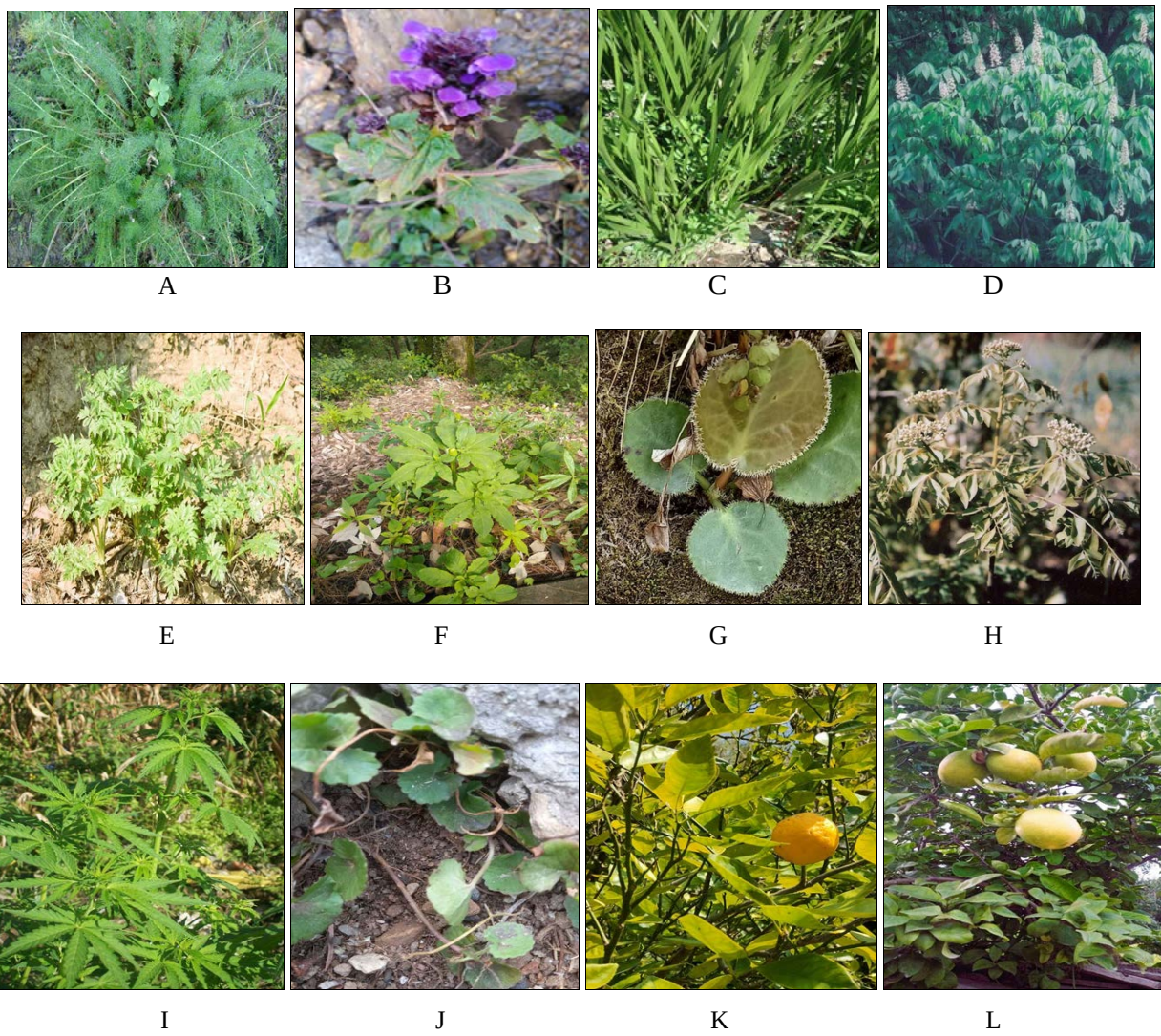
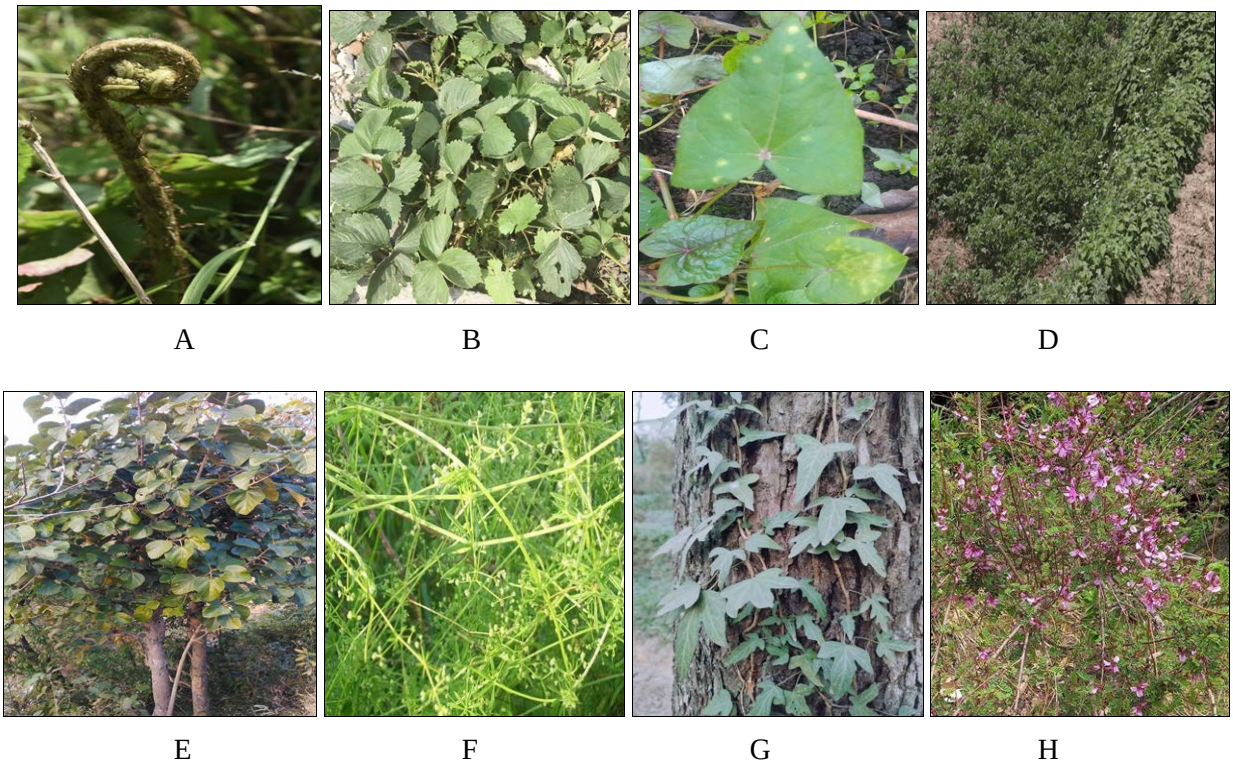


Fig 3: A. *Achillea millefolium* L.; **B.** *Aconitum heterophyllum* Wall. ex Royle; **C.** *Acorus calamus* L.; **D.** *Aesculus indica* (Wall. ex Cambess.) Hook.; **E.** *Angelica glauca* Edgew.; **F.** *Arisaema serratum* (Thunb.) Schott; **G.** *Bergenia ciliata* (Haw.) Sternb.; **H.** *Bergera koenigii* L.; **I.** *Cannabis sativa* L.; **J.** *Centella asiatica* (L.) Urb.; **K.** *Citrus jambhiri* Lush.; **L.** *Citrus pseudolimon* Tan.



I J K L

Fig 4: A. *Diplazium esculentum* (Retz.) Sw.; **B.** *Duchesnea indica* (Andrews) Focke; **C.** *Fagopyrum dibotrys* (D.Don) H. Hara; **D.** *Fagopyrum esculentum* Moench; **E.** *Ficus auriculata* Lour;.**F.** *Galium aparine* L.; **G.** *Hedera helix* L.; **H.** *Indigofera heterantha* Wall. ex Brandis; **I.** *Juglans regia* L.; **J.** *Justicia adhatoda* L.; **K.** *Mangifera indica* L.; **L.** *Morchella esculenta* L.

A B C D

E F G h

I J K L

Results and Discussion

Ethnobotanical uses of 55 plant species from 52 genera and 37 families have been recorded from the study area. Rosaceae is the predominant family with 5 species (Fig. 6) followed by Polygonaceae and Rutaceae (4 species each); Pinaceae and Poaceae (3 species each); Apiaceae, Asteraceae, Lamiaceae and Scrophulariaceae (2 species each). Habit-wise distribution of the collected plant species indicates that there are 55% herbs, 27% trees, 16% shrubs and 2% climbers having ethnobotanical properties (Fig. 7) of which 46 species belong to Angiosperms, 5 species to Gymnosperms, 3 species to Pteridophytes and 1 species to Fungi.

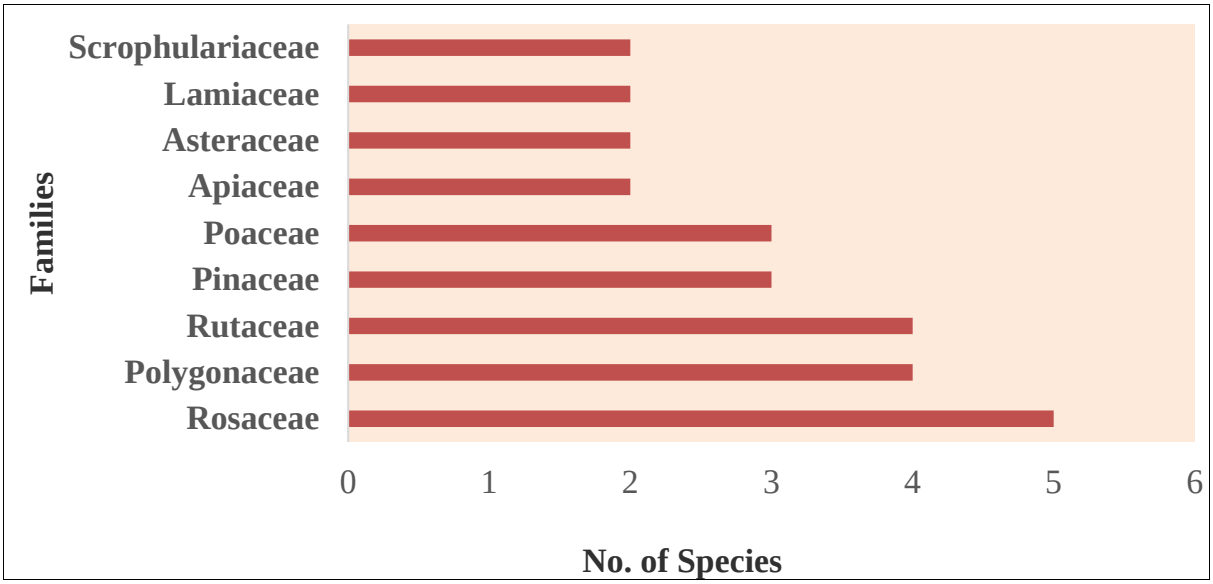


Fig 6: Dominant Families of Wild Plant Diversity in Hurang Narayan Sacred Grove

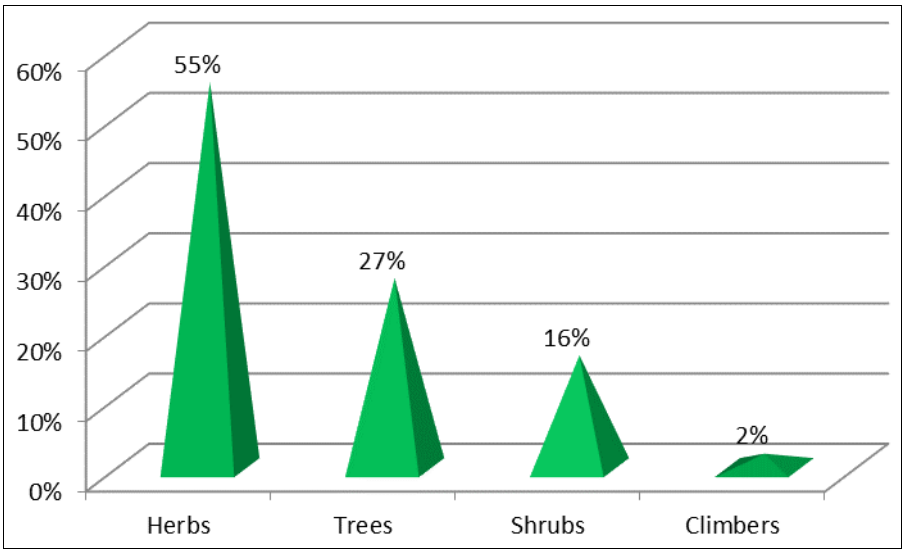


Fig 7: Habit-wise Categorisation of Ethnobotanical Plant Resources in Study Area

It has been found that Leaf (41%) is the most frequently used plant part (Fig. 8) followed by Fruit (14%), Whole Plant (10%), Roots (9%), Wood (6%), Flowers (5%), Rhizome (5%), Stem (5%), Seeds (3%) and Fruiting body (2%). Maximum use of leaves instead of reproductive parts of the plant indicates the awareness as well as concern of local inhabitant for the conservation of biodiversity.

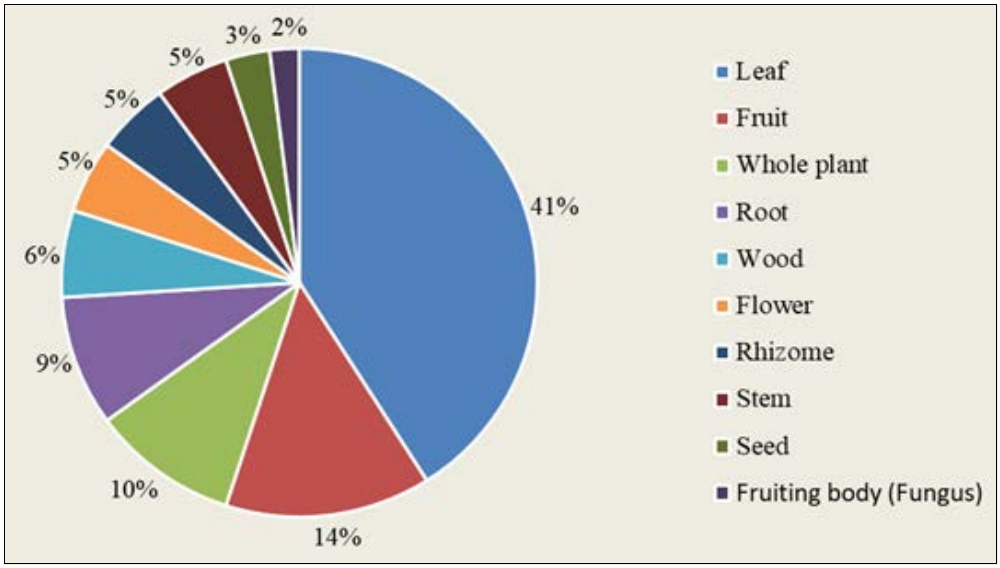


Fig 8: Plant Parts Used for Various Purposes in Chauhar Valley

There are many plant species which are used for ethnomedicinal purposes, for example, *Achillea millefolium* is used for healing of wounds; *Ajuga parviflora* is used for the treatment of diabetes, respiratory disorders and stomach disorders; *Arisaema serratum* is used for snake bite and stomach ache; *Bergenia ciliata* is well known for curing kidney stone and ear pain; *Fagopyrum dibotrys* is used for indigestion and dysentery; *Ficus auriculata* is used to treat diarrhoea and dysentery; *Picrorhiza kurroa* is used for jaundice; *Prinsepia utilis* is used for skin diseases; *Viola pilosa* is used for curing fever, common cold and cough. Thus, the present study describes the importance of medicinal plant species in the life of indigenous people for healthcare management.

Myths Associated with Hurang Narayan Temple: The temple of Hurang Narayan is built in pahadi style and after every 5 years, Kahika fair is organised to honour the supernatural powers of the deity. Hurang Narayan is the main diety of Chauhar valley. The Hurang village is covered with thick forest which is dedicated to the deity. People are not allowed to use the resources from this forest without the permission of deity.

It is believed that long ago, a boy named Narayan came to the Shiun village of Chauhar valley and started to live there with an old lady. He accepted the job of looking after the village animals. Meanwhile, he suffered from leprosy and was cured by nad community of Chauhar valley. Therefore, he blessed the valley with his special powers. Once, there was scarcity of water in the village. But whenever animals had to drink water while grazing in the forest, Narayan used to dig the ground with the stick. The water arose out of the soil and all the animals used to quench their thirst by drinking water there. When the villagers came to know about this miracle, the boy immediately disappeared without closing the spot from where water was coming out. Now, that place is worshipped as a sacred pond called 'Himri Ganga' (Fig. 9) and the forest is revered as Hurang Narayan sacred forest. It is believed that the water of this reservoir is pure having anti-allergic and anti-bacterial properties. It is used to cure skin infections. People from distant places visit here to fulfil their wishes.

Fig 9: Himri Ganga (Sacred Pond)

Traditional Healing System

It is the local belief that the deity protects the village from different type of diseases or upcoming disasters. Local people have strong faith in deity and many sacrifices are often made to gratify the deity. It is believed to be helpful in maintaining their family health and prosperity of community members. This belief also sustains for the use of plants which are offered to the deity before using for the treatment of various ailments by the local people. There are many medicinal plant species found in the sacred grove, e.g., *Acorus calamus*, *Angelica glauca*, *Bergenia ciliata*, *Centella asiatica*, *Paris polyphylla*, *Picrorhiza kurroa*, *Viola Pilosa*, etc. They are traditionally used by the local people for curing various diseases. The fresh twigs of *Zanthoxylum armatum* are used in incantation rituals for curing toothache and earache. *Cynodon dactylon* immersed in mustard oil is used in religious prayers for curing jaundice.

Religious and Socio-cultural Practices

Many religious and socio-cultural rituals are performed in the sacred Hurang Narayan sacred grove for rain, good health and fending off the upcoming disasters. The wood of *Cedrus deodara*, *Pinus roxburghii*, *Quercus oblongata*, *Mangifera indica*, *Ficus religiosa*, *Phyllanthus emblica*, *Azadirachta indica*, etc. is considered sacred and used in sacrificial fires. Seeds of *Brassica campestris* (Mustard) are given as offering to the visitors of temple. It is believed that incensation ('Dhuni') of these seeds ward off the evil spirits. *Ficus religiosa* is worshipped as sacred tree. *Cedrus deodara* is considered as 'Tree of God'. The chariot of the deity is made up of *Juglans regia* wood. *Desmostachya bipinnata* ('Kusha') is used in various religious rituals. 'Sair' festival is celebrated in the region to mark the end of crop harvest. During this festival, many herbs, shrubs and trees like *Cynodon dactylon*, *Benincasa hispida* (Pethu), *Punica granatum*, *Oryza sativa*, *Citrus* spp., *Juglans regia*, *Zea mays*, *Sesamum indicum* (Til), etc. are worshipped. In this festival, the younger members of the family offer sacred grass 'Dhrub' (*Cynodon dactylon*) or fruits of 'Akhrot' (*Juglans regia*) to the elders. Leaves of Mango tree (*Mangifera indica*), Banana (*Musa paradisiaca*) and needles of Chir (*Pinus roxburghi*) are used for decoration purposes in marriage ceremonies.

Threatened Plant Species: Of the total plant species collected from Hurang Narayan sacred grove, 9 species have been found to be threatened in Himalayan region (Table 2). Among these, 3 species (*Aconitum heterophyllum* and *Picrorhiza kurrooa* and *Zanthozyllum armatum*) have been reported to be critically endangered; 2 species (*Acorus calamus and Angelica glauca*) are endangered, and 4 species

(*Berberis asiatica*, *Paris polyphylla*, *Rheum australe* and *Viola pilosa*) are vulnerable. Being excessively used for various purposes, these plant species are globally facing high risk of extinction as a result of over-exploitation, habitat destruction and many other factors. For preventing the extinction of such species, the traditional knowledge pertaining to religious and socio-cultural practices can play a vital role. Hence, the concept of sacred groves needs to be encouraged among the tribal and indigenous communities throughout the world because it is generally believed that disturbing such forest patches could invite the wrath of the deity in the form of diseases or disasters. Hence, the flora as well as fauna in such forest patches could be protected forever.

Table 2: Threatened Medicinal Plants in Hurang Narayan Sacred Grove

Botanical Name	Family	Status
Aconitum heterophyllum	Ranunculaceae	Critically Endangered (Wani *et al.*, 2021) [98]. Near endemic to IHR (Badola and Aitken, 2003) [7].
Acorus Calamus	Acoraceae	Endangered (Ray and Saini, 2022 [74]; Sharma *et al.*, 2014) [82]
Angelica glauca	Apiaceae	Endangered (Bargali *et al.*, 2021 [11]; Mehta, *et al.*, 2020 [55]; Sharma *et al.*, 2014) [82]; Endemic to IHR (Butola & Vashistha, 2013 [16]; Badola & Aitken, 2003) [7].
Berberis asiatica	Berberidaceae	Vulnerable (Sharma *et al.*, 2014) [82].
Paris Polyphylla	Melanthiaceae	Vulnerable (Bargali *et al.*, 2021) [11].
Picrorhiza kurroa	Scrophulariaceae	Critically Endangered (Sharma *et al.*, 2014) [82].
Rheum australe	Polygonaceae	Vulnerable (Sharma *et al.*, 2014) [82]. Endangered (Butola and Badola, 2008) [15]. Near endemic to IHR (Badola & Aitken, 2003) [7].
Viola pilosa	Violaceae	Vulnerable (Sharma *et al.*, 2014) [82].
Zanthozylum armatum	Rutaceae	Critically Endangered (Sharma *et al.*, 2014) [82].

Conclusion

Sacred groves are the forest patches dedicated to local deities and managed by the local communities. Hurang Narayan sacred grove is home to a large number of medicinal and economically important plants. Some of these plants are facing the risk of disappearing from the outside world. Therefore, it is important to conserve these biological resources before they become completely depleted. The concept of sacred groves is the most effective method for the conservation of such plant species. The tribal and indigenous communities recognize the importance of plant wealth and therefore have adopted such kind of practices for the conservation of these valuable resources.

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