

ASSESSMENT OF ORCHID DIVERSITY IN SELECTED SACRED GROVES OF KULLU DISTRICT, HIMACHAL PRADESH, INDIA

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Abstract

Sacred groves are the patches of forest with spiritual significance to people and communities. They are one of the most valuable practices of nature conservation. It is believed that these sacred groves are well protected by the village folk deities and largely free from anthropogenic activities. In India, about 13,270 such sacred groves have been reported, out of which the *Devbhumi*, in Himachal Pradesh supports about 5,000 sacred groves. These sacred groves have not been explored for the floristic diversity including orchids. Therefore, while exploring the floristic diversity, presently an attempt was made to assess the diversity and indigenous uses of orchids occurring in the sacred groves. Extensive surveys have been carried out in Hadimba Devi, Rupasana Devi, Shangchul Rishi, Bhriku Rishi and Jamdagni Rishi sacred groves of Kullu district, Himachal Pradesh and a total of 7 orchid species have been reported. Four species are native and three are non-native. These orchid species were found to be distributed between 1500 - 2400 m amsl. *Calanthe tricarinata*, *Epipactis helleborine*, and *Herminium lanceum* were reported from Hadimba Devi, *Epipactis helleborine*, *Habenaria edgeworthii* and *Herminium lanceum* from Rupasana Devi, *Cephalanthera longifolia*, *Epipactis helleborine*, *Habenaria edgeworthii*, and *Spiranthes sinensis* from Shangchul Rishi, *Calanthe tricarinata* and *Habenaria edgeworthii* from Bhriku Rishi and *Goodyera repens*, *Habenaria edgeworthii* and *Herminium lanceum* from Jamdagni Rishi, sacred groves. The reported species have relatively small populations. Some of these species were used for the treatment of various ailments such as wounds, cuts, cough and blood purification, etc. Therefore, regular monitoring of the populations of these species is required to understand the dynamics and their conservation status within the sacred groves.

Introduction

INDIA HAS a strong tradition of conservation through the aegis of sacred groves and religious prescriptions (Chandrashekara and Sankar, 1998; Ramakrishnan, 1996; Ramanujam and Kadamban, 2001). In India, 13,270 sacred groves are documented. Out of these, 5,627 sacred groves are in Indian Himalayan Region (IHR). The state of Himachal Pradesh, also known as *Devbhumi* (Source: <http://moef & cc.gov.in>) supports about 5,000 sacred groves. Sacred groves are patches of forest which protect several plant and animal species valuable for food, medicinal and other uses (Ramakrishnan *et al.*, 1998). It is believed that sacred groves are well protected by folk deity and are known as undisturbed area which expresses an important relationship of human beings and nature (Hughes and Chandran, 1998). These groves vary from a tree to a forest and species composition along an altitudinal gradient and play a vital role in the conservation of biodiversity. Orchids belong to the family Orchidaceae, which is one of the largest families of the angiosperms. The estimated number of species ranges from 17,000 to 35,000; these orchids are widely distributed, in tropics, with highest diversity (Dressler, 1981). They are found in diverse climatic situations (Hegde, 2012); the orchid diversity is lesser in the state which supports

natural, unique and socio-economically important orchids (Chauhan, 1999; Deva and Naithani, 1986; Samant, 2002). The majority of orchid species are used medicinally and as food (Samant and Dhar, 1997; Samant *et al.*, 1998). These are rich in phytochemical contents and alkaloid compounds that are contributed much towards the health care of indigenous people settled in the vicinity. There is no alternative to traditional health care for the majority of indigenous tribal and rural communities (Handa, 1986; Lawler, 1984) and so it plays a significant role in their health care. In view of the importance of orchids, in various ways, the present study has been conducted with a view to assessing diversity, nativity, morpho-physiological characteristics and indigenous uses of the orchids in selected sacred groves located in Kullu district of Himachal Pradesh, India.

Materials and Methods

Study Area

The selected sacred groves namely Hadimba Devi, Rupasana Devi, Bhriku Rishi, Jamdagni Rishi and Shangchul Rishi are located between (31°45'17" - 32°14'58" North latitudes and 77°05'30" - 77°10'49" East longitude) in Kullu District of Himachal Pradesh (Fig.1). On the basis of field observations, the study

sites were selected to represent the entire range of conditions in term of habitat, plant diversity, and disturbance. The altitude ranges from 1500 - 2400 m amsl. The approximate area of the five sacred groves ranges from 2-9 hectares. The average climate of these study sites is temperate with three distinct seasons, winter (November - March), summer (April - June) and rainy (July - September). The mean annual temperature of these study sites ranges from 4^o-20^oC and snowfall usually occurs during November and ends in early February.

These sacred groves are located in the middle of a deodar (*Cedrus deodara*) forest and fully managed by the local communities who are traditionally bound to these sacred groves except Hadimba Devi sacred grove which is fully managed by Archaeological Survey of India. Both the genders are allowed but mainly males play an important role in the management of sacred groves. Annual rituals are held in these sacred groves for 1-3 days during the festival and thousands of people participate from nearby villages and towns. These

selected sacred groves are composed of temperate forest types which are mainly dominated by coniferous and broad leaved species namely *Cedrus deodara*, *Pinus wallichiana*, *Picea smithiana*, *Quercus floribunda* and *Q. leucotrichophora*. These sacred groves are rich for phyto-diversity and provide suitable habitats for the growth of orchids.

Assessment, Sampling, Identification and Data Analysis

Extensive field surveys have been carried out in Hadimba Devi, Rupasana Devi, Shangchul Rishi, Bhriagu Rishi and Jamdagni Rishi sacred groves of Kullu district, Himachal Pradesh. The rapid sampling was done for the inventory of orchids. The plant samples of each species were collected from each sacred grove and brought to the institute for identification. The species were identified by using local (Aswal and Mehrotra, 1994; Chowdhery and Wadhwa, 1984; Dhaliwal and Sharma, 1999 and Singh and Rawat, 2000) and regional (Deva and Naithani, 1986; Pangtey *et al.*,

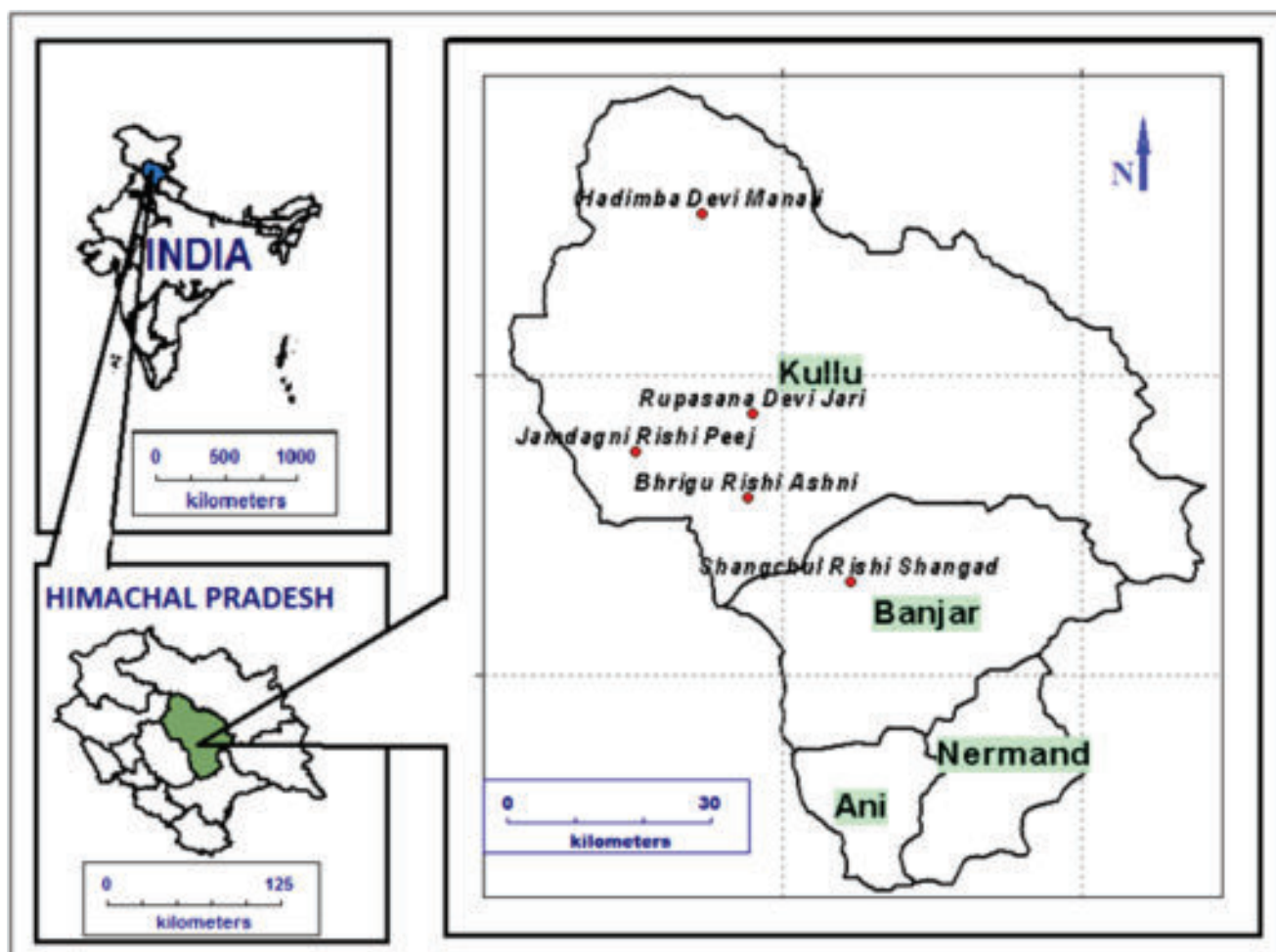


Fig.1. Map showing the location of the study sites of sacred groves in Kullu District of Himachal Pradesh.

1991) floras. All identified species were listed and analyzed for the floristic diversity following Samant *et al.* (1998). For ethno-botanical importance of the species, local knowledgeable people were interviewed in these sacred groves. Data on species diversity, distribution pattern and nativity were analyzed. Nativity of the species was identified following Anonymous (1883-1970); Samant (2002, 2009); Samant *et al.* (1998). To assess the status of particular species, information on habitat preference, population size, distribution range, and use values were collected (Rana and Samant, 2010; Samant *et al.*, 1995). Information on indigenous uses and tradition practices of the species was collected through interviews of local inhabitants (Chauhan, 1999; Jain, 1991; Samant *et al.*, 1998, 2002, 2007).

Results

A total of 7 species of orchids belonging to 7 genera have been recorded between 1500-2400 m amsl in selected sacred groves of Kullu District in Himachal Pradesh. *Calanthe tricarinata*, *Epipactis helleborine* and *Herminium lanceum* were reported from Hadimba Devi, *Epipactis helleborine*, *Habenaria edgeworthii* and *Herminium lanceum* from Rupasana Devi, *Cephalanthera longifolia*, *Epipactis helleborine*, *Habenaria edgeworthii* and *Spiranthes sinensis* from Shangchul Rishi, *Calanthe tricarinata* and *Habenaria edgeworthii* from Bhrigu Rishi and *Goodyera repens*, *Habenaria edgeworthii* and *Herminium lanceum* from Jamdagni Rishi sacred groves. The morpho-physiological characteristics of the orchid species are briefly described as follows:

***Goodyera repens* (L.) R. Br., Aiton Hort. Kew., ed. 2.5: 198. 1813.**

Satyrium repens L., Sp. Pl. 945. 1753.

Terrestrial herb. *Stem* erect, glabrous from a creeping base, 10-30 cm tall, 2-2.5 mm thick arising from a stoloniferous rhizome. *Rhizome* slender, with many nodes. *Leaves* usually thick, sub-rosulate at the base of stem, abaxially pale green, adaxially deep green with white venation. *Inflorescence* raceme. *Flowers* small, numerous, opening weakly, white, tingled with green, small, pedicel. *Sepals* subequal, ovate, acute, often pubescent outside. *Petals* nearly equal to sepal but narrower. *Lip* sessile, erect, on the base of column. *Column* short without appendages at base. *Anther* dorsal. *Pollinia* 2, yellow, clavate, sessile granular with or without a strap and a small gland.

Habitat

Shady moist, coniferous or mixed forests, mossy or

humus-covered ground, sometimes in cedar swamps.

Ecology

Occurs singly or in groups of 8-12 plants on moist shady forest floor.

Flowering

June-August.

Distribution

Himalaya from 1000-4200m (Pakistan, Jammu and Kashmir to Arunachal Pradesh), Assam, Tibet, Burma, China, Japan, Europe and America.

Part used

Roots and leaves.

Uses

Roots and leaves have been used for curing bladder problems, and for treatment of stomach and female disorders.

***Epipactis helleborine* (L.) Crantz, Strip. Austr. Ed. 2: 467. 1769.**

Serapias helleborine L., Sp. Pl. 949. 1753.

Terrestrial herb. *Plant* small, slender or robust. *Rhizome* short, woody with numerous roots. *Stem* erect, leafy, 20-70 cm high. *Stem* with leaves in close succession, lower portion glabrous, upper portion minutely pubescent. *Leaves* many, ovate or lanceolate, acute. *Inflorescence* raceme. *Flowers* green, flushed more or less with red violet dropping. *Sepals* sub-equal, sometimes brown veined, dorsal ovate, acute upto 12 mm long. *Petals* ovate, acute, keeled at the base, slightly shorter. *Lip* stretched forward, green outside and glossy dark brown inside. *Column* short and stout. *Pollinia* 2, narrow, 1 mm long. *Fruit* capsule, elliptic, dropping, puberulent.

Habitat

Moist to dry, rocky, shaded, deciduous to mixed woods, cedar swamps and forested stream margins.

Ecology

Occurs singly in moist habitats of *Cedrus deodara* forest.

Flowering

July-October.

Distribution

Himalaya from 1500-4000m (Pakistan, Kashmir to Bhutan), Afghanistan, Europe, Iraq, Africa, Hongkong, Japan and Burma.

Part used

Rhizomes and leaves.

Uses

Infusion of leaves is given for curing intermittent fever and its rhizome is used as an aphrodisiac.

Herminium lanceum (Thunb. ex Sw.) Vuijk, *Bulmea* 11 (1): 228. 1961.

Ophrys lancea Thunb. ex Sw., Kgl, Akad. Vet. Nya Hndl. Stockh 21 : 223. 1800

Terrestrial herb. *Tuber* small, oblong or ellipsoid. *Stem* 25-75 cm high. *Leaves* usually three, fleshy, lanceolate with long sheathing base. *Inflorescence* spike, cylindrical, dense, 6-25 cm long, many flowered. *Flowers* crowded green and small. *Sepals* subequal, obtuse, spreading, dorsal forming hood with petals. *Petals* narrow, equal to or slightly shorter than sepals. *Lip* often pendulous, oblong, longer than sepal.

Habitat

Shaded, wet and rock-shelters.

Ecology

Mostly found in the shady-moist habitats.

Flowering

July-August.

Distribution

Himalaya between 1250-3000 m (Shimla to Sikkim), S.E. Tibet, India, Burma, Thailand, Indo-China, China, Japan and Malaysia.

Part used

Leaves.

Uses

Extract of plant is given for curing urinary tract infections.

Spiranthes sinensis (Pers.) Ames, *Orchid.* 2: 53. 1908.

Neottia sinensis Pers., *Syn.* 2: 511. 1807.

Plant terrestrial. *Stem* erect, cylinder, 15-45 cm tall,

often slightly flexuous, leafy below. *Roots* fleshy, narrow, cylindrical, *tubers* 3-6 cm long. *Leaves* erect, spreading, linear or lanceolate, clustered near the base of stem, bent inwards. *Inflorescence* terminal spike, spike upto 3-10 cm long, slender, straight or slightly flexuous, dense with many flowers. *Sepals* subequal, lanceolate, acute, upto 5 mm long. *Petals* as long as sepals, ligulate, cohering with the inner margins of dorsal sepal. *Lip* sessile, obovate, 4-5 mm long, margins crisped. *Column* short, slightly incurved, 2-2.5 mm long. *Pollinia* 4, 2 in pair. *Fruit* capsule, fusiform, densely pubescent.

Habitat

Damp grassland, mosses dominated wet grassland.

Ecology

Mostly grows in open habitats.

Flowering

July-August.

Distribution

Himalaya between 2200-3700 m (Pakistan to Arunachal Pradesh) Assam, Nagaland, Mizoram, Tripura, Meghalaya, Manipur, Madhya Pradesh, Peninsular India. Afghanistan, Burma, Sri Lanka, Malaya, China and Japan.

Part used

Leaves and Tubers.

Uses

Decoction of plant is given for curing intermittent fever and its tubers are used as tonic.

Calanthe tricarinata Lindl., *Gen. and Sp. Orch.* 252. 1833.

Terrestrial orchid with short, ovoid pseudobulbs, 2-2.5 cm long carrying several, basally sheath clasping, plicate, elliptic to lanceolate-elliptic, acute, petiolate or sessile base leaves that blooms in the spring on an erect, 30-50cm long, densely several flowered, shortly pubescent inflorescence, 8-12 flowered, arising on a newly developing pseudobulb with lanceolate bracts that cover half of the pubescent ovary.

Distribution

Western Himalaya, Eastern Himalaya, Pakistan, Nepal, Myanmar, Southern China, Korea and Japan on damp grassy banks in mixed forests, in clumps on downed, rotting tree trunks in open forests, on steep open

grassy slopes and in bamboo scrub ranging from 1500 to 3200m.

Habitat

Grassy localities, damp and shady places of montane zones.

Ecology

Open grasslands near *Cedrus deodara*, *Corylus jacquemontii* and *Aesculus indica* forests.

Flowering

April-July.

Part used

Leaves and bulbs.

Uses

Leaf paste applied on sores and eczema, decoction of bulbs is given for curing jaundice.

Habenaria edgeworthii Hk.f. ex Collett, Fl. Siml. 504, 1902.

Terrestrial. *Tuber* oblong. Plants up to 75 cm, with rather small, sessile tuberoids. *Stem* leafy, somewhat flexuous. *Leaves* 2-4, ovate to lanceolate. *Inflorescence* spike, up to 25 cm long. *Bracts* lanceolate, equaling the ovary in length. *Flowers* yellow and green, deflexed in bud. *Sepals* green, margins ciliolate, the dorsal broader than long. *Petals* bright yellow, sometimes greenish-yellow, thick, erect, obliquely triangular 5mm long, curved inwards and forming a hood with dorsal sepal. *Column* 2-3mm, anther canals short, stigmatic processes short, oblong. *Ovary* twisted, glabrous.

Distribution

Himalaya, especially in Shimla, Garhwal provinces of Uttarakhand between 1500-3000m.

Habitat

Shady moist forests.

Ecology

Shaded and moist habitats.

Flowering

July-August.

Part used

Roots and leaves.

Uses

Used for curing skin related problems, appetizer, depurative, fever, cough, asthma, nervine and used as cardiac tonic.

Cephalanthera longifolia (L.) Fritsch, Osterr. Bot. Zeitschr. 38: 81. 1888.

Serapias helleborine var. *longifolia* L., Sp. Pl. 950. 1753.

Terrestrial herb, 10-50cm high. *Stem* arise from creeping irregular rhizome with numerous stiff roots, stem densely leafy throughout. *Flowers* white with a yellow or orange-edged lip. *Roots* many, clustered with rhizome. *Leaves* alternate, sessile, lanceolate or ovate-lanceolate. Each plant may produce either a single or several upright stems, and the flowers occur in spikes. The dark green *leaves* are long and tapering.

Habitat

Temperate climate ranging from 1800-3200m. Commonly found around the sides of large rocks. Narrow-leaved helleborine is a flower of open woodland: glades, margins, rides and steep rocky slopes where it can find permanent patches of light. It prefers calcareous soil found in chalk or limestone environments.

Ecology

Rocky woodland, prefers more open patches with permanent light, especially south-facing rocky slopes and woodland rides and edges.

Flowering

May-September.

Distribution

Himalaya in Pakistan, Kashmir to Arunachal Pradesh, Mizoram, Tripura, Himachal Pradesh (Kullu and Shimla districts). Populations can found in scattered locations, common in some parts of its European range, such as Southern France and Spain, but endangered particularly in northern areas such as Belgium.

Discussion

The present study revealed that a total of 7 species of orchids were found growing in selected sacred groves of Kullu district in Himachal Pradesh. The similar study was also reported by Marpa and Samant 2012; in which they have identified 16 species of orchids growing in Prashar Sacred Shrine of Himachal Pradesh. Deva and Naithani (1986) and Pangtey *et al.* (1991)

reported that the systematic studies on the orchids of IHR showed that the diversity of orchids decreases from Eastern Himalaya to the Trans, North Western Himalaya. Similar trends were also reported by Samant *et al.* (1995). The studied sacred groves although support only seven species, but these sacred groves support natural, unique and representative species. Undoubtedly, the sacred groves are a refuge for rarity and endemism. The study would help in updating the inventory and distribution pattern of orchids (Samant, 2009). On the basis of interviews and interactions with the local communities residing in the villages near the sacred groves revealed that these orchids are important due to their medicinal uses. Whole plant parts (tubers, bulbs, leaves, flowers, *etc.*) in powdered form or as a extract are used in herbal medicines to cure different diseases ailments such as rheumatism, bronchitis, nervous disorders, piles, inflammation, cancer, *etc.* (Chauhan, 1990; Samant, 2002). Orchids are rich in alkaloids and phytochemical compounds (Samant, 2002; Samant, 2009). Also, the orchid flowers exhibit a range of diversity in terms of their size, shape, colour, structure and fragrance and have been well established in floriculture (Samant, 2002). In the present study, *Calanthe tricarinata*, *Cephalanthera longifolia*, *Epipactis helleborine*, *Goodyera repens*, *Herminium lanceum*, and *Spiranthes sinensis* have been categorized as least concern indicating no pressures on these species at present and *Habenaria edgeworthii* under vulnerable indicating high pressure on the species. Regular monitoring of the populations of these species is required to understand the dynamics and their conservation status within the sacred groves. In addition, development of propagation protocols for mass multiplication and establishment of seedlings in the *ex situ* and *in situ* conditions, with the help of local inhabitants and Forest Department, and conservation awareness programmes for the inhabitants are essentially required.

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