

## DIVERSITY, DISTRIBUTION, INDIGENOUS USES, AND STATUS OF ORCHIDS IN KALATOP - KHAJJAR WILDLIFE SANCTUARY, CHAMBA DISTRICT, HIMACHAL PRADESH

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### Abstract

Study was conducted to explore the floristic diversity of Kalatop-Khajjar Wildlife Sanctuary in Chamba District, Himachal Pradesh during 2013-17. As, this sanctuary has not been explored for the floristic diversity including orchids, an attempt was presently made to assess the diversity and indigenous uses of orchids, occurring in the sanctuary. Twelve species of the orchids were recorded; of these, 6 species were natives and 1 species was near-endemic. These orchid species were distributed between 1900-2700 m amsl. Most of these species were used by the local inhabitants for curing wounds, cuts, cough, snake bite, etc. and as a blood purifier and tonic. Most of these species were found in shady moist forest floor. The high anthropogenic pressure and changing environmental conditions have increased the vulnerability of these species. Therefore, regular monitoring of the species in relation to climate change for understanding the dynamics, and creating awareness among the local inhabitants and forest officials are suggested.

### Introduction

ORCHIDS ARE one of the nature's most beautiful creations and represent royalty and aristocracy in floriculture. They are amongst the most evolved families of plants and are represented by 20,000-30,000 species (Dressler, 1993; Tremblay *et al.*, 2005). Systematic studies have been done by various workers (Chowdhary and Wadhwa, 1984; Collet, 1902) for compiling the floras. Inventorization of the orchids has also been done by various workers while exploring floristic diversity of the protected and unprotected areas (Barman *et al.*, 2016; Kumar *et al.*, 2016, 2017; Marpa and Samant, 2012; Samant, 2009; Sharma *et al.*, 2015, 2017a,b). Orchids are found in diverse climatic situations. Indian Himalayan Region (IHR) is one of the orchid rich belts of India that alone houses more than 900 species. Orchids are widely distributed with highest diversity in tropics. While the orchid diversity is relatively very less in Himachal Pradesh, it supports natural, unique and socio-economically important orchids (Chauhan, 1999; Deva and Naithani, 1986; Samant, 2002). The state is represented by 85 species (Vij *et al.*, 2013). Many of these orchids are variously used for their medicinal properties and food (Pathak *et al.*, 2010; Samant and Dhar, 1997, Samant *et al.*, 1998). Orchids are rich in phytochemical contents that contribute much towards the health care of native people settled in the neighbourhood. There is no alternative to traditional health care for the majority of indigenous tribal and rural communities. Therefore, they play a significant role in

the health care. The changing environmental conditions, land use patterns, over grazing, over-exploitation and expanding urbanization have resulted in shrinkage and degradation of natural habitats causing threat to floristic diversity, including orchids. In view of the importance of orchids in various ways, to keep abreast with actual orchid diversity at different localities and document the indigenous knowledge, the present study has been conducted in Kalatop-Khajjar Wildlife Sanctuary (KKWLS) in Chamba District of Himachal Pradesh with a view to: i) assessing the diversity of orchids in KKWLS; ii) assessing the orchid diversity for nativity, endemism and threat categories; iii) assess the indigenous uses; and iv) suggest management options.

### Materials and Methods

#### Study Area

Present study is carried out in Kalatop-Khajjar Wildlife Sanctuary (KKWLS) of District Chamba, Himachal Pradesh. Located in Western part of Chamba District, it lies in the catchments of Ravi River. It is one of the oldest preserved forests of the State (notified on 01.07.1949), which lies between 32° 26' North Latitude; 76° 32' East Longitude and the altitude of the sanctuary varies from 1850-2750 m (Fig. 1). It supports one of the most dense forests of deodar in Himachal Pradesh. Khajjar is among the 160 locations in the world that bear topographical resemblance with Switzerland. Khajjar Lake is a small lake, surrounded by saucer-shaped lush green meadow and

a floating island. The dense growth of weed called *vacha* has made its earth spongy. Little away from the lake is the temple of Khajji Nag from whom the area derives its name. It has a rare combination of three ecosystems *i.e.*, lake, pasture and forest. Fauna that can be seen in KKWLS includes Himalayan tahr, goral, black bear, Himalayan squirrel, langur, barking deer, musk deer, Himalayan black marten, leopard, Indian muntjak, and Himalayan serow. This sanctuary is well known for conserving the native Himalayan serow. The climate is temperate and the sanctuary mainly experiences three seasons *i.e.*, winter, summer and rainy. However, spring and autumn seasons also occur in March and October, respectively. Annual rainfall is around 672.3 mm and temperature ranging between -10 to 35°C. The vegetation is mainly dominated by coniferous forests and broad leaved forests.

*Surveys, Samplings, Identification, and Data Analysis*

Extensive field surveys in all seasons during 2014-2017 have been conducted in KKWLS. Rapid sampling was done along the topographical gradients *i.e.*, altitude,

habitat and aspect for the inventory of orchids. The plant samples of each species were collected from the sites and brought to the Institute for identification. The species were identified with the help of local (Aswal and Mehrotra, 1994; Chowdhery and Wadhwa, 1984; Dhaliwal and Sharma, 1999; Singh and Rawat, 2000) and regional (Deva and Naithani, 1986; Pangtey *et al.*, 1991; Vij *et al.*, 1983, 2013) floras. All identified species were listed and analyzed for the floristic diversity following Samant *et al.* (1998). Nativity of the species *i.e.*, the place of origin/ first record of species is also determined by the available literature (Anonymous, 1970; Samant *et al.*, 1998). Threat categories of the species have been identified based on habitat preference, population size, distribution range, nativity, endemism and use values (Rana and Samant, 2010). In order to document the utilization pattern of the important ethnobotanical plants, the inhabitants of the villages were interviewed in hindi and vernacular. This was primarily done by carrying the collected specimens to the village heads, family heads, elderly experienced people and women of the villages and asking questions about the use of species.

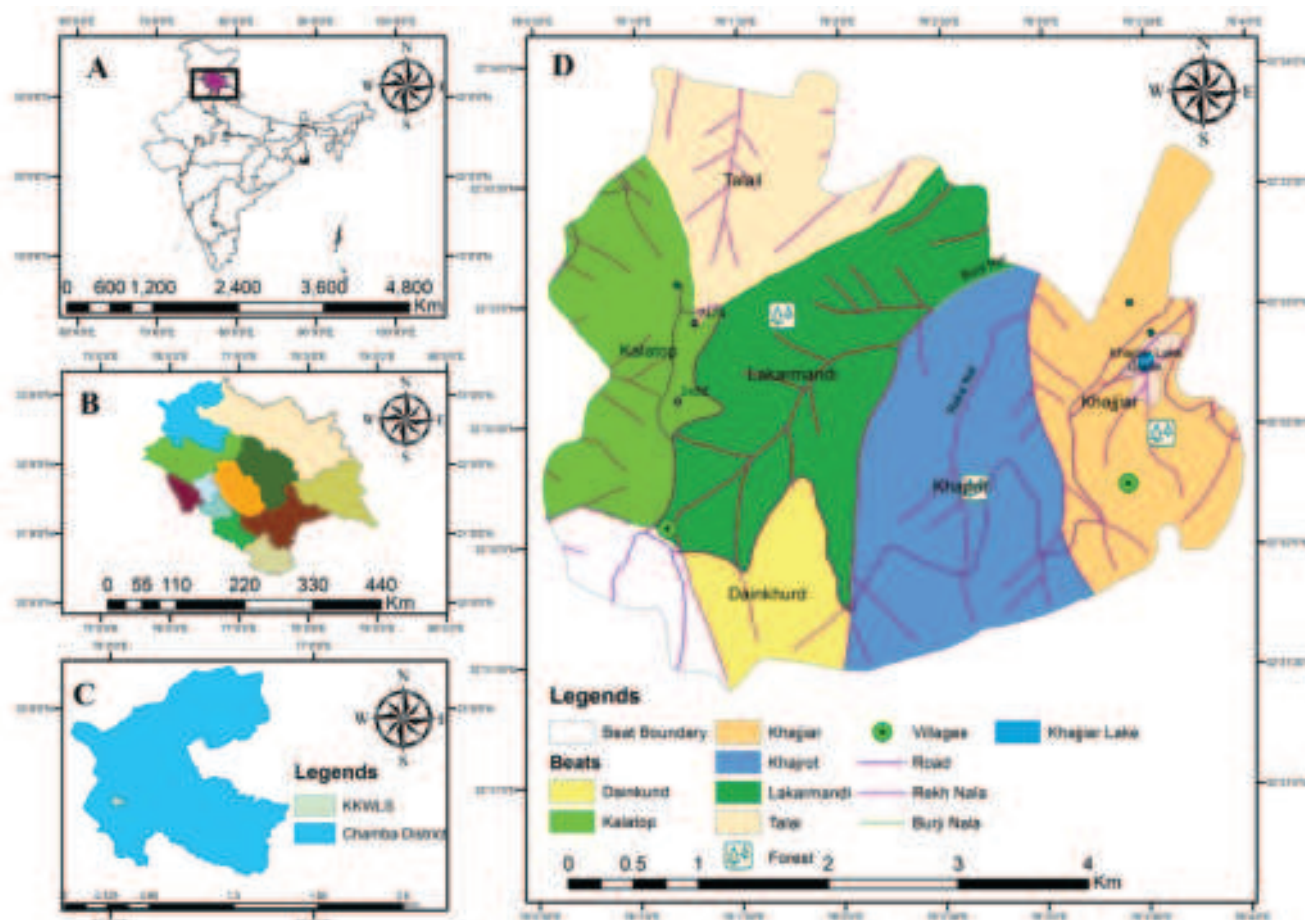


Fig. 1. Location map of the Kalatop-Khajjiar Wildlife Sanctuary (KKWLS) of District Chamba, Himachal Pradesh: A, Map of India showing the state of Himachal Pradesh; B, Himachal Pradesh; C, Chamba District; D, KKWLS.

## Results

### Species Diversity and Distribution Pattern

A total of 12 orchid species belonging to 11 genera were recorded from KKWLS (Table 1). Among the genera, *Malaxis* (2 species) represented the maximum diversity. Ten genera namely, *Calanthe*, *Cephalanthera*, *Crepidium*, *Epipactis*, *Goodyera*, *Habenaria*, *Herminium*, *Neottia*, *Satyrium*, and *Spiranthes*, each were represented by a single species. All the species were distributed in temperate zone between 1870-2750 m.

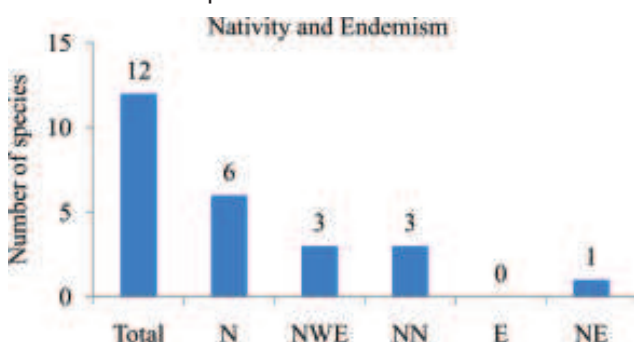


Fig. 2. Diversity of native (N), non-native (NN), native with extension (NWE), endemic (E), and near-endemic (NE) orchids of KKWLS.

### Nativity and Endemism

Six species namely, *Calanthe tricarinata*, *Crepidium acuminatum*, *Habenaria intermedia*, *Malaxis cylindrostachya*, *Neottia listeroides* and *Satyrium nepalense* were native to Indian Himalayan Region; three species namely, *Epipactis helleborine*, *Herminium lanceum* and *Malaxis muscifera* were native to Himalayan Region and other countries together; three species i.e., *Cephalanthera longifolia*, *Goodyera repens* and *Spiranthes sinensis* were non-natives; and single spe-

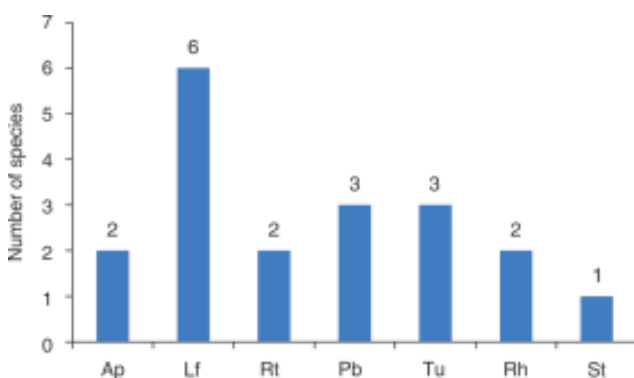


Fig. 3. Parts of economically important orchids used by the inhabitants of Kalatop-Khajjar Wildlife Sanctuary. (Lf, Leaf; Pb, Pseudobulb; Rh, Rhizome; St, Stem; Tb, Tuber; Ap, Aerial parts; Rt, Root).

cies *Satyrium nepalense* was near-endemic to the IHR (Fig. 2, Table 1).

### Threat Categorization

Of the total species, 3 species i.e., *C. acuminatum*, *G. repens* and *M. muscifera* were identified as Critically Endangered (CR); 3 species namely, *C. tricarinata*, *H. intermedia* and *H. lanceum* as vulnerable (VU) and 6 species namely *C. longifolia*, *E. helleborine*, *M. cylindrostachya*, *N. listeroides*, *S. nepalense*, and *S. sinensis* as near threatened (NT) (Table 1).

### Indigenous Uses

Leaves (6 spp.), roots (2 spp.), rhizomes (2 spp.), pseudobulb (3 spp.), stems (1 sp.), tubers (3 spp.) and aerial parts (2 spp.) were used by the inhabitants for their therapeutic use (Fig. 3). The inhabitants of the region use various parts of the orchid species for treatment of bone fracture, cold, dysentery, female disorder (like irregular menstruation, leucorrhoea), healing cuts and wounds, curing cough, paralysis, malaria, sores, eczema, kidney disorder, spermoprotic, leprosy, gout, muscular pains, sore throat, sprains, styptic, syphilis, tuberculosis, hemoptysis, debility, snake bite, diabetes, as an astringent, aphrodisiac, appetizer, blood purifier, expectorant, tonic and also as rejuvenating drugs. In the present study, it is found that of the total species, 11 species of orchids were widely used for medicine. Among 12 species, 6 were having aphrodisiac properties, 4 were used as blood purifier, 2 for curing each skin and respiratory system diseases, 2 for curing female disorders and 1 for curing urinary disorders, diabetes, malaria, haemoptysis, tuberculosis, and snake bite. Amongst the species studied, *C. acuminatum*, *H. intermedia* and *M. muscifera* are important species used in Ashtavarga group of medicine (Kant et al., 2012; Pathak et al., 2010). *S. nepalense*, on the other hand, is known for its aphrodisiac properties (Saklani et al., 2011) (Table 1).

## Discussion

The unique topographical gradients of the Himalayas harbour a representative, natural, unique and socio-economically important species. A large proportion of orchid habitats in Himachal Pradesh, especially in the study area, have lost their quality due to various anthropogenic activities and changing environmental conditions. Large scale exploitation of forests for tourism related activities and over-grazing by the nomadic community has detrimentally affected the delicately balanced ecological equilibrium. Orchids are very sensitive to ecological changes. In fact, they are more vulnerable to habitat loss and environmental degradation, and are considered as the indicator plants. In most of the cases, the plant parts such as tubers, rhizomes,



Figs. 4-12. Orchid Diversity in Kalatop-Khajjjar Wildlife Sanctuary of Chamba district, Himachal Pradesh: 4, *Calanthe tricarinata*; 5, *Cephalanthera longifolia*; 6, *Epipactis helleborine*; 7, *Goodyera repens*; 8, *Malaxis muscifera*; 9, *Habenaria intermedia*; 10, *Crepidium acuminatum*; 11, *Spiranthes sinensis*; 12, *Satyrium nepalense*.

Table 1. Diversity, distribution, indigenous uses, and status of orchids in Kalatop-Khajjar Wildlife Sanctuary, Chamba, Himachal Pradesh.

Orchid species	Altitudinal range (m)	Parts used	Medicinal uses	Status	Nativity
<i>Calanthe tricarinata</i> Lindl.	2200-2700	Lf, Pb	For curing sores, eczema, and as an aphrodisiac	VU	Reg Himal
<i>Cephalanthera longifolia</i> (L.) Fritsch.	1900-2500	Rt, Rh	Aphrodisiac, tonic	NT	Europe Afr Bor As Temp
<i>Crepidium acuminatum</i> (D. Don) Szlach.	1900-2200	St, Lf	For curing burning sensation, arthritis, and as blood purifier, aphrodisiac, and spermopiotic	CR	Reg Himal
<i>Epipactis helleborine</i> (L.) Crantz	2000-2700	Lf, Rh	For curing fever, and as blood purifier, and aphrodisiac	NT	Reg Himal Persia Europe As Bor
<i>Goodyera repens</i> (L.) R. Br.	2000-2700	Rt, Ap	For curing syphilis, irregular menstruation, and as blood purifier	CR	Reg Bor Temp
<i>Habenaria intermedia</i> D. Don	1900-2700	Lf, Tu	As cooling and spermopiotic, blood purifier, and for curing skin diseases, cough, asthma, leprosy, gout, muscular pains, sprains and general debility	VU	Reg Himal
<i>Herminium lanceum</i> (Thunb. ex Sw.) Vujik	1900-2600	Ap	For curing urinary problems	VU	Java Reg Himal
<i>Malaxis cylindrostachya</i> (Lindl.) Ktze.	1900-2700	Pb	As tonic, and for curing debility	NT	Reg Himal
<i>Malaxis muscifera</i> (Lindl.) Ktze.	1900-2700	Pb	As aphrodisiac, for curing stypic, dysentery, febrifuge, tonic, burns, debility, and also used in sterility	CR	Reg Himal Europe
<i>Neottia listeroides</i> Lindl.	1900-2700	-	-	NT	Reg Himal
<i>Satyrium nepalense</i> D. Don*	2300-2400	Tu	As energizing tonic, aphrodisiac, and for curing dysentery and malaria	NT	Reg Himal
<i>Spiranthes sinensis</i> (Pers.) Ames	1970-2750	Tu	For curing tuberculosis, haemoptysis, debility, snake bite, sore throat, cough, leucorrhoea, and diabetes	NT	As Temp et Trop Austria

\*, Near Endemic; Afr, Africa; As, Asia; Bor, Boreal; Himal, Himalaya; Reg, Region; Temp, Temperate; Trop, Tropical; CR, Critically Endangered; NT, Near Threatened; VU, Vulnerable; Ap, Aerial part; Pb, Pseudobulb; Lf, Leaf; Rt, Root; Rh, Rhizome; Tu, Tuber; and St, Stem.

and pseudobulbs are exploited. Perusal of literature also indicates that many of these orchids are variously used for their medicinal properties and food (Pathak *et al.*, 2010; Samant and Dhar, 1997; Samant *et al.*, 1998). The continuous exploitation of the species from wild, substantial loss of habitats, and weakening of customary laws to protect natural resources and realizing huge gap in existing ethnobotanical use(s) have resulted in the decline of populations of many orchid species, and also the loss of indigenous knowledge. Therefore, regular monitoring of the species in relation to climate change for understanding the dynamics and creating awareness among the local inhabitants and forest officials, and conservation through *in vitro* propagation are suggested. Though some attempts have been made for conservation of orchids of Himachal Pradesh by developing efficient *in vitro* mass propagation protocols (Bhatti *et al.*, 2017; Chauhan *et al.*, 2015; Pathak *et al.*, 1992, 2011), much

is still to be learnt about the nutritional requirements of these orchids.

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