



RESEARCH ARTICLE

Terrestrial orchid diversity in Hosanagara taluk of Shimogga district Central Western Ghats region of Karnataka

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Abstract

The current article evaluates the study of terrestrial orchids in the Hosanagara taluk of Shimogga district, reports a total of 30 terrestrial orchid species in the Hosanagara taluk region Shimogga district Karnataka from the period of January 2019-January 2022, and provides information on their distribution, phenology aspects, and biological status in the Hosanagara taluk of Shimogga district. Extensive field surveys were carried out periodically in different parts of the taluk, particularly in grasslands and hilly regions, to study the plant's diversity and phenological character. It was noticed that, when compared to other species, the *Habenaria* species is richly distributed in the Hosanagara taluk region. During field trips, some anthropogenic activities that have a significant impact on the diversity of terrestrial orchids were also observed. To learn more about the variety and current state of terrestrial orchid species in the Hosanagara taluk in the Shimogga District of Karnataka, further research must be conducted.

Keywords

Western Ghats; Hosanagara taluk; phenology; terrestrial orchids

Introduction

The Orchidaceae is one of the largest and widespread families of flowering plants, the Orchidaceae exhibits highly developed and specialized plant characteristics. There are around 25,000–35,000 currently recognized species in the Orchidaceae, which are divided into 600–800 genera (1, 2). The richest orchid environments in India are found in the Eastern Himalaya and Western Ghats. According to recent studies, India has 1300 species divided among 151 genera (3). More than 46% of the known orchid species are native to the Western Ghats (3). In Karnataka, the Orchidaceae family has 59 genera and roughly 203 species (4, 5). Although the family's blooms exhibit a very consistent structure, the arrangement of the vegetative elements varies significantly between species (6). These characteristics enable the family to flourish in a variety of conditions and increase the variety of its grow forms.

The orchids can be divided into epiphytes, terrestrial, saprophytes, or lithophytes since they have evolved to adapt to various habitats (7). These environmental changes are a factor in the structural changes of vegetative organs (8). Except for dry regions, orchids are extremely diverse plants that can be found all over the world. They can be found anywhere between sea level and 4,000 meters in elevation, but between 500 and 2,000 metres above sea level is where they are most common. About 200 species were known to occur in the Western Ghats at the time (9, 10) contributed significantly to the understanding of orchids in peninsular India.

Plant adaptive responses are manifested in morpho-anatomical and physiological strategies that alter the plant's exterior morphology, cell, tissue, and organ anatomy, as well as the thresholds of many physiological parameters. These structural and physiological modifications enable plants survive and reproduce in a range of habitats, as well as protect them from stress and herbivore damage. In the present work an attempt has been made to collect wild terrestrial orchids from Hosanagara taluks of Shimogga district.

Materials and methods

Hosanagara is a taluk in Shimogga district in the Indian state of Karnataka. It is present in the Western Ghats of India, Hosanagara is located at 13.92°N 75.07°E. Field visits were conducted throughout the year to collect data on flowering and fruiting periods. Field information was gathered on behavior, habitat, phenology, and other relevant topics. The diversity and distribution of terrestrial orchids in a taluk were observed during field visits during various seasons of the year. Random sample techniques were used to conduct the survey, in this sampling method, each member of the population has an exactly equal chance of being selected (11, 12).

When a species was found in a higher concentration than had previously been seen throughout the investigation, a square area measuring five meters by five meters was established. The number of individuals and other information for this species, along with all other species found in the plot, were noted. With the use of regional floras and books on the Orchidaceae, specimens were identified. During field trips, necessary photos were

taken. Herbarium was made according to (13) guidelines. The specimens are preserved in the herbarium at the Sahyadri Science College in Shimogga, Karnataka, India, The plants are kept in the net house for additional phenological observation.

Result and Discussion

A total of 30 terrestrial orchid species from the Orchidaceae family were identified by floristic analysis of the terrestrial orchids in the various study areas. 26 species of orchids from 11 genera were discovered in Hosanagara taluk, both inside and outside the transect. Due to its species' capacity to adapt to a variety of climatic conditions over a broader altitudinal range, the genus *Habenaria*, which has eight species, is the best represented. In comparison to *Habenaria*, *Nervilia* represents four species, *Liparis* three, *Malaxis* two, *Zeuxine* two, and other plants each represent a single species.

The largest orchid diversity is found in moist deciduous forests followed by evergreen forest and grassland, and dry deciduous forest. Scrub forests have the lowest diversity. Evergreen forests are surprisingly underrepresented in orchid diversity (fig 1). The majority of *Habenaria* species are found in grasslands. The 30 species of known orchids in the Hosanagara taluk account for the majority of the terrestrial orchid variety reported from the Shimogga district. All species listed in Shimogga flora are recorded during the current survey (12). *Habenaria* 8 species, *Liparis* 4 species, *Nervilia* 4 species, *Peristylus* 3 species, *Zeuxine* 2 species, and other plants observed single species each in this investigation (Table 1).

Table 1. Terrestrial orchid species with their distribution.

Sl. No.	Orchid Name	Distribution type
1	<i>Dienia ophrydis</i> (J.Koenig)	Moist deciduous forest
2.	<i>Epipogium roseum</i> (D.Don) Lindl	Evergreen forest, Moist deciduous forest
3.	<i>Geodorum densiflorum</i> (Lam.) Schltr	Evergreen forest, Moist deciduous forest, Dry deciduous forest
4.	<i>Habenaria crinifera</i> Lindl	Evergreen forest, Moist deciduous forest
5.	<i>Habenaria elwesii</i> Hook. f	Evergreen forest, Moist deciduous forest, Grassland
6.	<i>Habenaria furcifera</i> Lindl.	Evergreen forest, Moist deciduous forest, Grassland, Dry deciduous forest
7.	<i>Habenaria grandifloriformis</i> Blatt. & Mc.Cann.	Evergreen forest, Moist deciduous forest, Grassland, Dry deciduous forest
8.	<i>Habenaria heyneana</i> Lindl.	Evergreen forest, Moist deciduous forest, Grassland, Dry deciduous forest
9.	<i>Habenaria longicorniculata</i> J. Graham.	Evergreen forest, Moist deciduous forest, Grassland, Dry deciduous forest
10.	<i>Habenaria multicaudata</i> Sedgw.	Moist deciduous forest, Dry deciduous forest
11.	<i>Habenaria plantaginea</i> Lindl.	Evergreen forest, Moist deciduous forest, Grassland, Dry deciduous forest
12.	<i>Liparis deflexa</i> Hook. F.	Moist deciduous forest, Dry deciduous forest
13.	<i>Liparis nervosa</i> (Thunb.) Lindl.	Moist deciduous forest, Dry deciduous forest
14.	<i>Liparis odorata</i> (Willd.) Lindl	Moist deciduous forest, Dry deciduous forest
15.	<i>Liparis wightiana</i> Thwaites	Moist deciduous forest
16.	<i>Malaxis rheedii</i> B. Heyne ex Wallace	Moist deciduous forest, Dry deciduous forest
17.	<i>Malaxis versicolor</i> (Lindl.) Abeyw.	Moist deciduous forest, Dry deciduous forest
18.	<i>Nervilia concolor</i> (Blume) Schltr.	Evergreen forest, Moist deciduous forest, Grassland, Dry deciduous forest
19.	<i>Nervilia infundibulifolia</i> Blatt. & McCann	Evergreen forest, Moist deciduous forest, Grassland, Dry deciduous forest
20.	<i>Nervilia prainiana</i> (Zoll. & Moritzi) Seidenf.	Evergreen forest, Moist deciduous forest, Grassland, Dry deciduous forest
21.	<i>Nervilia plicata</i> (Andrews) Schltr.	Evergreen forest, Moist deciduous forest, Grassland, Dry deciduous forest
22.	<i>Odisha cleistantha</i> S.Misra.	Evergreen forest, Moist deciduous forest, Grassland, Dry deciduous forest
23.	<i>Pecteilis gigantea</i> (Sm.) Raf.	Evergreen forest, Moist deciduous forest, Grassland, Dry deciduous forest
24.	<i>Peristylus aristatus</i> Lind	Moist deciduous forest, Grassland, Dry deciduous forest
25.	<i>Peristylus spiralis</i> A.Rich	Moist deciduous forest, Grassland
26.	<i>Peristylus plantagineus</i> (Lindl.)	Moist deciduous forest, Grassland, Dry deciduous forest
27.	<i>Satyrium nepalense</i> D.Don	Moist deciduous forest, Grassland
28.	<i>Tropidia angulosa</i> (Lindl.) Blume	Dry deciduous forest, Moist deciduous forest
29.	<i>Zeuxine gracilis</i> (Breda) Blume	Moist deciduous forest, Grassland, Dry deciduous forest
30.	<i>Zeuxine longilabris</i> (Lindl.) Trimen	Moist deciduous forest, Grassland, Dry deciduous forest

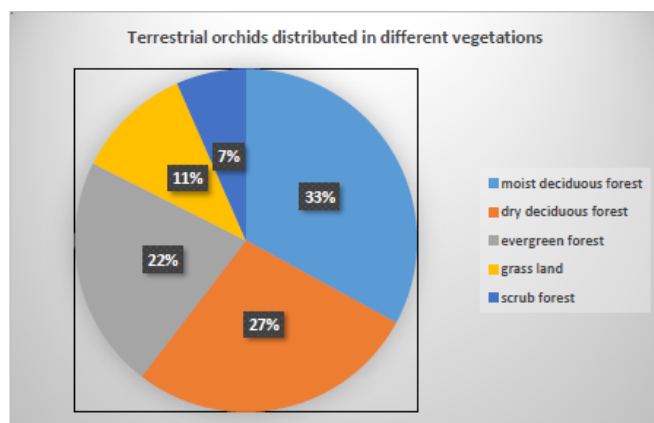


Fig 1. Terrestrial orchids distributed in different vegetations of Hosanagara taluk.

The transect study in the selected different forest reveals that *Nervilia plicata* (2.66), *Habenaria grandifloriformis* (2.5) and *Peristylus plantagineus* (2.66) is the most abundant species. The highest SIV in *Nervilia prainiana* (21.42), *Malaxis versicolor* (13.68) and has highest density observed in *Habenaria longicorniculata* (0.48) and *Nervilia prainiana* (0.96). *Habenaria grandifloriformis* has a frequency (0.24) and is followed by *Nervilia infundibulifolia* (0.24). (Table 2). *Zeuxine gracilis* and *Zeuxine longilabris* are saprophytic orchids shows SIV of 11.9 and 5.95. The recorded orchid species in the different forests in Hosanagara taluk showed a Shannon diversity value of 2.96, evenness of 0.889 and Simpson's species richness value of 0.94 which indicates rich orchid diversity in the taluk (Table 2).

In the present study, five saprophytic land orchids were observed. *Habenaria* is the largest terrestrial orchid flora in the studied area. All plant samples were categorized up to species level. In comparison to evergreen forests, moist deciduous forests in Hosanagara taluk contribute to the highest diversity of terrestrial orchids. The growth of terrestrial orchids is favoured by moist deciduous forests and grasslands. It might be because terrestrial orchids with open canopies need a lot of air and sunlight to develop. All of the identified species are listed as Not Evaluated (NE) on the IUCN Red List, however, only some of them are common in the research area, while the others are rare. Altering rainfall patterns, wild flower harvesting, habitat degradation, road construction, landslides, and forest fires are the main causes of the loss in the variety of terrestrial orchids.

Conclusion

The diversity of terrestrial orchids should be in urgent need of preservation. Understanding the variety, location, and phenology of wild terrestrial orchid species in the Hosanagara taluk has been a goal of this study. We emphasize the importance of protecting these terrestrial orchid species and the ecology in a taluk because research advances new methods for their protection and advancement. Thirty terrestrial orchid species were observed in Hosanagara taluk of Shimogga district Karnataka. *Habenaria* is the dominant terrestrial orchid represents eight species in Hosanagara taluk of Shimogga District.

Table 2. Species composition and their importance value of terrestrial orchids with in the transects of selected forests in Hosanagara taluk.

Plant name	F	D	A	RF	RD	SIV
<i>Dienia ophrydis</i> (J.Koenig)	0.04	0.04	2	0.59	1.19	1.78
<i>Epipogium roseum</i> (D. Don) Lindl.	0.08	0.08	1	1.19	1.19	2.38
<i>Geodorum densiflorum</i> (Lam.) Schltr.	0.08	0.08	1	1.19	1.19	2.38
<i>Habenaria crinifera</i> Lindl.	0.16	0.28	1.75	2.38	4.16	6.54
<i>Habenaria elwesii</i> Hook. f	0.04	0.08	2	0.59	1.19	1.78
<i>Habenaria furcifera</i> Lindl.	0.16	0.32	2	2.38	4.76	7.14
<i>Habenaria grandifloriformis</i> Blatt. & Mc.Cann.	0.24	0.6	2.5	3.57	8.92	12.49
<i>Habenaria heyneana</i> Lindl.	0.08	0.16	2	1.19	2.38	3.57
<i>Habenaria longicorniculata</i> J. Graham.	0.28	0.48	1.71	4.16	7.14	11.3
<i>Habenaria multicaudata</i> Sedgw.	0.04	0.08	2	0.59	1.19	1.78
<i>Habenaria plantaginea</i> Lindl.	0.16	0.32	2	2.38	4.76	7.14
<i>Liparis deflexa</i> Hook. F.	0.16	0.24	1.5	2.38	3.57	5.95
<i>Liparis nervosa</i> (Thunb.) Lindl.	0.16	0.2	1.25	2.38	2.97	5.35
<i>Liparis odorata</i> (Willd.)Lindl	0.16	0.24	1.5	2.38	3.57	5.95
<i>Liparis wightiana</i> Thwaites	0.04	0.08	2	0.59	1.19	1.78
<i>Malaxis rheedii</i> B. Heyne ex Wallace	0.04	0.08	2	0.59	1.19	1.78
<i>Malaxis versicolor</i> (Lindl.) Abeyw.	0.32	0.6	1.87	4.76	8.92	13.68
<i>Nervilia concolor</i> (Blume) Schltr.	0.12	0.28	2.33	1.78	4.16	5.94
<i>Nervilia infundibulifolia</i> Blatt. & McCann	0.24	0.48	2	3.57	7.14	10.71
<i>Nervilia prainiana</i> (Zoll. & Moritzi) Seidenf.	0.48	0.96	2	7.14	14.28	21.42
<i>Nervilia plicata</i> (Andrews)Schltr.	0.12	0.32	2.66	1.78	4.76	6.54
<i>Odisha cleistantha</i> S.Misra.	0.04	0.04	1	0.59	0.59	1.18
<i>Pecteilis gigantea</i> (Sm.) Raf.	0.04	0.12	3	0.59	1.78	2.37
<i>Peristylus aristatus</i> Lindl.	0.04	0.12	3	0.59	1.78	2.37
<i>Peristylus plantagineus</i> (Lindl.)	0.12	0.32	2.66	1.78	4.76	6.54
<i>Peristylus spiralis</i> A.Rich	0.12	0.28	2.33	1.78	4.16	5.94
<i>Satyrium nepalense</i> D.Don	0.04	0.08	2	0.59	1.19	1.78
<i>Tropidia angulosa</i> (Lindl.) Blume	0.04	0.08	2	0.59	1.19	1.78
<i>Zeuxine gracilis</i> (Breda) Blume	0.16	0.24	1.5	2.38	3.57	5.95
<i>Zeuxine longilabris</i> (Lindl.)Trimen	0.32	0.48	1.5	4.76	7.14	11.9

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Authors' contributions

1. SMH carried out the fieldwork, data collection, identification, photography, herbarium preparation, and manuscript writing. 2. KK carried out the fieldwork and guided data interpretation and manuscript writing. All authors have read and approved the manuscript.

Compliance with ethical standards

Conflict of interest: The authors do not have any conflict of interest to declare.

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