



Comparative studies on orchid species diversity of three blocks of Surguja district, Chhattisgarh, Central India

Ram Kumar Rajwade, Devendra Kumar Patel

Department of Botany, Guru Ghasidas Vishwavidyalaya, (A Central University), Bilaspur, Chhattisgarh, India

Abstract

The Surguja district, located in the northern region of Chhattisgarh, is made up of hills, plains, plateaus, and highlands. Approximately 58% of the district is covered by forests. Surajpur in the north, Balrampur in the east, Jashpur in the southeast, Raigarh in the south, and Korba in the west are the districts that encircle the district in Chhattisgarh state. It is located between latitudes 23°37'25" to 24°06'17" north and longitudes 81°34'40" to 84°04'40" east. With a total area of roughly 5732 km², the district is 244.62 km long from east to west and 67.37 km long from north to south. The region's average elevation is approximately 600 meters (2000 feet) above mean sea level. Batauli, Sitapur, Mainpat, Dhorpur (Lundra), Ambikapur, Lakhapur, and Udaipur are the seven blocks that jointly make up the Surguja district. The district contains 574 settlements in total. Ambikapur is the district headquarters. Rihand, Mahan, Kanhar, and Moran are the district's principal rivers. Extensive field surveys of orchids were conducted from the year 2022 to 2024 in various parts of the Ambikapur, Lundra, and Lakhapur blocks and adjoining areas. In this study, a total of 23 species belonging to 12 genera (6 species under 3 genera are terrestrial, and 17 species under 9 genera are epiphytic) were identified in the three blocks of Surguja District, Chhattisgarh, Central India. Block-wise distribution in orchid species in Ambikapur block in 16 species under 11 genera (11 epiphyte species under 8 genera, 5 terrestrial species under 3 genera), Lundra block in 15 species belongs to 10 genera (11 epiphyte species belong to 8 genera, 4 terrestrial species for 2 genera), and Lakhapur block in 19 genera under 10 genera (15 epiphyte species under 8 genera, 4 terrestrial species under 2 genera), found in the area. The study represents the orchid species diversity and distribution throughout the three blocks of Surguja district and the adjoining areas with the associated host range, habit, and flowering season.

Keywords: Ambikapur, Chhattisgarh, Diversity, Epiphytes, Lundra, Lakhapur, Orchid species, Surguja, Terrestrial.

Introduction

The Surguja district, located in the northern part of the Chhattisgarh, is made up of hills, plains, plateaus, and highlands. Approximately 58% of the district is covered by forests, (<https://surguja.gov.in/about-district/>). Surajpur in the north, Balrampur in the east, Jashpur in the southeast, Raigarh in the south, and Korba in the west are the districts that encircle the district in Chhattisgarh state. It is located between latitudes 23°37'25" and 24°06'17" north and longitudes 81°34'40" and 84°04'40" east. With a total area of roughly 5732 km², the district is 244.62 km long from east to west and 67.37 km long from north to south. The region's average elevation is roughly 600 meters (2000 feet) above mean sea level. Batauli, Sitapur, Mainpat, Dhorpur (Lundra), Ambikapur, Lakhapur, and Udaipur are the seven blocks that jointly make up the Surguja district. The district contains 574 settlements in total. Ambikapur is the district headquarters. Rihand, Mahan, Kanhar, and Moran are the district's principal rivers, (<https://surguja.gov.in/about-district/>).

The most amazing, beautiful, and extravagant group of flowering plants in nature are orchids. Among monocotyledons, orchids are thought to be the most highly evolved in terms of floral specialization and diverse colour and shape. They are members of the Orchidaceae family. The largest and most sophisticated botanical family of blooming plants, orchids make up 9% of India's flora. (Yonzon and others, 2011) ^[40].

Orchids are found all over the world, from the tropics to the high altitudes; they are not found in Antarctica or a few remote islands. They are mostly found in three regions: the Eastern Himalayas, Indo-Malayan, and tropical America. In

tropical forests, around 73% of species are epiphytes, and they significantly contribute to the epiphytic plant groups.

Although orchids can be found across India, from sea level to the snow-covered alpine regions, the quantity of orchids varies according to the local climate. (Jalal, 2012). The Orchidaceae family is found practically everywhere in the world and includes between 30,000 to 35,000 species in 750–800 genera. There are 1263 taxa in 155 genera in India (Singh *et al.*, 2019) ^[37], including 52 taxa dispersed throughout 21 genera in Chhattisgarh. (Singh and others, 2019) ^[37],

Materials and methods

Field survey and photography

Periodic field surveys were carried out for three years (2022–2024) to locate various species of orchids from various regions of Surguja District, Chhattisgarh. The duration of each field survey ranged between 0 to 15 days. A preliminary survey was carried out throughout the state to recognize the areas rich in orchid diversity. The identified areas were investigated through proper observations and taking all the measures. The most important duration for orchid collection is the flowering period, so more than 95 tours were arranged in accordance with their flowering season.

Orchids were collected from 48 different localities of three blocks of Surguja District. The species were photographed in their natural habitats as well as in the laboratory using digital cameras-DSLR (Canon 700D). Details on the habit, habitat, flowering, and fruiting period of orchids were recorded at the time of collection. For epiphytic orchids, the information about host species was also recorded.

Herbarium preparation and identification

All the representative parts for identification of orchids were collected and used for herbaria preparation. Very rare terrestrial orchids were collected without tubers and used for herbarium preparation. The collected specimens were washed, wiped, and pressed in blotting paper. Specimens were further processed as per conventional drying, poisoning, mounting, and labeling (Jain and Rao, 1977) ^[13]. All the processed specimens were deposited at the Department of Botany Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.), and Botanical Survey of India, Acharya Jagdish Chandra Bose, Region Centre, Shibpur (BSI), Kolkata, (West Bengal). All the species were studied for their gross morphological characters during the collection. The collected species were critically examined under a microscope for their identification. The identification and confirmation of plant specimens were done using standard references (Hooker, 1894; 1895; King and Pantling, 1898 ^[20]; Santapau & Kapadia, 1966 ^[32]; Chaudhary, 1984; Bose & Bhattacharya, 1999; Singh *et al.*, 2001 ^[36]; Khanna *et al.*, 2005; Singh *et al.*, 2019 ^[37]; Jalal, 2018; 2019; Chowlu, 2019; Rawat *et al.*, 2023 ^[31]; Verma *et al.*, 1993 ^[41]; Krishen, 2013 ^[43]; Sharma & Lakshminarasimhan, 1996) ^[44]. Indented keys have been prepared for easy identification of genera and species. WFO, POWO, Tropicos, and Plant List have been followed for the species nomenclature. For each species, the correct botanical name followed by important synonyms has been cited.

Results and discussions

The present paper deals with the comparative distribution of the orchid species with their number in each block, such as Ambikapur-16 species under 11 genera, Lundra-15 species under 10 genera, and Lakhanpur-19 species under 10 genera. There were 23 species belonging to 12 genera. (17 epiphyte species in 9 genera, 6 species in 3 genera were terrestrial. Amongst epiphytes, the maximum genera are *Dendrobium* (5 species), *Luisia* and *Habenaria* (3 species), and the minimum genera are 2 species in *Vanda*, *Aerides*, and *Eulophia*; 1 species in *Acampe*, *Epipactis*, *Rhynchostylis*, *Pelatantheria*, *Oberonia*, and *Smitinandia*.

Orchids of three blocks of Surguja district

Mixed deciduous forest and sal-dominant forest

This forest type occurs up to an elevation of 500-1000 m masl from the plains and foothills of the Surguja district. The climate associated with it is a temperature and rainfall of 1200-1400 mm. This can be seen in all the localities during summer, rainy, and moderate winter along the area. The district is the most exploited for orchid collections (Table 1) amongst various localities.

Ambikapur block

Ambikapur is situated in the northern part of the Surguja district of Chhattisgarh and is bounded on the north by Surajpur and Balrampur districts, on the west by Lakhanpur Block, on the south by Mainpat Block, and on the east by Lundra and Batauli Blocks. The block area lies between latitudes 22° 86'N to 23° 24'N and longitudes 83° 02' E to 83° 35'E. The geographical extension of the study area is 676.32 km², representing around 13% of the district's geographical area. The species available are *Acampe praemorsa* (Roxb.) Blatt. & McCann, *Aerides multiflora* Roxb., *Aerides odorata* Lour., *Dendrobium*

macrostachyum Lindl., *Epipactis veratrifolia* Boiss. & Hohen., *Eulophia herbacea* Lindl., *Eulophia picta* (R. Br.) Ormerod, *Habenaria commelinifolia* (Roxb.) Wall. ex Lindl., *Habenaria marginata* Colebr., *Luisia inconspicua* (Hook.f.) King & Pantl., *Luisia zeylanica* (Lindl.), *Oberonia falconeri* Hook.f., *Pelatantheria insectifera* (Rchb.f.) Ridl., *Rhynchostylis retusa* (L.) Blume., *Vanda tessellata* (Roxb.) Hook. ex G. Don, *Vanda testacea* (Lindl.) Rchb.f., Gard.

Lundra block

Lundra is situated on the northeastern part of the Surguja district of Chhattisgarh and is bounded in the west by Ambikapur Block, in the south by Batauli Block, in the north by Balrampur District, and in the east by Jashpur District. The block area lies between latitudes 23° 01'N to 23° 28'N' and longitudes 83° 23' E to 83° 57' E. The geographical extension of the study area is 742.94 km², representing around 14.3% of the district's geographical area. The species available are *Acampe praemorsa* (Roxb.) Blatt. & McCann, *Aerides multiflora* Roxb., *Aerides odorata* Lour., *Dendrobium formosum* Roxb. ex Lindl., *Dendrobium macrostachyum* Lindl., *Eulophia picta* (R.Br.) Ormerod, *Habenaria commelinifolia* (Roxb.) Wall. ex Lindl., *Habenaria laciniata* Dalzell, *Habenaria marginata* Colebr., *Oberonia falconeri* Hook.f., *Pelatantheria insectifera* (Rchb.f.) Ridl., *Rhynchostylis retusa* (L.) Blume., *Smitinandia micrantha* (Lindl.) Holttum, *Vanda tessellata* (Roxb.) Hook. ex G. Don, *Vanda testacea* (Lindl.) Rchb.f., Gard.

Lakhanpur block

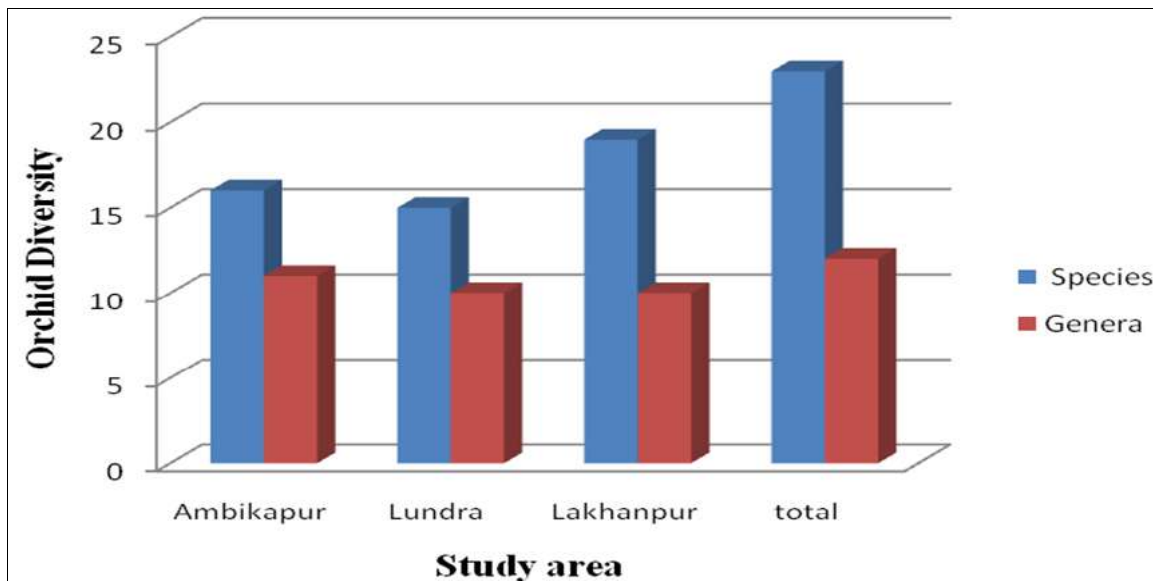
Lakhanpur is situated in the central part of the Surguja district of Chhattisgarh and is bounded in the west by Udaipur Block and in the east by Mainpat and Ambikapur Block. The block area lies between latitudes 22° 73'N to 23° 11'N and longitudes 82° 85' E to 83° 22'E. The geographical extension of the study area is 780.08 km², representing around 15% of the district's area. The species available are *Acampe praemorsa* (Roxb.) Blatt. & McCann, *Aerides multiflora* Roxb., *Aerides odorata* Lour., *Dendrobium crepidatum* Lindl. & Paxton, *Dendrobium formosum* Roxb. ex Lindl., *Dendrobium herbaceum* Lindl., *Dendrobium macrostachyum* Lindl., *Dendrobium transparens* Wall. ex Lindl., *Eulophia herbacea* Lindl., *Eulophia picta* (R.Br.) Ormerod, *Habenaria commelinifolia* (Roxb.) Wall. ex Lindl., *Habenaria marginata* Colebr., *Luisia trichorhiza* (Hook.) Blume, *Luisia zeylanica* Lindl., *Oberonia falconeri* Hook.f., *Pelatantheria insectifera* (Rchb.f.) Ridl., *Rhynchostylis retusa* (L.) Blume., *Vanda tessellata* (Roxb.) Hook. ex G. Don, *Vanda testacea* (Lindl.) Rchb.f., Gard.

Earlier orchid species were reported in different regions of Surguja, such as Singh *et al.*, (2001) ^[36] and Khanna *et al.*, (2005) ^[19], which reported 30 species belonging to 15 genera of orchid flora after 10 years. Tiwari (2015) reported *Papilionathe teresschr.* orchid species in Matinga Surguja, while Sharma & Rajwade (2017) explored *Oberonia* richness in Maheshpur, Udaipur; Rajwade and Patel (2023) ^[30]; epiphytic orchid species diversity in Mainpat, and Rajwade and Patel (2024) ^[29]; and orchids of the Ramgarh (Puti) Hills region of Surguja. The present study of the three blocks of Surguja district reported 23 species belonging to 12 genera of orchid flora.

Table 1: Total Number of Orchid species and Genera of Three blocks of Surguja District, Chhattisgarh, Central India.

S. No.	Study area (Blocks)	Total number of Species	Total Number of Genera
1	Ambikapur	16 (11E&5T)	11 (8E&3T)
2	Lundra	15 (11E&4T)	10 (8E&2T)
3	Lakhanpur	19 (15E&4T)	10 (8E&2T)
Total		23 (17E&6T)	12 (9E&3T)

(Abbreviation: ‘E’- Epiphytes, ‘T’- Terrestrial)



Graph 1: Total Number of Orchid species and Genera of three blocks of Surguja District, Chhattisgarh, Central India.

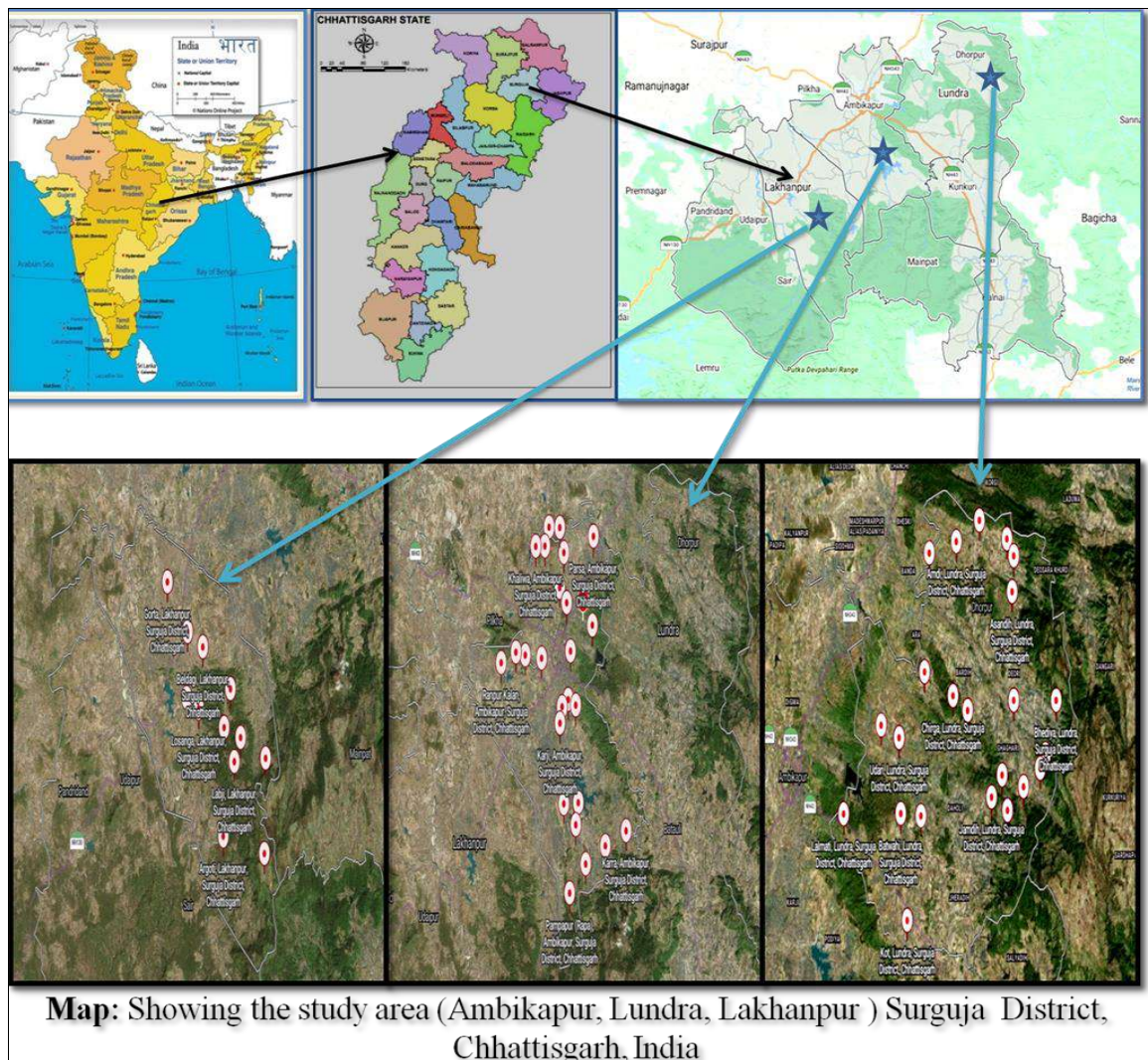


Table 2: Diversity and Distribution of Orchid species in Three blocks of Surguja District, Chhattisgarh, Central India.

S.N.	Name of the species	Ambi.	Lun.	Lakh.	Habit	Flowering
	<i>Acampe praemorsa</i> (Roxb.) Blatt. & McCann	+	+	+	Epiphytes	September- November
	<i>Aerides multiflora</i> Roxb.	+	+	+	Epiphytes	May- July
	<i>Aerides odorata</i> Lour.	+	+	+	Epiphytes	June- July
	<i>Dendrobium crepidatum</i> Lindl. & Paxton.	-	-	+	Epiphytes	February-March
	<i>Dendrobium formosum</i> Roxb. ex Lindl.	-	+	+	Epiphytes	June- August
	<i>Dendrobium herbaceum</i> Lindl.	-	-	+	Epiphytes	February-March
	<i>Dendrobium macrostachyum</i> Lindl.	+	+	+	Epiphytes	June- August
	<i>Dendrobium transparens</i> Wall. ex Lindl.	-	-	+	Epiphytes	March-June
	<i>Epipactis veratrifolia</i> Boiss. &Hohen.	+	-	-	Terrestrial	February-March
	<i>Eulophia herbacealindl.</i>	+	-	+	Terrestrial	June-July
	<i>Eulophia picta</i> (R.Br.) Ormerod	+	+	+	Terrestrial	June-July
	<i>Habenaria commelinifolia</i> (Roxb.) Wall. ex Lindl.	+	+	+	Terrestrial	August- September
	<i>Habenaria laciniata</i> Dalzell	-	+	-	Terrestrial	June- July
	<i>Habenaria marginata</i> Colebr	+	+	+	Terrestrial	July- August
	<i>Luisia inconspicua</i> (Hook.f.) King &Pantl.	+	-	-	Epiphytes	August- September
	<i>Luisia trichorhiza</i> (Hook.) Blume	-	-	+	Epiphytes	February- March
	<i>Luisia zeylanica</i> Lindl.	+	-	+	Epiphytes	March- April
	<i>Oberonia falconeri</i> Hook.f.	+	+	+	Epiphytes	September- November
	<i>Pelatantheria insectifera</i> (Rchb.f.) Ridl.	+	+	+	Epiphytes	June- August
	<i>Rhynchostylis retusa</i> (L.) Blume.	+	+	+	Epiphytes	May-August
	<i>Smitinandia micrantha</i> (Lindl.) Holttum	-	+	-	Epiphytes	May-June
	<i>Vanda tessellata</i> (Roxb.) Hook. ex G. Don	+	+	+	Epiphytes	March-April, December-January
	<i>Vanda testacea</i> (Lindl.) Rchb.f., Gard	+	+	+	Epiphytes	May-July
	Total	16	15	19		

(Abbreviation: '-'- Absent, '+'- Present, 'Ambi.'- Ambikapur, 'Lun.'-Lundra, 'Lakh.'- Lakhanpur)

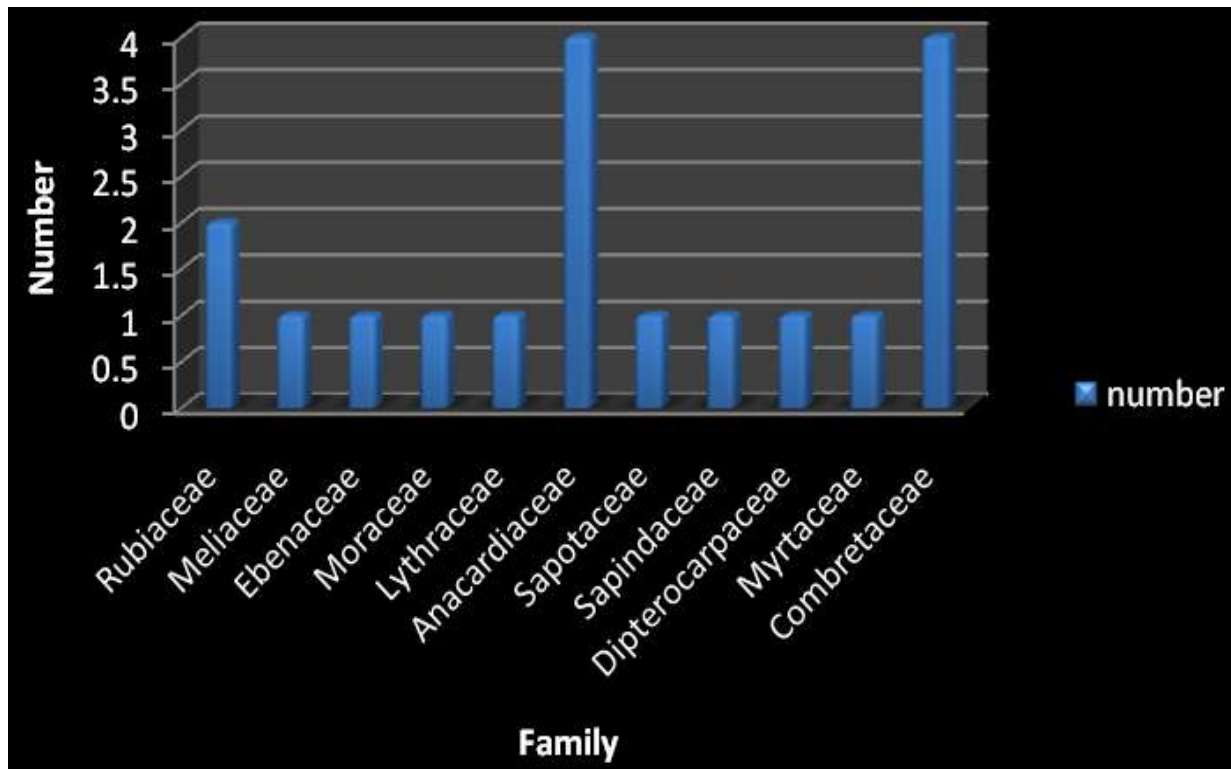
Table 3: Epiphytic Orchid Species and Name, Number of Associates host tree species

S.N.	Name	Host Trees	Total Number of Host Tree
1.	<i>Acampe praemorsa</i> (Roxb.) Blatter &Mc. Cann.	<i>Madhucalongifolia</i> var. <i>latifolia</i> (Roxb.) A.Chev., <i>Shorea robusta</i> C.F.Gaertn.	2
2.	<i>Aerides odorata</i> Lour.	<i>Diospyros melanoxylon</i> Roxb., <i>Shorea robusta</i> C.F.Gaertn., <i>Terminalia bellirica</i> (Gaertn.) Roxb.	3
3.	<i>Aerides multiflora</i> Roxb.	<i>Diospyros melanoxylon</i> Roxb., <i>Shorearobusta</i> C.F.Gaertn.	2
4.	<i>Dendrobium crepidatum</i> Lindl. &Paxton.	<i>Shorea robusta</i> C.F.Gaertn.	1
5.	<i>Dendrobium formosum</i> Roxb. ex Lindl.	<i>Shorea robusta</i> C.F.Gaertn.	1
6.	<i>Dendrobium herbaceum</i> Lindl.	<i>Shorea robusta</i> C.F.Gaertn.	1
7.	<i>Dendrobium transparens</i> Wall. ex Lindl	<i>Shorea robusta</i> C.F.Gaertn.	2
8.	<i>Dednrobium macrostachyum</i> Lindl.	<i>Diospyros melanoxylon</i> Roxb., <i>Shorearobusta</i> C.F.Gaertn.	2
9.	<i>Luisia incospicua</i> (Hook.F.) King&Pantl.	<i>Madhucalongifolia</i> var. <i>latifolia</i> (Roxb.) A.Chev.	1
10.	<i>Luisia trichorhiza</i> (Hook.) Blume	<i>Shorea robusta</i> C.F.Gaertn.	1
11.	<i>Luisia zeylanica</i> Lindl.	<i>Shorea robusta</i> C.F.Gaertn.	1
12.	<i>Oberonia falconeri</i> Hook.f.	<i>Diospyros melanoxylon</i> Roxb., <i>Shorea robusta</i> C.F.Gaertn., <i>Terminalia elliptica</i> Willd.	3
13.	<i>Pelatantheria insectifera</i> (Reichb.f.) Ridl.	<i>Shorea robusta</i> C.F.Gaertn.	1
14.	<i>Rhynchostylis retusa</i> (L.) Blume	<i>Diospyros melanoxylon</i> Roxb., <i>Madhuca longifolia</i> var. <i>latifolia</i> (Roxb.) A.Chev., <i>Mangifera indica</i> L., <i>Shorearobusta</i> C.F.Gaertn., <i>Terminalia bellirica</i> (Gaertn.) Roxb., <i>Terminalia elliptica</i> Willd.	6
15.	<i>Smitinandia micrantha</i> (Lindl.) Holttum	<i>Mangifera indica</i> L.	1
16.	<i>Vanda tessellate</i> (Roxb.) Hook. ex. G. Don.	<i>Azadirachta indica</i> A.Juss., <i>Adina cordifolia</i> (Roxb.) Brandis, <i>Diospyros melanoxylon</i> Roxb., <i>Ficus benghalensis</i> L., <i>Lagerstroemia parviflora</i> Roxb., <i>Lannea coromandelica</i> (Houtt.) Merr., <i>Madhuca longifolia</i> var. <i>latifolia</i> (Roxb.) A.Chev., <i>Mangifera indica</i> L., <i>Neolamarckia cadamba</i> (Roxb.) Bosser, <i>Schleichera oleosa</i> (Lour.) Oken, <i>Semecarpus anacardium</i> L.f., <i>Shorea robusta</i> C.F.Gaertn., <i>Syzygium cumini</i> (L.) Skeels, <i>Terminalia anogeissiana</i> Gere & Boatwr., <i>Terminalia bellirica</i> (Gaertn.) Roxb., <i>Terminalia chebula</i> Retz., <i>Terminalia elliptica</i> Willd.	16
17.	<i>Vanda testacea</i> (Lindl.) Reichb. f.	<i>Diospyros melanoxylon</i> Roxb., <i>Terminalia chebula</i> Retz., <i>Terminalia elliptica</i> Willd.	3

Table 4: Associated host tree species, Botanical name, common name and their family

S. No.	Botanical name	Common name	Family
	<i>Adina cordifolia</i> (Roxb.) Brandis	Haldu	Rubiaceae
	<i>Azadirachta indica</i> A.Juss.	Neem	Meliaceae
	<i>Diospyros melanoxylon</i> Roxb.	Tendu	Ebenaceae
	<i>Ficus benghalensis</i> L.	Bargad	Moraceae
1.	<i>Lagerstroemia parviflora</i> Roxb.	Sidha tree	Lythraceae
2.	<i>Lannea coromandelica</i> (Houtt.) Merr.	Jhingan	Anacardiaceae
3.	<i>Madhuca longifolia</i> var. <i>latifolia</i> (Roxb.) A.Chev.	Mahua	Sapotaceae
4.	<i>Mangifera indica</i> L.	Aam	Anacardiaceae
5.	<i>Neolamarckia cadamba</i> (Roxb.) Bosser	Kadamb	Rubiaceae
6.	<i>Schleichera oleosa</i> (Lour.) Oken	Kusum	Sapindaceae
7.	<i>Semecarpus anacardium</i> L.f.	Bhelwa	Anacardiaceae
8.	<i>Shorea robusta</i> C.F.Gaertn.	Sal	Dipterocarpaceae
9.	<i>Syzygium cumini</i> (L.) Skeels	Jamun	Myrtaceae
10.	<i>Terminalia anogeissiana</i> Gere & Boatwr.	Dhawra	Combretaceae
11.	<i>Terminalia bellirica</i> (Gaertn.) Roxb.	Bahera	Combretaceae
12.	<i>Terminalia chebula</i> Retz.	Harra	Combretaceae
13.	<i>Terminalia elliptica</i> Willd.	Saj	Combretaceae





Graph 2: Host tree species and their number

Acknowledgments

I extend my sincere gratitude to Dr. Devendra Kumar Patel, my supervisor of the Department of Botany, Guru Ghasidas Vishwavidyalaya, (a central university) Bilaspur, Chhattisgarh, for constant supervision and valuable suggestions during the present studies. and local people of the area and the Forest Department to help me with the field visit of Ambikapur, Lundra, and Lakhanpur block of Surguja district, Chhattisgarh, Central India.

References

- Bose TK, Bhattacharjee SK, 1999. *Orchids of India*. Revised Edition. Naya Prokash. Calcutta
- Chowdhery HJ. *Orchid Flora of Arunachal Pradesh*. Dehra Dun, 1998.
- Hooker JD, 1890. *Orchidaceae*. In: *Flora of British India*. L. Reeve and Co., Ashford, Kent. 687 – 864 & VI: 1 – 198.
- <http://www.theplantlist.org>.
- https://cgstate.gov.in/html/documents/Images/Resize_Image/district.jpg
- <https://powo.science.kew.org/>.
- <https://surguja.gov.in/about-district/>
- <https://surguja.gov.in/history/>, <https://surguja.gov.in/>
- <https://surguja.gov.in/website-policies>
- <https://www.bing.com/maps?q=mainpat+block+surguja%2C+chhattisgarh%2C+india&FORM=HDRSC4&cp=22.088821~82.32399&lvl=11.0>
- https://www.nationsonline.org/gallery/India/map_of_india_50-L.jpg.
- About District | District Surguja, Government of Chhattisgarh | India.
- Jain SK, Rao RR. *A Handbook of Field and Herbarium Methods*. Today and Tomorrow's Printers and Publishers, New Delhi, 1977.
- Jala JS. *The Wild orchid of Goa*, 2022.
- Jalal JS. Distribution pattern of orchids in Uttarakhand, Western Himalayas, India. *International Journal of Plant Biology*,2012:3(1):e5.
- Jalal JS. Diversity and distribution of orchids of Goa, Western Ghats, India. *Journal of Threatened Taxa*,2019:11(15):15015-15042.
- Jalal JS, Rawat G, Kumar P, Pangtey Y. *Orchidaceae*, Uttarakhand, Western Himalaya, India. *Check list*,2008:4(3):304-320.
- Jalal JS. *Orchid of Maharashtra*, 2020.
- Khanna KK, Kumar Anand, Jha AK, Bishen Singh, Singh M. Floristic Diversity of Chhattisgarh (Angiosperms.) -A new Connaught place Dehradun 248001 (India) 2005, 438-455.
- King G, Pantling R. *The Orchids of the Sikkim-Himalaya*. In *Annals of the sRoyal Botanic Garden*, Calcutta, 1898.
- Kotia A, Kumar P, Tiwari UL, Jalal JS. Orchid diversity and distribution in Kanger Valley National Park, Chhattisgarh. *J. Econ. Taxon. Bot*, 2013, 37(1).
- Kumar P, Jalal J, Rawat G. *Orchidaceae*, Chotanagpur, state of Jharkhand, India. *Check List*,2007:3(4):297-304.
- Lokho A. Diversity of *Dendrobium* Sw. its distributional patterns and present status in Northeast India. *International Journal of Scientific and Research Publications*,2013:3(5):1-9.
- Mujaffara S, Mishrab S, Deodab VS, Moinuddinb S, Mustakimb S. *Orchid Species Diversity of East Nimar, Madhya Pradesh, India*.
- Pant B, Paudel MR, Chand MB, Pradhan S, Malla BB, Raskoti BB. *Orchid diversity in two community forests of Makawanpur district, central Nepal*. *Journal of Threatened Taxa*,2018:10(11):12523-12530.
- Paramanik M, Mahato A, Raha S. *Orchids in Purulia District, West Bengal*.

27. Prapitasari B, Kurniawan AP. Morphological Characterization of Epiphytic Orchids in the Tourism sArea of CurugCibereumSelabintana, Mount GedePangrango, West Java. Biosaintropis (Bioscience-Tropic),2022;8(1):1-12.
28. Rajput D, Saikia LR, Gogoi K, Nasrin T. Orchid diversity of Mesaki reserve forest, Assam, India.
29. Rajwade RK, Patel K. Orchid species diversity of Ramgarh Hills (PUTA), Udaipur Surguja, Chhattisgarh, India, International Journal of Botany Studies,2024;9(5):33-39.
30. Rajwade RK, Patel DK. Epiphytic Orchid species diversity of Mainpat, Surguja, Chhattisgarh, India.Scopejournal, 2023.
31. Rawat GP, Jalal JS, Singh G. Orchid of Uttarakhand a field Guide, 2023.
32. Santapau H, Kapadia Z. Orchids of Bombay, 1966.
33. Sebastian J, Kathiresan D, Kuriakose G. Species diversity and abundance patterns of epiphytic orchids in Aralam Wildlife Sanctuary in Kerala, India. Journal of Threatened Taxa,2021;13(8):19060-19069.
34. Sharma A, Rajwade RK. Exploration of *Oberonia sp.* from Maheshpur of Sarguja, Chhattisgarh, Journal of Scientific Letters,2017;2(2):56-60.
35. Singh Jalal J, Jayanthi J. An annotated checklist of the orchids of the western Himalayas, India. *Lankesteriana*,2015;15(1):07-50.
36. Singh NP, Khanna KK, Mudgal V, Dixit RD. Flora of Madhya Pradesh, Volume –III BSI. August,2001;15:12-73.
37. Singh SK, Agarwala Dinesh, Jalal Jeewan, Dash Sudhansu Sekhar, Mao A. Orchids of India - pictorial guide, 2019. 10.13140/RG.2.2.27112.01282.
38. Timsina B, Kindlmann P, Subedi S, Khatri S, Rokaya MB. Epiphytic orchid diversity along an altitudinal gradient in Central Nepal. *Plants*,2021;10(7):1381.
39. Yonzone Rajendra, Kamran A. Ethnobotanical Uses of Orchids. Abstract in an International Seminar of XVIIIth Annual Conference of IAAT “Multidisciplinary approaches in Angiosperm Systematics” Kalyani University, West Bengal, 2008, 11-12.
40. Yonzone R, Lama D, Bhujel RB, Rai S, Kendra DKV, Viswavidyalaya UBK, *et al.* Epiphytic orchid species diversity of Darjeeling Himalaya of West Bengal, India. Asian J Pharm Life Ssci ISSN, 2231, 4423, 2011.
41. Verma DM, Balakrishnan NP, Dixit RD. Flora of Madhya Pradesh. Botanical Survey of India, Calcutta, 1993, 280.
42. Mudgal V, Khanna KK, Hajra PK. Flora of Madhya Pradesh. Vol, II, Botanical Survey of India, Calcutta, 1997, 681.
43. Krishen P. Jungle trees of central India: A field guide for tree spotters. Penguin Books, 2013.
44. Sharma BD, Lakshminarasimhan P. Flora of Maharashtra state. Kolkata: Botanical Survey of India, 1996, 1.