International Journal of Ecology and Environmental Sciences
www.ecologyjournal.in
Online ISSN: 2664-7133, Print ISSN: 2664-7125
Received: 10-07-2025, Accepted: 10-08-2025, Published: 25-08-2025
Volume 7, Issue 3, 2025, Page No. 66-73

Orchids diversity of Batauli and Sitapur blocks, of Surguja district, Chhattisgarh, India

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Abstract
The present study area, located in the eastern to southern part of the Surguja District of Chhattisgarh, is made up of hills, valleys, plateaus, and plains. Approximately 18.39% of the area is covered by the Surguja District. The study area is covered by the west of Mainpat and Ambikapur, the north by Lundra, and the east by Jashpur District. It lies betweens latitudes 22° 83' N to 23° 06' N (Batauli) and 22° 62' N to 22° 90' N (Sitapur) and longitudes 83° 33' E to 83° 53' E (Batauli) and 83° 42' E to 83° 69' E (Sitapur). The geographical extension of the study area is 401.73 km² (Batauli) and 500.99 km² (Sitapur), representing around 7.74% (Batauli) and 9.65% (Sitapur) of the district's geographical area. The vegetation of the study area is a mixed deciduous type with a temperature between 25^0C and 30^0C and an annual rainfall of 120 mm. The major drainage system of the study area is the Mand and Maini rivers, both of which are part of the Mahanadi Basin. Extensive field surveys of orchids were conducted from 2023 to 2024 in various parts of the Batauli and Sitapur blocks and adjoining areas. In this study, a total of 24 genera belonging to 12 genera (20 species under 12 genera in Batauli blocks and 18 species under 10 genera in Sitapur blocks) are reported in two blocks of Surguja District, Chhattisgarh. The study represents *Acampe praemorsa var. longepedunculata* (Trimen) Goverts, a new addition to the orchid flora and the orchid species diversity and distribution throughout the two blocks of Surguja district and adjoining areas, with the habit, flowering season, and color photo plate.

Keywords: *Acampe praemorsa var. longepedunculata* (Trimen) goverts, Batauli, orchids, diversity, new addition, Sitapur, Surguja, Chhattisgarh

Introduction

Orchids are one of the most valuable, drastic, magnificent, and intriguing groups of flowering plants in nature. As members of the *Orchidaceae* family, orchids are thought to be the most highly evolved monocotyledons in terms of floral specialization. Orchid diversity is the greatest and most sophisticated form found in India. Orchids show the diverse variation of shape, size, color, habitat, and distribution. Orchids cover over all 9% of the flowering plants. (Yonzone *et al.*, 2011) [44].

Orchids are found throughout the world, from the high alpine to the tropics, and are absent from Antarctica and a few remote islands (Jalal, 2012) [18]. They are primarily found in the Eastern Himalayas, Indo-Malaya, and tropical America. They make a significant contribution to the epiphytic plant groups in tropical forests, with about 73% of species being epiphytes.

Orchids can be found in India from sea level to areas covered by snow. The amount of orchids in various locations varies depending on the climate (Jalal, 2012) [18]. The *Orchidaceae* family is found practically everywhere in the world, with between 30,000 to 35,000 species spread in 750–800 genera. According to Singh *et al.*, (2019) [41], there are 1263 taxa in 155 genera in India; in Madhya Pradesh, 89 species of orchids under 39 genera (including Chhattisgarh state) (Singh *et al.*, 2001) [40] have been reported, while in Chhattisgarh, 69 species of orchids under 27 genera have been reported (Khanna *et al.*, 2005); BSI-checklisted 52 species under 21 genera are found in Chhattisgarh (Singh *et al.*, 2019); recently, a checklist by Pandey *et al.* (2023) has 50 species under 22 genera distributed in Chhattisgarh, Naik *et al.*, (2024) reported a 20 species of orchids in Kangar valley national park in Chhattisgarh; Sharma and Rajwade, (2017) [39], reports a Oberonia lindley in Maheshpur, Udaipur, Surguja District, Chhattigarh; Rajwade and Patel, (2023) [35], reported 14 Species under 8 genera of Epiphytic orchid of Mainpat, Surguja district, Chhattisgarh; Rajwade *et al.*, (2024) [33], reported a *Zeuxine strateumatica* (L.) Schltr. in addition of the orchid flora of Bilaspur district, Chhattisgarh; Rajwade and Patel, (2024) [33] recored a 12 species belongs to 8 genera of Ramgarh hills (Puta), Udaipur block of Surguja District, Chhattisgarh; Rajwade and Patel, (2025) [34], reported 23 Species belong to 12 genera in Ambikapur, Lunda and Lakhanpur block, of Surguja District, Chhattisgarh, India.

Materials and methods

1. Study area

a. Batauli Block is situated in the eastern part of the Surguja district of Chhattisgarh and is bounded in the west by Mainpat and Ambikapur blocks, in the north by Lundra Block, in the south by Sitapur Block, and in the east by Jushpur District. The block area lies between latitudes 22° 83' N to 23° 06' N and longitudes 83° 33' E to 83° 53' 83053'E. The geographical extension of the study area is 401.73 km², representing around 7.74% of the district's geographical area. Geomorphologically, the northern part comprises a denudational plateau, the eastern and southern parts comprise a pediment, and the western parts comprise a region of plateau. The major drainage of the block includes the Mand River and part of the Mahanadi Basin.

b. Sitapur Block is situated in the southern part of the Surguja district of Chhattisgarh and is bounded in the west by Mainpat and Ambikapur blocks, in the north by Batauli Block, in the west by Mainpat Block, and in the east and west by Jushpur District. The block area lies between latitudes 22° 62' N to 22° 90' N and longitudes 83° 42' E to 83° 69' E. The geographical extension of the study area is 500.99 km², representing around 9.65% of the district's geographical area.

Geomorphologically, blocks are comprised of pediments except in the northeastern part, which has denudational hills and valleys on Proterozoic rocks. The vegetation of the Sitapur block. The major drainage of the block includes the Mand River and the Maini River, both of which are part of the Mahanadi Basin.

2. Field Survey and Identification

Periodic Random field surveys were carried out for three years (2023–2024) to locate various species of orchids from the Batauli and Sitapur blocks regions of Surguja District, Chhattisgarh. The species were photographed in their natural habitats as well as in the laboratory using digital cameras (Canon 700D). Details on the habit, habitat, flowering, and fruiting period of orchids were recorded at the time of collection. Plant materials collected during the field survey were The identification and confirmation of plant specimens were done using standard references (Hooker, 1894; 1895; King and Pantling, 1898; Santapau & Kapadia, 1966; Chaudhary, 1984; Bose & Bhattacharya, 1999; Singh *et al.*, 2001; Khanna *et al.*, 2005; Singh *et al.*, 2019; Jalal, 2018; 2019; Chowlu, 2022; Rawat *et al.*, 2023; Verma *et al.*, 1993; Krishen, 2013; Sharma & Lakshminarasimhan, 1996; WFO; POWO; Tropicos; Gbif; and Plant List have been followed for the species nomenclature) [1, 3, 20, 23, 36, 37, 40, 41]. For each species, the correct botanical name is followed by important Plant materials collected during the field survey were used for the preparation of e-herbarium specimens.

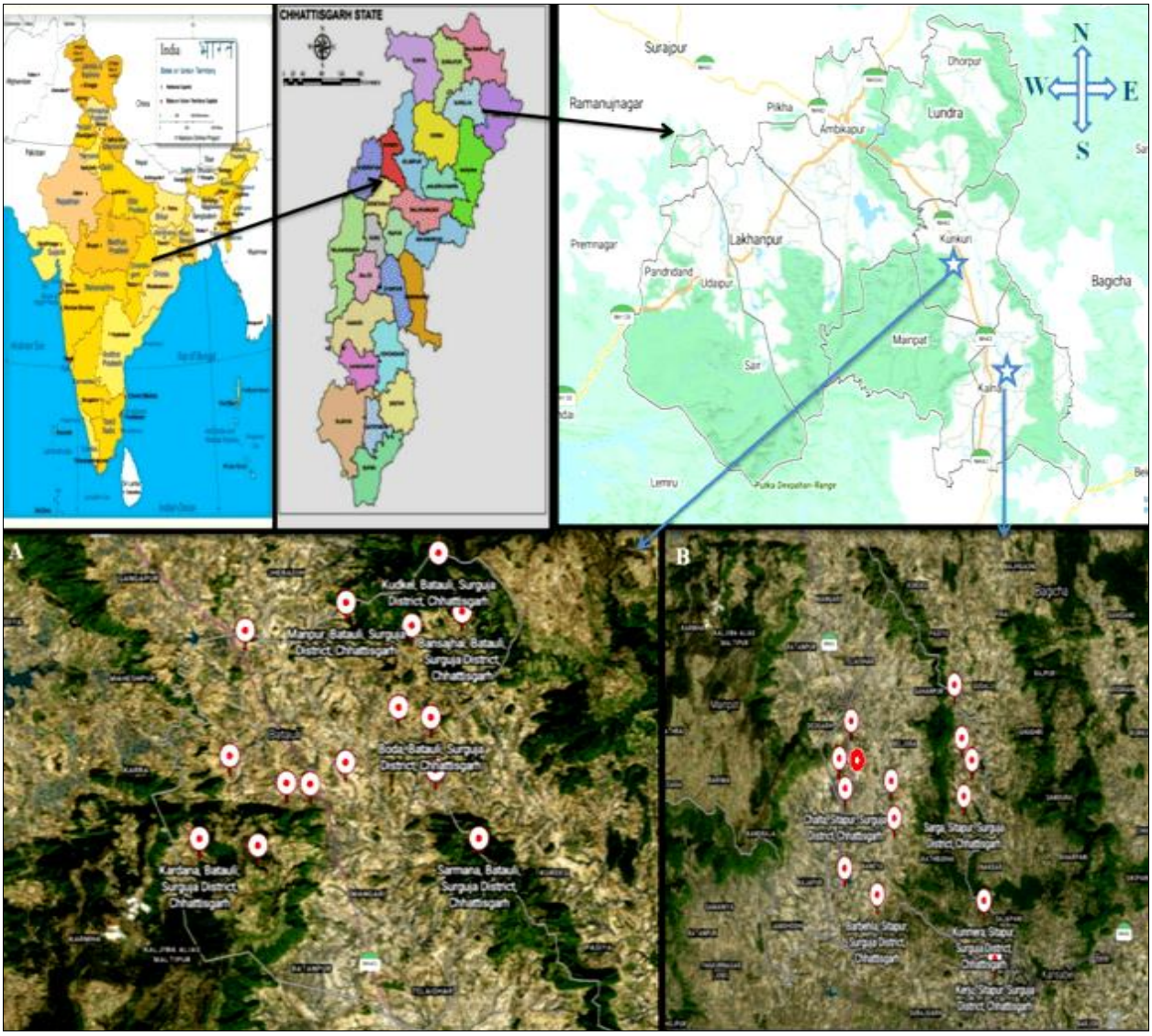


Fig 1: Showing the Study Area (A- Batauli, B- Sitapur), Surguja District, Chhattisgarh, Central India

Results and Discussions

The present study deals with the comparative study of the orchid species diversity with their number in each block, such as Batauli-20 species under 12 genera, and Sitapur-18 species under 10 genera. There were 24 species belonging to 12 genera. (17 epiphyte species in 9 genera; 6 species in 3 genera are terrestrial), and one species is a new report to the orchid flora of Chhattisgarh, India.

Orchids of two blocks of Surguja district

Mixed deciduous forests and sal-dominant forests were found in the study area. This forest type occurs up to an elevation of 500-1000 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**.**

1. **Sub-study area of Batauli Block:** The orchid species available in the Batauli Blocks are *Acampe praemorsa* (Roxb.) Blatt. & McCann, *Aerides multiflora* Roxb., *Aerides odorata* Lour., *Coelogyne imbricata* (Hook.) Rchb.f., *Dendrobium crepidatum* Lindl. & Paxton., *Dendrobium formosum* Roxb. ex Lindl., *Dendrobium herbaceum* Lindl., *Dendrobium macrostachyum* Lindl., *Dendrobium transparens* Wall. ex Lindl., *Eulophia herbacea* Lindl., *Habenaria commelinifolia* (Roxb.) Wall. ex Lindl., *Habenaria marginata* Colebr., *Luisia inconspicua* (Hook.f.) King & Pantl., *Luisia trichorhiza* (Hook.) Blume, *Luisia zeylanica* Lindl., *Oberonia falconeri* Hook.f., *Pelatantheria insectifera* (Rchb.f.) Ridl., *Rhynchostylis retusa* (L.) Blume, *Thunia alba* var. *bracteata* (Roxb.) N. Pearce & P.J. Cribb., *Vanda tessellata* (Roxb.) Hook. ex G. Don, and *Vanda testacea* (Lindl.) Rchb.f., Gard.

2. **Sub-Study Area of Sitapur Block:** The orchid species available in the Sitapur Blocks are *Acampe praemorsa* (Roxb.) Blatt. & McCann, *Acampe praemorsa var. longepedunculata* (Trimen) Goverts, *Aerides multiflora* Roxb., and *Aerides odorata.* Lour., *Dendrobium herbaceum* Lindl., *Dendrobium macrostachyum* Lindl., *Eulophia diffusiflora* M.W. Chase. Kumar & Schut., *Habenaria commelinifolia* (Roxb.) Wall. ex Lindl., *Habenaria laciniata* Dalzell, *Habenaria marginata* Colebr., *Luisia inconspicua* (Hook.f.) King & Pantl., *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) [40] and Khanna *et al.*, (2005), which reported 30 species belonging to 15 genera of orchid flora after 10 years. Tiwari (2015) [43] reported *the Papilionanthe teres* (Schtr.) orchid species in Matringa, Udaipur, and Surguja, Chhattisgarh, while Sharma & Rajwade (2017) [39] explored Oberonia richness in Maheshpur, Udaipur; Rajwade and Patel, (2023) [35] reported 14 epiphytic orchid species belonging to 8 genera of orchid flora in Mainpat; Rajwade and Patel, (2024) [33] reported 12 orchid species belonging to 8 genera of the Ramgarh (Puta) Hills region of Surguja; and Rajwade and Patel, (2025) [34] reported comparative studies of a total of 23 species under 12 genera of orchid diversity in three blocks (Ambikapur, Lundra, and Lakhanpur) of the Surguja district of Chhattisgarh. The present study of the two blocks (Batauli and Sitapur) of Surguja district reported 24 species belonging to 12 genera of orchid flora of Chhattisgarh. Some species, e.g., *Acampe praemorsa* (Roxb.) Blatt. & McCann, *Aerides multiflora* Roxb., *Coelogyne imbricata* (Hook.) Rchb.f., *Rhynchostylis retusa* (L.) Blume., *Vanda tessellata* (Roxb.) Hook. ex G. Don, and *Vanda testacea* (Lindl.) Rchb.f., Gard, are also used to cure some illnesses and are also used by local people in daily life. and *Acampe praemorsa* var. *longepedunculata* (Trimen) Goverts is a new addition to the orchid flora of Chhattisgarh, India.

Enumerations of the new additions to the Orchid flora:
***Acampe praemorsa* var. *longepedunculata* (Trimen) Goverts:** Acampe rigida (Buch. -Ham.ex Sm.) Hunt in Kew Bull. 24:98.1970; Rawat *et al*., orch. Uttarakhand. 63.2023 [36]; Chowlu K., Orch. Namsai, Arunachal Pradesh. 34-35 2022; Sharma *et al*., Fl. Maharashtra 2: 11. 1996; Saxena &Brahmam, Fl. Orrisa 3: 1771-1772 1995; Singh *et al*., Orch.India Pict.Gui.38-39. 2019 [41]**,** (Plate 03).
Plant epiphytic herbs. Stem 1.5–2.0 cm thick, covered with a sheath of fallen leaves, woody. Leaves are 22.0×2.5–3.0 cm, coriaceous, channeled, oblong, entire, and emarginate at the apex with two equal rounded lobes. Inflorescence 4.5–5.0 cm long including peduncle, corymbose panicle, with closely arranged copular sheaths. Flowers are 1.5 × 1.0 cm, densely arranged at the apex of the peduncle, fleshy, bracteate, and pedicellate. Bract, 0.2 × 0.2 cm, ovate–oblong, acute, brown, persistent. Pedicel with ovary 0.3–0.6 cm long. Sepals and petals are similar, coriaceous, entire, and creamy-yellow with dark brownish-red irregular transverse strips. Dorsal sepal, 0.9 × 0.5 cm, obovate–oblong, obtuse; lateral sepals as long and as broad as dorsal ones, ovate, obtuse, rarely subretuse. Petals, 0.9 × 0.3 cm, oblong, acute apex. Lip 0.8–0.9 × 0.4 cm, white with purplish strips; lateral lobes small, erect, and subentire; midlobe dilated beyond lateral lobes, margin irregularly waved, obtuse. Spur short, rounded sac. Column 0.2 × 0.2 cm, broadly margined with deep brownish-red. Pollinia 2 is large, globose, waxy, and yellow. Capsules 7.0–8.0 × 0.7–1.0 cm, subcylindric, longitudinally ribbed.

Flowering: September-October
Ecological notes: Epiphytic herbs, species found in moist and dry deciduous forests up to 700 masl. Common host species are *Madhuca indica* J.F. Gmel., *Mangifera indica* L., *Tamarindus indica* L., and *Tectona grandis* L.f., which are new to the study area of Surguja District.

Specimens examined: India, Chhattisgarh, Surguja District, Sitapur, 18/09/2024 (flowering stage), Ram Kumar Rajwade & Dr. Devendra Kumar Patel.

Locality in Chhattisgarh: Surguja.
Distribution: India (Assam, Manipur, Meghalaya, Nagaland, Tripura, Arunachal Pradesh, Sikkim, West Bengal, Andhra Pradesh, Chhattisgarh, Jharkhand, Kerala, Odisha, Andaman & Nicobar Island), Bangladesh, China, Thailand, Malaysia, and the Philippines. Myanmar, Nepal, and Sri Lanka.

Conclusions

Man-made, diverse activities pose the primary threat in the region. Besides this, forest fires, mining, overexploitation, and deforestation also cause great harm to the species of human activities. The orchid resources of the Batauli and Sitapur blocks of the Surguja district, Chhattisgarh, are some species soon going to be threatened. Thus, it is very important to take up conservation measures, to work out suitable conservation strategies, and also to protect their survival in natural habitats.

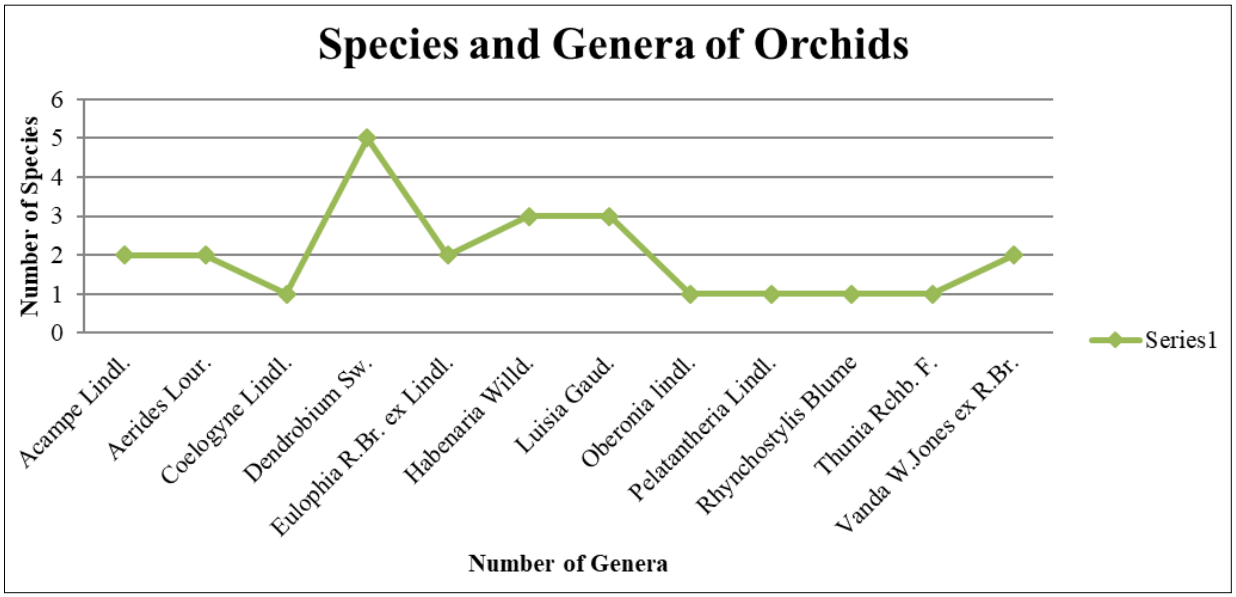
Table.1: Diversity, Habitat, and Phenology of Orchid flora in different Sub- Study area of Surguja District, Chhattisgarh, India

S. No.	Name of the species	Batau.	Sita.	Habitat	Phenology
1.	*Acampe praemorsa* (Roxb.) Blatt. & McCann	+	+	E	October-November
2.	*Acampe praemorsa var. longepedunculata* (Trimen) Goverts	-	+	E	September- October
3.	*Aerides multiflora* Roxb.	+	+	E	May- July
4.	*Aerides odorata* Lour.	+	+	E	June-July
5.	*Coelogyne imbricata* (Hook.) Rchb.f.	+	-	E/L	August-September
6.	*Dendrobium crepidatum* Lindl. & Paxton.	+	-	E	Ferbruary- March
7.	*Dendrobium formosum* Roxb. ex Lindl.	+	-	E	June-July
8.	*Dendrobium herbaceum* Lindl.	+	+	E	Ferbruary- March
9.	*Dendrobium macrostachyum* Lindl.	+	+	E	June-July
10.	*Dendrobium transparens* Wall. ex Lindl	+	-	E	May-July
11.	*Eulophia herbacea* lindl.	+	-	T	June-July
12.	*Eulophia diffusiflora* M.W. Chase. Kumar& Schut.	-	+	T	June-July
13.	*Habenaria commelinifolia* (Roxb.) Wall. ex Lindl.	+	+	T	August-September
14.	*Habenaria laciniata* Dalzell	-	+	T	June-July
15.	*Habenaria marginata* Colebr	+	+	T	July-August
16.	*Luisia inconspicua* (Hook.f.) King & Pantl.	+	+	E	August-September
17.	*Luisia trichorhiza* (Hook.) Blume	+	+	E	Ferbruary- March
18.	*Luisia zeylanica* Lindl.	+	+	E	March-April
19.	*Oberonia falconeri* Hook.f.	+	+	E	September- October
20.	*Pelatantheria insectifera* (Rchb.f.) Ridl.	+	+	E	June-August
21.	*Rhynchostylis retusa* (L.) Blume.	+	+	E	May-July
22.	*Thunia alba* var. *bracteata* (Roxb.) N. Pearce & P.J. Cribb	+	-	E	August-September
23.	*Vanda tessellata* (Roxb.) Hook. ex G. Don	+	+	E	May-July
24.	*Vanda testacea* (Lindl.) Rchb.f., Gard	+	+	E	Every month in various area
Total = 24 S		20	18	18E, 5T,1E/L	

Abbreviation- 'E'=Epiphytes, 'T'=Terrestrial, 'E/L'=Both Epphytes/Lithophytes, 'Batau.'=Batauli, 'Sita.'=Sitapur

Table 2: Orchid genera and their species of Batauli and Sitapur Blocks, Surguja District, Chhattisgarh, India

S. No.	Name of Genera	Number of species
1	*Acampe* Lindl.	2
2	*Aerides* Lour.	2
3	*Coelogyne* Lindl.	1
4	*Dendrobium* Sw.	5
5	*Eulophia* R.Br. ex Lindl.	2
6	*Habenaria* Willd.	3
7	*Luisia* Gaud.	3
8	*Oberonia* lindl.	1
9	*Pelatantheria* Lindl.	1
10	*Rhynchostylis* Blume	1
11	*Thunia* Rchb. F.	1
12	*Vanda* W. Jones ex R.Br.	2
	Total	24

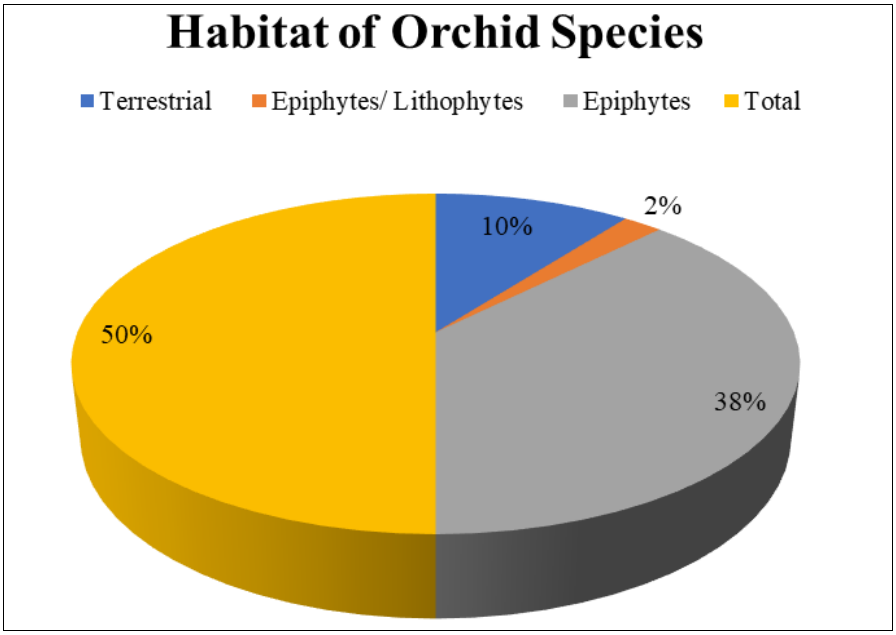


Graphs 1: Orchid genera and their species of Batauli and Sitapur Blocks, Surguja District, Chhattisgarh, India

Table 2: Habitat of Orchid species of Batauli and Sitapur Blocks, Surguja District, Chhattisgarh, India

S. No.	Habitat	Number of Species	Number of Genera
1	Terrestrial	5S	2G
2	Epiphytes/ Lithophytes	1S	1G
3	Epiphytes	18S	9G
	Total	24 S	12G

(Abbreviation: 'S'-Species, 'G'- Genera)



Graph 2: Habitat of Orchid Species of Batauli and Sitapur Blocks, Surguja District, Chhattisgarh, India

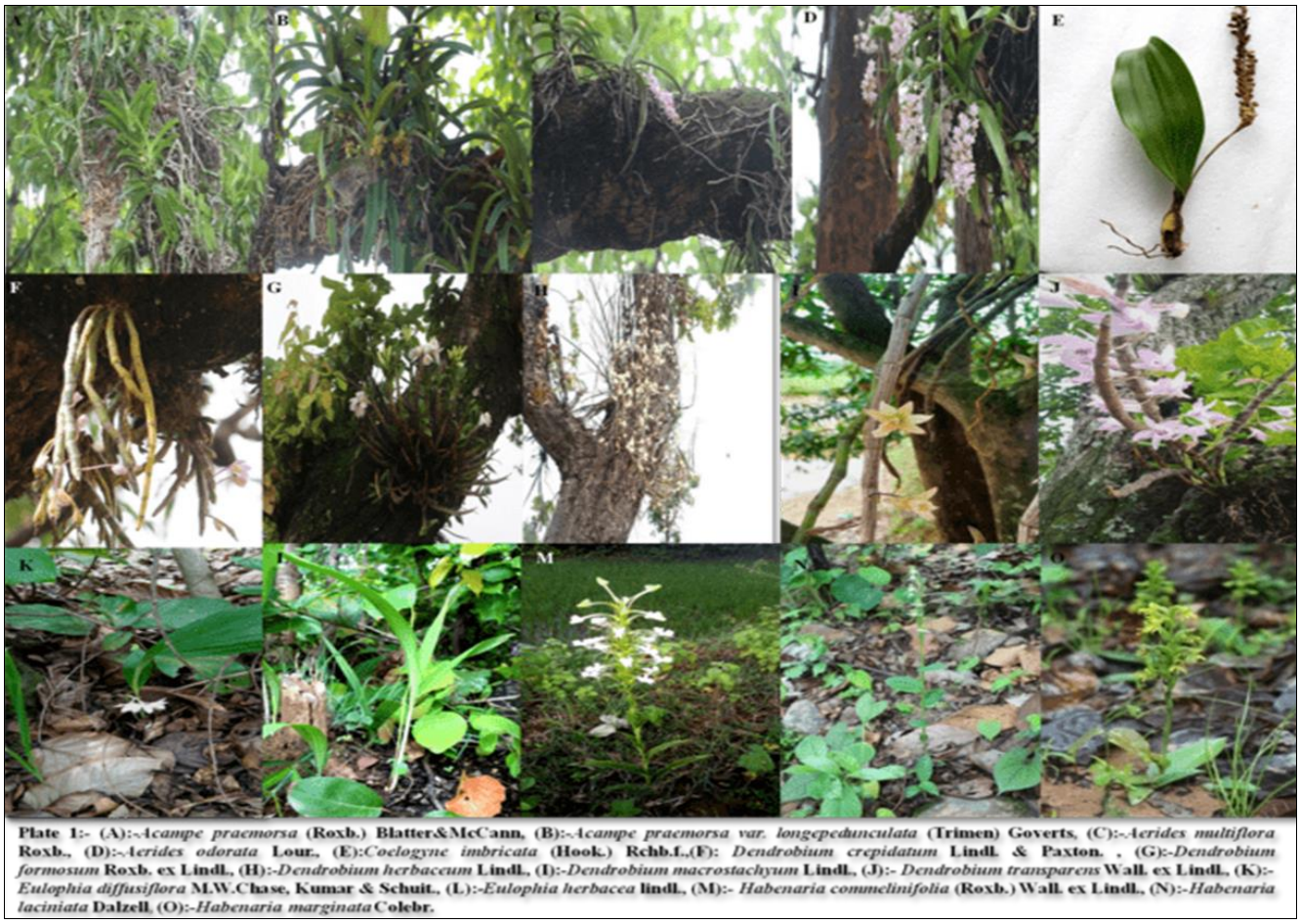


Plate 1:- (A):-*Acampe praemorsa* (Roxb.) Blatter&McCann, (B):-*Acampe praemorsa var. longepedunculata* (Trimen) Goverts, (C):-*Aerides multiflora* Roxb., (D):-*Aerides odorata* Lour., (E):*Coelogyne imbricata* (Hook.) Rchb.f.,(F): *Dendrobium crepidatum* Lindl. & Paxton. , (G):-*Dendrobium formosum* Roxb. ex Lindl., (H):-*Dendrobium herbaceum* Lindl., (I):-*Dendrobium macrostachyum* Lindl., (J):- *Dendrobium transparens* Wall. ex Lindl., (K):-*Eulophia diffusiflora* M.W.Chase, Kumar & Schuit., (L):-*Eulophia herbacea* lindl., (M):- *Habenaria commelinifolia* (Roxb.) Wall. ex Lindl., (N):-*Habenaria laciniata* Dalzell, (O):-*Habenaria marginata* Colebr.

Plate 2: (P):-*Luisia inconspicua* (Hook.f.) King & Pantl., (Q):-*Luisia trichorhiza* (Hook.) Blume, (R):-*Luisia zeylanica* Lindl., (S):- *Oberonia falconeri* Hook.f., (T):- *Pelatantheria insectifera* (Rchb.f.) Ridl., (U):- *Rhynchostylis retusa* (L.) Blume.,(V):- *Thunia alba* var. *bracteata* (Roxb.) N. Pearce & P.J.Cribb, (W&X):-*Vanda tessellata (Roxb.)* Hook. ex G.Don, (Y):-*Vanda testacea* (Lindl.) Rchb.f., Gard.

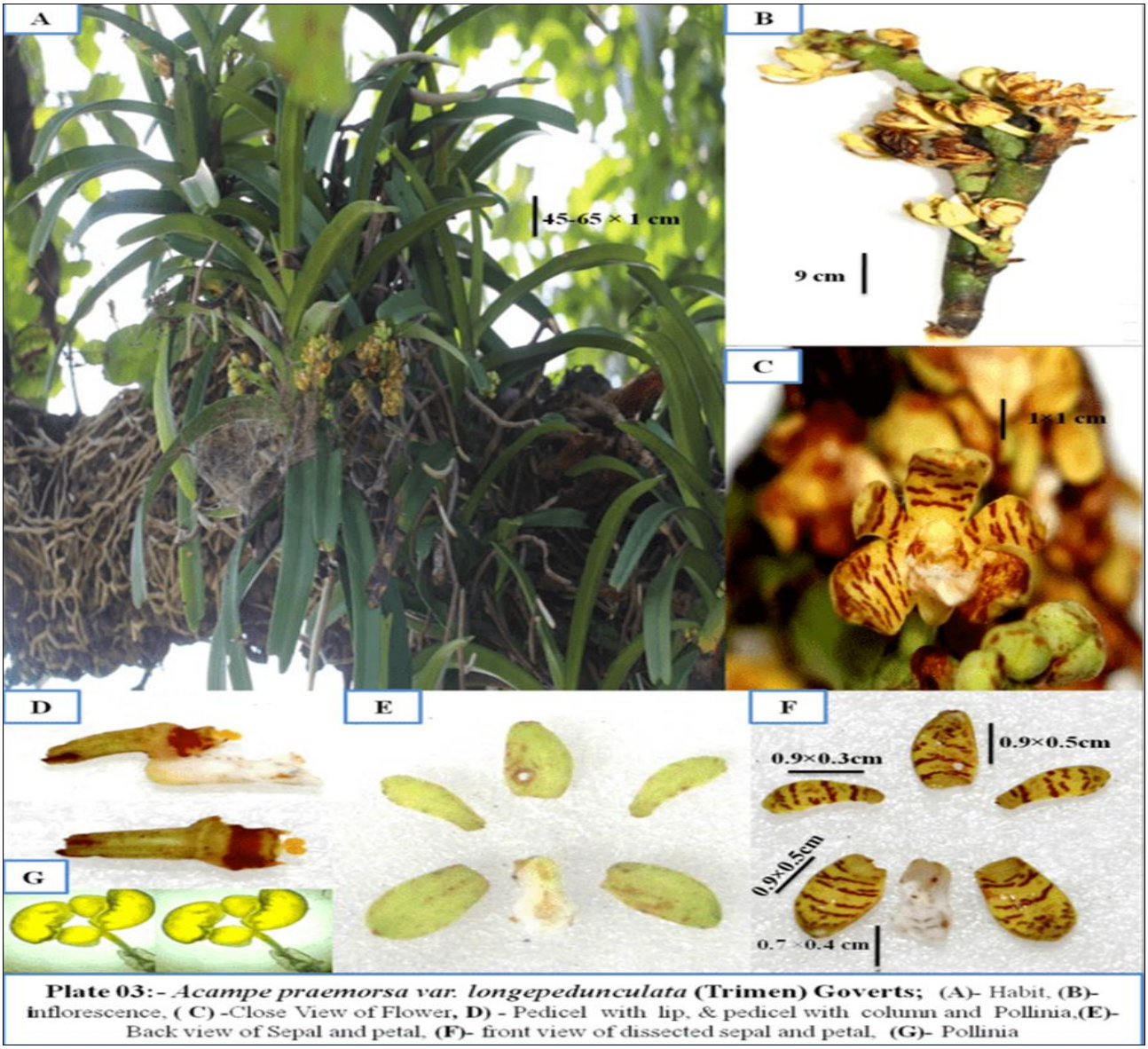


Plate 03:- *Acampe praemorsa var. longepedunculata* (Trimen) Goverts; (A)- Habit, (B)- inflorescence, (C) -Close View of Flower, D) - Pedicel with lip, & pedicel with column and Pollinia,(E)- Back view of Sepal and petal, (F)- front view of dissected sepal and petal, (G)- Pollinia

Acknowledgments

I extend my sincere gratitude to Dr. Devendra Kumar Patel, my supervisor of the Department of Botany, G.G.V. (A Central University) Bilaspur, Chhattisgarh, for constant supervision and valuable suggestions during the present studies. I am also thankful to the authorities of G.G.V. Bilaspur, Chhattisgarh, for facilities and to Mr. Dileshwar Tigga, Mr. Krishna Rajwade, Mr. Ravi Pradhan, and the Forest Department for helping me with the field survey of Batauli and Sitapur block, Surguja, Chhattisgarh.

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