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Orchid species diversity of Ramgarh Hills (PUTA), Udaipur Surguja, Chhattisgarh, India

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Abstract
Ramgarh Hills (Puta) are located on Udaipur Block in the Surguja district of Chhattisgarh. The Ramgarh Hill area's GPS coordinates show Puta's name as the place. Udaipur Ramgarh Hill lies 22^{0}54'55"N to 83^{0}94'80.83''E. Ramgarh Hill is called Ramgiri. The Ramgarh mountain is in the shape of a hat (cap). Ramgarh is the most ancient of the historical places in Surguja. Ramgarh is the centre of Sodha due to Lard Rama and Mahakavi Kalidas. According to ancient belief, Rama's brother Lakshman and his wife Sita resided in the Vanasthan period. Right here, Jogi Mara is due to the tapas of Rama Sita bengarya in the name of Sita and Lakshman cave in the name of Lakshman. The vegetation of Ramgarh Hills is mixed deciduous with a temperature between 25°C - 45°C and an annual rainfall of 120 mm. This is very famous for the oldest temple and caves, which are of historical significance. In the present study, an extensive field survey was carried out in the Ramgarh Hill Puta area (tropical forest) of Udaipur, in the Surguja division. A total number of orchid species belonging to eight genera and 12 species were recorded. The majority of orchids were distributed between the altitude range of 479.87 M to 915 MSL. *Vanda* and *Oberonia* were found to be dominant. *Acampe praemorsa* (Roxb.) Blatt. & McCann., *Pelatantheria insectifera* (Reichb. f.) Ridl, and *Rhynchostylis retusa* (L.) Blume. are the riches in the area of Ramgarh (Puta) Hills, Udaipur Block, Surguja, Chhattisgarh.

Keywords: Ramgarh hill (Puta), historical place, Orchidaceae, distribution, *Acampe praemorsa*, *Pelatantheria insectifera*, *Rhynchostylis retusa*

Introduction
Orchid flowers are one of the most fascinating and gorgeous of all natural flowers and exhibit a wide range of diversity in their form, size, colour, and texture that make them unique among ornamental plants. They are not only attractive for horticultural and commercial value but also important for medicinal value. Orchids are nature's most extravagant group of flowering plants.

Orchids are distributed throughout the world, from the tropics to the alpine. They are concentrated in three areas, notably tropical America, Indo-Malaya, and the Eastern Himalayas. About 73% of species are epiphytes, and these make a significant contribution to the epiphytic plant communities in tropical forests. Orchids are very widely distributed, but their largest diversity occurs in the tropics. Orchid species are not found on a few isolated islands and Antarctica. India's orchids are found from sea level to the snow-covered alpine regions, but their numbers vary in the different areas due to the prevailing climatic conditions. (Jalal J.S. 2012).

Orchidaceae is considered one of the most prominent families of flowering plants and is almost globally distributed, comprising around 30000–35000 species in approximately 750–800 genera present worldwide. In India, it is represented by 1263 taxa in 155 genera (Singh et al. 2019), of which 52 taxa under 21 genera are found in Chhattisgarh. Singh et al. (2019).

Study area
Ramgarh Hills (Puta) of Chhattisgarh lies in Udaipur block, Surguja district of Chhattisgarh, and is well known for its biological diversity. Ramgarh Hills are located 50 km from the Ambikapur headquarters of the Surguja district. It is located on Ambikapur Bilaspur Road. It has a total area of 12 km in the Ramgarh Hill area. GPS coordination shows Puta's name as the place. Ramgarh Hills flanked Udaipur blocks. the altitude range from 479.87 m to 915 MSL. Udaipur lies 22054'55"N to 83094'80.83''E. The vegetation of Ramgarh Hills is mixed deciduous with a temperature between 25 °C - 45 °C and an annual rainfall of 120 mm. Ramgarh Hill is called Ramgiri. The Ramgarh mountain is in the shape of a hat (cap). Ramgarh is the most ancient of the historical places in Surguja. Ramgarh is the centre of Sodha due to Lard Rama and Mahakavi Kalidas. According to ancient belief, Rama's brother Lakshman and his wife Sita resided in the Vanasthan period. Right here, Jogi mara is due to the tapas of Rama Sita bengarya in the name of Sita and Lakshman cave in the name of Lakshman. This is very famous for its historical significance. There are the oldest temples and caves, which are of historical significance.

Field survey
During the survey of orchids in Ramgarh Hill (Puta) and adjoining areas, we came across interesting species of orchids, and upon critical observations of the specimens, they were identified. Review the relevant literature (Verma et al., 1989; Singh N.P. et al., 2001; Kumar A. et al., 2003; Khanna et al., 2005; Kotia et al., 2013; Singh R.N. et al., 2019). Websites of the Plant List (http://www.theplantlist.org.), POWO, were consulted for updating species names. revealed that these species have been reported from the Ramgarh hill area of Udaipur, Surguja, Chhattisgarh, India. The present collection thus forms the first report of orchid species from the Ramgarh hill in Udaipur, Surguja. We are here to provide a description, phenology, and other relevant notes on the species for easy identification. The voucher specimens have been deposited in the form of an herbarium in the Department of Botany, G.G.V. Bilaspur, Chhattisgarh.

Results and discussion

While conducting an orchid survey of the Ramgarh hill (Puta) area in January 2023–December 2023, around 12 species belonging to 8 genera of orchids were recorded from Ramgarh hill (Puta), Udaipur block, Surguja. Orchids are beings to appear from 479.87 m to 915 MSL elevation onwards. Apart from climatic conditions, altitude plays a vital role in the distribution of orchids

Further, *Acampe praemorsa* (Roxb.) Blatt. & McCann, *Rhynchostylis retusa* (L.) Blume, and *Pelatantheria insectifera* (Reichb.f.) Ridl. Orchid species are not reported from the Ramgarh Hill, Udaipur, and Surguja areas of the state. *Aerides multiflora*, *Oberonia falconeri*, *Vanda tessellata*, and *Vanda testacea* orchid species are commonly distributed in the Ramgarh Hills (Puta), Udaipur, and Surguja.

Earlier orchid species were reported in different regions of Surguja, such as Khanna et al., 2001; Khanna et al., 2005, which reported 30 species belonging to 15 genera of orchid flora after 10 years. Tiwari A.P. (2015) reported Papilionathe teres schtr orchid species in Matringa Surguja, while Amit et al. (2017) explored Oberonia richness in Maheshpur, Udaipur region of Surguja. The present study of the Ramgarh Hill (Puta) area of Udaipur, Surguja, reported 12 species belonging to 8 genera of orchid flora.

Species description

***1. Acampe praemorsa* (Roxb.) Blatt. & McCann.**

Epiphytic. Stems are woody, sheathed, 21–30×0.5–1.5 cm, and produce buds in flowering time. They are erect, leaves alternate, 1.8–20×0.9–3.1 cm, distichous, narrowly ooblong, and anunequally bilobed at the apex with a small, fine tip. Inflorescence is condensed, short, and unbranched. 1.8-2.7×0.3-0.4 cm, Flowers clustered, not fully opening, 1×1 cm, 8 in number very fragrant; yellowish-green in colour, bract- 0.2×0.2 cm brownish persistence, sepals 1.0×0.5cm and petals 0.8×0.3 cm, fleshy, succulent, creamy yellow with brown transverse linings or/and spots labellum 0.7×0.1cm across. peduncle 0.6×0.1 cm, capsule subsessile, longitudinally ribbed. cigar shape, 2×0.6cm

Flowering: September-October
Fruiting: October–November, and it takes almost one year to mature.

Ecological notes: species in open patches of *Shorea robusta, Schleichera oleosa,* and along the roadsides. Distribution in Sal mixed forest. A new species is found in these areas. Ramgarh Hill, Surguja.

2. *Aerides odoratum* Lour.

Epiphytic, 25–50 cm high, semi-pendulous. stem thick, woody. Leaves alternate, distichous, spreading, thick, 10–20 cm long, oblong, flat, wavy, keeled, and unequally bilobed at the apex. Inflorescence raceme, extra-axillary, 10–30 cm long, Flowers are white with purple blotches and spots. Spur large, funnel-shaped, curved upwards, tip greenish, yellowish, or reddish. capsule ovoid shortly stalked.

Flowering: June–July.
Fruiting: August onwards and takes almost one year to mature.

Ecological notes: Common in dense Sal forest, it can be seen in the Udaipur range and is commonly associated with the same hosts: *Shorea robusta, Schleichera oleosa, Mangifera indica,* and *Diospyros melanoxylon*.
Distribution in Ramgarh Hill, Udaipur area, Surguja.

3. *Aerides multiflora* Roxb:

Epiphytic, semipenduluous. Stems are 10–25 cm long, with a deep brown leaf base. Leaves are narrowly oblong, conduplicate, 10-15cm long, deeply channelled, obliquely bifid at the apex, and frequently flushed with a reddish tint, especially during the non-flowering condition. Inflorescence axillary, 10–40 cm long, raceme. Flowers pinkish-white or purple with darker blotches; capsules stalked; ovoid.

Flowering: June–July
Fruiting: August onwards, and it takes almost one year to mature.

Ecological notes: common in dense Sal mixed forest, easy to locate in the Udaipur range, and commonly associated with host plants *Shorea robusta, Schleichera oleosa, Maduca latifolia, Mangifera indica, Diospyros melanoxylon*, and *Miliusa tomentosa*. Distribution recorded in the Udaipur range in Udaipur to Ramgarh Hill Way, Surguja District, Chhattisgarh.

4. *Dendrobium macrostachyum Lindl.*

Epiphytic; stem 35–40 cm, erect, unbranched, elongated, fusiform, slightly swollen, greenish or brown pendulous. Leaves 5×0.5 cm alternate, distichous, sessile, linear-lanceolate. Inflorescence condensed racemes. Flowers are 3.0 x 1.2 cm, greenish-white, and odorous. Capsule clavate fusiform, strongly ribbed, tapering at the base into a long pedicel.

Flowering: June–August.
Fruiting: July-October

Ecological notes: A common species of the Sal mixed forest, the plant was recorded at the top of the slope. The host of the species in the region was *Mangifera indica* L., *Diospyros melanoxylon* Roxb., *Terminalia bellirica* (Gaertn.) Roxb., *Madhuca longifolia* (L.) J.F. Macbr., *Terminalia elliptica* Willd., *Terminalia chebula* Retz. Distribution in Ramgarh Hill in the 550 m range in Puta, Udaipur, Surguja.

5. *Dendrobium herbaceum* Lindl.

Epiphytic, stem 35 cm caespitose, erect, branched, elongated, fusiform, slightly swollen, yellowish or dark brown to black, ridged, and furrowed. Leaves 4×0.5 cm alternate, distichous, sessile, linear-lanceolate. Inflorescence condensed racemes. Flowers are 1.0 x 0.8 cm, greenish-white, and odorous. Capsule clavate fusiform, strongly ribbed, tapering at the base into a long pedicel.

Flowering: February–March
Fruiting: April-October

Ecological notes: A common species of the Sal mixed forest, the plant was recorded at the top of the slope. The only host of the species in the region was *Shorea robusta.* Distribution in Ramgarh Hill in the 915m range in Udaipur, Surguja.

6. *Habenaria commelinifolia* (Roxb.) Wall. *Ex* Lindl.
Terrestrial herb, tubers ellipsoid. Leaves alternate, 7–15×2.5–5cm acute, oblong-lanceolate (commelinaceous) with white margins. Inflorescence 30-34 cm long spike, laxly flowered with white flowers bract 3.5×0.3 cm, lanceolate, greenish, acute apex, flower 2.5×0.5 cm, sepal 0.5-1.3×0.3-0.6 cm, petal 0.7×0.4 cm, labellum trifid 1.5cm acute, spur 6 ×0.2 cm curved, capsule 1.5 ×1.4 cm curved.

Flowering: August–September
Fruiting: November–December
***Ecological notes*:** Plants recorded in dense Sal forest floor and humus-rich place of the forest, distribution in Ramgarh hill area of Udaipur, Surguja.

7. *Habenaria marginata* Colebr.
Terrestrial herb, Tubers are small and cylindrical, 3.51 cm sometimes elongated. Stem reduced. Leaves are subradical, sessile, oblong, or linear-oblong, 3–12×3–3.5 cm long, and the margins are pale-yellow. Inflorescence spikes densely flowered. 18 cm bract, 2×0.3cm lanceolate acute, Flowers range from greenish-yellow to orange. 1×1cm, sepal 0.5 cm oblong, obovate, dorsal sepal hood curved, petal 0.8 cm, labellum trifid, yellow, filiform, capsule 1.2×0.2 cm oblong curved ribbed.

Flowering: July-August
Fruiting: August to October
***Ecological notes*:** Sal mixed forest of Ramgarh hill area of Udaipur, Surguja.

8.*Oberonia falconeri* Hook. f.
Epiphytic. Leaves are 2–9 cm long, thick, slightly curved, broadly ensiform, acute, or acuminate. Inflorescence 7-8 cm terminal, equal to or longer than the leaves; the laxly many-flowered peduncle was strongly grooved. Flowers greenish-yellow, shortly peduncle small, spiral. Capsule 0.2×0.1 cm ovate, ribbed.

Flowering: September–October
***Fruiting*:** October through the whole year.
Ecological notes: common in Sal forest, Sal mixed forest, dense canopy cover; distributed in both forest ranges, Ramgarh hill area, Udaipur, Surguja.

9. *Pelatantheria insectifera* (Reichb. f.) Ridl**:**
Epiphytic, up to 60 cm in length. Roots, thin and vermiform, may arise from anywhere on the internode. Leaves are many, 3.5×2 cm, alternate, shallow channelled, oblong, and unequally bilobed at the apex. Inflorescence raceme, 2×0.5cm subsessile, shorter than the leaves, usually 3 to 5-flowered, decurved, and appearing from an old place on the stem. Flowers are small, attractive, and well spread. Bract minute, deciduous. Capsule oblong clavate, stout, four-angled; pedicel short and stout.

Flowering: June-July
Fruiting: July-October
Ecological notes: Plants are not common; some plants were seen in the dense Sal forest of the Ramgarh Hill Road area. These species were not recorded in previous Arthur in the Surguja region of Chhattisgarh. The new report is in these areas.

10. ***Rhynchostylis retusa* (L.) Blume.**
Epiphytic, pendulous. Stems are 10–20 cm long, woody, and covered with persistent sheathing bases of fallen leaves. Leaves are dense, 15 cm long, linear, and deeply channeled. Inflorescence raceme, longer than the leaves, axillary, drooping, densely many flowered. Flowers are fragrant, white or pink, with purple or pink markings, and dense. capsules were oblong and winged.

Flowering: May–June.
Fruiting: July–October.
Ecological notes: found in moist areas with a good amount of sunlight. Udaipur to Ramgarh Hill is a distribution location. A new report on these areas.

11.*Vanda tessellata* (Roxb.) Hook, *ex* G. Don:
Epiphytic. Stem 40–60×1.5 cm. woody, Leaves are several, distichous, linear, keeled, auriculate at the base, unequally bilobed at the apex, 10–20 x 1-3 cm. inflorescence 20–26 cm, 3 to 10-flowered axillary raceme, longer than the leaves, zig-zag. Flowers are yellowish-green with a blue tinge, scented, and 3.5–1.6 cm across. Sepal 2.5×1.2 cm, oblong, wavy dark brownish colour with the net-like patches, petal 3×2 cm sepal-like in colour and patches, spur 0.8×0.4 cm across, capsule 10×2 cm oblong, ribbed.

Flowering: March–May and November–December
Fruiting: June onwards and takes almost one year to mature; other species are January onwards and take almost one year to mature.

Ecological notes: One of the most common orchids in the study area has a large number of host trees and is found growing in almost all forest types. Udaipur to Ramgarh Hill area is the main spot of occurrence.

12. *Vanda testacea* (Lindl.) Reichb. f.
Epiphytic. Stems are thick, 10–20 cm. Leaves are leathery, 7–10 x 1–1.3 cm. Inflorescence raceme, axillary, erect, as long as the leaves or longer. Flowers are yellow, long-pediceled, and 1.5 cm across. Sepal 1.5×0.5 cm, oblong curved, yellow, petal 1.5×0.5 spur small labellum. creamy white Capsule 3.5×1.5 cm oblong ribbed.

Flowering: April–May
***Fruiting*:** June onwards, and it takes almost one year to mature.

Ecological notes: Reported as common in open Sal mixed forest areas where plants grow
in high numbers. Distributed on Ramgarh Hill. Surguja District, Chhattisgarh.

Flowering phenology

According to the flowering season of orchids in Ramgarh Hill, Sarguja has been considered into three phenological groups. These orchids start flowering during the onset of the pre-, monsoon, and post-monsoon seasons; those classified as pre-monsoon orchids are *Vanda tesellata, Vanda tessetea,* and *Rhynchostylis retusa; Aerides odorous; Aerides multiflora; Habenaria commeliniferia; Habenaria marginata; Pelatantheria insectifera* under the monsoon group*; Acampe praemorsa;* and *Dendrobium herbeceum* blooms to post-monsoon season.

Host preferences of the epiphytic species

Vanda tessellata had the maximum number of host tree species, whereas other species were found on one or more host trees, namely, *Mangifera indica, Artocarpus heterophyllus, Syzygium cumini, Shorea robusta, Ficus benghalensis, Dillenia indica, Careya arborea, and Caesalpinia pulcherrima. Dendrobium herbecium* is associated in these areas with a *Shorea robusta C.F. Gaertn. tree,* and other species such as *Acampe, Aerides, Oberonia, Rhynchostylis,* and *Vanda* species mostly prefer *Madhuca latifolia, Mangifera indica, Terminalia chebula, and Shorea robusta* C.F. Gaertn.

Table 1: List of the orchid species found of Ramgarh Hill (Puta), Udaipur, Surguja, Chhattisgarh.

S.No.	Botanical name	Habitat	GPS coordination	Phenology
1.	*Acampe praemorsa* (Roxb.) Blatter &McCann.	Epiphytic	$22^0$80¨42.75''N- $82^0$91'19.46''E, PUTA	Oct-Nov
2.	*Aerides odorata* lour.	Epiphytic	$22^0$87'95.1166"N -$82^0$94'80.86668" E, PUTA	June –July
3.	*Aerides multifloa* Roxb.	Epiphytic	$22^0$87'95.1166"N -$82^0$94'80.86668" E, PUTA	June –July
4.	*Dendrobium herbaceum* Lindl.	Epiphytic	$22^0$53'53.35494"N -$82^0$55'46.34376"E, PUTA	Feb-March
5.	*Dendrobium macrostachyum* Lindl.	Epiphytic	$22^0$53'32.28846"N -$82^0$54'27.48665"E, PUTA	June –July
6.	*Habenaria marginata* colebr.	Terrestrial	$22^0$53'21.75216"N -$82^0$56'41.42774"E, PUTA	August-September
7.	*Habenaria commelinifolia* (Roxb.) Wallich ex Lindl.	Terrestrial	$22^0$53'53.14506"N -$82^0$94'80.86668" E, PUTA	July-August
8.	*Oberonia falconeri* Hook.f.	Epiphytic	$22^0$87'95.3335"N -$82^0$94'80.8333"E, PUTA	July–August
9.	*Pelatantheria insectifera* (Reichb.f.) Ridl.	Epiphytic	$22^0$53'22.78013"N -$82^0$56'2.87131"E, PUTA	August-September
10	*Rhynchostylis retusa* (L.) Blume.	Epiphytic	$22^0$53'21.75644"N-$82^0$56'41.42774"E, PUTA	May-July
11.	*Vanda testacea* (Lindl.) Reichb.f.	Epiphytic	$22^0$87'95.1166"N -$82^0$94'80.86668" E,PUTA	April –May
12.	*Vanda tessellata* (Roxb.) Hook. ex G. Don.	Epiphytic	$22^0$88;09.59998"N -$82^0$94'80.86668" E, PUTA	April - May /Sept-Oct/Nov- Dec.

Table 2: Different altitude and Host range of Epiphytic orchid species of Ramgarh Hill, (Puta), Udaipur, Surguja, Chhattisgarh.

S.N.	Species	Habitat	Host plant / phorophytes	Altitude
1.	*Acampe praemorsa* (Roxb.) Blatter&McCann.	Epiphytic	*Shorea robusta* C.F.Gaertn, *Soymida febrifuga* (Roxb.) A.Juss., *Diospyros melanoxylon* Roxb., *Adina cordifolia* (Roxb.) Brandis	680.8M-728.9M
2.	*Aerides odorata* lour.	Epiphytic	*Syzygium cumini* (L.) Skeels, *Shorea robusta* C.F.Gaertn.	578 M
3.	*Aerides multifloa* Roxb.	Epiphytic	*Mangifera indica* L., *Diospyros melanoxylon* Roxb., *Terminalia bellirica* (Gaertn.) Roxb., *Madhuca longifolia* (L.) J.F.Macbr., *Terminalia elliptica* Willd.	530 M
4.	*Dendrobium herbaceum* Lindl.	Epiphytic	*Shorea robusta* C.F.Gaertn.	915 M
5.	*Dendrobium macrostachyum* Lindl.	Epiphytic	*Mangifera indica* L., *Diospyros melanoxylon* Roxb., *Terminalia bellirica* (Gaertn.) Roxb., *Madhuca longifolia* (L.) J.F.Macbr., *Terminalia elliptica* Willd., *Terminalia chebula* Retz.	545-700 M
6.	*Oberonia falconeri* Hook.f.	Epiphytic	*Mangifera indica* L., *Diospyros melanoxylon* Roxb., *Madhuca longifolia* (L.) J.F.Macbr., *Syzygium cumini* (L.) Skeels,, *Shorea robusta* C.F.Gaertn	530.7 M-557.1 M
7.	*Pelatantheria insectifera* (Reichb.f.) sRidl.	Epiphytic	*Shorea robusta* C.F.Gaertn. *Madhuca longifolia* (L.) J.F.Macbr., *Syzygium cumini* (L.) Skeels	545 M
8.	*Rhynchostylis retusa* (L.) Blume.	Epiphytic	*Ficus religiosa* L., *Mangifera indica* L., *Diospyros melanoxylon* Roxb., *Madhuca longifolia* (L.) J.F.Macbr., *Syzygium cumini* (L.) Skeels, *Shorea robusta* C.F.Gaertn.	534.4 M
9.	*Vanda testacea* (Lindl.) Reichb.f.	Epiphytic	*Diospyros melanoxylon* Roxb., *Ficus religiosa* L., *Mangifera Indica, Madhuca longifolia* (L.) J.F.Macbr., *Syzygium cumini* (L.) Skeels, *Shorea robusta* C.F.Gaertn.	530-915M
10	*Vanda tessellata* (Roxb.) Hook. ex G.Don.	Epiphytic	*Schleichera oleosa* (Lour.) Oken, *Diospyros melanoxylon* Roxb., *Terminalia bellirica* (Gaertn.) Roxb., *Schleichera oleosa* (Lour.) Oken, *Ficus religiosa* L., *Syzygium cumini* (L.) Skeels, *Terminalia chebula* Retz.	530- 896 M

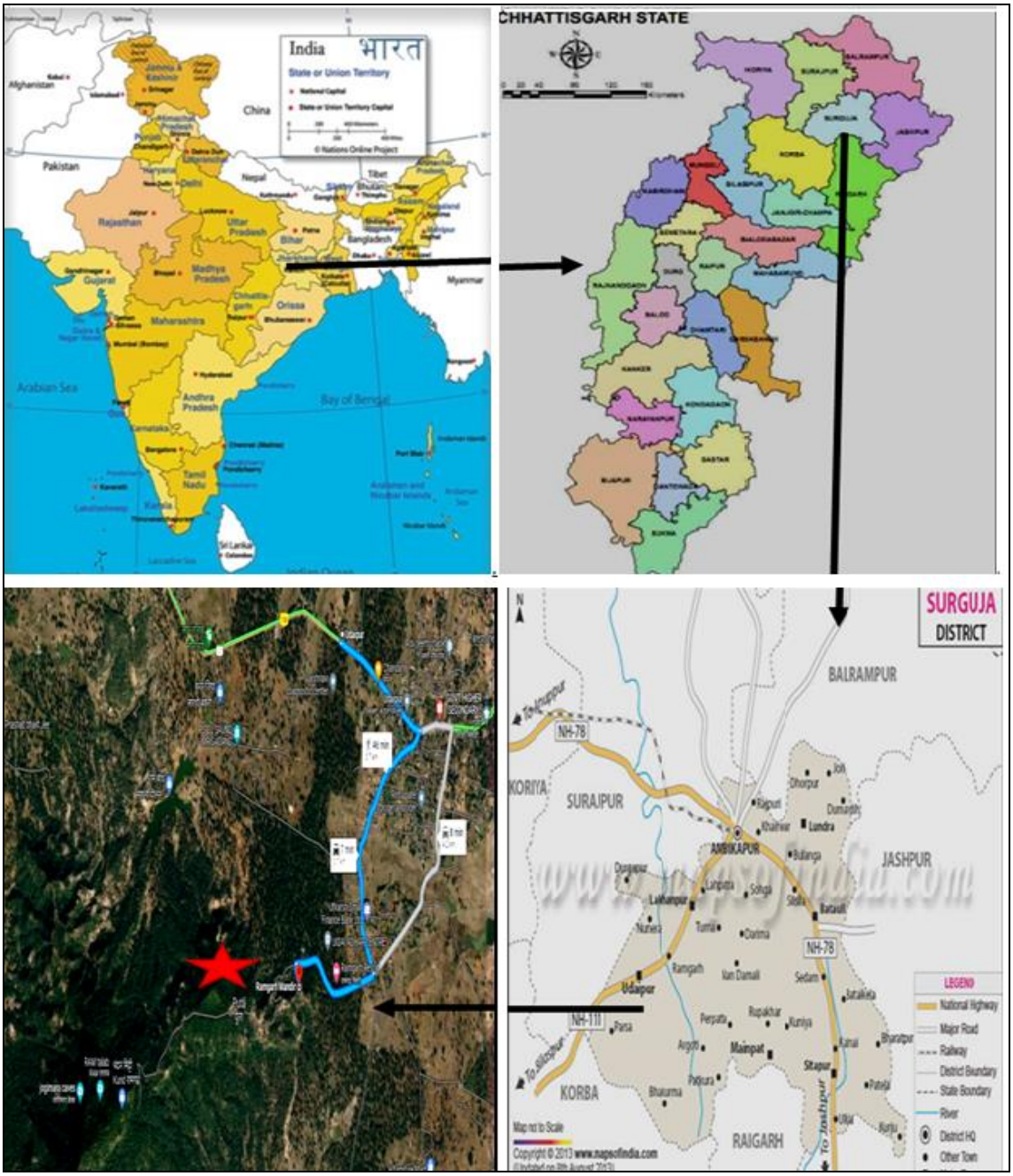

Fig 1: Maps of the study Area (Star Mark Show Ramgarh Hill (Puta)

Fig 2

Palate 1: (A)- Acampe praemorsa (Roxb.) Blatter & McCann., (B)- Aerides odorata lour., (C) Aerides multiflora Roxb., (D) - Dendrobium macrostachyum Lindl., (E)- Dendrobium herbaceum Lindl., (F)- Habenaria commelinifolia (Roxb.) Wallich ex Lindl., (G)-Habenaria marginata colebr., (H) - Oberonia falconeri Hook.f., (I)- Pelatantheria insectifera (Reichb.f.) Ridl., (J)- Rhynchostylis retusa (L.) Blume., (K) Vanda tessellata (Roxb.) Hook. ex G.Don., (L)- Vanda testacea (Lindl.) Reichb.f.. (Puta).

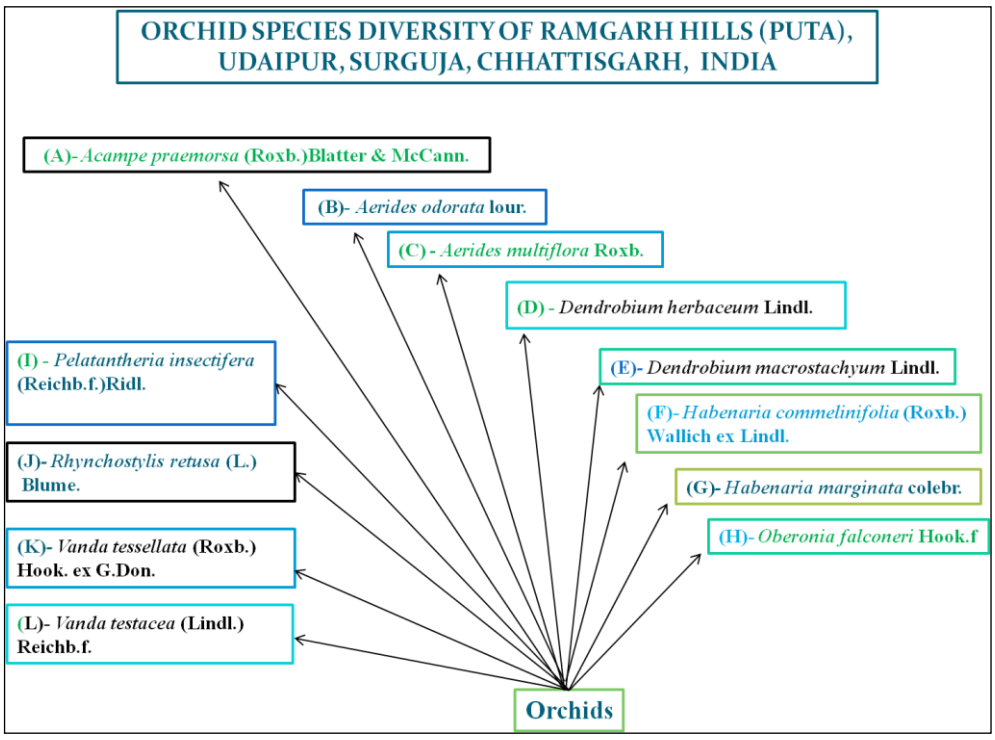

Fig 3

Conclusion

Although the Ramgarh Hills (Puta) of Udaipur, Surguja, are not so rich in orchid species populations, they provide a platform to grow diverse floral and faunal wealth. Orchids are the unexplored floral wealth of Udaipur Block, Surguja Chhattisgarh. Therefore, the present study highlights the diversity of orchids and needs more exploration work towards their documentation and conservation.

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