



# JOURNAL OF BIODIVERSITY AND CONSERVATION

## Carnivorous plants of Jamtara Forest Division, Jharkhand, India

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### ARTICLE INFO

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#### Article History

Received: 5 June 2023

Received in revised form: 20 July 2023

Accepted: 21 July 2023

Keywords: Carnivorous plants. *Utricularia*, *Drosera*,  
Jamtara

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### Abstract

*Carnivorous plants are available almost everywhere. They frequently use a variety of lures, such as vivid colours, delicious secretions, and other curiosities, to entice unwary prey. These herbs are also used medicinally and traditionally to treat a variety of illnesses. The goal of the present study is to catalogue the carnivorous plants found in Jamtara Forest Division (JFD), Jharkhand, India. To enumerate the carnivorous plants available in JFD, a field investigation and literature review were conducted in May 2023. Six carnivorous plants belonging to two families were enumerated by the authors during their fieldwork throughout the division's four ranges. The conservation and effective use of it are highlighted in this paper.*

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### INTRODUCTION

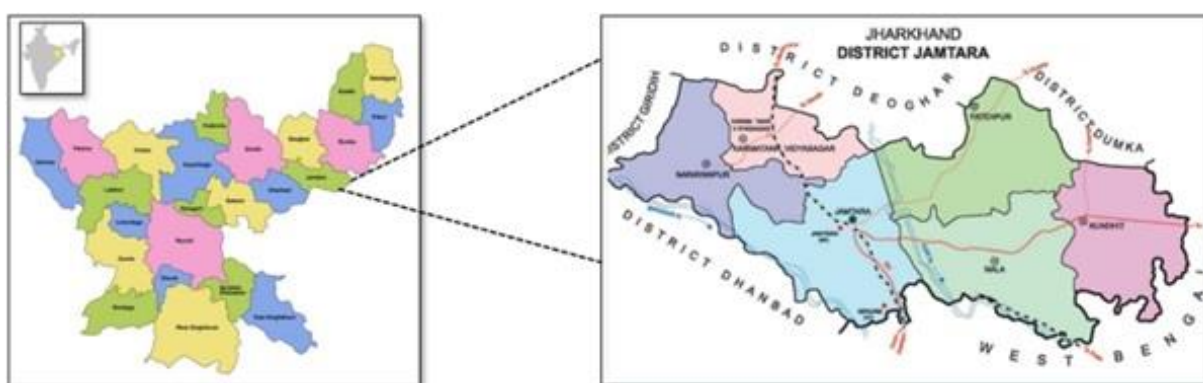
Given that their adaptations are characterised by unfavourable ecological conditions, carnivorous plants have been used as a model to illustrate how ecological factors and

evolution interact. In conditions where many plants would never thrive, such as acid bogs, alkaline pine barrens, cold streams of melting snow, and humid tropical rainforests, they are frequently found (Mulligan 2021). According to Mishra and Kumar (2021a), these plants obtain nutrition by capturing and devouring their prey, such as insects, mosquito larvae, tadpoles, protozoa, rotifers, water fleas, nematodes, small fish, etc. As a result, these relationships with animals serve as food guardians, butlers, kleptoparasites, rivals for prey, digestive symbionts, providers of nutrition through excreta, or even prey mutualists (Givnish et al. 2018). The existence of snap, bladder, or catapult tentacle traps allows carnivorous plants to hunt successfully. The plants can chase even highly mobile insects because to their advanced capturing organs. The mechanical and electrical sensors are both functioning, which causes the trap to close quickly. Within a few seconds of the prey touching the sensor, viscoelastic energy held in the open trap state is released (Mishra and Kumar 2019). A different method of getting extra nutrients including nitrogen, phosphate, and potassium is by capturing and digesting animals using specific traps. All carnivorous plants are mixotrophic since they can still fix carbon dioxide and receive inorganic and organic resources from trapped prey (Mithofer 2022). Therefore, even once light is no longer a limiting factor, carnivory may still play a key role in preventing competitive displacement by non-carnivorous plants. Due to their smaller root systems than non-carnivorous plants or because of the lower soil nutrient uptake by roots as a result of being denied prey, carnivorous plants under no-shade situations may be at a competitive disadvantage (Abbott 2017). A vast variety of plants, including sundews, pitcher plants, butterworts, bladderworts, and venus flytraps, are classified as insectivorous plants. The over 150 species of insects, arachnids, primarily spiders and mites, molluscs like snails and slugs, occasionally earthworms, and tiny vertebrates like small fish, amphibians, reptiles, rodents, and birds are also among the victims of these plants. According to reports, a rat was the largest victim to yet (Mishra and Kumar 2020). More than 800 distinct species of meat-eating plants, including both monocotyledons and dicotyledons, representing 20 genera in 12 families and more than 10 distinct evolutionary lineages have been identified by botanists. The largest carnivorous plant family encompasses about 300 species (genus *Utricularia* has about 275 species) distributed throughout the world's tropical regions (Ellison and Adamec 2018; Mishra and Kumar 2021b). They are also used in a variety of traditional medicines. In Asia, the fluid from young, unopened monkey pitchers (*Nepenthes*) is used to alleviate incontinence, distress, and pain as well as to drink and heal wounds. Their pitchers are used as pans to boil rice, and their lianas (woody vines) can be utilised as ropes. *Drosera's* roots, flowers, and fruits have

been used to treat conditions such as diabetes, bronchial asthma, neurological disorders, arthritis, and more. Species of *Pinguicula* are used to cause milk to curdle for yoghurt or cheese. Some cold sore treatments contain *Sarracenia* extract, which is said to be beneficial against viral infections. Traditional uses of *Utricularia* species include treating kidney stones, urinary tract infections, wounds, and malaria (Raju and Christina 2013; Kumar et al. 2018; Mishra and Kumar 2021a). Two of the biggest risks to the conservation of carnivorous plants are habitat degradation and excessive collection. In order to better understand the variety and ecology of carnivorous plants in Jamtara Forest Division, Jharkhand, India, the present survey was carried out there and results are presented here.

### METHODOLOGY

Jamtara Forest Division (JFD) is located in Jamtara district, which is in the eastern part of the state Jharkhand. The average elevation of Jamtara, which is located at 23.95°N 86.8°E, is 155 metres. The division's total geographic area is 1786.43 sq km, of which 78.78 sq km are designated as forest areas. The division is organised administratively into four ranges: Jamtara, Nala, Kundahit, and Narayanpur. The division is covered in a variety of plants, including Sal Forest and Dry Deciduous Forest. From East and North-East to West and South-West are the hill ranges. JFD is home to several tribal communities, including Santhal, Pahadia, Oran, and others. The region has a climate that is extreme; the average temperature ranges from 17°C to 32°C. In the winter, the temperature drops to 2°C, while in the months of April and May, it soars to 45°C. Although the monsoon season begins in July and lasts until October, pre-monsoon showers begin in the middle of June every year.



**Figure 1: Geographical location of study area**

The Jamtara and Kundahit Ranges of the Division receive slightly more rainfall on average each year than the surrounding areas (Figure 1). In the month of May 2023, field surveys were carried out in the division's four ranges in varied ecological settings, including marshy

areas, wetland areas, and areas near streams and nalas. The identification of the existing carnivorous plants was done by a review of the literature, using information from the book "Botany of Bihar and Orissa" (Haines 1921–1925), morphological characteristics, and close comparison with other species that are similar. The GPS location is used to gather all carnivorous plants. The available carnivorous plants were listed according to their morphology.

## RESULTS AND DISCUSSION

From the field survey authors found 6 carnivorous plants (*Drosera burmanni*, *D.indica*, *Utricularia aurea*, *U. polygaloides*, *U. caerulea*, and *U. bifida*) from different ranges of Jamtara Forest Division belonging to 2 families (Droseraceae and Lentibulariaceae). Among these all the plants are terrestrial except *U. aurea* i.e., submerged free floating herb (Plate 1). Details are explained below:

### *Drosera burmanni* Vahl. (Plate 1A)

*Common name:* Tropical sundew

*Family:* Droseraceae

*Morphology:* It is a small, compact, acaulescent annual or biannual herb. These species are ranges between less than 1 cm to about 3 cm in and may be golden green, dark green, green with red tentacles or all red. Leaves are obovate, prostrate, densely covered with glandular hairs, greenish pink. This blunt ended spatulate leaves tend to have an overall maroon coloration with long tentacles. Petiole absent. Short stems with few fibrous roots. Stipules 3-7 mm long, this species shows scapiform inflorescence, erect, 5-20 cm long. Flowers few in erect racemes. The flower stalks tend to be greater than 10 cm long and bend at the apex. This species is described as having white flowers but at some location it has pink flowers. Pedicle erect. sepals 5, united at base, elliptic, oblong to broadly lanceolate. Petals obovate to oblong-lanceolate. Pinkish to Whitish. Stamens 5. Ovary ovoid, superior, 3 chambered, 2 ovules in each locule, style apically lobed, placentas 5 or 6, styles 5 or 6, filiform, 2-3 mm long, incurved, stigma tooth like. Capsules ovoid, 5-6 valved. Seeds numerous, dark brown to black. It lives for few months during the warm rainy season, seeds prolifically, then dies off when the soil dries out, returning from seeds when the rains return (Plate 1A).

*GPS location:* 24° 0' 1"N 86° 52' 20"E

*Uses:* Used against cough and asthma.

***Drosera Indica* L.**

*Common name:* Indian sundew

*Family:* Droseraceae

*Morphology:* It is an unbranched annual herb, supported by a fibrous root system, 5-50 cm long. This plant produces a scrambling stem several inches in length. Leaves cauline, narrowly linear, alternate, sparse up to 10 cm, lower leaves recurved, upper leaves erect, young plants stand upright, while older one form scrambling stems with only the newest growth exhibiting an upright habit, petioles 5-10 mm, glabrous, stipules absent or reduced and hair like. Leaves are opposite, raceme 1-30 flowered, peduncle up to 12 cm long, bracts linear, 6-8 mm long. Flowers are white or pink purple, usually over 1.5 cm across, 3-15 on axillary, terminal. Calyx segments oblong-ovate, sub obtuse, entire, glandular-pubescent. Petals 5 narrow, obtuse, pink, orange, reddish violet or white in colour, sepals 5, united near base, lanceolate to narrowly oblong, glandular. Styles 3, capsule broadly oblong. Stamen 5. Ovary obovate or subglobose. Seeds minute, ovoid, reticulate.

*GPS location:* 24° 0' 1" N 86° 52' 20" E

*Uses:* Used against nervous system disorders, and asthma.

***Utricularia aurea* Lour. (Plate 1B)**

*Common name:* Golden bladderwort

*Family:* Lentibulariaceae

*Morphology:* It is a submerged floating herb, rhizoids usually present at the base of the inflorescence stalk, either short or linear or elongated, bearing leaf like branches. Leaves are numerous, filiform, or somewhat inflated segment, the ultimate segments capillary, usually with some bristles; stipule-like auricles usually present at the base of the primary segments. Bladder dimorphic, mostly lateral on the secondary or tertiary leaf segments, obliquely ovoid. Inflorescence stalk erect, emergent, terete, glabrous. Scales absent. Bracts basifixed, broadly ovate to circular, apex rounded. Flowers 5-12; the axis initially short, becoming elongated in fruit; pedicels dorsoventrally compressed. Sepals sub equal, ovate, apex rounded. Petals pale yellow with reddish-brown veins, glabrous to densely pubescent; adaxial lip broadly ovate, apex rounded, apex rounded; abaxial lip limb transversely elliptical, the base with a prominent, apex rounded and emarginated. Filaments curved. Capsule globose. Seeds

numerous, very narrowly winged in all angles, lens- or prism-shaped and brownish yellow in colour (Plate 1B).

*GPS location:* 23° 50' 49" N 87° 5' 40" E

*Uses:* Whole plant is used in treating malaria.

***Utricularia polygaloides* Edgew.**

*Common name:* Milkwort bladderwort

*Family:* Lentibulariaceae

*Morphology:* It is an herb, rhizoids up to 3 cm long, glandular, branches 1-3 mm long; stolons up to 2 cm long, glandular, sparsely branched. Foliar organs linear, solitary at scape base and scattered on stolons, 1-nerved, acute to obtuse at apex. Traps up to 1 mm across, globose; stalk distally thickened, glandular hairy; mouth basal; appendages 2, simple, subulate, hairy. Racemes up to 26 cm long, tapering at base, terete, glabrous, up to 12 flowered; scales basifixed, ovate to lanceolate, 1, 3- or 5-nerved, acute to obtuse at apex; bracts basifixed, broadly ovate, 3 or 5-nerved, acute to acuminate at apex. Flowers up to 9 mm long. Calyx-lobes ovate to lanceolate; upper lobe acute to acuminate at apex; lower lobe bi- or tridentate or rarely acuminate at apex. Corolla violet with white streaks; upper lip oblong or obovate, obtuse at apex; lower lip obovate, hairy in throat, raised and gibbous at base, rounded or emarginate at apex; spur equal to calyx-lobe in length, conical, pointing downwards, acute at apex. Filaments strap-shaped, 1-nerved; anther thecae distinct. Ovary ovoid, compressed, slightly curved; style distinct; stigma blipped, upper lip reduced or 3-denticulate, or distinct and oblong, lower lip semi-orbicular and recurved. Capsules ovoid, compressed, dehisce by marginally thickened vertical slits on both sides; seeds ellipsoid.

*GPS location:* 24° 0' 1" N 86° 52' 20" E

*Uses:* Whole plant is used in treating inflammation.

***Utricularia caerulea* L.**

*Common name:* Blue bladderwort

*Family:* Lentibulariaceae

*Morphology:* It is an annual, marshy terrestrial herb. Rhizoids arising from the base of the inflorescence stalk, numerous, capillary, glandular, rarely branched up to 3 cm long, Stolons sparsely glandular. Leaves spatulate, rounded to obtuse at apex petiolate, 1- nerved, 1- 6 per

stolons. Traps ovoid, dimorphic, short- stalked on vegetative organs, beaked, oblique at mouth, glandular. Larger ones 1-2 mm long. Smaller one 0.2 -0.4mm long. Racemes simple or rarely branched, terete or flattened, glabrous. Inflorescence stalk erect, flowers clustered at apex, 4 or 5-flowered. Bracts elliptic to rhomboid. Bracteoles linear, papillose. Flowers 4 - 6 mm long. Pedicels erect, papillose, often recurved in fruit. Calyx lobes subequal, upper lobe broadly ovate to orbicular, apex rounded; lower sepal broader. Corolla purple, pink, blue or violet. Ovary ovoid, attached to upper calyx-lobe at base, style distinct; stigma lower lip orbicular, semiorbicular, hairy; upper lip filiform, glabrous. Capsule sub-globose to obliquely ovoid, papillose, Capsules globose dehisce vertically by a ventral slit. Seeds ovoid, ellipsoid to obovoid.

*GPS location:* 23° 50' 40" N 87° 5' 28' E

*Uses:* Whole plant paste is used in treating cuts and wounds.

### ***Utricularia bifida* L.**

*Common name:* Bladderwort

*Family:* Lentibulariaceae

*Morphology:* It is a terrestrial herb. Rhizoids filiform; stolons branched, filiform. Foliar organs narrowly linear, obtuse at apex, 1-nerved. Traps numerous, reniform, stalked; appendages 2, subulate. Racemes erect, solitary, 1-5-flowered; scales ovate, basifixed, acute at apex; bracts ovate to linear-lanceolate, basifixed, acute at apex; bracteoles subulate, shorter than the bract. Flowers 4-8 mm long; pedicels broadly winged, erect in anthesis, recurved in fruit. Calyx-lobes 2, subequal, broadly ovate, apex obtuse. Corolla yellow; upper lip linear-oblong, rounded at apex; lower lip orbicular to obovate, rounded at apex; spur subulate, about as long as the limb. Filaments straight. Ovary ovoid; stigma 2-lipped. Capsules ovoid, slightly compressed. Seeds ovoid.

*GPS location:* 24° 0' 1" N 86° 52' 20" E

*Uses:* Whole plant is used in treating urinary problems.

After a literature survey, it was found that very few reports are available online on carnivorous plants in Jharkhand state. It might be due to a lack of exploration work and a lack of idea about their habitat, and somehow the uses are going to go extinct among the indigenous communities of the state. It was found that Bakshi et al. (2017) recorded *D.*



*burmanni* from Palamau Tiger Reserve, Jharkhand state. The present exploration work highlights the carnivorous plant wealth of the state of Jharkhand.



**Plate 1: Some carnivorous plants of Jamtara Forest Division: A) *D. burmanni*, B) *U. aurea***

### CONCLUSION

Botanists have been interested in carnivorous plants for many years, but there is still a lot that is unknown about them. Different plant families experienced independent development of carnivory. They also demonstrate how specialized plants may become as a result of their adaptations to various niches in terms of trap design, digestive system, and pollination. Carnivorous plants have long held a fascination despite having little economic significance and being among the most widely grown plants. Today, carnivorous species, specifically *Utricularia* species, can be utilized as plant indicators to assess the level of eutrophication in surface waters. Government and non-governmental organizations should also raise awareness by teaching the local populations the value of conservation this distinctive flora. In this aspect, present study in Jamtara Forest Division, Jharkhand concludes that there is a need of more exploration works in Jharkhand state and the enumerated species in present study should be used for educational purposes, conservation works of their habitat and diversity.



## ACKNOWLEDGEMENT

Authors are thankful to the PCCF & Head of Forest Force and the PCCF (WL) & Chief Wildlife Warden, Department of Forest, Environment & Climate Change, Government of Jharkhand, Jharkhand. Authors are also thankful to the field staff and local communities of Jamtara Forest Division, Jamtara, Jharkhand.

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