

Original Research Article

Ecology and Distribution Pattern of Insectivorous plant in Sanjay Dubri Tiger Reserve Sidhi (M.P.)

Abstract-

Some angiosperm flowering plants of the plant kingdom obtain essential nutrients for themselves by feeding on small arthropods similar to animals; they are called insectivorous or carnivorous plants. These are often found in such places where the soil is acidic, moist land/swamp and lacking nutrients. The presence of several species of insectivorous plants such as *Drosera* L., ~~*aldrovanda*~~ *Aldrovanda* L., *Nipenthes* L., *Utricularia* L., and *Pinguicula* L., etc. has been reported ~~in~~ ~~from~~ different sites in India. *Drosera* *Burmanni*, *Drosera indica* and *Utricularia aurea* have also been reported in Sanjay Dubri Tiger Reserve Sidhi, madhya Pradesh. The availability of insectivorous plants will prove helpful in the study of soil diversity, geographical structure, climatic environmental conditions, and etc. ~~The presence~~ ~~the availability~~ of the specific plants species to create the special characteristics of the area as well as raise the question in mind to observe ~~d~~ the association of specific types of insect species and some associated plant species linkage ~~who~~ ~~that~~ are available here.

Key Words: -Insectivorous plant, Angiosperm, nutrients, environmental conditions.

Introduction-

Insectivorous plants eat insects to keep themselves healthy and fit. ~~It~~ ~~They~~ ~~consume~~s insects in the form of nutrient supplements. They are found in all the continents except the continent of Antarctica (ref.). These are often found growing in swamp or moist acidic and low nutrient soil. There are many such natural places in the four enclaves of Sanjay Dubri which create suitable conditions for their growth.

Insectivorous plants are mixotrophic, which grow in areas rich in nitrogen, phosphorus, and potassium in the soil, for which they feed on insects, ~~thus increasing~~ ~~by doing this~~, the process of photosynthesis ~~increases~~ and the plant continues its life by staying healthy (refs.). There is lack of oxygen in the area where insectivorous plants grow. Complete oxidation of organic matter does not take place.

Comment [HK1]: The journal guidelines must be followed for the abstract.

Comment [HK2]: Scientific names must be followed by the author's name

Comment [HK3]: Sections (Purpose of the work, Methodology, Major results and Conclusion) are not separate please separate

Comment [HK4]: Adding reference(s) is required here for background information

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Due to the excess of acidic substances in the environment, acidity increases in soil, for this reason which microorganisms cannot survive, these plants live well and by eating insects, they play an important role in keeping the environment healthy. The term carnivorous syndrome is in vogue in the plant world, which means the development of internal structure, glandular structure, gene expression and developmental characteristics of insectivorous plants. Out of 2,500,000 floral species, about 810 floral species are insectivores, mainly belonging to *Nipenthes* and *Lamiales* (~~adamec~~ Adamec et al. 2021). Carnivorous syndrome develops 11 times more in insectivorous plants. These plants belong to 13 families of the world as an example *Triantha occidentalis*, (*Tofieldiaceae*) (Fleischmann et al.2018), (Lin et al.2021), latest reported insectivorous plants are observed.

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Insectivorous plants are classified as a polyphytic group due to based on their specific characteristics and ability to capture and eat-consume insects. *Drosera Burmannii*, *Drosera indica* insectivorous plants have been observed in Sidhi district. Such glands are found in the leaves of *Drosera* species, which releasing sticky substances to attract insects. *Aldrovanda* is a rootless insectivorous plant which is found in ~~Sunder forest~~ Sunder Forest (West Bengal) in India.

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The taxonomic classification of *Drosera burmannii* insectivorous plant is described. This plant belongs to the Family of Droseraceae, Order- Caryophyllales Class- Dicotyledoneae, Division- Angiospermeae.

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During the field survey and investigation work we have found specific closed association with *Eriocaulon aquaticum* herb. This herb also seen in tidal muddy area of rivers, ponds and springs in July to December month with *Drosera burmannii* plant.

The Taxonomic classification of *Eriocaulon aquaticum*- Family- Eriocaulaceae, and Order- Eriocaulales, division- Angiospermeae and kingdom- Plantae.

Comment [HK11]: This sentence makes no sense in light of the information that has been provided.

This plant phenotypically seen with white flower in month of July to December. Its plant looks like a pipewort. These herbs found throughout the muddy places of Sanjay Dubri Tiger Reserve in Sidhi District. *Eriocaulon aquaticum* herb is single hollow pipe with 4-12 cm in heights. The lower section of the herb is connected some narrow ~~lanceolet~~ lanceolate leaves. *Eriocaulon aquaticum* plant is basically seen in very low nutrients soil.

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It is crucial to clearly articulate the primary objective of the study at this juncture.

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Material & Methods-

During the study and survey work between the months of October - November 2022 in Sanjay Dubri Tiger Reserve Sidhi, in this study we have found insectivorous plants in all 4 ranges in SDTR forest areas. It is a bit difficult to reach their habitat ~~because as they are growing~~ in rainfed/swamp/moist areas. *Drosera* is a true hollow carnivorous plant because it attracts and eats special insects, which leads to their growth and development (Lioyol 1942, Chase et al. 2009). The plants were collected using conventional procedures. Flora, monographs, reviews, journals, and other sources were reviewed to determine the identity of the insectivorous plant (refs.). The field data and field observations were recorded in a field diary.

Recently, Ellison and ~~adamee~~ Adamec (2018) gave a new definition. ~~He~~ ~~They~~ ~~has~~ ~~have~~ described 5 essential symptoms of Carnivorous Syndrome - 1. Catching insects in a special way, 2. Killing, 3. Digestion, 4. Absorption or assimilation, 5. Using the nutrients obtained from them for our growth and development.

Nepenthes and *Drosera* have endogenously special types of enzymes which help in the digestion of insects. Insectivorous plants capture insects both actively and passively (Kroll et al. 2012). For this, they catch prey by changing their entire morphology or only the shape of the leaves (Fukushima et al. 2015; Dkhar Pareek 2019; Davila-lara 2020; whitewood 2020).

Interestingly, prey capture is the result of parallel evolution in some insectivorous plants, such as Nepenthaceae, Cephalotaceae and Sarraciniaceae (Thorogood et al. 2017).

There are 5 types of hunting method found in insectivorous plants in which 3 active types and 2 passive types of method. In active type of trapping method, plants become dynamic by expending plant energy to catch the prey. eg. Snaptrap of *Dionaea muscipula*, flypaper traps of *Drosera* and *Pinguicula*. In passive type hunting trapping no energy is expended. The prey comes to their surface and sticks automatically. (Pietro Paolo and Pietro Paolo 2001) Ex. Eel-Trap of *genlisea*, Pitfall-trap of *Cephalotus follicularis*, *Darlingtonia californica*, *Sarracenia*, *Heliamphora* and *Nepenthes*.

In order to digest the prey, they secrete several types of hydrolytic enzymes which are controlled by genes (Ravee et al, 2018). It has now been discovered that the development of carnivorous

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syndrome is part of a protective mechanism (Mithofer 2011; Pavlovic and Saganova 2015; Bemm et. al, 2016; Fleischmann et. al, 2018; Hedrich and Fukushima 2021).

Comment [D15]: This entire section should be moved to the Introduction after it has been rewritten in a consistent manner.

Result & Discussion-

Drosera ~~Burmanni~~ burmannii insectivorous plant was found during the survey study in Sanjay Dubri Tiger Reserve area, for which the following parameters were prepared, which is as follows-

1. Habitat Status-

Generally this plant was found in marshy sandy nitrogen free soil in all the forest areas of Sanjay Dubri Tiger Reserve. Availability of insectivorous plants was reported in Dubari forest range of this tiger reserve on the bank of river Banas from where continuous water flow was found in the form of spring from the mountain side towards the river. The association of insectivorous plants *Drosera burmannii* with *Eriocaulon aquaticum* is specifically observed which clearly indicates the availability of insectivorous plants with the soil. The presence of *Drosera burmannii* was found in 4 (all four forest ranges) of Sanjay Dubri Tiger Reserve which expresses a specific type of soil quality.

2. Colour status-

The colour of *Drosera burmannii* insectivorous plant is green in the initial stage and as the plant matures the color of the plant changes to dark red and purple. The color of the leaves of this plant is green, small pointed thorn-like protrusions are found in them, which to trap insects.

3. Growing Season-

Drosera burmannii insectivorous plant has grown in month of September to October but maturation period between Nov. to last December. *Drosera burmannii* plant is abundantly seen in December to January month and afterward the plant died due to climatic changes and dry soil with increasing temperature of atmosphere in Sanjay Dubri Tiger Reserve Sidhi (M.P.). Approximately 4 month of a one year we have naturally seen in reserve and buffer zone of SDTR.



Photograph 1 - Bastua Range-Near Umradi River



Photograph 2 - Mohan Range- Kusmi



Photograph 3 - Dubri Range- Near Banas River

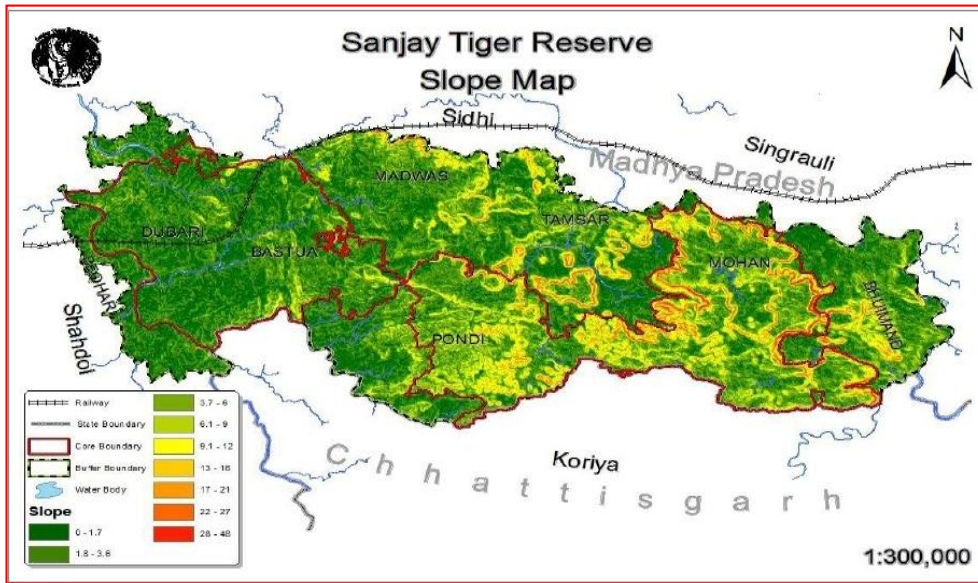


Photograph 4 - Pondi Range

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4. Occurrence Site of *Droseraburmannii*:

Droseraburmannii plant is naturally found in all zone of SDTR such as Dubri, Mohan, Bastua and Pondi in different location, but mainly grow in moist sandy or muddy sandy acidic soil. It has been seen nearby area of spring, rivers and ponds.



Map1 Sanjay Tiger Reserve Slope Map

5. Some Specific Angiospermic plant association with *Droseraburmannii*-

During the field study and investigative work, we have observed the specific association of *Droseraburmannii* with *Eriocaulon aquaticum* herb in Sanjay Dubri Tiger Reserve Sidhi. This is an herbaceous pipeworts plant with white headed flowers found in fresh and tide muddy places in rivers, ponds and springs. The presence of *Eriocaulon aquaticum* plant is shows that the nutrient deficient soil and availability of *Droseraburmannii* in nearby area.

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Conclusion-

The *Drosera burmannii* insectivorous plant is a special ecological diversity of the Sanjay Dubri Tiger Reserve Sidhi (M.P.). This is a rare endangered insectivorous plant shows that the specific natural microclimatic habitat of the national park as well as forest. In this forest also famous for the Birth place of first white tiger “Mohan” which indicates a specific naturality and specificity of this Habitat. Our research work is based on the conservation and sustainable development of threatened and rare endangered flora of Sanjay Dubri Tiger reserve Sidhi to maintain the ecological diversity of availability of some renowned floras.

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Reference-

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