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Studies on Ethnobotanical and Phytochemical Analysis of invasive plant *Monochoria hastata,* growing in different regions of Jharkhand, India

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ABSTRACT

This study reflects the ethnobotanical importance and phytochemical properties of *Monochoria hastata*, an invasive aquatic plant growing in aquatic habitat. This plnat has been observed in several parts of Jharkhand like Ranchi, Gumla, Khunti, Simdega, Pakur, Dumka, Medini Nagar as well as Lohardaga. Besides its invasive properties this plant has several benefits in culinary practices besides its medicinal importance. The plant is used in the dietary pattern,the flowers of the plants are compared with the prawns owing to its delicate flavor. Phytochemical analysis was performed on leaf extracts, revealing high antioxidant activity through DPPH, attributed to the plant's phenolic and flavonoid content. This study shows the importance of *M. hastata* as a probable source of natural antioxidants. The findings are the base of valuable ethnobotanical perceptions and open a new vista for future pharmacological investigations of this plant in dietary, medicinal, and market-related applications.

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KEY WORDS : Ethnobotany, Invasive plant, Jharkhand, *Monochoria hastata,* Phytochemical.

Introduction

Eastern India's Jharkhand state is renowned for its abundant biodiversity, which includes a wide range of invasive plant species with substantial negative effects on the environment and the economy[2]. The various environments found in the state from marshes to forests offer these plants a special place to flourish and disperse[11]. Native flora and fauna in Jharkhand are being negatively impacted by the rapid spread of invasive species, such as *Monochoria hastata*, over several districts[12]. Managing these plants can be difficult since they frequently flourish in disturbed areas like marshes and agricultural fields[18]. All across Jharkhand, but especially in areas like Ranchi, Gumla, Khunti, Simdega, and Lohardaga. A number of variables, including soil composition, human activity, and the availability of water, affect how widely the plant spreads. Many plants, such as *Monochoria hastata*, are employed in traditional local cuisines despite being invasive. These plants are prized for their nutritional qualities throughout Jharkhand[6,16,18].

In Jharkhand, local communities have long utilized aquatic plants for their diverse benefits, integrating them into daily life and traditional practices[7]. These plants, thriving in the region's abundant water bodies, provide vital resources such as food, medicine[8]. They play a crucial role in local diets, contributing essential nutrients and supporting traditional health remedies. Aquatic plants also offer ecological benefits, such as water purification and habitat support, enhancing the sustainability of local environments[14]. This traditional knowledge underscores the importance of preserving these plants and understanding their contributions to both cultural heritage and ecological balance[4].

Arrow pond weed, or *Monochoria hastata.* Solms, is a member of the Pontederiaceae family of aquatic herbs, which includes a wide range of annual and perennial species[9]. There are eight species in the genus, most of which are found in Australia, Asia, and Africa.[8] A perennial aquatic herb, *Monochoria hastata* is typically found in ponds, rice fields, and wetlands in northern Australia and Southeast Asia. It is well recognized for its therapeutic applications, which include the management

TABLE -1 : Ethnobotanical Practices, Culinary Uses, and Market Value of *Monochoria hastata* in Different Districts of Jharkhand.

Name	Districts	Culinary Practice	Preparation Method	Market Role/Value	Ethnobotanical Insights
Mrs. Sunita Devi	Ranchi	Collected fresh flowers early in the morning, cleaned them thoroughly, and trimed the stems for cooking	Consumed domestically; occasionally shared with neighbors	Values the flower's prawn-like taste and delicate texture	believes it adds flavor and family meals
Mr. Ramesh Oraon	Khunti	Gathered and sold flowers in local market	Harvested flowers from rice fields and wetlands, ensuring the plants remain undamaged	Sold in local markets for ¹ 120-160 per kg	Views *Monochoria hastata* as an important cash crop, especially during harvest season; widely known in local markets
Ms. Priya Sore	Gumla	Prepared flowers in stir-fries and curries with small fish	Collected fresh flowers early in the morning, cleaned them thoroughly, and trimed the stems for cooking	Primarily used in household; no market sale	Values the flower's prawn-like taste
Mr. Anil Munda	Simdega	Added flowers to traditional curries and soups	Cleaned flowers, added them to slow-cooked curries with local spices	Occasionally sold in village markets; traded in exchange for goods	Considers the flowers a delicacy, likening their flavor to seafood.
Mrs. Rina Toppo	Lohardaga	Prepared chutneys and side dishes with flowers	Crushed the flowers into a paste with spices to prepare chutney	Sold in local weekly markets	versatile plant in the kitchen; passed down from

of conditions like liver problems, asthma, and toothaches[13].

Material and Methods

Plant samples were gathered from all across Jharkhand, but especially from districts like Simdega, Lohardaga, Gumla, Ranchi, and Khunti. The collection concentrated on regions where *Monochoria hastata* was prevalent. In order to acquire ethnobotanical data regarding the applications of *Monochoria hastata,* interviews were undertaken with local inhabitants.[5] With the permission of the locals, these interviews shed light on the customary knowledge related to the plant.

The process followed the usual protocols for the phytochemical screening.[17] To determine the components, screening was done on the powdered sample's aqueous extract. Several reagents have been

used in this procedure to determine whether the primary group of natural components was present.

Results

This invasive species competes with natural vegetation in marshes and rice fields, where it flourishes. The local people have incorporated *Monochoria hastata* into their daily life despite the plant's invasiveness, using it for both commercial and culinary uses. Even though the plant's potential for therapeutic benefits is still mostly unknown, it is now an important resource in a number of Jharkhand districts. The following findings were noticed based on data collected from locals:

Flower Harvesting and Collection

Collecting *Monochoria hastata* flowers from ponds, rice fields, and wetlands is a seasonal tradition for the local populations. The flowers are carefully selected, usually in the early morning hours when they are at their best and freshest. In order to ensure that the plant continues to develop and produce more flowers in the future, harvesters typically take extra precautions when plucking the blossoms.

TABLE -2 : Phytochemical Analysis of Crude Extracts from the Leaves of *Monochoria hastata*

Phytochemical Test	Result
Tannins	+++
Flavonoids	++
Terpenoids	+
Steroids	-
Phlobatannins	
Carbohydrates	++
Alkaloids	+
Coumarins	++
Anthraquinones	-
Proteins	++
Anthocyanins	-
Phenols	++
Saponins	++
Glycosides	+

Fig. 1 : Natural Habitat of *Monochoria hastata*

Preparation and Cooking

The blooms of *Monochoria hastata* go through a quick preparation step before cooking. After giving the flower, a thorough cleaning to get rid of any contaminants, the stems are frequently cut shorter. Their texture and flavor are improved by this processing, which makes them more appetizing for use in cooking.

Culinary Practices and Taste

Monochoria hastata flowers are highly valued in local culinary traditions due to their distinct flavor, frequently likened to shrimp over the years. Usually, the blossoms are cooked in a variety of ways, such as stir-fries and curries, which highlight their delicate flavor and texture. Their flavor is similar to prawns, which makes them a popular ingredient, particularly in areas where seafood is a staple diet.

Acceptance and Popularity

The use of *Monochoria hastata* flowers in traditional cuisine has gained wide spread acceptance among local people. The flowers are considered a delicacy, and their unique taste has made them a sought-after ingredient in many households. Over time, they have become an integral part of the local culinary heritage, with many traditional recipes incorporating these flowers as a key ingredient.

Market Value

In addition to being valued for their culinary uses, *Monochoria hastata* flowers also have a high commercial

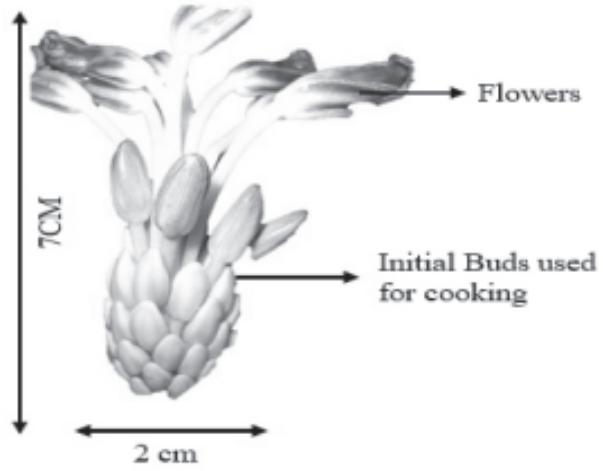

Fig. 2. Flower bud of *Monochoria hastata*

value. Prices per kilogram for these flowers range from ¹ 120 to ¹ 160 in local markets like Shalimar Marke at Ranchi. Their popularity and demand among customers are reflected in this price range, which makes them a profitable product for those who harvest and sell them.

Medicinal Potential

The medical benefit of *Monochoria hastata* is currently unknown and little researched, despite their popularity as a food preparation item. Although diverse civilizations have long utilized various parts of the plant to treat different illnesses, not much is known about the precise medical benefits of the blooms. This offers a chance to investigate the possible health advantages of this plant in more detail.

Phytochemical Analysis

The Phytochemical Analysis of Crude Extracts from the Leaves of *Monochoria hastata* reveals the presence of several bioactive compounds with potential health benefits. High levels of tannins(+++) and flavonoids (++) indicate strong antioxidant properties, which can help combat oxidative stress and support cardiovascular health. The presence of terpenoids (+) and saponins (++) further suggests anti-inflammatory and cholesterol-lowering effects, aligning with the plant's use in traditional medicine (Table.1).

In comparison to ethnobotanical practices, the results corroborate the traditional use of *Monochoria hastata* by local communities in Jharkhand. In Khunti, the plant is harvested from wet lands and sold in local markets, reflecting its economic value as a minor forest product (MFP). In households, people use the flowers for cooking, especially in stir-fries and curries. The moderate carbohydrate (++) content makes the plant a good energy source in the diet, while proteins (++) provide essential nutrients.

Ethnobotanical use highlights sustainable harvesting practices, with locals ensuring the plant regenerates naturally. This is seen in the methods carefully gather flowers without damaging the plants, supporting biodiversity. Additionally, the plant's market role, with a price range of ¹ 120-160 per kg in some regions, reflects its economic importance as a sustainable livelihood option.

Discussion

The outcomes of this study on *Monochoria hastata's* total phenolic content and antioxidant potential align with the findings of different researchers. An investigater[10] reported a positive correlation between phenolic content and antioxidant activity in various plant species. Similar to the results obtained in this study, the high phenolic content in *M. hastata* suggests strong free radical scavenging ability. In comparison, previous[3]

Fig.3. Single Flower of *Monochoria hastata*

Fig.4. Processed flower buds for cooking

research on *Monochoria vaginalis*, another species from the same family, showed lower phenolic content, indicating variability in antioxidant potential among species. Furthermore, studies on other medicinal plants, such as *Annona squamosa* and *Annona reticulata*, also report phenolic compounds as primary contributors to antioxidant activity.[1] This comparison highlights the unique chemical profile of *M. hastata*, positioning it as a valuable candidate for natural antioxidant research in line with global studies.

Conclusion

The phytochemical analysis of *Monochoria hastata* validates its traditional use in both culinary and medicinal contexts. Its bioactive compounds offer health benefits, while sustainable harvesting ensures continued availability. With its potential in modern cuisine and its role in supporting local economies, *Monochoria hastata* is valuable for promoting both nutrition and sustainability

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