Exploring the ethnomedicinal potential of the wetland flora in Jajpur district, Odisha, Eastern India

Satikanta Sahoo, Dayanidhi Bagartee, Taranisen Panda

Correspondence

Satikanta Sahoo[1] , Dayanidhi Bagartee[2] , Taranisen Panda[3]

[1]P.G. Department of Botany, N.C. (Autonomous) College, Jajpur-755001, Odisha, India
[2]P.G Department of Botany, Anchal College, Padampur, Bargarh-768036,Odisha, India
[3]Chandbali College, Chandbali,-756133, Odisha, India

*Corresponding Author: Dayanidhi.bagartee@gmail.com

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Databases and Inventories

Abstract

Background: Wetlands are highly productive ecosystems that provide essential ecological services and sustain diverse flora and fauna. In Odisha, India, wetland plants play a vital role in traditional healthcare, particularly among rural and indigenous communities. Despite their ecological and cultural importance, systematic documentation of the ethnomedicinal uses of wetland flora in Jajpur district has been limited. This study addresses that gap by integrating traditional knowledge with quantitative ethnobotanical analysis to evaluate the cultural significance and therapeutic potential of wetland plants.

Methods: Field surveys were conducted across diverse wetland habitats of Jajpur district between 2023 and 2025. Plant specimens were collected, identified, and preserved following standard herbarium techniques. Ethnomedicinal data were obtained from 239 informants, including traditional healers, farmers, and elderly community members, using semi-structured interviews, free listing, and guided field walks. Quantitative ethnobotanical indices such as Frequency of Citation (FC), Relative Frequency of Citation (RFC), and Use Value (UV) were applied to assess cultural importance and consensus among informants.

Results: A total of 45 ethnomedicinal plant species belonging to 32 families were documented, with *Cynodon dactylon*, *Bacopa monnieri*, *Boerhavia diffusa*, *Centella asiatica*, and *Tridax procumbens* emerging as culturally dominant and therapeutically versatile. Leaves were the most frequently used plant part, and remedies were prepared in the form of juices, pastes, and decoctions to treat common ailments such as fever, gastrointestinal disorders, respiratory complaints, and skin infections.

Conclusions: The findings highlight wetlands as vital repositories of traditional medicine and emphasize the need for conservation and ecological monitoring.

Keywords: Ethnomedicine; Wetlands; FC; RFC; Jajpur

Background

Wetlands are complex ecosystems that include marshes, fens, peatlands, and shallow water bodies, which may be natural or artificial, permanent or temporary, with static or flowing water that can be fresh, brackish, or saline. They are among the

most productive ecosystems on Earth, providing essential ecological services such as water purification, flood regulation, carbon sequestration, and habitat for diverse flora and fauna (Ramsar Convention Secretariat, 2021). Wetlands support a wide variety of aquatic organisms and play a crucial role in maintaining ecological balance and biodiversity at local and global scales (Davidson *et al*.,2018).

Wetlands are often described as ecotones transitional zones between terrestrial and aquatic ecosystems, where the water table is at or near the surface, or the land is periodically inundated (Mitsch and Gosselink, 2000). They occur in a wide range of forms, including peat bogs, mangrove forests, freshwater marshes, floodplains, riparian swamps, shallow lakes, estuaries, coastal lagoons, and salt marshes. These ecosystems vary significantly in their hydrology, vegetation, and ecological functions, contributing to their high biological diversity and resilience (Junk *et al*., 2013; UNEP, 2023).

Globally, wetlands also include region-specific types such as wet meadows and wet prairies of North America, vernal pools in Mediterranean climates, sloughs in the United States, billabongs in Australia, and muskegs found in Canada and Alaska (Mishra and Panda, 2013). Recent studies highlight that despite their ecological importance, wetlands are under severe threat due to urbanization, industrialization, climate change, and land-use transformation, leading to significant loss in their extent and functionality (IPBES, 2023).

Aquatic habitats support a wide range of organisms that exhibit diverse morphological, physiological, and ecological adaptations, enabling survival in water-dominated environments. Covering nearly 71% of the Earth's surface, aquatic ecosystems are fundamental to global biodiversity and ecological balance (Ramsar Convention Secretariat, 2021).

India possesses rich and varied water resources, including rivers, lakes, reservoirs, floodplains, and wetlands, which play significant ecological and socio-economic roles by supporting biodiversity, agriculture, fisheries, and traditional livelihoods (Davidson *et al*., 2019). Odisha, situated along the eastern coast of India, is particularly endowed with diverse wetland ecosystems comprising both inland and coastal types that sustain biological communities and local livelihoods. These wetlands include rivers, streams, and natural waterlogged areas, and their structure and function are strongly influenced by seasonal variations. Jajpur is located in the northeastern part of Odisha state. In Jajpur district, wetlands represent a key ecological component, consisting of both larger water bodies (>2.25 ha) and numerous smaller wetlands that collectively enhance regional biodiversity(National Wetland Atlas Orissa,2010). Seasonal dynamics are evident through reductions in open water extent from post-monsoon to pre-monsoon periods, accompanied by increases in aquatic vegetation cover, reflecting ecological succession and nutrient enrichment. Similarly, turbidity patterns indicate that moderate turbidity predominates across seasons, while high turbidity is less common during pre-monsoon. These observations highlight the dynamic nature and environmental sensitivity of wetland ecosystems. However, increasing anthropogenic pressures, including urbanization, industrialization, and land-use changes, pose serious threats to wetland integrity and biodiversity, necessitating systematic assessment and sustainable management strategies for their conservation (IPBES, 2023; UNEP, 2021).

Plants growing in an aquatic habitat are called aquatic plants. The large aquatic plants are called aquatic macrophytes. Fasset (2000) defined macrophytes as plants that, under normal conditions, germinate and grow with at least their base in the water and are large enough to be seen with the naked eye. The use of local plants is more sustainable than the use of plants from other areas. The use of plants in a regulated manner will help to keep our ecosystem healthy for a long period. Macrophytes play an important role in the livelihood of rural communities. Most of the wetland plants are considered a conventional resource. As the major and minor plant products are obtained from these resources, they are socioeconomically very important (Mishra and Panda 2013). These plants have different uses in different forms. For its nutritional value, they are used as human food (Mohan et al 1998), as animal food (Boyd 1969), Fish food (Pattanaik *et al* 1991, Rath and Dutta 1991, Ray and Das 1994, 1995). They have nutritional and medicinal property (Sarat and Kaul 1982; Holmes and Newbold 1984; Reddy & De Busk 1985; Mishra *et al* 1987). They are the producer of fuel and fertilizer (Taheruzzaman & Kushari 1989). They have phytoremediation potential (Ewadh 2020; Ewadh & Sattee 2022; Cerbaro & Rocha 2022; Abdulwahid 2023; Sahoo *et al* 2025). Some aquatic plants are cultivated for protein, biogas and for compost making (Sculthorpe 1967). Though, there is well advanced heath care access, the rural and tribal people depend on local traditional healer for herbal treatments. The Odisha represents rich biodiversity, culture and traditional healthcare. The state harbor nearly 22% tribal population and 31% forest cover with diverse medicinal plants and traditional healing practices (Bagartee et al 2025). The reknown Indian indigenous medicinal system that includes Ayurveda, Siddha and Unani show importance on health, culture and nature reinforcing disease prevention and cure(Bagartee *et al.* 2025).

Ethnomedicinal knowledge plays a crucial role in traditional healthcare systems, particularly among rural and indigenous communities that depend on locally available plant resources for the treatment of various ailments. In Odisha, a few studies have documented the ethnomedicinal uses of wetland plants, indicating their importance in managing a range of health conditions (Mishra *et al*., 2016; Sen & Behera, 2018). However, these studies are largely generalized or region-specific and lack detailed, systematic, and quantitative evaluation. In the context of Jajpur district, existing research has primarily focused on the diversity, distribution, and pollution status of wetland flora (Sahoo & Nayak, 2022a, 2022b; Sahoo *et al*., 2024; Sahoo *et al*., 2025), with little or no emphasis on their ethnomedicinal applications and cultural relevance. Thus, despite the availability of floristic and ecological data, there remains a significant research gap regarding the documentation, validation, and quantitative assessment of traditional knowledge associated with wetland plants in this region. Addressing this gap is essential not only for preserving indigenous knowledge systems but also for identifying potential plant resources for future pharmacological studies. Therefore, the present study is undertaken to systematically document the ethnomedicinal uses of wetland plants in Jajpur district and to analyze their relative importance using quantitative ethnobotanical indices. This study provides new insights by integrating traditional knowledge with scientific evaluation, thereby contributing to both biodiversity conservation and the sustainable utilization of wetland plant resources.

Materials and Methods

Study area

The study was conducted in Jajpur district, situated in the eastern coastal region of Odisha, India, between 20°50'N to 21°20'N latitude and 86°00'E to 86°45'E longitude, covering an area of 2,886 sq. km. The district is characterized by diverse wetland habitats, including rivers, lakes, ponds, marshes, and paddy fields, which support a rich aquatic and semi-aquatic flora. Jajpur experiences a tropical climate, with an average annual rainfall of 1,400-1,600 mm and temperatures ranging from 12°C to 42°C. The district is home to rural and semi-urban communities that rely on wetland resources for food, medicine, and livelihood, preserving extensive traditional knowledge regarding plant uses (Sahoo *et al*. 2024) (Figure 1)

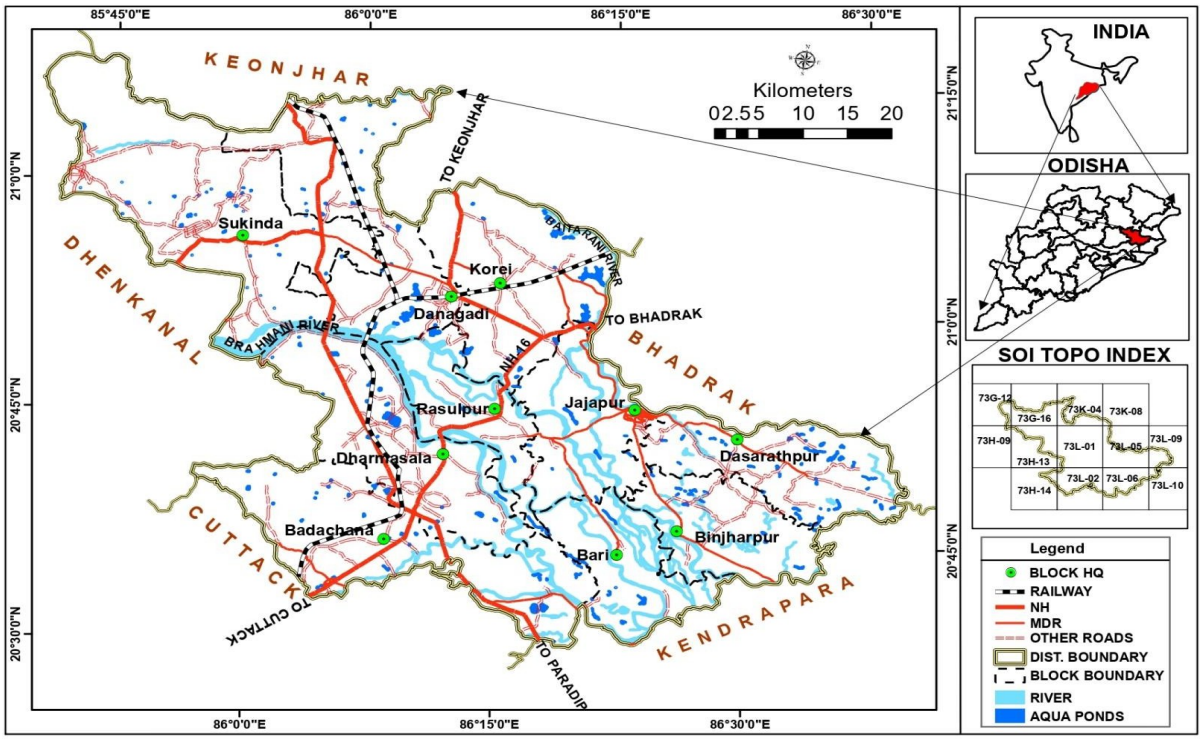

Figure 1. Map of Jajpur District, Odisha, India, showing the study area

Field Survey and Specimen Collection

Regular field surveys were conducted across different seasons from 2023 to 2025 in diverse wetland and aquatic habitats of Jajpur district, Odisha. This extended study period was intentionally selected to capture seasonal variations in species composition, phenology, and availability of aquatic and semi-aquatic plants, as well as to ensure comprehensive and repeated validation of ethnomedicinal information through interactions with local communities. The surveyed habitats included rivers, ponds, lakes, marshes, swamps, irrigation tanks, and seasonal floodplains, representing the major wetland types of the region. The primary objective was to collect plant specimens and document their ethnomedicinal uses through field

observations and community interactions. Plant specimens were collected following standard floristic techniques, ensuring the inclusion of diagnostic parts such as roots, stems, leaves, flowers, and fruits for accurate identification. Collected specimens were processed, pressed, and dried using conventional herbarium preparation methods as described by Jain and Rao (1977). Each specimen was then mounted on herbarium sheets and labeled with essential details, including scientific name, local name, habitat characteristics, and collection data. Properly identified voucher specimens were deposited in the departmental herbarium for future reference and verification.

Ethnomedicinal Data Collection

Information on the traditional uses of wetland plants was gathered from traditional healers (Kavirajs), herbalists, farmers, and elderly community members. A total of 239 informants were interviewed, comprising 198 men and 41 women aged 30-85 years. Data were collected using semi-structured questionnaires, free listing, and guided field walks, which allowed respondents to demonstrate plant collection and preparation methods (Cook, 1996). Before each interview, prior informed consent was obtained to respect ethical norms and ensure voluntary participation. The data recorded included the local name of the plant, plant part used, mode of preparation, method of administration, and specific ailments treated.

Data Validation and Analysis

Plant identification was carried out using regional floras, including Saxena and Brahmam (1994-96) for *Flora of Orissa* and Haines (1921-25) for *Flora of Bihar and Orissa*. Scientific names were further verified using World Flora Online and updated nomenclature sources. Data were tabulated and analyzed in Microsoft Excel and SPSS for descriptive statistics. Graphical representations (pie charts, bar diagrams) were generated using Python (Matplotlib) to illustrate plant part usage, family distribution, and disease category consensus.

Quantitative Analysis and Statistical Parameters

To evaluate the cultural significance of plant species and the consensus among informants, quantitative ethnobotanical indices were applied following standard approaches.

- **Frequency of Citation (FC):** Number of informants who mentioned a specific species (Tardío, **J.,** & Pardo-de-Santayana)
- **Use Reports (UR):** Each record of a plant species being used for a particular purpose by a specific informant (Heinrich,1998)
- **Relative Frequency of Citation (RFC):** RFC = FC / N (where N = total number of informants). This value ranges from 0 to 1 (Tardío, J., & Pardo-de-Santayana)
- **Use Value (UV):** Indicates the versatility of each plant species based on the number of different uses cited by informants (Phillips & Gentry, 1993)

$$UV = \frac{\sum U_i}{N}$$

ΣUi: The sum of the number of uses reported by each informant for that species.
N: The total number of informants interviewed about that plant species

Results

Demographic Profile of Informants

A total of 239 informants participated in the present study, comprising 198 men (82.8%) and 41 women (17.2%), with ages ranging from 30 to 85 years. Most informants were traditional healers (locally known as Kavirajs) or elderly individuals with long-standing knowledge of plant-based remedies. The majority belonged to rural agrarian communities living near wetland habitats. Informants were categorized based on their occupation: 45% were farmers, 32% traditional healers, and 23% were fishermen, homemakers, or laborers (Table 1).

Table 1A. Distribution of Informants by Age Group and Sex

Age Group (years)	Male	Female	Total
30-45 (30.1%)	60	12	72
46-60 (42.3%)	84	17	101
61-85 (27.6%)	54	12	66
Total	**198 (82.8%)**	**41 (17.2%)**	**239**

Table 1B. Occupational Distribution of Respondents

Occupation	Male	Female	Total
Farmers	98	10	108 (45.2%)
Traditional Healers	65	11	76 (31.8%)
Others	35	20	55 (23.0%)
Total	198	41	239

A total of 45 ethnomedicinal plants under 32 families have been documented from the Jajpur district. Asteraceae was found to be the dominant family with 5 species. Poaceae has species. Araceae and Nymphaceae have 3 species each and the remaining families have one species each(Table 2). The recorded species were used to cure a wide range of diseases, including fever, cough, cold, asthma, stomach disorders, jaundice, wounds, bone fractures, piles, rheumatism, and paralytic diseases. The mode of preparation of these traditional medicines varied widely; remedies were prepared in the form of leaf juice, root extract, paste, decoction, or seed mixture, depending on the nature of the ailment and the plant part used. The plant parts utilized included leaves, roots, tubers, seeds, petioles, and whole plants, with leaves being the most frequently used part, reflecting their easy availability and high concentration of bioactive compounds. Some preparations were taken orally for internal ailments, while others were applied externally to treat wounds, fractures, or skin infections.

Quantitative indices like Use Report UR, Use Value UV, Frequency of Citation FC, and Relative Frequency of Citation RFC provide a clear understanding of the cultural importance and medicinal value of the documented plant species. Among all the plants, *Cynodon dactylon* shows the highest values UR 185, UV 0.77, FC 177, and RFC 0.74, which indicates that it is the most widely used and culturally important species in the study area. Plants such as *Bacopa monnieri*, *Boerhavia diffusa*, and *Centella asiatica* also show high values for these quantitative indices, reflecting their versatile medicinal roles and strong acceptance in traditional healthcare practices. These plants are frequently cited by informants and are used for a wide range of ailments, suggesting strong ethnopharmacological significance, which is consistent with earlier observations on cultural importance made by Heinrich *et al*. 1998. In contrast, species like *Centipeda minima*, *Corchorus capsularis*, and *Adiantum capillus-veneris* show comparatively lower values, indicating that their use is more limited and focused on specific conditions. Overall, the patterns revealed through quantitative indices like UR, UV, FC, and RFC show that a few key species dominate local medicinal knowledge and play an important role in primary healthcare, while others have more specialized but still valuable functions. This highlights the structured nature of indigenous knowledge, where certain plants emerge as essential traditional remedies with significant cultural and therapeutic importance.

The conservation assessment revealed most wetland plants in Jajpur are classified as Least Concern (LC), thriving in moist, swampy, riparian, and floating habitats with diverse flowering seasons. However, several species such as *Alocasia macrorrhizos, Cynodon dactylon,* and *Vetiveria zizanioides* remain Not Evaluated (NE), while *Nelumbo nucifera* is Data Deficient (DD), highlighting the need for further ecological monitoring and protection (Table 3).

Table 2. List of Wetland plants and their ethnomedicinal uses in Jajpur District of Odisha

Scientific name, Family, Voucher No.	**Local Name**	**Mode of use**	**UR**	**UV**	**FC**	**RFC**
Aeschynomene aspera L. Fabaceae NCAC/25/047	Solo	Leaf juice mixed with honey is used to treat cough, cold, and fever.	26	0.10	22	0.09
Alternanthera sessilis (L.) R.Br.ex Dc. Amaranthaceae NCAC/25/056	Madaranga	Fried leaves with ghee are used to boost lactation and purify blood.	24	0.10	24	0.10
Alocasia macrorrhizos (L.) G.Don. Araceae NCAC/25/049	Mana saru	Root extract with honey is used for stomach disorders.	37	0.15	31	0.12
Adiantum capillus-veneris L. Adiantaceae NCAC/25/022	Dodhari	Paste of the whole plant mixed with milk is used to set bone fractures.	18	0.07	18	0.07
Abutilon indicum (L.) Sweet Malvaceae NCAC/25/018	Pedipedika	Decoction with milk is used for paralysis.	68	0.28	55	0.23

Bacopa monnieri (L.) Pennell Scrophulariaceae NCAC/25/069	Brahmi	Leaf juice with cow milk is given to cure cough and asthma.	160	0.66	143	0.59
Boerhavia diffusa L. Nyctaginaceae NCAC/25/077	Ghoda Puruni	Root powder mixed with honey is traditionally used to treat asthma and jaundice.	124	0.51	98	0.41
Centella asiatica (L.)Urban Apiaceae NCAC/25/081	Thalakudi	Leaf juice can enhance memory power. Leaf paste has wound healing capacity.	102	0.42	95	0.39
Commelina benghalensis L. Commelinaceae NCAC/25/098	Kanasiri	Decoction with milk is used for urination disorders.	58	0.24	52	0.21
Colocasia esculenta (L.)Schott Araceae NCAC/25/115	Saru	Colocasia esculenta petiole juice with turmeric is used against cuts and injuries.	35	0.14	28	0.11
Centipeda minima (L.) A.Braun&Asch. Asteraceae NCAC/25/102	Nakachinka	Leaf juice with honey is traditionally used to cure nasal congestion.	23	0.09	23	0.09
Cynodon dactylon (L.)Pers. Poaceae NCAC/25/132	Duba	Plant juice with butter is traditionally used to cure piles.	185	0.77	177	0.74
Cardiospermum halicacabum L. Sapindaceae NCAC/25/079	Phutphutika	Seeds with ghee are traditionally used as a tonic in rheumatism and fever.	32	0.13	25	0.10
Corchorus capsularis L. Tiliaceae NCAC/25/120	Nalita	Paste of seed is applied to eradicate lice. Leaf juice with honey can cure fever.	18	0.07	17	0.07
Cyperus rotundus L. Cyperaceae NCAC/25/135	Mutha	Whole plant or tuber with honey is traditionally used to cure fever, diarrhea, and cholera.	31	0.12	24	0.10
Cleome viscosa L. Capparaceae NCAC/25/085	Anasorisa	Leaf paste with turmeric is applied on cuts and wounds	21	0.08	21	0.08
Enydra fluctuans Lour. Asteraceae NCAC/25/156	Hidimicha	Leaf juice with honey can cure night blindness.	27	0.11	22	0.09
Echinochloa colona (L.) Link Poaceae NCAC/25/148	Suanghasa	Plant juice with milk is traditionally used in curing constipation.	32	0.13	28	0.11
Eclipta prostrata(L.)L. Asteraceae NCAC/25/111	Bhrungaraj	Plant juice can cure jaundice. Leaf juice with honey is prescribed against fever.	46	0.19	27	0.11
Euphorbia hirta L. Euphorbiaceae NCAC/25/167	Chitakuti	Latex with breast milk is traditionally used to cure redness and conjunctivitis of the eye.	51	0.21	39	0.16
Glinus oppositifolius(L.)A.DC. Molluginaceae NCAC/25/182	Pitasaga	plant paste with turmeric is traditionally used against skin disease.	44	0.18	36	0.15
Hedyotis diffusa Willd. Rubiaceae NCAC/25/188	Pitasaga	plant extract with turmeric is traditionally used for healing wounds. Smoke of plant with neem leaves is used to eradicate insects.	17	0.07	17	0.07
Heliotropium indicum L. Boraginaceae NCAC/25/192	Hatisundha	plant paste with turmeric is traditionally used for healing wounds.	47	0.19	39	0.16
Hygrophila auriculata(Schum.)Heine Acanthaceae NCAC/25/201	Koilekha	Leaf juice is given against cut and wound. Powder of plant with pepper can cure Cough.	42	0.17	28	0.11
Hydrilla verticillata(L.f.)Royle Hydrocharitaceae NCAC/25/199	Chingudiadala	Whole plant is traditionally used as fish food. Plant extract with honey is used as an antidiabetic agent. Decoction with turmeric is used as an antibacterial agent.	63	0.26	45	0.18

Ipomoea aquatic Forssk. Convolvulaceae NCAC/25/208	Kalamasaga	Leaf juice can enhance lactation. Paste of leaf and pepper can cure pimples.	55	0.23	46	0.19
Jussiaea repens L. Onagraceae NCAC/25/214	Jagal	Leaf paste with sandalwood is traditionally used as a coolant against boils and burns.	38	0.15	32	0.13
Leucas aspera(Willd.)Link Lamiaceae NCAC/25/231	Gayasa	Leaf juice with honey can cure gonorrhea, spermatorrhea and increase sperm formation.	52	0.21	31	0.12
Marsilea quadrifolia L. Marsileaceae NCAC/25/238	Sunusunia	Leaf juice with sugar candy is taken to enhance digestion power.	75	0.31	55	0.23
Monochoria hastate Solms-Laub. Pontederiaceae NCAC/25/244	Kaupana	The leaf paste applied directly to treat boil.	28	0.11	24	0.10
Nelumbo nucifera Gaertn. Nymphaceae NCAC/25/253	Padma	Paste of rhizome with honey is given against diabetes .Leaf paste with mustard oil is used against skin disease.	65	0.27	52	0.21
Nymphaea nouchali Burm. Nymphaceae NCAC/25/259	Nilakain	Rhizome decoction with milk is used against diabetes and dysentery.	26	0.10	18	0.07
*Nymphaea pubescens*Willd. Nymphaceae NCAC/25/257	Dhalakain	Powder of rhizome with honey can cure dysentery, dyspepsia and piles. Decoction of flower can cure sore in mouth.	30	0.12	22	0.09
Nymphoides indica(L.)Kuntze Menyanthaceae NCAC/25/260	Panisiuli	Leaf paste with mustard oil is traditionally applied on the belly of newborn babies to reduce gas.	19	0.07	17	0.07
Oxalis corniculata L. Oxalidaceae NCAC/25/262	Ambiliti	Leaf juice with lime is traditionally used to remove warts. plant extract with honey is used to cure scurvy.	32	0.13	25	0.10
Pistia stratiotes L. Araceae NCAC/25/266	Borajhanji	Leaf paste with turmeric is traditionally used to cure skin disease.	24	0.10	20	0.08
Phyllanthus amarus Schum.&Thonn. Euphorbiaceae NCAC/25/269	Bhuinanla	plant extract with honey is traditionally used against jaundice, fever, and diarrhea.	76	0.31	54	0.22
Saccharum spontaneum L. Poaceae NCAC/25/275	Kasatandi	Root decoction with honey is traditionally used to cure tuberculosis, dysentery, kidney, and bladder stones.	24	0.10	18	0.07
Scoparia dulcis L. Scrophulariaceae NCAC/25/080	Banaganjei	Leaf extract with honey is traditionally used against malaria, diabetes, and gonorrhea.	25	0.10	18	0.07
Sesamum indicum L. Pedaliacaea NCAC/25/282	Khasa	Seeds with jaggery are traditionally used against piles. Seed oil with hibiscus extract is applied for blackening of hair.	42	0.17	31	0.12
*Solanum nigrum*L. Solanaceae NCAC/25/293	Nunununia	seeds with honey are traditionally used in fevers, diarrhea, eye diseases, hydrophobia, and cough.	68	0.28	52	0.21
Sphaeranthus indicus L. Asteraceae NCAC/25/296	Bhuinkadamba	Seeds with honey are traditionally used in fevers, diarrhea, eye diseases, hydrophobia, and cough.	28	0.11	22	0.09
Trapa natans L. Trapaceae NCAC/25/301	Panisingada	Seeds with milk are traditionally taken for sound health and to enhance memory power	43	0.17	31	0.12
Tridax procumbens L. Asteraceae NCAC/25/305	Bisalyakarani	Plant juice with turmeric is traditionally used in the treatment of decaying of the fingernail bed.	87	0.36	68	0.28

Trianthema portulacastrum L. Aiozaceae NCAC/25/303	Puruni	Leaf extract with honey is traditionally used to cure jaundice and gonorrhea.	48	0.20	37	0.15
Vetiveria zizanioides(L.)Nash Poaceae NCAC/25/317	Kainsa	Root decoction with honey is traditionally used in curing hypertension, cholera, and diabetes.	26	0.10	18	0.07

Table 3. Conservation Status of Plants

Scientific name	**IUCN Status**	**Habitat**	**Flowering Season**
Aeschynomene aspera L.	LC	Moist, swampy, marshy wetlands	August-January
Alternanthera sessilis (L.) R.Br.ex Dc.	LC	Moist & swampy areas	June - November
Alocasia macrorrhizos (L.) G.Don.	NE	Moist area	June - September
Adiantum capillus-veneris L.	LC	Forest Wetlands & Shaded Moist Areas	July - November
Abutilon indicum (L.) Sweet	LC	Moist area	August - December
Bacopa monnieri (L.) Pennell	LC	swampy areas	April - October
Boerhavia diffusa L.	LC	Swampy area	July - October
Centella asiatica (L.)Urban	LC	Moist & swampy areas	April - October
Commelina benghalensis L.	LC	Riparian & Marshy	June - November
Colocasia esculenta (L.)Schott	LC	Moist & swampy areas	July - October
Centipeda minima (L.) A.Braun & Asch.	LC	Moist & marshy areas	July - December
Cynodon dactylon (L.)Pers.	NE	Moist Terrestrial	July - October
Cardiospermum halicacabum L.	LC	moist thickets	July - December
Corchorus capsularis L.	NE	Moist areas	July - October
Cyperus rotundus L.	LC	Riparian & Marshy	June-October
Cleome viscosa L.	LC	Forest Wetlands & Shaded Moist Areas	June-October
Enydra fluctuans Lour.	LC	Riparian & Marshy	July-October
Echinochloa colona (L.) Link	LC	Submerged	July-October
Eclipta prostrata (L.)L.	LC	Moist & marshy areas	July-October
Euphorbia hirta L.	LC	moist habitats	June-October
Glinus oppositifolius(L.)A.DC.		Moist & sandy soils	February to April
Hedyotis diffusa Willd.	LC	moist soils, marshy ground	August to November or May to October
Heliotropium indicum L.	NE	Forest Wetlands & Shaded Moist Areas	July to November
Hygrophila auriculata (Schum.)Heine	LC	Riparian & Marshy	September to March
Hydrilla verticillata (L.f.)Royle	LC	Submerged	September to March
Ipomoea aquatic Forssk.	LC	Riparian & Marshy	June to early fall
Jussiaea repens L.	LC	Marshy and swampy area	April-October
Leucas aspera(Willd.)Link	NE	Moist area	September to February/March
Marsilea quadrifolia L.	LC	Emergent or submerged	June to December
Monochoria hastate Solms-Laub.	LC	Moist area	March to August
Nelumbo nucifera Gaertn.	DD	Floating	June to August
Nymphaea nouchali Burm.	LC	Floating	August to October
Nymphaea pubescens Willd.	LC	Floating	August to October
Nymphoides indica(L.)Kuntze	LC	Floating	October to May
Oxalis corniculata L.	LC	Forest Wetlands & Shaded Moist Areas	throughout the year
Pistia stratiotes L.	LC	Floating	June-September
Phyllanthus amarus Schum. & Thonn.	NE	Moist places	July to October
Saccharum spontaneum L.	LC	Moist Terrestrial	August to November
Scoparia dulcis L.	NE	Moist area	June to September
Sesamum indicum L.	NA	Moist area	April to June
Solanum nigrum L.	MA	Moist terrestrial	May to October
Sphaeranthus indicus L.	LC	moist deciduous habitats	November to January
Trapa natans L.	LC	Floating	June to August
Tridax procumbens L.	NE	Moist area	all year round
Trianthema portulacastrum L.	NE	Moist area	June to October
Vetiveria zizanioides(L.)Nash	NE	Moist Terrestrial	July to December

Alternanthera sessilis (L.) R.Br.ex DC.

Typha angustata Bory and Chaub

Alocasia macrorrhizos (L.) G.Don.

Lemna minor L.

Oxalis corniculata L.

Trapa natans L.

Figure 2. Some plants observed during field visits.

Discussion

Demographic Profile of Participants in the Study Area

The demographic profile of the informants reveals a clear predominance of middle-aged respondents, with the 46-60 years age group accounting for the highest proportion (42.3%, n = 101), followed by the 30-45 years group (30.1%, n = 72) and the 61-85 years group (27.6%, n = 66). This pattern indicates that the majority of knowledge holders fall within economically active and experience-rich age categories, which are typically associated with greater engagement in livelihood activities and sustained interaction with traditional knowledge systems (Ndavaro et al., 2024). Sex-wise distribution shows a marked male dominance (82.8%, n = 198) compared to females (17.2%, n = 41), which may reflect either higher male participation in community activities or comparatively greater accessibility of male respondents during field data collection (Kalita et al., 2004; Panda et al., 2020).

Regarding occupational structure, farmers represent the largest group of informants (45.2%, n = 108), highlighting the agrarian nature of the study population and their close dependence on plant resources for livelihood. Traditional healers constitute a substantial proportion (31.8%, n = 76), emphasizing their continued role as key custodians of indigenous

medicinal knowledge within the community. The remaining respondents fall under the category of "others" (23.0%, n = 55), indicating a heterogeneous mix of occupations beyond primary agricultural and healing practices and suggesting that ethnomedicinal knowledge is also shared within the wider community (Albuquerque et al., 2014). Overall, the occupational distribution suggests that the informant pool is primarily rooted in the primary sector, particularly agriculture and traditional healthcare systems, which serve as important reservoirs of ethnobotanical knowledge in the study area.

Floristic Diversity and Spatial Occurrence

The wetlands of Jajpur District support diverse hydrophytic and semi-aquatic species, with Asteraceae, Poaceae, Araceae, Euphorbiaceae, and Nymphaeaceae identified as dominant families. Similar dominance of Asteraceae and Poaceae has been reported in wetland studies from Kerala and Northeast India, highlighting their ecological adaptability and ethnomedicinal significance (Prajeesh *et al*., 2014; Saha *et al*., 2022). Frequently used species such as *Cynodon dactylon*, *Eclipta prostrata*, and *Bacopa monnieri* showed wide spatial distribution across marshy fields and seasonal wetlands, consistent with earlier findings that common medicinal hydrophytes occupy multiple microhabitats (Gond *et al*., 2012). In contrast, niche-specific species like *Marsilea quadrifolia* and *Nymphoides indica* were restricted to permanently saturated zones, a pattern also noted in previous surveys of wetland flora in eastern India (Chowdhury & Das, 2015). Overall, the floristic patterns observed in Jajpur wetlands closely align with earlier regional studies, emphasizing the ecological and cultural importance of dominant wetland plant families.

Ethnomedicinal Utilization of Wetland Plants

The ethnomedicinal plants of the wetlands in Jajpur District form a cornerstone of traditional health practices, with communities depending on these resources for both primary and preventive healthcare. Commonly used species such as *Bacopa monnieri*, *Centella asiatica*, *Boerhavia diffusa*, *Cynodon dactylon*, *Eclipta prostrata*, and *Enhydra fluctuans* are widely employed for treating fever, digestive disorders, respiratory ailments, jaundice, skin infections, and general weakness, similar to trends reported from wetland regions of Uttar Pradesh, West Bengal, and Northeast India (Gond *et al*., 2012; Chowdhury & Das, 2015; Saha *et al.*, 2022). Studies from Assam further confirm that aquatic and semi-aquatic macrophytes play an important role in herbal medicine, especially in rural communities with limited access to modern healthcare (Deka, Dutta & Talukdar, 2019). Traditional healers typically prepare remedies using fresh leaves, roots, rhizomes, or whole-plant extracts in the form of juices, pastes, and decoctions, reflecting long-established indigenous therapeutic practices (Jain *et al*., 2011). Ethnomedicinal studies from coastal Odisha also document extensive use of wetland-associated species, particularly for treating skin diseases, gastrointestinal disorders, and inflammatory conditions, underscoring their significance in local healthcare traditions (Sahu *et al*., 2011). Overall, the utilization patterns observed in Jajpur align closely with regional ethnobotanical findings, emphasizing the essential role of wetland plants in community healthcare and livelihood support.

Cynodon dactylon (RFC 0.74): The Most Culturally Dominant Wetland Medicinal Plant

Cynodon dactylon (local name: Duba) emerges as the most culturally significant wetland medicinal plant in Jajpur District, reflected in its exceptionally high Relative Frequency of Citation (RFC = 0.74). The plant is widely used in the district as fresh juice mixed with butter for treating piles, while its additional roles in cooling the body, reducing inflammation, controlling bleeding, and healing wounds are consistent with ethnomedicinal findings across India (Dutta & Gogoi 2021; Jolly & Narayanan 2000). Beyond its therapeutic importance, *C. dactylon* also carries deep ritual and cultural value, being recognized as a sacred grass in Hindu traditions and widely associated with purity and protective functions during religious ceremonies (Tripathi *et al.* 2025). Compared with function-specific plants such as *Boerhavia diffusa* or *Centella asiatica*, *C. dactylon* stands out due to its broad-spectrum uses, year-round availability, and adaptability across wetland, pasture, and agricultural landscapes (Shendye & Gurav 2014). Its polyvalent medicinal roles, widespread cultural acceptance, and ecological abundance collectively explain why it receives the highest informant consensus and dominates the ethnomedicinal practices of wetland-dependent communities in Jajpur District.

***Bacopa monnieri* (RFC 0.59): A Key Cognitive and Respiratory Ethnomedicinal Plant**

Bacopa monnieri (locally known as Brahmi) exhibits a high Relative Frequency of Citation (RFC = 0.59), indicating its widespread recognition among wetland-dependent communities of Jajpur District. The plant is commonly administered as fresh leaf juice, either alone or mixed with cow milk, to enhance memory, learning ability, and concentration, corresponding with its traditional classification as a *medhya rasayana* in Ayurveda (Aguiar and Borowski, 2013; Walker and Pellegrini, 2023). In addition to its neurological benefits, *B. monnieri* is also used for treating cough and asthma, which is supported by studies documenting its anti-inflammatory and bronchodilatory properties (Jeyasri *et al*., 2020). Compared with general-purpose medicinal plants such as *Cynodon dactylon*, *B. monnieri* is valued for its specialized cognitive and respiratory applications, explaining its high cultural importance and frequent citation.

***Boerhavia diffusa* (RFC 0.41): A Valued Hepatoprotective and Multi-purpose Medicinal Herb**

Boerhavia diffusa (locally known as Punarnava) holds a significant Relative Frequency of Citation (RFC = 0.41) in Jajpur District, reflecting its widespread use by traditional practitioners and rural communities. The plant's roots, leaves, and whole herb are utilized in diverse therapeutic contexts, especially for jaundice, kidney and urinary disorders, asthma, and digestive complaints; such uses are widely documented among indigenous groups in the Indian subcontinent and beyond (Pandey 2025). Ethnomedical surveys report that tribal and village healers use different parts of *B. diffusa* to manage liver dysfunction (jaundice), respiratory problems (asthma), eye conditions, anemia, and gastrointestinal disorders, corroborating its versatile role in folk healthcare traditions (Pandey 2025). In addition, scientific reviews of the genus note that *B. diffusa* contains a rich array of bioactive compounds including rotenoids, flavonoids, lignans, alkaloids, and glycosides which contribute to its anti-inflammatory, antioxidant, hepatoprotective and immunomodulatory activities (Patil & Bhalsing 2016). Compared with *Cynodon dactylon*, which serves more general household uses, *B. diffusa* is particularly valued for systemic therapeutic roles, especially those related to liver and respiratory health. Its relatively high RFC reflects both its broad ethnomedicinal application and the strong cultural trust placed in this herb by wetland-dependent communities.

***Centella asiatica* (RFC 0.39): A Dual-Purpose Cognitive and Wound-Healing Wetland Herb**

Centella asiatica (locally known as Thalakudi) ranks as the fourth most important ethnomedicinal wetland plant in Jajpur District, with a Relative Frequency of Citation (RFC = 0.39), indicating its consistent use and strong cultural acceptance among local communities. In the study area, the plant is traditionally used in two principal therapeutic forms: oral consumption of fresh leaf juice for memory enhancement and topical application of leaf paste for wound healing. These uses are strongly supported by pharmacological and ethnomedicinal evidence documenting the neuroprotective, wound-healing, and anti-inflammatory properties of *C. asiatica* (Brinkhaus *et al*., 2000; Orhan, 2012). Recent phytochemical and mechanistic studies further confirm that triterpenoid compounds of *C. asiatica* contribute significantly to cognitive enhancement and tissue regeneration, validating its continued use in traditional healthcare systems (Gray *et al*., 2018). Compared with *Bacopa monnieri*, which is primarily valued for cognitive enhancement, *C. asiatica* demonstrates a broader therapeutic range due to its combined internal (neurological) and external (dermatological) applications. Its relatively high RFC therefore reflects its multifunctional medicinal value, ecological availability in wetland habitats, and long-standing trust among wetland-dependent communities.

***Tridax procumbens* (RFC 0.36): A Widely Used Wound-Healing and Anti-infective Wetland Herb**

Tridax procumbens occupies an important position among the ethnomedicinal wetland plants of Jajpur District, Odisha, with a relatively high Relative Frequency of Citation (RFC = 0.36), indicating its frequent use by local healers and rural households. In the study area, the plant is predominantly employed for the treatment of cuts, wounds, burns, and skin infections, where freshly crushed leaves or leaf juice are applied directly to the affected areas to control bleeding and promote rapid healing. Similar topical applications of *T. procumbens* for wound management have been widely documented in different parts of India, and experimental studies have also confirmed its wound-healing potential through topical formulations (Yaduvanshi *et al*., 2011). In addition to its external use, the plant is traditionally utilized for treating fever, diarrhea, dysentery, and inflammatory conditions, reflecting its broader therapeutic relevance in folk medicine (Singh, 2022). Reviews on the pharmacological properties of *T. procumbens* further report its anti-inflammatory, antimicrobial, and hemostatic activities, which provide scientific support for its widespread traditional use in primary healthcare (Jangid *et al*., 2025). Compared with *Centella asiatica*, which is valued for both cognitive enhancement and wound repair, *T. procumbens* is more specifically associated with first-aid treatment and dermatological applications. Its high RFC thus underscores its accessibility, low cost, and strong cultural acceptance as an effective medicinal plant among wetland-dependent communities.

Ethnobotanical Indices of Wetland Plants

The application of quantitative ethnobotanical indices in the present study provides an objective framework for evaluating the cultural importance, consensus, and therapeutic relevance of wetland medicinal plants used in Jajpur District. High values of Frequency of Citation (FC) and Relative Frequency of Citation (RFC) for species such as *Cynodon dactylon*, *Bacopa monnieri*, *Boerhavia diffusa*, *Centella asiatica*, and *Tridax procumbens* indicate their widespread recognition and repeated use among informants, reflecting strong cultural acceptance and perceived efficacy. Similar patterns of high RFC values for commonly available and multipurpose medicinal plants have been reported in ethnobotanical studies from India and other parts of Asia, where frequently cited species are often those integrated into daily healthcare practices (Heinrich et al., 2009; Jain et al., 2011). The Use Value (UV) further highlights the versatility of these plants, as higher UVs correspond to species employed for multiple ailments, particularly wounds, digestive disorders, fever, and respiratory complaints. Comparable relationships between high UV and therapeutic versatility have been observed in several ethnomedicinal investigations across South Asia, indicating that plants with broader use spectra tend to occupy a central role in traditional medicine (Giday *et al*., 2009). The

Informant Consensus Factor (ICF) values calculated for different ailment categories reveal higher agreement among informants for common health problems such as gastrointestinal disorders, fever, cough, and skin-related ailments, suggesting a well-established and shared traditional knowledge system. High ICF values for similar ailment groups have also been reported in ethnobotanical studies from wetland and tribal regions, where common diseases show greater consensus than rare or specialized ailments (Tardío and Pardo-de-Santayana, 2008). Overall, the quantitative indices employed in this study not only validate the ethnomedicinal importance of selected wetland plants in Jajpur District but also demonstrate strong congruence with ethnobotanical patterns documented elsewhere, underscoring the reliability, continuity, and comparative significance of indigenous medicinal knowledge systems.

The wetland flora of Jajpur district demonstrates remarkable ecological diversity, with most species assessed as Least Conscern (LC), thriving in marshes, riparian zones, and floating habitats. However, several plants remain Not Evaluated (NE) or Data Deficient (DD), such as Cynodon dactylon and Nelumbo nucifera, underscoring gaps in conservation assessment. Their varied flowering seasons highlight adaptability, while systematic monitoring is essential for sustainable management (Panda & Misra 2011; Saha *et al.* 2022).

Conclusion

This study provides the first systematic documentation of the ethnomedicinal potential of wetland flora in Jajpur district, Odisha, revealing the deep interconnection between biodiversity, traditional knowledge, and community healthcare. A total of 45 species across 32 families were recorded, with dominant taxa such as *Cynodon dactylon, Bacopa monnieri, Boerhavia diffusa, Centella asiatica and Tridax procumbens* emerging as culturally significant and therapeutically versatile. Quantitative ethnobotanical indices confirmed their widespread acceptance and multifunctional roles in treating common ailments, underscoring the reliability and resilience of indigenous knowledge systems.

The findings highlight that wetlands are not only ecological assets but also vital repositories of traditional medicine, sustaining rural livelihoods and primary healthcare. However, the conservation status of several species remains uncertain, pointing to the need for ecological monitoring and sustainable management. By integrating ethnomedicinal knowledge with scientific evaluation, this research bridges cultural heritage and modern pharmacology, offering valuable insights for biodiversity conservation, drug discovery, and community-based healthcare strategies.

In conclusion, the ethnomedicinal wealth of Jajpur's wetlands represents both a living tradition and a promising resource for ecological and biomedical innovation. Safeguarding these ecosystems and the knowledge they harbor is essential for sustaining cultural identity, enhancing healthcare resilience, and advancing future scientific exploration.

Declarations

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