

RESEARCH ARTICLE

TRADITIONAL WISDOM AND NATURAL RESOURCES: ETHNOBOTANICAL PERSPECTIVES ON MEDICINAL PLANT USE IN ODISHA, INDIA

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ABSTRACT

Indigenous knowledge within a community develops over time and is rooted in experience, often tested over centuries, and adapted to local culture and environment. This knowledge of resource utilization for medicinal purposes may have been established through trial and error, accumulated over thousands of years, and often becomes integrated into everyday cultural practices. Jaundice, a common symptom, particularly in developing countries, manifests as elevated bilirubin levels due to liver disorders, leading to yellowing of the skin and eyes. The present study conducts an ethno-medicinal investigation in Bhadrak district, Odisha, India, to explore, document, and preserve traditional knowledge for treating jaundice among local inhabitants. Ethnobotanical data were collected from 157 informants using semi-structured questionnaires, complemented by open-ended interviews, informal discussions, and direct observations. A total of 44 medicinal plant species from 32 families were documented for the treatment of jaundice. Analysis of growth forms revealed that herbs comprised 47.7%, followed by trees at 29.6%, shrubs at 13.6%, and climbers at 9.1%. The most commonly used plant parts were leaves, fruits, roots, and bark. Decoction was the primary method of preparation, followed by paste and powder. The most popular plant species for managing jaundice included *Boerhavia diffusa*, *Lawsonia inermis*, *Phyllanthus emblica*, and *Tinospora cordifolia*. This study highlights the local people's reliance on herbal remedies for jaundice treatment and provides a baseline for future phytochemical and pharmacological research to discover new plant-based therapies.

KEYWORDS

Bhadrak district, Bilirubin, Bioactive Compounds, Herbal practitioners, Jaundice, Medicinal plants, Traditional knowledge

1. INTRODUCTION

The plant-based traditional medical system has been used in almost all cultures throughout the world and still is the mainstay of more than three-quarters of the world's population for their primary healthcare (WHO, 1998; Wang et al., 2025). This therapeutic knowledge might have been established by trial and error, and in every period, the healing properties of certain medicinal plants are identified, noted, and conveyed to successive generations (Samuelsson & Bohlin, 2017). With the advent of human civilization, written records of many traditional healthcare systems (Ayurveda, Siddha, Unani, etc.) have been developed primarily based on plants (Satyavati et al., 1987). Many plant-based drugs remain in demand for a variety of diseases such as congestive cardiac failure, bronchitis, skin allergies, inflammatory conditions, and others (Fakim, 2006; Sharma et al., 2021). For instance, serpentine isolated from *Rauwolfia serpentina* and Vinblastine from *Catharanthus roseus* are pivotal in treating hypertension and various cancers, respectively (Harrison, 1998; Jones, 1998). In the developing world, over four billion people rely on plant products as their primary source of healthcare (Ekor, 2014). Nevertheless, about one-third of all vascular plants currently face extinction threats (BGCI, 2020; Nic Lughadha et al., 2020; IUCN, 2022), and medicinal plants constitute a critical component of this flora (Lambert et al., 2005; Gowthami et al., 2021). The rate of plant species loss is

increasing, driven by population growth, urbanization, and the rising demand for plant resources (Ross, 2005; Renata de Barros et al., 2022). A group researcher stated an average loss of 2.3 species per year over the past 2.5 centuries, while seed-bearing plants are declining at a rate of nearly three species annually since 1900 (Humphreys et al., 2019; Ledford, 2019).

The liver is a vital organ responsible for many metabolic functions, including processing lipids, proteins, and carbohydrates, and it acts as the body's main detoxification center. It neutralizes toxins from the intestinal tract, playing an essential role in overall health (Datta et al., 2023). A common sign of liver disorders is jaundice, characterized by yellowing of the skin and mucous membranes due to bilirubin buildup, a bile pigment (Pandit et al., 2012). Jaundice occurs when plasma bilirubin levels rise above 2 mg/dL (Rahim et al., 2012). Conditions that can lead to jaundice include acute liver inflammation, bile duct inflammation, hemolytic anemia, bile duct obstructions, cholestasis, and Gilbert's syndrome (Janghel et al., 2019). Symptoms of jaundice include yellowing of the skin and eyes, starting from the head and spreading downward, along with itching, fatigue, abdominal pain, unintended weight loss, vomiting, fever, pale stools, and dark urine. Severe cases can cause neurological symptoms such as psychosis, lethargy, seizures, coma, or even death (Muhammad et al., 2016; Tewari et al., 2017). Ayurveda, known as the Science of Life,

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extensively documents the use of medicinal plants to treat various health issues, including liver diseases.

Indigenous knowledge of medicinal plants is extremely valuable, yet without proper documentation, it risks being lost to future generations (Maroyi, 2011). Ethnomedicinal practitioners worldwide have long used native plants to manage liver disorders, and recent clinical research supports the hepatoprotective effects of many of these plants (Samadi-Noshahr et al., 2020; Mokhtari et al., 2021). Many studies have reported the use of plants for different ailments in Odisha, India, but there is a lack of baseline information on plant-based treatments for jaundice specifically in Bhadrak district of Odisha, India, highlighting an urgent need for systematic documentation of local ethnobotanical knowledge (Panda et al., 2018; Das et al., 2023). In this context, the present study aims to document and analyze the medicinal plant species used by tribal communities in Bhadrak district for managing jaundice. This research seeks to fill gaps in healthcare by recognizing indigenous knowledge systems and to help preserve biodiversity and traditional medicinal practices.

2. MATERIALS AND METHODS

2.1 Study site

Odisha, located on the east coast of India, is the ninth largest state of India by area and the eleventh largest by population. With the eastern Ghat range of hills, almost passing through the heart of the state, the high Similipala hills to its north, and the Bay of Bengal forming its eastern and southeastern frontiers. Odisha has varied ecosystems from marine to semi-arid on the west provides 'niches' for diverse animal and plant communities. The entire territory lies in the tropical zone, for which high temperature is recorded, particularly during April-May. Moreover, the sea exercises a moderating influence over the climate of the coastal belt, whereas the hill tracts experience an extreme climate. The vegetation found in this region is a tropical moist deciduous forest type (Champion and Seth, 1968).

Bhadrak district (20°43'-21°13' N and 86°6'-87°E) is located in northeast Odisha and covers an area of 2,505 square kilometers, with a population of 1.507 million (2011 Census). (Figure 1). It borders the Balasore district in the north, Jajpur in the south, the Bay of Bengal and Kendrapada district in the east, and Koenjhar in the west (Figure 1). The district accounts for 1.61% of the state's territory and shares 3.62% of the state's population. The majority of the inhabitants are villagers, and the people are engaged in agricultural practices as their primary occupation. Being situated in proximity to the Bay of Bengal, the district is experiencing periodic thunderstorms during the monsoon and dust storms in April and May.

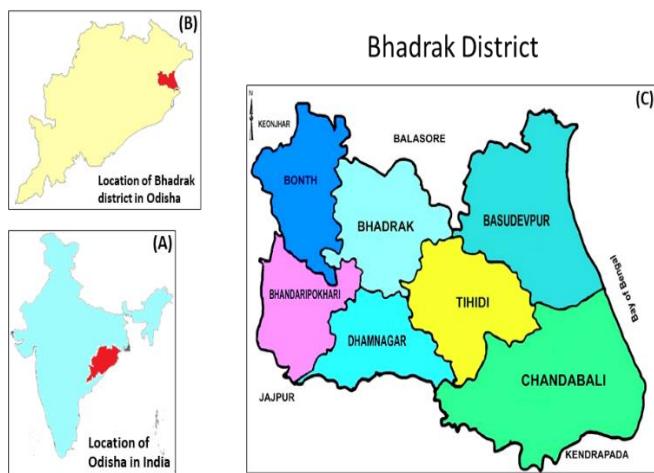


Figure 1: A. Location of Odisha state in India, B. location of Bhadrak district in Odisha and C. map of Bhadrak district showing study sites

2.2 Data collection

Extensive field surveys (July 2014 - July 2020) were conducted to document the plant species used for treating jaundice, covering all seasons in Bhadrak district. Before the field study, the aims, methods, and expected benefits were clearly explained to informants in the local language (Odia), and their consent and cooperation were obtained for documenting the plants they used. The district's seven blocks (Basudevapur, Bhadrak, Bhandaripokhari, Bonth, Chandabali, Dhamnagar, and Tihidi) were visited, and 157 informants (103 males and 54 females) were interviewed. Participants varied in age, profession, and educational background (Table

1). Inclusion criteria targeted individuals with direct or indirect experience with plant species, especially those using plants for jaundice treatment or having traditional knowledge about them. Exclusion criteria included individuals under 18, those with health conditions that could affect their ability to provide reliable information, language barriers that hindered accurate data collection, lack of informed consent, or limited knowledge or experience with relevant plant species.

Age	Number	In percent (%)
21-40	15	9.5
41-60	73	46.5
61-70	44	28.1
71 above	25	15.9
Sex		
Male	103	65.6
Female	54	34.4
Educational level		
Primary	30	19.1
Middle	37	23.6
High School	50	31.9
Higher Secondary	25	15.9
University	15	9.5
Occupation		
Self Employed (local farmers, healers)	78	49.7
Govt. Employed (teacher, bank officer)	42	26.8
Unemployed (students, housewives)	37	23.5

Information about the use of plant species for jaundice was gathered through a combination of tools and techniques, including semi-structured questionnaires, open-ended interviews, informal discussions, and direct observations (Martin, 1995; Huntington, 2000). Personal interviews and group discussions conducted in the local language provided specific information about the plants, which was further verified by cross-checking (Cunningham, 2001). During the survey, key parameters such as vernacular names, botanical names, flowering and fruiting seasons, parts used, availability, methods of consumption, and medicinal applications were recorded from respondents. Initially, plant species were identified by local names, with references to relevant Odisha flora (Saxena and Brahmam, 1996) for accuracy. The plant list was categorized according to their systematic positions following the APG IV (2016) classification system. The current names of each species were confirmed following the database Plants of the World Online.

3. RESULTS AND DISCUSSION

Traditional knowledge of plants has played a pivotal role in people's lives historically and has the potential to continue contributing significantly in the future to the sustainable development of societies and economies (Bekalo et al., 2009). In the present study, all 157 informants were literate, with at least a primary school education, including teachers, farmers, healers, unemployed students, and housewives. Among the interviewees, 46.5% were elderly individuals aged 60, and 9.5% were between 21 and 40 years old. Additionally, 26.8% held government jobs such as teachers and officers, while 49.7% were self-employed, including farmers and healers, and the remaining 23.5% were unemployed (Table 1).

The interview questions were formulated, and responses were obtained as depicted in Table 2. Traditional healers diagnosed jaundice based on symptoms such as extreme weakness, headache, fever, loss of appetite, severe constipation, nausea, yellow discoloration of the eyes, tongue, skin, and urine, dull pain in the liver region, and intense itching. Remedies were suggested based on these symptoms.

Table 2: The key interview questions and the corresponding responses during the study

Sl. No.	Interview Question	Summary of Responses
1	Informants experience	Informants shared the duration of their experience using <i>Solanum</i> species for treating various ailments.
2	Local names of medicinal plants	Local names of medicinal plants used by informants were documented.
3	Scientific names and family	Knowledge of scientific names and plant families was probed and recorded.
4	Plant type	Informants identified the plant type (herb, shrub, climber, or tree) for each medicinal plant.
5	Flowering and fruiting phenology	Phenological information, including flowering and fruiting patterns, was collected for medicinal plants.
6	Medicinal use for specific diseases	Informants detailed the diseases for which they used specific medicinal plants.
7	Plant parts used	The specific plant parts used in medicinal preparations were documented.
8	preparation method	Detailed descriptions of the methods used for preparing medicinal concoctions were recorded.
9	use singly or in combination	Informants specified whether medicinal plants were used singly or in combination with other plant parts.
10	Additional ingredients	Any additional ingredients, aside from plant material, were noted.
11	Consumption state (dried or fresh)	The state in which medicinal plants were consumed (dried or fresh) was recorded.
12	Administration method	The method of administration, such as tea, infusion, or topical application, was documented.
13	Dosage information	The recommended dosage for medicinal preparations was gathered.
14	Duration of treatment	The duration of treatment recommended for specific ailments was documented.
15	Age group of patients	Informants identified the age groups (baby, child, adult) for which medicinal plants were recommended.
16	Plant source (cultivated or wild)	Whether the medicinal plants were cultivated, harvested from gardens/farms, or sourced from the wild was documented.
17	Reported side effects	Any reported side effects of the medicinal preparations were noted.
18	Duration of preparation	The duration for which the medicinal preparation should be taken was recorded.
19	Food value	Any recognized food value of the medicinal plants was documented.
20	Other uses	Additional uses of the medicinal plants, beyond medicinal purposes, were captured.

A total of 44 medicinal plants, belonging to 32 families and 43 genera, were identified as remedies for jaundice (Table 3, Figures 2 and 3). The well-represented families in species quantity were Acanthaceae, Euphorbiaceae, and Poaceae (3 sp. each), followed by Apocynaceae, Convolvulaceae, Cucurbitaceae, Lamiaceae, Malvaceae, and Oxalidaceae (2 sp. each). Twenty-three families were monospecific, contributing to 71.8% of the total number of families. The most frequently used plant species for the treatment of jaundice were *Averrhoa carambola* L., *Boerhaavia diffusa*

L., *Cucumis sativus* L., *Lawsonia inermis* L., *Mangifera indica* L., *Phyllanthus emblica* L., *Portulaca oleracea* L., *Saccharum officinarum* L., and *Tinospora cordifolia* (Willd.) Miers ex Hook. f. & Thoms. Leaves were the plant parts most frequently used, constituting (27.0%), followed by fruits (16.7%), roots, whole plants, and bark (10.4% each), seeds (8.3%), tubers (4.2%), and others (12.6%) (Figure 4). The predominant use of leaves is comparable with studies (Appiah et al., 2019; Lal et al., 2023). This preferential use of leaves is attributed to their greater availability and ease of collection compared to other plant parts (Lal et al., 2023).

Table 3: Ethnobotanical inventory of medicinal plants used for jaundice in Bhadrak district, Odisha, India

Botanical name, family & local name	Growth forms	Parts used	Mode of application
<i>Abutilon indicum</i> (L.) Sweet. (Malvaceae), 'Pedipedika'	Herb	Leaf	Fried leaves are taken for a week.
<i>Adhatoda vasica</i> Nees (Acanthaceae), 'Basanga'	Tree	Leaf	Leaves are taken with honey for a fortnight.
<i>Alstonia scholaris</i> (L.) R. Br. (Apocynaceae), 'Chatuan'	Tree	Bark	Decoction of bark is taken for a week.
<i>Andrographis paniculata</i> (Burm.f) Wal Ex. Nees (Acanthaceae), 'Bhiunlimba'	Herb	Leaf, twig	Leaves and young twigs are crushed into a paste, 20-30 g paste is taken twice daily for 3 weeks.
<i>Argemone mexicana</i> L. (Papaveraceae), 'Kantakusum'	Herb	Whole plant	After peeling the spines, the whole plant is dried in shade, made into powder and 2 g of this powder is given orally with curd twice a day for 2-3 weeks.
<i>Asparagus racemosus</i> Willd. (Liliaceae), 'Satabari'	Herb	Root	The decoction obtained from root is taken till cure.
<i>Azadirachta indica</i> A. Juss. (Meliaceae), 'Neem'	Tree	Flower	Spoonful of roasted flower mixed sugar is administered daily twice for about 10 days.
<i>Averrhoa carambola</i> L. (Oxalidaceae), 'Karmanga'	Tree	Fruit	The decoction of fruits is prescribed orally twice daily for 3 weeks.
<i>Boerhavia diffusa</i> L. (Nyctaginaceae), 'Goudapuruni'	Herb	Root	Root paste is taken orally for a week.
<i>Cajanus cajan</i> (L.) Huth. (Fabaceae), 'Harada'	Shrub	Leaf	Leaves are crushed and made into pills, one pill is taken orally twice daily for a month.

Table 3 (Cont): Ethnobotanical inventory of medicinal plants used for jaundice in Bhadrak district, Odisha, India

Botanical name, family & local name	Growth forms	Parts used	Mode of application
<i>Carica papaya</i> L. (Caricaceae), 'Amrutabhandu'	Tree	Root	Roots of the plant with roots of <i>Lawsonia inermis</i> are taken in equal quantities and ground. Two spoonfuls of paste mixed in a glass of rice washing water is administered twice daily for 15 days.
<i>Coccinia indica</i> Wight & Arn. (Cucurbitaceae), 'Banakunduri'	Climber	Root, leaf	Paste of root and juice of leaf is taken for a week.
<i>Crinum asiaticum</i> L. (Amaryllidaceae)	Herb	Tuber	Two spoonfuls of tuberous root powder with a pinch of sugar mixed in a glass of goat milk is administered daily twice for 15 days.
<i>Cucumis sativus</i> L. (Cucurbitaceae), 'Kakudi'	Climber	Fruit	Fresh fruit is cut into small pieces and is given to the patient thrice daily for a month.
<i>Curculigo orchioides</i> Gaertn. (Hypoxidaceae), 'Talamuli'	Herb	Rhizome	Two teaspoonfuls of rhizome extract mixed with curd is given twice daily for a week.
<i>Curcuma longa</i> L. (Zingiberaceae), 'Haldi'	Herb	Pulp	20 gms of mashed pulp of Haldi is taken in morning and evening for 21 days.
<i>Cynodon dactylon</i> (L.) Pers. (Poaceae), 'Duba'	Herb	Leaf	The juice of leaves is taken orally twice daily for a week.
<i>Cyperus rotundus</i> L. (Cyperaceae), 'Mutha Ghas'	Herb	Tuber	Tubers crushed with water are given for a week.
<i>Eclipta alba</i> (L.) Hassk. (Asteraceae), 'Bhrungaraj'	Herb	Whole plant	Two teaspoonfuls decoction of whole plant is taken orally twice daily.
<i>Evolvulus alsinoides</i> (L.) L. (Convolvulaceae), 'Bichhamalia'	Herb	Whole plant	Crushed juice of whole plant is taken orally till cure.
<i>Flacourtia indica</i> (Burm.f.) Merr. (Flacourtiaceae), 'Bainchaikoli'	Shrub	Fruit	Fruits decoction is given orally twice daily for 2-3 weeks.
<i>Glycosmis pentaphylla</i> (Retz.) DC. (Rutaceae), 'Chauladhua'	Tree	Bark	Fresh bark is grinded and half cup of bark decoction is taken twice daily.
<i>Holarrhena pubescens</i> (Buch-Ham) Wall. ex G. Don. (Apocynaceae), 'Kerua'	Tree	Seed	The seeds are crushed, soaked in water for a night; dried in shade made into powder, 2-3 g powder is taken twice daily for three weeks.
<i>Hygrophila auriculata</i> (Schum.) Heine (Acanthaceae), 'Koelikhia'	Herb	Leaf	One spoon of decoction of leaf is taken for a week.
<i>Ipomea aquatica</i> Forssk. (Convolvulaceae), 'Kalama'	Climber	Twig, leaf	Tender twig with leaves is taken orally for a week.
<i>Lawsonia inermis</i> L. (Lythraceae), 'Manjuati'	Shrub	Root	Roots are crushed and its juice with rice water is given for 7 days
<i>Mangifera indica</i> L. (Anacardiaceae), 'Amba'	Tree	Bark	The bark decoction is administered orally thrice daily for 21 days.
<i>Mentha spicata</i> L. (Lamiaceae), 'Pudina'	Herb	Leaf	Powdered dry leaves are taken for 15 days.
<i>Morus alba</i> L. (Moraceae), 'Pimpudikoli'	Herb	Fruit	One cup of the juice extracted from fresh fruits is given twice a day for two weeks.
<i>Musa × paradisiaca</i> L. (Musaceae), Kadali	Shrub	Fruit	Lime coat applied on a completely ripen banana and kept in open field over night is given next day early morning in empty stomach for 7 days to cure jaundice.
<i>Ocimum sanctum</i> L. (Lamiaceae), 'Tulasi'	Herb	Leaf	Leaves with fruit of <i>Azadirachta indica</i> , seeds of <i>Syzygium cumini</i> , <i>Phyllanthus emblica</i> and <i>Piper nigrum</i> are taken in equal quantities are ground. One spoonful of the paste is taken for a week.
<i>Oroxylum indicum</i> (L.) Kurz (Bignoniaceae), 'Phanaphania'	Tree	Stem bark	Stem bark is boiled in water for one hour. Three spoonfuls of this decoction is administered twice daily for 15 days.
<i>Oryza sativa</i> L. (Poaceae), 'Dhana'	Herb	Seed	About 50mg of sundried rice is soaked in 200ml of water for whole night. Root of <i>Lawsonia inermis</i> L. is crushed and juice is extracted. Juice with rice water is taken twice daily for a month.
<i>Oxalis corniculata</i> L. (Oxalidaceae), 'Amliti'	Herb	Leaf	The juice of leaves is given twice daily for three weeks.
<i>Phyllanthus emblica</i> L. (Euphorbiaceae), 'Aonla'	Tree	Fruit	Three teaspoons of fruit powder are dissolved in one cup of water and taken orally thrice a day for three weeks.
<i>Phyllanthus fraternus</i> Webster. (Euphorbiaceae), 'Bhuiyanla'	Herb	Whole plant	Decoction of whole plant is taken for a week.
<i>Portulaca oleracea</i> L. (Portulacaceae), 'Balibaula'	Herb	Whole plant	Three spoonfuls powder of whole plant mixed with a spoonful of honey is administered on empty stomach once daily for a fortnight.

Table 3 (Cont): Ethnobotanical inventory of medicinal plants used for jaundice in Bhadrak district, Odisha, India

Botanical name, family & local name	Growth forms	Parts used	Mode of application
<i>Punica granatum</i> L. (Punicaceae), 'Dalimba'	Shrub	Seed	Seeds of the plant and fruit of <i>P. emblica</i> are grounded together along with sugar. Three teaspoons of the powder are dissolved in one cup of water and taken orally thrice a day for three weeks.
<i>Ricinus communis</i> L. (Euphorbiaceae), 'Jada'	Shrub	Leaf	Three tablets prepared from extracted leaf juice (soaked in water for a whole night) with five black pepper and a few seeds of <i>Coriandrum sativum</i> (Jeera) are taken once daily for three weeks.
<i>Saccharum officinarum</i> L. (Poaceae), 'Akhu'	Herb	Stem	One glass of juice extracted from stem is taken in empty stomach for a fortnight.
<i>Syzygium cumini</i> (L.) Skeels (Myrtaceae), 'Jamu'	Tree	Seed, bark	Powder of seed and stem bark is boiled with water for some time and given orally for a week.
<i>Terminalia chebula</i> Retz. (Combretaceae), 'Harida'	Tree	Fruit	Infusion of dried fruits is given as a drink in early morning for jaundice.
<i>Thespesia populneoides</i> Roxb.Kostel. (Malvaceae), 'Habali'	Tree	Leaf	Extract of 3-4 leaves with an equal quantity of cow milk is taken in empty stomach early in the morning for seven days.
<i>Tinospora cordifolia</i> (Willd.) Hook.f. & Thomas (Menispermaceae), 'Guluchilata'	Climber	Fruit	Two spoonfuls of dried fruit powder mixed with honey is administered once in morning for 15 days.

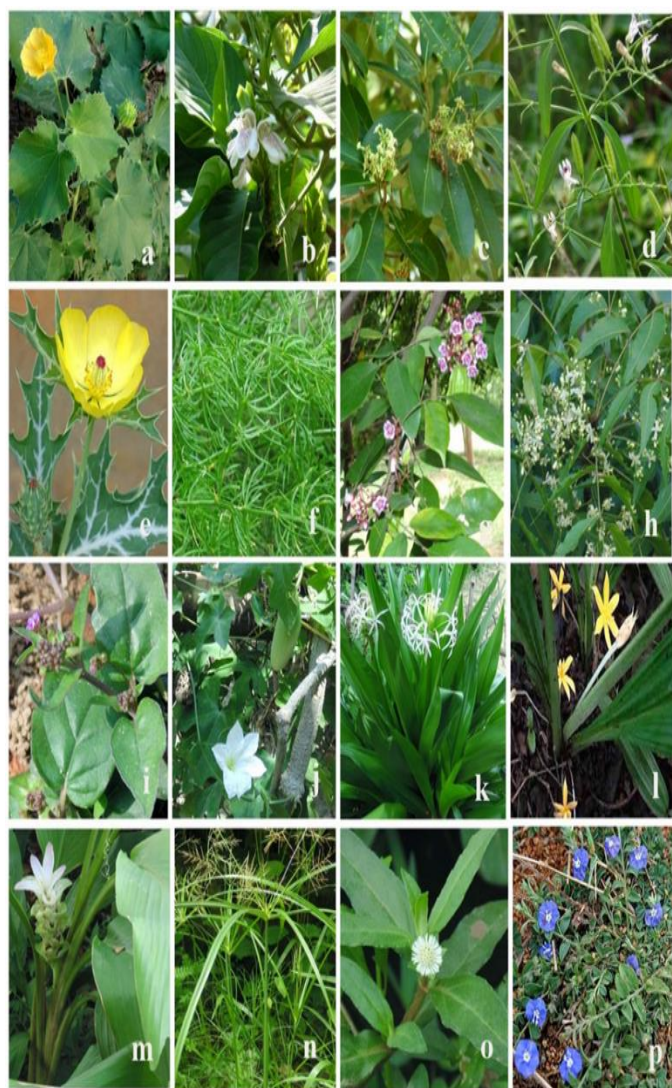


Figure 2: a. *Abutilon indicum* (L.) Sweet. b. *Adhatoda vasica* Nees. c. *Alstonia scholaris* (L.) R. Br. d. *Andrographis paniculata* (Burm.f) Wal Ex. Nees e. *Argemone mexicana* L. f. *Asparagus racemosus* Willd. g. *Averrhoa carambola* L. h. *Azadirachta indica* A. Juss. i. *Boerhavia diffusa* L. j. *Coccinia indica* Wight & Arn. k. *Crinum asiaticum* L. l. *Curculigo orchioides* Gaertn. m. *Curcuma longa* L. n. *Cyperus rotundus* L. o. *Eclipta alba* (L.) Hassk. p. *Evolvulus alsinoides* (L.) L.



Figure 3: a. *Flacourtia indica* (Burm.f.) Merr. b. *Glycosmis pentaphylla* (Retz.) DC. c. *Hygrophila auriculata* (Schum.) Heine. d. *Ipomea aquatica* Forssk. e. *Lawsonia inermis* L. f. *Mentha spicata* (L.) emend. Nath. g. *Morus alba* L. h. *Ocimum sanctum* L. i. *Oxalis corniculata* L. j. *Phyllanthus emblica* L. k. *Portulaca oleracea* L. l. *Punica granatum* L. m. *Ricinus communis* L. n. *Syzygium cumini* (L.) Skeels o. *Thespesia populneoides* Roxb.Kostel. p. *Tinospora cordifolia* (Willd.) Hook.f. & Thomas.

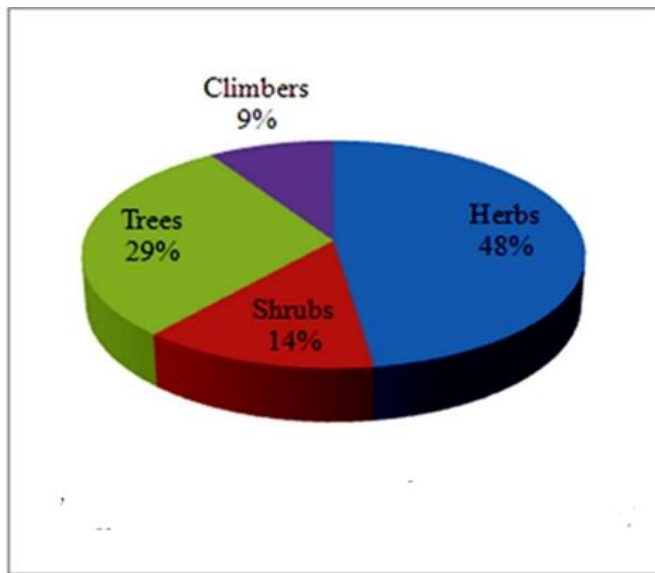


Figure 4: The growth form analysis of the plant species used for the treatment of jaundice

Furthermore, the absence of hard tissues in leaves is easier to process into powders, decoctions, and infusions, allowing for efficient extraction of bioactive compounds. Their harvesting is less harmful to plants than roots or stem barks (Boadu and Asase, 2017; Adeniyi et al., 2018). Habit analysis showed that herbs were represented by the highest proportion with (47.7%), followed by trees (29.6%), shrubs (13.6%), and climbers (9.1%) (Figure 5). The preferential use of herbs may be due to their better availability is substantiated by the studies (Gazzaneo et al., 2005; Addo-Fordjour et al., 2008). In the current investigation, the most frequently used form was decoction, followed by paste, powder, and pill. Higher use of decoction preparation for the treatment of jaundice has been reported by several workers (Boadu and Asase, 2017; Adeniyi et al., 2018; Appiah et al., 2019). Traditional healers advised patients to avoid alcohol, butter, non-vegetarian foods, salty, spicy, and sour foods.

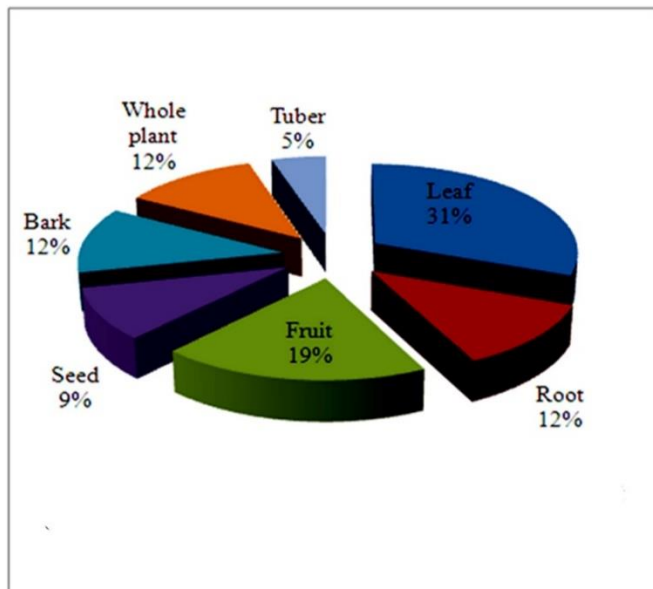


Figure 5: Percent distribution of plant parts used for the treatment of jaundice

In the study area, the fruit of *Averrhoa carambola* L. was used to treat jaundice. Various parts of the plant are used in traditional medicine in countries such as China, India, and Malaysia (Luan et al., 2021). Various authors have reported the use of *A. carambola* in treating jaundice (Gogoi et al., 2010; Gupta and Gupta, 2024). The fruit extract showed decreased serum alanine aminotransferase (ALT), aspartate aminotransferase (AST), and alkaline phosphatase (ALP) levels, thereby enhancing liver function and antioxidant activity in carbon tetrachloride-induced liver damage (Azeem et al., 2010). A group researcher demonstrated that administering Intake of fruit juice (at doses of 5, 10, and 20 g/kg daily for 14 days) exhibited hepatoprotective effects by reducing malondialdehyde (MDA)

and Cyclic Adenosine monophosphate (cAMP levels) while increasing sorbitol dehydrogenase (SDH) and superoxide dismutase (SOD) activities in the livers of streptozotocin-induced diabetic mice (Yang et al., 2018). The root of *Boerhavia diffusa* L. was used to treat jaundice.

It is widely used all over India for its hepatoprotective benefits (Janghel et al., 2019; Raghuvanshi et al., 2021; Das et al., 2023). Studies showed that both aqueous and powdered extracts of *B. diffusa* root exhibit protective effects on the liver, particularly against thioacetamide-induced hepatotoxicity in Wistar albino rats (Rawat et al., 1997). Furthermore, ursolic acid, a triterpenic acid found in *B. diffusa*, has shown hepatoprotective properties against liver damage caused by various toxins (Negi et al., 2007). In the present study, roots of *Lawsonia inermis* L. were crushed, and the juice with rice water was taken for jaundice. Several authors opined that the root of *L. inermis* is used in folk medicine in treating jaundice (Janghel et al., 2019; Gulam et al., 2023; Batiha et al., 2024). The phytochemical studies have revealed the presence of lactones, flavonoids, sterols, terpenes, carbohydrates, and tannins, known for their hepatoprotective properties (Ravishah et al., 2012). Research on Wistar rats has indicated that *L. inermis* root extracts possess significant hepatoprotective activity (Ravishah et al., 2012).

Similarly, in the current study, *Phyllanthus emblica* L., fruit powder was used to treat jaundice. In animal models, the presence of gallic acid in *P. emblica* has shown in vivo improvements in dyslipidemia, hepatosteatosis, and oxidative stress induced by high-fat diets (HFD) (Huang et al., 2017). The hepatoprotective effects of water extracts of *P. emblica* fruit (WEPE) on non-alcoholic fatty liver disease (NAFLD) have revealed significant reductions in body weight, peritoneal fat, and epididymal fat in HFD-fed rats (Huang et al., 2017). Moreover, WEPE enhanced antioxidant enzyme activities, mitigated steatosis by affecting adiponectin in adipocytes and PPAR- α in the liver, and lowered SREBP-1c levels in hepatic tissues, potentially reducing hepatic fat accumulation. A more recent study highlighted the potential inhibitory effects of *P. emblica* against hepatic steatosis and liver fibrosis (Paik et al., 2020). Juice extracted from *Saccharum officinarum* L. stem was used to cure jaundice.

In traditional Indian medicine, *S. officinarum* juice is employed for treating jaundice and liver-related ailments (Singh et al., 2015). Experimental studies on 24 Wistar Albino rats demonstrate that fresh sugarcane juice at 20 mL/kg body weight exhibits hepatoprotective effects by restoring serum enzyme levels to normal (Singh and Shukla, 2021). Several studies also support the efficacy of sugarcane juice in jaundice treatment (Janghel et al., 2019; Raghuvanshi et al., 2021). In current research, dried fruits of *T. cordifolia* were used to treat jaundice. Some researcher suggested that *T. cordifolia* has anti-hepatotoxic properties and protects against CCl₄-induced liver damage. Multiple studies show that *T. cordifolia* enhances liver function against alcohol-induced multivitamin deficiency and prevents hepatic damage from anti-tubercular drugs and bile salts, as well as shows potential in inactivating hepatitis B and E surface antigens (Karkal and Bairy, 2007; Rege et al., 1993; Singh et al., 2003; Dabur and Mittal, 2016).

Research on rats has demonstrated protection against carbon tetrachloride (CCl₄)-induced hepatic damage (Kavitha et al., 2011). *T. cordifolia* has significantly reduced the harmful effects of paracetamol, exhibiting antioxidant and hepatoprotective activities in albino mice (Singh et al., 2015; Kaushik et al., 2017). Similarly, various studies have documented the traditional use of several herbal remedies for jaundice treatment and confirmed the potential of *Adhatoda vasica* Nees, *Argemone mexicana* L., *Carica papaya* L., *Eclipta alba* (L.) Hassk., *Hygrophila auriculata* (K. Schum.), *Morus alba* L., *Phyllanthus fraternus* G.L. Webster, *Punica granatum* L., *Ricinus communis* L., and *Terminalia chebula* Retz., which have been used by communities across different regions in India (Janghel et al., 2019; Raghuvanshi et al., 2021; Das et al., 2023).

4. CONCLUSION

The present study demonstrates that folk medicine still exists among people and plays an important role in treating jaundice. It also confirms ancient traditions in Bhadrak district, Odisha, India. Documenting 44 plant species used for jaundice highlights the region's plant diversity, with herbs, especially leaves, being primarily used in sustainable harvesting methods. Plants like *Boerhavia diffusa*, *Lawsonia inermis*, *Phyllanthus emblica*, and *Tinospora cordifolia* show hepatoprotective properties supported by pharmacological research, offering hope for new treatments. However, the survival of this traditional knowledge is threatened by decreasing interest among young people, lack of proper documentation, and environmental damage caused by industrial growth. Additionally, providing modern medical care, particularly in developing countries, remains a distant goal because of economic limitations. Therefore,

thorough pharmacological validation, conservation of medicinal plants, and integration of ethnomedicine into mainstream healthcare are essential for preserving and promoting this valuable heritage for future generations.

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CONFLICT OF INTEREST

The author declares that there is no conflict of interest.

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