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TABLE OF CONTENTS

ARTICLE 2

Ethnomedicinal Significance of Selected Riparian Plant Species: An Assessment of Life Form Diversity and Therapeutic Potential

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ABSTRACT

Riparian ecosystems are ecologically dynamic landscape mosaics that sustain high plant diversity with substantial ethnomedicinal importance. Owing to their constant water availability, fertile alluvial soils, and microhabitat heterogeneity, riparian habitats serve as centers of both ecological and medicinal richness (Riis et al., 2020; Khan et al., 2025). This paper presents a comprehensive synthesis of the reported ethnomedicinal uses of riparian plant species, emphasizing the diversity of life forms and their therapeutic implications. Forty taxa were selected based on the frequency of citation in ethnobotanical-pharmacological literature and their confirmed occurrence in riparian or moisture-influenced zones. Species verification was achieved through The World Flora Online and The International Plant Names Index (Addoun et al., 2021). Among the collected data, herbaceous taxa represented 50%, shrubs 22.5%, trees 20%, and climbers 7.5%. This dominance of herbaceous life forms highlights the ecological flexibility and harvesting convenience typical of moisture-rich environments (Elujoba et al., 2005). Riparian medicinal plants were recorded for a wide range of traditional applications—gastrointestinal, inflammatory, respiratory, metabolic, and microbial disorders—demonstrating their integrated role in local healthcare. The review underscores that these ecosystems act as "natural pharmacies," combining cultural heritage with biochemical diversity.

Keywords: ethnomedicine; riparian ecosystems; life-form diversity; traditional medicine; medicinal biodiversity; phytochemistry

1. INTRODUCTION

Medicinal plants constitute a cornerstone of human cultural heritage and remain essential to primary healthcare in both rural and urban societies. Their importance is particularly pronounced in developing regions where access to modern pharmaceutical infrastructure is scarce (Elujoba et al., 2005). Over centuries, empirical observation and experimentation have fostered a vast corpus of ethnomedicinal knowledge linking specific plant species to therapeutic functions. This cumulative wisdom continues to inform modern pharmacognosy and medicinal chemistry, serving as a foundation for the isolation, characterization, and standardization of bioactive compounds (Dar et al., 2023).

Riparian vegetation—located at the transitional interface between terrestrial and aquatic ecosystems—constitutes an ecotone characterized by exceptional productivity and biodiversity (Riis et al., 2020). Dynamic hydrological regimes, periodic flooding, alluvial deposition, and continuous nutrient renewal create fertile substrates that support dense and structurally diverse plant communities (Khan et al., 2025). Within these zones, numerous species hold

long-standing medicinal and cultural significance. Traditionally, riparian plants are used to alleviate gastrointestinal disorders, skin infections, fever, respiratory ailments, and inflammatory conditions, attesting to their central role in indigenous healthcare systems (Tesfaye & Ravichadran, 2018; Khouchlaa et al., 2023).

Phytochemical and pharmacological investigations indicate that riparian species are rich in secondary metabolites such as alkaloids, glycosides, flavonoids, terpenoids, and phenolic acids, which likely underpin their curative efficacy (Baig et al., 2021; Albeshri et al., 2021). Nevertheless, ethnomedicinal documentation for this ecological group remains highly fragmented, often restricted to localized surveys without broader synthesis. This fragmentation underscores the need for a comprehensive assessment that correlates life form diversity with ethnotherapeutic potentials.

Accordingly, the present study was designed to:

(i) collect and validate published information on the ethnomedicinal uses of riparian plant species;

(ii) classify recorded taxa according to ecological life forms using morphological growth-form categories; and

(iii) analyze the distribution and extent of therapeutic applications to identify recurring pharmacological patterns.

2. MATERIALS AND METHODS

This study was carried out through a systematic literature review and meta-synthesis of available ethnobotanical and pharmacological information. Scientific data were retrieved from major academic databases, including Google Scholar, ScienceDirect, and PubMed, covering publications from 2000 to 2025. Search terms included: “riparian medicinal plants,” “ethnomedicinal applications,” “traditional healthcare,” “life-form classification,” and “medicinal flora.”

All plant species were taxonomically verified using The World Flora Online (WFO) and the International Plant Names Index (IPNI) to ensure correct nomenclature and resolve synonyms. Only peer-reviewed articles, ethnobotanical surveys, and official botanical records were included to guarantee data authenticity (Figure 1).

Species were selected based on their confirmed affinity to riparian or moisture-influenced habitats and well-documented medicinal uses. Data on botanical identity, vernacular names, growth forms, and therapeutic applications were systematically extracted and organized into a structured dataset. For comparative purposes, life forms were classified as herbs, shrubs, trees, and climbers—a morphological growth-form typology widely applied in ethnobotanical surveys. This system groups plants by their general vegetative architecture and is distinct from the Raunkiaer (1934) classification, which categorizes species based on the position of regenerating buds during unfavorable seasons.

The study emphasized the qualitative synthesis of existing information rather than experimental validation. All primary sources are cited in the results and discussion sections (Figure 2; Table 1).

3. RESULTS AND DISCUSSION

The interpretation of ethnomedicinal records collected for the sampled riparian plant species revealed specific trends in the composition of life forms. The predominant growth form recorded among the taxa included herbaceous species (20 species, 50%), which represented the highest percentage of medicinal plants. Shrubs were the second most abundant life form (9 species, 22.5%), with trees (8 species, 20%) and climbers (3 species, 7.5%) being less represented (Figure 2). This distribution of life forms demonstrates how short-lived and persistent herbaceous vegetation are common in riparian habitats, where the abundance of moisture and nutrient enrichment maximize their growth and regeneration. Furthermore, the presence of woody shrubs and trees also indicates the structural complexity of plant communities along river basins, providing a stable source of medicinal biomass throughout different seasons.

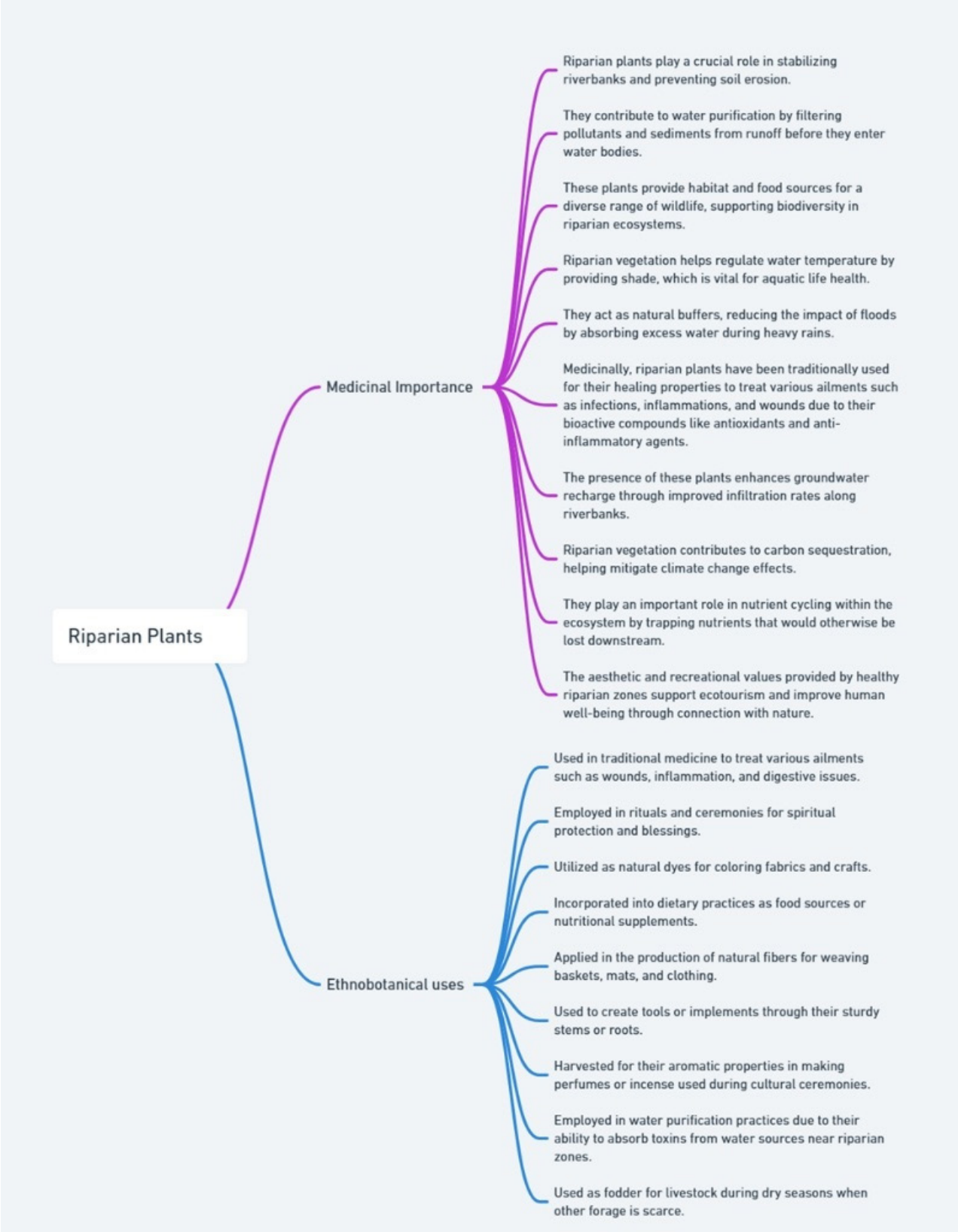

Figure 1. Overview of the ethnomedicinal and ethnobotanical significance of riparian flora. A conceptual mind map summarizing the principal categories of medicinal importance (including anti-inflammatory, antimicrobial, and wound-healing properties) and ethnobotanical uses documented for riparian plant species (Khouchlaa et al., 2023; Pham et al., 2018; Asgarpanah & Ramezanloo, 2012).

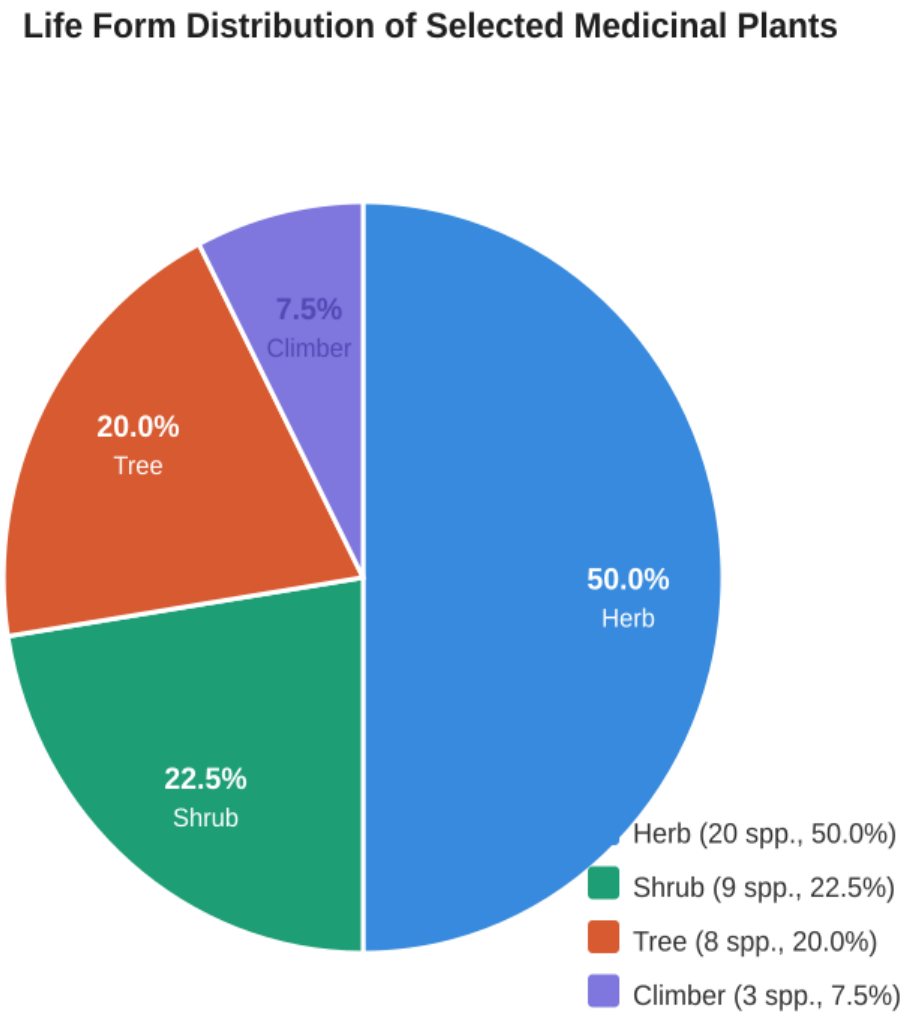

Figure 2. Distribution of life forms among selected species. Pie diagram showing the proportion of herbs (20 species; 50%), shrubs (9; 22.5%), trees (8; 20%), and climbers (3; 7.5%) recorded among the forty riparian taxa, demonstrating the dominance of herbaceous forms (Riis et al., 2020; Baliga, 2012; Rehman & Rao, 2023).

Table 1. Ethnomedicinal uses and life-form classification of selected riparian plant species.

No.	Scientific Name	Common Name	Life Form	Major Medicinal Uses	Citations
1	*Abutilon indicum (L.) Sweet*	Indian Mallow	Herb	Anti-inflammatory, diuretic, treatment of cough, asthma	(Rajeshwari et al., 2018)
2	*Vachellia nilotica (L.) P.J.H. Hurter & Mabb.*	Babul, Gum Arabic Tree	Tree	Antimicrobial, astringent, diarrhea, wound healing	(Ali et al., 2012)
3	*Alcea rosea L.*	Hollyhock	Herb	Demulcent, anti-inflammatory, respiratory ailments	(Azadeh et al., 2023)

No.	Scientific Name	Common Name	Life Form	Major Medicinal Uses	Citations
4	*Alstonia scholaris (L.) R.Br.*	Devil's Tree	Tree	Antimalarial, antipyretic, respiratory disorders	(Baliga et al., 2012)
5	*Althaea officinalis L.*	Marshmallow	Herb	Soothing agent, cough, gastrointestinal irritation	(Turgumbayeva et al., 2025)
6	*Asclepias curassavica L.*	Tropical Milkweed	Herb	Cardiotonic, expectorant, skin diseases	(Al-Snafi et al., 2015)
7	*Bombax ceiba L.*	Silk Cotton Tree	Tree	Astringent, anti-diarrheal, wound healing	(Taher et al., 2024)
8	*Calendula arvensis L.*	Field Marigold	Herb	Antiseptic, wound healing, skin inflammation	(Khouchlaa et al., 2023)
9	*Calotropis procera (Aiton) Dryand.*	Apple of Sodom	Shrub	Analgesic, anti-inflammatory, skin diseases	(Mossa et al., 1991)
10	*Caralluma tuberculata N.E.Br.*	Bitter Cucumber (Wild)	Herb	Antidiabetic, appetite suppressant	(Baig et al., 2021)
11	*Carissa carandas Lour.*	Karonda	Shrub	Antioxidant, digestive disorders, anemia	(Tesfaye et al., 2018)
12	*Catharanthus roseus (L.) G.Don*	Madagascar Periwinkle	Herb	Anticancer, antidiabetic, antihypertensive	(Pham et al., 2018)
13	*Centaurium pulchellum (Sw.) Hayek*	Lesser Centaury	Herb	Digestive tonic, liver disorders	(Krstić et al., 2003)
14	*Chenopodium murale L.*	Nettleleaf Goosefoot	Herb	Anthelmintic, digestive stimulant	(Rehman et al., 2023)
15	*Cleome viscosa L.*	Wild Mustard	Herb	Analgesic, antimicrobial, fever treatment	(Singh et al., 2015)
16	*Corchorus olitorius L.*	Jute Mallow	Herb	Anti-inflammatory, laxative, nutritional tonic	(Abdel-Razek et al., 2022)
17	*Cryptolepis dubia (Burm.f.) M.R.Almeida*	Indian Sarsaparilla	Climber	Antipyretic, antimalarial	(Hegde et al., 2023)
18	*Datura metel L.*	Thorn Apple	Shrub	Analgesic, antispasmodic (toxic—used carefully)	(Chouhan et al., 2024)
19	*Ficus religiosa L.*	Peepal Tree	Tree	Anti-asthmatic, anti-diabetic, wound healing	(Murugesu et al., 2021)
20	*Ficus carica L.*	Fig	Tree	Digestive aid, laxative, antioxidant	(Mawa et al., 2013)
21	*Fumaria vaillantii Loisel.*	Fumitory	Herb	Liver tonic, blood purifier	(Lamba et al., 1977)
22	*Grewia asiatica L.*	Phalsa	Shrub	Cooling agent, antioxidant, digestive	(Jariwala et al., 2024)

No.	Scientific Name	Common Name	Life Form	Major Medicinal Uses	Citations
23	*Hibiscus rosa-sinensis L.*	China Rose	Shrub	Hair growth, anti-inflammatory, menstrual disorders	(Missoum et al., 2018)
24	*Leptadenia pyrotechnica (Forssk.) Decne.*	Khimp	Shrub	Lactagogue, tonic, digestive	(Idrees et al., 2016)
25	*Morus alba L.*	White Mulberry	Tree	Antidiabetic, antioxidant, lipid-lowering	(Hussain et al., 2017)
26	*Nerium oleander L.*	Oleander	Shrub	Cardiotonic (toxic—medicinal in controlled doses)	(Hase et al., 2017)
27	*Oxystelma esculentum (L.f.) Sm.*	Rosy Milkweed Vine	Climber	Anti-ulcer, anti-inflammatory	(Pandya et al., 2011)
28	*Peganum harmala L.*	Syrian Rue	Herb	Antimicrobial, nervous disorders	(Asgarpanah et al., 2012)
29	*Pergularia daemia (Forssk.) Chiov.*	Veliparuthi	Climber	Anti-rheumatic, antidiabetic	(Chandak et al., 2019)
30	*Plantago ciliata Desf.*	Plantain	Herb	Wound healing, digestive disorders	(Addoun et al., 2021)
31	*Plumeria rubra L.*	Frangipani	Shrub	Anti-inflammatory, skin infections	(Khan et al., 2021)
32	*Rhazya stricta Decne.*	Harmal Bush	Herb	Anticancer, antihypertensive	(Albeshri et al., 2021)
33	*Sida rhombifolia L.*	Arrowleaf Sida	Herb	Analgesic, anti-inflammatory	(Mah et al., 2017)
34	*Solanum virginianum L.*	Yellow-berried Nightshade	Herb	Respiratory disorders, anti-asthmatic	(Saraswathi et al., 2021)
35	*Stellaria media (L.) Vill.*	Chickweed	Herb	Anti-inflammatory, skin ailments	(Miere et al., 2023)
36	*Tabernaemontana divaricata (L.) R.Br.*	Crape Jasmine	Shrub	Analgesic, sedative	(Ghosh et al., 2021)
37	*Tecomella undulata (Sm.) Seem.*	Rohida	Tree	Hepatoprotective, anti-inflammatory	(Vats et al., 2025)
38	*Tribulus terrestris L.*	Puncture Vine	Herb	Aphrodisiac, diuretic, kidney disorders	(Saeed et al., 2024)
39	*Vinca major L.*	Greater Periwinkle	Herb	Antihypertensive, wound healing	(Javaid et al., 2021)
40	*Woodfordia fruticosa (L.) Kurz*	Fire-Flame Bush	Tree	Astringent, antimicrobial, gynecological disorders	(Giri et al., 2023)

The medicinal applications of the selected species showed a high degree of diversity in their uses. A significant proportion of the plants (e.g., Althaea officinalis, Ficus carica) were found to be integral in the management of gastrointestinal ailments, such as gut upsets, diarrhea, constipation, and liver-related conditions. Riparian medicinal plants were also frequently employed to treat respiratory diseases like cough, asthma, bronchitis, and throat infections, highlighting the importance of these ecosystems in addressing common community health issues. Furthermore, some species were reported to have potent anti-inflammatory, analgesic, and antipyretic effects, implying their widespread use in treating pain, fever, and inflammation in traditional healthcare systems.

Further analysis of the ethnomedicine data revealed that the species in use possessed numerous therapeutic properties beyond single applications. Many plants were believed to have broad-spectrum antimicrobial, antidiabetic, wound-healing, and antioxidant effects, with many being used to treat both internal and external disorders. For instance, species such as Catharanthus roseus and Vachellia nilotica exhibit multipurpose pharmacological profiles. Some species were also used to treat metabolic conditions, heart ailments, and skin diseases. The prevalence of such multipurpose medicinal plants across various life forms underscores the extensive ethnomedicinal value of riparian vegetation and indicates the long history of traditional knowledge associated with these ecosystems.

From a conservation perspective, the reliance on these plants suggests that riparian zones act as "natural pharmacies." However, the fragmented nature of current documentation poses a risk to the preservation of this indigenous heritage. The findings suggest that integrating traditional knowledge associated with these ecosystems into modern conservation strategies is essential for the sustainable utilization of medicinal biodiversity and the potential discovery of new bioactive compounds for pharmaceutical development.

4. Conclusion

The present literature-based analysis highlights the significant ethnomedicinal relevance of riparian vegetation species and their important role in conventional medical practices. The predominance of herbaceous and shrubby taxa can be attributed to their ecological adaptability as well as their extensive utilization by local communities in riparian environments. The wide spectrum of reported therapeutic applications—including digestive and respiratory treatments, along with antimicrobial and anti-inflammatory uses—demonstrates the considerable pharmaceutical potential and diversity of riparian flora. These findings emphasize that riparian ecosystems represent landscapes of profound biological and cultural importance, underscoring the urgent need for their conservation. Protecting these habitats is essential not only for maintaining ecological integrity but also for preserving traditional medicinal knowledge. Future research and sustainable utilization of riparian medicinal plants should integrate phytochemical profiling, pharmacological validation, and conservation assessments to fully explore and safeguard their therapeutic potential.

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