



ZÖFÖ-SÖFÖ (AGERATUM CONYZOIDES) AS AN UNDEREXPLORED ETHNOMEDICINAL PLANT: A STUDY OF NIAS INDIGENOUS HERBAL HERITAGE

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KEYWORD

Zöfö-Söfö;
Ageratum Conyzoides;
Ethnomedicine;
Ethnobotany;
Nias Indigenous Knowledge.

ABSTRACT

Zöfö-söfö (*Ageratum conyzoides*) is a widely distributed medicinal plant with significant ethnomedicinal value in various traditional healing systems, including the indigenous knowledge of the Nias community in Indonesia. This study aims to explore Zöfö-söfö as an underexplored ethnomedicinal plant through a qualitative literature review focusing on its traditional uses, phytochemical composition, pharmacological potential, and cultural significance. Data were collected from scientific journals, ethnobotanical studies, and ethnopharmacological reports obtained through academic databases such as Google Scholar, ScienceDirect, and SpringerLink. The findings indicate that Zöfö-söfö is traditionally used to treat fever, cough, malaria, digestive disorders, wounds, and inflammatory conditions. These applications are supported by phytochemical evidence identifying bioactive compounds such as flavonoids, alkaloids, tannins, and essential oils, which contribute to antimicrobial, anti-inflammatory, and analgesic properties. Although the plant is well documented in global ethnopharmacological literature, its specific role in the Nias indigenous medical system remains insufficiently studied, revealing a significant research gap. This study emphasizes the importance of preserving indigenous ethnomedicinal knowledge, which is increasingly threatened by modernization and cultural transformation. Furthermore, Zöfö-söfö has potential educational value as a contextual learning resource in biology education, particularly in teaching biodiversity, plant physiology, and ethnobotany. In conclusion, Zöfö-söfö represents a meaningful link between traditional knowledge and modern scientific validation, highlighting the need for further interdisciplinary research.

INTRODUCTION

Zöfö-söfö, locally known in Nias Island as a traditional medicinal plant, refers to *Ageratum conyzoides*, a herbaceous species widely distributed in tropical and subtropical regions. Although often regarded as a common weed growing in agricultural fields, home gardens, and roadside areas, this plant holds significant ethnomedicinal value for the indigenous communities of Nias. For generations, Zöfö-söfö has been integrated into traditional healing practices, reflecting a deep connection between local ecological knowledge and healthcare systems [1].

In the cultural context of the Nias people, Zöfö-söfö is not merely a wild plant but a vital component of indigenous medical heritage. It is traditionally used to treat a variety of health conditions, including fever, cough, malaria, flatulence, colds, and swelling caused by injuries [2]. The plant is processed in different ways depending on the ailment and cultural practice. Common methods include boiling the leaves to produce herbal

decoctions for internal consumption, crushing the leaves for external application on wounds, or burning the plant for therapeutic inhalation. These practices demonstrate a sophisticated understanding of herbal preparation techniques passed down through oral tradition [3].

The widespread use of *Ageratum conyzoides* in ethnomedicine is not unique to Nias but is also documented in various parts of Asia, Africa, and South America. Phytochemical studies have shown that the plant contains biologically active compounds such as flavonoids, alkaloids, tannins, and essential oils, which contribute to its antimicrobial, anti-inflammatory, and analgesic properties [4]. Despite this scientific validation, its traditional knowledge systems remain underdocumented, particularly in isolated cultural contexts such as Nias Island.

The increasing interest in ethnobotany and ethnopharmacology has highlighted the importance of preserving indigenous knowledge systems before they are lost due to modernization and cultural homogenization. In many rural communities, younger generations are becoming less familiar with traditional medicinal plants, leading to a gradual erosion of ecological wisdom. In this regard, Zöfö-söfö represents an important case study for documenting and revitalizing indigenous health practices within a scientific framework [5].

Moreover, integrating ethnomedicinal knowledge into modern education and research can contribute to sustainable healthcare solutions and biodiversity conservation. Ethnobotanical studies emphasize that traditional knowledge often provides preliminary insights for drug discovery and ecological management [6]. Therefore, investigating Zöfö-söfö within the Nias community not only preserves cultural heritage but also supports broader scientific and environmental objectives.

This study aims to explore Zöfö-söfö as an underexplored ethnomedicinal plant by examining its traditional uses, cultural significance, and potential pharmacological relevance. By situating the plant within the indigenous knowledge system of the Nias people, this research contributes to the growing discourse on biocultural diversity and the importance of preserving traditional ecological knowledge in the era of globalization.

METHOD

His study employs a qualitative literature review (library research method) to examine the ethnomedicinal significance of Zöfö-söfö (*Ageratum conyzoides*) within the indigenous herbal heritage of the Nias community. A literature review approach was selected because the primary objective of this research is to synthesize existing scientific knowledge and ethnobotanical reports regarding the plant's traditional uses, phytochemical properties, and cultural relevance, rather than generating new experimental or field-based data [7].

The research process began with the identification of relevant academic sources from scientific databases such as Google Scholar, ScienceDirect, PubMed, SpringerLink, and JSTOR. Additional sources were collected from ethnobotanical books, peer-reviewed journal articles, and credible ethnopharmacological reviews. Keywords used in the search strategy included “*Ageratum conyzoides*,” “ethnomedicine,” “ethnobotany,” “traditional herbal medicine,” “Nias indigenous knowledge,” and “medicinal plants in Southeast Asia.” The selection of literature was limited to publications in English and Indonesian, with a publication range primarily between 1990 and 2025 to ensure both foundational and recent scientific perspectives were included [8].

Inclusion criteria for the reviewed literature consisted of: (1) studies focusing on the ethnomedicinal uses of *Ageratum conyzoides*, (2) ethnobotanical research related to Southeast Asian or Indonesian traditional knowledge systems, (3) pharmacological studies identifying bioactive compounds and biological activities of the plant, and (4) publications discussing indigenous knowledge preservation, particularly in island or rural communities. Studies that lacked scientific methodology or were not peer-reviewed were excluded to maintain academic reliability.

The collected data were analyzed using thematic analysis, which involved categorizing information into key themes such as traditional medicinal uses, preparation methods, phytochemical composition,

pharmacological activities, and cultural significance. This analytical approach allows for the systematic identification of patterns across different studies and supports the integration of ethnobotanical knowledge with modern scientific findings. Through this process, the study highlights how Zöfö-söfö is positioned both as a culturally significant medicinal plant and a scientifically validated species with potential pharmacological applications [9].

To ensure the validity and reliability of the findings, triangulation of sources was applied by comparing information from ethnobotanical field reports, pharmacological experiments, and review articles. This cross-verification helps reduce bias and ensures that conclusions are grounded in multiple lines of evidence. Furthermore, the study acknowledges the limitations of literature-based research, particularly the absence of direct fieldwork in Nias, which may restrict the depth of cultural interpretation. However, this limitation is addressed by focusing on credible ethnographic and ethnobotanical documentation related to similar cultural contexts in Indonesia.

Ethical considerations in this study involve proper citation of all referenced works and respect for indigenous knowledge systems. The research emphasizes that traditional knowledge should not be exploited but rather documented and preserved as part of global biocultural heritage. In line with this, the study aligns with principles of ethnobotanical ethics, which advocate for the respectful representation of indigenous communities and their intellectual contributions.

Overall, this literature-based methodology provides a comprehensive framework for understanding Zöfö-söfö as an underexplored ethnomedicinal plant. By synthesizing scientific and cultural perspectives, the study contributes to a deeper appreciation of Nias indigenous herbal heritage and supports the integration of traditional knowledge into modern ethnopharmacological research [10].

RESULTS

Based on the synthesis of literature from ethnobotanical, ethnopharmacological, and phytochemical studies, Zöfö-söfö (*Ageratum conyzoides*) emerges as a widely distributed medicinal plant with significant but underdocumented cultural importance in the Nias indigenous community. The reviewed literature indicates that although the plant is globally recognized for its medicinal potential, its specific ethnomedicinal role in Nias remains underexplored in scientific publications. This gap highlights the importance of documenting local knowledge systems before they are further diminished by modernization and cultural change.

1. Ethnomedicinal Uses in Traditional Knowledge Systems

The literature consistently reports that *Ageratum conyzoides* is used in traditional medicine systems across tropical regions, including Southeast Asia, Africa, and South America. In the Nias context, secondary ethnobotanical sources indicate that the plant, locally known as Zöfö-söfö, is used to treat fever, cough, malaria, digestive disorders, colds, and wound-related inflammation. These findings align with broader ethnomedicinal documentation that recognizes the plant as a multipurpose herbal remedy [4]. Preparation methods vary depending on the intended treatment. Decoction (boiling leaves in water) is commonly used for internal ailments, while fresh crushed leaves are applied externally to wounds and skin inflammation. Some reports also mention the use of smoke from burned leaves for respiratory relief. These practices reflect a sophisticated indigenous understanding of dosage forms and therapeutic application, consistent with ethnopharmacological principles observed in other traditional societies [11].

2. Phytochemical and Pharmacological Evidence

Phytochemical investigations reveal that *Ageratum conyzoides* contains several bioactive compounds, including flavonoids, alkaloids, coumarins, tannins, and essential oils. These compounds are associated with a range of biological activities such as antimicrobial, anti-inflammatory, analgesic, and antipyretic effects. Okunade (2002) reports that the plant exhibits significant pharmacological potential, particularly in inhibiting microbial growth and reducing inflammation. Further studies suggest that the essential oils extracted from the plant contain precocene I and precocene II, which are responsible for insecticidal and wound-healing properties. These scientific findings provide biochemical validation for its traditional use in treating infections and external injuries. However, despite these well-documented properties, there is

limited region-specific pharmacological validation related to Nias-derived plant samples, indicating a research gap between global scientific knowledge and local ethnobotanical application.

3. Cultural Significance in Nias Indigenous Knowledge

Although scientific literature on Nias-specific usage is limited, ethnographic interpretations suggest that Zöfö-söfö is part of a broader indigenous health system that integrates natural resources with spiritual and cultural practices. Traditional healers in rural communities rely on environmental observation and generational knowledge transfer to identify medicinal plants. In this context, Zöfö-söfö is not only a therapeutic agent but also a symbol of ecological wisdom and cultural continuity [12]. The literature emphasizes that such knowledge is typically transmitted orally, making it vulnerable to loss due to modernization and reduced intergenerational learning. This supports findings from Cunningham (2001), who highlights that indigenous ethnobotanical knowledge is rapidly declining in many developing regions due to environmental and cultural pressures.

4. Ethnobotanical Relevance and Educational Potential

The reviewed studies strongly support the integration of ethnobotanical knowledge into formal education systems. *Ageratum conyzoides* serves as an effective example for teaching biological concepts such as plant morphology, secondary metabolites, ecological adaptation, and human-plant interactions. In the context of Nias heritage, Zöfö-söfö can function as a contextual learning resource that connects biology education with local cultural identity. Ethnobotanical education also promotes environmental awareness and conservation attitudes among students. By linking scientific concepts with familiar local plants, learners develop a more meaningful understanding of biodiversity. This approach aligns with ethnopedagogical frameworks that emphasize culturally responsive teaching methods [13].

5. Research Gap and Novelty Identification

Despite extensive global research on *Ageratum conyzoides*, the literature reveals a significant gap regarding its ethnomedicinal documentation in Nias Island. Most existing studies focus on pharmacological properties or general ethnobotanical usage in broader regions of Indonesia. There is limited empirical or qualitative documentation specifically addressing how Nias communities prepare, apply, and transmit knowledge about Zöfö-söfö. This gap represents an important opportunity for future research in ethnopharmacology and biocultural conservation. The lack of localized scientific validation also suggests the need for field-based studies to complement existing literature. Such research could provide deeper insights into dosage, preparation techniques, and cultural meanings associated with the plant.

6. Synthesis of Findings

Overall, the literature demonstrates that Zöfö-söfö (*Ageratum conyzoides*) occupies a dual position as both a scientifically recognized medicinal plant and a culturally significant ethnomedicinal resource. While its pharmacological properties are well documented, its role within the Nias indigenous knowledge system remains underrepresented in academic research [10]. This imbalance underscores the importance of integrating ethnobotanical fieldwork with laboratory-based studies to fully understand its therapeutic and cultural value. The synthesis of findings suggests that Zöfö-söfö has strong potential for further investigation in ethnopharmacology, conservation biology, and educational development. Recognizing and preserving such indigenous knowledge systems is essential for maintaining biocultural diversity and supporting sustainable healthcare alternatives.

DISCUSSION

The findings from the literature review highlight that Zöfö-söfö (*Ageratum conyzoides*) represents a significant ethnomedicinal resource that bridges traditional knowledge systems and modern pharmacological science. Although the plant is widely studied in global ethnobotanical and phytochemical literature, its specific cultural and medicinal applications within the Nias indigenous community remain insufficiently documented. This discussion interprets these findings in relation to ethnobotanical theory, pharmacological validation, cultural preservation, and educational implications.

1. Ethnomedicinal Knowledge as a Biocultural System

The literature confirms that *Ageratum conyzoides* is deeply embedded in traditional medicinal systems across tropical regions. In Nias, Zöfö-söfö is used to treat fever, malaria, wounds, digestive disorders, and respiratory ailments, reflecting a holistic understanding of plant-based healing. This aligns with the concept of ethnomedicine, which recognizes health practices as part of a broader cultural and ecological system rather than isolated biological treatments [11]. The continued use of Zöfö-söfö demonstrates the resilience of indigenous knowledge systems despite increasing exposure to modern medicine. However, this knowledge is primarily transmitted orally, making it vulnerable to erosion. As [14] notes, the loss of traditional ecological knowledge often occurs when younger generations shift away from subsistence lifestyles. In the case of Nias, this trend may lead to the gradual disappearance of valuable ethnomedicinal practices unless they are systematically documented and integrated into educational frameworks.

2. Pharmacological Validation and Scientific Relevance

From a pharmacological perspective, *Ageratum conyzoides* has been extensively studied for its bioactive compounds, including flavonoids, alkaloids, tannins, and essential oils. These compounds are responsible for its antimicrobial, anti-inflammatory, analgesic, and wound-healing properties. [4] provides evidence that supports many of the traditional uses reported in ethnobotanical literature. The presence of precocene compounds further strengthens the scientific relevance of the plant, particularly in insecticidal and dermatological applications. However, while global studies confirm its pharmacological potential, there is limited localized research that examines how environmental factors in Nias may influence the phytochemical composition of the plant. This represents a critical research gap, as variations in soil composition, climate, and harvesting practices can significantly affect medicinal potency. The discrepancy between global pharmacological data and local ethnomedicinal documentation suggests that Zöfö-söfö is underexplored not in terms of biological properties, but in terms of context-specific ethnopharmacology. This highlights the importance of regionally grounded studies that integrate laboratory analysis with indigenous knowledge systems.

3. Cultural Significance and Knowledge Transmission

The ethnobotanical role of Zöfö-söfö in Nias extends beyond its medicinal function; it is also a cultural artifact embedded within traditional healing systems. The plant is part of a broader ecological worldview in which nature and human health are interconnected. Traditional healers in Nias often rely on experiential knowledge passed through generations, reinforcing the cultural identity of the community. However, modernization, urbanization, and formal education systems have contributed to the weakening of this knowledge transmission process. Younger generations increasingly depend on biomedical healthcare systems, leading to reduced familiarity with medicinal plants. This shift creates a risk of cultural disconnection and loss of biocultural diversity. Therefore, documenting plants like Zöfö-söfö is not only a scientific endeavor but also a cultural preservation strategy.

4. Ethnobotany and Educational Integration

One of the key implications of this study is the potential integration of ethnobotanical knowledge into biology education. Zöfö-söfö can serve as a contextual learning tool that connects abstract biological concepts with real-life cultural practices. For example, topics such as plant secondary metabolites, ecological adaptation, and human-plant interactions can be taught using locally familiar species [15]. Emphasizes that ethnobotanical education enhances student engagement by linking scientific knowledge with cultural relevance. In the context of Nias, incorporating Zöfö-söfö into biology curricula can strengthen students' appreciation of local biodiversity and encourage conservation awareness. This approach also aligns with ethnopedagogical principles, which advocate for culturally responsive teaching methods that respect indigenous knowledge systems.

5. Conservation and Sustainability Implications

The increasing interest in herbal medicine and natural products raises concerns about the sustainability of medicinal plant harvesting. Although *Ageratum conyzoides* is not currently endangered due to its widespread distribution, overharvesting in localized areas could still disrupt ecological balance. Sustainable harvesting practices should therefore be encouraged, particularly if the plant becomes more

widely used in commercial or pharmaceutical applications. Ethnobotanical literature suggests that indigenous communities often possess sustainable resource management practices developed through long-term ecological interaction [16]. In Nias, such practices may include selective harvesting and seasonal collection methods. Recognizing and integrating these practices into conservation strategies can contribute to both biodiversity protection and cultural preservation.

6. Research Gap and Future Directions

The most significant finding from this review is the lack of empirical studies specifically focusing on Zöfö-söfö in the Nias context. While pharmacological and ethnobotanical data exist at a general level, there is limited documentation of local preparation techniques, dosage variations, and cultural meanings associated with the plant. Future research should adopt interdisciplinary approaches combining ethnography, phytochemistry, and educational studies. Field-based ethnobotanical surveys in Nias are essential to validate and expand existing knowledge. Additionally, laboratory analysis of locally sourced plant specimens could reveal potential variations in chemical composition influenced by environmental conditions. In synthesis, Zöfö-söfö (*Ageratum conyzoides*) represents a valuable intersection between traditional knowledge and scientific inquiry. Its pharmacological properties are well established, yet its ethnomedicinal significance within the Nias community remains underexplored. This gap highlights the importance of integrating indigenous knowledge systems into scientific research frameworks. The plant serves as a model for understanding how local communities interact with biodiversity to develop sustainable healthcare practices. Furthermore, it demonstrates the importance of preserving ethnobotanical knowledge as part of global biocultural heritage. Strengthening research in this area will not only contribute to scientific advancement but also support cultural sustainability and educational innovation.

CONCLUSION

Based on the comprehensive literature review, Zöfö-söfö (*Ageratum conyzoides*) is confirmed as a medicinally important plant with a wide range of ethnomedicinal applications across tropical regions, including its traditional use within the Nias indigenous community. The findings of this study indicate that the plant plays a significant role in local healthcare practices, where it is traditionally used to treat fever, cough, malaria, digestive disorders, wounds, and inflammatory conditions. These uses are supported by global ethnobotanical literature, which consistently identifies *Ageratum conyzoides* as a multipurpose medicinal herb with strong therapeutic potential.

The review of scientific literature further confirms that Zöfö-söfö contains a variety of bioactive compounds such as flavonoids, alkaloids, tannins, and essential oils. These compounds contribute to its antimicrobial, anti-inflammatory, analgesic, and wound-healing properties. This scientific validation strengthens the credibility of traditional knowledge held by the Nias community and demonstrates that indigenous medicinal practices are often aligned with pharmacological evidence, even when they originate from non-formal knowledge systems.

However, despite its global recognition in ethnopharmacology, the specific ethnomedicinal knowledge of Zöfö-söfö in the Nias context remains underdocumented and underexplored. Most available studies focus on general uses of the plant in broader Southeast Asian or tropical regions, without detailed attention to local variations in preparation methods, dosage, cultural meanings, and transmission of knowledge within the Nias community. This gap indicates that the ethnobotanical profile of Zöfö-söfö in Nias is still not fully integrated into academic discourse.

Furthermore, the study highlights that traditional knowledge associated with Zöfö-söfö is primarily transmitted orally across generations. This mode of transmission makes it vulnerable to gradual decline due to modernization, urbanization, and increasing reliance on modern healthcare systems. As younger generations become less familiar with medicinal plants, there is a risk of losing valuable biocultural heritage. Therefore, Zöfö-söfö is not only significant as a medicinal plant but also as a cultural symbol representing the relationship between the Nias people and their natural environment [17].

In addition, the findings suggest that Zöfö-söfö has strong relevance for educational development, particularly in biology learning. Its integration into ethnobotanical-based education can enhance students' understanding of plant biology, ecological relationships, and the importance of biodiversity conservation. By connecting scientific concepts with local knowledge systems, Zöfö-söfö can serve as an effective contextual learning resource that strengthens both cognitive understanding and cultural identity [18].

Overall, this study concludes that Zöfö-söfö (*Ageratum conyzoides*) represents an important intersection between traditional knowledge and modern scientific understanding. While its pharmacological properties are well established in global research, its ethnomedicinal significance within the Nias indigenous system remains insufficiently explored. This highlights the importance of further interdisciplinary research to document, preserve, and scientifically validate indigenous herbal knowledge before it is lost.

Recommendations

Based on the findings of this literature review, several recommendations are proposed for future research, education, and cultural preservation efforts.

First, there is a strong need for field-based ethnobotanical studies in Nias Island. Future research should involve direct engagement with local healers, elders, and community members to document detailed information about Zöfö-söfö, including preparation techniques, dosage variations, cultural beliefs, and specific healing practices. Such primary data collection would significantly enrich the existing academic understanding of the plant and provide a more accurate representation of its ethnomedicinal role in Nias society.

Second, phytochemical and pharmacological studies using locally sourced specimens should be conducted. Environmental conditions such as soil type, climate, and altitude may influence the chemical composition of *Ageratum conyzoides*. Therefore, analyzing plants specifically from Nias could reveal unique biochemical variations and potentially new medicinal properties that have not been previously reported in global literature.

Third, it is recommended that educational institutions integrate ethnobotanical knowledge into biology curricula. Zöfö-söfö can be used as a local learning resource to teach topics such as plant anatomy, secondary metabolites, ecosystem interactions, and sustainable resource use. This approach will not only improve students' scientific understanding but also strengthen their appreciation of local cultural heritage and biodiversity conservation.

Fourth, there should be community-based conservation and knowledge preservation programs. These programs may include documentation of traditional medicinal plants, creation of local herbal gardens, and intergenerational knowledge-sharing activities. By involving both elders and youth, such initiatives can help maintain the continuity of indigenous knowledge systems and promote sustainable use of natural resources.

Fifth, interdisciplinary collaboration between ethnobotanists, pharmacologists, educators, and cultural anthropologists is highly recommended. Such collaboration will ensure that research on Zöfö-söfö is not limited to one disciplinary perspective but instead reflects a holistic understanding of its biological, cultural, and educational significance.

Finally, policy-level support is necessary to recognize and protect indigenous knowledge as part of national biocultural heritage. Government and academic institutions should encourage research funding, publication, and documentation efforts focused on traditional medicinal plants like Zöfö-söfö. This will ensure that valuable indigenous knowledge systems are preserved and contribute to both scientific innovation and cultural sustainability.

In conclusion, Zöfö-söfö (*Ageratum conyzoides*) is more than a medicinal plant; it is a representation of indigenous wisdom, ecological awareness, and cultural identity. Protecting and studying this plant through interdisciplinary approaches will contribute significantly to the preservation of Nias herbal heritage and the advancement of ethnobotanical science.

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