



The types of mangrove plants used as food sources in the Percut Sei Tuan district, Deli Serdang Regency, North Sumatra

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Abstract

The research on mangroves in the Percut Sei Tuan District is currently limited to a general understanding of mangrove forest utilization, with a lack of in-depth exploration of the potential use of specific mangrove species as food sources. Therefore, further investigation is necessary to examine and optimize their utilization, particularly in the context of sustainability and local food security. The objective of this study is to identify the mangrove species utilized as food sources by the community in the Percut Sei Tuan District, Deli Serdang Regency, North Sumatra. The research employs a qualitative descriptive method, utilizing semi-structured interviews with informants/respondents. Data analysis is conducted descriptively and presentationally. The findings reveal that five mangrove species, namely *Avicennia marina*, *Sonneratia caseolaris*, *Sonneratia alba*, *Acanthus ilicifolius*, and *Nypa fruticans*, are utilized as food sources. The plant parts utilized from mangroves include fruits (80%) and leaves (20%). This insight provides a comprehensive understanding of the potential for diversifying food sources from mangrove ecosystems.

Keywords: Food resources, mangroves, Percut Sei Tuan, North Sumatra

Introduction

Mangroves, as ecosystems in coastal areas, provide significant physical, ecological, and economic benefits. Physical benefits involve their protective function against coastline erosion, wave and wind attenuation, as well as reducing the risk of seawater intrusion and tsunami hazards. Meanwhile, ecological benefits include the role of mangroves as nursery areas, feeding grounds, and spawning areas for various marine organisms, as well as habitats for birds and various types of biota such as fish, shrimp, crabs, and shellfish. In economic terms, mangroves serve as a livelihood source through the utilization of wood, construction materials, textiles, medicines, and potential as natural tourist attractions (Hasan *et al.*, 2022^[8]; Rachman *et al.*, 2023)^[15].

The mangrove, as a critical ecosystem in coastal areas, not only serves as a habitat for various marine life forms but also makes a significant contribution to the food aspects of the local community. One crucial dimension of the role of the mangrove ecosystem lies in the types of mangrove plants that serve as a source of food. According to Samosir & Restu (2017), there are six types of benefits that mangrove forests in Tanjung Rejo Village, Percut Sei Tuan District, Deli Serdang Regency, North Sumatra, provide: food, fish pond cultivation, support for traditional fishing activities, mangrove seed cultivation areas, support for ecotourism, and even use in the batik industry.

Mangroves provide crucial benefits as a food resource in coastal areas. The mangrove ecosystem offers a fertile habitat for various types of fish, clams, and shrimp, creating a thriving environment for marine resources. Local communities can rely on the catches from mangroves to meet their daily food needs, fostering economic sustainability and food security in the region (Islam *et al.*, 2022)^[11].

Additionally, the fallen and decomposing mangrove leaves serve as a vital source of nutrients for the surrounding environment. This decomposition process supplies nutrients to the water, supporting the growth of phytoplankton and zooplankton, which, in turn, become the food source for fish and other marine organisms. Therefore, the benefits of mangroves as a food resource are not only direct through direct catches but also involve their crucial contribution to the food chain and the sustainability of marine ecosystems along coastal regions (Indarjani & Wibowo, 2021^[10]; Rao *et al.*, 2022)^[17].

The mangrove forest in Tanjung Rejo Village has become an ecotourism destination due to its scenic beauty. The ecotourism approach there is not only about the natural allure but also involves tourists in local cultural and traditional experiences. The implementation of ecotourism is considered one of the sustainable development strategies to preserve the mangrove ecosystem. To preserve and understand traditional values, especially regarding the usefulness of mangrove trees (ethnobotany), is considered a necessity. This ethnobotanical knowledge not only enriches the tourist experience but also preserves local wisdom that may be lost due to modernization (Indarjani & Wibowo, 2021^[10]; Rao *et al.*, 2022^[17]; Rupidara *et al.*, 2020)^[19].

However, findings from this research still have limitations, particularly in the general understanding of mangrove forest utilization. Details regarding the use of specific mangrove types as food are not adequately revealed. Therefore, this research is specifically conducted with the primary aim of identifying the types of mangroves utilized as food by the community in Percut Sei Tuan District, Deli Serdang Regency, North Sumatra. With an emphasis on this aspect, the research is expected to provide a deeper and more detailed understanding of the contribution of mangroves as a food source at the local level, opening opportunities for the sustainable optimization of natural resource utilization.

Research method

This research was conducted from September to November 2022 in three villages, namely Tanjung Rejo Village, Tanjung Selamat Village, and Percut Village. The research method employed was exploratory descriptive. Data collection was carried out through interview methods involving 99 respondents selected through purposive sampling. The research procedures included initial survey stages, the execution of research through interviews and documentation, recording mangrove plant samples, data analysis, and report compilation.

Data analysis involved the documentation of the types of mangrove plants used as food, using a descriptive approach. Additionally, the calculation of the percentage of mangrove types, mangrove organs, and methods of mangrove utilization was conducted based on predetermined formulas. Through this series of research procedures, it is expected that the study will provide a profound understanding of the types of mangroves used as food and contribute to the development of sustainable strategies in the utilization of mangrove ecosystems.

Results and discussion

Types of Mangrove Plants and Plant Parts Used

Based on the results of interviews with 99 respondents, five types of mangrove plants were identified for use as food sources. These include *Avicennia marina*, *Sonneratia caseolaris*, *Sonneratia alba*, *Nypa fruticans*, and *Acanthus ilicifolius*. This provides a more in-depth insight into the diversity of local food sources derived from mangrove ecosystems in the region.

Table 1: Types of Mangrove Plants Used as Food

No	Mangrove Species		Plant Organs		Food Categories
	Local Name	Scientific Name	Fruit	Leaves	
1	Api-api	<i>Avicennia marina</i>	✓		Dodol
2	Berembang	<i>Sonneratia caseolaris</i>	✓		Syrup & Jams
3	Perepat	<i>Sonneratia alba</i>	✓		Syrup & Jams
4	Jeruju	<i>Acanthus ilicifolius</i>		✓	Onion Cake/Chips
5	Nipah	<i>Nypa fruticans</i>	✓		Juice

Based on Table 1, it can be concluded that mangrove fruits are the most utilized part of the plant by the community as a food source. The majority of the mangrove plant is utilized for its fruit (80%), with the remaining portion being the leaves (20%). This can be explained by several reasons involving: (1) High nutritional content, as mangrove fruits are rich in essential nutrients such as vitamins, minerals, fiber, and antioxidants, (2) Delightful and unique taste characteristics, providing a special variation in the flavor of foods, (3) Diverse processing potential, with the ability to process mangrove fruits into various food products such as dodol, syrup, jam, and juice, and (4) High market demand for mangrove fruits, encouraging efforts to develop cultivation or processing of mangrove fruits as a strategic step to meet the growing market demand. This provides a more comprehensive understanding of preferences and the potential utilization of mangrove fruits in the context of local food and the market.

Mangrove fruit has become the most frequently utilized part of the plant by the community as a primary food source. This reflects a high preference for mangrove fruit as a

crucial component in local dietary patterns. The abundance of nutrients, including vitamins, minerals, fiber, and antioxidants in mangrove fruit, makes it a favored choice among the community. Furthermore, its delightful and unique taste adds an extra allure, enriching culinary experiences and introducing valuable variations to daily meals. This phenomenon indicates that mangrove fruit is not merely a nutritional aspect of the community's diet but also an essential element in the local culinary identity and the economy of the local community (Rosulva *et al.*, 2022) [18].

The utilization of mangroves as a food source encompasses various aspects that significantly impact the sustainability and diversity of local food sources. Mangrove plants, especially mangrove fruit, are the community's primary choice in creating diverse and nutritious dietary patterns. The high nutritional content, including vitamins, minerals, fiber, and antioxidants, positions mangrove fruit as a valuable nutritional source. Additionally, its unique taste characteristics provide special variations in local cuisine, creating a distinctive culinary heritage for the local community (Prasetyo *et al.*, 2023) [14].

The importance of mangrove fruit as a food source is also reflected in various processed products, such as dodol, syrup, jam, and juice. These processing methods not only diversify food products but also create local economic opportunities through the development of mangrove-based food industries. The community's involvement in cultivating and processing mangrove fruit as part of their livelihoods highlights the crucial role of the mangrove ecosystem in supporting local economic sustainability.

In this context, a deeper understanding of the types of mangroves that contribute the most as food sources not only depicts community preferences but also opens opportunities for more intelligent and sustainable management strategies. Thus, the utilization of mangroves as a food source becomes not only a basic necessity but also a key element in preserving the ecosystem and enhancing the well-being of the local community.

Description of Mangrove Plants as a Food Source

1. *Avicennia marina* F. (Api-api)

Stem and Bark: The api-api tree features a robust, woody stem capable of withstanding tidal environments. The bark is typically ash-gray or light brown.

Leaves: The leaves are oval or lance-shaped, with a dark green upper surface and fine hairs on the lower surface. They are of moderate to small size.

Fruit: The fruits are typically capsule-shaped and green when young, maturing to brown or black. The fruits of the api-api tree may have the potential for consumption after appropriate processing.

Flowers: The flowers are small and inconspicuous, usually white or yellowish. They cluster at the ends of branches.

Fruit as a Food Source: While direct consumption of api-api fruit may not be common, there is potential for processing it into food products such as jams, syrups, or snacks.

Avicennia marina, or more commonly known as the white mangrove tree, provides a range of significant benefits overall. This plant plays a crucial role in the mangrove

ecosystem by providing a vital habitat for various marine organisms. Additionally, *Avicennia marina* aids in shoreline stabilization, reducing the risk of erosion and the impacts of tidal waves. The plant also contributes to the nutrient cycle in the mangrove ecosystem, helping maintain ecological balance. The utilization of *Avicennia marina* in various applications, such as the timber industry, traditional medicine, and its potential as a food source, demonstrates its multifunctional value in supporting environmental well-being and local communities (Silalahi *et al.*, 2016^[20]; Sumartini, 2021)^[21].

The utilization of *Avicennia marina* as the main ingredient for dodol adds a unique touch to the making of this traditional snack. Although uncommon in culinary use, this plant can be processed into dodol with a distinctive flavor. This process not only creates different variations of dodol but also holds the potential to extract added value from local resources. With further exploration into the use of *Avicennia marina* for dodol, we can produce snacks that are not only delicious but also contribute to the sustainability of natural resources (Rao *et al.*, 2022)^[17].

2. *Sonneratia caseolaris* L. (Berembang)

Stem and Bark: *Sonneratia caseolaris* has a distinctive stem with a cylindrical shape, often exhibiting a slight taper. The bark is smooth and ranges in color from brown to grayish.

Leaves: The leaves are simple, opposite, and elliptical, with pointed tips. They are typically green, providing a lush appearance to the plant.

Flowers: The flowers are bisexual and arranged in clusters. The corolla is white, and the petals may have a reddish tint, creating an attractive and visually appealing display.

Fruits: The fruit of *Sonneratia caseolaris* is a unique, pear-shaped capsule. When mature, it turns from green to brownish and contains seeds. The fruit is a crucial part of its culinary use.

Sonneratia caseolaris, provides a range of significant benefits in the context of the mangrove ecosystem. This plant plays a key role in maintaining the natural balance by providing a vital habitat for various marine organisms, thus supporting the sustainability of the ecosystem. In terms of coastal protection, mangrove apple contributes to soil stabilization, helping reduce the risk of erosion and mitigate the impact of tidal waves. Additionally, the plant participates in the nutrient cycle of the mangrove, supporting essential ecological functions. The presence of mangrove apple not only brings environmental benefits but also contributes economic value to local communities. Mangrove apple wood can be utilized as raw material, while its potential use in traditional medicine adds extra value in the field of health (Dara & Sikaraja, 2018)^[3].

The primary edible part of *Sonneratia caseolaris* is its fruit. The fruit, resembling a small apple or crabapple, is consumed after proper processing and preparation. The fruit can be processed into various food products, such as jams, jellies, or syrups. It may also be used in traditional dishes or desserts. The fruit contributes a unique and distinct flavor to dishes. It is appreciated for its taste, which may have a combination of sweetness and tartness. *Sonneratia*

caseolaris fruits are a potential source of essential nutrients, including vitamins and minerals. The nutritional content contributes to the overall health benefits of incorporating them into the diet. Sustainable harvesting practices are crucial to ensure the long-term availability of *Sonneratia caseolaris* as a food resource without adversely affecting the mangrove ecosystem (Alharanu & Eviana, 2020^[2]; Rajis *et al.*, 2017)^[16].

3. *Sonneratia alba* L. (Perepat)

Stem and Bark: *Sonneratia alba*, commonly known as the white mangrove, features a sturdy stem and bark. The bark may have a smooth or slightly textured surface, with a color ranging from white to light brown.

Leaves: The leaves of *Sonneratia alba* are simple, opposite, and elliptical in shape. They have pointed tips and a glossy green color, contributing to the overall aesthetics of the plant.

Flowers: The flowers of *Sonneratia alba* are typically small and inconspicuous, with white petals. The flowers may occur in clusters, and they play a crucial role in the plant's reproductive cycle.

Sonneratia alba, provides significant benefits overall. This plant plays a crucial role in supporting the sustainability of the mangrove ecosystem by offering a vital habitat for diverse marine life forms. Mangrove apple also contributes to coastal protection through soil stabilization, reducing the risk of erosion, and providing defense against tidal waves. Additionally, the plant contributes to the nutrient cycle in the mangrove ecosystem, supporting the continuity of crucial ecological functions. The presence of *Sonneratia alba* not only yields ecological benefits but also generates economic value for local communities. Mangrove apple wood can be utilized for various purposes, from construction materials to handicrafts, while its potential in traditional medicine adds value to healthcare (Wintah *et al.*, 2022).

Utilizing *Sonneratia alba* fruit to create syrup and jam offers creative opportunities in the culinary field. This distinctive fruit, with its unique flavor, can be processed into refreshing syrup and delicious jam. The process of transforming *Sonneratia alba* fruit into these products not only introduces intriguing culinary variations but also has the potential to support local economies and the preservation of mangrove ecosystems. *Sonneratia alba* syrup can serve as a refreshing choice for beverages, while the jam can be a delightful addition to breakfast or desserts. This innovation not only brings about a new culinary experience but also fosters awareness of environmental sustainability, making *Sonneratia alba* a valuable and versatile raw material (Wintah *et al.*, 2018).

4. *Acanthus ilicifolius* L. (Jeruju)

Stem and Bark: *Acanthus ilicifolius*, commonly known as sea holly, has a distinctive stem and bark. The stem is typically sturdy, and the bark may have a textured appearance.

Leaves: The leaves of *Acanthus ilicifolius* are simple, opposite, and characterized by their spiny edges. They resemble holly leaves, contributing to the plant's common name.

Flowers: The flowers are arranged in spikes, with showy bracts. The overall appearance of the plant is ornamental, making it stand out in its coastal habitat.

Acanthus ilicifolius, or sea holly, offers a range of diverse benefits overall. This plant plays a crucial role in the mangrove ecosystem by providing essential habitat for various marine life forms. Moreover, sea holly has the ability to protect coastlines from erosion through its robust roots, creating a natural barrier against tidal waves. The plant also contributes to ecological balance by participating in the nutrient cycle within the mangrove ecosystem (Destiana *et al.*, 2023^[4]; Nusaibah *et al.*, 2021)^[13].

The presence of *Acanthus ilicifolius* is not only beneficial for the environment but also holds economic potential. Some local communities utilize it in activities such as crafting handmade goods or traditional medicine. In this way, sea holly not only supports the sustainability of the mangrove ecosystem but also adds value to the well-being of local communities (Destiana *et al.*, 2023)^[4].

The utilization of *Acanthus ilicifolius* as an ingredient for making onion cakes or chips offers a unique variation in snack production. Despite not being commonly used in culinary applications, this plant can be processed into savory onion cakes or crispy chips. This process not only creates distinct snack products but also has the potential to unearth added value from local resources. Through further exploration of the use of *Acanthus ilicifolius* in making onion cakes or chips, we can create a new culinary experience that introduces diversity in flavors and textures while harnessing the sustainability of natural resources (Hakim *et al.*, 2021)^[7].

5. *Nypa fruticans* W. (Nipah)

Trunk and Bark: *Nypa fruticans*, commonly known as the nipah palm, has a unique trunk structure. The trunk is submerged in mud, and the bark is smooth with a greenish to brownish color.

Leaves: The leaves of *Nypa fruticans* are large, pinnate, and feather-like. They can reach lengths of up to 7 meters, making them distinctive in appearance.

Roots: *Nypa fruticans* has a network of aerial roots, providing stability and anchorage in its watery habitat.

Nypa fruticans, or nipah, provides a variety of benefits in general. This plant plays a crucial role in supporting life in coastal ecosystems by offering abundant resources. Nira, the liquid produced from the flower stalk of nipah, is not only utilized as the primary raw material for making coconut sugar and traditional beverages but also serves as a base for other products such as arrack or syrup. Beyond its economic value, *Nypa fruticans* also contributes to the ecological balance of coastal areas by stabilizing the soil, protecting shorelines from erosion, and providing habitat for various marine organisms. The presence of this plant reflects a harmonious relationship between humans and the environment in coastal regions (Afrizal & Pato, 2017^[1]; Hirdan *et al.*, 2021^[9]; Khairi *et al.*, 2020)^[12].

The utilization of *Nypa fruticans* as the base for juice provides a refreshing and healthy beverage alternative. This unique nipa palm fruit can be processed into a delicious juice, offering a natural flavor and rich nutritional content. The juice-making process from *Nypa fruticans* not only creates a revitalizing drink but also has the potential to support the sustainability of coastal ecosystems and local

economies. *Nypa fruticans* juice can be a healthy beverage choice, delivering a tropical flavor uniqueness that can be enjoyed while contributing to environmental conservation (Febriadi & Saeni, 2018)^[6].

Conclusion

Based on the research findings, it can be concluded that there are five types of mangrove plants used as food sources, namely *Avicennia marina*, *Sonneratia caseolaris*, *Sonneratia alba*, *Nypa fruticans*, and *Acanthus ilicifolius*. This indicates a local food demand and supports the sustainability of the mangrove ecosystem, highlighting the importance of utilizing mangroves as a food source in the Percut Sei Tuan District, Deli Serdang Regency, North Sumatra. In the processing of mangrove fruits into processed food products such as dodol, syrup, jam, and juice, there is potential for local economic development. Besides providing diverse nutritional benefits, mangrove fruits also add value to local cuisine through their unique flavors.

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