Utilization Of Various Types Of Mangrove Fruit As A High Carbohydrate Food Source

Christine Fransin Mamuaja*[A] , Frans Lumuindong[B] , Lis M Yapanto[C]

[A]Department of Agricultural Technology, Faculty of Agriculture, Sam Ratulangi University, Jl. .Kampus Unsrat, Manado 95115, Indonesia
[B]Faculty of Fisheries and Marine Science. Universitas Sam Ratulangi Manado
[C]Fakultas Perikanan Dan Ilmu Kelautan Universitas Negeri Gorontalo
*[A]Corresponding author: mamuajachristine@unsrat.ac.id

Abstract
Local communities typically utilize mangrove forests to fulfill their daily requirements, such as the need for firewood, building materials, and food sources. Utilizing mangrove forest products as a means of diversifying the food supply is one strategy for overcoming the food crisis. Mangrove species with edible fruit include lindur (Bruguiera gymnorhiza (L) Lamk), Nipah (Nypa fruticans (Thunb.) Wurmb.), api-api (Avicennia marina), mangrove (Rhizophora sp.), tumu, tancang (Bruguiera), pidada (Sonneratia caseolaris), and warakas. (Acrostichum aureum). Bruguiera gymnorrhiza, also known as lindur, is ingested by mixing it with rice, whereas Avicennia alba (api-api) fruit can be processed into chips. The fruits of Sonneratia alba (broccoli) are processed into syrup and confectionery. The nutritional composition of mangrove fruit is predominantly composed of carbohydrates. This is due to a number of factors, such as the community's dearth of knowledge regarding the benefits of mangrove fruit and the community's belief that rice is the only source of carbohydrates.

Keywords: Mangrove Fruit, Food sources.

INTRODUCTION

Indonesia as the largest archipelagic country in the world has 17,508 islands
with a coastline of 81,000 kilometers and has enormous coastal and marine resource potential (Bengen, 2002). Natural resources in coastal and oceanic areas consist of renewable resources such as fisheries, mangrove forests and coral reefs as well as non-renewable resources such as oil and mineral gas and environmental services. (Dahuri et al., 2001). Indonesia is one of the countries that has the largest mangrove forests in the world, reaching 8.60 million hectares, although currently it is reported that around 5.30 million hectares of this forest have been damaged (Gunarto, 2004).Some experts define the term "typical in protected tropical and sub-tropical beaches (Saenger, et al, 1983). Meanwhile Soerianegara (1987) in Noor et al. (1999) defines mangrove forests as forests that mainly grow on alluvial mud soils in coastal areas and river mouths which are influenced by tides, and consist of the tree species Avicennia, Sonneratia, Rhizophora, Bruguiera, Ceriops, Lumnitzera, Excoecaria, Xylocarpus, Aegiceras, Scyphyphora and Nypa. This type of mangrove (Rhizophora spp.) usually grows on the outermost part which is often battered by waves. R. apiculata and R. mucronata mangroves grow on muddy soils. Meanwhile, R. stylosa and prepat

mangroves (S. alba) grow on muddy sand. In the calmer part of the sea live black fires (A. alba) in this outer zone or pioneer zone. In the deeper part, which is still inundated by high tide, it is common to find a mixture of R. mucronata mangroves with kendeka species (Bruguiera spp.), kaboa (Aegiceras corniculata) and others. Meanwhile, near the river banks, where the water is fresher, nipah (Nypa fruticans), peudada (S. caseolaris) and bintaro (Cerbera spp.) are common. In the drier parts of the forest interior, nyirih (Xylocarpus spp.), teruntum (L. racemosa), dungun (H. littoralis) and blind-blind wood (E. agallocha) are found (Wales, 2010).

Mangrove forest is a type of forest that grows in tidal areas, especially on protected beaches, lagoons and river mouths which are inundated at high tide and free from inundation at low tide whose plant communities are tolerant to salt (Kusuma et al, 2003). Mangrove forest or also called mangrove forest is a forest that grows aboveswampswaterybrackishlocated atcoastlineand influenced byups and downsea water. This forest grows especially in places where it occursmuddingand material accumulationorganic.(Wikipedia). Mangroves are tree plants or plant communities that live between the sea and land that are affected by tides. Mangrove habitat is often found at the meeting place between river mouths and sea water which then protects the land from large sea waves. Rivers carry fresh water to mangroves and at high tide, mangrove trees are surrounded by salt or brackish water.

According to Onrizal (2006), various types of mangrove plants can be used traditionally by local communities as medicinal ingredients and as food ingredients.

DISCUSSION

The use of mangrove forests by local communities is generally carried out to fulfill their daily needs, such as the use of firewood, building materials and places to get food. Utilization of mangrove forests as a food ingredient can be done in traditional ways according to the habits of each local community. Several types of mangroves that are used as food ingredients are as follows: Acrosticum aureum, Avicennia marina, Bruguiera sexangula. These types are used are the leaves to be eaten and cooked as a vegetable; and the types Avicennia alba and A. Officinalis the seeds can be boiled and eaten (Onrizal, 2006). The types of mangroves whose fruit can be consumed include: lindur (Bruguiera gymnorhiza (L) Lamk), Nipah (Nypa fruticans (Thunb.) Wurmb.) , api-api (Avicennia marina), mangrove (Rhizophora sp.), tumu, tancang (bruguiera sp.), pidada (Sonneratia caseolaris). and warakas (Acrostichum aureum).

1. Lindur fruit (Bruguiera Gymnorhiza (L) Lamk) as a food source

According to Alfredo Wanma (2007) that the use of mangrove species as food and medicine, by local people is still done traditionally. The Biak ethnic community is one of the local communities in the Papua region who utilizes mangrove forests to meet their daily needs. Mangrove forests can directly provide these needs, one of which is as a source of carbohydrates. By the Biak people, the fruit of lindur (Bruguiera gymnorhiza (L) Lamk) can be used as a food

ingredient which contains carbohydrates which are obtained by extracting the starch content.

In its natural form, the use of B. gymnorrhiza, which we hereafter refer to as lindur fruit for food processing, is very limited. Under natural conditions, its shelf life is very limited because, like other agricultural products, this lindur fruit will spoil quickly. Flour is one of the solutions to preserve lindur fruit because flouring can break the chain of lindur fruit metabolism so that it becomes more durable because it has a low water content and is more flexible to be applied to various types of processed food so that later it is hoped that it will be more easily introduced to the public. Then cooked/steamed. After cooking, the slices are put in a noken/bag and then ground/pounded with wood to form starch and to reduce the water content. The resulting starch is put into a container and then cleaned of the remains of fruit peels and fibers by stirring the starch with wood so that the fruit skins and fibers can stick to the wood. The resulting starch is then dried in the sun to become flour. Bruguiera gymnorhiza (L) Lamk flour products can be utilized and processed the same as wheat flour, sago flour and others. (Alfredo Wanma, 2007). Boiling and soaking besides inactivating enzymes can also reduce and eliminate toxins present in lindur fruit, including tannins and HCN. Bruguiera gymnorhiza (L) Lamk flour products can be utilized and processed the same as wheat flour, sago flour and others. (Alfredo Wanma, 2007). Boiling and soaking besides inactivating enzymes can also reduce and eliminate toxins present in lindur fruit, including tannins and HCN. Bruguiera gymnorhiza (L) Lamk flour products can be utilized and processed the same as wheat flour, sago flour and others. (Alfredo Wanma, 2007). Boiling and soaking besides inactivating enzymes can also reduce and eliminate toxins present in lindur fruit, including tannins and HCN.

In order to be used more widely, as well as to increase the economic value of lindur fruit, it must first be turned into flour. The superiority of lindur fruit flour has a carbohydrate content of 80.3763%, 0.7575% fiber, 12.1761% water content, 3.0917% fat, and 1.427% protein (Anonymous, 2009). Other sources say that Lindur fruit has an average length of 27 cm with an average weight of 45 g. The results of the chemical analysis of lindur fruit were 73.756% water content, 1.246% fat content, 1.128% protein, 23.528% carbohydrates and 0.342% ash content. Meanwhile, the anti-nutritional content of HCN is 6.8559 mg and tannin is 34.105 mg.

2. Nipah Fruit (Nypa Fruticans (Thunb.) Wurmb) As a Food Source

Nipah (Nypa fruticans (Thunb.) Wurmb.) belongs to the Palmae tribe, growing along rivers which are affected by tides. This plant is also grouped into mangrove forest plants. Plants grow closely together, often forming large pure communities along rivers near estuaries to brackish water streams (Kitamura et al., 1997). The fruit is rounded like a pandanus fruit with a hump up to 45 cm long. The distribution of this plant species is mainly in the equator, extending from Sri Lanka to Southeast Asia to Northern Australia. The area of nipa palm plantations in Indonesia is estimated to be 700,000 ha, the largest compared to Papua New Guinea

(500,000 ha) and the Philippines (8,000 ha) (www.kehati.or.id,2009).

It was reported that the people of Batu Ampar, Pontianak, used nipa traditionally to produce sugar and salt in addition to snacks made from nipa fruit (endosperm) (Santoso et al., 2005). Nipa sugar is obtained by processing sap (a sweet liquid obtained from flower bunches before they bloom), while nipa salt is obtained from the flesh of old fronds. The content of carbohydrates, sugar content, and protein content of young nipah fruit is quite good (Table 1). The total sugar content is 27.2 g/100 g and the carbohydrate content is 56.4 g/100 g (high enough) so it has the potential to substitute for staple foods (rice, corn and sago) or as a food substitute and diversification. The results of the analysis showed that young nipah fruit did not contain vitamin E, but contained vitamin C of 0.

Table 1. Results of analysis of young nipah fruit flesh

Test Type	Unit	Great value
Moisture content Ash	g/100gg/100	48.96
content Fat content Protein	gg/100gg/10	0.90
content	0gg/100gg/1	0.60
Carbohydrate Content Total	00gg/100g	2.65
sugar Vitamin C	mg/100 g	55,41
Vitamin E		26,22
		0.70
		0

Source: Endro Subiandono (2010)

Nipa flour can be produced by processing old nipa fruit. Nipah flour can be made from old nipa fruit flesh. The process of making nipah flour includes separating the meat from the shell, cleaning the epidermis, and then pounding or blending it. After this process is complete, it is then dried/dried and sifted. Nipa flour yield is obtained by making flour from every 100 old nipa fruit flesh.

You can get the fruit right away - Malaysia). In addition to the fruit being eaten directly, the sap can also be tapped from the fruit as raw material for nipa sugar. The people of Ujung Manik Village, Kawunganten District-Cilacap Regency, have been cultivating the nipa plant as a sugar producer. How to collect nipa sap is easier than coconut sap, because it doesn't need to be climbed (nipa plants are always short/shrubs), but sometimes it is constrained by rising tides. The taste of nipa sugar is still sweet but slightly salty, while its appearance is like coconut sugar. The price of nipa sugar is lower than coconut sugar.

3. Fire Fruit (Avicennia Marina) As Food Source

Api-api is the name of a groupplantfromclanAvicennia, tribe Acanthaceae. Fires usually grow on the edge or nearseaas part of the communitymangrove forest.The composition of the results of the analysis of the mangrove api-api plant parts

shows that the seeds of the plant contain a lot of protein as much as 10.8% and carbohydrates as much as 21.4%, so that the seeds of these plants can be used as an alternative food ingredient. (Nyoto S, et al, 2005). Test results on the levels of vitamins B and C in Avicennia marina seeds showed higher results, as follows: The content of vitamin B in the seeds was 3.74 mg/100g of material and the content of vitamin C was 22.24 mg/100 g of material. The content of these two vitamins indicates that the seeds as a food ingredient can also meet the needs of some of the vitamins B and C needed by the body.

Api-api fruit to be used as food ingredients must go through a processing process first. This is because in this type of fruit has a toxic content which is quite dangerous if consumed by humans. In addition, this processing is intended to remove the salt content contained in the fruit. However, if processed properly, this fruit is safe for consumption. The process of processing api-api fruit before being used as food ingredients is as follows:

a. The fires were peeled, the skin was split into 4 parts and the white cotton was thrown away
b. Bring the water to a boil, add the fire until it is submerged in water
c. Add the ashes, stir until smooth
d. Hold it with your hands if it looks half cooked then drain it
e. Wash thoroughly the outer skin until it looks like it has changed from its original color
f. Soak in clean water
g. Change the soaking water every 5 hours or if the soaking water tastes bitter, do it continuously until the water tastes fresh.

pioneer species (in the leading zone), fast and easy to grow, and natural rejuvenation is very fast, even it is estimated that plants that are 2 years old have started to produce fruit. The use of ripe plant fruit needs to be treated, namely: peeling the skin or removing the skin, mixed with kitchen ashes and rinsed with clean water, then soaked 2 x 24 hours (to remove toxins), drained and can be used as food raw materials. According to information, there are still people from the coast of Cilincing, North Jakarta, who use the young leaves of the api-api plant as an ingredient for ointments, as well as coastal communities in East Java.

Api-api fruit contains 76.56 grams of carbohydrates, 0.9 grams of fat, 4.83 grams of protein, 18.52 of water. With such a large nutritional content, it can make the processed mangrove fruit into nutritious food and save a lot of energy. In addition, the content in mangrove fruit can also be used to replace damaged cells and maintain osmotic pressure in the blood.

4. Mangrove Fruit (Rhizophora Sp.) As a Food Source

This type of plant is also spread throughout the coastal areas in Indonesia. But very few use it as a food ingredient. The people of Kajang District (Bulukumba Regency, South Sulawesi) have known the use of mangrove fruit since the time of the Kingdom of Gowa (adab 16). Fruits used as raw materials are ripe/old fruits. The process of cooking the fruit starts with peeling the outer skin, then the inner skin is peeled, cooked and soaked for 2-3 days. Furthermore, the inner skin is used as a mixture of food (fish vegetables). (Rasyid A, 1994).

5. Pidada fruit (Sonneratia caseolaris) as a food source

Pidada red or red quarter (Sonneratia caseolaris) is a kind of tree that inhabits the edge of the swamps.river Andmangrove forest, which is included inethnic groupLythraceae (formerly,Sonneratiaceae). Redheads are one of a kindspeechwhich is often encountered. Locally, this tree is often called pidada or just perepat. Other names include: alatat , bembang , pedada , red perepat , rambai , bogem , feel at home , bidada , bogem , kapidada , bhughem , poghem , red wahat , red warakat , red posi .

This plant is often found on the north coast of Java Island, Cilacap to East Java, also in Kalimantan, Sumatra, Sulawesi, NTB and NTT, Irian Jaya. Including the pioneer species (front zone). The leaves of this plant are often used by the community as animal feed. The nature of the fruit is non-toxic and can be eaten directly. Ripe fruit tastes sour, but wild animals like the fruit of this plant. Old fruit is a raw material for food and does not require treatment or can be cooked directly

into a variety of foods or drinks. The fruit is edible, as are the young leaves, which are often eatenhungry.This fruit is also often eaten raw, or cooked as a mixturefish.

6. Fruit of Tumu, Tancang (Bruguiera Sp.) As a Food Source

This plant is also found in Sumatra, Java, Kalimantan, Sulawesi, NTB, NTT to Irian Jaya. According to information, the people of Ujung Manik Village (Cilacap-Central Java), the people of Kajang District (Bulukumba Regency-South Sulawesi), have used the fruit of the Tancang plant as an alternative food source. In fact, around 1940, the coastal community in Kwala Sepetang (Taping District, Negeri Perak-Malaysia) used the fruit of this plant as an alternative to food. The process of using the fruit of the Tancang plant is: peeling the skin of the Tancang fruit, breaking the fruit (so it becomes soft quickly when cooked), then cooking it in water until fully cooked, discarding the cooking water in a safe (poisonous) place, then soaking it for 2 x 24 hours or 3 x 24 hours and the water is still disposed of in a safe place.

7. Warakas Fruit (Acrostichum Aureum) As a Food Source

This plant outside Java is also often called piyaipiyai. The part of the plant that is used as food is the young leaves or leaf buds that are still reddish in color. The process of cooking warakas leaves is not much different from beluntas leaves, in fact they are often mixed with beluntas leaves to make urap vegetables. Often this plant is a weed plant for the mangrove forest community, so the presence of this plant tends to be killed because it can inhibit the growth of the main plants (Rhizophora, Bruguiera, etc.)

CONCLUSION

One alternative that can be used in overcoming the food crisis is through food diversification by utilizing mangrove forest products such as the Lindur species whose fruit can be processed into cakes. In addition, people living in coastal areas or around mangrove forests such as in Muara Angke Jakarta and Balikpapan Bay have traditionally consumed several types of mangrove fruit as vegetables, such as Rhizopora mucronata, Acrosticum aerum (Kerakas) and Sesbania grandiflora (turi). Meanwhile, Bruguiera

gymnnorrhiza or called lindur is consumed by mixing it with rice, while the fruit of Avicennia alba (api-api) can be processed into chips. Sonneratia alba fruit (broccoli) is processed into syrup and candy. Likewise in parts of East-West Indonesia, Flores, Sumba, Sabu and Alor, people use this mangrove fruit as a substitute for rice and corn during food crises. The people of Lembata, NTT, are used to consuming mangrove fruit and forest nuts as local food at certain times. However, the utilization of mangrove forest products only takes place in a small part of Indonesia. This is caused by several factors such as the lack of knowledge from the community regarding the benefits of mangrove fruit, the existence of a mindset in the community that thinks that the only source of carbohydrates is rice. the utilization of mangrove forest products only takes place in a small part of Indonesia. This is caused by several factors such as the lack of knowledge from the community regarding the benefits of mangrove fruit, the existence of a mindset in the community that thinks that the only source of carbohydrates is rice. the utilization of mangrove forest products only takes place in a small part of Indonesia. This is caused by several factors such as the lack of knowledge from the community regarding the benefits of mangrove fruit, the existence of a mindset in the community that thinks that the only source of carbohydrates is rice.

REFERENCES

Alfredo Vanma. 2007. Utilization of Mangrove Forest "Bruguiera Gymnorhiza (L) Lamk as a Carbohydrate Producing Material" Wetland Conservation Warta Vol 15 No. 2, July.

Wurmb.

Bengen, D., 2002. Synopsis of Coastal and Marine Ecosystems and Natural Resources. Center for Coastal and Marine Resources Studies IPB, Bogor.

Dahuri, R., J. Rais, SP Ginting and MJ Sitepu, 2001. Integrated Management of Coastal and Marine Resources. PT Pradnya Pramita, Jakarta.

Endro Subiandono*, NM Heriyanto, and Endang Karlina. 2011. Nipah Potential (Nypa fruticans (Thunb.) Wurmb.) as a Food Source from Mangrove Forests. Germplasm Bulletin Vol.17 No.1 Th.2011.

Gunarto. 2004. Mangrove Conservation as a Support for Coastal Fisheries Biological Resources. Journal of Agricultural Research and Development 23 (1) page 15 – 21. Mars. South Sulawesi.

Hery Purnobasuki, Drs., M.Sc., Ph.D. The Potential of Mangrove Fruit as an Alternative Food Source

Kitamura, S., C. Anwar, A. Chaniago, and S. Baba. 1997. Handbook of Mangroves in Indonesia: Bali and Lombok. Ministry of Indonesia and JICA, Jakarta.

Nyoto Santoso, Bayu Catur Nurcahya, Ahmad Faisal Siregar, Ida Farida. 2005. Food Recipes Made from Mangrove Raw Materials and Utilization of Nipah. Mangrove Research and Development Institute

Rasyid A. 1994. Introduction to special foods from the mangrove forests of South Sulawesi.

Santoso, N., BC Nurcahya, AF Siregar, and I. Farida. 2005. Food recipes made from mangroves and nipah utilization. LPP Mangrove, Bogor.

www.kehati.or.id.2009. Detailed data of Nypa fruticans