



PAPUASIA BIODIVERSITY AND FOREST PRODUCT

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ABSTRACT

Many flora and fauna still unknown species, approximately about 1/3 from all world flora doesn't known in science. Fortunately even science don't know, in many villages that plants and animals occur local people known them especially the biodiversity that are usually using by them. One of the biodiversity family that have many advantages and potentially to develop as a forest food product is Pandanaceae family. Papuasia biodiversity and forest product are discussed more in this paper.

INTRODUCTION

Land of Papua lying in west New Guinea island is place that have mega biodiversity. Papua is a part of flora Malesia region where 2/3 world flora occur. Many flora and fauna still unknown species, approximately about 1/3 from all world flora doesn't known in science. Fortunately even science don't know, in many villages that plants and animals occur local people known them especially the biodiversity that are usually using by them.

Deforestation and degradation of forest in this century increase and increase in number of area and local forest people with their contact in the world outside them start to leave their traditional knowledge of biodiversity. Many young generation attract to learn about a new things outside their community so that losing of local knowledge happen in many villages.

Global warming and deforestation walking together, in time that deforestation done it is the time that global warming increasing. Climate changing and damage of environment become a dangerous treatment for human life. Go green, come back to the reforestation become to wise decesion. Protect our forest must do with increasing the quality life of forest traditional people. How to take many advantages of forest without cut the trees or doing open forest for many purpose reason.

Biodiversity and forest product is not a good sounds but it is important to do to get both benefit and protection of forest. What kind of product and how to make a product are become responsibility of all people who working in the area and them who have give benefit indirect or direct forest.

Forest faculty University of Papua (UNIPA) in Manokwari have a strong purpose of their future department working that is become a research faculty of the world. The majority research not only focus on biodiversity, ecology and wood product but also ethnology-botany, silviculture, ecotourism and non wood product to get a good products and make a better life for our future. To reach our vision and mission some partnership and collaboration to abroad university is a one important things to build like what We have done with Gootingen University in Germany and also sister link with our host university : Cenderawasih University in Jayapura.

One of the forest non timber product is Pandanaceae product . This family in New Guinea island is my more than 700 species (Stone, 1978). Pandanacea have 5 genera but one genera namely Martelidendron only occur in Madagskar. The 4 genera namely Pandanus, Freycinetia, Sararanga and Benstonea have found in Papua. Sararanga have only 2 species in the world. One in Philipine namely *Sararanga philipinensis* and another species is *Sararanga sinuosa* from New Guinea island. Taxonomy and Product of Pandanaceae are explain more in this paper.

Taxonomy

Pandanacea is a plant family with 5 genera namely Pandanus, Martelidendron, Sararanga, Freycinetia and Benstonea. Pandanus, Benstonea and Freycinetia are found in the Malesian region but Sararanga is only found in Eastern Malesia in the Philippines and New Guinea. . The largest concentration of this group of plants is on the island of New Guinea.

Stone (1983) reported in the world there are 600-700 species of Pandanus and there are as many as 500 species in New Guinea, while for Freycinetia according to Stone 1976 there are as many as 60 species in New Guinea, compared to 8 species in Malaya and 24 species in Borneo, further Sinaga 2011 found as many as 91 species of Freycinetia in Papua. For Sararanga there are only 2 in the whole world, namely 1 type in the Philippines and 1 other type namely *Sararanga sinuosa* in Papua or New Guinea.

This group of plants in its large classification has close ties to the palm-palm (Palmae) and Pineapple (Agavaceae) groups. The leaves of the Pandan group, show closeness to Agavaceae, while the ability of pandan fruit to produce oil such as coconut (*P. conoideus* and *P.*

julianetti) and also the ability to produce flour or starch and the shape of pandan fruit show the closeness of this group to Palmae or Arecaceae.

Especially for *P. tectorius* fruit has proximity to coconut because the phalange is fibrous so that it can be carried away by the flow of sea water and the seeds in it have white institutions with a taste like coconut. This closeness is supported by Schaffner who places Palmales and Pandanales in one branch of classification (Sinaga, 2007). The family Pandanaceae can be directly distinguished by the presence of distinctive characters of each genus.

Pandanus which is a true pandanus has a stature in the form of a small tree to a tree with a height of up to 33 m with roots reaching 10 m with 20 cm still. The small pandanus has roots 2 m high with 2-3 cm at rest. In addition to trees, some are epiphytic shrubs and some are pseudo lianas that are almost missing trunks such as *P. epiphyticus*.

Leaves are generally large, 2-3 m long, 8-12 cm wide triangular leaf tips taper - pointed, leaves and mother bones lower leaves are prickly, waxy leaf texture, light green dark green, male flowers and female flowers are found on different plants, fruits are terminal or lateral, solitary or grain-shaped or large start. Pandan root is a distinctive breath root, the leaves are arranged alternately to three-layered. The flowering of the spadix and its fruit is a drupa.

Sararanga is a branched, branched tree with a straight trunk. Sararanga is a pandan that does not have supporting roots This group is very different from the other two genera because it has a paniculate, pendulous compound ridge with a length of up to 100 cm. Sararanga is easily recognized by the spiro-tetrostichous and concomitany square of flowering rakis. Floral jewelry does not exist.

The fruits are berries and pollen grains that are coarse. This tree bears fruit with 4-5 bunches in one tree that appears between the armpits, even terminal leaves. The series of fruits arranged like grapes causes Papuans to call it Papua Grapes.

Martellidendrons originally classified as Pandanus have a seed locus that is not separated by endocarp, stigmas are generally two separated from each other and face each other forming a cross at the upper end of the drupe, have staminoides in female flowers and there are always pistiloides in male flowers.

Freycinetia is characterized by its way of life that always climbs on other plants . Woody stems 6-7 cm in diameter, leaves arranged alternately to tristichous, reaching a length of 150

cm with a width of approximately 10 cm, but some types have a small size such as *F. elegantula* with a leaf length of 2-3 cm. It has auricle at the base of the leaves, Spadix flowering and drupe-fruiting, slippery pollen grain. The results of research so far show that in Papua there are 4 groups of Freycinetia, namely Freycinetia stacked leaves, Freycinetia slightly stacked leaves, Freycinetia leaves are not stacked and Freycinetia grass.

Benstonea was originally a section under Pandanus with characteristic phalanges or sharp thorny berrinya. The cross section of male flowers is single (sometimes 2 or 3) stamens with short filaments and narrow anther, besides that the female drupa is always mono carpel and the stigma groove is abaxial. Callmander in his biomecular research found that this group is separate from Pandanus with a strong generative character.

That is what underlies the separation of Benstonea from Pandanus. Some Pandanus with characteristic spines on their berries later changed their genus names, for example Pandanus lauterbachii which was discovered by K.Schum.& Warb which later became Benstonea lauterbachii (K.Schum.&Warb) Call. & Burki. This means that Callmander and Burki have made changes to the Pandanus species. The species of the genus Benstonea is the third largest member of the Pandanaceae with 50 species currently (Callmander et al. 2013).

Utilization of Pandan Plant

The group Pandanaceae whose benefits have been widely developed, is limited to the conoideous Pandanus. Many of these plant groups, whose uses are more traditional and known only in limited circles, include Freycinetia banksii, and *F. macrostachya*. Other widely used species are Pandanus broximus and Pandanus julianetti known as forest coconuts.

This species is only found in the central mountainous regions of Papua and is used mainly as food, board and clothing. Root fibers are used as material for making bags or noken, stems are used as floorboards or walls of houses, leaves are used as mats, traditional roofs and umbrellas, fruit arrangements are popular foods in traditional occasions always provided as snacks.

Pandanus which is always used as an ornamental plant because of its beauty or performance is Pandanus papuanus. The length of the breath root ranges from 3 to 4 meters with a width of 20-40 cm, with a diameter reaching more than 100 cm and a tree height reaching

20 meters, and thorns on a rather large tree trunk with a blunt oval shape, making this plant a giant pandan that is sturdy and beautiful to look at.

Studies conducted by Miller et al. (1956) showed that in fresh fruit *Pandanus* spp. carbohydrate content ranges from 14 to 18% in the form of starch and sugar, calcium 9 to 16%, phosphorus ranges between 25 and 33% and iron 0.89-0.58%. *Pandanus* is also very rich in karatenoid pigments and contains atolls so it is a source of pro vitamin A.

Englberger et al. (2003) reported that *P. tectorius* fruit can be eaten and made into cakes and is a source of pro vitamin A. As many as 9 million children and 1 million women in Indonesia are deficient in Vitamin A (Anonim, 2010). Diversification of food with sources of Vitamin A is expected to reduce this figure.

The results of nutritional analysis showed high carbohydrate values in both *Pandanus tectorius* and *Freycinetia macrostachya*. Therefore, these two pandanus fruits have the potential for food development. Departing from this, in the research of PENPERINAS MP3EI, nutritional analysis of various varieties of fresh fruit *P. tectorius* was carried out

Trials of making various foods from Pandan such as syrup, candy, dodol, jam, chocolate and cake were also carried out. One product that has gone through a series of research until the right composition of ingredients is *P.tectorius* syrup and jam.

Based on the results of organoleptic tests, it turns out that the original taste of *P.tectorius* is very popular so that the product continues to be produced today. It has even been disseminated to groups of Papuan mamas around the campus in Amban, to Nuni on the North Coast of Manokwari and even to Sidey, Prafi to Bintuni.

Product exhibitions and sales have been carried out to Jayapura, Papua Province and even to Makassar, Jakarta to Thailand.

Research PANDANACEAE and Product

Like handycraf noken or traditional bags that have been known for a long time until now which continue to be developed as research-based industrial products, demilian is the case with food from the PANDANACEAE family. *Pandanus* fruits, namely red fruits (*Pandanus conoideus*) and yellow fruits (*Pandanus tectorius*) and *Sararanga sinuosa* which have potential as special foods and souvenirs are being researched and continue to be developed.

Since 2009 research on the Diversity of *Pandanus* and *Freycinetia* Species has been conducted in Maripi and Mupi Beach Forest Areas and Prafi natural forest areas, Manokwari (Sinaga, 2009). This research was continued with research on Taxonomy and Chemical

Content of Freycinetia in Manokwari which was funded by the Higher Education through Fundamental Research (Ismoyo and Sinaga, 2010).

Research produced 5 (five) new species of Freycinetia, 2 (two) of them, namely Freycinetia aculeata Sinaga and F. gunungmejensis Sinaga have been published in the international journal Reinwardtia (Volume 13, No.2 of 2010). The interest in revealing the nutritional content of the Pandanaceae group is so large that it encourages the analysis of the nutritional content of braktea (F. macrostachya) which shows a high carbohydrate content of 73.13% and has the opportunity to be developed as a food source (Sinaga, 2011).

. Silviculture research has also been carried out as a challenge in providing raw materials sustainably because so far people take raw materials directly from the forest. It is expected that HTI (Industrial Plantation Forest) can be built together with the improvement and development of Pandanaceae products. In order for this product to be sustainable, there needs to be a sustainable supply of raw materials, therefore Pandanus and Sararanga silviculture techniques or Papua grapes will continue to be developed as well as research related to biology such as fruit bio-ecology research to see fruit productivity per tree per season which is useful in the plan to provide raw materials for food products.

On the food products produced, organoleptic tests and nutritional value of products are carried out. Furthermore, this technology is taught to the local community and marketing and business feasibility research is carried out. Thus, it is hoped that SMEs (Small and Medium Enterprises) syrup, jam, dodol, candy and various cakes and derivative products of Pandan Papua can develop in Papua.

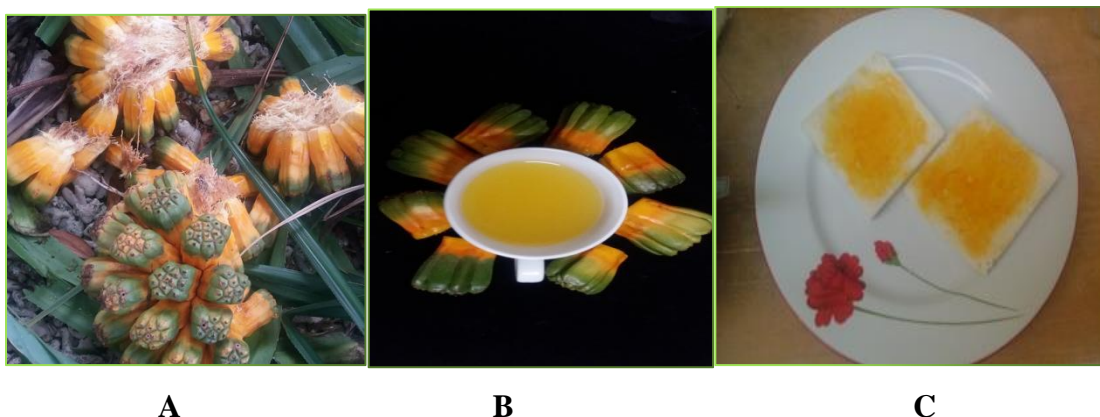


Figure 1. *P.tectorius* A. Fruit and phalange ; B. Syrup C. Jam

Food Products : *Pandanus tectorius* Syrup and Jam

The yellow part in Figure 1A can be made syrup as well as jam. How to make jam begins by taking the soft part of the fruit and then cut it into several pieces. After that it is blended until smooth and filtered. Then cooked using granulated sugar. There are several spices that must be added regarding the taste and character of the fruit. So that the other is not too sweet but has a sweet-sour taste and the tartness of the fruit is lost, citric acid is added. More technology for making pandanus jam can be seen in the book TTG (Appropriate Technology for Making Jam).

Especially for syrup before blending, fruit ripening is useful so that the taste of syrup is stronger and durable. After cooking, then the ingredients are blended. After filtering, immediately add water in a ratio of 1: 4 and then boiled again. Don't forget to add sugar according to taste, generally 1 pandan uses 1 kg of sugar.

The color of jam and syrup in Figure 1 is the original color without the addition of dyes. If you want a varied taste, you can add the ingredients we want. For example, if you want pineapple and pandan flavor, pineapple fruit can be added.



Figure 2. Booklet of Appropriate Technology for Making Pandanus tectorius Fruit Jam

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LEMBAR
HASIL PENILAIAN SEJAWAT SEBIDANG ATAU PEER REVIEW
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