The Potention of Nipah Fiber (*Nypa fruticans* Wurmb.) in The Production of Nata Fruticans Using Soybean Sprouts as a Source of Nitrogen

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ABSTRACT

Nypa is a mangrove plant that acts as a food source, such as nata. Research has shown that nipah plant waste, such as frond fibers and nipah fruit skin fibers, can be used as a raw material in making nata fruticans. The purpose of this study was to determine the potential of nipah fiber (Nypa fruticans Wurmb.*) in nata production using soybean sprouts as a nitrogen source. The samples of nipah fiber (Nypa fruticans) used were leaves (DN), midrib (PN) and fruit skin (KB), taken in the Kuala Tungkal area, West Tanjung Jabung Regency, Jambi Province. This research method includes making the mother solution, making nata starter, and producing nata sheet by using soybean as a source of nitrogen with a concentration of 5%, 10% and 15% and ZA as a control. The results of this study indicate that the best volume and thickness of nata fruticans can be seen from the midrib substrate with a concentration of 10% soybean sprouts. The yields produced for all treatments were still lower compared to controls. Meanwhile, the water content of all treatments was better than the control. The best quality of Nata Fruticans based on thickness, yield and average moisture content was generally obtained from the substrate from the leaf midrib fibers with a concentration of 10% soybean sprouts.*

Introduction

Nipah (*Nypa fruticans*) is a mangrove plant that is easily found in the coastal areas of Jambi Province. Based on surveys and interviews with the Jambi coastal community, in the East Tanjung Jabung area, it is known that the community has not utilized nipah optimally. The community only uses nipah in a limited scope, for example as pennant banners at public party activities or as firewood. In fact, most of these people consider nipah to be a disturbing plant. However, Nipah (*Nypa fruticans*) in several areas has been widely used for various purposes, such as for roofs, sources of medicinal materials, fuel and foodstuffs (Hossain and Islam. 2015).

The benefits of nipah plants as a source of food are obtained by fermenting palm water to form nata products. Nata can be produced from sources that contain carbohydrates, one of which is palm plant fiber. Nipah plant fibers, among others, are found in the fronds and skin of the palm fruit. Nipah plant waste, especially frond fibers and nipah fruit skin fibers, can be used as raw material for nata fruticans. Akpakpan, et.al. (2011), reported that palm fronds contain cellulose and lignin respectively 42.22% and 19.85% lignin, while the nipah fruit peel fibers respectively contain cellulose and lignin at 36.5% and 27.3% (Tamunaidu and Shiro, 2010).

The simple compounds that are mostly used as a carbon source in making nata include maltose, sucrose, lactose, glucose, fructose and manose. Sucrose is a very economical composition to use and is best for the growth and proliferation of bacteria for forming nata. Nata is produced from the fermentation process of substrates containing sugar and nitrogen at a pH that is in accordance with the development of A. xylinum, which ranges from 4 - 4.5 (Pambayun, 2002).

Cellulose fiber is part of the flour which will be the substrate in making nata fruticans by A. xylinum. According to Fifendy and Annisah (2012), the carbohydrate content, pH, and nitrogen content in the substrate and environmental conditions affect the formation of nata.

Food intake is beneficial for the digestive system and many people. Elisabeth (2006) states that this product is a diet food because of the content of cellulose (dietary fiber) which is good for the digestive process of the small intestine and absorption of water in the large intestine.

There is not much information about the production of nata frutican from palm fiber, even though fiber has many health benefits, such as weight control over diabetes, gastrointestinal disorders, blood cholesterol and cardiovascular disease. Previous research on frutican nata production used limited sources, namely palm sap (Lempang, 2012) and nipah fruit juice (Nisa, 2019; Fadhillah, 2019; and Utami, 2019; Aini., Et al., 2019).

Zwavelzure Ammoniak or ZA is a nitrogen source commonly used by the community in making nata. The use of ZA with a maximum amount of 0.5% of the total media is still categorized as safe, but in fact using the safe limit of ZA is often neglected, therefore an alternative source of nitrogen is needed in making nata. On the other hand, sprouts are known to have good nitrogen content in making nata (Basalamah et al., 2018). so that it can be used as an alternative to using ZA. And the reference regarding the use of soybean sprouts in the production of nata fruticans from Nipah fiber (*Nypa fruticans* Wurmb.) Is still very limited, so a study was conducted to determine the potential of nipah fiber in the production of nata fruticans using nitrogen source soybean sprouts.

Materials and Methods

Mother Solution *Acetobacter xylinum,* Nipah Media

Acetobacter xylinum were cultured in coconut water solution media and transferred to palm water using 2.5 g soybean sprouts as a substitute for ZA which acts as a nitrogen source, and incubated at 27 ° C for 7 days.

Acetobacter xylinum Starter

500 ml or 1 liter of palm fiber, 2.5 g of soybean sprouts and 20 ml of 25% vinegar added 50-100 g of granulated sugar. Then the mixture is boiled and put into a bottle of 550 ml. After that, the bottles were closed and cooled for 6 hours, then inoculated in 50 ml of A.xylinum mother liquor. The bottle mouth was covered with newspaper and incubated at 27 ° C for 7 days.

Nata Sheet Production

Nata sheets are produced, using several substrates from Nipah as a source of fiber or a source of carbohydrates, namely leaves (DN), midrib (PN) and fruit skins (KB). Meanwhile, as a nitrogen source in this study used ZA (control) and soybean sprouts variations of 5%, 10%, and 15%.

Nipah fiber was filtered, added soybean sprouts by 2.5 g, and 25% vinegar acid by 10 mL, and sugar by 50-100 g (composition / 1 Liter of nipah fiber water). The mixture was stirred and boiled. After cooling, it was transferred to a fermentation tray of 800 mL for each tray, and incubated for 4 hours so that the sap solution inside cooled. The starter was added and incubated again at 28-30 °C. In this step, the fermentation process of nipah fiber nipah sheets is carried out for 9-11 days, and after that the nata sheets could be be harvested.

Data Analysis

The data in this study were volume, thickness, yield, and moisture content of nata fruticans. The data was analyzed in a descriptive qualitative method.

Result dan Discussion

Thickness and Volume of Nata Fruticans Using Soybean Sprouts as Nitrogen Source

Nata fruticans produced using soybean sprouts as a nitrogen source showed the same tendency to influence the thickness of the nata fruticans (Figure 1) and the volume of the nata fruticans (Table 1.) formed. The highest thickness and volume are found in nata fruticans, which are sourced from palm leaf midrib fibers using soybean sprouts with a concentration of 10%.

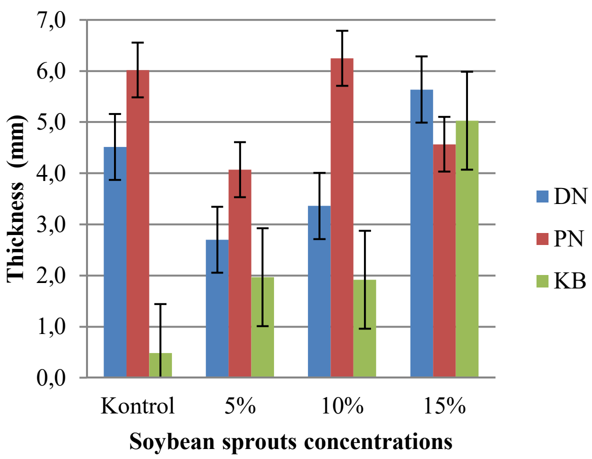

Figure 1. The thickness of Nata Fruticans from Nipah leave (DN), midrib (PN) and fruit skin (KB), on various soybean sprout concentrations, also the control (ZA)

The effect of fiber on the thickness and volume of nata fruticans shows a pattern of high to low yields successively produced by the midrib, leaves and then followed by the fruit skin. This trend was seen in almost all treatments except for treatment using 15% nitrogen. The use of soybean sprouts with a concentration of 15% of Nipah leaves produces thicker and more nata compared to other fiber sources.

Tabel 1. Volume of nata fruticans from midrib, fruit skin, and nipah leaves at various concentrations of soybean sprouts

Fiber sources	Concentrations	Volume (cm^3)*
Leaves (DN)	Control	16,70 ± 1,2
	5%	10,00 ± 1,2
	10%	12,40 ± 1,0
	15%	22,80 ± 1,4
Midrib (PN)	Control	22,20 ± 2,4
	5%	15,00 ± 1,2
	10%	23,10 ± 1,5
	15%	16,90 ± 0,8
Fruit skin (KB)	Control	3,00 ± 0,4
	5%	9,60 ± 1,7
	10%	8,00 ± 1,3
	15%	15,90 ± 1,6

**± denotes the deviation*

The thickness and volume of nata played a role in determining the development of *A. xylinum* bacteria produced from nipah water media. This is based on the fact that cellulose in nata is a layer of extracellular mucus that is outside the cells secreted by *A. xylinum*, and is mostly composed of liquid bacterial cells in the form of a network of cellulose fine fibers connected to each other due to the development of *A. xylinum*. In this study, it was found that nata fruticans using 10% soybean sprouts were the best medium for the growth and development of *A. xylinum*.

In addition, the fiber content of the nata-forming media can also affect the thickness and volume of the nata that is formed. This statement is consistent with Tensiska (2008), which states that the chemical composition of food fiber varies depending on the cell wall composition of the producing plant. Basically, the components of plant cell walls consist of cellulose, hemicellulose, pectin, lignin, all of which are included in food fiber. In this study, it is suspected that the fiber content of Nipah leaves is higher than other fiber sources. Based on Akpakpan, et al. (2011) it is known that the Nipah midrib contains cellulose as much as 37.56%.

The thickness and low volume of nata in fruit skin fiber due to fruit skin have less fiber compared to the midrib and palm leaves, according to the results of Subiandono et al. (2011) that the crude fiber contained in Nipah flour is 22.1% the same as coconut cake which is 22.3%. Besides that, the study of Wijana et al. (2013) stated that the cellulose content of the frond fiber and the Nipah fruit skin fiber were both influenced by the type of raw material itself. This is because the midrib fiber and Nipah fruit skin fiber have different initial cellulose levels, namely the cellulose content of the Nipah leaves compared to the nipah fruit skin fibers. This is reinforced by the research of Tamunaidu and Shiro (2010), that the cellulose contained in nipah midrib fibers is more than the fiber of the nipah rind, namely the content of cellulose in the frond fibers as much as 42.22% and the fiber of the nipah fruit skin as much as 36.5%.

The effect of the concentration of soybean sprouts on the thickness and volume of nata fruticans, showed an average concentration of 15% thicker followed by control, 10% and 5%, but on the concentration of 10% soybean sprouts added to the midrib fibers showed an exception and was higher than all. The treatment included control using ZA as a nitrogen source.

The nitrogen from soybean sprouts is used by *A. xylinum* as nutrition so that it can grow and develop optimally. It is resulting in better nata production. The results show a tendency for lower yields on nata fruticans using 5% and 10% soybean sprouts. This amount had not met the nutritional needs of *A. xylinum*. This condition was supported by the statement of Arifiani, (2015) that the nitrogen content in soybean sprouts is around 20-35%, while the Urea nitrogen content (ZA) is around 46.50%.

The addition of soybean sprouts in this study shows that treatment soybean sprout 15% on media with leaf fiber and nipah fruit skin or 10% soybean sprouts with palm midrib has potential as an alternative to ZA.

Yield and Moisture Content of Nata Fruticans Using Soybean Sprouts as a Source of Nitrogen

The production of nata fruticans using soybean sprouts as a nitrogen source showed that the use of ZA as a nitrogen source (control) gave a higher average yield value than other treatments. The yield with the highest value was found in the treatment of Nipah leaf fiber (Figure 2).

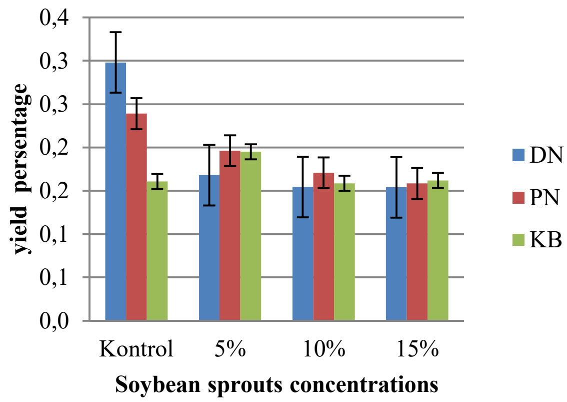

Figure 2. Nata fruticans Yield from Nipah Leaves (DN), Midrib (PN), fruit skin (KB), in various concentrations of soybean sprout and control (ZA)

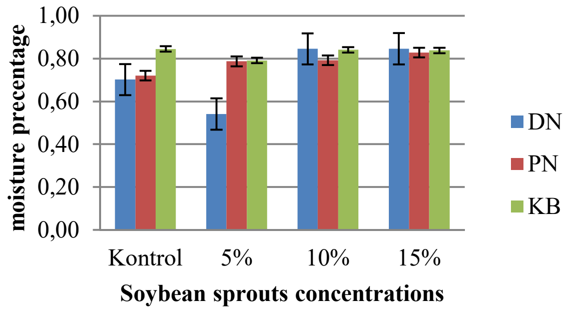

Figure 3. Moisture content of Nata fruticans from Nipah Leaves (DN), Midrib (PN), fruit skin (KB), in various concentrations of soybean sprout and control (ZA)

When viewed based on the source of nipah fiber used it appears that the yield of nipah leaf fibers is formed less than other sources of fiber except in the treatment using ZA as a source of nitrogen, and the amount of yield of nata fruticans formed based on variations in the concentration of soybean sprouts shows that the treatment using ZA as a nitrogen source (control) showed more results for all treatments except for treatments using nipah fruit skin fiber. While the water content of nata fruticans in this study showed a tendency to be inversely proportional to the amount of yield (Figure 3).

Putranto, K and Taufik, A. (2017) also stated that the sprouts extract affected the yield and moisture content of the nata formed. The thicker the nata, the higher the yield of nata, but the nata water content tends to decrease. This is because thick nata has a looser cellulose structure than thin nata, so that the water content in the nata is lower.

The yield of nata is a product of the fermentation reaction carried out by the Acetobacter xylinum bacteria in forming nata.

The yield of nata is directly proportional to the amount of nutrients in Nata medium (Lempang, 2007). Rossi, et al., (2008), said that the excessive use of nitrogen in the medium substrate, where an increase in the concentration of nitrogen is not followed by an increase in the concentration of other substances, so that the use of urea as a nitrogen source is likely to be a lot of nitrogen that is not utilized.

Conclusion

This study shows the best volume and thickness of nata fruticans is from the midrib substrate with a concentration of 10% soybean sprouts. The yield for all treatments was still low compared to controls. Meanwhile, the water content of all treatments was better than the control. The best quality of Nata Fruticans based on thickness, yield and average moisture content was generally obtained from the substrate from the leaf midrib with a concentration of 10% soybean sprouts.

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