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## Chemical properties of nira aren (*Arenga pinnata*) from Lareh Sago Halaban District of West Sumatera, Indonesia

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**Abstract.** Nira is the fresh liquor taken from the Palm Plant (*Arenga pinnata*). On the local method, Nira has harvested twice a day, in the morning and the afternoon. Ten hours of spontaneously fermented incubation had faced by the Nira before it ready to serve. The study aimed to determine the chemical properties of Nira, likely protein, fat content, water content, pH, and TTA (Total Titrable Acid) of the Lareh Sago Halaban District. The method used was the descriptive method and analysis in the laboratory. The sample of this study was taken from four different sub-district, which are Padang Tengah (NPT), Batu Payung (NBP), Sitanang (NST), and Lareh nan Panjang (NLP). The result revealed that the protein content was 0,33% - 0,38%. The highest was in NPT Nira, 0,14% -0,44% fat content and the highest was in NBP nira, 87,46% -90,29% water content and the highest in NST Nira, pH 6,8 – 7,0 and highest in NPT and NST Nira, Alcohol content 0-0,66% and highest in NBP Nira. Since fermentation spontaneously happens on Nira, there is always a chance to find Microorganisms to applicate on milk fermented to support human health.

**Keywords:** Nira, *Arenga pinnata*, Lareh Sago Halaban District, Chemical Properties, Spontaneous Fermentation

### 1. Introduction

Indonesia is a tropical area that is overgrown with various kinds of plants. Soil conditions and suitable climate support plant growth, one of which is aren (*Arenga pinnata*). Palm plants (*Arenga pinnata*) are very widely spread in Indonesia. Almost all parts of the palm plant (*Arenga pinnata*) can be used like fruit, leaves, stems, palm fiber, and sap. Aren (*Arenga pinnata*) has the potential to be developed. One of the products from the palm plant that is widely known is sap.

Nira is a clear liquid produced from the tapping process of male flower sap. Sap can be processed into several products, including palm sugar, sugar, vinegar, drinks, and alcohol. At present, the creation of latex that is in great demand by the public is ant sugar. Farmers mainly cultivate the cultivation of sugar palm (*Arenga pinnata*) in small-scale areas because plant management has not implemented good cultivation techniques that cause low crop productivity. Base on data processing issued by the Directorate General of Transportation in 2003 and the estimated area development rate of several



provinces that cultivate palm trees, the total area planted throughout Indonesia has reached 60,482 ha with a palm sugar production of 30,376 tonnes/year [1].

Nira is produced from sugar palm (*Arenga pinnata*), which is about 8 to 10 years old. The Anau (*Arenga pinnata*) plant that has produced sap can produce sap for about 6 to 10 months. Taking liquid is usually done in the morning at 08.00 WIB and in the afternoon at 17.00 WIB. Usually, the term for taking this sap is called tapping. Tapping sap usually uses bamboo. During the tapping process for  $\pm$  10 hours, the fluid is left alone without any treatment. In the process of tapping sap, good handling is needed, both before tapping and after tapping. Good handling of liquid is necessary because it contains certain sugars such as sucrose, glucose, fructose, and carbohydrates, which have an average acidity of 6-7 and have a sweet smell that will be easily contaminated by microorganisms if not appropriately handled. Although the sap that comes out of the flower is sterile, the damage of the juice can also occur during the process of collecting or tapping from the tree. Furthermore, when the sap is stored to wait for processing.

During the storage process, there are microorganisms in the sap so that the fermentation process occurs spontaneously. Spontaneous fermentation occurs due to microorganisms in the fluid without knowing the type of microorganisms beforehand. Based on previous research, it is known that the organisms in sap are included in lactic acid bacteria. Nira contains nutritional values, including water content of 87.20 % water content, 11.28 % sucrose, 0.20 % protein, 0.02 % fat, 0.24 % ash, and 4.80 % reducing sugar [2]. Nutritious Nira is one reason for the growth and development of microbes such as fungi or bacteria. This study aimed to see the chemical analysis of sap by testing the water content, protein content, fat content, pH, and alcohol content of the latex.

## 2. Materials and methods

### 2.1. Materials

The sample used as material for this research is Nira from various regions in Lareh Sago Halaban District, including Padang Tengah, Batu Payung, Sitanang and Lareh nan Panjang. The materials used to see the nutritional value of Nira are H<sub>2</sub>SO<sub>4</sub>, 30% NaOH, distilled water, methyl red indicator, 0.1 N NaOH, spirits, benzene, phenolphthalein (pp). The equipment used in this study were label paper, porcelain plates, pH meter, electric oven, analytical scales, kjeldahl flasks, funnels, distillation flasks, beaker glasses, Erlenmeyer, fume hoods, Bunsen, hyacinth pipettes, volumetric flasks, a set of soxhlet tools, bunsen, grease paper and aluminum foil.

### 2.2. Methods

The method used in this research is descriptive method and laboratory analysis.

**2.2.1 Water content.** The dishes are oven at 110°C for one hour. The plates were cooled in a desiccator to remove moisture and weighed. The sample was weighed as much as 5 grams in a plate that had been dried and baked at 105°C for 8 hours. The sample was then cooled in a desiccator for 30 minutes and weighed. This stage is repeated until a constant weight is achieved [3].

### 2.2.2 Protein content

- Destruction stage  
The sample is weighed as much as 1 gram. The sample was put in a kjeldahl flask. One grain of selenium is put into the tube and 1 gram of H<sub>2</sub>SO<sub>4</sub> is added. The tube containing the solution is inserted into the heating device. The digestion process is carried out until the solution becomes clear.
- Distillation stage  
The clear solution was cooled and taken 25 ml the sample and then added 150 ml of distilled water and 25 ml of 30% NaOH then distilled. The solution is heated (2/3 distilled) until all N

from the liquid in the flask is captured by 0.05 N H<sub>2</sub>SO<sub>4</sub> which has been mixed with methyl red indicator drops in erlenmeyer

- The titration stage  
The distillate in erlenmeyer was titer with 0.01N NaOH. A total of 25 ml 0.05 N H<sub>2</sub>SO<sub>4</sub> plus 3 drops of red methylated indicator was added to another erlenmeyer and titrated with 0.1 NaOH, resulting in a color change from pink to yellow as blank [3].

2.2.3 *Fat content* The fat squash will be used in the oven for 30 minutes at a temperature of 100-105°C. The fat flask is cooled in a desiccator to remove moisture and weighed. The sample is weighed as much as 1 g. then wrapped in filter paper, covered with fat-free cotton and put in a sokhlet that has been connected to the fat flask. Samples were previously ovenized and their weights were determined. The hexane solvent is poured until the sample is immersed and reflux or extraction is carried out for 5-6 hours or until the fat solvent that drops into the fat flask is clear. Fat solvent that has been used, refined, and collected. The fat extract in the fat flask is dried in an oven at 100-105°C for 1 hour. The fat flask is cooled in a desiccator and weighed. The drying stage of the fat flask was repeated until a constant weight was obtained [3].

2.2.4 *pH*. The degree of acidity of the sample was measured using a pH-meter, and calibrated with a buffer solution with pH values of 4 and 7. The sample was prepared as much as 5 grams, then added with 10 mL of distilled water, after which the sample was stirred for five minutes. The sample is transferred to the measuring cup, the pH-meter is immersed in the sample approximately 2-4 cm. The pH value is obtained by reading the scale indicated by the needle [3].

2.2.5 *Alcohol content*. Prepare a sample of 100 ml and put it in the Kjeldahl distillation flask and then add 100 ml of distilled water. Then it is distilled at 80°C. The distillate is collected in the Erlenmeyer up to a volume of 50 ml. The distillate is then put into a pycnometer which has been weighed beforehand. The distillate is added to fill the pycnometer. Excess distillate at the top of the capillary tube is removed. The pycnometer containing the distillate is weighed and its weight recorded [4].

### 3. Results and discussion

**Table 1.** An average score of proximate tests of *Nira*.

Sample code	Proximate test				
	Water content (%)	Protein content (%)	Fat level (%)	pH	Alcohol content (%)
NPT	87.46	0.38	0.26	7	0
NBP	90.29	0.33	0.44	6.8	0
NST	89.19	0.37	0.21	7	0
NLP	88.58	0.35	0.14	6.9	0.66

Note: NPT (Nira from Padang Tengah), NBP (Nira from Batu Payung), NST (Nira from Sitanang), NLP (Nira from Lareh nan Panjang).

#### 3.1. Water content

The data revealed that the sap's moisture content ranged from 87.46 to 90.29%. The water content in the sample code sap of NPT, NBP, NST, and NLP was 87.46%, 90.29%, 89.19%, and 88.58%, respectively. [2] The water content value in sap was 87.20%. The high level of water content because most of the juice consists of liquid compared to other organic materials, which causes the high water content in the sap. Meanwhile, other solid ingredients in fluid, namely sucrose and reducing sugar were 11.28% and 4.80% [2].

### 3.2. Protein content

Table 1 can see protein content in the range of 0.33 to 0.38%. The protein content in the sample code sap of NPT, NBP, NST, and NLP was 0.38%, 0.33%, 0.37%, and 0.35%. The results obtained in this study were higher than the research conducted by [2], which stated that the value of protein content in sap was 0.20%. The difference in protein in the fluid can be caused by the palm plant's condition and the palm plant's genetic characteristics.

### 3.3. Fat level

The range of fat level on sap around 0.14 to 0.44%. Fat content in the sample code sap of NPT, NBP, NST, and NLP were 0.26%, 0.44%, 0.21%, and 0.14%, respectively. The different fat content in the sap is also caused by environmental conditions and genetic traits in the sap. In general, the content contained in sap is water and sucrose content. Based on research that has been done previously, the fat content in sap is 0.02 % [2].

### 3.4. pH

The pH values of the NPT, NBP, NST, and NLP sample codes were 7, 6.8, 7, and 6.9, respectively. The results of this study are higher than the research conducted [5] stated that the palm plant sap collected by the coco-sap chiller and traditional method is 7.5 and 5.0. [6] The pH value of fresh palm juice stored for 0 days at ambient temperature and refrigerator temperature are 6.11 and 6.10. The high pH value in the sap indicates that the liquid has not undergone a fermentation process. The fermentation process of the latex can take place quickly if left at room temperature, which can cause the pH of the sap to drop.

### 3.5. Alcohol content

The alcohol content of sap with the NPT, NBP, and NST codes was 0%, while NLP was 0.66%. The results of this study are lower than the research conducted by [5], where the value of the alcohol content of sap collected using the traditional method is 4.7%. Palm sap contains microbes that can produce amylase enzymes and then convert them to alcohol [7]. Fresh juice that has just been tapped has not yet undergone a fermentation process, and alcohol content of 0% has been obtained. Meanwhile, sap's fermentation process, which can produce alcohol, starts from fermentation for  $\pm$  1 hour because it is influenced by the activity of natural microorganisms found in the sap.

## 4. Conclusion

Nira is a fresh liquid that contains high water and sucrose content. The difference in nutritional content of the sap can be caused by the juice's environmental conditions and genetic traits. The results obtained for the water content value ranged from 87.46-90.29%, with the highest value, namely NBP. Protein content ranged from 0.33-0.38%, with the highest value, NPT. Fat content ranged from 0.14-0.44%, with the highest value being NBP., the pH value ranging from 6.8-7 with the highest values being NPT and NST, and the alcohol content ranging from 0-0.66%, with the highest value being NLP.

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