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CULTIVATING HEALTH: TRADITIONAL ALCOHOLIC DRINK 'TUAK' AS A POTENTIAL FUNCTIONAL DRINK FOR REGULATING BLOOD GLUCOSE LEVELS WHILE KEEPING CULTURAL SIGNIFICANCE INTACT

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Abstract. This research examines the potential for developing traditional alcoholic drinks using Raru (Cotylelobium melanoxylon Pierre) as an additional ingredient in the fermentation of tuak. Tuak, as a traditional alcoholic drink that is popular in many regions in Indonesia, plays an important cultural role in traditional celebrations. The advantages of palm wine as a traditional alcoholic drink include its natural sweet taste, good nutritional content, low alcohol content and affordable price. By analyzing the potential of Raru as an additional ingredient in making palm wine, this research seeks to develop traditional alcoholic drinks that not only maintain cultural and traditional aspects, but also provide additional health benefits, especially in lowering blood sugar levels, by launching a new product called "RaruReserve: Healthy Tuak".

Key words: *Tuak, Fermentation, Culture*

INTRODUCTION

Alcoholic drinks are drinks that contain ethanol. This drink is made from agricultural products containing carbohydrates by fermentation and distillation or fermentation without distillation. Fermentation can occur by pre-treatment or not, by adding other ingredients or not, or by processing by mixing concentrate with ethanol or by diluting drinks containing ethanol. Raru (*Cotylelobium melanoxylon* Pierre) is part of a group of tropical forest plant species endemic to Indonesia in the Dipterocarpaceae family. Raru is the name of a group of tree bark that is added to palm tree sap and is intended to improve the taste and alcohol content of drinks. Sumatran people believe that the bark of raru (*Cotylelobium melanoxylon* Pierre) can be used as an antidiabetic drug. And according to research results from Pasaribu (2011) [1], there are 4 types of rare forest plants, namely: *Cotylelobium melanoxylum* Pierre, *Shorea bolancarpoides* Symington, *Cotylelobium lanceolatum* craib, *Cotylelobium melanoxylon* Pierre, which contain flavonoid compounds which can lower blood sugar levels. Some people also know raru as a medicine to treat diabetes (lowers blood sugar). Diabetes mellitus (DM) is a disorder of carbohydrate metabolism where glucose in the blood cannot be used properly and accumulates in the blood vessels, causing hyperglycemia. Blood sugar levels are related to the pancreas' ability to produce insulin, which converts glucose into glycogen. Diabetes or often called diabetes is a disease caused by abnormalities in the insulin hormone. Due to a lack of this hormone, the body cannot absorb glucose into the blood. Tuak is an alcoholic drink served at every traditional celebration because it has been part of popular culture since ancient times. From a cultural perspective, palm wine is a drink that can strengthen ties of brotherhood and is always served during traditional celebrations [2]. Tuak will be served to every guest who comes. Tuak comes from the palm tree (*Arenga pinnata*). Tuak contains 85.87% water, 14.33% sucrose, 0.38% protein, 0.27% ash and 0.1% fat. Tuak also contains natural microbes, especially yeast and bacteria. These microorganisms are *Saccharoymyces* sp, especially *Saccharomyces cerevisiae* and *Acetobacter* sp. These microorganisms can ferment sugar (sucrose) and convert alcohol and carbon dioxide, but if left for a few days, the alcohol will turn into vinegar [3]. During the fermentation process, *Saccharomyces cerevisiae* will produce the enzymes zymase and invertase. The zymase enzyme functions as a biological catalyst that is able to convert

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glucose and fructose into alcohol and CO. The invertase enzyme plays a role in converting sucrose into inverter (glucose and fructose). The vinegar from palm wine is one of the spices used to preserve corpses. The equation for the reaction of palm wine to produce vinegar due to the standing process can be seen in the reaction.

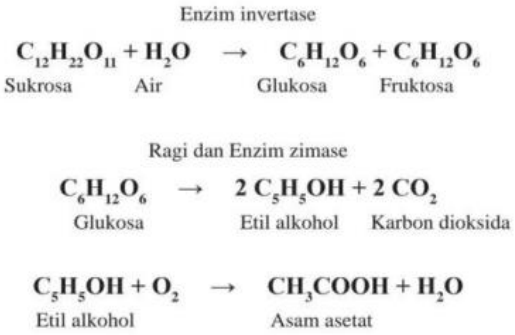
Research Objectives. Raru influences palm wine production and possible health benefits related to blood sugar levels, this research can provide valuable insight into the development of traditional alcoholic beverages that can provide additional health benefits, while maintaining the cultural and traditional aspects associated with palm wine consumption.

MATERIALS AND METHODS

The research was conducted in Kebun Lada Village, Hinai District, Langkat Regency, North Sumatra on October 14, 2023.

Materials. The materials used in this research were sap from 5 year old sugar palm trees and raru bark (*Cotylelobium melanoxylon*) which was obtained in Kebun Lada Village, Hinai District, Langkat Regency, North Sumatra. The raru bark is cut into smaller pieces about 5-7 cm long.

Methods. The process of converting tuak into vinegar uses the following equation [3]:



Procedures. In making palm wine from palm tree sap there are several stages, namely:

1. Collecting sap: Nira is fresh juice obtained from sugar palm or palm trees. It can be collected by cutting the flower stalk and letting the sap flow into a container containing small pieces of raru bark.
2. Fermentation: After the sap is collected, the sap is put into a larger container and given several pieces of raru bark and then left to ferment. This process can take several days to several weeks, depending on the strength of the wine desired. At least fermentation is left for 1-2 days to produce palm wine.
3. Filtering: After the fermentation process is complete, the palm wine is filtered to remove impurities from the raru bark.
4. Aging: The wine that has been filtered is then left for some time so that the flavors can develop. This can take several weeks to several months depending on wishes

Figure 1. Processing making palm wine from palm tree sap

RESULTS AND DISCUSSION

Alcohol Content

According to research conducted by Aryasa and his colleagues in 2019 [4], the ethanol content in palm wine varies during storage. On the first day of storage, the ethanol content in palm wine reached 4.839%. On the second day, ethanol levels increased to 5.076%, an increase of 0.237% compared to the first day. On the

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third day, palm wine stored at room temperature had an ethanol content of 5.233%, an increase of 0.157% compared to the previous day. On the fourth day, the ethanol content in palm wine reached 5.173%, a decrease of 0.06% compared to the third day. On the fifth day, the ethanol content was 4.971%, a decrease of 0.202% compared to the previous day. On the sixth day, the ethanol content was 4.954%, a decrease of 0.017% compared to the fifth day. On the seventh day, the ethanol content was 4.927%, with a decrease of 0.027% compared to the previous day.

The decrease in ethanol levels that occurred on the fourth, fifth, sixth and seventh days can be explained by research by Sari and colleagues in 2008. They stated that the optimal fermentation time for making ethanol or bioethanol is 3 days. If fermentation lasts more than 3 days, the alcohol content can actually decrease, because the alcohol is converted into other compounds, such as esters. The results of this research show that the ethanol content in palm wine during storage from the first day to the seventh day ranges from 4-5%.

Therefore, palm wine can be categorized as class A liquor. Apart from that, other research conducted by Ilyas and his colleagues in 2013 showed that palm wine contains 4% alcohol. Rizki and Lubis' research in 2021 [5] showed that the alcohol content in palm wine after storage from the first to the fifth day continued to increase, namely 8.1512%, 8.234%, 9.117%, 10.6214% and 11.615%.

Thus, it can be concluded that the alcohol content in fermented sap water (tuak) will continue to increase along with the length of fermentation. However, fermentation is taking place more than 3 days can reduce the alcohol content in palm wine and can even make it stale. In general, the alcohol content in palm wine ranges between 4-5%.

Taste and Aroma

The taste and aroma contained in the fermentation of sweet palm wine (tuak) have a slightly sour nuance and a distinctive freshness. Meanwhile, the color tends to be white with a slight turbidity. The duration of palm wine fermentation will be significant in influencing the taste and aroma characteristics of the final sap product. The longer the fermentation process takes, the taste of the palm wine will become very bitter and have a very unpleasant aroma, and it will turn yellow, indicating that the wine has passed its fresh state and has become unfit for consumption.

Product Quantity

In one fermentation process, 5 liters of pure sap can produce 5 liters of palm wine.

Product quality

The quality of palm wine produced during the first fermentation is very good, with an alluring sweet taste and a fresh aroma that excites the appetite.

Product Analysis

Product Description: Tuak is a type of liquid produced from coconut sap or other types of sap-producing trees such as siwalan, lontar and sugar palm which are tapped and left for several days. Nira tastes sweet, colorless and fragrant when still fresh. In general, the definition of palm wine is the term for drinks made from rice, nira (sweet liquid), or other drinks/fruit that contain fermented sugar assisted by saccharomyces bacteria. Tuak is a type of traditional alcoholic drink which is the result of fermentation from sap (mayang enau sap) and coconut as well as from several trees that contain sugar content such as palms, date palms, and others. Tuak is a typical Batak alcoholic drink made from sugar palm stems or coconut stems whose water is extracted and then mixed with raru.

Advantages of Palm Tuak

Palm wine has several advantages that can be attractive to consumers, including:

1. Natural sweet taste Palm wine has a natural sweet taste that comes from fermented palm sap. This natural sweet taste can be an alternative for consumers who want to avoid using added sugar in drinks.
2. Good nutritional content for health Palm wine contains nutrients that are good for health, such as B vitamins and amino acids. Apart from that, palm palm wine is also claimed to have health benefits, such as treating constipation, reducing fever, providing a warmth and freshness effect, facilitating breast milk, and relieving stress.
3. Low alcohol content Palm wine has a low alcohol content, so it can be an alternative for consumers

who want to avoid alcoholic drinks that have a higher alcohol content.
4. Affordable prices The price of palm palm palm wine is relatively affordable and competitive compared to other drinks on the market. With these advantages, palm palm palm wine can be an attractive drink choice for consumers who care about health and want to try unique traditional drinks.

Advantages of Palm Sugar Palm Tuak

1. Palm wine has a natural sweet taste that comes from fermented palm sap. This natural sweetness can be an alternative for consumers who want to avoid using added sugar in drinks.
2. Palm wine contains nutrients that are good for health, such as B vitamins and amino acids. Apart from that, palm palm wine is also claimed to have health benefits, such as treating constipation, reducing fever, providing a warmth and freshness effect, facilitating breast milk, and relieving stress.
3. Palm wine has a low alcohol content, so it can be an alternative for consumers who want to avoid alcoholic drinks that have a higher alcohol content.
4. The price of palm wine is relatively affordable and competitive compared to other drinks on the market. Consuming Palm Sugar Palm Tuak.
5. Tuak palm is a traditional drink that is popular in several regions in Indonesia, such as North Sumatra, South Sulawesi and Bali.
6. Palm wine consumption can be done at traditional events or as an everyday drink.
7. Several studies also show that consuming palm palm wine can provide health benefits, such as improving the immune system and reducing the risk of heart disease.

Regulation and Supervision

1. Palm wine is included in the category of alcoholic drinks and must be regulated and supervised by the government.
2. Several regions in Indonesia have issued regulations regarding the production and sale of palm palm wine, such as North Sumatra Regional Regulation Number 6 of 2011 concerning the Control and Supervision of Alcoholic Drinks and Traditional Liquor.
3. Supervision of the production and sale of palm wine needs to be carried out to ensure the quality and safety of the product and prevent misuse and negative impacts that may arise due to the consumption of alcoholic beverages.

Based on the results of the discussion, the author came up with an engineering idea that can be realized, namely the development of traditional 6 alcoholic drinks that can provide additional health benefits such as lowering blood sugar levels, while maintaining cultural and traditional aspects related to palm wine consumption. With the name resulting from the discussion, namely RaruReserve: Healthy Tuak.

CONCLUSION

From the results of the analysis and discussion above, several conclusions can be drawn as follows:

1. Raru (Cotylelobium melanoxylon Pierre) has the potential to develop traditional alcoholic drinks such as palm wine because it is considered to have potential health benefits related to reducing blood pressure. sugar level.
2. The process of making palm wine by fermenting sap involves various stages, including fermentation, filtration and aging, which greatly influence the physical and chemical properties of the final product.
3. The alcohol content in palm wine can vary during the storage process, and a decrease in alcohol content can occur if fermentation lasts more than 3 days.
4. Palm wine has several advantages, including a natural sweet taste, good nutritional content, low alcohol content, and affordable price, which makes it attractive to consumers who care about health and want to try traditional drinks.
5. Consuming palm palm wine is part of traditional culture in several regions in Indonesia, and several studies have shown that consuming palm palm wine can provide additional health benefits.

The main conclusion that can be drawn is that the development of traditional alcoholic drinks supplemented with Raru has the potential to produce products that can provide additional health benefits, especially for lowering blood sugar levels, while maintaining culture. character. and traditional aspects related to palm wine consumption. In addition, adequate regulations and controls must be implemented to ensure the quality, safety and responsible use of alcoholic beverages.Conclusion

should be explained clearly. Suggestion placed after conclusion contains a recommendation on the research done or an input that can be used directly by consumer. Conclusion and suggestion must be written using 40-80 words.

SUGGESTIONS

Can investigate further about the potential use of Raru (*Cotylelobium melanoxylon* Pierre) in making palm wine, especially in terms of health benefits associated with reducing blood sugar and cholesterol levels. Expanding research to understand in depth how Raru influences palm wine production, as well as the potential additional health benefits that Raru may offer in the context of lowering blood sugar and cholesterol.

By implementing these suggestions, this research can be more comprehensive and in-depth, providing deeper insight into the potential use of Raru in making palm wine that provides additional health benefits, while maintaining the cultural and traditional aspects associated with palm wine consumption.

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