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Ethnoscientific Study of Making Tuak (*Massari*) in Labissa Bone as a Biological Material Supplement

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Abstract

Background: Tuak is a traditional drink found in Labissa Village, Ajangale District, Bone Regency. Taking tuak is called Massari, the local wisdom of Labissa Village. The current independent Curriculum has the main characteristics of project-based learning: developing soft skills and student character, including integrating local wisdom in learning. This shows the need to explore local wisdom to be integrated into learning resources. **Methods:** This research aims to examine and analyze the process of making tuak, which will be incorporated as a biological supplement and is a type of ethnoscience research. The data source for this research used a purposive sampling technique. The data collection techniques used were observation, interviews, and literature study. Using two types of data: primary data and secondary data. Miles and Huberman's analysis techniques include data reduction, presentation, and conclusion drawing. The data validity test used is triangulation. **Results:** The research shows that making tuak (*massari*) can be integrated into biological materials. **Conclusions:** Making tuak (massari) in Labissa Village can supplement biological material, biodiversity, and biotechnology.

Keywords: Biological Supplements; Massari; Tuak.

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Introduction

Labissa Village is located in Ajangale District, Bone Regency, South Sulawesi. Bone Regency is famous for its history and customs, which are still upheld by the local community. In every history and custom, it is never separated from the role of the community and the results of its natural resources. Palm trees are the most abundant natural resource (BPS, 2024). Residents use this palm tree as an economical source for making traditional tuak. The process of taking tuak is called massari, which is a local wisdom of Labissa Village. In making tuak, various skills and insights can be developed into learning resources.

Decree of the Minister of Education, Culture, Research, and Technology Number 56/M/2022 concerning Guidelines for Implementing Curriculum in the Context of Learning Recovery, which aims to develop an educational unit curriculum, an independent curriculum. The independent Curriculum is a continuation of the development direction of

the 2013 curriculum, which is holistically oriented, competency-based, contextualized, and personalized by the cultural context, school mission, and local environment, as well as the needs of students. The independent Curriculum has the main characteristics, namely project-based learning to develop the students' soft skills and character, and it focuses on seven main themes, including the integration of local wisdom in learning.

One of the efforts is the integration of local wisdom through education. The activity of transforming indigenous or local knowledge into scientific knowledge is called ethnoscience (Ilhami et al., 2020). Ethnoscience is a more technical aspect of indigenous knowledge and indigenous science. Indigenous knowledge of traditional societies greatly influences education in Africa, the United States, Australia, and New Zealand, integrating local knowledge into the school curriculum (Sari et al., 2023). Local wisdom can be used as content in biology learning to support achieving learning objectives. This results in teachers facing many challenges related to local wisdom, which is used as a learning resource (Hidayati et al., 2020). Local wisdom can help produce concepts, ideas, or local wisdom products for preserving and developing culture, building character and love of national culture, increasing nationalism, and encouraging students to participate (Astuti et al., 2023).

From the research results of Festiyed et al. (2022), biology teachers explained that the theme of local wisdom is perfect to include in biology learning. Still, teachers have not been able to integrate local wisdom into science learning. The themes of local wisdom and science learning are still separate. Science learning in an ethnoscience-based approach can develop students' insight and skills in problem-solving (Winarto et al., 2022). Combining science knowledge in schools with indigenous science knowledge in the community can make students more aware of environmental issues and make learning more meaningful (Utari et al., 2021). Najib (2018), in his research, stated that there are obstacles to science learning. One example is the lack of science learning books that connect learning with the surrounding environment through local culture and wisdom. Supplements in the form of studies or references to teaching materials based on high-quality local wisdom and showing that the use of language is easy for students to understand (Oktavianty et al., 2022).

The research aims to examine the indigenous local knowledge of the community (ethnoscience) in Labissa village regarding the stages of making palm wine and its integration into science learning materials in schools.

Methods

This research uses a qualitative descriptive research approach. The type of ethnoscience research is chosen based on research methods that connect local community knowledge with scientific knowledge. The location of this research was Labissa Village, Ajangale District, Bone Regency.

Sample or Participant

The researchers used a purposive sampling technique, selecting samples based on the researcher's provisions and the required standards. This research involved five informants, namely 3 Tuak farmer informants and two biology teacher informants.

Instrument

The instruments used were an interview guide sheet with tuak farmers, an interview guide sheet with teachers, an observation guide related to the information the researcher wanted to learn, a cellphone camera, and stationery.

Data collection

The type of data used for the research process is primary data, namely data obtained directly by researchers originating from data collection, direct observation, and literature study. Sources of information for this primary data are tuak farmers in Labissa Village who have approximately 10 years of experience, teachers of SD Inpres 8/42 Labissa, and biology teachers of SMA Negeri 3 Wajo. The primary data is the result of observations and

interviews. Secondary data sources used in the research are biology textbooks, documentation, field notes, and literature studies.

Procedure

This research was carried out by directly observing the process of making tuak known as massari, in Labissa Village. After that, interviews will be conducted directly with tuak farmers and biology teachers. Assess the process of making tuak, which will be integrated into biology learning resources by examining the flow of learning objectives for biology material.

Data analysis

The data analysis technique used in this research is qualitative. Data analysis techniques used in Milles and Hubermann's research include data analysis techniques used in qualitative analysis: data collection, data presentation, and conclusion drawing.

Result

The Process of Making Siwalan Tuak (Massari).

Making Massari tuak is a tradition passed down from generation to generation. Tuak drink is a traditional drink in the village where the process of making massari tuak is skillful. The following are the results of observations of making tuak in Labissa Village.

Making tuak in Labissa Village begins with preparing the tools, namely a knife, and timpong. Timpong is a bamboo tool the community uses as a container to take tuak. The tuak maker uses a bamboo ladder that has been made to climb the palm tree.

Figure 1. A palm wine farmer climbs a palm tree carrying a knife and timpong

After that, the palm wine maker selects quality mayang, and then the tip of the mayang is cut using a knife.

Figure 2. The Mayang of the flower is cut off

The Mayang, whose tip has been cut, is inserted into a timpong so that the sap that comes out enters the timpong and is tied using a rope. After the sap is tapped, the sap will undergo a spontaneous fermentation process by microorganisms.

Figure 3. Timpong is inserted into the end of the Mayang and tied

After the timpong is complete, the sap is filtered and packaged into a traditional drink known as sweet palm wine, commonly called cenning palm wine, by the people of Labissa Village.

Figure 4. Packaging of tuak *cenning* from Labissa Bone

Result

Integration of Community Knowledge into Scientific Knowledge

Integrating knowledge of the process of making tuak in Labissa Village into biology material by examining the flow of learning objectives through an interview process with the teacher. The following results from integrating Indigenous community knowledge regarding the Massari process.

Table 2. Results of Integration of Indigenous Community Knowledge (*Massari)* into scientific knowledge

Research Focus	Original Science	Scientific Science
Definition of tuak	Tuak manis is a traditional drink with a distinctive sweet and sour taste.	Nira is a liquid that comes out by tapping. Nira is a raw material that can be used as tuak drinks. Nira contains acidity levels between 6 and 7 and sugar levels such as sucrose, glucose, fructose, and carbohydrates that will undergo fermentation by microorganisms, which will cause a sour taste due to the formation of acetic acid (Mardiyah, 2018).
Raw materials for making tuak	The raw material for making tuak is palm fruit, or siwalan, which grows abundantly in Labissa Village. In the Bugis language, it is known as buah ta'. Lontar sap is a drink that can only last 2 to 3 days.	Siwalan or palm tree (*Borassus Flabellifer L.*) is a type of palm (*Arcaceae*) with multipurpose properties. One of the functions of siwalan flowers is to be tapped by farmers to produce tuak drinks. The total sugar content in siwalan sap is around 130–180 mg/ml (Hawa & Makhfudhi, 2019). Siwalan tilapia contains a lot of sugar, so it quickly changes its taste to sour due to the fermentation process, which occurs if there are suitable environmental conditions for the growth of microorganisms (Ismawati & Yuniastri, 2019). After being tapped from the siwalan tree, the palm sap product can only be stored for a few hours (± 24-36 hours). When stored longer, bubbles appear, the taste turns sour, and the microorganisms present in it create a strong drink with a lot of alcohol (Widinugroho & Asri, 2022).

		The classification of palm trees is as follows Kingdom: *Plantae* Divisio: *Tracheopyhta* Kelas: *Mognoliopsida* Ordo: *Arecales* Famili: *Arecaceae* Genus: *Borassus L.* Spesies: *Borassus Flabellifer L*
The process of making tuak	Making tuak in Labissa Village begins with preparing the tools and materials used to make tuak, namely knives and timpong. Timpong is a tool made of bamboo that is used by the local community to make tuak. The tuak makers use bamboo ladders that have been made to climb the palm tree. After that, the tuak maker selects a good quality Mayang, and then the tip of the Mayang is cut using a knife. The cut mayang is put into the timpong so that the juice that comes out goes into the timpong and is tied with a rope. In tapping the sap in the timpong, a fermentation process occurs by microorganisms. After the timpong is filled, the sap is filtered and packaged into a traditional drink called tuak manis.	• Fermentation is a process of chemical changes caused by bacteria or organisms without the use of oxygen (Noor et al., 2018). • In the fermentation process, the sugar content in sap changes to alcohol, known as ethanol (Hawa & Makhfudhi, 2019). • Nira also experiences spontaneous fermentation due to the presence of contaminating microorganisms. Several things influence the fermentation process, including the type of microorganisms, temperature, oxygen, pH, and temperature (Bulu et al., 2019). • The microorganisms found in sap are lactic acid bacteria, lactobacillus, enterococcus, leuconostoc, streptococcus, and pediococcus (Bulu et al., 2019) saccharoryncess sp and acetobacter sp (Dayana, 2022). • The process that involves living things to produce products or services is called biotechnology (Sulistyowati & Roshayanti, 2022). • The utilization of living things naturally or has not undergone engineering in the production process is called conventional biotechnology (Hawa & Makhfudhi, 2019).
Benefits of tuak for the body	Tuak drinks have many benefits, such as maintaining immunity and energy and warming the body, but if excessively, it will negatively impact health.	• Tuak has many functions, including being a body warmer and breast milk booster for nursing mothers. It contains nutrients and protects breast milk to produce quality breast milk, overcome constipation and kidney disease diabetes, and maintain immunity (Firmando, 2020). • One of the simple carbohydrate drinks is Nira siwalan. The carbohydrates in siwalan sap can be used as an energy drink to slow fatigue (Falaach et al., 2022). Carbohydrate chemical compounds are composed of carbon (C), hydrogen (H), and oxygen (O) and have the formula CnH2nOn. One of the many benefits of carbohydrates is as a source of energy (Setiawan et al., 2022). • If alcohol is consumed excessively, it will increase metabolism in the liver by using enzymes with high activity, namely enzymes (ß3-ADH), which will disrupt the cytosolic system in the liver. This will have fatal consequences on emotions, balance, personality, and the body's coordination system (Noor et al., 2018).

Ethnoscience study of tuak making as a supplement to biological material.

ATP: Identifying biodiversity and classifying levels of creatures.

Biodiversity is the variation of organisms at the gene, species, and ecosystem levels. There are many functions and benefits of biodiversity, especially in Indonesia, namely biodiversity as a source of food, medicine, clothing, shelter, and cultural aspects (Irnaningtyas & Sylva Sagita, 2022).

As the objects of biological study, living things have a lot of diversity, so classifying them makes it easier to group living things. Classification of living things is done systematically and gradually. The taxon levels of living things start from the highest to the lowest.

Siwalan or palm tree (*Borassus Flabellifer L.*) is a type of palm (*Arcaceae*) with multipurpose properties. One of the functions of siwalan flowers is to be tapped by farmers to produce tuak drinks. The total sugar content in siwalan sap ranges from 130–180 mg/ml (Hawa & Makhfudhi, 2019).

Figure 1. Palm Tree (*Borassus Flabellifer L*).

The classification of Palm trees is as follows:

Kingdom: *Plantae*
Divisio: *Tracheopyhta*
Kelas: *Mognoliopsida*
Ordo: *Arecales*
Famili: *Arecaceae*
Genus: *Borassus L.*
Spesies: *Borassus Flabellifer L.*

ATP: Conduct planning and observational research on biotechnology products circulating in the community based on the basic principles of biotechnology processes.

Biotechnology is a science that applies scientific and engineering principles of processing with the help of living creatures, such as microorganisms, animal cells, and plants, that are used to increase the potential of living things and produce products or services for the benefit of living things (Irnaningtyas & Sylva Sagita, 2022). The process that involves living things to produce products or services is called biotechnology (Sulistyowati & Roshayanti, 2022).

The principle of biology is using living things, especially microorganisms, with enzymes. Microorganisms are used to change and produce food or beverage ingredients. One example is the process of making sweet tuak, which utilizes microorganisms for fermentation. Making tuak in Labissa Village begins with preparing the tools and materials used to make tuak, namely knives and timpong. Timpong is a tool made of bamboo that is used by the local community to make tuak. The tuak makers use bamboo ladders that have been made to climb the palm tree. After that, the tuak maker chooses a good quality mayang, and then the tip of the mayang is cut using a knife. The cut mayang is put into the timpong so that the juice that comes out goes into the timpong and is tied with a rope. In tapping the sap in the timpong, a fermentation process occurs by microorganisms. After the timpong is filled, the sap is filtered and packaged into a traditional drink called tuak manis.

ATP: Analyzing data from observations of biotechnology products communicated in various simple projects.

Nira is a liquid that comes out by tapping. Nira is a raw material that can be used as tuak drinks. Nira contains acidity levels between 6 and 7 and sugar levels such as sucrose, glucose, fructose, and carbohydrates, which will undergo fermentation by microorganisms, which will cause a sour taste due to the formation of acetic acid (Mardiyah, 2018). In tapping tuak, fermentation occurs, a process of chemical changes caused by bacteria or organisms without oxygen (Noor et al., 2018). In the fermentation process, the sugar content in sap changes to alcohol, known as ethanol (Hawa & Makhfudhi, 2019). Nira also experiences spontaneous fermentation due to contaminating microorganisms (Bulu et al., 2019). Apart

from sugar and microorganisms, several things influence the fermentation process, including the type of microorganism, temperature, oxygen, pH, and temperature (Bulu et al., 2019).

ATP: Impact and benefits of biotechnology products in daily life.

The biotechnology process has various impacts. The impact of the biotechnology process has many functions, including being able to be used as a body warmer and a breast milk booster for breastfeeding mothers because it contains nutrients and protects breast milk to produce quality breast milk, overcome constipation and kidney disease, diabetes and maintain immunity (Firmando, 2020). One of the simple carbohydrate drinks is Nira Siwalan. The carbohydrates in siwalan sap can be used as an energy drink to slow fatigue (Falaach et al., 2022). Carbohydrate chemical compounds are composed of carbon (C), hydrogen (H), and oxygen (O) and have the formula CnH2nOn. One of the many benefits of carbohydrates is as a source of energy (Setiawan et al., 2022). However, if consumed excessively, it will increase metabolism in the liver by using a high-activity enzyme, namely the enzyme (ß3-ADH), which will disrupt the cytosolic in the liver. This will have fatal consequences for emotions, balance, personality, and the body's coordination system (Noor et al., 2018).

ATP: Analyzing local wisdom, including understandings, beliefs, and faulty practices, over a long period and in a broad context.

From several interviews with local people in Labissa Village, it was said that tuak is a local wisdom in the form of a drink in Labissa Village. Making tuak still uses a traditional method passed down from generation to generation (Fransiska et al., 2024). Climbing the tuak tree still uses bamboo ladders made by the community, and the containers used still use bamboo, which the community calls timpong.

Conclusions

Making palm wine (*massari*) begins with preparing the tools. After that, the tapping process is done by cutting the palm tip and inserting it into a timpong. After the timpong is complete, the sap is filtered and packaged into a traditional drink known as sweet palm wine, commonly called tuak cenning, by the people of Labissa Village. Ethnoscience studies of the palm wine (massari) making process in Labissa Village can supplement biological materials on biodiversity and biotechnology.

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Declaration statement

The authors report no potential conflict of interest.

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