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TRADITIONAL FERMENTATION PROCESS OF LAIS FISH (CRYPTOPTERUS BICIRRHIS) IN BUTAS BAGU VILLAGE, SEMBAKUNG DISTRICT, NUNUKAN DISTRICT, NORTH KALIMANTAN

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ABSTRACT

North Kalimantan (Kaltara), the 34th province in Indonesia, with its capital city in Tanjung Selor, has very abundant natural resources (SDA) potential. North Kalimantan has a coastline of 3,515 km, which holds various capture fisheries potential. To discover the traditional fermentation process of Sikalut and Lais (Kryptopterus) fish in Butas Bagu Village. This final project aims to learn about the traditional fermentation process of lais fish (Cryptopterus Bicirrhis). Starting from Washing 1, Filleting, Disposing of Stomach Contents, Washing II, Draining Water, Salting, Freezing for 24 hours, Adding Cassava Dregs, and Putting Fish in Jars. Traditional fish processing should be done at night; the goal is to prevent flies from landing on the ingredients, and it should be done with caution if the preparations are mixed with other ingredients apart from cassava pulp or rice.

Introduction

The capital city of North Kalimantan (Kaltara), Tanjung Selor, is the 34th province of Indonesia and is home to a wealth of natural resources. 3,515 km of North Kalimantan's coastline offers a variety of fishing opportunities. To learn about Butas Bagu Village's traditional Sikalut and Lais (Kryptopterus) fish fermenting process (Hidayat, 2017). The goal of this final project is to explain and put into practice traditional fermented sikalut and lais fish (Tamba).

Washing step one, filleting and removing the stomach contents, washing step two, draining the water, salting, and defrosting for 24 hours before adding cassava dregs and packing the fish in jars (Darmayasa & Kusmaryani, 2016). In order to avoid flies falling on the materials, traditional fish processing should be done at night and with caution.

Along the coast of Tanah Kuning, Bulungan Regency, Tarakan City, Tanah Tidung Regency (KTT), and Nunukan Regency are places in Kaltara that have a chance of fishing. Not only fish but also seaweed has potential because of North Kalimantan. Some are islands, such as Nunukan, Tarakan, and Sebatik'. River mouths influence fish growth in the North Kalimantan region by producing chlorophyll (Meliala, Purnomo, & Rahman, 2019).

This chlorophyll will become plankton and a food source for fish. Nunukan Regency has abundant fishery products, such as cultivating seaweed, snapper, shrimp, crab, and many other fishery products.

In addition, the Sembakung River has abundant fishery potential with various types of fish, including snakehead fish, catfish, baung fish, and lais fish, as well as various other freshwater fishery products (Prihatin, Suprapto, & Rudiyanti, 2016).

In Kalimantan, this fish species of the family Siluridae, known as Lais fish, is a popular food fish because of its delicious meaty taste and high nutritional value. As consumption fish, lais fish are traded and have economic value, like the genera Kryptopterus and Ompok (Faulia, 2020).

Research on fishes of the Siluridea family in the Mahakam River is still limited to the study of the DNA barcode of the genus Kryptopterus (Jusmaldi, Solihin, Affandi, Rahardjo, & Gustiano, 2017) and the degree of gonadal maturity in Ompok myostoma. Studies on the cytochrome b gene of mitochondrial DNA can be conducted to investigate species' genetic diversity and relatedness within the same genus. Layfishes belong to the class Osteichthyes, subclass Actinopterygii, order Siluriformes, family Siluridae, and genus Cryptopterus. According to (Agustianti, 2016) data, the amateur fish belongs to Actinopterygii, order Siluriformes, family Siluridae, and genus Cryptopterus. According to (Saila, 2022), the characteristics of Cryptopterus are an elongated body shape and a straight, flat nose. The angled mouthpiece does not project beyond the eyes. The anterior nostrils and a pair of maxillary and mandibular antennae that extend behind the symphysis are generally short, rudimentary, or still required. The anal fin is very long, accessible, or connected to the deeply forked caudal fin. Teeth are pressed against the jaw like curved bands, in vomer-like single bands (except two separate pieces). It has 8-17 gill cover bones that strengthen. Gill ridges are common (15-17), relatively thin and long. Gill membranes are independent of each other and independent of the isthmus. This genus consists of several species, namely C. minor, C. bichirris, C. schilbeides, C. hexapterus, C. limpok, C. macrocephalus, C. apogon, C. microneme, C. lais, C. lumhioltzi, C. mononema, C. palembangensis, and C. parvanalis (Kottelat et al. 1993). The lais fish is known by regional names in Sumatra, namely lais padi, lais fungal, lais limpok, lais bemoan, lais unsung, lais beard, Jamis, while in Kalimantan, it is called lee, leis, lais tin, white lais, lais champion, lais judging, crust—yellow lais and yellow lais (Setiawan et al., 2020).

The history of fish processing began thousands of years ago. Since when people knew how to process fish, it is not known for certain. However, evidence suggests that simple fish processing methods were known as early as the Stone Age. Dying was believed to be the first method of preserving and processing fish. In the Neolithic period, people began to use fishing boats. Then, around 3500 BC, people began to use metal tools. Processing is a way to protect fish from decay so that they can be stored for a long time until it is time to eat them. Decomposition is caused by the influence of bacterial activity and the influence of enzyme activity (autolysis), which is the process of tissue decomposition that occurs by itself after the death of the fish and accelerates as the temperature increases, reaching a peak at 37˚C.

Fish processing begins with the traditional use of sunlight, which increases shelf life by reducing water content. However, traditional fish still has a poor image in the eyes

of consumers because it is of low quality and nutritional value, has inconsistent functional value, and does not provide quality and safety guarantees to consumers. There are several other processing methods, namely chilling, freezing, smoking, salting, frying, and fermenting fish (Office of Deputy Minister of Research and Technology for Empowerment and Socialization of Science and Technology, 2017).

Research Methods

Time and Place

This research started from 23 April 2022 to 15 May 2022 in Butas Bagu, Sembakung District, Jl. RT 01 Butas Bagu, Sembakung District, North Kalimantan, Indonesia.

Method of collecting data

1. Observation is observing by participating in the object being experienced. The type of observation used is participant observation, in which the person observes directly on the object of observation.
2. The discussion is based on observations and information from the local community about fermented fish (Tamba) manufacture, lecture materials, and some supporting literature.

Tools and materials

a. Tools

1. Basin;
2. Knife;
3. Cutting board;
4. Jar.

b. Materials

1. Fish Lais (Sikalut);
2. Water;
3. Salt;
4. Cassava (Cassava Dregs).

Pretreatment of Additives

Cassava pulp, a filler material for the fish fermentation process, is a waste material utilized by squeezing out the water contained in the cassava pulp. The procedure for treating cassava pulp is as follows: 2000 grams of a medium-sized cassava root are grated, and the grated cassava root is added to 15 ml of water. The cassava root is squeezed with the help of a filter, producing water and cassava pulp. The squeezed cassava pulp is dried with the help of sunlight for one day so that the dried cassava pulp is dehydrated. The dried cassava pulp is subjected to another treatment: heating at medium heat. The cassava pulp is poured into a pan and then fried (without oil) for 40 minutes at medium heat so that the cassava pulp takes on a brownish-yellow color. Cassava pulp that has gone through the heating process is left to cool.

Procedures

Procedures for processing this research based on Sikalut/lais fish are washed thoroughly under running water. The fish is filleted from head to tail and cleaned under running water. The fish is cleaned by removing the viscera and gills. Wash again to remove any remaining guts or dirt from the fish, then drain. Stack the washed and drained fish in a bowl with coarse salt. The washed and drained fish is stacked in a bowl and sprinkled with coarse salt. The fish is sprinkled evenly with 100 grams of salt. Fish that has been mixed with salt is left for about 24 hours. The preserved fish is then added to the cassava porridge. After mixing the fish and cassava porridge, the fish is placed in a small container and stored for a week to start the fermentation process.

Results and Discussion

Lais (Sikalut) Fermentation Process Flow

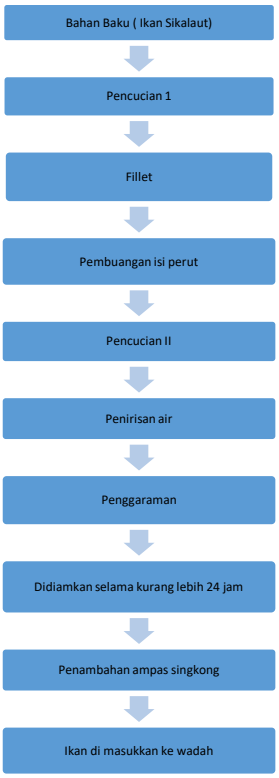

Figure 1
Flowchart of the Fermentation Process of Sikalut/Lais Fish (Kriptopterus)

Traditional fermentation processing of Sikalut/Lais (Tamba) fish has long been processed into preserved Agabag Dayak fish, especially in Butas Bagu village in Sembakung district, which is obtained from freshwater fish, which begins with fishing, cleaning the fish stomach, salting, and using additional materials for sample sources. This method of preservation is efficient and can be done with simple means. It is popular with the public because it has a distinctive flavor. The result of this fermented fish is a fish preservative and gives it a distinctive taste and aroma.

1 Washing I

The first washing aims to clean the dirt and mucus contained in the fish's body. It is placed in a basket/basin and then washed thoroughly using running water by spraying water on the fish's body so that contamination does not occur on the fish's body.

Figure 2 Washing I
(Source: personal documentation, 2022)

Fillet/ Disposal of stomach contents

The process of removing the stomach contents of Lais / Sikalut fish with a sharp stainless knife, the removal of the stomach contents begins with slitting the stomach of the fish; after slitting, all the stomach contents are then removed until it is completely consumed and there is not much left, and the body of the fish is sliced so that it can be lightly salted. Then, it is washed under running water.

Removing Stomach Contents and Gills

They remove the stomach and gill contents of the fish during filleting by slowly pulling on the gills so that all the contents of the fish's stomach can be pulled through the gill cavity.

Washing II

The second rinse aims to remove the remaining blood, mucus, and intestinal debris still attached to the fish body after removing the stomach contents, with the water flowing into the fish body so it is not contaminated.

Water Slicing in Fish

I was cutting the fish before salting aims to reduce the water content of the fish. The application of cutting for the fermentation of Sikalut fish is straightforward; a rice basket made of template-less material is used as a medium for cutting water in Sikalut fish.

Figure 3 Sikalut Fish Slicing Process
(source: Personal documentation, 2022)

Salting

Salting is preserving fish using crystal salt, brine, and seawater under room temperature, cold, and heating storage conditions. The salting method has long been performed by people who have eyes as fishermen/processors. Salt acts as a preservative because it removes water from the meat due to osmotic differences, at which point the

salt penetrates the fish meat so that it breaks down the cell walls of the decomposing microbes and reduces the water activity (AW) of the material so that the microbes cannot multiply (Anonymous, 1996; Junianto, 2003), (2018). Salt is essential for preserving fish because people know how to move from one place to another. Evidence of the use of salt to preserve fish is found in areas along the Nile, Tigris, Indus, Euphrates, and Yellow Rivers (China) from 3500 to 2000 BC. The Egyptians knew how to process fish well, using equipment that could be considered advanced with the introduction of smoking. In the Roman era, fish processing was even more advanced as spices were used to preserve and flavor processed products (Nielsen, 2005).

Salting of Sikalut/Lais fish is done by placing the fish in a container to initiate the salting process and then slowly sprinkling salt into the container with the Lais/Sikalut fish, slowly squeezing the fish body so that the salt mixes with the fish flesh. Coarse salt is used for salting at a ratio of 100 grams and 4 kg of Sikalut/Lais fish. The fish mixed with salt is then stored in a place protected from sunlight so that the fish does not spoil.

Storage of Fish Mixed with Salt

At this stage, the fish mixed with salt will be arranged in a basin and left for about 24 hours with the lid tightly closed. Do it at night.

Addition of Cassava Dregs

The fish, kept for about 24 hours, is added to the cassava porridge. In the native language, it is called (Lanam). It is 226.796 grams and 4 kg of fish. The purpose of using cassava porridge in fish is to accelerate the fermentation process and absorb the water content contained in the fish body.

Move the fish into the vessel.

The fish thoroughly mixed with the cassava pulp is transferred to a smaller vessel by stacking the fish until the vessel is complete and kept for a week for the fermentation process, as it exceeds the limit of one week for fermented fish when consumed with higher acidity.

The fermentation process in fish

The fermentation process in fish is a biological or semi-biological process in which complex compounds, especially proteins, are broken down into simple compounds under controlled conditions.

According to (Irianto, Dewi, & Giyatmi, 2013), the salting process for Sikalut/Lais fish is carried out by placing the fish in a container to start the salting process and then slowly sprinkling salt into the container with the Lais/Sikalut fish, squeezing the body of the fish so that the salt mixes with the fish flesh. Coarse salt is salted at 100 g to 4 kg of sikalut/lais fish. The fish mixed with salt is then stored in a place protected from sunlight so that the fish does not spoil.

The fermentation must then meet the following conditions:

1. Free of impurities
2. Relatively constant culture volume (no leakage or evaporation)
3. Dissolved oxygen content must meet standards.

4. Environmental conditions such as temperature and pH must be controlled. The process of fish fermentation, which is a biological or semi-biological process, can be divided into four groups, namely
5. High salt content is used in fermentation, for example, in the production of pedal, fish sauce, shrimp paste and cake
6. Organic acids are used in fermentation, such as producing fish silage by adding propionic and formic acids.
7. Mineral acids are used in fermentation, e.g., in producing fish silage using solid acids.
8. Bacteria are used in fermentation, for example, in producing becak em and chao anchovies.

Lay fish fermentation is salt fermentation, which can be distinguished in two ways: a. Fermentation by dry salting usually occurs in fish with low-fat content. b. Fermentation by wet salting, i.e., soaking in a salt solution, is usually carried out on fish with high-fat content. Fermentation by wet salting usually involves lactic acid fermentation as well.

So, when we talk about the factors that influence the fermentation process, they obviously cannot be separated from the microorganisms' activities. The most critical factors affecting fermentation are temperature, oxygen, water, and substrate.

Temperature

Temperature is one of the most critical environmental factors influencing and determining the type of organisms that prevail during fermentation. Some things related to temperature for each microorganism can be classified as follows:

a. Minimum temperature below which microorganism growth will cease.
b. Optimal temperature, which is the temperature that allows the fastest growth of the microorganisms.
c. Maximum temperature, above which growth of microorganisms is no longer possible.

2. Oxygen

The air or oxygen during the fermentation process must be regulated as best as possible to promote or inhibit the growth of specific microbes. Each microbe requires a different amount of oxygen for the growth or formation of new cells and fermentation.

3. Water

Microorganisms cannot grow in the absence of water. The water in the substrate used for the growth of microorganisms is expressed by the water activity or water activity = aw, which is the ratio between the vapor pressure of the solution (P) and the vapor pressure of pure water (Po) at the same temperature.

4. Substrate

Like other living organisms, microorganisms require food as an energy source and provide the essential chemical elements for cell growth. The substrate (food) that microbes require for survival is closely related to their chemical composition.

Microorganisms' need for substrates also varies. Some require a complete substrate, while others thrive on very simple substrates. This is because some microorganisms have enzyme systems (biological catalysts) that can digest compounds that others cannot.

Move the Fish Into The Jar

The fish that has been thoroughly mixed with the cassava pulp is transferred to a smaller jar by putting the fish in a stacking manner until the container is full and stored for one week for the fermentation process because it exceeds the limit of 1 week for fermented fish when it is consumed at its acidity level more felt.

Fermentation Process In Fish

The fermentation process in fish is a biological or semi-biological process of decomposing complex compounds, especially proteins, into simple compounds under controlled conditions.

According to (Irianto, Dewi, and Giyatmi, 2013), to obtain an optimum fermentation system, the salting process for Sikalut/Lais fish is carried out by placing the fish in a container to start the salting process, then slowly sprinkling salt into the container containing the lais/sikalut fish slowly and squeezing the body of the fish so that the salt mixes with the fish meat. The salt used for salting is coarse salt with a ratio of 100 grams and 4 kg of sikalut/lais fish. Fish mixed with salt is then stored in a place protected from sunlight so that spoilage does not occur in the fish.

Then, the fermentation must meet the following conditions:

1. Free from contamination
2. Relatively constant culture volume (does not leak or evaporate)
3. Dissolved oxygen levels must meet the standards.
4. Environmental conditions such as temperature and pH must be controlled.

The process of fermenting fish, which is a biological or semi-biological process, can, in principle, be divided into four groups, namely as follows:

a. Fermentation uses a high salt content, for example, in manufacturing pedal, fish sauce, shrimp paste, and cake.
b. Fermentation uses organic acids, for example, to make fish silage by adding propionic and formic acids.
c. Fermentation uses mineral acids; for example, the manufacture of fish silage uses strong acids.
d. Fermentation uses bacteria, for example, to manufacture becak em and chao anchovies.

Lais fish fermentation is salt fermentation, which can be distinguished in two ways: a. Fermentation by dry salting is usually done for fish with a low-fat content. b. Fermentation is done by wet salting, which is soaking in a salt solution, and this method is usually used for high-fat fish. Fermentation by wet salting usually also occurs in lactic fermentation.

So, when we talk about the factors that affect the fermentation process, they cannot be separated from the microorganisms' activities. Some main factors influencing the fermentation process include temperature, oxygen, water, and substrate (Irianto, H. E. 2013).

Temperature

Temperature is one of the most critical environmental factors influencing and determining the type of dominant organisms during fermentation. Some things related to temperature for each microorganism can be classified as follows:

a. Minimum temperature, below that temperature, the growth of microorganisms no longer occurs.
b. Optimum temperature, as the temperature that allows the fastest growth of microorganisms.
c. Maximum temperature: Above that temperature, the growth of microorganisms is no longer possible.

Oxygen

Air or oxygen during the fermentation process must be regulated as well as possible to increase or inhibit the growth of specific microbes. Each microbe requires a different amount of oxygen to grow or form new cells and ferment.

Water

Microorganisms cannot grow in the absence of water. Water in the substrate used for the growth of microorganisms is expressed in terms of water activity or water activity = aw, which is the ratio between the vapor pressure of the solution (P) and the vapor pressure of pure water (Po) at the same temperature.

Substrate

Like other creatures, microorganisms also need a food supply, which will be a source of energy and provide essential chemical elements for cell growth. The substrate (food) needed by microbes for their survival is closely related to their chemical composition.

The needs of microorganisms for substrates also vary. Some require a complete substrate, and some thrive on very simple substrates. This is because some microorganisms have enzyme systems (biological catalysts) that can digest compounds that others cannot.

Conclusion

From the results and the work carried out in Butas Bagu village, Sembakung District, Nunukan Regency, North Kalimantan, it can be concluded that The traditional process of fermentation of Sikalut/Lais fish in Butas Bagu Village, Sembakung District, Nunukan Regency, North Kalimantan, with the addition of cassava porridge within a week and the process flow The fermentation of Sikalut/Lais fish starts with washing I, filleting, removing viscera and gills, washing II, draining, salting, storing the fish mixed with salt, adding cassava porridge, transferring the fish to a container.

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