Quality study of dried *Peda* fish using a greenhouse effect vent dryer

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**Abstract:** The purpose of this study was to examine the physical and chemical characteristics of peda Tenggiri fish. Peda is a traditional processed fish product that is made by salting and then followed by fermentation. Types of fish commonly made peda include Tenggiri fish. The method used in this research was experimental and the parameters analyzed were air content, salt content, acid insoluble ash, and organoleptic. The results obtained from the initial water content of Tenggiri fish reached 37%, it can be denied that the water content of dried peda fish in Lhokseudu village has reached SNI (8273: 20016). Based on research, the initial salt content in Tenggiri fish ranges from 3.02%, the proportion that meets the Standard National Indonesian (SNI) so that it is still safe to use. The acid-insoluble ash content of Tenggiri fish reached 5.26% during the 23-hour drying process, the acid insoluble ash content increased, therefore the acid insoluble ash content did not meet the SNI standard.

1. **Introduction**

Fish is a food ingredient that is widely known and consumed by the public because it has a high nutritional content. The high water content can cause putrefaction in the fish. This condition is very detrimental because many fish are not used and have to be thrown away. However, there are limitations in processing and preservation techniques that cause fish to be easily damaged, so that proper techniques are needed to maintain fish quality. The simplest method of preservation is to process dried peda fish.

Peda is a product of fish fermentation by microorganisms through the addition of a certain level of salt. Peda making is a traditional fish preservation technique, easy to do, and does not require sophisticated special equipment. One of the fish that is usually used in the process of making peda is Tenggiri fish. The meat of Tenggiri contains high quality protein and vitamins which are very useful for growth and endurance. Peda is one of the fermentation products that is not further dried but is left half wet, so the fermentation process continues. One of the traditional fish processing techniques is fermentation.
In general, people usually dry peda fish using the drying method using sunlight as a heat source, and the peda fish that want to be dried are placed on an ancak (yarn net). One of the problems that often occur during the drying process is the weather factor. When the weather conditions are good and the sun is sufficient, the drying can be done well. However, when the weather is cloudy or rainy, the drying will be disrupted and will take a long time for the drying process. Drying with this method can cause a decrease in the quality of the fish. Drying in this way often occurs contamination from outside disturbances and hygiene is not guaranteed.

Based on the above, some difficulties are often faced in natural drying, especially during the rainy season. Therefore, it is necessary to process peda fish using modern drying methods. One of the modern drying systems with a solar energy system that has been designed or modified from previous dryers is the Green House Effect (GHE) Vent Dryer which can produce quality products because they are protected from outside disturbances. The dryer is designed using the principle of the greenhouse effect which still uses heat from the sun. solar dryers for fish can be formed from a transparent chamber that takes advantage of the greenhouse effect and can also add a solar collector connected to the drying chamber [1]. The modification of this solar tunnel type fish dryer aims to improve the efficiency of the dryer. The solar tunnel type fish dryer is designed with the aim of increasing the quantity and quality of the dried product, Design is focused on the ability of the tool to dry the product in a shorter time, produce more hygienic [2].

So far, traditional preserved/processed fishery products still have a bad image in the eyes of consumers, due to low quality and nutritional value and the absence of quality and safety guarantees. Fermented products usually contain a higher nutritional value than the original ingredient. Besides fermentation can help in preserving food and also provide certain properties that can be attractive to consumers, unique and can increase the economic value [3]. Traditional processing generally does not pay attention to the safety of the food products produced. Drying that is carried out by the community does not pay attention to the quality standards found in dried peda fish that still use conventional methods. Therefore, drying using a Green House Effect (GHE) Vent Dryer can affect the quality of peda fish. The purpose of this study was to determine the physical and chemical characteristics of dried peda fish.

2. Research Methods
This research method is qualitative with an experimental research design. This research was conducted in Gampong Lhokseudu, Leupung District, Aceh Besar District. Sample analysis was carried out at the Laboratory of Food and Agricultural Product Analysis, Department of Agricultural Product Technology, Faculty of Agriculture, Syiah Kuala University. The research was conducted in July-August 2020. The tools and materials used in this study were the Green House Effect (GHE) Ven, digital scales, salt, and Tenggiri fish.

2.1. Making Tenggiri Peda Fish
The method of making peda fish refers to the traditional method of making peda fish practiced by the people of Aceh. Fresh Tenggiri fish (still alive) is cleaned of dirt and discharged from the stomach. After weeding, the fish is washed clean and then drained for a while. After that, the fish is soaked for about 6 - 8 hours. The salting method used is dry salting. Fish that have been evenly coated with salt in the container are then left at room temperature for 12 hours or 24 hours. Furthermore, the samples obtained from Lhokseudu Village were analyzed for water content, salt content and acid insoluble ash in the Laboratory of Food and Agricultural Product Analysis.
2.2. Organoleptic Test
Sensory testing or organoleptic testing has been around since humans started using their senses to assess the safety quality of a food [4]. Organoleptic testing in this study used the hedonic test. The hedonic test is used to measure the level of liking for the product. The organoleptic analysis used the hedonic test with a hedonic scale which was transformed into a numerical scale, namely 1 (very dislike), 2 (dislike), 3 (neutral), 4 (like) and 5 (very like).

3. Results and Discussion
Parameters to be observed in this study include physical and chemical properties, organoleptic tests (color, aroma and texture) and (water content, salt content and acid insoluble ash). Quality standards for dried salted fish (SNI 8273: 2016) include a maximum water content of 40%, a maximum salt content of 12-20%, and a maximum ALT of 1 x 10^5 colonies / g, an acid insoluble ash content of 0.3% [5]. This research is expected to increase consumer acceptan ce and peda fish produced in accordance with SNI.

The purpose of this study was to determine the physical and chemical characteristics of peda tenggiri fish using a Green House Effect (GHE) Vent Dryer.

3.1 Moisture Content
Water content is one of the physical and chemical properties of a material that indicates the amount of water contained in food. Based on SNI, the maximum water content of dried peda fish is 40%. That the ability of the material to release water from its surface will be greater with increasing temperature of the drying air used and the longer the drying process, the lower the resulting moisture content [6]. This is also in accordance with Riansyah's statement which states that the higher the temperature and the duration of the drying time given, has a very big influence on the speed of water transfer [7]. The concentration of salt outside the fish's body is more concentrated than the liquid in the fish's body, so the salt will seep into the fish's body, while the water will seep out [8]. The results of the decrease in the water content of Tenggiri fish can be seen in Figure 1.

The results of the study can be seen in Figure 1 showing the water content of Tenggiri fish by 75%. After the drying process for 23 hours with the highest temperature of 79°C t at (T1) in the drying room, the water content decreased to 36.36%. For initial water content, this indicates that the water content of Tenggiri fish has reached SNI. So it can be concluded that the peda fish that have been marketed in the Village of Hokseudu have reached SNI. The higher the temperature and the duration of the given drying
time, the very big influence on the speed of water transfer. The higher the drying temperature, the faster the evaporation occurs, so that the water content in the material is lower [9].

3.2 Salt Content
Based on the results of research, the initial salt content in Tenggiri fish ranged from 2.45% - 3.02% with a salting time of 12-15 hours, this percentage meets the Indonesian National Standard (SNI) so that it is still safe for consumption. The Indonesian National Standard (SNI) requires that the salt content in peda fish is not more than 20% because high salt levels can lead to hypertension. During the drying process, the salt content begins to decrease due to reduced water content in the fish meat which causes a strong fish odor due to fermentation.

Based on field observations, it shows that with a salt content of 2.45% - 3.02% the condition of the Tenggiri fish is not good or is prone to damage to the fish meat due to the soft texture of the meat. The longer the drying process is carried out on peda fish, the condition of the fish is getting worse because the peda fish is left half wet in principle. The addition of salt can make the fish last longer, but it can also harm the health of the body. Excess salt can cause hypertension, stroke, kidney failure, coronary heart disease, obesity, cholesterol, and high fat in the blood. According to WHO, the recommended amount of salt consumed in a day is only 5%. People do not like it when the addition of excessive salt to fish causes the fish's flesh to change color.

Salt is a major factor in the process of salting salted fish, it functions as a preservative to prevent spoilage of the fish, thereby increasing its shelf life [10]. The higher the salt content given to the salting process, the more it increases its shelf life. The effect of salt concentration on the water content in peda fish meat increases salt concentration [11]. The initial and final salinity values can be seen in Figure 2.

![Figure 2. The value of salt content of Tenggiri](image)

The varying salt levels are thought to be due to the producers of peda Tenggiri fish in Lhokseudu Village who salted different amounts. In addition, based on observations in the field, it shows that some peda Tenggiri fish producers still use traditional methods, namely by doing it with makeshift tools which can cause changes in taste. As a result, the absorption of salt into fish meat in all fish production from Lhokseudu varies.

3.3 Ash is insoluble in acids
The results showed that the initial acid insoluble ash content in Tenggiri fish reached 5.26% - 7.09%. SNI requires a maximum acid insoluble ash content of 0.3%, the results show that the acid insoluble ash
content has not reached the SNI. Ash content can indicate the total minerals in a food ingredient. Most of the food ingredients, which are around 96% consist of organic matter and water. The rest consists of mineral elements [9]. Mineral elements are also known as organic substances or ash content. The higher the temperature and the length of time used during drying, the higher the ash content of the Tenggiri peda fish. The value of acid-insoluble ash content of Tenggiri fish can be seen in Figure 3.

![Value of acid-insoluble ash content of Tenggiri](image)

**Figure 3. Value of acid-insoluble ash content of Tenggiri**

The increase in ash content occurs because the longer the drying time and the higher the drying temperature, the more water is evaporated from the dried material [12]. That the ash content depends on the type of material, the method of ashing, the time and temperature used during drying [13]. If the material is processed through a drying process, the length of time, and the higher the drying temperature will increase the ash content because the water that comes out of the material is getting bigger.

### 3.4 Organoleptic test

This organoleptic test on peda Tenggiri was carried out by using the hedonic quality test. The hedonic quality test method is used to measure the level of preference and provide an assessment of the more specific characteristics of his observations on food products using an assessment sheet. In this assessment, the panelists consist of standard panelists where people have the ability and high sensitivity to peda fish products. The organoleptic test was carried out based on the hedonic scale by 7 panelists. The criteria assessed include color, aroma, and texture. The assessment criteria used a hedonic scale with the conditions that they namely 1 (very dislike), 2 (dislike), 3 (neutral), 4 (like) and 5 (very like).

#### 3.4.1 Aroma

The distinctive aroma of peda is caused by the presence of metal compounds ketones and butyl aldehydes resulting from hydrolysis of fat, while the rancid aroma is formed due to the destruction of fatty tissue in the fish's body due to the oxidation process and the process of fat hydrolysis by the lipase enzyme in the fish body to become fatty acids and glycerol [14]. The fermented peda product, which is made from the weeded guts of fish, produces a rancid aroma. This is because the removal of stomach contents will provide a wider surface for the oxidation process which can cause a rancid smell. A little smell and a rancid taste are sometimes acceptable, but if it is too hard it will disturb the taste, maybe this rancid smell indicates fewer panelists like peda fermented products.
3.4.2 Color
Evaluation of the quality of food ingredients generally depends on several factors, including taste, color, aroma, texture, and nutritional value. The color parameter is the first consideration for consumers to choose a food product before considering other parameters. The appearance of peda color in this study shows a pale to brownish red color. The hedonic test results of all panelists on the color parameter are categorized as like.

3.4.3 Texture
Any change in salt concentration in fermentation will cause water withdrawal from the fish tissue which causes various physical and chemical changes, such as texture [15]. Based on the results of the research, the texture of the Tenggiri fish meat is softer than other fish which are usually used as peda fish which is much harder, but due to the long drying process, the texture of peda Tenggiri fish is more destroyed because the temperature in the drying room is too hot. One of the quality parameters that play a major role in displaying the characteristics of peda fish is texture. Texture can be felt by the sensation of chewy, hard, soft, or tough and sticky, smooth or rough, gritty, and others. The texture of a good swordfish is dense, compact, flexible, and quite dry [16]. The organoleptic results of the level of preference for Tenggiri fish in replication III because the meat still looks intact, not too destroyed.

4. Conclusion
The initial water content of Tenggiri fish reaches 37%, it can be concluded that the water content of dried peda fish in Lhokseudu village has reached SNI (8273: 2001). Based on the results of research, the initial salt content in Tenggiri fish ranged from 3.02%, this percentage meets the Indonesian National Standard (SNI) so that it is still safe for consumption. The acid-insoluble ash content of Tenggiri fish reached 5.26% during the 23-hour drying process, the acid insoluble ash content increased, therefore the acid insoluble ash content did not meet the SNI standard. Based on the research results, the suggestion that can be given by researchers is that it is necessary to carry out further analysis of the ash insoluble in acid to meet SNI standards.

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