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Analysis of Protein Levels of Fermented Sarden Fish Pempek

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Abstract. Research on the topic "conducted to find out the chemical characteristics of fermented sardine lenjer pempek". Using a Randomized Block Design (RAK) which was arranged in a non-factorial manner with a comparison of the length of fermentation time consisting of 4 treatments and repeated 5 (five) times. Chemical parameters observed in this research is analysis protein, The tests carried out on pempek lenjer were compared with the length of fermentation time P0 (without fermentation/control), P1 (fermentation time 12hours), P2 (fermentation time 24 hours), P3 (36 hours of fermentation time). The results of the F test on chemical analysis were followed by Dunnet test. Observation parameters are chemical analysis of protein. The results showed P0: 6.86 %, P1: 7.44 %, P2: 7.86 %, the highest protein content with a value of P3: 9.03 %.

Keywords: fermentation time, pempek, sardines

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1. Introduction

One of the typical cuisines of South Sumatra which is usually consumed by children, teenagers, and adults is pempek. Pempek is made from ground fish, tapioca flour, salt and water [1]. The main ingredients for pempek are tapioca flour and ground fish meat which are added with salt, water and seasonings to taste [2]. Sardines (Sardinella sp.) are fish that are widely consumed by Indonesian people in various processed forms [3]. The type of sardine that is widely available in Indonesia is lemuru fish (Sardinellalemuru) [4]. Lemuru fish have the potential to be a source of protein [5] Lemuru fish is one of the small pelagic fishery commodities that are spread almost throughout Indonesia [6]. Lemuru fish can be used as raw material for processed fish food products such as tekwan, pempek and crackers. In addition to being rich in essential fatty acids [7] Therefore, an appropriate alternative for processing lemuru is needed to handle the abundant availability at harvest and increase its economic value.

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Fermentation is a form of preservation that is widely used in home industries and large companies, which functions to improve taste [8], inhibit the process of decay, and can increase the nutritional value of fish [9]. The fermentation process can also result in physical and chemical changes in the food [10]. These changes can improve nutritional aspects, digestibility so that it is easier for the body to absorb, and can increase the shelf life of fermented products [11].

Fermented fish products have been known as Southeast Asian products for many years [12]. The product is fermented using large amounts of salt until it becomes simpler components [13]. The advantage of fermented food is that it has a distinctive aroma, is easily absorbed by the body, and becomes functional food because it produces bioactive compounds [14].

Based on the times that have resulted in increased consumer awareness about healthy food [15], diversification efforts have been made on pempek products [16] namely sardine-based fermented fish pempek [17], [18]. The purpose of this study was to determine the chemical characteristics of fermented sardine pempek lenjer.

2. Materials and Methods

2.1. Place and Time

This research was carried out in July 2022.

2.2. Tools and Materials

The tools used in this study were plastic basins, knives, cutting boards, jars, scales, fish grinder, stirrer. The materials used for this study were sardines (Sardinella sp.) obtained from the Jakabaring Palembang wholesale market, salt, clean water and tapioca flour. The materials used in the chemical analysis are H2SO4, NaOH, H3BO3, 0.5 % phenolphthalein indicator, ethanol, petroleum ether, hexane and aquades and pempek lenjer sardines.

2.3. Research Method

The method used was a Randomized Block Design (RBD) which was arranged in a non-factorial manner consisting of four levels of treatment factors and was repeated 5 times. Data analysis used ANOVA and Dunnet's test.

Implementation of Research on Making Fermented Sardines

Sardines of the same size are weeded by removing the contents of the stomach and gills, then the fish is separated from the head, bones and skin, washed using clean running water. The clean sardines are then ground and then mixed with salt and stored for 0, 12, 24 and 36 hours, stored in a jar until the specified time.

Making Lenjer Pempek

Sardines that have been fermented are mixed with tapioca as much as 500 grams according to the treatment and added as much as 200 ml of water and kneaded until smooth. Furthermore, the pempek dough is formed into lenjeran with a diameter of 2 cm and a length of 6 cm. The printed pempek dough is then boiled for 15 minutes at a temperature of 100°C which is calculated from the time the pempek is added after the water boils. Pempek lenjer then drained and cooled at room temperature.

2.4. Observed Variables

The variables observed in the study were chemical analysis including protein content in pempek lenjer.

3. Results and Discussion

Based on the diversity analysis data, it was found that the length of fermentation time had a very significant effect on the protein content of fermented sardine pempek lenjer. Based on SNI 7756:2013 Frozen Boiled Fish Pempek protein content is 6.47% [19]. Whereas in this study the lowest protein content in the 0 hour treatment 6.86% fulfilled the SNI requirements. The results of the Dunnet test for the protein content of fermented sardine pempek lenjer in each treatment can be seen in Table 1.

Table 1. Dunnet Test Data on Fermentation Time on Protein Levels of Fermented Sardine Pempek Lenjer (%)

Treatment	The Average Value Protein Content (%)	Dunnet test Value	
		$\alpha_{0,05}$ = 0,16	$\alpha_{0,01}$ = 0,22
Fermentation 36 H (P3)	9,03	a	A
Fermentation 24 H (P2)	7,86	b	B
Fermentation 12 H (P1)	7,44	c	C
Fermentation 0 H (Control)	6,86	d	D

Note: Numbers followed by the same letter mean that they are not significantly different

The data were analyzed using ANOVA and further testing was carried out with Dunnet's test at alpha 0.05 and 0.01. The Dunnet test results in Table 1 show that the 36 hour fermentation treatment was significantly different from the 24 hour fermentation, 12 hour fermentation and 0 hour fermentation treatments. The 24 hour fermentation treatment was very significantly different from the 12 hour fermentation treatment and the 12 hour fermentation treatment was very significantly different from the 0 hour fermentation treatment. The highest protein content of fermented sardine pempek lenjer was found in treatment fermentation time of 36 hours with

an average value of 9.03% and the lowest protein content was found in treatment without fermentation with an average value of 6.86%.

The length of fermentation treatment affected the protein content of fermented sardine pempek lenjer and this can be seen in Table 1. The length of fermentation time 12 hours, 24 hours and 36 hours had protein levels that increased with increasing fermentation time compared to treatment control. Sardines fermentation process causes the breakdown of complex compounds in the form of proteins into simpler compounds [20] or derivatives of proteins, such as: proteose, peptones, peptides and amino acids. The breakdown process through hydrolysis is assisted by protease enzymes in sardines and protease enzymes derived from microorganisms (lactic acid bacteria) that are naturally found in sardines [21]. Longer fermentation time (36 hours) resulted in more protein derivatives and caused an increase in the percentage of pempek lenjer protein in P3 treatment. According to reference [22], during cassava fermentation the protein content increased from 2 % to 4 %.

Fermentation in sardines is a process of breaking down complex compounds, especially proteins, into simpler compounds. Fermentation is a processing method by utilizing the decomposition of compounds from complex protein ingredients [20]. These complex proteins are found in the fish body which are converted into simpler compounds with the help of enzymes derived from the fish body [23] or microorganisms and take place in controlled or regulated conditions. Proteins can be degraded, namely the breakdown of complex molecules into simpler molecules by the influence of enzymes. The products of protein degradation can be in the form of proteoses, peptones, polypeptides, peptides, amino acids and several other compounds [24].

Fermented food products usually have a higher nutritional value than the original ingredients. This is because the microbes in fermented products can break down complex components in food ingredients into simpler ingredients, making them easier to digest and also these microbes can synthesize several vitamins such as riboflavin, B12 and provitamin A [25]. Proteolytic bacteria are bacteria that are able to degrade proteins and produce extracellular protease enzymes. Protease is a proteolytic enzyme that catalyzes the breaking of peptide bonds in proteins. Common proteolytic bacteria are: bacteria from the genera Bacillus, Pseudomonas, Proteus, Streptobacillus, Staphylococcus and Streptococcus [26]

Sardines are fermented by adding 5% salt. The function of salt in the fermentation process is to reduce the water content in the food so that the water content is reduced and can inhibit the growth of bacteria. The less water in the fish meat will increase the protein content. The salt content used in fermented pickled white cabbage in reference [27] was 5% and 7.5%, respectively. The addition of salt content above 2.5% can reduce the potential for the growth of gram-negative bacteria which is not expected [28]. Reference [29] added that proteolytic

bacteria that cause foul odors in products can grow when fermentation uses a low salt content below 2.5% (<2.5%), while the use of a high salt content or more than 10 % (> 10%) can promote the growth of halophilic bacteria. According to [30], salt has a high osmotic pressure so it can attract water from fish meat. By decreasing the water content in salted snakehead fish, the protein content will increase.[31]

During the fermentation process there is an increase in the solubility of nutrients, especially proteins and carbohydrates (soluble sugars). Thus, fermentation can help increase the absorption of nutrients from these food products [9]. Fermented products are generally easily biodegradable and have a higher nutritional value than the original material [32]. This is not only caused by the catabolic nature of microbes or breaks down complex components into simpler ones so that they are easier to digest, but also can synthesize some complex vitamins. The benefits of fermentation include converting complex organic materials such as proteins, carbohydrates and fats into simpler and easier-to-digest molecules, changing undesirable tastes and aromas into favored ones and synthesizing proteins [33].

4. Conclusion

Based on the research that has been carried out, the following conclusions can be drawn: pempek lenjer of fermented sardines has a very significant effect on protein content. Protein content in fermented sardine pempek was found in P3 treatment with an average value of 9.03% and the lowest was in P0 treatment with an average value of 6.86%. This is in accordance with SNI 7756:2013 which states that frozen boiled fish pempek has a protein content of 6.47%

To obtain pempek lenjer fermented sardines with high nutritional value, it is recommended to use P3 treatment (fermentation time 36 hours). For further researchers, it is necessary to carry out further research on the effect of the length of fermentation time, it is better not to use too short a time to produce fermented sardine pempek lenjer with high protein content in each treatment.

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