Original Research Article
The Effect of Pineapple Extract (*Ananas comosus* L) on The Quality of Anchovy Fish Sauce

ABSTRACT

This research aims to determine the appropriate concentration of pineapple extract to produce anchovy fish sauce with quality that is in accordance with the Indonesian National Standard (SNI). The research was conducted from June to September 2021. The main research was carried out at the Laboratory of Fishery Products Processing, Faculty of Fisheries and Marine Sciences, Padjadjaran University, in contrast, the chemical quality test was carried out at the Laboratory of Ruminant Animal Nutrition and Animal Food Chemistry, Faculty of Animal Husbandry, Padjadjaran University. This research used an experimental method with a completely randomized design (CRD). The treatments used were the addition of pineapple extract concentrations of 0%, 10%, 15% and 20%. Each treatment used three replications. Observations were made by chemical tests for protein, fat, ash, water and pH levels. The results showed that each treatment had a significantly different effect on the levels of protein, fat, water, ash and the pH value of fish sauce. The treatment according to the Indonesian National Standard (SNI) was the addition of 10% pineapple extract with an average protein value of 15.88%. The lowest pH value is 6.17 with a concentration of 15% pineapple extract. The pH value does not meet the Indonesian National Standard (SNI).

*Keyword:* anchovy, pineapple extract, fish sauce quality, chemical quality
1. INTRODUCTION

Anchovy (*Stolephorus* sp.) is a type of small pelagic fish. Anchovy production in Indonesia in 2020 is obtained from the Riau Islands with a production volume of 54,875.85 tons [1]. Anchovy is one of the high-quality foods because all parts of its body can be consumed. Anchovy is good for health because it contains calcium and phosphorus for bone and tooth tissue [2]. Anchovy can be processed into various foods such as peyek, pepes and chili sauce.

One of the processed anchovy products that can be stored for a long time is fish sauce. Fish sauce is a food product that is processed through fermentation made from fish as well as fish waste and salt [3]. Making fish sauce traditionally requires a fermentation time of 4 to 12 months [4]. The long process of making fish sauce is a weakness, so it is necessary to have an alternative to speed up the processing process. The fermentation process in making fish sauce can be accelerated by using enzymes [5].

The enzyme that can accelerate the manufacture of fish sauce is the bromelain enzyme. Bromelain enzyme is one of the proteolytic enzymes, namely enzymes that play a role in protein breakdown which produces peptides or amino acids that can increase soluble protein levels [6]. Efforts to accelerate the process of protein hydrolysis in fish meat are mostly done by adding proteolytic enzymes from pineapple extract [7]. The use of extract preparations has the advantage that it is more practical to use because the raw material used is in the form of juice so that its storage does not require a large space [8] and this dosage form is the easiest to absorb [9]. The use of enzymes in fish sauce must pay attention to the quality it produces so that the nutrition of fish sauce can be measured.

Measurement of the quality of fish sauce in the Indonesian National Standard (SNI 01-4271-1996) includes pH level and amount of amino nitrogen. The quality test of fish sauce in this research included measurements of fat content, water content and ash content as a development step from previous research. Based on the description above, it is necessary to research the addition of appropriate levels of pineapple extract with different percentages on the quality of anchovy fish sauce as seen from the parameters of protein, fat, water, ash and pH levels.

2. RESEARCH AND METHODS

2.1 Time and Place of Research

This research was carried out from June to September 2021. The main research was carried out at the Laboratory of Fishery Products Processing, Faculty of Fisheries and Marine Sciences, Padjadjaran University, while chemical tests were carried out at the Laboratory of Ruminant Animal Nutrition and Animal Food Chemistry, Faculty of Animal Husbandry, Padjadjaran University.
2.2 Material and Methods

The tools and materials used in this research are cool bag, refrigerator, analytical scale, knife, plate, cutting board, beaker glass, measuring cup, strainer, stove, blender, pan, jar, mortar and pestle, ice gel, incubator, pH meter, anchovy, pineapple smooth cayenne, aquades, pH buffer solution 4, pH buffer solution 7, salt.

3. RESEARCH PROCEDURE

3.1 Pineapple Extract Manufacture

The pineapple fruit is peeled from the skin then the pineapple is cut into small pieces to put in a blender, after the pineapple is crushed then filtered and separated between the pulp and pineapple extract [10].

3.2 Fish Sauce Manufacture

The anchovies are first cleaned with running water and then put into a pan to be steamed for 10 minutes, then the anchovies are mashed using a mortar and pestle, the finely ground anchovies are put into jars, each jar is filled with 100 grams per unit and observed as many as 12 units. Pineapple extract was added with a volume of 0%, 10%, 15% and 20% per three units, the same volume of pineapple extract was added then added salt with a concentration of 7% (from the amount of meat) for each treatment, after that all the ingredients were mixed in a jar and then closed and allowed to stand for 3 days in an incubator with a temperature of 55°C after which the fish sauce was ready to be analyzed [11].

3.3 Research Methods

The research method used is an experimental method using a completely randomized design (CRD) consisting of 4 treatments and 3 replications with a fermentation time of 3 days.

The treatment of adding pineapple extract to anchovy fish sauce is:

A = Without the addition of pineapple extract (0%)
B = Addition of 10% pineapple extract
C = Addition of 15% pineapple extract
D = Addition of 20% pineapple extract

The data analysis used to prove the effect of adding pineapple extract and fermentation time on the quality of anchovy fish sauce was using the ANOVA method. Further analysis was used when it was found that the treatment had an effect on anchovy fish sauce. The analysis used is the
method of multiple comparisons in the form of the Duncan test method (DMRT). Data from chemical test results in the form of protein, fat, water and ash were analyzed descriptively.

4. RESULT AND DISCUSSIONS

4.1 Protein content

Proteins are macromolecules composed of amino acids that function to regulate metabolism and form tissues in the body. Protein content is one of the conditions that must be present in fish sauce. Based on Table 1, the average value of the highest fish sauce protein content is found in the 0% treatment, while the lowest value is in the 20% pineapple extract addition treatment. The low protein value in fish sauce is probably due to enzyme activity. Bromelain enzymes can affect protein levels in fish sauce, bromelain enzyme activity is affected by temperature and bromelain in pineapple flesh can be inactivated at 70°C and has an optimum temperature of 37°C [12]. The increase in temperature that exceeds the optimum limit causes the bromelain enzyme to be denatured, causing the enzyme to lose its activity. The treatment in this study used a temperature of 55°C which made the enzyme denatured. Bromelain enzyme activity can also be influenced by concentration, time, fruit maturity and pH, ripe pineapple has a pH of 3.0-3.5 [13]. Under acidic conditions, the bromelain enzyme is denatured so that it undergoes structural conformational changes and reduces its activity. This study resulted in a protein content of 13%-17%. This result is in accordance with the standard when compared with SNI 01-4271-1996 which states that fish sauce is classified as good, that is, it has a protein content of at least 5%.

Table 1. The Average Protein Content of Fish Sauce with the Addition of Pineapple Extract

| Addition Concentration Pineapple Extract (%) | Average Protein Content (%) |
|---------------------------------------------|----------------------------|
| 0                                           | 17.19 ± 0.81^b             |
| 10                                          | 15.88 ± 0.65^ab            |
| 15                                          | 15.13 ± 0.98^a             |
| 20                                          | 13.62 ± 0.72^a             |

Note: The average value followed by the same letter shows a non-significant difference based on Duncan’s further test at the 5% test level (p>0.05).

4.2 Fat Content

Fat content in foodstuffs has an influence in the form of a specific aroma in food [14]. Based on Table 2. The results of the analysis show that the addition of pineapple extract up to 20% produces soy sauce which has relatively the same fat content, which is 1.21%-1.54%. The results of this study indicate that the fat content decreased with increasing concentration of pineapple extract. The decrease in fat content occurs because the pineapple extract contains saponins, tannins and flavonoids [15].
Table 2. The Average Fat Content Value of Fish Sauce with the Addition of Pineapple Extract

| Addition Concentration Pineapple Extract (%) | Average Fat Content (%) |
|----------------------------------------------|-------------------------|
| 0                                            | 2.86 ± 0.44<sup>b</sup> |
| 10                                           | 1.54 ± 0.19<sup>a</sup> |
| 15                                           | 1.23 ± 0.16<sup>a</sup> |
| 20                                           | 1.21 ± 0.17<sup>a</sup> |

Note: The average value followed by the same letter shows a non-significant difference based on Duncan's further test at the 5% test level (p>0.05).

4.3 Water Content

Water in foodstuffs can affect the taste, texture and appearance of foodstuffs [16]. Based on Table 3, the results of the analysis show that the water content increases. The increase in water content in fish sauce can be influenced by several factors such as the result of chemical reactions, water vapor on the surface of the material, microbial metabolism that plays a role during fermentation and the fermentation time [17]. Another factor increasing the water content of fish sauce in this study is thought to be influenced by the addition of the ingredients used in the form of pineapple which has a high water content, smooth cayenne pineapple has a water content of 86.7% [18].

Table 3. The Average Water Content of Fish Sauce with the Addition of Pineapple Extract

| Addition Concentration Pineapple Extract (%) | Average Water Content (%) |
|----------------------------------------------|---------------------------|
| 0                                            | 70.90 ± 0.11<sup>a</sup> |
| 10                                           | 72.06 ± 0.21<sup>b</sup> |
| 15                                           | 72.96 ± 0.64<sup>c</sup> |
| 20                                           | 73.85 ± 0.33<sup>d</sup> |

Note: The average value followed by the same letter shows a non-significant difference based on Duncan's further test at the 5% test level (p>0.05).

4.4 Ash Content

The ash content in food serves to show the mineral content and determine whether a processing is good or not [19]. Based on Table 4. The average value of ash content given pineapple extract was lower than the treatment not given pineapple extract. The addition of more and more pineapple extract should make the ash content increase. The decrease in ash content is related to microbial growth because microbes will utilize the minerals contained in the material to grow [20]. The addition of pineapple extract can affect the presence of lactic acid bacteria colonies in
fish sauce, the addition of pineapple extract volume can increase lactic acid bacteria. The presence of lactic acid bacteria can be an indication of a decrease in ash content [21].

Table 4. The Average Ash Content of Fish Sauce with the Addition of Pineapple Extract

| Addition Concentration | Average Ash Content (%) |
|------------------------|-------------------------|
| Pineapple Extract (%)  |                         |
| 0                      | 37.67 ± 0.94<sup>c</sup>|
| 10                     | 35.92 ± 0.40<sup>ab</sup>|
| 15                     | 35.34 ± 0.77<sup>a</sup>|
| 20                     | 34.65 ± 0.08<sup>a</sup>|

Note: The average value followed by the same letter shows a non-significant difference based on Duncan’s further test at the 5% test level (p>0.05).

4.5 Nilai pH

The pH value is related to the shelf life of the product because it is related to the condition of the product against microbial attack [22]. Based on Table 5. The highest average pH value was in the 0% treatment, which was 6.90. The pH measurement results in the sample decreased and increased again at 20% treatment. The decrease in pH value in fish sauce occurs due to an increase in total lactic acid bacteria so that the conditions during fermentation become acidic [23]. The lactic acid produced can reduce the pH value and cause a sour taste, the bacteria that plays a role in meat fermentation is Pediococcus cerevisae [24]. Fish sauce which is hydrolyzed using bromelain enzymes will be more acidic due to the extraction of pineapple fruit which contains natural organic acids from the fruit [25]. The addition of 20% pineapple extract treatment resulted in an increased pH value. The increase in pH value was caused by the reshuffling of proteins into amino acids during autolysis to produce basic ammonia compounds [26]. The catabolism process that occurs in amino acids will form folate compounds such as ammonia (NH3) which can increase the pH because these compounds have alkaline properties [27].

Table 5. The Average pH value of fish sauce with the addition of pineapple extract

| Addition Concentration | Average pH Value |
|------------------------|------------------|
| Pineapple Extract (%)  |                  |
| 0                      | 6.90 ± 0<sup>d</sup>|
| 10                     | 6.67 ± 0<sup>c</sup>|
| 15                     | 6.17 ± 0<sup>b</sup>|
| 20                     | 6.37 ± 0<sup>b</sup>|

Note: The average value followed by the same letter shows a non-significant difference based on Duncan’s further test at the 5% test level (p>0.05).

5.CONCLUSION

The results showed that each treatment had a significantly different effect on the levels of protein, fat, water, ash and the pH value of fish sauce. The treatment was in accordance with the Indonesian National Standard (SNI), namely the addition of 10% pineapple extract with an average protein value of 15.88%.
Other test results, namely the highest fat content of 2.86% and the highest ash 37.67% were found in fish sauce without the addition of pineapple extract (0%) and the highest water content in the 20% treatment was 73.85%. The lowest pH value is 6.17 with a concentration of 15% pineapple extract. The pH value does not meet the Indonesian National Standard (SNI).

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