Processing Cindalok Condiment Using Foam-Mat Drying Method

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Abstract
This study was conducted to determine the effect of egg white on the physicochemical and sensory characteristics of grass jelly condiments, using a randomized block design (RAK) consisting of 1 factor 3 treatment levels, where the ratio of egg white and grass jelly concentrations was 50g: 500g, 75g: 500g, 100g: 500g used nine replications so that 27 trials were obtained. Data were analyzed statistically using the ANOVA test, followed by the BNJ test. The Friedman test analyzed organoleptic data for the best treatment using the effective index method. The best treatment of cindalok condiments was found in the ratio of egg white and cindalok concentrations of 100g:500g, namely yield of 79.78%, the water content of 7.91%, the water activity of 0.63, ash content of 4.83%, total protein of 26.03%, total acid 7.39%.

Keywords: cindalok; condiments; egg white

1. Introduction

Cindalok is a typical fermented product of Kalimantan as daily and traditional food (Zakria, 2017). Cindalok is made from little shrimp, which is made with the addition of rice and salt and then fermented in a closed container for 1 to 2 weeks (Irianto et al., 2013). Fermentation in cindalok is considered complete if the texture of the shrimp used has been crushed, resulting in a prominent sour taste and a characteristic sour aroma (Novelia et al., 2020). The quality of cindalok can be assessed through organoleptic tests in the form of appearance tests based on color, texture, smell, and taste (Novelia et al., 2020).

Cindalok is easily damaged and has a porridge-like texture and a prominent sour aroma. One way to extend the shelf life of cindalok is that it can be made in the form of condiments. According to Eritha (2006), along with the development of the times, the food products desired by modern society not only consider the elements of nutritional fulfillment but also need to be practical, fast, durable, and do not require a lot of storage space. Condiments can be in liquid form and dry form (powder). According to Firdhausi et al. (2015), making condiments generally consists of two stages: extraction and drying. Product quality is strongly influenced by the drying process (Mahapatra and Nguyen, 2009).

One of the drying methods that can be used to make cindalok condiments is the foam mat drying method. Foam mat drying is a drying method that involves mixing the material to be dried with a foaming agent to produce a stable foam and dried with hot air at temperatures ranging from 50-80oC. The foaming agent is an active ingredient that can reduce surface tension and facilitate foam formation (Sharada, 2013). This study uses egg white as a foaming agent. Egg white contains protein and can act as a foaming agent by binding other ingredients to blend together, which is expected to obtain better quality condiments. This study aims to determine the ratio of egg white to the best physicochemical and sensory characteristics of the condiments.

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2. Methods

2.a. Research Design
The design used in this study used a Randomized Block Design (RAK), which consisted of one factor, namely egg white (P). This study was divided into three levels of treatment (cincalok: egg white), namely:

\[ p_1 = 500g : 50g \]
\[ p_2 = 500g : 75g \]
\[ p_3 = 500g : 100g \]

It used nine replications to obtain twenty-seven experimental units. The research was conducted at the Food Technology Laboratory, Food Chemistry Laboratory, and the Food Design Laboratory, Faculty of Agriculture, Tanjungpura University.

2.b Tools and Materials
The tools used to make tempeh and date snack bars are kitchen utensils. The materials used for the research were cincalok, egg white, garlic, and chili.

2.c. Cincalok Condiment Manufacturing
Initially, the cincalok was drained to remove some of the water contained in the cincalok using a container. Then the cincalok was weighed as much as 500 g, adding chili as much as 3 g, and garlic as much as 5 g (Dyastuti, 2013). The next step is the addition of 50, 75, or 100 g of egg white according to the treatment; beat the egg white for 5 minutes until it forms a foam. Mix all the ingredients and place them on a 60x45 baking sheet, which has been coated with aluminum foil.

They were then dried in a cabinet for 6 hours at a temperature of 60°C. Dried cincalok in a blender until smooth and the cincalok condiments are obtained (Kamsiati, 2006). Then the yield, water activity, moisture content, ash content, protein content, and total acid was analyzed.

2.d. Data Analysis
The data from this study will be analyzed statistically with the F test (ANOVA) with a test level of 5%. If it has a significant effect, it is continued with the Honest Significant Difference (BNJ) test with a level of 5%. The hedonic test data were analyzed using the Friedman method through the SPSS version 20 system. The best treatment was determined using De Garmo et al. (1984).

3. Results and Discussion

3.a. Water Content
Water content is the amount of water contained in the material expressed in percent, where water is an essential component in food ingredients because water can affect the physical properties, texture, and taste of food (Winarno, 2008). Based on the results of the ANOVA, statistical analysis showed that the addition of egg whites had a significant effect on the water content of the resulting cincalok condiments, meaning that F count > F table, so it was necessary to do a BNJ test with a level of 5% to determine the difference between each treatment. The moisture content of cincalok condiments ranged from 10.47% - 12.54%. The moisture content of cincalok condiments is presented in Table 1.

The data in Table 1 shows that the highest water content of cincalok condiments is found in the 500g:100g treatment, which is 12.54%, while the lowest is in the 500g:50g treatment, which is 10.47%. The water content is close to some condiment products, namely shredded, chili paste, and shrimp paste, so this study uses the SNI for shrimp paste. According to SNI 2716-2016, the excellent water content in packaged shrimp paste is 42%. Thus, the results of this study indicate that the water content of cincalok condiments has met SNI.
Table 1. Condiment Moisture Content (%)

<table>
<thead>
<tr>
<th>Cincalok : Egg White(g/g)</th>
<th>Moisture Content (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>500 : 50</td>
<td>10,47 ± 0,31</td>
</tr>
<tr>
<td>500 : 75</td>
<td>11,59 ± 0,20</td>
</tr>
<tr>
<td>500 : 100</td>
<td>12,54 ± 0,35</td>
</tr>
</tbody>
</table>

BNJ = 0,28

This study's results indicate that the water content will increase the more egg whites are added. This is by Sujionohadi (2013), who said that water composition in egg white is 87.8%. In the process of processing cincalok condiments, using a temperature of 60°C for 6 hours can increase the water content of cincalok condiments due to the addition of high egg whites, which can improve the water content because when left at room temperature, the resulting cincalok condiments are hygroscopic (the ability to absorb water).

3.b. Total Protein

Protein is a source of amino acids consisting of elements C, H, O, and N. Protein functions as a substance to build new tissues, regulates the body's metabolic processes, and as fuel if the body's energy needs are not met by fat and carbohydrates (Winarno, 1986). Total protein analysis aims to determine the amount of protein contained in cincalok condiments. Based on the results of ANOVA statistical analysis, it showed that the addition of egg whites to the manufacture of cincalok condiments had a significant effect on the total protein analysis, meaning that the calculated F value > F table, so that further tests were carried out with the BNJ test with a test level of 5% to determine the difference between each treatment. The total protein condiment of cincalok is presented in Table 2.

Table 2. Total Protein Condiment (%)

<table>
<thead>
<tr>
<th>Cincalok : Egg White(g/g)</th>
<th>Total Protein (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>500 : 50</td>
<td>24,91 ± 0,36</td>
</tr>
<tr>
<td>500 : 75</td>
<td>25,54 ± 0,30</td>
</tr>
<tr>
<td>500 : 100</td>
<td>26,03 ± 0,15</td>
</tr>
</tbody>
</table>

BNJ= 0,27

Table 2 shows the protein content of cincalok condiments produced in this study in the range of 24.91-26.03%. The highest total protein was found in the 500g:100g treatment, which is 26.03%, and the lowest complete protein was found in the 500g:50g treatment. That is 24.91%. Currently, there is no commercial standard for cincalok products, so in this study, SNI for shrimp paste is used. According to SNI 2716-2016, the protein content in shrimp paste is at least 15%, and the study results show that all treatments have met SNI.

The more treatment the addition of cincalok condiment egg white produced, the higher the total protein. This is presumably because egg white and cincalok contain high protein. This is to the statement of Winarno and Koswara (2002), which states that egg white has a total protein of 10.30g per 100g of the egg, while the protein content of cincalok ranges from 28.65% (Yanuar, 2013).

3.c. Total Acid

Total acid analysis in this study aims to determine the total acid contained in cincalok condiment with the concentration of egg white addition. The ANOVA results showed that the addition of egg whites to the manufacture of cincalok condiments had a significant effect on the total acid, meaning that the calculated F value > F table so that a further BNJ test was carried out with a test level of 5% to determine the difference between each treatment. The total cincalok condiment acid is presented in Table 3.

Table 3 shows the total cincalok condiment acid produced in this study in the range of 7.39-8.45%. The highest total acid was found in the 500g:50g treatment, which was 8.45%, and the
The lowest total acid was found in the 500g:100g treatment, which was 7.39%. The higher the concentration of egg white use, the lower the total acid; on the contrary, if the concentration of egg white is low, it produces a high total acid. This is presumably because the higher the concentration of egg white, the total lactic acid will decrease.

![Table 3. Total Asam Bumbu Cincalok (%)](image)

<table>
<thead>
<tr>
<th>Cincalok : Putih Telur (g/g)</th>
<th>Total Asam (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>500 : 50</td>
<td>8.45 ± 0.21^c</td>
</tr>
<tr>
<td>500 : 75</td>
<td>7.82 ± 0.17^b</td>
</tr>
<tr>
<td>500 : 100</td>
<td>7.39 ± 0.34^a</td>
</tr>
</tbody>
</table>

BNJ = 0.17

3.d. Ash Level

Ash content is a parameter to indicate the value of inorganic (mineral) content in a material or product. The higher the ash content, the more inorganic material contained in the product (Kusumaningrum et al., 2013). Based on the results of ANOVA, statistical analysis showed that the addition of egg whites to the manufacture of cincalok condiments had a significant effect on the ash content, meaning that $F_{count} > F_{table}$ so that the BNJ test was carried out at a level of 5% to determine the difference between each treatment. The ash content of cincalok condiments is presented in Table 4.

![Table 4. Ash Level](image)

<table>
<thead>
<tr>
<th>Cincalok : Egg White (g/g)</th>
<th>Ash Level (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>500 : 50</td>
<td>4.24 ± 0.20^a</td>
</tr>
<tr>
<td>500 : 75</td>
<td>4.47 ± 0.24^a</td>
</tr>
<tr>
<td>500 : 100</td>
<td>4.83 ± 0.26^b</td>
</tr>
</tbody>
</table>

Table 4 shows the range of ash content of cincalok condiments is 4.24-4.87, where the highest ash content is in the 500g:100g treatment, which is 4.83%, and the lowest ash content is in the 500g:50g treatment, which is 4.24%. Currently, there is no commercial standard for cincalok products, so in this study, SNI for shrimp paste is used. According to SNI 2716-2016, the excellent ash content in shrimp paste in packaging is a maximum of 5%, and the manufacture of cincalok condiments produces cincalok condiments ash content that meets SNI. This shows that the higher the egg white concentration, the higher the ash content. This is presumably because adding egg whites containing minerals can increase the ash content. By the research of Li et al. (2016), the ash content of corn flour increased as the concentration of egg white increased. Adding egg whites can increase the mineral content because egg whites contain several minerals such as iron, phosphorus, calcium, magnesium, potassium, and others (American Egg Board, 2000).

3.e. Yield

Yield is expressed as a percentage of the final product produced per weight of processed material (Hartanti et al., 2003) so that the efficiency of the processing process can be known. The higher the yield value of a product, the more excellent the opportunity to use the product or processed material. Based on the results of ANOVA, statistical analysis showed that the addition of egg whites to the manufacture of cincalok condiments had a significant effect on the yield, meaning that the calculated $F_{value} > F_{table}$ so that the BNJ test was carried out at a 5% level to determine the difference between each treatment. The yield of cincalok condiments is presented in Table 5.

Table 5 shows the yield value in the range of 68.38-79.78%, where the lowest yield was found in the 500g:50g treatment, which was 68.38%, while the highest yield was found in the 500g:100g treatment, which was 79.78%. The yield of cincalok condiments tends to increase with the increasing concentration of egg whites used. This shows that the more the concentration of egg
white is added, the more the amount of bound material. Estiasih and Sofiah (2009) stated that flour processing using foaming or foaming agents would affect the yield obtained because the use of foaming or foam-forming materials causes the total solids of the product to increase, as a result of which the powder yield also increases.

Table 5. Condiment Yield

<table>
<thead>
<tr>
<th>Cincalok : Egg White (g/g)</th>
<th>Yield (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>500 : 50</td>
<td>68.38 ± 0.63&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>500 : 75</td>
<td>70.15 ± 2.87&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>500 : 100</td>
<td>79.78 ± 0.65&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

BNJ = 1.80

3.f. Water Activity (Aw)

Water activity (Aw) is defined as the amount of free water in food. The free water contained in these foodstuffs will affect the shelf life of foodstuffs. Foodstuffs with a high water activity value are generally easily damaged by food because high water activity can trigger microbial growth and specific chemical reactions, such as oxidation or enzymatic reactions in foodstuffs. Based on the ANOVA statistical analysis results, adding egg whites to the manufacture of cincalok condiments had no significant effect on water activity, F count < F table, so the BNJ test was not carried out. The water activity of cincalok condiments is presented in Table 6.

Table 6. Condiment Water Activity

<table>
<thead>
<tr>
<th>Cincalok : Egg White (g/g)</th>
<th>Water Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>500 : 50</td>
<td>0.62 ± 0.04&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>500 : 75</td>
<td>0.62 ± 0.03&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>500 : 100</td>
<td>0.63 ± 0.03&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

BNJ = 0.03

Table 6 shows the water activity value of cincalok condiments in the range of 0.062-0.063, where the highest water activity value is found in the 500g:100g treatment, which is 0.63, and the lowest water activity is found in the 500g:50g treatment, which is 0.62. Measurement of water activity refers to the method of Scott (1957) using a hygrometer. According to Purnomo (1995), the water activity value for dry materials such as dry grains, dried nuts, cakes, dried fruits, and flour, in general, ranges from 0.60-0.85. Generally, pathogenic bacteria cannot grow at water activity values below 0.86.

3.g. Best Treatment

Determination of the best treatment based on the results of research on cincalok condiments was carried out by the method of De Garmo et al. (1984). The best treatment is indicated by the highest yield value (NP). The weighting of parameter values is determined based on the requirements of SNI; the rest is based on the level of importance in the quality of the condiments. The best value of cincalok condiments is presented in Table 7.

Table 7. Best Treatment Cincalok Condiment

<table>
<thead>
<tr>
<th>Cincalok : Egg White (g/g)</th>
<th>NP</th>
</tr>
</thead>
<tbody>
<tr>
<td>500 : 50</td>
<td>2.99</td>
</tr>
<tr>
<td>500 : 75</td>
<td>3.99</td>
</tr>
<tr>
<td>500 : 100</td>
<td>5.00</td>
</tr>
</tbody>
</table>

Based on the calculation of the yield values in Table 7, the best treatment (Cincalok: Egg White) in making the best cincalok condiments was 500g:100g with a yield value of 5.00.
4. Conclusion
Based on the results of this study, the best physicochemical characteristics in the manufacture of cincalok condiments were found in the 500g:100g treatment. The best physicochemical characteristics were yielded at 79.78%, water content 7.91%, water activity 0.63, ash content 4.83%, total protein 26.03%, total acid 7.39%

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Yanuar, N. 2013. Proses Pembuatan Cincalok Teri Nasi (Stolephoruscommersoni-ilacapede) dengan Metode Fermentasi Garam Tinggi (Kajian Konsentrasi Garam dan Konsentrasi Gula).[Skripsi Universitas Tanjungpura Pontianak].