*Original Research Article*

Impact on Physicochemical Quality and Antioxidant Activity Chicken Corned Using Rice Bran Oil as Potential Antioxidant

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ABSTRACT

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| **Aims:** This study aims to assess the quality of chicken corned using rice bran oil, focusing on moisture content, water holding capacity, cooking loss, yield, texture, and antioxidant activity.  **Study design:** This study is an experiment done in a lab where the tests are arranged randomly, meaning the order is different each time to make sure the results are fair.  **Place and Duration of Study:** This study was carried out at the Laboratory of Animal Product Technology, Faculty of Animal Science, Universitas Brawijaya. The study took place from August - September 2024.  **Methodology:** This study employs four treatments, each replicated five times. The primary focus is to examine the effects of varying levels of rice bran oil addition on chicken corned. The 4 treatments are SPC0 (without using rice bran oil), SPC1 (6%), SPC2 (8%), SPC3 (10%) of the total rice bran oil content.  **Results:** The incorporation of different rice bran oils in chicken corned preparation significantly influenced moisture content, water-holding capacity, cooking loss, yield, texture, and antioxidant activity (P<0.01). The variables of moisture content and cooking loss decreased, while the increase in water holding capacity, yield and antioxidants activity increased along with the increasing use of added rice bran oil.  **Conclusion:** In addition to being useful for helping the emulsion process that can improve texture, rice bran oil can also extend the shelf life of chicken corned. Further research is needed to determine the safety of chicken corned with the use of rice bran oil. |

*Keywords: Corned; chicken meat; restructure meat; rice bran oil; emulsion.*

1. INTRODUCTION

Chicken corned is one of the processed meat products that are in great demand by the Indonesian people. Corned is a processed meat product with potato spices, broth, salt, onion, pepper, and sodium nitrate (NaNO2) (Kristiangsih and Fitrianti, 2019). Corned chicken products have a pale colour, lack of fibre content, and are prone to rancidity, making them less attractive to consumers. Rancidity results from the reaction of saturated and unsaturated fatty acids with oxygen, leading to the oxidation and hydrolysis of the oil (Suaniti and Ratnayani, 2023). The colour of meat products tend to be pale

because the ability of myoglobin to bind oxygen changes during the heating process, causing the colour of the meat to turn brownish (Izzah, Nurtiana, Ningrum, Anggraeni, Nugroho, Hasanah, Alfidah and Febriyani, 2024). The addition of ingredients that contain high antioxidants can inhibit oxidation to extend the shelf life of the product. In corned beef with the use of palm oil, it produces nitrate which functions as a colour giver and can inhibit bacteria (Cahyono, Yuliastuti and Amanati, 2019). Rancidity results from the reaction of saturated and unsaturated fatty acids with oxygen, leading to the oxidation and hydrolysis of the oil (Domingol, Sartagoda, Catandijan and Yasin, 2023). One of the food ingredients that contain high antioxidants is rice bran oil.

Rice bran oil is edible and rich in vitamins, antioxidants, and essential nutrients necessary for the human body. It has a good mix of different types of fats. About 22% are saturated fats, 41% are healthy monounsaturated fats, and 37% are polyunsaturated fats, which are also good for you (Singanusong and Jacoby, 2021). Rice bran oil can be used to produce high-quality emulsion gels that can replace fat properties in foods (Nourbehesht, Shekarchizadeh and Soltanizadeh, 2018). Rice bran oil provides advantages over other vegetable oils because of its natural antioxidants, including oryzanol (Nayik, Majid, Gull and Muzaffar, 2015). The addition of rice bran oil in the manufacture of chicken corned can provide potential in improving the physical texture of food ingredients, adding nutritional value and calories and providing a savoury taste to food products. The addition of rice bran oil not only enriches the nutritional value of chicken corned, but also improves the quality of the product in terms of proximate composition, sensory quality, and texture. However, further research is needed to determine the right proportion and its impact on the quality and antioxidant value of corned.

2. material and methods

**2.1 Materials**

The materials utilized in this study consisted of broiler meat obtained from traditional markets, rice bran oil, tapioca flour, sugar, salt, milk powder, pepper and isolate soy protein (ISP) obtained from Superindo, shallots, garlic, nutmeg, eggs and ice cubes. The tools used in making chicken corned samples include Mettler Toledo AB204-S analytical scales, chopper, baking pan, pot, basin, knife, cutting board, gas stove, spoon, fork, dandang, and solet.

**2.2 Methods**

This study used an experiment in a laboratory where the different parts were chosen randomly to make sure everything was fair and equal. with four treatments and five replications. The four treatments were SPC0 (without using rice bran oil), SPC1 (6%), SPC2 (8%), SPC3 (10%) of the total chicken meat used.

**2.3 Data Analysis**

The experimental data collected were analyzed using Microsoft Excel. A series of statistical analyses, including the calculation of the mean, standard deviation, and analysis of variance (ANOVA), were conducted on the numerical data. The ANOVA revealed significant differences among the treatments. If a true or highly probable difference exists in the data, the analysis will proceed with Duncan's Multiple Range Test as a pairwise comparison to clearly identify which means are significantly different from each other.

**2.4 Chemical Composition of Rice Bran Oil**

The rice bran oil used in this study has a chemical composition such as oleic acid, linoleic acid (omega-6), linolenic acid (omega-3) and gamma-oryzanol. Rice bran oil also has antioxidant content such as tocopherol and tocotrienol and has vitamin and mineral content.

**2.5 Production of Corned Chicken using Rice Bran Oil**

Procedure for preparing chicken corned using the modified RBO: First, we wash the chicken meat with water to make sure it's clean. Then, we cut it into small bits. After that, we use a special machine called a chopper to grind the chicken until it's smooth and all mixed together. Salt (2%) and ice cubes (4%) are added during the grinding process. Then other ingredients such as tapioca flour (5%), shallots (2,5%), garlic (2,5%), egg white (4%), sugar (2%), pepper (2%), ISP (2%), skim milk powder (5%) and rice bran oil according to the treatment are mixed until evenly mixed. The chicken corned mixture is put into a baking pan, then steamed for ± 30 minutes at a temperature of 90 ± 2 °C. After steaming, the sample is cooled to room temperature, then analyzed.

**2.6 Quality of Corned Chicken**

**2.6.1 Moisture Content**

Moisture content according to AOAC (2005) was determined by gravimetric method. Petri dish without sample was weighed (A). A 2 g sample of chicken corned was weighed, placed in a Petri dish that had been heated in a 100-105°C oven for 12 hours and weighed (B). Samples were dried for 24 hours, then placed in an applicator for 1 hour before weighing (C). The results can be calculated with the formula of moisture content =

% *Moisture content = B – C* x 100%

*A*

*A :* *Sample weight*

*B : Weight of cup + sample before oven*

*C : Weight of cup + sample after oven*

**2.6.2 Water Holding Capacity**

The water holding capacity according to AOAC (2005) is done by placing a 0.3 g cut sample on Whatman No. 42 filter paper. Place it between two glass plates, each bearing a weight of 35 kg, and let it stand for 5 minutes. After 5 minutes, remove the filter paper and the sample. Please draw the wet area and the pressed meat sample area separately on a transparent plastic plate. Measure the circular area of ​​the sample, as well as the outer circular area formed by water. Therefore, the circular area formed by free water is equal to the inner circular area minus the outer circular area. The calculation formula for water retention (WHC) is as follows:

*Amount of Free Water* (*mgH2O*) =

*Wet area* (*cm*2) – 8

0,0948

% *Wet Area Content* = *mgH2O*  x 100%

*Sample Weight*

% *Water Holding Capacity* =

*Sample moisture content* (%) – Wet area content(%)

**2.6.3 Cooking Loss**

Cooking loss according to AOAC (2005) is done by taking 25 g of sample. The sample was placed inside a plastic bag and tightly sealed to prevent water from entering during the boiling process. The samples were boiled in a waterbath at 80oC for 50 minutes. The boiled samples were removed and cooled from the plastic bag. Dried using tissue. To find out how much your sample weighs after cooking, you first weigh it at the end. Then, you can figure out how much weight was lost during cooking by using formula:

*Cooking loss* (%) = A – B x 100%

A

A = *Weight before ripening*

B = *Weight after ripening*

**2.6.4 Yield**

The yield test, based on a method from AOAC in 2005, was done by first measuring how much the dough weighed before cooking. After cooking, the cooked dough was weighed again. Then, we used a special math formula to figure out how much the dough made after cooking.

% *Yield* = *Weight after ripening* x 100%

*Weight before ripening*

**2.6.5 Texture**

Texture is a parameter that includes tenderness, elasticity, and density of the pore structure. Texture test measurements use a texture analyser with N units according to AOAC (2005).

**2.6.6 Antioxidant Activity**

Antioxidant activity according to AOAC (2005) is carried out by means of a sample that is used as a comparison and a sample solution to be tested is made. The solution was pipetted as much as 1 mL into a test tube and added with 0.004% DPPH solution. We let the solution sit out at room temperature for 30 minutes. After that, we checked how much light the solution absorbed using a special machine called a spectrophotometer, which was set to a specific color of light called 517 nanometers. We used methanol as a blank, which means we compared the solution to pure methanol to make sure our measurements were correct. The free radical inhibition percentage was calculated using the following formula:

% *inhibition* = 𝐴 𝐷𝑃𝑃𝐻 𝑥 𝐴 𝑠𝑎𝑚𝑝le 𝐷𝑃𝑃𝐻 𝑥 100%

𝐴 𝐷𝑃𝑃𝐻

*ADPPH = Absorbance DPPH*

*A Sample+DPPH = Sample* *absorbance + DPPH*

3. results and discussion

**3.1 Moisture Content**

**Table 1. Average moisture content of chicken corned**

|  |  |
| --- | --- |
| **Treatments** | **Moisture Content (%) ± SD** |
| SPC0 | 52,56 ± 0,81a |
| SPC1 | 50,21 ± 0,76b |
| SPC2 | 48,73 ± 0,41c |
| SPC3 | 47,15 ± 0,54d |

*\*a, b, c, d shows a highly significant effect*

How wet or dry something is can affect how long it stays good to use. Generally, the higher the moisture level, the shorter the product's shelf life. The incorporation of rice bran oil into the corned chicken preparation yields a profoundly impactful effect (P < 0.01). The moisture content of corned chicken decreased due to the increasing percentage of rice bran oil. When we add rice bran oil and other ingredients to the meat mixture, they help take out some of the water, making the mixture less wet. The decrease in moisture content occurs due to the use of rice bran oil and other food ingredients that can reduce the moisture content in the meat emulsion system. The addition of rice bran oil containing fat can reduce the moisture content which means the product is more resistant to damage (Rysova and Smidova, 2021). In addition, the use of salt can reduce the moisture content in corned chicken.

**3.2 Water Holding Capacity**

**Table 2. Average water holding capacity of Chicken Corned**

|  |  |
| --- | --- |
| **Treatments** | **Water Holding Capacity (%) ± SD** |
| SPC0 | 51,31 ± 0,69a |
| SPC1 | 52,49 ± 0,35b |
| SPC2 | 53,90 ± 0,50c |
| SPC3 | 55,69 ± 0,80d |

*\*a, b, c, d shows a highly significant effect*

Using rice bran oil in the preparation of corned chicken has a highly significant impact (P < 0.01). This can occur because the use of rice bran oil in corned chicken has a more optimal water binding ability and emulsification power. Water holding capacity can increase due to the interaction between oil and protein which increases water holding. Rice bran oil content has an effect on water holding capacity, where the percentage of rice bran oil contributes to increase or decrease the water holding capacity depending on the formulation and interaction of other components in the flour (Lv, He and Sun, 2018)

**3.3** **Cooking loss**

**Table 3. Average cooking loss of chicken corned**

|  |  |
| --- | --- |
| **Treatments** | **Cooking Loss**  **(%) ± SD** |
| SPC0 | 6,67 ± 0,08a |
| SPC1 | 5,36 ± 0,10b |
| SPC2 | 4,30 ± 0,18c |
| SPC3 | 3,79 ± 0,15d |

*\*a, b, c, d shows a highly significant effect*

Using rice bran oil in the preparation of corned chicken significantly influences its cooking loss, with a statistical significance of P < 0.01. This can occur because rice bran oil is one of the ingredients that contains protein and fat. The low level of cooking loss indicates that during the cooking process, the loss of water and other nutrients occurs in smaller amounts. The cooking loss can be influenced by protein content, where the higher the protein content of a product, the lower the cooking shrinkage (Irawati, Warnoto and Kususiyah, 2015). Replacing animal fat with RBO and rice bran fibre can reduce cooking loss and improve emulsion stability.

**3.4 Yield**

**Table 4. Average yield of chicken corned**

|  |  |
| --- | --- |
| **Treatments** | **Yield (%) ± SD** |
| SPC0 | 92,35 ± 0,09a |
| SPC1 | 93,62 ± 0,15b |
| SPC2 | 94,23 ± 0,21c |
| SPC3 | 95,25 ± 0,19d |

*\*a, b, c, d shows a highly significant effect*

The use of rice bran oil in making corned chicken has a very significant effect (P < 0.01). This can occur because the more addition of rice bran oil will increase the yield of corned chicken. Other food ingredients can also affect the yield value. The yield increases due to the vegetable fat content in rice bran oil, the higher fat content added will increase the yield. (Al-Abdullatif, Hussein, Suliman, Akasha, Al-Badwi, Ali and Azzam, 2023). Yield is also related to water holding capacity, the higher the ability of a product to bind water, the greater the yield that can be obtained (Indra and Nuraini, 2021).

**3.5 Texture**

**Table 5. Average texture of chicken corned**

|  |  |
| --- | --- |
| **Treatments** | **Texture (%) ± SD** |
| SPC0 | 15,37 ± 0,08a |
| SPC1 | 14,55 ± 0,07b |
| SPC2 | 13,48 ± 0,06c |
| SPC3 | 12,25 ± 0,05d |

*\*a, b, c, d shows a highly significant effect*

The incorporation of rice bran oil in the preparation of corned chicken significantly influences its texture (P < 0.01). This can occur because the use of rice bran oil (RBO) in corned chicken formulation improves physical quality, especially in the aspect of texture. RBO is celebrated for its abundant treasure of unsaturated fatty acids and bioactive elements like γ-oryzanol and tocopherols, nature’s antioxidants that weave their protective magic. These chemicals can affect how well proteins and fats stay the same when they are being made or stored, thereby affecting the final texture of processed meat products. The texture of processed chicken meat can be influenced by the protein content in the additives used (Evanuarini, Susilo and Amertaningtyas, 2023). When more rice bran oil was added to the chicken corned, it became softer and less tough to chew, making it feel more chewy.

**3.6** **Antioxidant Activity**

**Table 6. Average antioxidant activity of chicken corned**

|  |  |
| --- | --- |
| **Treatments** | **Antioxidant Activity (%) ± SD** |
| SPC0 | 1,80 ± 0,32a |
| SPC1 | 11,37 ± 0,75b |
| SPC2 | 17,56 ± 0,83c |
| SPC3 | 23,52 ± 0,94d |

*\*a, b, c, d shows a highly significant effect*

The use of rice bran oil in making corned chicken has a very significant effect (P < 0.01). The antioxidant activity of corned chicken has increased. This can happen because of the content of unsaturated fatty acids in rice bran oil which has antioxidant compounds such as γ-oryzanol, tocopherol, and tocotrienol. These compounds can ward off free radicals and prevent lipid oxidation. (Liu, Zhang, Xue, Zhang, Xiao, Xu, Fan, Liu, Wu, Wu, and Zhang, 2023). The antioxidant activity of chicken corned increased as the percentage of rice bran oil increased. The increase in antioxidant value is because rice bran oil can reduce the formation of free radicals from oxidised fat, thereby increasing the antioxidant capacity of the chicken corned product.

**Table 7. Quality of Corned Chicken using Rice Bran Oil**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Variables** | **Treatments** | | | | |
| **SPC0 ± SD** | **SPC1 ± SD** | **SPC2 ± SD** | **SPC3 ± SD** |
| Moisture Content (%)WeE | 52,56 ± 0,81a | 50,21 ± 0,76b | 48,73 ± 0,41c | 47,15 ± 0,54d |
| Water Holding Capacity (%) | 51,31 ± 0,69a | 52,49 ± 0,35b | 53,90 ± 0,50c | 55,69 ± 0,80d |
| Cooking Loss (%) | 6,67 ± 0,08a | 5,36 ± 0,10b | 4,30 ± 0,18c | 3,79 ± 0,15d |
| Yield (%) | 92,35 ± 0,09a | 93,62 ± 0,15b | 94,23 ± 0,21c | 95,25 ± 0,19d |
| Texture (N) | 15,37 ± 0,08a | 14,55 ± 0,07b | 13,48 ± 0,06c | 12,25 ± 0,05d |
| Antioxidant Activity (%) | 1,80 ± 0,32a | 11,37 ± 0,75b | 17,56 ± 0,83c | 23,52 ± 0,94d |

*\*a, b, c, d shows a very significant effect*

4. Conclusion

The use of rice bran oil in making chicken corned can improve the texture and antioxidants produced. The use of 10% rice bran oil in chicken corned can improve the quality based on moisture content, water holding capacity, cooking loss, texture yield and antioxidant activity. Different percentages of rice bran oil use can have a very significant effect on each variable. Further research is needed on the safety of chicken corned with the use of rice bran oil.

**DISCLAIMER (ARTIFICIAL INTELLIGENCE)**

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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**COMPETING INTERESTS**

Authors have declared that no competing interests exist.

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