JGPS, Mei 2026, Volume 10 Nomor 1
ISSN 2599-0152 eISSN 2599-2465
http://jos.unsoed.ac.id/index.php/jgps

APPLICATION OF KUNIRAN FISH PROTEIN ISOLATE (*Upeneus sulphureus*) AS AN EMULSIFIER IN CHICKEN SAUSAGE

Aplikasi Isolat Protein Ikan Kuniran (Upeneus sulphureus) sebagai Pengemulsi pada Sosis Ayam

Detia Setiani[1*], Sakinah Haryati[1], Bhatara Ayi Meata[1]
[1]Fisheries Science Study Program, Faculty of Agriculture, Sultan Ageng Tirtayasa University, Serang, Indonesia
Email: detiasetiani123@gmail.com

ABSTRACT

Chicken sausage is a processed food product made from meat. A common problem in sausage making is the emulsion breaking during the processing process, resulting in an unstable texture. Therefore, an emulsifier is needed to maintain emulsion stability. This study aims to determine the optimum concentration of fish protein isolate as an emulsifier in chicken sausage. The method used was a completely randomized design with the addition of kuniran fish (Upeneus sulphureus) protein isolate at concentrations of 0%, 2.5%, 5%, and 7.5% with 3 replications for each treatment. Data on cooking loss, water-holding capacity, moisture content, ash, protein, and fat were analyzed using one-way ANOVA at a 5% level and continued with DMRT. Organoleptic tests were analyzed using Kruskal-Wallis and Mann-Whitney. The results showed that kuniran fish protein isolate used as an emulsifier in chicken sausage at a concentration of 7.5% (treatment P3) was optimal as an emulsifier in chicken sausage. The ANOVA test showed a cooking loss value of 8.33%, water holding capacity of 62.51%, water content of 28.74%, ash content of 6.26%, protein content of 51.60%, and fat content of 13.22%. The organoleptic test of P3 obtained good acceptance in all parameters. The Total Plate Count (TPC) value of the microbiological test was 3.2x10³ CFU/g, meeting SNI requirements.

***Keyword :** chicken sausages; emulsifier; goldband goatfish; protein isolate*

ABSTRAK

Sosis ayam merupakan produk olahan pangan berbahan baku daging. Permasalahan yang sering terjadi dalam pembuatan sosis adalah pecahnya emulsi selama proses pengolahan sehingga tekstur menjadi tidak kompak. Oleh karena itu, diperlukan penggunaan emulsifier untuk menjaga stabilitas emulsi. Penelitian ini bertujuan menentukan konsentrasi optimum isolat protein ikan sebagai pengemulsi pada sosis ayam. Metode yang digunakan adalah Rancangan Acak Lengkap (RAK) dengan penambahan isolat protein ikan kuniran (*Upeneus sulphureus*) pada konsentrasi 0%, 2.5%, 5%, dan 7.5% dengan 3 ulangan setiap perlakuan. Data *cooking loss*, daya ikat air, kadar air, abu, protein, dan lemak dianalisis menggunakan *One Way ANOVA* taraf 5% dan dilanjutkan DMRT. Uji organoleptik dianalisis menggunakan *Kruskal Wallis* dan *Mann-Whitney*. Hasil penelitian menunjukkan bahwa isolat protein ikan kuniran digunakan sebagai pengemulsi pada sosis ayam konsentrasi 7.5% (perlakuan P3) adalah yang optimal sebagai pengemulsi pada sosis ayam. Uji ANOVA menunjukkan nilai *cooking loss* 8.33%, daya ikat air 62.51%, kadar air 28.74%, kadar abu 6.26%, kadar protein 51.60%, dan kadar lemak 13.22%. Uji organoleptik P3 mendapatkan

DOI 10.20884/1.jgipas.2026.10.1.20370

penerimaan yang baik pada semua parameter. Nilai Angka Lempeng Total (ALT) uji mikrobiologi adalah 3,2x10^3 CFU/g, memenuhi syarat SNI.

Kata Kunci : ikan kuniran; isolat protein; pengemulsi; sosis ayam

INTRODUCTION

Chicken sausage is a popular processed meat product due to its convenience. Problems often occur in sausage production, such as emulsion breakage, excessive heating, and rapid processing, which can result in an uncoordinated texture. Emulsifiers influence sausage quality by maintaining the stability of the emulsion between water and fat and creating the desired texture. Soy protein isolate (SIP) has been widely used as an additive due to its emulsifying properties (Kharisma *et al.* 2016). According to research by Arzani and Utama (2023), sausages require both an emulsifier and a binder for excellent quality. Kharisma *et al.* (2016) found that a combination of 4% SIP and 0.5% carrageenan provided optimal emulsion stability and quality. Challenges with SIP use include a bitter taste and dependence on imported raw materials, so it is necessary to consider animal protein isolates from the kuniran fish (*Upeneus sulphureus*).

The utilization of kuniran fish has been limited; however, kuniran fish is included in the fish with a high protein content and has the potential as a natural emulsifier in food processing, one of which is as a food additive in chicken sausages. The lack of optimal utilization of kuniran fish is also a problem in itself due to its low shelf life and limited market value. Kuniran fish is included in fish with a very high protein content (20-22%) and low fat (1.2-2.8%) (Dogan and Omer 2017). These characteristics can make kuniran fish protein isolate have the potential as a natural emulsifier in food processing, one of which is in the production of chicken sausages.

Based on research by Khoiri *et al.* (2024), emulsifying agents, such as protein isolates, are crucial for maintaining product texture and stability. Without an emulsifier, sausages can easily break. Sausages without emulsifiers exhibit poor texture and are prone to damage during cooking, as demonstrated by this study. According to Aslim *et al.* (2023), tilapia sausages made with the addition of soy protein isolate and porang flour in a 1:1 ratio produced a better texture

DOI 10.20884/1.jgipas.2026.10.1.20370

compared to other treatments.

Chicken sausage was chosen as the research material because fish have strong natural gel-forming properties. The addition of protein isolate to fish sausage did not have a significant effect compared to chicken sausage (Khoiri *et al.* 2024). According to Prasetyo (2021), fish contains protease enzymes that aid gel formation. This study used kuniran fish protein isolate as an emulsifier to improve the physical and sensory stability of chicken sausage and support the sustainability of marine resources. The aim of this study was to determine the optimum concentration of kuniran fish protein isolate as an emulsifier in chicken sausage.

METHOD

This research was conducted from January to April 2026 on the production of turmeric fish, protein isolate, and chicken sausage. Physical and organoleptic tests were conducted at the Aquatic Product Processing Technology Laboratory, Sultan Ageng Tirtayasa University, while chemical tests were conducted at the Bogor Agricultural Institute. A completely randomized design with one factor was used with three replications for each of the four treatment levels of turmeric fish protein isolate concentration, referring to Sujianti *et al.* (2023), with slight modifications to the protein isolate concentration and type: 0%, 2.5%, 5%, and 7.5%.

The equipment used in this study included a Mitochiba 300 W blender for mixing the dough, a Camry EK3650 digital scale with an accuracy of 0.01 g, and a Memmert UFE 500 drying oven with a temperature of 250°C. pH measurements were carried out using a Hanna HI99161 digital pH meter, a Thermo Scientific water bath, and a centrifuge for the protein isolate. The dough was filled using a sausage mold and triangular plastic bags.

The materials used in this study consisted of kuniran fish meat, NaOH, HCl, distilled water, and ice cubes for wet fish protein isolate. The sausages were made from fresh broiler chicken meat and extracted kuniran fish protein isolate. Seasoning, egg white, and baking powder were added. A 23 mm collagen casing was used as the wrapper, and boiled water was used during the manufacturing and testing process.

DOI 10.20884/1.jgipas.2026.10.1.20370

Preparation of raw materials

The fish used in this study were fresh kuniran fish. The first stage of raw material preparation involved preparing the ingredients and equipment. Then, the kuniran fish's innards, scales, and head were cleaned, the meat removed, and then weighed. The fish was then washed. The meat was then ground using a chopper, and the resulting kuniran fish was weighed again.

Making kuniran fish protein isolate

The preparation of kuniran fish protein isolate followed the method of Haryati *et al.* (2020) with modifications in pH and fish type. First, cold-distilled water was added to the fish meat at a ratio of 1:5 and homogenized using a hand blender for 1 minute. The pH of the fish pulp was adjusted to 11 by adding 2M NaOH. The mixture was centrifuged to separate the supernatant from the sediment at 4800 rpm for 10 minutes. The supernatant was adjusted to pH 5.5 by adding 2M HCl and centrifuging at 4800 rpm for 20 minutes. The resulting sediment was used as an emulsifier.

Making chicken sausages with the addition of turmeric fish protein isolate

The steps for making chicken sausage based on the method of Sujianti *et al.* (2023) begin with cleaning, filleting, and grinding the chicken until smooth. The meat was divided into 100 g portions for each experimental unit, and then the spices were mixed. The chicken sausage formula with turmeric fish protein isolate is shown in Table 1.

Table 1. Chicken Sausage Formula

Material Name	Function	Concentration (%b/b)			
		P0	P1	P2	P3
Kuniran fish protein isolate	Emulsifier	0	2,5	5	7,5
Chicken fillet meat	The main ingredient	100	100	100	100
Sago flour	Texture binder	5	5	5	5
Baking powder	Developer	1,25	1,25	1,25	1,25
Egg whites	Texture binder	6,25	6,25	6,25	6,25
White garlic	Natural flavoring	4	4	4	4
Ground pepper	Spicy aroma	0,75	0,75	0,75	0,75
Salt	Flavor binder	2,25	2,25	2,25	2,25
Sugar	Natural sweetener	2	2	2	2
Vegetable oil	Texture softener	4,75	4,75	4,75	4,75
Ice water	Water binder	30	30	30	30

Description: percentage of added protein isolate based on the weight of the main ingredient.

DOI 10.20884/1.jgipas.2026.10.1.20370

Physical analysis

Physical analysis of the application of turmeric fish protein isolate as an emulsifier in chicken sausages includes a cooking loss test using the steaming method used by Purnawati *et al.* (2015), namely by weighing the sausage before and after steaming. The water-binding capacity test follows the

Protein content analysis used the Kjeldahl method (Purnawati *et al*., 2015). Fat content analysis used the Soxhlet method (Bhargavi *et al*. 2018). Ash content analysis used the furnace method based on SNI 2354 1:2010.

Microbiological analysis

Microbiological analysis using the Total Plate Count (TPC) method refers to BSN (2015), starting with sample preparation, serial dilution, cultivation, then incubation, colony counting, and finally calculating the total plate count results. This analysis aims to check the safety and cleanliness of the product.

Sensory assessment

The sensory assessment in this study used organoleptic testing. The organoleptic testing was conducted following the method described by Irawati *et al*. (2015), in which panelists

Hamm Press method (pressure) using Laksmi *et al*. (2012), namely by pressing the sample between glass plates with a load of 5 kg.

Chemical analysis

Analysis in this study included water content analysis using the thermogravimetric method with an oven.

responded to appearance, odor, taste, texture, the folding test, and the bite test. A total of 30 panelists were involved in this test, and the assessment was carried out using a prepared questionnaire with a hedonic quality scale based on BSN (2015), which uses a range of 3–9, where a score of 9 indicates the best quality, 7 good quality, 5 medium quality, and 3 lowest quality.

Data analysis

The data obtained were quantitative data processed using Microsoft Excel and SPSS version 25. The parameters analyzed included proximate tests, cooking loss, water holding capacity, total plate count analysis, and organoleptic tests, with ANOVA analysis and DMRT further tests. Organoleptic data were further tested using Kruskal-Wallis and Mann-Whitney tests.

DOI 10.20884/1.jgipas.2026.10.1.20370

RESULTS AND DISCUSSION

The physical analysis results included cooking loss and water holding capacity, which indicate product characteristics. Chemical analysis included moisture, protein, ash, and fat content, with nutritional values for each treatment. Microbiological analysis included a total plate count to determine product safety. The results of the physical and chemical analysis data can be seen in Table 2.

Table 2. Results of Physical and Chemical Analysis of the Application of Kuniran Fish Protein Isolate in Chicken Sausage

Parameter	**Concentration of Kuniran Fish Protein Isolate**			
	P0 (0%)	**P1 (2,5%)**	**P2 (5%)**	**P3 (7,5%)**
Cooking Loss	54,00 ± 4,58[c]	32,33 ± 7,63[b]	20,67 ± 6,66[b]	8,33 ± 6,43[a]
Water Holding Capacity	33,26 ± 0,97[a]	38,80 ± 0,75[b]	43,68 ± 1,96[c]	62,51 ± 1,09[d]
Water content (%)	26,58 ± 0,26[b]	22,27 ± 0,24[c]	27,39 ± 0,52[b]	28,74 ± 0,15[a]
Ash Content (%)	13,54 ± 0,11[c]	16,21 ± 0,06[c]	8,43 ± 0,04[b]	6,26 ± 0,24[a]
Protein Content (%)	46,28 ± 0,03[a]	56,80 ± 0,06[b]	50,27 ± 0,06[c]	51,60 ± 0,06[d]
Fat Content (%)	18,89 ± 0,03[d]	20,97 ± 0,04[c]	15,48 ± 0,01[b]	13,22 ± 0,07[a]

Note: Different superscripts in the same row indicate significant differences between treatments at a significance level of 5%: P0 (fish protein isolate 0%); P1 (fish protein isolate 2.5%); P2 (fish protein isolate 5%); P3 (fish protein isolate 7.5%)

Cooking loss

The ANOVA cooking loss test value (Table 2) shows that the kuniran fish protein isolate has a significant effect ($p<0.05$) on chicken sausages. The average value is 8.33-54.00%, with the optimal concentration of fish protein isolate as an emulsifier of 7.5% at 8.33%. Based on these results, the higher the concentration of fish protein isolate, the lower the cooking loss, this can be caused by the addition of fish protein isolate. Research by Sujianti *et al.* (2023), states that the amount of protein content can affect cooking loss in sausages, where the protein is able to bind water so that the higher the protein content, the higher the water binding ability and causes less water to come out and the cooking loss value is lower. The cooking loss value in this study is relatively high compared to the research by Khoiri *et al.* (2024) with the lowest cooking loss value in chicken sausages with 20% soy protein isolate at 5.60%. Based on research by Da Rosa (2015), the standard cooking loss value for processed meat is generally in the range of 1.5-54%. In this study, the cooking loss value was still within the normal range. Prijambodo *et al.* (2014) stated that water and oil loss during the cooking process can cause weight loss in chicken sausages.

DOI 10.20884/1.jgipas.2026.10.1.20370

Water holding capacity

The ANOVA test value of water binding capacity (Table 2), chicken sausage with kuniran fish protein isolate showed a significant difference ($p<0.05$). The average value was 33.26-62.51%, the optimum concentration of fish protein isolate as an emulsifier in chicken sausage was 7.5% at 62.51%. Water binding capacity is the main factor in gel formation, and the addition of fish protein isolate can increase the water binding capacity of the product (Khoiri *et al*. 2024). In line with the research of Vatria and Nugroho (2022), stating that the increase in water binding capacity can be influenced by the high protein isolate which is the main factor in gel formation and causes the gelatinization process during heating resulting in protein denaturation, so that the sausage texture is denser and more stable. The water binding capacity value of this study is higher than the research of Da Rosa (2015), the best value of the best water binding capacity was found at a concentration of 4% soy protein isolate in catfish sausage at 55.03%. The results of this study are in line with the research of Haryati *et al*. (2021), at a concentration of 5% catfish protein isolate has the ability to form gels, the formation of this gel has an important role in forming texture in processed products.

Water content

The results of the ANOVA analysis of water content (Table 2) showed a significant difference in chicken sausages with the concentration of kuniran fish protein isolate ($p<0.05$). The average water content was 22.27-28.74%, the lowest value at a concentration of 2.5% at 22.75% (dw). This is because the water content value of this study decreased with increasing concentration of fish protein isolate. In line with the research of Rahman *et al.* (2024), soy protein isolate has hygroscopic properties, namely, the ability to absorb and retain water in sausage dough so that it can affect the water content value of the sausage. The water content value in this study was lower than that of Da Rosa's research (2015); the lowest result was the addition of 4% soy protein isolate to catfish sausage with a value of 63.43% (dw). Musdalifah and Tanod (2016) found that low water content in processed meat products can make the product texture more-chewy and can be stored longer. The water content values of all treatments in this study met the requirements

DOI 10.20884/1.jgipas.2026.10.1.20370

of SNI 3820:2015, namely a maximum water content of 67% for meat sausages.

Ash content

The results of the ANOVA test on ash content (Table 2) showed that the application of fish protein isolate was significantly different in chicken sausages ($p<0.05$). The average ash content was 6.26-13.54% (dw), the lowest value was in P3 with a concentration of 7.5% fish protein isolate at 6.26% (dw). The ash content decreased with increasing concentration of kuniran fish protein isolate, because the addition of the isolate caused a decrease in the mineral content in the sausage. Based on research by Oktasari *et al.* (2015), in the process of making gourami fish protein isolate, demineralization was carried out using hydrochloric acid (HCl) solution to remove inorganic minerals, so the decrease in ash content was caused by the use of kuniran fish protein isolate that had undergone demineralization using hydrochloric acid (HCl). The ash content value in this study was higher than in the study by Sujianti *et al.* (2023), where the best results were found in soy protein isolate in 10% chicken sausage with a value of 2.31% (dw). All treatments in this study did not meet the SNI 3820:2015 standard because the ash content exceeded the maximum limit of 3%.

Protein content

The protein content ranges from 46.28 to 56.80% (dw), with the optimum value as an emulsifier in sausages at a concentration of 2.5% fish protein isolate, with treatment P1 being 56.80% (dw). The results of the ANOVA analysis of protein content (Table 2) showed a significant difference between chicken sausages and the concentration of kuniran fish protein isolate ($p<0.05$). The higher protein content in P1 was due to the higher water content of P1, as the dry weight (dw) protein content is calculated based on the proportion of the total sample weight, where water is the largest component in food ingredients (Prasetyo *et al*. 2019). Fish protein isolates contain myofibrillar proteins, such as actin and myosin, which play a role in increasing protein content and improving product texture (Fatimah *et al.* 2024). The protein content in this study was higher than that in the study by Sujianti *et al.* (2023), stated that the best protein content value in chicken sausage with the addition of soy protein

DOI 10.20884/1.jgipas.2026.10.1.20370

isolate in chicken sausage was at a concentration of 10% with a value of 20.50% (dw). The results of the study showed that chicken sausage products with fish protein isolate met the requirements of SNI 3820-2015; good meat sausages must contain a minimum of 8% protein.

Fat content

The average fat content of the sausages in this study was between 13.22 and 20.97% (dw). The results of the ANOVA analysis of fat content (Table 2) showed that the difference in the addition of the concentration of kuniran fish isolate significantly affected the fat content of chicken sausages ($p<0.05$). The study showed that increasing the concentration of kuniran fish protein isolate was able to reduce the fat content. The lowest fat content value was found at a concentration of 7.5% fish protein isolate, treatment P3 with a value of 13.22% (dw). The low-fat content in this study may have occurred because it had gone through a cooking process and also the addition of fish protein isolate. According to Astuti *et al.* (2014), excessive heating can cause the emulsion to become unstable because the protein is unable to coat all fat particles, so the fat separates and comes out. The fat content in this study was higher than the study by Da Rosa (2015); the lowest fat content value for catfish sausage was 4.33% (dw) at 4% soy protein isolate. According to BSN (2015), the maximum fat content in meat sausages is 20%, chicken sausages with turmeric fish protein isolate meet SNI requirements.

Organoleptic test

Organoleptic testing of sausages includes assessments of appearance, odor, taste, texture, folding test, and bite test. These tests are conducted to determine the panelists' acceptance of the overall quality of the sausage product. The results of the organoleptic test for the application of turmeric fish protein isolate to chicken sausage are shown in Table 3.

Table 3. Organoleptic Test Results of Chicken Sausage with the Application of Kuniran Fish Protein Isolate

Parameter	Concentration of Kuniran Fish Protein Isolate			
	P0 (0%)	P1 (2,5%)	P2 (5%)	P3 (7,5%)
Appearance	8,27 ± 1,11[a]	8,27± 0,98[a]	8,07 ± 1,26[a]	7,80 ± 1,45[a]
Smell	7,47 ± 1,54[a]	7,60 ± 1,40[a]	7,07 ± 1,44[a]	7,00 ± 1,38[a]
Flavor	7,93 ± 1,46[a]	8,07 ± 1,46[a]	7,40 ± 1,52[a]	8,07 ± 1,46[a]

DOI 10.20884/1.jgipas.2026.10.1.20370

Parameter	Concentration of Kuniran Fish Protein Isolate			
	P0 (0%)	**P1 (2,5%)**	**P2 (5%)**	**P3 (7,5%)**
Texture	5,33 ± 1,67[a]	6,67 ± 1,67[ab]	7,67 ± 1,09[b]	8,53 ± 0,86[c]
Fold test	5,07 ± 1,44[a]	6,13 ± 1,25[a]	7,47 ± 1,36[b]	8,40 ± 1,07[c]
Bite test	5,20 ± 1,77[a]	6,60 ± 1,10[b]	7,60 ± 1,19[c]	8,00 ± 1,46[c]

Note: Different superscripts in the same row indicate a significant difference between treatments at the significance level: P0 (fish protein isolate 0%); P1 (fish protein isolate 2.5%); P2 (fish protein isolate 5%); P3 (fish protein isolate 7.5%).

Appearance

The average value of the sausage appearance in this study ranged from 7.80 to 8.27, the results of the Kruskall-Wallis analysis of the hedonic quality test of appearance (Table 3), and the application of kuniran fish protein isolate with different concentrations did not have a significantly different effect on chicken sausages ($p>0.05$). The scale of the hedonic quality test of the appearance parameter is 9 (product-specific bright), 7 (less bright), 5 (rather dull), and 3 (dull, slimy). The highest appearance value was found at the concentrations of kuniran fish protein isolate 0% (P0) and 2.5% (P1) with the same appearance value of 8.27 with the criteria of less bright to product-specific bright appearance. This is caused by the addition of kuniran fish protein isolate, which is pale white to gray. In addition, the high amino acid content triggers the Maillard reaction between lysine and glucose at high temperatures, resulting in a brownish color (Mananda *et al.* 2014). The sausage appearance value in this study was higher than that in the study of Sujianti *et al.* (2023), where the best score was found at a protein isolate concentration of 10% with a score of 7.09. This is in line with the study of Kharisma *et al.* (2016), which stated that the filler material affects the color of the sausage, making it darker. The appearance of sausages with kuniran fish protein isolate meets the requirements of SNI 3820:2015, with a minimum score of 7.

Smell

The average value of the sausage odor in this study was 6.87-7.60, the results of the Kruskall-Wallis sausage odor test (Table 3), the application of different concentrations of kuniran fish protein isolate did not have a significant effect on chicken sausage ($p>0.05$). The higher the addition of fish protein isolate, the lower the level of preference for the smell of the sausage decreased. The hedonic quality test value scale for the odor parameter was 9 (strong

DOI 10.20884/1.jgipas.2026.10.1.20370

specific type), 7 (less strong specific type), 5 (dominant type-specific spices less), and 3 (fishy, musty). The highest value was at a concentration of kuniran fish protein isolate 2.5% treatment P1 with an average of 7.60; this value falls into the criteria of less strong specific type to dominant type-specific spices. This is due to the addition of spices that affect the smell of chicken sausage. Da Rosa (2015) stated that the aroma of sausages tends to be uniform due to the use of spices in the dough. The odor value in this study was lower than Kharisma *et al*. (2016), with the best score of 7.80 at a concentration of 4%. Increasing the concentration of protein isolate can reduce odor due to the stronger fish aroma from the protein isolate (Khoiri *et al*. 2024). The taste test score for this sausage met the requirements of SNI 3820:2015, which is a minimum of 7.

Flavor

The average value of sausage flavor is 7.40-8.07; the results of the Kruskall-Wallis test of taste parameters (Table 3), the application of kuniran fish protein isolate did not show any significant difference ($p>0.05$) in chicken sausages. The higher the fish protein isolate, the higher the level of taste preference. The highest value of sausage flavor parameters was at a concentration of kuniran fish protein isolate of 7.5% in treatment P3 with an average of 8.07 with hedonic criteria of strong product-specific taste to less strong product-specific taste. The scale of the hedonic quality test of taste parameters is 9 (strong product-specific), 7 (less strong product-specific), 5 (slightly sour), and 3 (sour). The difference in taste values is influenced by the addition of fish protein isolate. Nugraha *et al*. (2023) stated that the difference in taste between protein isolate and meat protein can reduce preferences if used excessively. The taste value in this study was higher than Kharisma *et al*. (2016); the best score was at a concentration of 4% protein isolate in catfish sausage at 7.93. Protein isolates function as water and fat binders, making sausage emulsions more stable, but excessive use can affect meat flavor (Khoiri *et al.* 2024). Hedonic test scores for flavor parameters for all treatments met SNI 3820:2015 requirements with a minimum score of 7.

Texture

The average value of sausage texture ranged from 5.07 to 8.40. The Kruskal-Wallis

DOI 10.20884/1.jgipas.2026.10.1.20370

test results showed a significant difference ($p<0.05$) due to the addition of kuniran fish protein isolate. The highest value was found in treatment P3 (7.5%) at 8.53, with the criteria of dense, compact, and quite elastic to quite dense and compact sausage texture. The hedonic quality test value scale for texture parameters was 9 (dense, compact, quite elastic), 7 (quite dense and compact), 5 (slightly soft), and 3 (soft). Table 3 shows that with the addition of kuniran fish protein isolate concentration, the level of acceptance of the texture of chicken sausage increased due to the addition of fish protein isolate. The addition of protein isolate can be used as a stabilizer or emulsifier in the product so that it is more stable and can also improve the final texture of the meat product (Da Rosa 2015). The value of the texture parameters in this study was higher than that in the study of Kharisma *et al*. (2016), where the best score was found at a concentration of 7% soy protein isolate in catfish sausage with a score of 7.8. These results are due to the addition of protein isolates, which have gel-forming properties, contributing to the texture of processed meat products (Astawan *et al.* 2020). Only P2 and P3 texture test scores met the requirements of SNI 3820:2015, with a minimum score of 7.

Fold test

The average value of the sausage folding test was 5.07-8.40; the results of the Kruskall-Wallis test of the folding test parameters (Table 3), the application of kuniran fish protein isolate, showed a significant difference ($p<0.05$) in chicken sausages. The folding test value was in the range of 5.07 - 8.40. The hedonic quality value scale of the folding test parameters was 9 (not cracked when folded ¼ circle), 7 (not cracked when folded ½ circle), 5 (cracked when folded), and 3 (easily broken when folded). The highest value was at a concentration of kuniran fish protein isolate of 7.5%, treatment P3, with an average of 8.40, the value fell into the range of not cracked when folded ¼ circle to not cracked when folded ½ circle. The higher the concentration of kuniran fish protein isolate, the folding test value of chicken sausages increased. This increase was because the protein isolate was able to improve emulsion stability, resulting in better elasticity (Sitepu and Simamora 2022). The value of this study is higher than that of Kharisma *et al.* (2016),

DOI 10.20884/1.jgipas.2026.10.1.20370

where the best value of the folding test of chicken sausage with protein isolate was at a concentration of 4%, with a value of 4, or grade A, which did not crack when folded once. The chewy texture of chicken sausage is influenced by the strength of the gel formed due to the heating process, the gelatinization process of the isolate more dominantly affects the chewy texture of a product (Khoiri *et al.* 2024).

Bite test

The average value of the sausage bite test is 5.20-8.00, the results of the Kruskall-Wallis test of the bite test parameters in (Table 3) show that the application of kuniran fish protein isolate has a significant difference (p <0.05) in chicken sausages. The bite test value is in the range of 5.20 - 8.00. The hedonic quality value scale of the bite test parameters is 9 (very chewy and elastic), 7 (chewy and quite elastic), 5 (somewhat chewy), and 3 (not chewy). The highest value is at a concentration of kuniran fish protein isolate of 7.5%, treatment P3 with an average of 8.00; the value is included in the criteria of very chewy and to chewy and quite elastic. The bite test value is included in the very chewy criteria in this study due to the addition of sufficient protein isolate, which can produce protein to form gels or myofibrils to make a better product texture (Khoiri *et al.* 2024). Based on research data, the higher the content of turmeric fish protein isolate, the higher the bite test value of chicken sausage. This value is higher than the research of Khoiri *et al.* (2024), where the best bite test value for chicken sausage with the addition of soy protein isolate was at a concentration of 10% with a score of 4.56, a criterion of moderately strong elasticity. The role of protein greatly influences the elasticity and gel strength in processed products that require additional protein (Kharisma *et al.* 2016).

Total plate count analysis

The results of the Total Plate Count (TPC) test on chicken sausages with the application of kuniran fish protein isolate (*Upeneus sulphureus*) were with a value of P0 (0%) 3.2x103, P1 (2.5%) 3.4x103, P2 (5%) 3.6x103, and P3 (7.5%) 4.0x103 CFU/g. Based on the results of the TPL test, the sausages were declared to have met all the microbial count standards required in SNI 3820:2015 for sausages with the lowest value at P0 (3.2x103 CFU/g), the maximum

DOI 10.20884/1.jgipas.2026.10.1.20370

allowable TPL limit was a maximum of 1 x 104 CFU/g. Factors that influence these results are the process of selecting product raw materials, as well as the processing and presentation of products that are still safe (Sari et al. 2023). The results of the total plate count in this study were lower than those of Apriantini *et al.* (2021), the ALT results for beef sausage were 3.85 x 104, a higher result than in this study. According Nisa (2019) research, the causes of food contamination are divided into two: environmental hygiene and equipment hygiene.

CONCLUSION

The concentration of fish protein isolate 7.5%, is the optimum condition to maintain emulsion stability, supported by the cooking loss test value of 8.33%, water binding capacity of 62.51%, water content of 28.74% (dw), ash of 6.26 (dw) protein of 51.60% (dw), and fat of 13.22% (dw). The best panelist acceptance with parameter values of appearance (7.80), smell (6.87), flavor (8.07), texture (8.53), fold test (8.40), and bite test (8.00). Microbiological aspects are indicated by the total plate count (TLC) value of 3.2x103 CFU/g, meeting the requirements of SNI 3820:2015. The use of 7.5% kuniran fish protein isolate is the optimum concentration as an emulsifier for chicken sausage.

BIBLIOGRAPHY

Apriantini A, Afriandi D, Febriyani, Arief II. 2019. *Fisikokimia, mikrobiologi dan organoleptik sosis daging sapi dengan penambahan tepung biji durian (Durio zibethinus Murr).* Jurnal Ilmu Produksi dan Teknologi Hasil Peternakan 9(2): 79-88.

Arzani LDP, Utama QD. 2023. *Kajian komposisi bahan tambahan pangan pada produk daging ayam olahan komersial.* Journal of Food Science and Technology 3(1): 58–80.

Aslim F, Faridah A, Kasmita, Holinesti R. 2023. *Pengaruh penambahan isolat protein kedelai dan tepung porang terhadap sifat organoleptik sosis ikan nila.* Jurnal Pendidikan Tata Boga dan Teknologi 4(3): 353-358.

Astawan M, Ayu PGP, Arsy NR. 2020. *Isolat Protein (Teknik Produksi, Sifat-sifat Fungsional dan Aplikasinya di Industri Pangan.* Bogor: IPB Press. 218 hlm.

Astuti RT, Darmanto YS, Wijayanti I. 2014. *Pengaruh penambahan isolat protein kedelai terhadap karakteristik bakso dari surimi ikan swangi (Priacanthus tayenus).* Jurnal Pengolahan dan Bioteknologi Hasil Perikanan. 3(3): 47-54.

DOI 10.20884/1.jgipas.2026.10.1.20370

Badan Standarisasi Nasional. 2015. *Sosis daging SNI 3820:2015. Badan Standarisasi Nasional.* Jakarta. 43 hlm.

Badan Standarisasi Nasional. 2015. SNI no. 2332.3 *Cara uji mikrobiologi – Bagian 3 penentuan Angka Lempeng Total (ALT) pada produk perikanan.* Standar Nasional Indonesia. 39 hlm.

Bhargavi G, Nageswara RP, Renganathan S. 2018. *Review on the Extraction Methods of Crude oil from all Generation Biofuels in last few Decades. IOP Conference Series: Materials Science and Engineering* 330 (1).

Da Rosa ASL. 2015. *Pengaruh penambahan isolat protein kedelai terhadap kualitas sosis ikan lele (Clarias sp.).* Skripsi. Malang: Fakultas Perikanan dan Ilmu Kelautan. 95 hlm.

Dogan G, Omer OE. 2017. *Determination of amino acid and fatty acid composition of goldband goatfish [Upeneus moluccensis (Bleeker, 1855)] fishing from the Gulf of Antalya (Turkey).* International Aquatic Research 9(4): 313-327.

Haryati S, Sukarno, Budijanto S, Prangdimurti E. 2020. *Characterization of functional properties catfish protein isolates (Clarias sp.). IOP Conference Series: Earth and Environmental Science* 404(1): 012-031.

Irawati A, Warnoto, Kususiyah. 2015. *Pengaruh pemberian jamur tiram putih (Pleurotus ostreatus) terhadap pH, DMA, susut masak, dan uji organoleptik sosis daging ayam broiler.* Jurnal Sains Peternakan Indonesia10(2).

Kharisma M, Dewi EN, Wijayanti I. 2016. *Pengaruh penambahan isolat protein kedelai yang berbeda dan karagenan terhadap karakteristik sosis ikan patin (Pangasius pangasius)*. Jurnal Pengolahan dan Bioteknologi Hasil Perikanan 5(1): 44–48.

Khoiri A, Unzillatirrizqi YER, Nurwati. 2024. *Pengaruh penambahan konsentrasi isolated soy protein (ISP) terhadap sifat fisik dan organoleptik sosis ayam.* Jurnal Cendekia Ilmiah 3(5): 4690-4706.

Laksmi RT, Legowo AM, Kusrahayu. 2012. *Daya ikat air, pH, dan sifat organoleptik chicken nugget yang disubstitusi dengan telur rebus.* Animal Agriculture Journal 1(1).

Mananda AB, Witono Y, Taruna I, Won KW. 2014. *Physicochemical and functional properties of mixed fishes hydrolysates obtained enzymaticly from Apogon albimaculosus, Platycephalidae Cynoglossus lingua cymbacephalus and International Symposium and Annual Meeting of KSABC.* Korea 19-21 June 2015.

Musdalifah, Tanod WA. 2016. *Tingkat Penerimaan Konsumen terhadap Bakso Ikan Lele dengan Konsentrasi Daging yang Berbeda.* Kauderni: Journal of Fisheries Marine and Aquatic Science 1(1): 1-6.

Nisa IF. 2019. *Analisis faktor yang mempengaruhi keberadaan bakteri Eschericia coli pada makanan jajanan pedagang kaki lima di Lingkungan Sekolah dasar Kecamatan Ngronggot Kabupaten*

DOI 10.20884/1.jgipas.2026.10.1.20370

Nganjuk di prodi kesehatan masyarakat pascasarjana. Tesis. Semarang: Universitas Negeri Semarang.

Nugraha R, Firli LN, Rani DM, Hidayaningsih a, Lestari ND, Wongso H, Tarman K. 2023. *Antioxidant activity of endophytic fungi from medicinal plants. Journal of Natural Products* 66(3): 47-55.

Oktasari T, Suparmi, Karnila R. 2015. *Pembuatan isolat protein ikan gurami (Osphronemus gouramy) dengan metode pH berbeda. Jurnal Online Mahasiswa*. 1–12.

Prasetyo H. 2021. *Produksi enzim protease dari limbah hasil perikanan dan pemanfatannya: kajian pustaka*. Skripsi. Malang: Fakultas Perikanan dan Ilmu Kelautan. Universitas Brawijaya. 72 hlm.

Prijambodo OM, Trisnawati CY, Sutedja AM, 2014. *Karakteristik fisikokimia dan organoleptik sosis ayam dengan proporsi kacang merah dan minyak kelapa sawit*. Jurnal Teknologi Pangan dan Gizi 13(1):6- 11.

Purnawati RT, Praptiningsih Y, Sukatiningsih. 2015. *Karakteristik sensoris dan fisiko kimia sosis lele dumbo (Clarias gariepinus) yang dibuat dengan variasi dan konsentrasi bahan pengikat*. Jurnal Berkala Ilmiah Pertanian 9(9):1-7.

Sitepu GSB, Simamora GRR. 2022. *Pengaruh Penyimpanan Beku Minced Fish Dan Frekuensi Pencucian Terhadap Kualitas Mutu Surimi Dan Kamaboko Ikan Patin (Pangasius sp.). Jambura Fish Processing Journal 4*(2): 52–63.

Sujianti A, Susilawati, Astuti S, Nurdin SU. 2023. *Karakteristik sensori dan fisik sosis ayam dengan penambahan pati aren (Arenga pinnata) dan isolat protein kedelai.* Jurnal Agroindustri Berkelanjutan 2(1): 130-146.

Vatria B, Nugroho TS. 2022. *Karakteristik mutu sosis ikan nila (Oreochromis niloticus) dengan penambahan isolat protein kedelai sebagai emulsifier alami.* Manfish Jurnal 3(20): 1–3.

DOI 10.20884/1.jgipas.2026.10.1.20370