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Submission date: 07-Apr-2023 09:28AM (UTC+0700)

Submission ID: 2058065499

File name: IJSER_2023.pdf (277.03K)

Word count: 2860

Character count: 14956

The Use of Albumin in Sardine Fish - Based Pempek to Increase Protein Levels and Substitute Snakehead Fish as a Basic Ingredient for High Protein Pempek

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Abstract: The reduced population of snakehead fish, the essential ingredient of pempek (one of Indonesia's typical foods), has caused a lot of production to replace it with other fish bases and add albumin to the material used as a substitute base. So snakehead fish farming may continue to boost the fish population, and pempek production can remain economically viable. The methodology used is an experiment that uses an increase in albumin concentration in making pempek based on sardines. The use of albumin of 5%, 10%, 15%, and 20% to 25% as an additional protein material was to be given to the sample. Thirty moderately trained panellists were selected from a limited circle who had been tested for sensitivity first. Duncan tests were performed on a model that took an intermediate value against a homogeneous sample. The sample test found that adding albumin can increase sardines' protein content and the taste, chewiness, aroma, and colour of the pempek itself. It was found that adding albumin by 10% was the best choice chosen by the panellists while obtaining high quality for the sardines - based fish. By researching the addition of albumin to other fish that will be the primary raw material for pempek, it is hoped that the snakehead fish population can increase to meet the high consumer demand for these fish. In addition, using snakehead fish albumin can also increase the protein value of sardines. The raw material for pempek can replace snakehead fish with almost the same protein content at a more affordable price.

Keywords: Albumin, pempek, food

1. Introduction

Pempek is a famous Palembang speciality in Indonesia (Rozalena & Mutialela Caropeboka, 2021). The people of Palembang have succeeded in developing processed fish products into various types of pempek with multiple fillings and other additives such as chicken eggs, fish skins, tofu, and other essential ingredients (Amrullah et al., 2022). Raw pempek is a kind of gel with a chewy and elastic texture (Kartika & Harahap, 2019). The crucial components for making pempek are fish meat, tapioca, water, acceptable salt, and another additional seasoning (Setiagraha et al., 2021). The ingredients are made in various forms and then cooked by boiling, steaming, frying, or baking (Atmaja, 2021). When served or eaten, pempek is not enough to be eaten casually but served with soup or cukopempek as a compliment (Supriadi et al., 2018).

In general, the raw material for fish used in making pempek is snakehead fish which can produce an attractive taste, aroma, and colour in the final product (Rahayu et al., 2018). But its limited availability makes the snakehead fish relatively expensive (Norfirdaus et al., 2021). It is because it is influenced by the season, so it will affect the selling price. In addition, the demand for snakehead fish commodities continues to increase (Hartati et al., 2018). The total catch of mackerel is higher in the eastern season, namely in April, May, and June. Therefore, it is necessary to diversify protein sources by utilizing other types of fish whose availability level is relatively high and easy to obtain at a more affordable price (Falahun et al., 2021).

In making pempek, it needs to be developed using other types of fish that are diverse in quantity and cheap in price and have not been widely used, including sardines, seluang fish, red-eyed sepat fish, and bilis fish (Syah, 2020). On this occasion, sardines will be used as the primary material for protein sources (Rozalena & Mutialela Caropeboka, 2021). Sardines can be an option to replace protein sources in making pempek because sardines are abundant in the market and the price is relatively low; for the enrichment of sardines pempek in the manufacturing process, albumin is added from snakehead fish itself (Adriani, 2019).

In light of the preceding, studies will determine whether adding albumin to the manufacturing process of sardines pempek improves the product's colour, texture, and flavour; increases its protein content; and attracts more customers (Palma - Albino et al., 2021).

2. Literature Review

2.1 Albumin

Snakehead fish is very rich in albumin. This fish is a source of albumin for people with hypoalbumin (low albumin) and wounds, both postoperative wounds and burns (Chai et al., 2021). During this time, albumin is produced from human blood, which is expensive (Kaspchak et al., 2019). The discovery of Cork fish albumin extract was then used as an alternative to getting cheaper albumin. Albumin is the main protein in human plasma and makes up about 60% of the total plasma proteins.

The liver produces 12 grams of albumin daily, 25% of the total hepatic protein synthesis, and half of all organ - secreted proteins. As a source of foodstuffs containing protein and albumin, Snakehead fish is needed in large quantities, and the need for albumin filtrate in hospitals is increasing. Many snakehead fish of diverse sizes and weights are required to meet these demands.

2.2 Pempek

Pempek is still one of the favourite foods in Indonesia. There are still many groups of people who still really like the taste of pempek; in addition to the taste that is so distinctive with the taste of fish meat and the mixture of tapioca pempek flour also tastes more delicious to serve if eaten with vinegar sauce made with palm sugar ingredients, apart from the delicious taste. Pempek also has a unique shape and variety in the manufacturing process.

Making pempek usually uses the basic ingredients of protein sources from fish meat mixed with supporting ingredients as a binder for the shape of the pempek so that it does not spoil when boiled. These ingredients are mixed evenly or homogeneously with fish meat. Water is added as an ingredient, so fish meat and tapioca flour can be mixed evenly. Still, it is necessary to know that in making pempek, it is necessary to pay attention to the amount of fish meat and tapioca flour in a Pempek dough because it can affect the quality of the texture produced.

3. Methods

The method used is an experiment by trying the level of albumin concentration in making pempek. Albumin stiffness's effect is measured using a multiple comparison test, with the snakehead fish pempek as a reference. The ingredients used in this study were snakehead fish of 300 - 500g per head with a total weight of filet meat of 900g, fresh sardines with a total weight of 4.5kg, salt, water, tapioca flour, and albumin, the materials needed for organoleptic testing, namely mineral water, snakehead fish pempek, and sardines pempek. The tools used for this study are digital scales, volumetric flask, Erlenmeyer, grinding machines, cutting boards, basins, sieves, knives, pots, plates, spoons, and frying spatula.

4. Result and Discussion

4.1 Protein Levels

Proteins, like carbs and fats, are macronutrients that the body needs in large amounts. However, proteins are mainly used to make biomolecules and not as energy sources (constituents of body shape). The treatment of adding albumin to the manufacture of sardines pempek affects the protein levels of sardines pempek, which can be seen in figure 1. With this, the addition of albumin with a percentage of 5%, 10%, 15%, 20%, and 25% results in the protein content of each treatment increasing and making sardines pempek have a high protein nutritional value and are suitable for consumption.

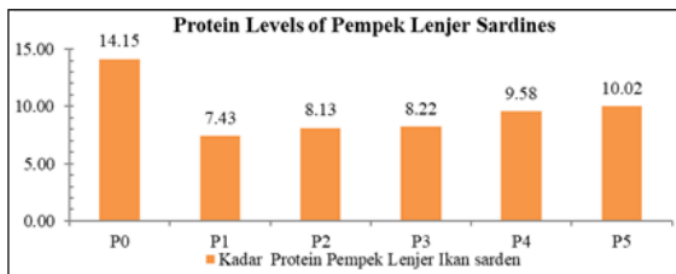


Figure 1: Average Value of Pempek Lenjer Sardines Protein Content

The protein content of sardines pempek after the addition of albumin affects the increase in protein levels of each treatment, judging from the P₅ treatment having the highest protein content. The P₁ treatment has the lowest protein content. In contrast, the P₀ treatment is a snakehead fish pempek with the addition of 0% albumin as a control for comparison, with sardine pempek having a higher protein content than sardine pempek protein. It is because snakehead fish protein is much higher than sardines protein.

4.2 Organoleptic Test

a) Taste of Sardines Pempek

The addition of albumin with each percentage of 5%, 10%, 15%, 20%, and 25% has a very noticeable effect on the taste of sardines pempek lenjer, so it is necessary to carry out further tests of Duncan as for the results of the Duncan pempek sardines test in each treatment as shown in the table below.

Table 1: Duncan Test Data on Albumin Addition to Sardines PempekLenjer Taste

Treatment	Average	Differences of Albumin Addition				BJND Test	
		2	3	4	5	0,05	0,01
P4	5,17	-	-	-	-	a	A
P5	5,20	0,03tn	-	-	-	a	A
P3	5,67	0,47tn	0,50tn	-	-	ab	A
P1	5,97	0,30tn	0,77*	0,80*		b	A
P2	6,03	0,06tn	0,36tn	0,83*	0,86*	b	A
P0,05 (P, DBG)		2,77	2,92	3,02	3,09	-	-
P0,01 (P, DBG)		3,64	3,80	3,90	3,98	-	-
BJND0,05 (P,Sy)		0,72	0,76	0,78	0,80	-	-
BJND0,01 (P,Sy)		0,94	0,98	1,01	1,03	-	-

Source: Test Result

Notes: The numbers followed by the same letter mean different unreal

The data from the Organoleptic Test study in table 1 showed various accurate levels on the sardines with results. The P₄ treatment was not different from the P₅ and P₃ treatments but was significantly different from the P₁ and P₂ treatments; the P₅ treatment was not separate from the P₃ treatment. The difference between P₃'s therapy and P₁'s and P₂'s is

substantial; P₃'s treatment is intangible in contrast to P₁'s and P₂'s, and P₁'s treatment is not other than P₂'s. The P₂ therapy yielded the most significant average value, at 6.03 (10%), while the P₄ treatment yielded the lowest, at 5.17 (20%). The average value can be seen in the graph in figure 2.

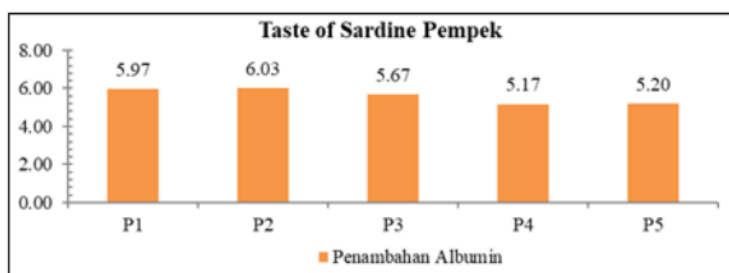


Figure 2: Taste of Sardines Pempek

b) The chewiness of Sardines Pempek

According to the results of organoleptic tests, sardine pempek tends to be somewhat less chewy than snakehead fish pempek. It is demonstrated by organoleptic results, with chewiness parameters receiving the highest value with an average of 4.33 in the P₁ and P₃ treatments having the same value. The chewiness of sardine pempek, which tends to be

hard, causes sardines pempek to receive a low discount from the panellist. The diversity analysis showed that adding albumin to sardines had a genuine effect, so further tests needed to be carried out. Still, after other tests using the Duncan test method, the results of adding albumin had a natural effect on the suppleness of sardines.

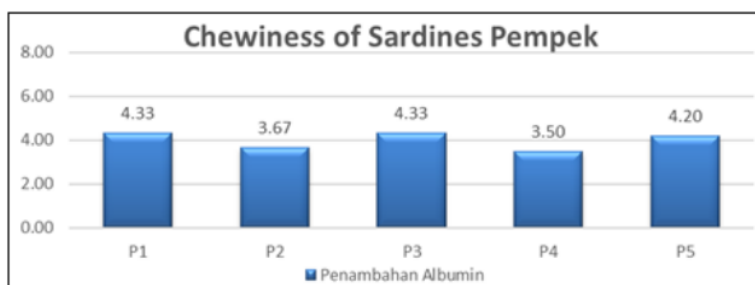


Figure 3: The chewiness of Sardines Pempek

c) The scent of Sardine Pempek

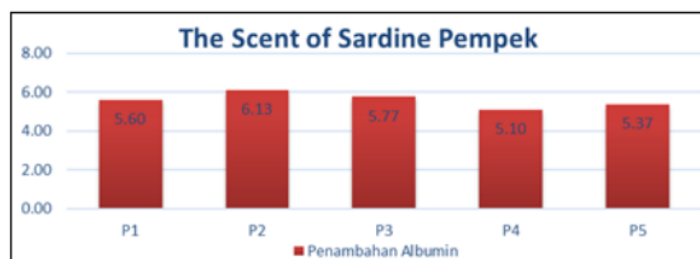


Figure 4: The Scent of Sardine Pempek

The aroma of sardines pempek based on the results of organoleptic tests got a value of 6.13, where the matter was the same as snakehead fish. The aroma of sardines pempek got the highest value of 6.13 in the P2 treatment with the addition of 10% albumin, while the lowest value was found in the P4 therapy with the addition of 20% albumin; this showed that the addition of 10% albumin to sardines pempek was preferred by the panellists compared to other treatments.

The results of the diversity analysis on sardines pempek obtained results where the addition of albumin had a very noticeable effect on the aroma of sardines pempek using 30 semi - trained panellists so that it was necessary to carry out further tests using the Duncan test method. Still, after testing using the Duncan test, the results of adding albumin had a natural effect on the aroma of sardines pempek.

d) The Colour of Sardine Pempek

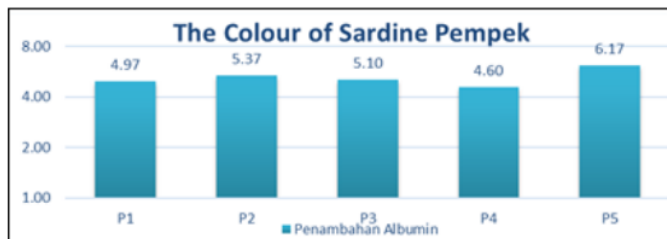


Figure 4: The Colour of Sardine Pempek

The results of the organoleptic test of sardines with the addition of albumin obtained the highest average value of 6.17 in the P5 treatment with the addition of 25% albumin, where the matter was the same as snakehead fish which was the control in this study. In comparison, the lowest value in P4 obtained an average value of 4.60 with the addition of 20% albumin. The results of this organoleptic test were obtained from 30 half - trained panellists.

raw material of snakehead fish and can still restore the snakehead fish population so that it can still be consumed because it has good nutrition.

The diversity analysis results on sardines pempek obtained results where the addition of albumin had an authentic effect on the colour of sardines pempek using 30 semi - trained panellists, so further tests needed to be carried out using the Duncan test method. Still, after testing using the Duncan test, the results of adding albumin had an authentic effect on the colour of sardines pempek.

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5. Conclusion

Making sardines pempek will obtain high - quality content and is preferred by panellists, and it should be recommended to make sardines pempek using P2 treatment with the addition of 10% albumin. Besides being able to replace the original raw materials that are increasingly difficult to find, the addition of albumin can also provide a reasonably high protein addition that is almost the same as snakehead fish so that we can still obtain pempek with a quality close to the

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