

STUDY OF PREFERENCE LEVEL OF IWAK SAMBAL (SALAWAK) BASED ON BY-PRODUCTS OF CATFISH FILLET (*PANGASIVUS SP.*)

Studi Tingkat Kesukaan Sambal Iwak (Salawak) Berbahan Dasar Hasil Samping *Fillet* Ikan Patin (*Pangasius Sp.*)

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(Received March 5th 2024; Accepted April 18th 2024)

ABSTRACT

This research is also motivated by utilizing the by-product of catfish fillets which are processed into fish sauce. The aim of this research was to determine the level of preference for iwak (salawak) chili sauce made from by-products of catfish (*Pangasius sp.*) fillets with the addition of the best concentration of cayenne pepper. As well as knowing the chemical quality (macro nutrients and micro nutrients) and microbiological quality (Total Plate Number) of salawak that consumers like most. The process flow for making iwak (salawak) chili sauce includes preparation of raw materials, melting (thawing), washing, soaking with lime, frying, separating the meat from the spines, cooking spices, cooking iwak (salawak) chili sauce, packaging and labeling. The results of the panelists' preference (hedonic) test for iwak (salawak) chili sauce were obtained in treatment P2, namely with the addition of 10% cayenne pepper, chemical quality values including water content 58.23%, protein 11.47%, fat 18.37%, carbohydrates 7.68%, vitamin A 96.91 mcg/100g, calcium 151.83 mg/100g, and iron 1.03 mg/100 g. Meanwhile, the microbiological value of Total Plate Number (ALT) is 3.7×10^5 .

Keywords: Formulation, By-products, Catfish, Sambal

ABSTRAK

Penelitian ini juga dilatarbelakangi untuk memanfaatkan hasil samping fillet ikan patin yang diolah menjadi sambal ikan. Tujuan penelitian ini untuk mengetahui tingkat kesukaan sambal iwak (salawak) berbahan dasar hasil samping fillet ikan patin (*Pangasius sp.*) dengan penambahan konsentrasi cabai rawit terbaik. Serta mengetahui mutu kimia (makro nutrisi dan mikro, nutrisi) dan mutu mikrobiologi (Angka Lempeng Total) pada salawak yang paling disukai konsumen. Alur proses pembuatan sambal iwak (salawak) meliputi persiapan bahan baku, pelelehan (thawing), pencucian, perendaman dengan jeruk nipis, penggorengan, pemisahan daging dengan duri, pemasakan bumbu, pemasakan sambal iwak (salawak), pengemasan dan pelabelan. Hasil uji kesukaan (hedonik) panelis terhadap sambal iwak

(salawak) diperoleh pada perlakuan P2 yaitu dengan penambahan cabai rawit 10%, nilai mutu kimia diantaranya yaitu kadar air 58,23%, protein 11,47%, lemak 18,37%, karbohidrat 7,68%, vitamin A 96,91 mcg/100g, kalsium 151,83 mg/100g dan besi 1,03 mg/100 g. Nilai mikrobiologi Angka Lempeng Total (ALT) yaitu $3,7 \times 10^5$.

Kata Kunci: Formulasi, Hasil Samping, Ikan Patin, Sambal

INTRODUCTION

Patin fish is a freshwater fish that is known to the public because of its thick flesh and not many spines. Its body components are 54.20% flesh, 12.44% bones, 4.46% skin, 20.59% head, 5.53% stomach contents. and 2.79% tail (Aprilia *et al.*, 2020). Apart from that, catfish also has a distinctive taste and contains 16.08% protein, 5.75% fat, 1.57% carbohydrates, 75.7% water and 0.97% ash (Panangan *et al.*, 2012).

Catfish production is increasing from year to year, increasing by 22.25% in 2018, reaching around 391,151 tons/year, an increase from the previous year, namely around 319,966 tons/year (KKP, 2019). With the increase in catfish production in the fillet processing industry, the yield is around 45%, resulting in quite large by-products (Nurilmala *et al.*, 2018). The by-products produced are 3.5-4 tons/day, consisting of 3-4% skin, 20-25% head, 15-18% bones and fins, 5-7% stomach contents, 7-9% belly, and 8-11% fillet meat flakes (KKP, 2020).

The resulting by-products give rise to new problems, therefore utilizing and processing them is carried out immediately in order to reduce the occurrence of the resulting by-products. Fillet meat flakes (trimming) are some of the by-products with a fairly cheap price, namely IDR 20,000/kg and if they are immediately processed further, they will produce added value. Fillet meat flakes can be made into various fish-based preparations, one of which is made into fish sauce which the author calls salawak (salawak is an abbreviation of sambal iwak which means fish sauce).

In Indonesian food culture, chili sauce is one part of life, this is because chili sauce plays a very important role as a stimulant and enhancer of taste in appetite, so that chili sauce becomes an absolute part of accompanying dishes, chili sauce is usually eaten with rice (Affandi *et al.*, 2020). In general, the main material for making. The chili sauce is shallots, chilies, garlic, sugar and salt. Apart from that, chili sauce can also be added to the main ingredient fish with the aim of increasing the protein content in the chili sauce. Iwak chili sauce (salawak) is a processed fishery product that has a semi-wet texture, has a unique taste and a level of spiciness that can be adjusted to the consumer's wishes. The advantage of the iwak chili product (salawak) when compared to fish chili sauce in general which is already circulating on the market is the use of raw materials with the use of by-products of catfish (*Pangasius sp.*) fillets. Spices are added in making iwak chili sauce (salawak) to improve the taste and extend shelf life. Some foods use a lot of spices to add taste, apart from adding taste they also function as preservatives and antioxidants. The addition of spices can strengthen the flavor so that food products can be accepted by consumers. Spice formulations can make food more delicious so that it can satisfy consumers (Putri, 2018).

METHODS

Place and Time

The research period took place from March to May at Tefa, the Karawang Marine Fisheries Polytechnic, located on Jl. Tanjungpura Outer Ring, Karangpawitan, West Karawang, Karawang. Chemical testing at the Saraswanti Bogor laboratory and microbiological testing at BLUPBB located in Cilebar District, Karawang.

Tools and Materials

The main ingredients for trimming catfish fillets and additional ingredients are red chilies, cayenne peppers, garlic and red onions, galangal, ginger, carrots, lime, lemongrass, bay leaves, salt, white sugar and flavorings.

Tools used Stove, Frying Pan, Sutil, Knife, Blender, Stainless Container, Scales, Cutting Board, Jar, Food Processor.

Design

The method used was an experiment by adding cayenne pepper with a cayenne pepper formulation of 0% (P1), 10% (P2), 15% (P3). The process of making iwak (salawak) chili sauce made from by-products of catfish fillets (*Pangasius* sp.), begins with receiving the main raw material, namely frozen catfish fillet trimming meat, then the catfish fillet trimming meat is melted or thawed using the meat method. Place the fish in a container filled with water and let it sit for a few minutes until the fish flesh is soft in order to make the next process easier. The fish meat that has been thawed is then soaked using lime for 15 minutes, the aim is to remove the fishy smell and salt is added to improve the taste of the fish meat. The trimmed fish fillet meat is then cooked by frying for 5 minutes. After trimming the catfish fillet meat is fried, then separate the meat from the remaining fish spines manually using a fork, then mash the meat using a food processor, cook the spices with a little oil (sauté) in the formulation of mashed ingredients, mash the fish meat. then add it to the iwak chili sauce (salawak) until cooked, then drain, package and label.

Tests include liking level testing (hedonics), chemical tests for macro nutrients (protein, carbohydrates, water content, ash content and fat content), micro nutrients (vitamin A, calcium and iron) carried out on one of the best samples according to the panelists, as well as microbiological testing.

Likeability Test (Hedonic)

The calculation of the results of the liking (hedonic) test is carried out based on the hedonic test according to SNI 01-2346 of 2006. The data obtained from the assessment sheet is calculated and the quality is determined according to the average results of the panelists with a 95% confidence level. To calculate it, use the following formula:

$$P = x - (1.96. S/\sqrt{n}) \leq \mu \leq (x + (1.96. S/\sqrt{n})) = 95\%$$

$$\bar{X} = \frac{\sum_{i=1}^n X_i}{n}$$

$$S^2 = \frac{\sum_{i=1}^n (X_i - \bar{X})^2}{n}$$

$$S = \frac{\sqrt{(\sum_{i=1}^n (X_i - \bar{X})^2)}}{n}$$

Information:

n : Number of Examiners/Panelists

s : Diversity of Quality Values

1,96 : Standard Deviation Coefficient 95%

x : Average Quality Value

xi : Quality Score of Examiners/Panelists 1st, Up to n

s : Quality Assessment Standard Deviation

Chemical Test

Protein Test

Protein content analysis uses the Total Nitrogen method as stated in SNI 01-2354.4-2006. The nitrogen content is analyzed using stoichiometry and the protein content is obtained by multiplying the amount of nitrogen by a conversion factor. Formula for calculating protein content using the formula:

$$\text{protein levels (\%)} : \frac{(va - vb)hcl \times 14,007 \times 6,25 \times 100\% \times 1000}{W \times 1000}$$

Information:

V a : milli liters of HCl to titrate the sample

V b : milli liters of HCl to titrate the blank

N : HCl normality is used

6,25 : nitrogen to protein conversion factor

14.007 : nitrogen equivalent weight

W : weight/sample weight (protein content expressed in grams/100g sample (%))

Fat Content Test

Determination of fat content refers to the Indonesian National Standard (SNI) number 01-2345.3-2006, which begins with extracting the sample using an organic solvent with the aim of removing the fat content from the sample assisted by heating with a temperature reaching boiling point and a time of 8 (eight) hours. Next, the organic solvent that binds the fat is separated through an evaporation process, so that the fat remains in the flask. Fat content is calculated using gravimetry (BSN, 2006). The formula for calculating fat content can be seen below:

$$\text{fat level (\%)} = \frac{(C-A) \times 100\%}{B}$$

Information:

A : weight of empty round bottom flask in grams

B : sample weight in grams

C : weight of round bottom flask and fat obtained from extraction in grams

Test Carbohydrate Levels

According to Santi (2012) carbohydrate content can be determined using the equation:

$$\text{carbohydrate levels (\%bk)} = 100\% - (A+B+C+D)$$

Information:

A : Water content

B : Ash content

C : Fat level

D : Protein content

Water Content Test

Calculation of water content in food ingredients is determined according to Indonesian National Standard (SNI) number 2354.2 – 2015. Water content calculation formula:

$$\text{water content} = \frac{B-C}{B-A} \times 100\%$$

Information:

A : weight of empty cup (g)

B : cup weight + initial example (g)

C : cup weight + initial example (g)

Ash Content Test

Analysis of ash content is determined using the gravimetric method in accordance with the Indonesian National Standard (SNI) number 01-2891-1992. The analysis begins by weighing the sample (B) at 2-3 g and placing it in a porcelain cup with the weight (A) known in advance. Next, burn until the smoke disappears, then ash in a kiln at a temperature of 550°C until the ashing process is complete for ± 4 hours, cool in a desiccator, weigh until a constant weight (C) is obtained. The ash content calculation can be seen below:

$$\text{ash content} = \frac{(C-A)}{B} \times 100\%$$

Information:

- A : weight of empty cup (g)
- B : sample weight (g)
- C : cup weight + sample after annealing (g)

Test Vitamin A Levels

According to Krismaputri (2013), the way to test vitamin A is to weigh 5 g of a ground sample, add 10 ml of 30% KOH in methanol and 20 ml of chloroform, put it in a water bath for 30 minutes, until the 15th minute the sample is vortexed. After 30 minutes, the extract was filtered and collected in a 25 ml measuring flask. Next, the extract was diluted with 10 ml of chloroform in a volumetric flask and 1 ml of extract. The absorbance on the spectrophotometer was read at a wavelength of 440 nm.

Test Calcium Levels (Ca)

According to Ditamy (2019), the method for testing calcium (ca) is that the sample solution from the digestion process is pipetted with 10 ml, put into a 100 ml volumetric flask, add 2.5 ml of lanthanum oxide (La²O³) and fill with aqua demineralisata to the marker line (dilution factor = 100 ml / 10 ml = 10 times). Put it in a vital flask then place it in the autosampler, measure the absorbance using an atomic absorption spectrophotometer with a wavelength of 422.7 nm. The absorbance results obtained are in the range of calibration curve values for calcium standard solutions. Determination of calcium concentration is determined by the regression line equation from the calibration curve.

Microbiology Test

Microbiological testing in the form of Total Plate Number (ALT) analysis, determining ALT in food ingredients can be carried out based on SNI 2332-3:2015. The principle of ALT test analysis is to grow microorganisms using the agar pour method, then carry out incubation under aerobic/anaerobic conditions with appropriate temperature and time until they grow and reproduce by forming colonies which are then counted. (BSN, 2015).

RESULT

Hedonic Test

1. Appearance

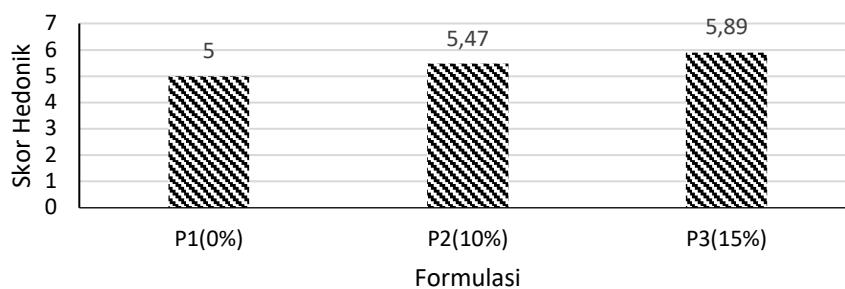


Figure 1. Average Value of Appearance Liking Test

2. Aroma

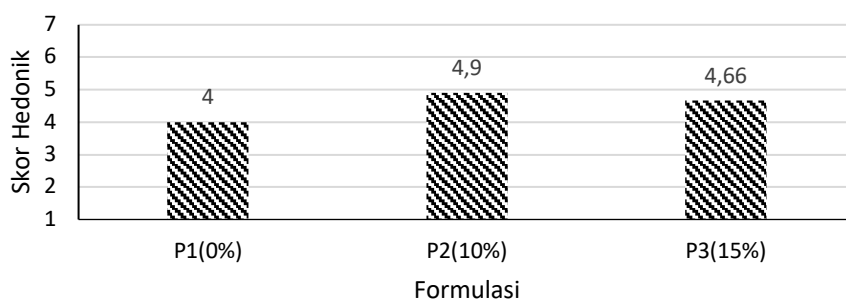


Figure 2. Average Value of the Scent Likeness Test

3. Flavor

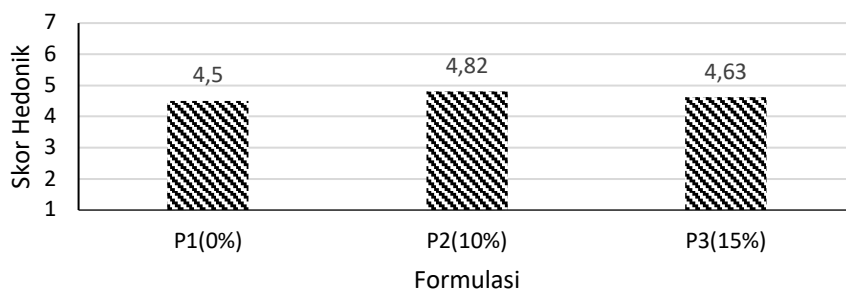


Figure 3. Average Value of Taste Likeness Test

4. Texture

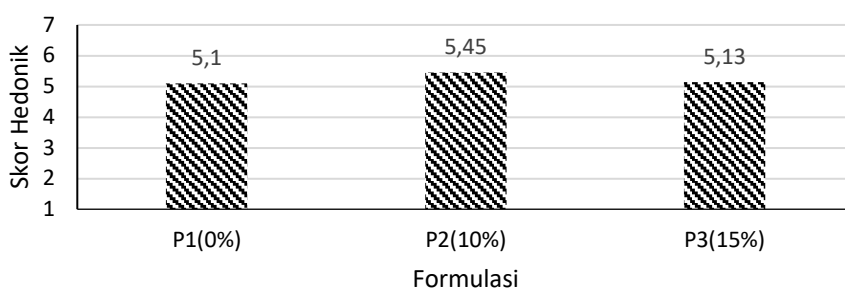


Figure 4. Average Value of the Likeness Test for Texture

Chemical Test

The chemical test results are presented in Table 1.

Table 1. Chemical Test Results for Iwak Sambal (Salawak)

No	Parameter	Unit	Test Results	SNI
1	Water content	%	58,23	Maks.80%
2	Fat level	%	18,37	-
3	Protein content	%	11,47	Min.0,5%
4	Carbohydrate	%	7,68	-
5	Ash content	%	4,25	-
6	Vitamin A	mcg/100 g	96, 91	-
7	Calcium	mg/100 g	151,83	-
8	Iron	mg/100 g	1,03	-

Total Plate Number Test

The results of the total plate number test are presented in Table 2.

Table 2. Total Plate Number Test Results

No	Parameter	Unit	Test Results	SNI
1	ALT	Cfu/g	3,7 x 10 ⁵	1 x 10 ⁴

DISCUSSION

One of several characteristics is the first appearance that consumers see before consuming a food product, besides that, it is also the shape, size and color. The results of the preference (hedonic) test for the appearance of iwak (salawak) chili sauce with the addition of different concentrations of cayenne pepper can be seen in Figure 1. Figure 1 shows the panelists' preference test scores for the appearance of iwak (salawak) chili sauce have different values, namely ranging from 5.07 -5.89, of the three formulations, the highest value that the panelists really liked was P3 with an additional formulation of 15% cayenne pepper. This means that the more chilies you add, the redder they will be, because red chilies contain carotenoid compounds such as carotene, kapsonubin, capsanthin, and zeaxanthin, these compounds are the compounds that make up the color of red chilies (Nursari *et al.*, 2016). Apart from the addition of cayenne pepper, the appearance of the iwak (salawak) chili sauce is also influenced by the ingredients used and the cooking temperature. When making the iwak (salawak) chili sauce, the chilies used are still fresh, ripe and have bright red skin. If you use immature chilies that are still green, the resulting color will be brownish. The cooking temperature also affects the color of the fish sauce with a temperature of 80-100°C, if too high a temperature is used it will produce a dark color of the fish sauce so that the appearance of the iwak (salawak) sauce becomes less attractive. (Nafisafallah, 2015).

The interesting thing in determining whether a food product tastes good or not is the aroma, which is a factor in determining the quality of a food product that consumers can accept. The results of the preference (hedonic) test for the aroma of iwak (salawak) chili sauce with the addition of different concentrations of cayenne pepper in Figure 2 which shows the (hedonic) test for the aroma of iwak (salawak) chili sauce, namely P1 4.50 (Neutral), P2 4.98 (like) , P3 4.66 (somewhat like). Of the three formulations, there was a difference in the value of the aroma of iwak chili sauce (salawak), the lowest value was treatment P1 where in this treatment there was no addition of cayenne pepper so the fishy smell of fish was quite strong

and the panelists didn't like it. In the P3 treatment with the addition of a 15% concentration of cayenne pepper, the aroma produced was more dominant than the aroma of the fish. The aroma that the panelists really liked was in the P2 formulation which added 10% cayenne pepper, where the smell of fish and cayenne pepper was balanced. So it can be concluded that adding cayenne pepper to iwak (salawak) chili sauce can reduce the fishy smell because cayenne pepper contains vitamin C (ascorbic acid). The ascorbic acid content in cayenne pepper can react with Trimethylamine (TMA) to form trimethyl ammonium. Trimethylamine (TMA) is the source of the fishy smell in fish after the fish dies. After turning into trimethyl ammonium it can reduce the fishy smell (Poernomo *et al.*, 2004).

One important factor in determining consumers' desire to accept/reject a food product is taste. There are several commonly known tastes, namely sweet, salty, sour and bitter. Meanwhile, the other flavors are a combination of these basic flavors. Salt is one of the kitchen spices that must be added to every dish, this really affects the taste because salt is a flavor enhancer and enhancer of pre-existing spices. Food products will taste bland and be undesirable if the salt content is less than 0.3% (Nursari *et al.*, 2016). The results of the preference (hedonic) test for the taste of iwak (salawak) chili sauce with the addition of different concentrations of cayenne pepper are as shown in figure 3.

The results of the panelists' preference test for the taste of fish sauce (salawak) were P1 4.52 (Neutral), P2 4.82 (liked), P3 4.63 (somewhat liked) of the three formulations, the highest value was obtained in the P2 treatment, namely with the addition of cayenne pepper concentration is 10%. The more concentration of cayenne pepper that is added makes the chili taste spicier, this is influenced by the chemical compound capsaicin in chilies, this compound is what causes chilies to have a spicy taste. The type of cayenne pepper used in making iwak chili sauce (salawak) is the white cayenne pepper which has an orange/orange color and is larger in size compared to other types of cayenne pepper. This type of chili was chosen because it has a very spicy taste with a capsaicin compound content of 0.1-1% (Edowai *et al.*, 2016).

Texture is one of the biggest determining factors in the quality of taste in food. Each food ingredient has texture properties that depend on its physical condition, size and shape. The texture that is usually assessed in a food product is hardness, elasticity, crispness and viscosity (Karim *et al.*, 2013). Figure 4 shows the results of the panelists' liking (hedonic) test for the texture of iwak (salawak) chili sauce with the addition of different concentrations of cayenne pepper. Descriptively, they were given a somewhat like value of 5.12-5.45. The more cayenne pepper that is added, the texture of the iwak (salawak) chili sauce will be a little dry, this is because cayenne pepper contains ascorbic acid compounds which can help reduce the water content, the more cayenne pepper that is added, the more water holding capacity of the iwak chili sauce can be increased (salawak) (Madina, 2018). Of the three formulations, the highest or most preferred value was formulation P2 with the addition of a cayenne pepper concentration of 10%.

From the chemical test results, iwak (salawak) chili sauce has the advantage of having a fairly high protein content compared to chili sauce in general, namely 11.47% and a water content of 58.23%, which meets the SNI requirements for chili sauce. The results of the chemical test for iwak chili sauce (salawak) are in table 1. Water content as an important component in food has an effect on texture, color and taste. Table 1 shows that the water content in iwak (salawak) chili sauce is 58.23%, which meets the quality requirements for chili sauce in SNI 4864-2018, namely a maximum of 80%. The water content of food also affects its storage capacity. The higher the water content in food, the shorter the shelf life so that the food becomes easily damaged. The water content produced in iwak chili sauce (salawak) is influenced by the cooking process and processing temperature. When cooking, the water content of the food will evaporate, this is because the water content in the food will be

immediately evaporated by the heat from the pan and cooking oil as a heat conductor, so that some of the free water in the food will evaporate and decrease. With higher temperatures and longer cooking times, the water content of food will decrease (Nilasari *et al.*, 2017).

Chemical testing of the fat content of iwak (salawak) chili sauce was 18.37%, the source of the fat contained in iwak (salawak) chili sauce came from catfish meat, cayenne pepper and cooking oil. Apart from that, the fat contained in iwak chili sauce (salawak) is caused by the processing process by frying, frying as a way of processing food can increase the fat content, because cooking oil is absorbed into the food, causing the fat content in the food to increase. Apart from that, fat in food can make it taste better (Sundari *et al.*, 2015). Fats and oils are an effective source of energy compared to carbohydrates and protein. 1 gram of oil or fat can provide 9 kcal, while protein and carbohydrates only provide 4 kcal (Widarta, 2017).

Protein levels as a nutritional content have an important role in the body, as fuel for the body and as a building and regulating substance. The chemical test results for the protein content of iwak (salawak) chili sauce, namely 11.47%, have met the quality requirements for terasi chili sauce in the Indonesian National Standard number 01-4865.1-1998, which is a minimum of 0.5%. This shows that the protein content of iwak (salawak) chili sauce is higher than chili sauce in general. This has similarities with research by Arsyad & Habi (2021) which shows that adding fish meat can increase the protein content, because fresh fish contains quite high protein and this will influence the increase in protein produced.

The results of the chemical test for carbohydrate content in iwak (salawak) chili sauce are 7.68%, carbohydrate requirements are in the range of 45-65% (Widyaningrum, 2019). So the iwak chili sauce (salawak) cannot meet the body's carbohydrate needs. The source of carbohydrates in iwak chili sauce (salawak) comes from catfish meat, cayenne pepper, red chili and carrots. In food, carbohydrates play an important role in determining characteristics such as color, texture and taste. Carbohydrates are one of the nutritional elements that function as the main energy source for the human body (Fitri & Fitriana, 2020).

Ash content is an inorganic substance left over from burning food. The ash found in food indicates the minerals contained in a processed product. The chemical test results for the ash content of iwak (salawak) chili sauce, namely 4.25%, do not meet the quality requirements for chili sauce in SNI 4864-2018, namely a maximum of 0.1%. These results show that the ash content in iwak (salawak) chili sauce is higher when compared to chili sauce in general. This is similar to previous research, namely Arsyad & Habi (2021) stated that adding more fish meat to the chili sauce will increase the ash content of the product. Apart from that, the content of food ingredients is influenced by the temperature used in the processing process, the higher the temperature used, the percentage of ash content will increase, because the water content that comes out of the food ingredients will be higher so that the percentage of ash content will be higher. During the ashing process, the organic content will evaporate, so that the remaining inorganic content is like minerals (Arsyad & Habi, 2021).

The chemical test results for vitamin A in iwak (salawak) chili sauce were 96.91 mcg/100g. The vitamin A found in iwak chili sauce (salawak) is due to the addition of carrots to fulfill the nutritional content, where vitamin A has an important role for health, especially eye health, as well as helping in the growth process. Carrots contain vitamin A because of their high carotene content which makes them reddish yellow. Vitamin A in carrots is very high at 12,000 SI (Agustina & Handayani, 2016). Apart from that, the source of vitamin A found in iwak chili sauce (salawak) comes from white cayenne pepper, which contains 11,050 SI of vitamin A (Indonesian food composition, 2008 in Nafisafallah, 2015). The body's need for vitamin A is different, namely for adult men it is 900 mcg while for adult women it is 700 mcg (Noya, 2018). From these results, the iwak chili sauce (salawak) cannot fulfill the body's vitamin A needs.

The results of the chemical test for calcium contained in iwak chili sauce (salawak) were 151.83 mg/100g. Calcium (Ca) is a macro mineral that is found in abundance in the body, between 1.5-2% of an adult's weight, the body's need for calcium is more than 100 mg/day, so this iwak chili sauce (salawak) can help meet calcium (Ca) needs inside the body. Calcium has a function for body metabolism, especially in the formation of bones and teeth. Sources of calcium are milk, fish, dried shrimp, spinach and cheese (Adriani *et al.*, 2019).

The chemical test results for iron in iwak (salawak) chili sauce were 1.03 mg/100 g. The source of iron found in iwak chili sauce (salawak) comes from catfish meat with iron (Fe) 1.6 mg/100 g (Larassati, 2020). Iron is a micro mineral found in the human and animal body. Iron (Fe) is needed in human hemopobosis (blood formation) and acts as a means of transporting oxygen from the lungs to the human body's tissues. The body's need for iron is less than 100 mg/day (Ditamy, 2019). From these results, the iwak chili sauce (salawak) cannot meet the body's need for iron (Fe).

Microbiological tests are carried out to determine the number of microbes in food ingredients. For iwak (salawak) chili sauce, microbiological tests were carried out on the best samples most liked by the panelists using the ALT method. The ALT method is to calculate the amount of microbial contamination without grouping certain types of bacteria, using sodium agar as a bacterial growth medium. Table 2 shows that the results of the microbiological test (ALT) contained in iwak (salawak) chili sauce do not meet the quality requirements for chili sauce in the Indonesian National Standard (SNI) number 01-4865.1- of 1998, namely the maximum ALT limit of 1×10^4 . This is thought to be due to contamination from equipment used that is not clean, besides that it is also influenced by several factors including the raw materials used, the place or environment of production, storage, and the water used does not meet drinking water requirements in processing. Microbial contamination that occurs in food starts from the beginning of the harvesting, handling, collection and processing stages (Susanti *et al.*, 2019).

CONCLUSION

Making iwak (salawak) chili sauce starts from the stages of receiving raw materials, melting (thawing), washing, soaking with lime, frying the fish meat, separating the flesh from the spines, cooking the spices, cooking the iwak (salawak) chili sauce, packaging and labeling. The results of the preference (hedonic) test for iwak chili sauce (salawak) were the best formulation that the panelists preferred in formulation P2 (addition of cayenne pepper concentration by 10%). namely with a mean value of the liking test for appearance 5.47 (like), for aroma 4.48 (rather like), taste 4.82 (like) and texture 5.47 (like). The chemical qualities contained in the best formulation of iwak (salawak) chili sauce that were most preferred by the panelists include water content 58.23%, ash content 4.25%, fat 18.37%, protein 11.47%, carbohydrates 7.68%, vitamin A 96.91 mcg/100g, calcium 151.83 mg/100 g and iron 1.03 mg/100 g. The microbiological quality of ALT is 3.7×10^5 .

ACKNOWLEDGEMENT

We would like to express our gratitude for the cooperation from various parties which we cannot convey one by one on this occasion. We would also like to thank the leadership of the Karawang Marine and Fisheries Polytechnic and their staff for providing the opportunity to carry out this research which will then be published in an accredited national journal..

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