Hedonic Profile and Spoilage Detection of Mackerel Tuna Fish Balls Preserved with Coconut Shell Liquid Smoke During Storage

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Abstract

The processing of mackerel tuna-based food products is still very limited, so efforts to diversify other mackerel tuna-based food products are needed. One of the products that can be made from fish meat is fishballs. Fishballs are a nutrient-rich product with a high-water content so that the product quickly became spoilage when stored at room temperatures. Liquid smoke is reported to have been used as a natural preservative. However, there are no reports regarding mackerel tuna fishballs that soaking in coconut shell liquid smoke could affect the consumer's preference on hendonic properties such as color, aroma, taste and texture. The product was analyzed using hedonic test is a test for color, aroma, taste, texture. The data was analyzed descriptively. The result shows that color preference of average 3.92 (likes), aroma preference of average 3.22 (likes), taste preference of average 3.81 (likes), and texture preference of average 3.26 (likes). Based on spoilage detection which shows spoilage characteristics such as off odor, off flavor, and acidity so that shelf life of mackerel tuna fishballs preserved with coconut shell liquid smoke predicted less than 5 days and more than three days at room temperatures.

Keywords: *Euthynnus Affinis, Organoleptic, Sensory-Based Detection, Food Diversification*

1. Introduction

The Lampulo Ocean Fisheries Port (PPS) is the largest port as a fisheries center in Aceh Province with various catch characteristics, one of which is mackerel tuna or little tuna (*Euthynnus affinis*). The main problem with tuna fisheries management in this location is that its utilization status is thought to have reached 'fully exploited' in line with the increasing number of purse seine fishing fleets (Salmarika & Wisudo, 2019). However, the processing of mackerel tuna-based food products is still very limited to side dishes, shrimp crisp and nuggets (Amraini et al., 2022; Fatah & Lisa, 2022). This is one of the reasons for the fall in fish prices during big harvests, so efforts to diversify other mackerel tuna-based food products are needed.

One of the products that can be made from fish meat is fishballs. Fishballs defined as processed fishery products using mince fish meat or surimi at minimum 40% and mixed with flour and other ingredients, which undergo formation and cooking (Nasional, 2014). Fishballs are a nutrient-rich product with a high-water content so that the product quickly became spoilage when its stored at room temperatures.

Food preservation aims to prevent food spoilage thereby extending shelf life. Preservation can be done by adding preservatives. Liquid smoke is one of the products of plant or wood pyrolysis which is reported to have been used as a natural preservative (Budijanto et al., 2008). Based on the identification and safety testing of smoke for food products, it was reported that coconut shell liquid smoke with an LD_{50} value greater than 15.000 mg/kg is considered a non-toxic material and safe for use in food products. In

addition, no carcinogenic compounds such as Policyclic Aromatic Hydrocarbon (PAH) and Benzoa pyrene were found in coconut shell liquid smoke (Budijanto et al., 2021).

The concentration of coconut shell liquid smoke was reported to have a very significant effect on moisture content, ash content and pH of mackerel tuna fish balls that preserved with coconut shell liquid smoke (Purwanti et al., 2022). However, there are no reports regarding fish balls that soaking in coconut shell liquid smoke could affect the consumer's preference on sensory properties such as color, aroma, taste and texture.

2. Method

Samples

Material used in this research consisted of garlic, onion, pepper, salt, cold water, mackerel tuna meat, wheat flour, distillated water and coconut shell liquid smoke.

Fishballs Processing

Seasonings, such as garlic, onion, pepper, salt, water were blended. Fish meat, seasoning, and tapioca were mixed while cold water was added. The dough was then molded into small balls. Boiled until perfectly cooked (Purwanti et al., 2022).

Coconut Shell Liquid Smoke Preservation

The liquid smoke was diluted into 1.5%, 2.0%, and 2.5%. The meat balls then soaked into liquid smoke solution for 30 minutes. The meat balls stored in sealed container for 3, 5, 7 days at room temperatures (Purwanti et al., 2022).

Samples Analysis

Organoleptic testing or sensory evaluation is a scientific measurement in measuring and analyzing the characteristics of a food ingredient received by the senses of sight, tasting, smelling, touching, and interpreting reactions as a result of sensing processes carried out by humans as a measuring tool. Preference test or hedonic test is a test in which panelists are asked to give personal responses about likes or dislikes for color, aroma, taste, texture. Consumer acceptability scores on a 5-point hedonic scale (Scale: 1-dislikes; 2-dislike slightly; 3-neither like nor dislike; 4-likes; 5-very likes) (Soekarto, 1981)

Data Analysis

Data analysis used for the hedonic test for color, aroma, taste, texture was descriptive analysis.

3. Results and Discussions

Color Preference

The hedonic test values for the color of mackerel fishballs ranged from 3.80 (likes) – 4.18 (likes), with an average of 3.92 (likes). Mackerel tuna fishballs generally have a grayish white color with a smooth surface. Unlike fish fishballs in general, mackerel tuna fishballs have a thick gray color and tend to be darker due to the color of tuna meat which consists of two meat colors, red and grayish white (Ardianti et al., 2018). The natural color of mackerel tuna fishballs which tend to be dark has an impact on the panelist's assessment so that the test scores tend to be lower.

Table 4. The Results of Hedonic Observations of The Color of Mackerel Tuna Soaked in Coconut Shell Liquid Smoke

Coconut Shell Liquid Smoke Concentration (K)	Storage Time (L)		
	L1 = 3 Days	L2 = 5 Days	L3= 7 Days
K1 = 1,5%	3.84	3.91	3.80
K2 = 2%	3.82	3.89	3.93
K3 = 2,5%	4.18	3.96	3.91
Without Treatment (K)		3.97	

The addition of liquid smoke resulted in a sensory value of the color of mackerel tuna fishballs which was somewhat favored by the panelists when compared to fishballs without treatment (K). The results of the research also showed that the highest color preference of samples increases with increasing concentration of liquid smoke solution added. Fishballs that soaked into the liquid smoke solution resulted of fishball color compounds dissolved into the liquid smoke solution so that fishball color become brighter than the fishballs without treatment. Mackerel fishballs reported to have rather white color with the addition of liquid smoke thus has high preference (Riyadi & Atmaka, 2010).

Aroma Preference

The hedonic test values for the aroma of fishballs ranged from 3.13 (likes) – 3.29 (likes), with an average of 3.22 (likes). The organoleptic test of aroma on fishballs tended to decrease with increasing storage time and concentration of coconut shell liquid smoke. Identification using Gas Chromatography-Mass Spectrometry found about 40 identified components of liquid smoke. Seven of them dominant components namely 2-Methoxyphenol (guaiacol), 3,4-Dimethoxyphenol, Phenol, 2-methoxy-4-methylphenol, 4-Ethyl-2- methoxyphenol, 3-Methylphenol, and 5-Methyl-1,2,3-trimethoxybenzene (Budijanto et al., 2021).

Table 4. The Results of Hedonic Observations of The Aroma of Mackerel Tuna Soaked in Coconut Shell Liquid Smoke

Coconut Shell Liquid Smoke Concentration (K)	Storage Time (L)		
	L1 = 3 Days	L2 = 5 Days	L3= 7 Days
K1 = 1,5%	3.17	3.15	3.27
K2 = 2%	3.13	3.24	3.21
K3 = 2,5%	3.25	3.29	3.27
Without Treatment (K)		4.37	

Decreasing the preference value for the aroma of fishball soaked in liquid smoke with different concentrations during storage. Fishballs on day 3 to day 5 were still acceptable to the panelists. On the 7th day, it started to smell a little sour and less pleasant. According to Saleh et al., (2010), during storage, the sensory value of aroma/smell tends to decrease, this is in line with the increase in the value of ammonia, fat oxidation. The increasing number of microorganisms causes the formation of compounds that produce unpleasant odors and tastes (Poluakan et al., 2015).

Taste Preference

The hedonic test values for the taste of mackerel tuna fishballs ranged from 3.58 (likes) –

4.00 (likes), with an average of 3.81 (likes). The higher the concentration of liquid smoke added and the longer storage time, the preference taste value tends to decrease.The higher concentration of liquid smoke added can caused strong smokey taste of fishballs (Budiarti et al., 2016). The longer storage (≥ 5 days) decrease in taste preference value due to spoilage by bacteria. Microorganism producing produce enzymes that will break down protein caused off-odor and off-flavor (Poluakan et al., 2015; Widyaningsih et al., 2018).

Table 4. The Results of Hedonic Observations of The Taste of Mackerel Tuna Soaked in Coconut Shell Liquid Smoke

Coconut Shell Liqud Smoke Concentration (K)	Storage Time (L)		
	L1 = 3 Days	L2 = 5 Days	L3= 7 Days
K1 = 1,5%	3.76	3.86	3.97
K2 = 2%	3.58	3.91	3.87
K3 = 2,5%	4.00	3.93	3.84
Without Treatment (K)		4.15	

During the storage period the taste quality value of mackerel tuna fishballs decreased progressively from storage day 0, 3 days, 5 days to day 7. On the 0th day of storage, it showed that the taste of mackerel tuna fishballs had product-specific and savory taste criteria. The treatment with the addition of 2.5% liquid smoke has a distinctive taste, namely smoke from mackerel tuna fishballs because liquid smoke is added to this treatment with different concentrations. On the 5th day of storage, it showed that the taste of mackerel tuna fishballs was marked by the criteria of savory taste in the fishballs starting to decrease. On the 7th day of storage, it showed that the taste of mackerel tuna fishballs had a lower preference value and had begun to be rejected by the panelists because the taste was close to sour and rather bland. The longer the storage, the more rotten the fishballs because of microorganism activities (Poluakan et al., 2015; Widyaningsih et al., 2018)

Texture Preference

The hedonic values for the texture of fishballs ranged from 3.08 (likes) – 3.39 (likes), with an average of 3.26 (likes). the higher the concentration of liquid smoke tends to increase texture preference. Liquid smoke affects the texture of the tuna fishballs so the meatballs are more chewy in texture compared to tuna meatballs that do not use liquid smoke (Korah et al., 2020).

Table 4. The Results of Hedonic Observations of The Texture of Mackerel Tuna Soaked in Coconut Shell Liquid Smoke

Coconut Shell Liquid Smoke Concentration (K)	Storage Time (L)		
	L1 = 3 Days	L2 = 5 Days	L3= 7 Days
K1 = 1,5%	3.29	3.28	3.28
K2 = 2%	3.28	3.39	3.08
K3 = 2,5%	3.31	3.24	3.19
Without Treatment (K)		4,23	

During the storage period, the textural quality value of mackerel tuna fishballs decreased from the 3rd, 5th, to the 7th day of storage. On the 3rd and 5th day of storage, it showed that the texture of mackerel tuna fishballs had the criteria of a solid, compact and chewy texture in all treatments. Then on the 7th day the texture of the mackerel tuna

fishballs was not solid. Changes in the texture of mackerel tuna fishballs occur with the length of storage time which results in denaturation of product proteins by enzyme and microbial activity (Widyaningsih et al., 2018). Microbiology activity also decline the pH value causes the hydrolysis of the glycosidic bonds to occur loss of viscosity and potential to form a gel thereby reducing chewiness (Zahiruddin et al., 2008).

4. Conclusions

It can be concluded that coconut shell liquid smoke can be used as mackerel tuna fishballs natural preservatives. Hedonic test proved to be fast, easy, effective in estimated consumer preference (color, aroma, taste and texture) mackerel tuna fishballs with coconut shell liquid smoke as preservatives. Sensory detection of spoilage predicted less than 5 days and more than three days at room temperatures. The preference test can also directly be used to determine the shelf life of tuna fishballs.

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