



Quality Evaluation of Frigate Mackerel Fish Pindang and Flying Fish Pindang from Fish Processing Centers in Kusamba Village, Klungkung Regency, Bali

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ABSTRACT

Pindang is one of the traditional processed products derived from fish. Various types of fish can be processed into pindang, namely frigate mackerel, flying, sardinella, tuna, mackerel, cakalang and milkfish. Various types of fish cause the community carries out various types of processing and will eventually produce different quality. This study aimed to evaluate and analyze the chemical, microbiological and organoleptic quality produced. Quality evaluation in comparative experimental research by comparing the quality of frigate mackerel fish pindang with flying fish. Parameters evaluated included chemical parameters, namely water content, salt content, histamine content, total volatile bases content, and trimethylamine content; microbiological parameters such as the number of bacteria and organoleptic parameters including appearance, smell, texture, and taste. Based on the study's results, the quality of frigate mackerel pindang with flying fish had significantly different qualities, especially in the chemical and organoleptic assessments.

1. INTRODUCTION

1.1. Research Background

Pemindangan is fish processing by salting followed by boiling or steaming in complete form or in the form of pieces of fish, especially large fish such as tuna, cakalang and mackerel. Pindang is classified as a semi-perishable processed product because the shelf life of pindang fish is generally relatively short. The rapid formation of histamine due to the activities of the enzymes and bacteria found in the fish makes the fish spoil faster and the shelf life of the fish will be shorter [1]. The purpose of roasting is to inhibit activity and even kill spoilage bacteria, so that it has a delicious taste favored by the public.

The process of processing fish by pemindangan has several advantages, including; Processed pindang fish products have a distinctive taste, according to the tastes of the Indonesian people; The process of processing pindang fish is very simple using simple tools; Processed pindang products can be eaten immediately because they have gone through an adequate and mature cooking process.

Each region must have its uniqueness in processing pindang itself, but the process will remain the same through salting and boiling. The difference for each region usually lies in the container, the type of fish and the processing modifications.

1.2. Literature Review

Frigate Mackerel (*Auxis thazard*) is a pelagic fish with high economic value in Indonesia, especially in Sibolga waters and its surroundings. Exploitation of this species continues to increase throughout the year and is generally caught by purse seine gear. frigate mackerel is a type of fish from the Scombridae family (pelagic fish) found throughout the western Indo Pacific's warm waters, including the archipelagic and archipelago seas [2]. quite high, which means that this fish is one of the fishery products that are the target of fishermen's catches. The increasing demand for frigate mackerel makes it possible to continuously increase catches without thinking about the sustainability these fish resources in the waters [3].

Flying fish (*Decapterus russelli*) is a type of fish that belongs to the genus Decapterus, family Carangidae. This small to medium-sized fish is quite an important consumption fish, marketed fresh or processed as boiled fish, salted fish, and others. The results of the study [4] show that the proximate value of dried



flying catfish is a moisture content of 25.58%; 20.39%, and 17.80%; ash content 9.64%, 9.69% and 7.71%, fat content 8.08%, 11.40%, and 15.16%, and protein content 53.73%, 58.10%, and 59.11%. The proximate test value of pindang fish for carbohydrate content was 0.99%, protein content was 27.00%, fat content was 3.80%, mineral content was 2.26%, water content was 64.45% and ash content was 1.50%. The experimental results show that chitosan can potentially extend the shelf-life of flying fish pindang. The shelf-life of chitosan-dipped pindang is 3 days at room temperature storage, while the shelf-life of controls is only 1 day [6]. On sensory characteristics (color, aroma, texture, and overall) boiled fish with redistillation liquid smoke treatment is preferable to distillation liquid smoke treatment [7].

Fish is one of the things that are hunted by the people of Indonesia, including the type of flying fish, which resembles tuna, but has a more savory and delicious taste than other types of pindang. Likewise, the price is IDR 8,000 for flying fish pindang/pack and IDR 6,000 for frigate mackerel pindang/pack [8].

1.3. Research Objective

The study aimed to evaluate chemical quality, namely histamine content, water content, salt content, total volatile bases content; microbiological quality, namely the number of bacteria, and organoleptic quality, namely appearance, smell, texture and taste of frigate mackerel pindang, and flying fish pindang.

2. MATERIALS AND METHODS (Heading 1)

2.1. Material

The materials for this research were frigate mackerel pindang and flying fish pindang or the local name is pindang slungung produced by the Fish Preservation Center in Kusamba Village, Dawan District, Klungkung Regency, Bali. The equipment for selecting fish used is a heating stove made of bricks, firewood as a heating source, a large steenless cooking pot, and bamboo baskets. frigate mackerel and flying fish as shown in Figure 1 are the raw materials for making pindang, which have a length of \pm 26 cm and a weight of \pm 200 grams.



Fig. 1. The raw material for frigate mackerel and flying fish

Clean water in a large cooking pot is heated in a heating stove, with a heating source from burning wood until the water boils. Each frigate mackerel and flying fish which are fresh fish, arranged in a bamboo basket, alternately 8 fish, added \pm 10% salt by weight of the fish, then a boiling process is carried out in the

form of boiling for \pm 30 minutes, until the fish eyes pop, then cooled. The frigate mackerel pindang and flying fish pindang products were brought to the laboratory to evaluate the chemical, microbiological and organoleptic quality.

2.2. Evaluation Parameters

The quality parameters evaluated included chemical quality such as histamine content, water content, salt content, and total volatile bases content, microbiological quality such as the number of bacteria; and organoleptic quality, such as appearance, smell, texture, and taste [5].

2.3. Method

This research is a comparative experimental study that evaluates the quality of frigate mackerel pindang with flying fish pindang. The analysis results in the form of data for each parameter of frigate mackerel pindang and flying fish pindang are displayed in the form of tables and graphs, and pictures. The chemical, microbiological, and organoleptic quality analysis results are numerical, presented as an average with a standard deviation. Differences in the results of the analysis of each parameter were tested statistically using a paired t-test; the difference was stated to be significant if the P value $<$ 0.05.

3. RESULT AND DISCUSSION

Based on the research results conducted at the Laboratory of the Faculty of Agriculture, University of Warmadewa Denpasar and the Denpasar Bali Fisheries Product Quality Development and Testing Laboratory (LPPMHP) for each sample of frigate mackerel pindang and flying fish pindang, the data is obtained in Table 1.

Based on table 1 above, the histamine level as a quality reduction criterion is higher for frigate mackerel pindang, which is 18.20 mgN% compared to 8.18 mgN% for frigate mackerel pindang. Histamine is important in many allergic reactions; histamine poisoning usually occurs due to "overdose" [9]. Symptoms of poisoning that appear are vomiting, swollen lips, headaches, nausea, facial flushing, itching, and weakness [9], the Food and Drug Administration determines that for tuna, mahi-mahi and similar fish, 5 mg of histamine/100 g of fish meat is a level to watch out for and an indicator of decomposition, while 50 mg of histamine/100 g of fish meat is a level that is dangerous/causing poisoning [9], while the results of the study [9] storage of frigate mackerel pindang at cold temperatures for 3 weeks or more increases histamine levels to 66.36 mg/100 g to the point where it is dangerous/toxic. Based on statistical analysis, a significant difference is indicated by a different notation. 6 types of histamine-forming bacteria were identified in lisa cob (*Auxis Rochei*), which are *P. vulgaris*, *H. alvei*, *M. Morganii*, *E. aerogenes*, *K. oxytoca*, and *K. pneumoniae*.

Table 1. Evaluation of the chemical, microbiological and organoleptic quality of frigate mackarel pindang and flying fish pindang.

Treatment	Quality Evaluation								
	Chemistry				Microbiology	Organoleptic			
	Histamine (mgN%)	Water content (%)	Salinity (%)	TVB content (mgN%)	total bacteria (koloni/g)	Appearance	Smell	Texture	Flavor
Frigate Mackarel Pindang	18,20±2,05 ^a	64,90±1,10 ^a	2,85±0,30 ^a	43,23 ±0,50 ^a	45.10 ² ±5.10 ^{2a}	8±0,5 ^a	7±0,1 ^b	7±0,5 ^a	7±1,0 ^b
Flying Fish Pindang	8,18±1,00 ^b	62,60±0,90 ^a	3,20±0,50 ^a	20,25 ±0,60 ^b	30.10 ² ±3.10 ^{2a}	8±0,5 ^a	8,5±0,5 ^a	8±0,1 ^a	9±0,5 ^a

Information; ± standard deviation

The letter notations behind different standard deviations indicate different significance

Evaluation of the quality of the water content and salt content of frigate mackarel pindang (Table 1) is 64.90% and 2.85%, while the pindang flying fish is 62.60% and 3.20%, after statistical analysis there is no significant difference, this is because the water content of fresh fish is between 60-70%. while after becoming pindang fish it has a water content of 62.74%, while for pindang vacuum the water content is 64.29% [10]. The addition of salt in the pindang process is 15% of the weight of the fish,

while the boiling process is relatively the same for ± 30 minutes or the fish's eyes have erupted which indicates the pindang is cooked so that the salt content is not significantly different, this is following the results of the study [10], The total salt content of 3.2% to 3.85% was not able to kill microorganisms to provide preservation for frigate mackerel pindang, but this amount was only able to give a salty taste to the panelists.

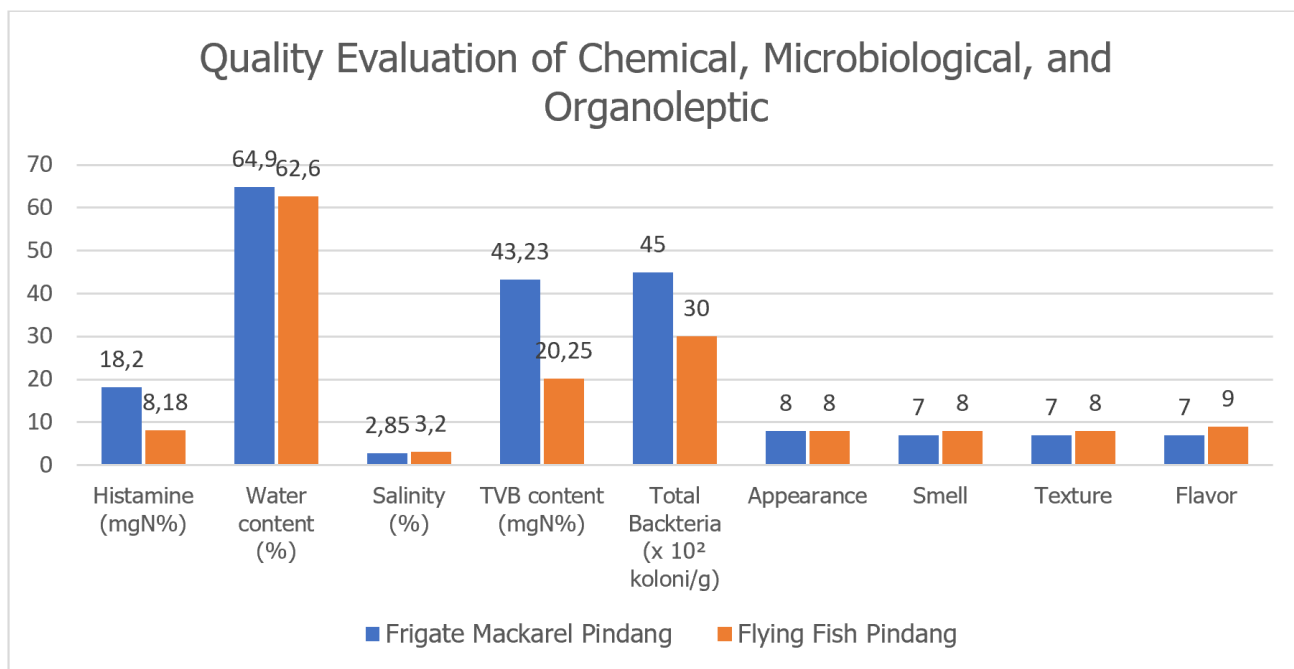


Figure 2. Graph of chemical, microbiological, and organoleptic quality evaluation frigate Mackarel pindang and flying fish pindang.

Total bacteria according to Table 1 for frigate mackarel pindang has a total of 45,102 ± 5,102 koloni/g and flying fish pindang after being analyzed has a total of 30,102 ± 3,102 koloni/g there is no significant difference, indicated by the same notation, according to SNI 2729: 2013 states the requirements The quality of fresh fish is to have a TPC value of 5x10⁵ CFU/g, so that the total bacteria of frigate mackarel pindang are still very suitable for consumption. Total Volatile Base Nitrogen (TVB-N), as one of the analyzes to test the decline in the quality of frigate mackarel and flying fish, The increase in TVB content in fish meat during storage is due to the degradation of protein and its

derivatives by microorganisms [11]. However, the total volatile bases (TVB) significantly affected the total TVB levels for frigate mackerel pindang of 43.23 ± 0.50 mgN%, while pindang ikan layang was 20.25 ± 0.60 mgN%. The total TVB is closely related to the number of bacteria between frigate mackarel pindang and flying fish pindang. TVB and TPC values also increased during the storage process for lisa cob (*Auxis rochei*). The frigate mackarel pindang produced was stored at room temperature with storage at 0 hour to 32 hours, namely 23.3 to 38.4 mgN% and 2.7.10² to 1.8. 10⁵ colonies/g. [1]. TVB value between 20-30 mN/100 g is the acceptable limit for fish consumption, whereas if

the TVB value is more than 30 mgN/100 g, it is considered rotten fish [12].



Figure 3. The appearance of frigate mackerel pindang and flying fish pindang

Organoleptic assessment, which includes appearance, smell, texture and taste, there are differences in the scores (Table 1) given by the panelists as shown in Figure 2, for the appearance value of frigate mackerel pindang and flying fish pindang with a value of 8 according to the score sheet, namely intact, clean, neat and interesting. This is because frigate mackerel pindang and flying fish pindang are still in a fresh pindang state, because they have just been produced, so their appearance is still intact, according to research results [13] the frigate mackerel pindang appearance score is 7-8. As for the smell, there is a significant difference indicated by the notation with different letters, namely a score of 7 for frigate mackerel pindang. The average value is

4. CONCLUSION

Based on the results of the study it can be concluded as follows; (1) Evaluation of the chemical quality of flying fish pindang is better than frigate mackerel pindang such as histamine of 8.18 mgN% and frigate mackerel pindang 18.20 mgN%. The TVB level for flying fish pindang is 20.25 mgN%, while frigate mackerel pindang has a TVB level of 43.23 mgN%.; (2) Evaluation of the organoleptic quality of flying fish pindang is better than frigate mackerel pindang with smell and taste scores by panelists of 8.5 and 9. In contrast, frigate mackerel pindang gets smell and taste scores of 7.

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REFERENCE

- [1] Fatuni, Y. S., Suwandi, R., & Jacob, A. M. (2014). Identification on Histamine Content and Histamine-Forming Bacteria of Boiled Badeng Slender Tuna. *Jurnal Pengolahan Hasil Perikanan Indonesia*, 17(2). <https://doi.org/10.17844/jphpi.v17i2.8698>
- [2] Piscandika, D., Efrizal, T., & Zen, L. W. (2014). Potensi dan Tingkat Pemanfaatan Ikan Tongkol (*Euthynnus affinis* dan *Auxis thazard*) yang Didaratkan pada Tempat Pendaratan Ikan Desa Malang Rapat Kecamatan Gunung Kijang Kabupaten Bintan Provinsi

8.5 which is very tasty, fresh and fragrant for flying fish pindang According to the SNI organoleptic score of 7, it is required for pindang with a fresh aroma, the smell of meat typical of sea fish.

Food texture is the result of the response of the sense of touch to a form of physical stimulation when there is direct contact between the sense of touch and the product. The texture of a product includes thickness, density, and elasticity [14]. The frigate mackerel pindang texture has a score of 7, while the flying fish pindang texture score is 8. Statistical analysis does not show a significant difference with the same notation, namely solid, compact, and flexible characteristics [1].

Taste is a compound that causes taste sensations (sweet, bitter, sour, salty), trigeminal (astringent, cold, hot), and taste is the biological perception of food after it is put in the mouth [15]. The taste value significantly differs from the panelist's score for frigate mackerel pindang of 7, which is delicious, while for flying fish pindang, the taste value is 9 with the SNI score sheet criteria, namely very tasty, specific type of savory. The taste of boiled tuna preferred by consumers is cooking for 3 hours with a value of 8.4 because it has a fresh and fragrant taste like boiled fish [16]. While cooking for 3.5 hours has an average of 8.2 and cooking for 2 hours has an average of 8.0. Panelists like the aroma of products that can be felt by the senses of touch and taste, including the senses of the mouth and sight, which are one the factors determining the quality of food

- Kepulauan Riau , Bintan Provinsi Kepulauan Riau Potential. In Skirpsi (pp. 1–9).
- [3] Fayetri, W. R., Efrizal, T., & Zulfikar, A. (2013). Kajian Analitik Stok Ikan Tongkol (*Euthynnus affinis*) Berbasis Data Panjang Berat yang Didaratkan di Tempat Pendaratan Ikan Pasar Sedanau Kabupaten Natuna. *Jurnal Online UMRAH*, 3(2), 1–9.
- [4] Sormin, R. B. D., Lokollo, E., Gaspersz, F. F., & Tahalea, V. F. J. (2021). Proksimat dan Total Bakteri Ikan Layang (*Decapterus* Sp.) Asin Kering Hasil Pengerangan Menggunakan Pengerang Surya Tertutup. *Inasua: Jurnal Teknologi Hasil Perikanan*, 1(1), 29–39. <https://doi.org/10.30598/Jinasua.2021.1.1.29>
- [5] Junianingsih, I. (2015). Uji Kualitas Mutu Pindang Cue-Besek Ikan Layang (*Decapterus* Sp.) Di Desa Jangkar Kabupaten Situbondo. *Jurnal Ilmu Perikanan*, 6(2), 91–98. <https://journal.ibrahimy.ac.id/index.php/JSAPI/article/view/289%0Ahttps://lens.org/075-322-345-997-903>
- [6] Ariyani, F., & Yennie, Y. (2008). Pengawetan Pindang Ikan Layang (*Decapterus Russellii*) Menggunakan Kitosan. *Jurnal Pascapanen Dan Bioteknologi Kelautan Dan Perikanan*, 3(2), 139. <https://doi.org/10.15578/jpbkp.v3i2.16>
- [7] Himawati, E. (2010). Pengaruh Penambahan Asap Cair Tempurung Kelapa Destilasi Dan Redestilasi Terhadap Sifat Kimia, Mikrobiologi, Dan Sensoris Ikan Pindang Layang (*Decapterus* Spp) Selama Penyimpanan.
- [8] Sari, D. A. M., & Nuraini, Y. (2020). Manajemen Usaha Pengolahan Ikan Pindang Di Poklahsar Pindang Panjul Segara Kabupaten Tabanan Provinsi Bali. *Jurnal Penyuluhan Perikanan Dan Kelautan*, 14(3), 237–249. <https://doi.org/10.33378/jppik.v14i3.213>
- [9] Ariyani, F., Yulianti, Y., & Martati, T. (2004). STUDI Perubahan Kadar Histamin Pada Pindang Tongkol (*Euthynnus Affinis*) Selama Penyimpanan. *Jurnal*

- Penelitian Perikanan Indonesia, 10(3), 35. <https://doi.org/10.15578/Jppi.10.3.2004.35-46>
- [10] Pandit, I. G. S., & Permatananda, P. A. N. K. (2022). Pengaruh Pengemasan Vakum Terhadap Mutu Dan Daya Simpan Pindang Tongkol (Auxis Tharzad, Lac.). Jurnal Teknologi Pangan Dan Gizi, 21(1), 19–31.
- [11] Husni, A., Ustadi, U., & Hakim, A. (2014). Penggunaan Ekstrak Rumput Laut Padina Sp. Untuk Peningkatan Daya Simpan Filet Nila Merah Yang Disimpan Pada Suhu Dingin (The Use Of Seaweed Padina Sp. Ectract To Extent Shelf Life of Refrigerated Red Nile Fillet). Jurnal Agritech, 34(03), 239. <https://doi.org/10.22146/agritech.9451>
- [12] Nurjanah, Setyaningsih, I., Sukarno, & Muldani, M. (2004). Kemunduran Mutu Ikan Nila Merah (Oreochromis sp.) Selama Penyimpanan Pada Suhu Ruang. Buletin Teknologi Hasil Perikanan, VII, 37–43.
- [13] Pandit, I. G. S. (2017). Application of d ifferent Fresh Fish Handling Technique on the Quality of Raw Ingredients of Pindang Production. Jurnal Perikanan Universitas Gadjah Mada 19, 19, 89–96.
- [14] Meilgaard, M. (2006). Sensory Evaluation Techniques. CRC Press, 4th Edition (Chapter 1).
- [15] Midayanto, D. N., & Yuwono, S. S. (2014). SEBAGAI SYARAT TAMBAHAN DALAM STANDAR NASIONAL INDONESIA Determination of Quality Attribute of TofuTexture to be Recommended as an Additional Requirement in Indonesian National Standard. Pangan Dan Agroindustri, 2(4), 259–267.
- [16] Hidayat, R., Maimun, M., & Sukarno, S. (2020). Analisis Mutu Pindang Ikan Tongkol (Euthynnus affinis) dengan Teknik Pengolahan Oven Steam. Jurnal Fishtech, 9 (1), 21–33. <https://doi.org/10.36706/fishtech.v9i1.11003>