



## The Changes in Protein Content, Moisture Content, and Organoleptic Pindang of *Auxis thazard* Due to Re-boiling Stored in Cold Temperatures



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### Keywords

*Auxis thazard*;  
Cold temperatures;  
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Organoleptic;  
Protein content;

### Abstract

This research used descriptive method for analyzing the change of protein content, moisture content, organoleptic as a result of *Auxis thazard* boiling for many times. The result showed that there will be a dropping of protein content and moisture content of boiled fish at every time to be boiled for many times until storage for 72 hours. According to organoleptic, storage boiled fish during 72 hours starts getting a change to worse way with condition such as part of fish head with the body had already broken, part of tail had already broken, the color of fish had been increasingly pallid, the face of fish had been dry especially part of head had been very dry, the taste started to stray from delicious, the odor began to smell iron rust, texture of the fish had been rough. In the whole, the organoleptic value at the storage for 24 hours the panelist giving the value like (7.39) the storage during 48 hours' likes (6.80) and the storage during 72 hours' panelist giving the value more or less likes (6.22). From this research to be suggested to the Producer maximum to storage and re-boiling *Auxis thazard* only 48 hours.

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## 1. Introduction

Pindang is a processed fish which is very popular in the society which made traditionally using simple equipment. Aside from being fish processed, pindang is also one method of preserving fish. The preservation principle comes from heating elements with boiling, giving salt which also functions as flavoring (Ilyas, 1980). Giving salt and boiling process can reduce the number of microbes and reduce enzyme activity so that fish can avoid damage. Pindang has a short shelf life (about 2 days) because the pindang only uses natural preservatives, especially the raw material used has reduced its freshness, so it will have a shorter shelf life. According to Saleh (2002) the quality of pindang can be improved by improving the quality of raw materials, processing methods, packaging, and storage.

Kusamba Village located in Klungkung Regency is a center for processing pindang, an average production of 20 tons per day. Pindang from Kusamba are usually made from *Auxis thazard*, Cakalang fish, Selengseng, Sutra fish, and Lemuru fish which raw materials come from Kusamba village fishermen, Amed Karangasem, Tanjung Benoa, Ambengan, Lombok, and Banyuwangi.

Pindang produced as much as 20 tons/day are not all absorbed on the market, there are several the pindang makers which their pindang have not been sold. To deal with this, the pindang makers in Kusamba keeps the unsold fish in the refrigerator. The next day pindang will be boiled again by adding a little salt for 15 minutes with a small fire on the stove so that no shocks can damage the fish. Looking at the problems above, the researcher wants to know the extent to which changes in protein content, moisture content, and organoleptic changes in *Auxis thazard*.

Seeing the reality in the community, it becomes a habit to have food that is not eaten so it is stored in the refrigerator and reheated the next day to be enjoyed again. The food treated as above is not damaged so it has a longer shelf life than usual only nutrition will definitely decrease due to repeated cooking. Seeing these events and the habits of fish processors in Kusamba Village giving inspiration to researchers to examine the extent of changes in moisture content, protein content, and organoleptic in the repeated boiling of *Auxis thazard*.

### Problems

- a) How changes in protein content, moisture content, and organoleptic of pindang of *Auxis thazard* due to repeated boiling that stored in cold temperatures?
- b) Does repeat boiling on pindang of *Auxis thazard* can extend the shelf life?

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### Purpose

- a) To know changes in protein content, moisture content, and organoleptic due to repeated boiling of pindang of *Auxis thazard* that stored in cold temperatures.
- b) To know the effects of repeated boiling on the shelf life of pindang of *Auxis thazard* that stored in cold temperatures.

### Benefits

- a) The results of this study as information for maker group in making well pindang.
- b) The results of this study are useful as reading material and sources of information for students in completing their education.

### Hypothesis

- a) It is suspected that there is a decline in the protein content, moisture content, and organoleptic in repeated boiling pindang of *Auxis thazard* that stored in cold temperature.
- b) It is suspected by repeated boiling can extend the shelf life of pindang of *Auxis thazard* that stored in cold temperature.

### Literature Review

#### a) Fish

Fish is a functional source of food because it plays an important role in health due to fish containing long-chain unsaturated fatty acids, especially those containing Omega-3 fatty acids which can reduce triglyceride levels, reduce cholesterol levels in the blood, and can increase metabolism of fat (Erni Wally, Eny Mentang, Roike L Montolalu, 2015). Many fish have advantages and disadvantages or weaknesses of the composition of nutritional content, which is more attention is how to minimize the risk of impact from its deficiencies or weaknesses.

Fish have a disadvantage that is to have a very high moisture content up to 80% which is highly favored by bacteria for its life so that it is likely to be damaged by bacteria, which in turn will damage the fish quickly. Fish have very smooth tendons so that the meat is very easy to become pulp, this also provides an opportunity for bacteria to damage fish more easily and quickly. To be able to overcome the above problems, it is necessary to take appropriate and fast fish handling actions and preserve and process fish quickly and precisely (Afrianto and Evi, 1991).

According to Riyanto *et al.*, (2000) the pH and TVB-N values are related to the activity of bacteria and enzymes which naturally exist. This condition causes an increase in pH which results in the formation of ammonia, TMA and its derivatives. PH value is one of the indicators used to determine the level of freshness of fish, changes in the pH of the meat are very large because it affects the process of autolysis and bacterial attack. The maximum pH limit for fish is 6.8.

Decay that occurs in food, including fish caused by bacterial activity is called Putrefaction, while what is caused by non-bacteria is called deterioration. The Putrefaction process and deterioration cannot be stopped completely, because it needs to be done is to slow down the process by certain methods and techniques so that the changes can be minimized (Darmanto, 2001).

#### b) Pindang process

According to Ilyas (1980), pindang process is a technique of processing and preserving by boiling or steaming fish in a salty atmosphere for a certain period of time in a container and then the process of reducing the moisture content to a certain extent. The basic principle of pindang process is:

- 1) Kill or reduce bacteria through heating,
- 2) Addition of salt can kill or inhibit the growth of bacteria left in fish,
- 3) The occurrence of a reduction in moisture content in fish meat.

Pindang process can be grouped by the process, the container used, type of fish treated or added seasoning, and the area of origin ([Adawyah, 2007](#)). Dividing types of pindang can be seen in table 1.

Table 1  
Types of Pindang in Indonesia

Grouping Basis	Name in Trade
1	2
Process	Pindang cue (boiling in salt water), pindang salt (boiling with salt and a little water, pindang presto (high-pressure technique, soft spines)
Container	Pindang naya (pindang cue with naya container), pindang besek (pindang cue with besek container), pindang badeng (pindang salt in a badeng container), pindang paso (pindang salt in paso), pindang kendil (pindang salt in kendil).
Type of fish	Pindang bandeng, pindang tuna, pindang laying, pindang cekalang, pindang tawes, pindang gurami, and so on.
Seasoning	Pindang seasoning (using additional spices such as turmeric)
Origin	Pindang Pekalongan, Pindang Kudus, Pindang Juwono, Pindang Tuban, Pindang Muncar, and so on.

Source: [Adawyah \(2007\)](#)

c) *Standard of Pindang*

Quality description of pindang that have a high quality can be seen in table 2

Table 2  
Description of the high-quality pindang

NO	Parameter	Description
	1	2
1	Form and color	Whole fish is not broken, smooth, not injured or blisters, clean, no foreign matter. There are no deposits of fat, salt or other impurities. The color is specific for each type, brilliant, not moldy and not slimy.
2	Odor	Specific odors of scent or like the odor of boiled fish, savory, fresh, without rancid odor, sour, stale, or rotten.
3	Taste	Savory like pindang specific, tasty, not too salty, salty taste evenly distributed and no foreign flavor
4	Texture	Pindang meat is compact, solid, quite dry, and not runny or wet (rough)

Source: [Wibowo, 2000](#)

According to [Himawati \(2010\)](#), the standard of pindang products includes requirements including raw materials, auxiliary materials, and additional materials, technical, sanitary and hygienic requirements, handling methods, processing methods, packaging and storage methods. The quality requirements of pindang according to SNI 01-2717-1992 can be seen in table 3.

Table 3  
Quality Requirements for Pindang

No	Test Type	Quality Requirements	
		Pindang salt water	Pindang salt
A	Organoleptic	7	6
	Minimum value		
B	Mold	Negative	Negative
	Microbiology		
	TPC per gram max	$1 \times 10^5$	$1 \times 10^5$
	E.coli MPN per gram max	3 CFU	3 CFU
	Salmonella*	Negative	Negative
	Vibrio cholera *	Negative	Negative
C	Staphylococcus aureus *	$1 \times 10^3$	$1 \times 10^3$
	Chemist		
	Water, % weight / max weight	70	70
	Salt, % weight / max weight	10	10

Description: \* if needed

Source: National Standardization Agency, 1992 (SNI 01-2717-1992)

## 2. Materials and Methods

The method used in this research is a descriptive method with collecting data technique which is an interview and takes samples directly to the pindang makers in Kusamba Village, Klungkung Regency. Pindang sample used average size 165 g with a length of 25 cm. Subsequent research was carried out at the Faculty of Agriculture laboratory (Warmadewa University), while specifically protein analysis was carried out at the Food Technology Laboratory (Udayana University).

### Research Procedure

Take samples directly from the pindang makers in Kusamba Village, Klungkung Regency.

- The size of pindang used as a sample is about 165 grams with a length of 25 cm.
- Samples are stored in a refrigerator with a temperature of 5°C
- The next day the sample is boiled for 15 minutes by adding a little salt, and after which protein tests, moisture content and organoleptic tests are carried out.  
Storage is carried out for 3 days, and every time storage is carried out Protein content, Moisture content, and Organoleptic. Data is collected and tabulated and after that data is analyzed with statistics.
- Organoleptic analysis observed in terms of texture, odor, taste, and appearance

## 3. Results and Discussions

From the results of the study of tuna fish with repeated boiling at a cold storage temperature of 5°C, and room temperature can be as shown in Table 4. The physical state of the pindang tuna before treatment can be seen in Figure 1.



Figure 1. The physical State of Pindang

Table 4  
Protein Value, Moisture content, and Organoleptic of Pindang of *Auxis thazard* with repeated boiling stored in cold temperatures

Days to-	Protein Content (%)	Moisture content (%)	Appearance	Odor	Texture	Taste
1	17,23	68,55	7.59	7.60	7.80	7.39
2	16,70	65,93	7.02	7.50	7.70	7.35
3	15,98	65,67	6.59	6.84	7.30	6.49
4	15,40	63,04	5.68	6.35	6.59	6.27

### 3.1 Changes in Protein Content, Moisture content, Organoleptic of Pindang in Storage for 24 hours at 5°C

At the beginning of making pindang tuna fish, has a protein content of 17.23 (%), moisture content 68.55% after being stored at 5°C for 24 hours and boiling for 15 minutes in boiling water by adding a little salt.

The protein content of pindang decreased to 16.70%. Moisture content becomes 65.93%. The decrease in the content of protein and moisture caused by boiling action by adding salt that can attract water from the pindang, the water comes out contains protein, so the moisture content and protein content from pindang will be decrease. According to [Sundari and Dian \(2015\)](#) said that there is a decrease in moisture content if cooking is done by boiling.

Judging from the results of the organoleptic test, the panelists gave a successive assessment: Texture 7.70 (very like). The texture of the pindang is still compact, not hard so that the pindang texture is still favored by the panelists. Taste Value 7.39 (likes), the taste of the pindang is still favored by the panelists because the pindang is still tasty, there is no taste that disturbs the tongue. Odor Value 7.60 (very like), the odor of the pindang has not changed, it is still specific to the odor of pindang so the panelists really like the odor of the pindang. Appearance Value 7.59 (very like), overall the pindang still looks attractive because the pindang is still intact, no part of the fish is broken, has a texture that is still compact and not hard, the pindang does not look stiff. Judging from the panelist's assessment, it turned out that the pindang was stored for 24 hours and the next day it was boiled again. The protein content of pindang was still high. As said by [Suryaningrum, et al., \(2010\)](#) that fish protein ranges from 12.94-17.52% including high. The moisture content is also high so that the pindang does not look dry and with organoleptic values classified as very favored by the panelists.

The physical condition of the pindang that is stored for 24 hours can be seen in Figure 2.



Figure 2. The physical condition of the pindang that is stored for 24 hours

### *3.2 Changes in the Protein Content, Moisture content, Organoleptic of Pindang in Storage for 48 hours at 5°C*

Changes in protein content after 48 hours of storage decreased the protein content to 15.98%, Moisture content 65.67%. Decrease in protein content is also caused by repeated boiling besides that it is also caused by the time stored in the refrigerator, even though it has been stored in cold temperatures does not rule out a decrease in nutrition because preservation does not stop damage but only slows the occurrence of damage (Winarno, FG, 1982).

Judging from the results of the test organoleptic panelists give a rating in a row: Texture 7.30 (likes), the texture of the pindang is still compact but rather hard, and the surface of the pindang is rather dry but has a high moisture content, the panelists still like the pindang. Values of Taste 6.49 (likes), the taste of scales is still favored by the panelists because the taste of the pang has not changed, there is no taste that disturbs the tongue, by adding salt when boiling makes the pindang do not lose the saltiness caused by the boiling. Odor Value 6.34 (likes), Odor from the pindang has not changed, it is still specific to the odor of pindang, so the panelists still like the odor of the scent, and there is no odor or odor that is too dry. The appearance value is 6.59 (like), overall the scales still look attractive because the pindang is still intact but the pindang surface starts to dry due to being repeatedly boiled, such conditions the panelists still like the scoop. The physical condition of the Pindang kept for 48 hours in the refrigerator at 5°C can be seen in Figure 3.



Figure 3. The physical condition of the Pindang kept for 48 hours

### *3.3 Changes in protein content, Moisture Content, Organoleptic Pindang in Storage for 72 hours at 5°C*

Changes in protein content after 72 hours of storage decreased the protein content to 15.40%, moisture content 63.04%. Every stage of storage and boiling that is repeated causes the protein content and moisture content to decrease. The decline in protein content is also caused by repeated

boiling, but it is also caused by the length of time stored in the refrigerator. Stored in the refrigerator cannot stop damage but only slows down damage, besides that makes the product surface dry. The protein content at 72 hours' storage becomes 15.40%, as said by Suryaningrum *et al.*, (2010) that fish protein ranges from 12.94-17.52% including high. The moisture content of pindang in 72 hours' storage to 63.04% is still considered good according to the Pindang National Standard which implies a view of having a moisture content of 70%.

Judging from the results of the test Organoleptic panelists give a successive assessment Texture 6.59 (like), The texture of the fish pindang is still compact but rather hard and the pindang surface is rather dry, especially the fish head and the parts of the pindang have begun to break and the skin is peeling, but it has a high enough moisture content that makes the inner part of pindang still soft, panelists still like the pindang texture. Values of Taste 6.27 (Rather like), the taste of the pindang is rather favored by the panelists because the taste of pindang starts to be no longer tasty but has not been felt itchy or bitter. Odor Value 6.35 (likes), The odor of the scent undergoes a slight change, such as iron odors, due to the more intense salt in the fish's body due to reduced moisture content so that the odor of mineral salt contained in salt is more intense, the most odor is iron like rust odor. For the panelist's appearance, it gives a value of 5.68 (rather like), overall the pindang looks less attractive because the pindang is not intact. Dull pindang color is a bit blackish, the surface of the pindang is rather dry due to periodically being broken down, such a situation the panelists rather like the pindang.

Judging from the chemical testing in the form of protein content and moisture content of pindang tuna fish is still suitable for consumption, but organoleptically rather favored by the panelists. The physical state of the fish which is stored for 72 hours in the refrigerator at 5°C can be seen in Figure 4.



Figure 4. The physical condition of the Pindang kept for 72 hours

#### 4. Conclusion

The Results of Repeated Boiling Pindang Were Stored at 5°C as follows:

- a) Changes in protein and moisture contents of the pindang have decreased to 72 hours of stored. Protein content on the first day was 17.23%, while after being stored for 72 hours it was 15.40%. The first day's moisture content was 68.55%, while after being stored for 72 hours it became 63.04%.

Organoleptic assessment of the texture for the first day in a row 7.80 (Very Like), after being stored 24 hours 17.70 (very like), after being stored 48 at 7.30 (like) while after being stored 72 hours the Texture value is 6.59 (like).

Odor value in a row the first day 7.60 (Very like), after being stored 24 hours 7.50 (very like), it has been stored 48 hours 6.84 (like), while after storage for 72 hours it becomes 5.68 (rather like).

Values of taste in the first day 7.39 (like), after being stored for 24 hours 7.35 (like), after being stored 48 hours 6.49 (rather like); while after being stored for 72 hours is 6.27 (rather like).



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Appearance value for the first day in a row 7.59 (very like), after being stored for 24 hours 7.02 (like), after being stored for 48 hours 6.59 (like) and after being stored for 72 hours 5.68 (Rather like).

- b) Repeated boiling pindang Of *Auxis thazard* were stored in cold temperature seen from the results of protein content, up to 72 hours' storage is still considered high, moisture content up to 72 hours of storage is still good because according to pindang standards, moisture content up to 70% is still considered good. In terms of organoleptic storage up to 72 hours, the panelists give a rather like assessment for all organoleptic parameters. This shows that the pindang can still be stored for 3 days at 5°C with repeated boiling, but the appearance of the leaf is unattractive because there is a broken part of the leaf and the skin is rather dry with a rather black color.

### *Suggestions*

Looking at the results of the research, the thing that can be suggested is:

- a) For the processors of pindang that store their products in refrigerators at a temperature of 5°C if they do not sell well, it is advisable to only store the pindang for a maximum of two days (48 hours) to be resold in full condition of pindang.
- b) If the processors want to sell the pindang more than 48 hours then the next day (72 hours) the pindang is sold in a packaged condition, not intact with a cut in half (only meat) because nutrition is still good and worth consumption, just the figure is not good.

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