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PENGUJIAN MUTU TUNA (*Thunnus albacares*) LOIN BEKU

Quality Testing of Frozen Loin Tuna (Thunnus albacares)

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ABSTRAK

Indonesia sebagai negara penghasil tuna terbesar memiliki potensi dalam pasar tuna internasional. Tuna loin beku merupakan produk hasil perikanan dengan bahan baku tuna segar. Penelitian ini bertujuan untuk mengetahui mutu produk tuna loin beku di PT. Harta Samudra Ambon Maluku. Pengujian mutu organoleptic mengacu SNI 01-4110.1-2006, pengujian ALT mengacu SNI 2332.3:2015, *E. coli* mengacu SNI 2332.1:2015., *Salmonella* mengacu pada SNI 01-2332-2006), kimia (histamin) mengacu pada SNI 2354.10 :2009, pengamatan penerapan rantai dingin secara langsung diruang proses dan produk tuna loin beku, perhitungan rendemen dilakukan 10 kali pengamatan perhitungan produktivitas dilakukan 10 kali pengamatan. Hasil uji organoleptik bahan baku nilai 8 sedangkan organoleptic produk tuna loin beku mendapatkan nilai 8. Hasil uji mikrobiologi produk tuna loin ALT 1,7 X 10^3 kol/g, E. coli <3 APM/g, Salmonella negative. Hasil uji rendemen perapihan (trimming l) 96,53 %, dan perapihan (trimming ll) 90, 26%, sedangkan hasil uji produktivitas perapihan (trimming l) 104,42 kg/jam/org dan perapihan (trimming ll) 152,21 kg/jam/org. Secara keseluruham produk tuna loin beku telah memenuhi standar SNI tuna loin beku (7968 : 2014).

ABSTRACT

Indonesia as the largest tuna producing country has potential in the international tuna market. Frozen tuna loin is a fishery product made from fresh tuna as raw material. This study aims to determine the quality of frozen tuna loin products at PT. Treasures of the Ambon Maluku Ocean. Organoleptic quality testing refers to SNI 01-4110.1-2006, ALT test refers to SNI 2332.3: 2015, E. coli refers to SNI 2332.1: 2015., Salmonella refers to SNI 01-2332-2006), chemistry (histamine) refers to SNI 2354.10: 2009, direct observation of the application of cold chain in the processing room and frozen tuna loin products, yield calculations were carried out 10 times. Observations for productivity calculations were carried out 10 times. Organoleptic test results for raw materials scored 8 while organoleptic frozen tuna loin products scored 8. Microbiological test results for tuna loin products ALT 1.7 X 10^3 col/g, *E. coli* <3 APM/g, *Salmonella* negative. The result of trimming yield test (trimming l) was 96.53%, and trimming II was 90.26%, while the result of trimming productivity test (trimming l) was 104.42 kg/hour/person and trimming II) 152.21 kg/hour/person. Overall frozen tuna loin products comply with SNI standards for frozen tuna loin (7968: 2014).

Kata Kunci	*Loin beku, Alur proses, Mutu, Rendemen dan Produktivitas*
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INTRODUCTION

Indonesia as the largest tuna producing country has potential in the international tuna market. Based on official FAO data, Indonesia is a country that deserves to be taken into account in the tuna fishing business. There are 7.7 million metric tons of tuna and tuna-like species caught worldwide, and in 2017 the volume of Indonesian tuna exports reached 198,131 tons with a value of 659.99 million dollars (Sary & Salampessy, 2019). The economic value of trade in Indonesian tuna fishery products is very large and is an opportunity that can continue to be exploited. However, we still have to prioritize sustainability aspects so that tuna fisheries continue to be sustainable. The high global market demand is the focus of the Directorate General of Capture Fisheries (DJPT) of the Ministry of Maritime Affairs and Fisheries (KKP) to manage tuna from upstream to downstream and protect tuna habitat (Sary & Salampessy, 2019). The action plan to be implemented with the aim of increasing seafood GDP in the future includes increasing seafood production, improving the investment environment and improving supply chains from upstream to downstream (Hardianti & Setyowati, 2019).

The quality of frozen tuna loin must of course comply with the SNI standards for frozen tuna loin, namely free from chemical (histamine), microbiological hazards (Total Plate Number (ALT), Escherichia coli, Coliform, Staphylococcus aureus, Vibrio parahaemolyticus, and Salmonella), as well as the application of cold chains. You must pay attention to the central temperature of the fish at each stage of the process, the water temperature and the room temperature of the production room. So this research aims to determine the quality testing of frozen tuna (*Thunnus albacares*) loin products.

METHODS

Time and Place of Research

The research was carried out from 29 August to 23 October 2022, which coincided with PT. Ambon Maluku Ocean Treasures. This company is a fishery product processing company with one of the products being frozen tuna loin.

Tools and Materials

The tools used for processing frozen tuna loin in field II are gancu, thermometer, raffia wire, sprinkler, washing tub, stainless steel knife, basket, plastic basket, bucket, work table, knife, scale, cutting board, hopper, trolley, frozen plate, freezer (Air Blast Freezer), vacuum machine, vacuum plastic, main barrel and pan. The tools used for quality inspection are histamine level readers, micropipettes, plastic bottles, mixing wells marked with red, tips, antibody-coated wells, tissue paper, sterile plastic, tally sheets, digital scales, stopwatches, digital thermometers, cooking thermometers, colony counters, test tubes, ovens, autoclaves, petri dishes, pipettes, beakers, Erlenmeyer flasks, electric stoves, incubators and Bunsen Materials.

And the ingredients used are fresh tuna fish and the final product is frozen tuna loin. The auxiliary materials used are water and ice which meet drinking water standards.

Organoleptic Testing

This microbiological test takes the form of Total Plate Number (ALT), *e. colli*, *Coliform*, *Vibrio parahaemolyticus*, *Salmonella*, *Vibrio cholera*, *Staphylococcus* testing which refers to SNI using samples. Microbiological test data will be taken 10 times. Organoleptic testing was carried out by 6 panelists.

Microbiology Testing

Microbiological testing includes ALT testing referring to SNI 2332.3:2015, E. coli referring to SNI 01-2332.1-2006, Salmonella referring to SNI 01-2332.2-2006, and Vibrio cholerae referring to SNI 01-2332.4-2006. Microbiology quality testing was carried out 10 times at the PT Laboratory, Ambon Maluku Ocean Treasures.

Chemical Testing (Histamine)

Histamine testing refers to SNI 4104: 2015. Microbiological quality testing was carried out 5 times in the PT laboratory. Ambon Maluku Ocean Treasures.

Observation of Cold Chain Implementation

Observations of cold chain implementation were observed at the temperature of the fish center, water and production processing room.

Yield Observation

The yield calculation is carried out 10 times at the raw material receiving, trimming (l) and trimming (ll) stages. The yield calculation refers to (Nurjanah, 2011) with the formula:

$$\text{Yield} : \frac{Final\ Weight}{Initial\ Weight} \text{ x } 100\%$$

Productivity Observations

Productivity calculations were carried out 10 times in repetition at the raw material receiving, trimming (l) and trimming (ll) stages. The yield calculation refers to (Kusriyanto, 1993) with the formula:

$$\text{Labor Productivity} = \frac{\text{Amount of Production Results}}{\text{Unit of Time/Person}}$$

RESULT AND DISCUSSION

The frozen tuna loin processing process is carried out in several stages, namely: receiving raw materials, weighing, washing, trimming, grading, weighing, washing, CO injection, storage in the chilling room, trimming, weighing, vacuum, storage at ABF, packaging and labeling, cold storage and stuffing.

Results of Organoleptic Quality Testing of Raw Materials

Organoleptic monitoring of the quality of raw materials aims to determine the quality of raw materials that have been received by the company. Organoleptic testing can also provide information regarding the quality of raw materials received from suppliers. Organoleptic assessment is the most widely used method for determining signs of fish freshness because it is easier and quicker to do. The average results of organoleptic testing of raw materials can be seen in table 1.

Table 1. Organoleptic Testing of Raw Materials

Repitition	Interval Value	Organoleptic Value	SNI
1	8,13 ≤ μ ≤ 8,48		
2	7,95 ≤ μ ≤ 8,42		
3	8,05 ≤ μ ≤ 8,41		
4	8,09 ≤ μ ≤ 8,55	8	7
	7,89 ≤ μ ≤ 8,31		
6	8,05 ≤ μ ≤ 8,45		

Based on table 8, the loin that has been organoleptically tested meets the standards in accordance with SNI 7530:2018 for fresh tuna loin. so that the raw materials tested by sampling are suitable for processing to the next stage. Treatment in the form of adding crushed ice can inhibit the number of bacteria because at low temperatures the bacteria cannot reproduce quickly and can also maintain the quality of the water content in the fish's body so that the fish remains fresh (Wijana, Nyoman Rai, 2018).

Organoleptic Quality Testing of Final Products

Microbiological testing of raw materials is tested to determine the bacteria present, namely ALT, *E. coli*, and Salmonella. The number of bacteria greatly influences the shelf life of fish, the large number of bacteria found in raw materials reduces the shelf life of fish due to the rotting process. To assess hygienic conditions 37 in the production environment, analysis for specific indicator organisms of fecal contamination will be necessary. Other bacteria, such as *staphylococcus aureus* and *salmonella*, are more commonly associated with cross-contamination during production. Bacteria can also infect fish from the outside during careless handling of land fish, storage and slaughter. The final product testing results can be seen in Table 2.

Table 2. Final Product Sensory Test

Observation	ALT(Coloni/gr)	*E. coli* (APM/gr)	*Salmonella* (+/-)
1	$1,2 \times 10^3$	<3	Negative
2	$2,2 \times 10^3$	<3	Negative
3	$1,4 \times 10^3$	<3	Negative
4	$1,8 \times 10^3$	<3	Negative
5	$1,9 \times 10^3$	<3	Negative
Average	$1,7 \times 10^3$	<3	Negative
Standard Pt. HS	$< 5 \times 10^5$	**<3**	**Negative**
Standard SNI	$< 5 \times 10^5$	**<3**	**Negative**

The ALT, *E. coli*, and *Salmonella* tests show that the results of these raw materials have met standards in accordance with SNI standards (National Standardization Agency, 2015), which means that the raw materials are safe to be processed to the next stage. Correct handling must start after the fish is caught or harvested. Processed fish must be handled carefully. Apart from bacteria, there are also external factors that can contaminate the fish, such as the environment, equipment and materials that touch the product directly. Journal (2022) that *Escherichia colli, Staphylococcus aureus* and *Vibrio cholera* contamination is most often found on workers' hands and especially in the packaging area.

Histamine Testing

Histamine testing was carried out using the Biolan method. Biolan method is applied at Pt. Harta Samudra to test histamine in tuna fish. This method is different from the SNI method for testing histamine, the results of histamine testing come out within a few minutes, so it is very efficient and makes testing easier, and raw materials can be processed after the test results. Histamine levels in raw materials were tested at the PT laboratory. Harta Samudra, test results can be seen in Table 3.

Table 2. Histamine Test Results

Testing	Histamin	Standard	SNI
1	0,7		
2	0,2		
3	1,1		
4	0,3	50 ppm	100
5	0,7		
6	0,6		
Average	0,5±0,32		

From table 3 it can be seen that the histamine test results do not exceed the company standard of 50 ppm. Fish handling and processing at PT. Harta Samudra implements a good cold chain and good and correct handling of raw materials, handled quickly, carefully and carefully so that the product temperature does not increase and is always below 4.4. Low temperatures will minimize the increase in histamine levels. The fast, sanitary process and low room temperature settings keep histamine under control.
Fishery products are a source of protein, fat and vitamins. However, after the fish dies, enzymes from the bacteria growing in it can immediately catalyze reactions that produce biogenic amines, including histamine, which are toxins (Januar, 2009). This histamine problem is among the top three public health problems that often arise from seafood (Januar, 2009).

Observation of Fish Temperature During Processing

The fish cold chain must be maintained because fish is a perishable food, must be handled quickly, must be kept refrigerated at all times, and has a significant impact on food quality and safety. Fish that are not cold treated have a shorter shelf life. The shelf life of fish is shorter compared to other products. After death, fish, crustaceans, and mollusks undergo rapid deterioration under the influence of various biochemical processes and microbiological degradation mechanisms. Temperature is one of the factors that influences the final quality of fish products preserved by cooling and freezing. Fish temperature can be seen as an indicator of good or poor fish handling. The temperature in the cold chain from fishing to further processing must be maintained or kept near 0°C. Measure the temperature by inserting a thermometer into the fish's body temperature center. Temperature measurement is done by inserting a thermometer into the fish's thermal center. The temperature measurement results can be seen in Table 4.

Table 4. Fish Temperature

No	Process	Average	Company Standards
1	Receiving Raw Materials	0,5±0,53	
2	Weighing I	0,83±0,54	
3	Washing l	1,1±0,52	
4	Trimming I	1,42±0,33	

5	Grading	1,64±0,25	
6	Weighing II	1,54±0,20	
7	Washing ll	1,3±0,34	
8	CO injection	1,45±0,30	4,4 ℃
9	Temporary storage	0,6±0,33	
10	Trimming II	0,67±0,25	
11	Weighing III	0,61±0,52	
12	Vaccum sealing	1,13±0,36	

Based on table 4, the results of observations of the temperature of the fish center at PT. Harta Samudra is very good, the central temperature of the fish is maintained low so that there is no increase in histamine and spoilage occurs, apart from that the processing process is carried out quickly and sanitarily, making the product remain fresh, as well as being supported by a cool room temperature which can maintain the quality of the fish. The temperature of tuna products is maintained below 4.4oC. Temperature plays a very important role in the growth of microorganisms. If the temperature rises, the speed of metabolism and growth is accelerated, if the temperature falls, the speed of metabolism also falls and growth is slowed (Effendi, 2009).

Yield Calculation Results

Yield is the percentage of product obtained from comparing the initial weight of raw materials with the final weight. So you can know the severity of the processing loss. The yield is obtained by (calculating) weighing the final weight of the material produced from the process compared to the weight of the initial material before undergoing the process multiplied by 100%. The yield test results can be seen in Table 5.

Table 5. Yield Calculation Results

Observation	Raw Material (Kg)	Tidying up (*Trimming I*)	%	Tidying up (*Trimming II)*	%
1	16,71	16,05	96,05	15,18	90,84
2	31,23	27,91	89,37	26,71	85,53
3	25,61	24,01	93,75	23,32	91,06
4	75,91	74,79	98,52	72,03	94,89
5	17,31	16,69	96,42	14,01	80,94
6	43,91	42,46	96,70	41,02	93,42
7	37,66	36,56	97,08	34,95	92,80
8	20,11	20,59	102,39	18,02	89,61
9	26,06	25,33	97,20	22,72	87,18
10	57,29	56,02	97,78	55,21	96,37
Average	**35,18**	**34,04**	**96,53± 3,33**	**32,317**	**90,26± 4,66**

The data in table 5 shows that the results of the yield calculations carried out showed that the yield at the trimming stage (trimming 1) was an average of 96.53% and for trimming (trimming 2) 90.26%. The resulting yield is quite good because it is not lacking and does not exceed the predetermined limits. It can be concluded that the yield decreases at each stage of the process. The loin must be processed properly so that each fish is not reduced too much.

Many things can influence the yield results, including the skill of the worker, the level of freshness of the fish, handling and processing methods, and so on. In general, the

edible portion of fish ranges from 45-50% of the fish body (FAO, 2010). For the tuna group, the edible portion of the fish ranges from 50-60% (Sary & Salampessy, 2019).

Productivity Calculation Results

Data collection on labor productivity is carried out at the trimming process (trimming l) and trimming (ll trimming) stages. Productivity in general is a concept that shows the relationship between employee work results and the unit of time to produce a product. According to (Soeharto, 2001). Several things that influence productivity include: physical conditions of the field and auxiliary facilities, supervision of planning and coordination, composition of work groups, overtime work, experience, workforce density. Productivity calculations can be seen in Table 6.

Table 6. Results Of Productivity Calculations

Observation	**Average productivity (kg/hour/person)**	
	Trimming (Tyding up 1)	**Trimming (Tyding up 2)**
1	104.80	175.33
2	102.78	189.22
3	106.61	109.88
4	100.56	144.08
5	103.01	172.65
6	103.54	138.81
7	115.61	176.50
8	103.86	115.73
9	103.13	138.11
10	100.35	161.83
Average	**104.42±4,33**	**152.21±27,07**

Based on table 6, the average labor productivity calculation that can be produced is for trimming l productivity of 104.42 kg/hour/person, trimming productivity II of 152.21 kg/hour/person. These results are influenced by the amount of raw materials entered. If the quantity of raw materials requested by buyers is high or there are a lot of urgent orders in large quantities then productivity can change to be greater. Apart from that, productivity is also influenced by the tools used for work, experienced employees, work motivation and also supervision by superiors. Therefore, productivity is very important in achieving effective production targets. Work efficiency and time can reduce the burden of high production costs.

Productivity in this process is also influenced by auxiliary facilities such as sharp stainless knives and other supporting facilities, the composition of the work group which consists of permanent workers who have experience of more than 5 years to 14 years, so the time required is faster. In other words, productivity is very important in achieving maximum (effective) production targets and work and time efficiency so that it can reduce the burden of high production costs. If employees work slowly without calculating work productivity, it will make the workload heavy. Apart from that, coordination and work planning is needed before entering the production room, so that the resulting targets are maximized. PT employee productivity. Harta Samudra is quite good, because it can

produce a lot of output in a short time so that work efficiency can be achieved to meet daily production targets.

CONCLUSSION AND SUGGESTION

Frozen tuna loin processing flow at PT. Ocean Treasures include:

Receiving raw materials, temporary storage, weighing l, washing l, trimming l,/trimming, bdetermination of grade/grading, weighing l, washing l, injection of clear smoke and giving ozone, chilling, removal of CO gas, trimming l / trimming , Weighing etc., Vacuuming and tidying, Freezing / Frezzing, Metal Detector, storage. The results of organoleptic testing of raw materials and final products have an average value of 8. ALT, *E. Coli* and salmonella tests of raw materials show that the raw materials and final products are safe to process and consume. Histamine test results range from 0.5 PPM. The yield produced at the trimming stage (trimming l) was 34.04%, and trimming (trimming ll) 32.317%. The productivity produced at the trimming stage (trimming l) was 104.42 kg/hour/person and the trimming stage (trimming ll) 152.21 kg/hour/person.

REFERENCES

Amru, A. H., & Yuliati H. Sipahutar. 2022. Karakteristik Mutu Pengolahan Yellowfin Tuna (*Thunnus albacares*) Loin Masak Beku. *Aurelia Journal*, *4*(2), 123–136.

Badan Standarisasi Nasional. 2015. Penentuan Angka Lempeng Total (ALT) pada Produk Perikanan. *Badan Standardisasi Nasional: Jakarta*, 11.

Hardianti, W. M., & Setyowati, M. S. 2019. Implementasi Kebijakan Tax Allowance Dalam Upaya Peningkatan Iklim Investasi Pada Sektor Kelautan Dan Perikanan. *Jurnal Manajemen Pelayanan Publik*, *2*(2), 144. https://doi.org/10.24198/jmpp.v2i2.23001

Januar, H. I. 2009. Perbandingan Beberapa Metode Analisis Histamin Untuk Produk Perikanan. *Squalen Bulletin of Marine and Fisheries Postharvest and Biotechnology*, *4*(2), 48. https://doi.org/10.15578/squalen.v4i2.150

Kusriyanto. 1993. *Meningkatkan Produktivitas Karyawan. Jakarta. PT. Pustaka Binaman Pressindo*.

Nurjanah. 2011. *Rendemen Diperoleh Dari Perbandingan Bobotsampel Terhadap Bobot Total Dikali Seratuspersen*.

Sary, W., & Salampessy, R. B. 2019. Pengolahan Tuna (*Thunnus* sp.) Steak Beku di PT. Balinusra Windumas Benoa-Bali. *Buletin Jalanidhitah Sarva Jivitam*, *1*(2), 53. https://doi.org/10.15578/bjsj.v1i2.8555