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EFFECT OF TEMPERATURE AND STORAGE TIME OF TUNA FISH (*Euthynnus affinis*) ON ORGANOLEPTIC AND SENSORY QUALITY

Pengaruh Suhu Dan Waktu Penyimpanan Ikan Tongkol (*Euthynnus affinis*) Terhadap Mutu Organoleptik Dan Sensori

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ABSTRACT

Tuna Fish was one of the main commodities in Ternate North Maluku. The importance of understanding good handling practice would has an impact on the quality of the fish, therefore this research will discuss the effect of temperature and storage time on the organoleptic and sensory quality of tuna fish. The effect of temperature and storage time on organoleptic and sensory quality determined by visually observing and conducting an organoleptic tuna fish and boil test for sensory values on fish. Organoleptic and sensory test were conducted by 30 panelis and all data analyzed using oneway anova and descriptive for sensory quality. The research results were found that the organoleptic quality of room temperature from 0th hour was significantly different with 12th hour and 24th hour and the organoleptic value at chilling room from 0th and 12th hour was significantly different with 24th hour. Overal the results of the sensory/boiled test at chilling temperature were still suitable for consumption because there was no honeycomb, curd, pasty, blood spots and there was no itchy or smell when eaten. Sensory result at room temperature at 0th hour and 12th hour were still suitable for consumption because there was no honeycomb, curd, pasty, blood spots and also It didn't itchy or smell when eaten, which is different from the 24th hour, it was smells, itchy and there was a burning sensation on the tongue after consumed.

Keywords: Good Handling Practices, Organoleptic Test, Sensory Test

ABSTRAK

Ikan tongkol adalah salah satu komoditas utama di Maluku Utara Ternate. Pentingnya memahami praktik penanganan ikan yang baik akan berdampak pada kualitas ikan. Tujuan penelitian ini akan membahas tentang pengaruh suhu dan waktu penyimpanan pada kualitas organoleptik dan sensori pada ikan tongkol. Dampak suhu dan waktu penyimpanan pada

kualitas organoleptik dan sensori ditentukan dengan mengamati secara visual ikan tongkol segar dan uji rebus untuk melihat nilai sensori pada daging ikan. Uji organoleptik dan sensori dilakukan oleh 30 panelis dan seluruh data yang sudah dikumpulkan dianalisis menggunakan uji statistik Oneway ANOVA untuk mengetahui pengaruh suhu dan waktu penyimpanan terhadap mutu organoleptik pada ikan tongkol. Pengaruh suhu dan waktu penyimpanan terhadap mutu sensori dilakukan secara deskriptif. Hasil penelitian menunjukkan bahwa kualitas organoleptik pada suhu ruang dari jam ke-0 memiliki perbedaan yang nyata dengan mutu organoleptik pada jam ke-12 dan jam ke-24 dan nilai organoleptik pada ruang dingin dari jam ke-0 dan jam ke-12 berbeda nyata dengan mutu organoleptik jam ke-24. Secara keseluruhan hasil tes sensori/rebus pada suhu dingin masih layak untuk dikonsumsi karena tidak ada *honeycomb, curd, blood spot*, tidak bau dan tidak menimbulkan gatal pada saat dimakan. Hasil sensori pada suhu ruang pada jam ke-0 dan jam ke-12 masih layak untuk dikonsumsi karena tidak ada *honeycomb, curd, blood spot*, tidak bau dan tidak menimbulkan gatal pada saat dimakan. Berbeda pada jam ke-24 karena ikan sudah bau, gatal dan menimbulkan sensasi terbakar dilidah pada saat dikonsumsi.

Kata Kunci: penanganan ikan yang baik, organoleptik, sensori

INTRODUCTION

Tuna is one part of the highly economical pelagic fish. Pelagic fish are one of the fishery resources commonly found in Indonesia, both for domestic consumption and for export. Tuna (*Euthynnus* sp.) has a variety of habitats in coastal waters and oceans of Indonesia. Several factors that influence this are current speed, salinity, temperature, dissolved oxygen, and food availability which will later have an impact on tuna. Tuna usually inhabits the surface layer of water, up to a depth of 40 meters, and is in an ocean environment with an ideal temperature ranging from 20-28°C (Sugara et al., 2022). Ternate City has an ocean expanse of 5,547.55 km2 and its vast waters make it a very potential area for the development of its marine sector. The fisheries sector in Ternate City consists of fishing, aquaculture, and fishery product processing (Ternate City Government, 2020).

Proper handling of fish in the fisheries sector is very important to maintain the freshness of fish to consumers. The freshness level of fish plays an important role in determining the quality of fishery products (Litaay et al., 2018). Various fish handling techniques have been developed to ensure the quality of fish to consumers. By implementing these techniques, fish can have a longer shelf life and improve good sensory quality as well as increase the wider market. Good fish handling procedures include all activities targeted to maintain the quality of fish from capture to consumption. Fish quality degradation occurs, and bacterial contamination plays the most dominant and important role in fish spoilage or damage to fish (Litaay et al., 2018).

Traceability is also an important aspect of the product supply chain. Traceability serves as a system that documents the history of the product by allowing access to information stored on the product throughout the production cycle (Sudibyo, 2012). This identification method allows for product tracking and tracing, two important tools for recording production traces. An efficient traceability system demands proper documentation of the product's journey, applied from upstream to downstream. The technologies required for tracking and tracing include raw material receipt, production, distribution, packaging and labeling, and the use of QR codes (Febrianik et al., 2017). QR codes are two-dimensional images capable of storing numeric, alphanumeric, and binary data. Their utility in this application lies in storing master data, such as ship name, captain name, fishing location, and fish species (Kiswanto et al., 2020).

Overall, each type of fish shows different levels and forms of quality degradation. Proper handling during the early stages after fish are caught affects the quality of the final

product and also subsequent processing (Lacapa et al., 2021; Prastyo et al., 2018). Wahyu et al., (2019) in their research results explained that post-harvest handling is an important stage in ensuring and maintaining fish quality. The condition of the fish when frozen can stop bacterial activity and slow down the enzymatic process and increase the shelf life of the fish, unlike fish that are only cooled with ice (Dewi et al., 2023). Factors that can have a negative impact on fish quality include increased temperature, inadequate handling, and delayed handling (Lacapa et al., 2021).

One way to maintain the level of fish freshness is to inhibit or stop the activity of enzymes and microbes in the fish's body and avoid contamination. Organoleptic testing is one of the laboratory methods used to assess fish freshness. This test evaluates the physical condition of fresh tuna (*Euthynnus* sp) through a score sheet ranging from 1 (lowest value) to 9 (highest value), as described in SNI 01-2346-2006 (National Standardization Agency, 2006). The level of fish freshness is determined by several parameters, including organoleptic, physical, chemical, and biological assessments. Organoleptic and pH values are parameters that can be used to assess fish freshness (Al Fatich et al., 2023). In storing fishery products, temperature is an important parameter. With cold temperatures, fish will stay fresh and last longer (Dewi et al., 2023). The purpose of this study was to evaluate the level of freshness of tuna (*Euthynnus* sp.) through sensory and organoleptic testing methods, with different storage times and temperatures.

METHODS

Fresh tuna samples were taken from fishermen directly at the Ternate Nusantara Fisheries Port (PPN Ternate). Tuna fish were washed until clean and then separated according to the specified sample codes. Tuna fish were packed in plastic bags that had been separated according to their codes, then given different temperature treatments, at room temperature (± 26-27^{o}C) and cold temperature (± 0-5^{o}C). Tuna fish were stored and analyzed at 0, 12 and 24 hours.

Organoleptic testing of fresh fish was carried out by 30 non-standard panelists, then sensory testing was carried out by 6 standard panelists (National Standardization Agency, 2006). Tuna fish were stored for 0 hours at cold temperature and room temperature and then organoleptic tests were carried out using a scoresheet by non-standard panelists. After that, tuna fish were boiled in boiling water for about 10 minutes, then sensory testing was carried out by 6 standard panelists to see and assess the suitability of tuna fish for consumption. The treatment was also carried out on 12-hour and 24-hour storage.

Data processing was carried out using one-way ANOVA with Duncan's advanced test to determine whether there were significant differences in the organoleptic results of fish stored at different temperatures and times. The research data were analyzed using the SPSS 21 program. To determine the differences in sensory values of fish stored at different temperatures and times, they were processed descriptively.

RESULT

Organoleptic Quality

The following are the organoleptic quality values of tuna stored at room temperature and cold temperature with different storage times, namely 0 hours, 12 hours and 24 hours, which can be seen in Figure 1.

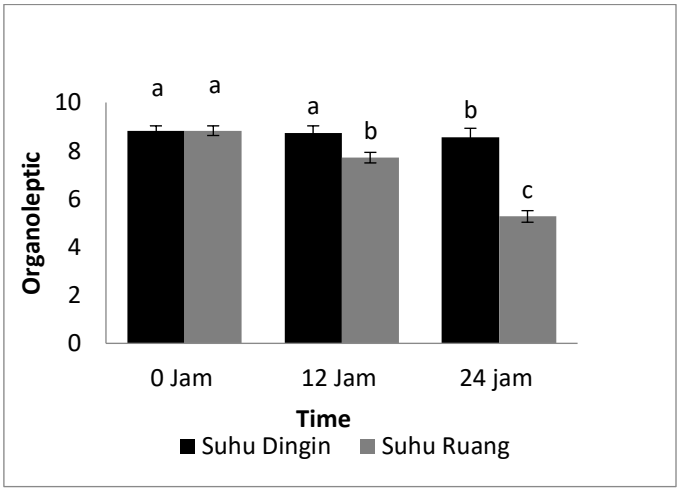

Figure 1. Organoleptic value of tuna stored at cold and room temperature with three times treatments, namely 0, 12, and 24 hours

Organoleptic assessment is based on SNI 01-2729.1-2006, test parameters include eyes, gills, body surface mucus, meat, odor, and texture. This sensory/organoleptic test is one of the basic methods commonly used to determine the level of fish freshness. Fish freshness analysis uses the organoleptic method by looking at the physical condition of the fish, where the level of fish freshness can be seen simply and easily. Organoleptic testing uses techniques or analysis methods by relying on human senses as the main tool to analyze the quality value of live fish and fishery products that are still intact and fresh (Wahyu *et al*., 2019). The organoleptic results of tuna after being stored at room temperature and cold temperatures at hours 0, 12 and 24 can be seen in Figure 2. The sensory results of tuna after being stored at room temperature and cold temperatures at hours 0, 12 and 24 can be seen in Figure 3.

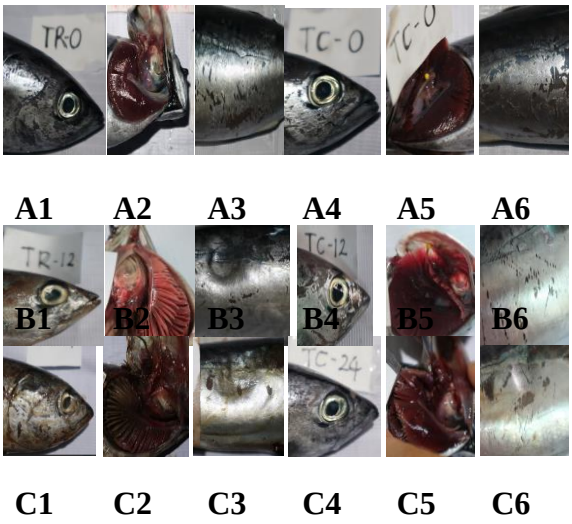

Figure 2. Organoleptic image of fish stored at cold temperatures and room temperature with three times treatments, namely 0 hour, 12 hours and 24 hours

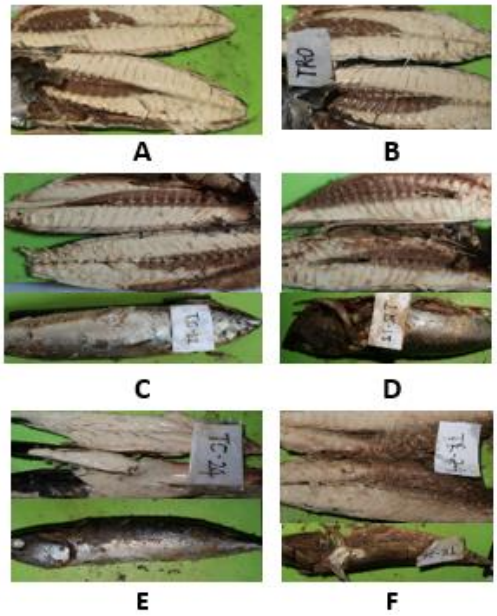

Figure 3. Sensory images of fish meat stored at cold temperatures and room temperature with three times treatments, namely 0 hour, 12 hours and 24 hours

DISCUSSION

Organoleptic Quality

Figure 1 shows that the organoleptic value of tuna at cold temperatures at hour 0 is 8.83 with the specifications of bright eyes, protruding fish eyeballs and clear corneas, the color of the gills looks bright red without mucus, the mucus layer on the body surface is clear and shiny bright and transparent, very bright meat cuts, and no redness along the spine, the stomach wall of the fish is classified as intact, the smell of fish is classified as very fresh, and its texture is dense, when pressed, elastic and difficult to tear the fish meat from the spine.

At hour 12, the organoleptic parameter value is 8.73 with the specifications of bright eyes, protruding eyeballs and clear corneas, the color of the gills is bright red without mucus, the mucus layer on the body surface is clear, transparent, and shiny bright, the meat cuts are very bright, there is no redness along the spine, and the stomach wall is intact, the smell is very fresh, and the texture is rather dense, elastic when pressed with fingers, it is difficult to tear the meat from the spine. The quality of fish that has been stored for a long time and still has good quality is due to the inhibition of the decomposition process caused by the enzymatic process and that caused by microbes. The application of the principle of storage using low temperatures is the inhibition of microbial growth and enzymatic reactions that occur in fish (Sitakar et al., 2016).

The 24^{th} hour is 8.56 with more or less the same specifications as the 12^{th} hour assessment. From the data in graph 1 above, it is also known that at room temperature the organoleptic values at 0 and 12 hours are not significantly different, but at 24 hours they are significantly different. The organoleptic values at 0 to 12 hours indicate that tuna is still suitable for consumption. The biochemical process and growth of pathogenic bacteria that occur in the fish's body cause the process of quality decline in fish to be slower (Nusaibah et al., 2020).

The condition of tuna treated at room temperature storage has an organoleptic value at 0 hours of 8.83 with specifications in accordance with national standards for fresh fish. At 12.00, there was a decrease in quality based on the assessment specifications from the scoresheet where the eyes were rather bright, the eyeballs were flat, the pupils were rather grayish, the cornea was rather cloudy, the color of the gills was rather dull red, without mucus, the mucus layer on the surface of the body began to be rather cloudy, the color was rather white,

less transparent, the meat cut was slightly less bright, specific type, there was no redness along the spine, the stomach wall was rather soft, the smell was neutral, the texture was rather soft, less elastic, and the meat was difficult to tear. The softening of the stomach wall of the fish when pressed using a finger is caused by the process of decomposition of the muscle tissue of the meat due to the enzymatic process.

Storage hours to 24, the organoleptic value decreased to 5.27 with the specifications of slightly sunken eyeballs, grayish pupils, slightly cloudy cornea, starting to have discoloration, reddish brown, a little mucus, thick body surface mucus clumping, starting to change color to white, cloudy, meat cuts starting to fade, lots of redness along the spine, the stomach wall is slightly soft, the smell of ammonia begins to be smelled, a little sour smell, and the texture is rather soft, less elastic, when pressed with a finger, it is quite easy to tear the meat from the spine. The decrease in organoleptic value is due to the treatment of fish without using ice, which causes bacterial and microbial activity to be very active and damages fish tissue (Litaay et al., 2020).

Treatment of room temperature storage, the results of the study also showed that the organoleptic value at 0 hours was significantly different from the 12^{th} and 24^{th} hours. From the results of the organoleptic values, it can be concluded that tuna at 0 and 12 hours is still suitable for consumption, in contrast to the 24th hour which is no longer suitable for consumption. At room temperature conditions, the rate of decline in fish quality will be rapid along with increasing storage time. The condition of the level of fish freshness is influenced by several factors, one of which is the initial handling after catching. This is in accordance with research (Miriyanti et al., 2019) where the catch of fishermen with fishing and handling methods on board ships that apply related standards and regulations will produce high organoleptic values of catches (fresh).

The results of Figure 2 above show that tuna fish stored at cold temperatures on days 0 and 12 do not have significant differences where the eyes are still bright, the gills are still red and the texture is still chewy, unlike tuna stored at room temperature, namely at hours 12 and 24 the eyes are sunken, the gills at hour 12 have begun to fade in color and at hour 24 the gills are greenish black. The decrease in the organoleptic value of fish gills is one indication of the occurrence of a process of quality decline due to the activity of microbes and proteolytic enzymes that degrade protein in fish meat (Kalista et al., 2018). The texture of the meat at hours 12 and 24 is also no longer elastic. Fish that experience quality decline will affect the quality of their meat, especially for human consumption (Nurilmala et al., 2022).

Sensory Quality

Sensory quality assessment was carried out on boiled tuna stored at cold temperatures and room temperature with storage periods of 0 hours, 12 hours, and 24 hours. The sensory quality of tuna stored at cold temperatures with storage periods of 0 hours, 12 hours, and 24 hours and tuna stored at room temperature with storage periods of 0 hours and 12 hours all had good sensory quality because there was no ruptured stomach, curd, honeycomb, blood spot, pasty, and specific fish odor. The odor indicator in sensory quality assessment is a quality assessment indicator that is commonly used to determine damage to fish. If the odor produced emits a strong ammonia odor and is accompanied by a rotten sour odor, then the fish can be categorized as rotten fish that is experiencing a process of quality decline (Yusfiani et al., 2019).

In contrast to tuna stored at 24 hours, namely the fish after being boiled had a ruptured stomach and a very pungent odor both before and after being boiled. This shows that tuna stored at room temperature at 24 hours is no longer suitable for consumption. Fish whose quality has decreased have grayish gills, are slimy and smell bad (Siburian et al., 2019). Boiled tuna raw materials stored at room temperature for 24 hours have undergone a process of decay

and autolysis because they have a pungent odor and a less elastic texture. Fish that have undergone the autolysis process are characterized by having an inelastic body texture, if the meat is pressed with a finger, it will take a relatively long time to return to its original state (Lestari & Yuwana, 2021). The sensory quality of Longtail tuna during temperature treatment and storage time up to 15 days, the results obtained, the higher the temperature and the longer the storage time, the higher the sensory value, TVB, and histamine (Al-Busaidi et al., 2011). Storage treatment with cold or frozen temperatures will maintain the quality of the fish by inhibiting the growth media of pathogenic bacteria in the fish's body.

CONCLUSION

Organoleptic quality at room temperature from hour 0 has a significant difference with organoleptic quality at hour 12 and hour 24 and organoleptic value in cold room from hour 0 and hour 12 is significantly different from organoleptic quality at hour 24. Overall, sensory/boiled test results at cold temperature are still suitable for consumption because there is no honeycomb, curd, blood spot, no odor and does not cause itching when eaten. Sensory results at room temperature at hour 0 and hour 12 are still suitable for consumption because there is no honeycomb, curd, blood spot, no odor and does not cause itching when eaten. Different at hour 24 because the fish already smells, itches and causes a burning sensation on the tongue when consumed.

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