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A REVIEW: POTENTIAL OF JAMBAL ROTI (*ARIUS THALLASSINUS*) SALTED FISH PRODUCTS FROM PANGANDARAN

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Pangandaran is an area on the southern coast of West Java. The economy in Pangandaran consists of several sectors, namely agriculture, fisheries, and tourism. Most of the people in Pangandaran work in the agriculture and fisheries sectors. Capture fishery product in Pangandaran is equal to 263,847 tons. Various types of fish are caught in the form of high-economic fish, especially marine catfish (*Arius thallassinus*). The production of marine catfish in Pangandaran in January 2021 is 1,548.10 kg. Catfish is processed into salted marine catfish. This salted cat catfish product is called the Pangandaran specialty salted fish jambal roti. The processing of this jambal roti salted fish includes salting, fermentation, and drying which affects the aroma quality and texture of the product. The salt used is krosok salt (pond salt). The salt is odorless, but the color is not pure white but brownish white. The quality of Pangandaran's typical Pangandaran jambal salted fish is still below the Indonesian National Standard (SNI) 272.1.2009 for dried salted fish, namely the moisture content and Total Plate Count (TPC) which are still not in accordance with the SNI standard for dried salted fish. The salted fish processing business in Pangandaran Regency has been efficient so far. Basic feasibility of processing jambal roti salted fish in Pangandaran is still low. This basic feasibility has a significant correlation with the quality of fish raw materials, the quality of the product, and the business experience of the jambal roti salted fish processors.

Keywords: Marine catfish, Jambal roti salted fish, Pangandaran, Salted fish quality

Introduction

Pangandaran Regency is one of the regencies in West Java Province with the capital of the Regency which is located in Parigi District. Pangandaran Regency with a total area of 1,010 km^2, Based on its astronomical location, Pangandaran Regency is located at 108 ° 8'0 "to 108 ° 50'0" East Longitude and 7 ° 24'0 "to 7 ° 54'20" South latitude. Pangandaran Regency is bordered by Ciamis Regency in the North, Tasikmalaya Regency in the West, Central Java Province in the East, and the South by the Indian Ocean. In 2014, based on constant prices, it was revealed that the contribution of the agriculture, livestock, forestry, and fisheries sectors was still dominant, namely 27.52 percent. The highest population distribution is in Pangandaran District with 15.57 percent.

In the past, local residents in various villages in Pangandaran Regency, West Java, could fulfill their needs for food sources for animal protein, including various types of marine fish and freshwater fish. The use of marine fish species by local residents in several Pangandaran villages is widely carried out because the area is close to the sea area. In other words, fishermen can be defined as people who actively carry out fishing work [2]. Another opinion according to [3].

In general, fishermen's fishing activities are carried out during the east wind season, while in the west wind season the fishermen only catch a small amount of fish. This is because in the west season it is caused by large waves and sea breezes, so that fishermen have difficulty in carrying out fishing activities. Traditionally, fishermen can determine fishing areas in the sea-based on experience, such as fishermen's habit of observing signs in nature, as well as information from other fishermen.

The capture fisheries sector in West Java in 2018 reached 263,847 tonnes [4]. Marine fishery production at Fish Auction Sites in West Java in 2019 amounted to 50,511 tonnes [5]. Based on the type of catch made by fishermen in Pangandaran, there are 12 species, including marine catfish (*Arius Thallassinus)*, baracuda fish (*Sphraena jello*), puffer fish (*Arathron meleagris*), kapasan fish (*Lactarius lactarius*), grouper fish (*Apinephilus lanceolatus*), curisi fish (*Nemipterus japonicas*), silver pompano fish (*Caranx ignobilis*), layur fish (*Trichiurus lep-*

terus), petek fish (*Leiognathus equulus*), stick fish (*Echenes naucratus*), anchovy (*Stolephorus commersonii*), tuna fish (*Euthynnus affinis*) [6]

Marine Catfish (*Arius thallassinus*)

The marine catfish belongs to the Ariidae family, with the Latin name Arius thalassinus. Has a different name in each region. In the Java area it is known as the manyong fish, kerbi marine catfish, or utik thorns. marine catfish in Indonesia are found in almost all coastal waters of Indonesia, especially on beaches with estuaries [7]. The marine catfish has different names based on the region. Java area is known for its manyong fish. West Java or Jakarta fish Manyung. While the area of South Sumatra is the white crow fish, Riau is the rice thorn or utek thorn, West Kalimantan is nervous and the South Sulawesi area is barukang, with the Latin name is Arius thalassinus [8]. The marine catfish has a combined body shape with a depressed head and a compressed body. This fish has complete fins, namely dorsal, ventral, pectoral, anal, and caudal fins. The special characteristic of this fish is the presence of adipose fin, which is an additional fin in the form of fat that is located behind the dorsal fin and is not related, and is located opposite the anal fin. The length of this marine catfish ranges from 25-70 cm and can even reach 150 cm [9]

Marine catfish is one of the basic fish (demersal) that can live in freshwater, estuary, and marine. Most of these fish first live in fresh water and then enter the estuary to spawn. In this ruin, the marine catfish can reach the open waters. The distribution of marine catfish in Indonesia is the free sea of Sumatra, South Java, the Straits of Malacca, East Sumatra, North Java, Southeastern Bali, South and West Kalimantan, East Kalimantan, South Sulawesi, North Sulawesi, and Maluku. Manyung fish in Indonesia are found in almost all coastal waters of Indonesia, especially on beaches with estuaries, namely at the bottom of the river mouth to the sea at a depth of 20-100 m [7].

The distribution area of the marine catfish in the waters of West Java Province is in the northern and southern waters. In the southern waters are around Sukabumi Regency, Tasikmalaya Regency, and Pangandaran Regency. In 2010, the number of marine catfish production in West Java Province reached 8,442.42 tons. In Southern waters, the production of marine catfish is dominated by Tasikmalaya Regency which reaches 70.6%, then Ciamis Regency is 16.3% and Sukabumi Regency reaches 13.1% [10]. Marine catfish production in Pangandaran in January 2021 is equal to 1548.10 kg [11]

The chemical composition of marine catfish depends on internal factors such as gender, gonad maturity, age, and external factors such as fishing season and habitat. The chemical composition of the marine catfish can be seen in table 1. (Wheaton and Lawson 1985 in [12])

Table 1. Chemical Composition of Catfish

Chemical Composition	total
Protein	12.7-21.2 g
Fat	0.2-2.9 g
Carbohydrate	0.4-0.6 g
Water	75.1-81.1 g
Ash	0.9-1.6 g
Calcium	14.0-98.0 mg
Phosphor	148-440 mg
Magnesium	34 mg
Potassium	109-468 mg
Vitamin A	96 IU
Vitamin C	0.0-11.7 IU
Riboflavin	80-197 µg
Pyrodixin (B6)	370 µg
Niacin	0.5-45 µg
Thiamin	40-45 µg
Cyanocobalamin (B12)	2,2-2,5 µg

Processed Salted Fish Manyung

Marine products of the types of fish caught by traditional fishermen, especially arad net fishermen, are usually sold directly without selling through fish auctions. Fishermen who get abundant marine products in the form of fish that are large, and which have a high selling price are usually auctioned off at fish auctions (TPI). Fishermen who get large types of fish can usually be processed into salted fish. According to [13], marine cat-

fish is a sea fish that is usually caught and processed as salted fish called jambal roti. Salted fish is a traditional processed product made with the addition of salt. Pangandaran is one of the areas on the island of Java in Indonesia that produces a lot of salted fish known as jambal roti salted fish.

Salted fish is a food ingredient made from fish meat that is preserved by adding a lot of salt. With this method of preserving fish meat, which usually goes bad in a short time, can be kept at room temperature for months, although it usually has to be tightly closed. Various types of fish are commonly salted, both land fish and sea fish. These fish are collected in a container and then sprinkled or soaked in a concentrated salt solution. Large fish are usually cut open or cut first so that the salt can easily penetrate the meat. Due to the difference in concentration and osmotic pressure, salt crystals will pull the cell fluid in the fish meat out of the body. Meanwhile, the salt particles seep into the fish meat. This process continues until a balance of salt concentration is reached outside and inside the meat. The high salt concentration and the shrinking of cell fluids will stop the autolysis process and inhibit the growth of bacteria in fish meat. Jambal roti is a type of salted fish that is well known in Indonesia, especially in Java. Jambal roti is a salt fermented product made from marine catfish. The term jambal roti is used because of the characteristic texture of the meat that crumbles easily after being fried, like toast with a distinctive aroma [7]. Jambal roti is a salt fermented product made from marine catfish. The term jambal roti is used because of the characteristic texture of the meat that crumbles easily after being fried, like toast with a distinctive aroma [7]. Jambal roti is a salt fermented product made from marine catfish. The term jambal roti is used because of the characteristic texture of the meat that crumbles easily after being fried, like toast with a distinctive aroma [7].

The characteristics of jambal roti include a fragrant aroma caused by degradation of protein and fat which produces methyl ketone, butylaldehyde, amino acids, and other compounds. In addition, the high content of nitrogen amino acids affects the taste of jambal roti. Another feature is the soft and compact texture as a result of the action of proteolytic enzymes produced by microorganisms [14]. The processing of this jambal roti salted fish includes salting, fermentation, and drying which affect the aroma quality and texture of the product. The fermentation process is the most decisive factor because at this stage there is a precursor to the distinctive taste and aroma of jambal roti which is caused by the growth of microorganisms. According to [14] that the manufacture of salted fish, jambal roti involves a fermentation process. The fermentation process carried out in fish results in a proteolytic reaction which is a process of biological decomposition of compounds that are simpler and more controlled. During the fermentation process, fish protein will be hydrolyzed into amino acids and peptides, then the amino acids will be further broken down into other components that play a role in the formation of the taste of the product.

Based on research [12], the manufacture of salted fish jambal roti typical Pangandaran has the same principle in the process of salting jambal roti fish in other regions. The process of making the typical Pangandaran jambal roti salted fish is as follows:

1. The head of the marine catfish is cut off then disemboweled and washed.
2. Salted fish by inserting salt into the stomach cavity of the fish. The amount of salt used is 25 - 35% of the weight of the whole fish (the weight of the marine catfish after removing the head and its stomach contents is around 70% of the whole weight, meaning that the amount of salt used is 35 - 50% of the weight of the fish after removing the head and entrails) . The fish are arranged in a layer of salt, in a salting bath where the bottom has been coated with a layer of salt. The top layer is the salt layer. The salting tub is closed tightly. After four days of salting, the fish is removed from the salting bath and the salt is removed from the stomach cavity of the fish.
3. The fish is split from the direction along the back toward the stomach so that the fish is split in half, as long as the stomach does not break. Thick flesh on the back of the fish is split again (incised). Obtained wet jambal roti fish product.
4. With the help of a soft-bristled brush, jambal roti is washed thoroughly.
5. The product of jambal roti fish is dried in the sun for 2-3 days or until dry. Every 3 - 4 hours, the fish is reversed, this is to get even drying. At the time of drying the product is smeared with a solution of brown sugar and garlic to taste (about 200 g brown sugar: 100 g garlic: 1 liter of water). The product is considered dry when pressed with fingers without finger marks.
6. While waiting for the customer to arrive, the dried jambal roti product is stored in a wooden crate, the inner surface of which is covered with paper.

The salt used is krosok salt. The salt is odorless, but the color is not pure white but brownish white. In simple terms, the salt purity test has been carried out by making a salt solution with a concentration of 70%, then leaving it to stand until a constant sediment occurs. The precipitate is separated and weighed. Deposit weight is expressed in%. From the test results, it was obtained a sludge of about 2.5% [12]. According to [15], the salting process is one way of preserving fish. The salt used is in the form of crystals or solutions. The salting process in fish will cause the discharge of fluid from the fish's body because of the difference in concentration.

The quality requirements for dried salted fish refer to the Indonesian National Standard (SNI)

272.1.2009 and dried salted fish is a processed product by salting and drying in whole or in pieces. The quality of dried salted fish can be seen in Table 2.

Table 2. Comparison of Quality Requirements for Dried Salted Fish and Jambal Roti Fish

Test	Quality Requirements	The quality of the typical pangandaran jambal roti	Source
Organoleptic			
- Minimum score	6.5	6.6	[12]
Microbiology			
- TPC, Max	1 x 105 colonies / gram	1.3 x 105 colonies / gram	[12]
Chemistry			
- Water, max	40% (w / w)	51.55 - 62.45%	
- Salt, max	20% (w / w)	4.75 - 13.17%	[16]
- Ash insoluble in acid, max	1.5% (w / w)	6.57 - 14.27%	

Marketing of jambal roti salted fish

Fish that are often used for processing salted fish or commonly referred to as jambal roti with the type of fish used are Kadukang fish (Hexanematichyhys sagor), Caung / Baung fish (Mystus nemurus), catfish which can be sold for 120 thousand / 1 kg. salted fish or jambal roti are usually sold for 100 thousand / 1 kg. Based on the results of research [17], showed that the average total cost of salted fish processing business in Pangandaran Regency is Rp. 30,438,078.20 per month. The average revenue earned is Rp. 33,216,666.67 per month so that the average profit earned by salted fish producers is Rp. 13,778,588.47 per month. The salted fish processing business in Pangandaran Regency which has been running so far has been efficient as indicated by the R / C ratio of more than one, namely 1.71, which means that every Rp. 1.00 spent in salted fish processing business activities provides revenue of 1, 71 times the costs incurred.

In food processing, an effective quality management system that can guarantee product quality and product safety is the Integrated Quality Management Program (PMMT) with the concept of *Hazard Analysis Critical Control Points* (*HACCP*). Internationally, the concept*HACCP* has been agreed to be applied to the food industry including fishery products. In its operations, PMMT has a concept*HACCP* in fishery product processing using two Basic Feasibility Programs, seven main principles *HACCP* and several supporting principles *HACCP.* The seven main principles *HACCP* can be applied more effectively to a food processing unit if the processing unit has implemented both Basic Feasibility Programs. Therefore, the processing unit must first apply the two Basic Feasibility Programs before applying the seven main principles *of HACCP [*12]. The level of application of the Basic Feasibility Program for processing jambal roti salted fish in Pangandaran is still low (average application rate = 54.78%). This basic feasibility has a significant correlation with the quality of fish raw materials, the quality of the product, and the business experience of the jambal roti salted fish processors [12]

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