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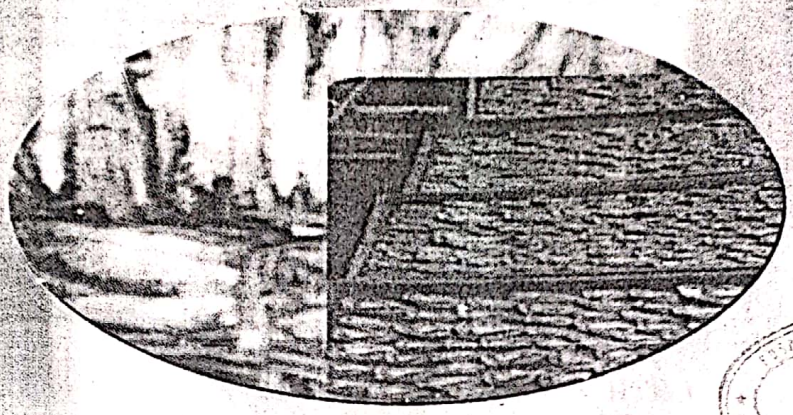

Quality Improvement of Traditional Fisheries Products in Asian Region

Widya Puraya Building, Diponegoro University
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Scientific Paper-06

STUDY ON THE PROCESSING OF PICUNGAN, A TRADITIONAL FERMENTED FISH PRODUCT FROM BANTEN

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ABSTRACT

Picungan is a traditional fermented fish product originating from Banten province. This product is processed by mixing fish, salt and picung seed (*Pangium edule* Reinw). Fish processed using picung seed are mostly marine fish, such as rays, scads, mackerels, croakers, bigeyes scads, and hairtails. Raw materials used in this study are cawtail ray (*Trygon sephen*), stripped mackerel (*Rastreliger kanagurta*) and hairtail (*Trichiurus savala*). Picungan is prepared by a processor in Binuangeun, Banten. The products were observed organoleptically, chemically and microbiologically. Observation was carried out after 3, 6, and 9 days fermentation period. In order to reveal the information on lactic acid bacteria showing an important role in the fermentation process of picungan, isolation and identification of the bacteria were carried out. Bacterial identification indicated that those lactic acid bacteria were *Lactobacillus* sp., including *Lactobacillus murinus*.

Keywords : Picung seed, fermented fish, *Lactobacillus* sp

Introduction

Picungan is a unique product which is only found in Banten province. Basically picungan is a traditional fermented fish product processed by involving *picung* (*Pangium edule*) seeds which can give a specific flavour to the product. The main purpose of picungan processing is to preserve fish in order to create a wider market, in which the product is not only marketed in processor's vicinity, but also to remote area far away from the beach. Scientific information about picungan is very rare, but Irianto (1999) has conducted a survey to this product.

All fish species, both small and large size fish, can be used as raw materials for picungan processing. However, raw materials used are marine fish, particularly scads, stripped mackerels, bearded croakers, hairtails, anchovies, bigeye scads, rays and sharks. The fish should be fresh to avoid undesirable flavour occurred in the product. Processors inform that iced fish will not produce an equal quality product to non-iced fish.

Picung used should be unripe one. *Picung* contains cyanide acid originating from gynocardase activity stimulating cyanide released from gynocardine glucocyde compounds. Role of *picung* in picungan processing is still unknown, but it can be suspected as carbohydrate source for lactic acid bacteria fermentation. *Picung* is also guessed to have disinfectant action to putrefactive bacteria (Emmawati, 1998).

Materials and Methods

1. Materials

Raw materials used in this study were cawtail ray (*Trygon sephen*), stripped mackerel (*Rastreliger kanagurta*) and hairtail (*Trichiurus savala*). Macerated picung seeds and salt were purchased from a retailer in Binuangeun.

2. Methods

a. Picungan preparation

Processing method of picungan can be seen in Figure 1. In the picungan processing, gills and guts were removed from the fish. Ungutted fish was then washed. Rays and hair tail had to be cut into pieces in desired sizes. For effective fermentation process, the fish was filleted in 1-1.5 cm thick.

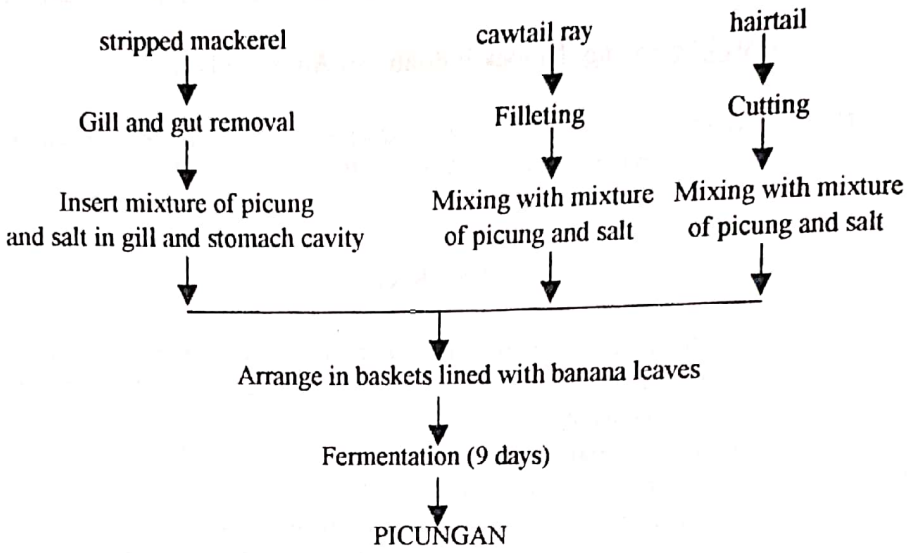

Figure 1. Method of Picungan Processing

For fermentation process, the fish was prepared by mixing thoroughly with picung and salt. Ratio of fish, picung and salt used was 4:2:1. For stripped mackerel, the mixture of picung and salt was also inserted into gill and stomach cavities. After that, the fish surface was sowed with the mixture of picung and salt. Picungan from rays and hairtail was processed by straightaway sowing cuts with the mixture of picung and salt. The fish was then packed and arranged layer by layer in baskets lined with banana leaves. Between layers were sprinkled with the mixture of picung and salt. Remaining picungan and salt mixture was sowed on the top layer. The products were kept for 9 days to allow fermentation process.

b. Analyses

During fermentation process, picungan was analysed organoleptically, chemically and microbiologically after 3, 6 and 9 days fermentation. Organoleptic analyses were including appearance, colour, odour, taste, texture and product description. Chemical parameters analysed were moisture (AOAC,1984) and lactic acid content as well as pH. Proximate composition and salt content was also determined to the products fermented for 6 days using methods as described by AOAC (1984).

Lactic acid was measured as follows; firstly weighing 10 g fish flesh and homogenizing with enough amount of distillated water. The mixture was diluted up to 100 mL with distillated water and was it allowed to stand at ambient temperature for 30 minutes while stirring, and then filtered. The filtrate (10 mL) was added with 2-3 drops of phenolphtalene and eventually titrated with 0.1 N NaOH. Total lactic acid was determined using following equation:

$$TA = \frac{a \times b \times c \times d}{e \times 1000} \times 100\%$$

TA = total lactic acid (%)
a = NaOH volume (mL)
b = normality of NaOH (0.1N)
c = molecule weight of lactic acid
d = dilution level
e = weight of sample (10 g)

Microbiological analyses was emphasized to reveal total plate and total lactic acid bacteria counts (Fardiaz, 1989). Isolation and identification of lactic acid bacteria were also conducted. Isolation was carried out using MRS agar. Isolates were identified visually (colony colour, form and size), morphologically (motility and gram) and physiologically (catalase and carbohydrate fermentation tests). Results of identification were compared to Bergey's Mannual of Systematic Bacteriology (Sneath *et al*, 1986) to determine the bacteria.

Results and Discussion

1. Organoleptic changes during fermentation

Sensory evaluation indicated that the highest acceptability score was shown by the products at the third day fermentation (Table 1) At that period, all picungan showed elastic texture and acceptable odour and taste, except picungan made from stripped mackerel having fishy odour.

At the sixth day fermentation, all organoleptic parameters of the product were still acceptable. Fermentation odour started being detected in all samples. The texture of picungan was to be slightly soft. In general, the acceptability score of picungan made of stripped mackerel reduced faster compared to other products.

At the ninth day fermentation, the acceptability score of organoleptic attributes reduced significantly, especially for texture. Ammoniac odour has appeared in picungan made of string ray, but in general, the product was still acceptable. The panellists noted that the taste of all products was delicious.

Table 1. Organoleptic score of picungan during fermentation

Fermentation Period (Days)	Picungan Sample	Organoleptic Acceptability (Scores)					Description
		Appearance	Colour	Odour	Taste	Texture	
3	Cawtail ray	6.5	6.2	5.8	6.3	6.5	-Elastic, fresh without ammoniac odour, delicious
	Stripped mackerel	6.3	6.6	6.0	6.8	6.3	-Elastic, fishy odour, delicious (slightly sour)
	Hairtail	6.3	6.2	6.0	6.8	6.8	-Elastic, picung odour, delicious
6	Cawtail ray	5.8	5.5	6.3	5.8	6.3	-Slightly fermentation odour, slightly soft texture, delicious
	Stripped mackerel	5.5	5.5	5.0	5.8	5.8	-Slightly fermentation odour, slightly soft texture, delicious
	Hairtail	6.0	5.8	5.8	6.5	6.8	-Slightly fermentation odour, elastic, delicious
9	Cawtail ray	5.7	5.7	4.7	5.0	5.0	-Slightly ammoniac odour, slightly soft texture, delicious
	Stripped mackerel	6.0	5.7	5.3	5.7	5.3	-Fermentation odour, soft texture, delicious
	Hairtail	5.3	5.3	5.7	6.0	6.0	-Fermentation odour, elastic, delicious

2. Chemical changes during fermentation

Moisture contents of picungan made of cawtail ray, stripped mackerel and hairtail exhibited insignificantly changes during 9 days fermentation period (Table 2). Lactic acid content of the product tended to increase until a certain period during fermentation and decreased later on. The highest lactic acid content of picungan processed from cawtail ray and hairtail were achieved at the sixth day fermentation. While, picungan of stripped mackerel had the highest lactic acid content at the ninth day fermentation.

Table 2. Chemical Changes of Picungan During Fermentation

Fermentation Period (Days)	Picungan Sample	Moisture Content (%)	Lactic Acid Content (%)	pH
3	Cawtail ray	77.88	0.08	7.04
	Stripped mackerel	69.66	0.17	6.09
	Hairtail	68.04	0.08	5.68
6	Cawtail ray	74.63	0.12	7.10
	Stripped mackerel	69.59	0.19	5.62
	Hairtail	68.71	0.20	5.83
9	Cawtail ray	75.21	0.10	7.59
	Stripped mackerel	68.83	0.24	6.12
	Hairtail	69.39	0.16	6.10

The pH values of picungan made of cawtail ray and hairtail tended to raise during nine days fermentation. However, pH value of picungan processed from stripped mackerel decreased at the sixth day fermentation and increased at the ninth day fermentation.

3. Microbiological changes during fermentation

Total lactic acid bacteria of picungan processed from cawtail ray, stripped mackerel and hairtail increased throughout a nine days fermentation period (Table 3). The environment generated in the picungan was to be suitable for the growth of lactic acid bacteria.

Table 3. Total Lactic Acid Bacteria of Picungan during Fermentation

Picungan Samples	Fermentation Period (days)		
	3	6	9
Cawtail ray	3.24×10^{10}	2.33×10^{12}	8.55×10^{12}
Stripped mackerel	1.47×10^{10}	5.50×10^{12}	6.47×10^{12}
Hairtail	2.56×10^{10}	6.3×10^{11}	5.32×10^{12}

Product specification

Chemical analyses showed that proximate composition of picungan made of cawtail ray, stripped mackerel and hairtail was 68.71 – 74.63% moisture, 4.40 – 9.33% ash, 17.92 – 20.50% protein, and 1.65 – 4.32% fat. The salt contents of the products were 3.38 - 9.83%. The salt seemed to be more difficult to penetrate into cawtail ray flesh compared to others.

Table 4. Proximate Composition of Picungan Fermented for 6 Days

Picungan Sample	Moisture Content (%)	Ash Content*) (%)	Protein content (%)	Fat content (%)	Salt content (%)
Cawtail ray	74.63	4.40	20.50	1.65	3.38
Stripped mackerel	69.59	9.33	17.92	3.19	7.98
Hairtail	68.71	6.27	18.79	4. 32	4.84

Note: *) including salt content

Identification of Isolated Lactic Acid Bacteria

Bacteria isolates obtained from picungan of cawtail ray, stripped mackerel and hairtail were 24 isolates and 8 of them were colonies of lactic acid bacteria (Table 5). Shape of isolates characterized as lactic acid bacteria was rod and cocci. Based on the gram staining, catalase, motility and sporing tests, those lactic acid bacteria were classified in the genus of *Lactobacillus*.

Fermentation test indicated that bacteria from PP2, PP5, PP8, PK3, PL6 and PL8 hydrolysed all carbohydrates, except xylose and rhamnose. Bacteria from isolate PK5 did not hydrolyse ribose, sucrose, and xylose, but hydrolysed others. Bacteria from isolate PL2 could not hydrolyse ribose, xylose and rhamnose. Based on the Bergey's Mannual of Systematic Bacteriology (Sneath *et al*, 1986) isolates PP5 and PP8 were probably *Lactobacillus murinus*. Other isolates were not able exactly determined, but guaranteed as *Lactobacillus* sp.

Table 5. Morphological and Physiological Characteristic of Lactic Acid Bacteria Isolated from Picungan

Code	Shape	Gram	Catalase	Motility	Spore Forming
PP1	rod	-	+		
PP2	rod	+	-	-	-
PP3	rod	+	+		
PP4	rod	-	+		
PP5	rod	+	-	-	-
PP6	rod	-	+		
PP7	rod	+	+		
PP8	rod	+	-	-	-
PK1	rod	+	+		
PK2	rod	-	+		
PK3	rod	+	-	-	-
PK4	rod	-	+		
PK5	rod	+	-	-	-
PK6	cocci	+	+		
PK7	cocci	+	+		
PK8	rod	+	+		
PL1	cocci	+	+		
PL2	rod	+	-	-	-
PL3	cocci	+	+	-	-
PL4	rod	-	+		
PL5	cocci	+	+		
PL6	rod	+	-	-	-
PL7	rod	-	+		
PL8	rod	+	-	-	-

Table 6. Fermentation Characteristic of Isolated Lactic Acid Bacteria to Carbohydrate

Code	Carbohydrate Fermentation													Predicted Species
	Ar	Cel	Fruc	Gluc	Lac	Malt	Mel	Raf	Rib	Sal	Suc	Xyl	Rham	
PP2	+	+	+	+	+	+	+	+	+	+	+	-	-	*Lactobacillus murinus*
PP5	+	+	+	+	+	+	+	+	+	+	+	-	-	*Lactobacillus murinus*
PP8	+	+	+	+	+	+	+	+	-	+	+	-	+	*Lactobacillus* sp.
PK3	+	+	+	+	+	+	+	+	-	+	-	-	+	*Lactobacillus* sp.
PK5	+	+	+	+	+	+	+	+	-	+	+	-	+	*Lactobacillus* sp.
PL2	+	+	+	+	+	+	+	+	-	+	+	-	-	*Lactobacillus* sp.
PL6	+	+	+	+	+	+	+	+	-	+	+	-	+	*Lactobacillus* sp.
PL8	+	+	+	+	+	+	+	+	-	+	+	-	+	*Lactobacillus* sp.

Conclusion

Based on the organoleptic observation, picungan was suggested to be kept 3 – 6 days. Lactic acid bacteria was growing well in picungan. Bacterial identification indicated that lactic acid bacteria showing important role in the picungan fermentation was *Lactobacillus murinus* and *Lactobacillus* sp.

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