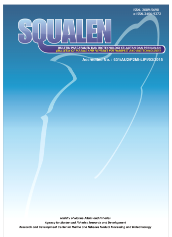

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SHORT COMMUNICATION

Preliminary Study on *Kecalok*, An Indigenous Shrimp Sauce from Indonesia

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Abstract

Kecalok is recognized as a typical shrimp sauce traditionally produced by the Malay inhabitants in Bangka Island and Palembang, Southern region of Sumatra. Comparing to *terasi*, the most common Indonesian fermented shrimp, the information on *kecalok* has rarely been reported. This study aimed to obtain the characteristics of both the geographical origin of *kecalok* product from Bangka and Palembang. A descriptive analysis was used to observe the profiles of both *kecalok* products including sensory, microbiology, proximate, and physical analysis. Results showed that *kecalok* from both locations had similar characteristics, i.e. a distinctive taste and aroma, high nutrition value, and containing some useful bacteria (LAB) which have beneficial role in human body. Therefore, *kecalok* will be a prospective functional based-indigenous food in Indonesia.

Keywords: ***Acetes* sp., *fermented shrimp, kecalok, shrimp sauce***

1. Introduction

Kecalok is commonly consumed as a condiment by the local community. It was produced through spontaneous fermentation of krill (*Acetes* shrimp) as primary raw material by adding some amount of solar salt and palm sugar. The fermentation process is occurred for 1-2 days to 2 weeks in a sealed glass container and provided a red-brownies, porridge-like, and a slightly runny product. In the ancient time, it was traditionally made not only to avoid spoilage of the krill, but also to provide an extending shelf life of the krill, especially in the peak harvest times.

Krill is a type of crustacean belong to the family of *Sergestidae* found in a large group in coastal and estuarine areas. *Acetes* played a crucial role at lower trophic levels food webs and influenced the production of marine animals at a higher trophic level. These crustaceans are characterized as economically important in Asian countries. They are a tiny shrimp (krill) around 1-1.5 cm in size, neritic, epipelagic, and planktonic shrimp (Deshmukh, 1991; Omori, 1975), and because of its small size, it is called *rebon.* In Indonesia, the terminology of *rebon* is not only count to one species, but also several species of small-sized shrimp. Based on Mantiri, Ohtsuka, and Sawamoto (2012), there are at least two genera called *rebon* shrimp, i.e., *Acetes* and *Mesodopsis*, but most of them come from the *Acetes* genera.

Some *Acetes* are marketed as fresh shrimp, but mostly are sold as processed or derivative products, such as dried shrimp, shrimp crackers, fermented shrimp, and others, predominated by paste product (*terasi*) (Deshmukh, 1991). Fermentation is a traditional and well-known preservation technology since long time ago. Even though it is produced by a simple technology, the fermented products are popular because they have a distinctive aroma and taste, high nutrients, and also high functional properties (Faithong, Benjakul, Patcharat, & Binsan, 2010; Steinkraus, 2002).

Kecalok is well known by Malay inhabitants in Bangka island, Bangka Belitung Province. Lately, it

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is also found in traditional markets in Palembang, South Sumatra, Indonesia. The information of *kecalok* nutritional value is scarce. Most recent study conducted by Yuktika, Sutiyanti, Dhewi, Martika, and Sa'diyah (2017), reported that *kecalok* as shrimp *rusip* which was a liquid, an orange in color, and salty taste with a slightly sour characteristics. The making of *kecalok* was originally intended to preserve the krill (*rebon*). In the harvest season, the abundant catch exceeds the raw material demand for main products processing such as crackers (*kemplang*) and local shrimp cake (*pempek*). In Bangka Island, *kecalok* is produced by the coastal community in Toboali, South Bangka (20 producers); Belo Laut (25 producers); Belinyu, West Bangka (4 producers); and Tanjung Pura, Central Bangka (4 producers).

The objective of this study aimed to obtain the sensory, microbiology, proximate, and physical properties of *kecalok* originated from Bangka Island and Palembang. The results are expected to be the initial information for developing *kecalok* product as a prospective functional food based on the indigenous shrimp fermented product.

2. Material and Method

The research was conducted using a descriptive analysis on the quality of the *kecalok* from both Bangka and Palembang including sensory, microbiology, proximate, and physical properties of the products. The descriptive analysis was intended to explore the relationship and similarities of suspicious objects (Arikunto, 2010). Furthermore, we also conducted some interview with the reseller and fisheries local officer to observe the processing steps, fermentation periods, prices, and selling areas of the *kecalok* product.

2.1. Sampling

Fresh *kecalok* were obtained from LCK store in Pangkal Pinang, Bangka - Belitung province (sample A) and purchased from a reseller at 16 Ilir Market, Palembang City, South Sumatra province, Indonesia (sample B) (Figure 1). The products sampling were done in triplicates and obtained in 600 ml of the sealed jar (Fig. 2). The products were transported to the laboratory in a styrofoam container and stored at 40 ^{o}C until further analysis.

2.2. Sensory Analysis

Sensory analysis was performed to the fresh products using the hedonic test by a twenty semi-trained panelists evaluating the products in terms of appearance, aroma, taste, and texture employing a score-based test according to SNI 2346:2015 (BSN, 2015).

2.3. Color Quantification

The color of *kecalok* was evaluated quantitatively using CIELAB Colorimeter (HunterLab, Reston, VA, USA). The samples were placed on colorimetric equipment and the color was represented by CIE system, L* (lightness), a* (redness/greenness) and b* (yellowness/blueness). Data were analysed by employing a method as described by Pongsetkul,

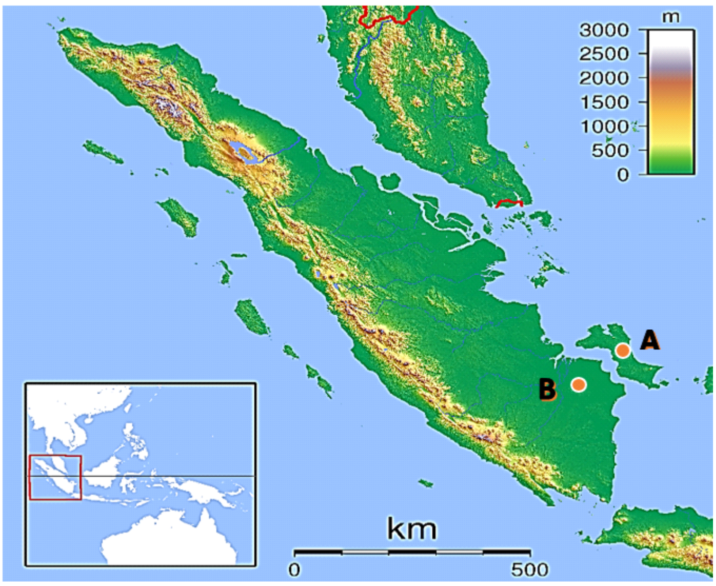

Figure 1. Sampling location of the *kecalok* product in Pangkal Pinang (A), and Palembang (B) Indonesia

A B C

Figure 2. Rebon (*Acetes* sp.) (A) and product of *kecalok* from Bangka island (B, doc. LCK), and product of *kecalok* originated from Palembang, Indonesia (C)

Benjakul, Sampavapol, Osako, and Faithong (2014), in which the value of *E** (total difference of color), and *C** (the difference in Chroma) were calculated as follows:

$$\Delta E = \sqrt{(\Delta L^*)^2 + (\Delta a^*)^2 + (\Delta b^*)^2}$$

Where, ΔL*, Δa* and Δb* were described the differences between color of the samples and the standard of white color values (L* = 93.55; a* = -0.84; and b* = 0.37).

$$\Delta C^* = \Delta C^*_{sample} - \Delta C^*_{standard}$$

Where

$$C^* = \sqrt{(a^*)^2 + (b^*)^2}$$

2.4. Microbiological Profiles

Analysis of total microbes (Total Plate Count/TPC) was conducted using agar medium according to SNI 2332.3:2015 (BSN, 2015) and lactic acid bacteria (LAB) on MRS Agar medium referred to (Fardiaz, 1989).

2.5. Proximate Analysis

Proximate analysis carried out were moisture content according to SNI 2354.2:2015 (BSN, 2015), protein content SNI 01-2354.4-2006 (BSN, 2006), fat content SNI 2354-3:2017 (BSN, 2017), and ash content SNI 2354.1:2010 (BSN, 2010). The pH value was detected with a pH meter (Lovibond) SNI 06-6989.11-2004 (BSN, 2004) and water activity (a_w) was measured using an a_w meter (Aqualab) (Syarief and Halid, 1993).

2.6. Data Analysis

The data obtained from triplicate samples were analyzed using a statistical package of SPSS v16.0 software. The data presented in tables represented the means value.

3. Results and Discussion

Fermentation is a simple and low-cost technology which has been used long-time by human in preserving their food. It also provides high nutritional value and distinctive characteristics such as aroma, taste, and texture of the product (Steinkraus, 2002). *Kecalok* is a typical Indonesia shrimp sauce which has similar characteristics to *rusip*, a fermented anchovies originated from Sumatra, Indonesia. The only difference between the two products is in the raw material; *rusip* is made from anchovy, while *kecalok* is made from krill. Puspita et al. (2017) called *kecalok* as *rusip* shrimp. However, in Bangka and Palembang the *rusip* is made from krill locally more familiar known as *kecalok* than shrimp *rusip*.

The product is commonly used as a complementary ingredient for various dishes. *Kecalok* has porridge-like shrimp, salty-umami taste, and a brown-reddish color. *Kecalok* is usually served with vegetables, mixed with red chili, orange peel, red onion, or served by pan-fried (The colour of Indonesia, 2015). *Kecalok* is distributed in traditional markets or souvenir shops around Bangka and Belitung islands. The product is packaged in a-250 g jar at the selling price of IDR 25,000 or packaged in a plastic bag with selling prices starting from IDR 5,000 - 15,000 per 250 g (Risnawati, 2018). While the products at traditional markets in Palembang were priced at the range from IDR 100,000-140,000/ kg for well-packaged products (Figure 2).

The processing of *kecalok* is begun with draining the fresh shrimp using porous containers (called *raga*) to remove free water from shrimp and sometimes involve squeezing. The shrimp was not washed using fresh water because it will affect the fermentation step

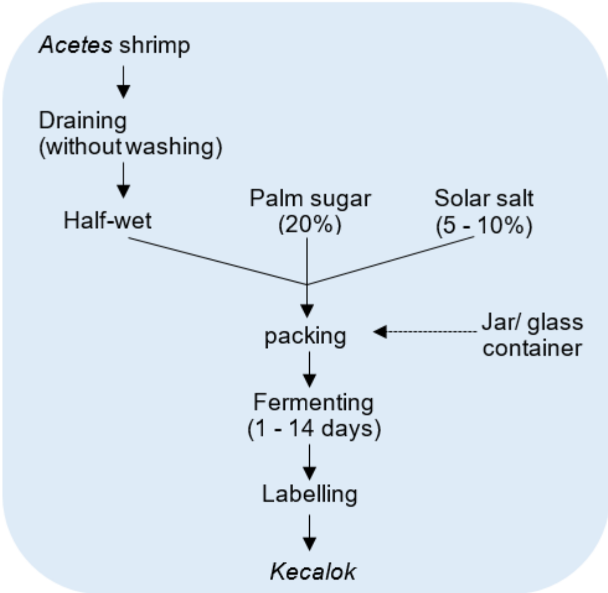

Figure 3. Flow sheet for *kecalok* production

which may probably produce a stench product. Fresh water washing may change the natural bacteria in raw material due to differences in salinity level.

Then, the shrimp was placed in a fermentation jar and added salt and palm sugar. *Kecalok* product from Toboali was only added 5% of salt and 20% of palm sugar, while from Belo Laut used 10% of salt and sometimes without palm sugar addition (Figure 3). The differences between salt and palm sugar additions are due to the preference of taste and required shelf-life of the product. *Kecalok* from the local market does not require a long shelf-life period. Therefore, it can use less salt and palm sugar. While for souvenir shops and wider distribution, it needs more salt to provide longer shelf life period. In addition, besides providing a distinctive flavor and aroma, salt and palm sugar are also useful for inhibiting pathogenic bacteria during fermentation process (Kurniawan & Muslih, 2014). According to Koesoemawardani and Ali (2016), the composition of salt and palm sugar in rusip product reached up to 25% and 10%, respectively. Whereas the amount of salt added to shrimp terasi in Indonesia is in the range of 5-10% (Ali, Yunianta, Aulanni'am & Kusnadi, 2019). Similar products in Southeast Asia countries have a high percentage of salt addition, such as *blachan* from Brunei which used 15-20% salt (Deshmukh, 1991), and 20% for *kapi* from Thailand (Pongsetkul et al., 2014).

The fermentation of *kecalok* was carried out in 1-2 days or until the texture of the shrimp becomes soft porridge-like and after a distinctive aroma was detected. The spontaneous fermentation was occurred through the contribution of hydrolytic enzyme originating from the shrimp (indigenous) and microbes from the raw materials (Faithong et al., 2010; Rajapakse, Mendis, Jung, Je, & Kim, 2005).

The characteristics of products obtained from Bangka and Palembang were compared using sensory, microbiology, proximate, and physical analysis. Both were compared to the attributes of shrimp paste *terasi* which was the most popular Indonesian shrimp fermented products (Table 1). The sensory analysis showed that the characteristics of the *kecalok* products obtained from Bangka and Palembang did not make significant difference ($p>0.05$) in terms of appearance, flavour, taste, and texture (Table 1).

In general, *kecalok* appeared viscous with a brown-reddish color and a distinct tasty odor, provided a savory (umami) and salty taste, but slightly sour. The pH values of the products were 6.38 and 6.47 of Bangka and Palembang products, respectively (Table 1). The low pH value is due to the addition of palm sugar as a microbial substrate and produced some organic compound especially lactic acid that changed to the lower pH of the environment. The more LAB, the higher the lactic acid and the lower the pH of the product will be (Bertoldi, Sant'anna, & Beirao, 2004). Yuktika et al. (2017) reported that the pH value of *kecalok* was getting lower from 8 to 5 during fermentation period of 1-8 days. Fish *rusip* also reported has a low pH value ranging from 4.7 to 6.37 (Irianto & Irianto 1998; Kusmarwati, Heruwati, Utami, & Rahayu, 2011).

Table 1. The characteristics of *kecalok*, Indonesian shrimp sauce

Characteristic	Shrimp *Acetes* sp*)	*Kecalok* Bangka	*Kecalok* Palembang	*Terasi* *)
a. Sensory				
Appearance	-	8.7±1.53^{a}	8.6±0.93^{a}	8.8±1.32 ^{a}
Flavour	-	8.2±0.91^{a}	8.0±0.12^{a}	8.9±0.32^{a}
Taste	-	8.8±1.32^{a}	8.8±0.22^{a}	8.9±0.73^{a}
Texture	-	8.7±0.58^{a}	8.5±0.83^{a}	8.9±0.42^{a}
b. Microbiology				
TPC (cfu.ml^{-1})	1.4 x 10^{4a}	6.9 x 10^{6b}	9.4 x 10^{6b}	1.3 x 10^{4a}
LAB (cfu.ml^{-1})	1.77 x 10^{3a}	1.4 x 10^{4c}	5.6 x 10^{3b}	9.0 x 10^{2a}
c. Proximate				
Protein (%)	20.89±1.42^{a}	32.48±0.82^{b}	33.44±1.67^{b}	41.9±1.02^{c}
Moisture (%)	65.45±2.76^{c}	37.03±1.36^{b}	36.22±0.67^{b}	22.89±1.28^{a}
Fat (%)	5.33±0.52^{a}	4.52±0.92^{a}	4.73±0.68^{a}	5.28±0.39^{b}
Ash (%)	4.66±0.54^{a}	24.67±1.03^{b}	25.15±0.62^{b}	28.37±0.82^{c}
c. Physical				
pH	7.20±0.62^{b}	6.38±0.78^{a}	6.47±0.55^{a}	7.32±0.37^{b}
a_w	-	0.804±0.52	0.802±0.43	0.734±0.31
Carapace/shell residue (%)	36.06	Dissolved (visual observation)	Dissolved (visual observation)	Dissolved, and sometimes found flakes of shell

Note (*): Ali et al. 2019; *terasi* (Indonesia shrimp paste) is used as a standard because *terasi* is the most common Indonesian shrimp-based fermented product. The different letters showed significant differences (p<0.05)

The texture of the *kecalok* is runny like a sauce due to the higher moisture content, while *terasi* has a more solid from (Table 1). This porridge-like texture is the reason for *kecalok* to be called as a liquid shrimp paste or shrimp sauce.The brown color of *terasi* is darker than *kecalok*, sometimes blackish brown. The color of *kecalok* is brighter supported by the higher value of L* (lightness) and lower value of a* (redness-greenness) of the product observed using the colorimeter (Table 2). According to Rahmi, Silvi, and Surhaini (2011), the higher L* value, the brighter the color, and the higher a* values, the reddest the product color will be. *Terasi* generally has a low of L* value (around 9.13), and a* values of 7.21 and b* of 11.13 (Daroonpunt et al., 2016). According to Chaijan and Pannipat (2012), the red or brownish color of fermented shrimp products is due to the enzymatic reactions such as polyphenol-oxidase and non-enzymatic enzymes such as the Maillard reaction or the oxidation of astaxanthin pigments originated from shrimp. In addition, Yarnpakdee, Benjakul, Kristinsson, and Kishimura (2015) mentioned that the color of the product is mainly due to the reaction of amino acids as a result of enzymatic hydrolysis with carbonyl groups from the oxidation of aldehydes and ketones. Aroma of the product is closely related to the presence of volatile compounds due to the fat oxidation, Maillard reaction, or the interactions of both (Van, Hwang, Jeong, & Touseef , 2012). Proteolytic degradation and lipolysis also provide the preferred aroma in fermented products (Kenneally, Leuchner, & Arent, 1998). The longer the fermentation period of *terasi*, the stronger aroma will be formed.

The nutrition characteristics of *kecalok* was not significantly different (p>0.05), particularly in terms of moisture, protein, fat, and ash contents. However, those were significantly different (p<0.05) from *terasi* shrimp paste except for fat content (Table 1). Protein

Table 2. Colorimetry value of *kecalok*, Indonesian shrimp sauce

Sample	*L**	*a**	*b**	ΔE*	ΔC*
Acetes sp. (raw)	58.767±0.52^{c}	11.367±0.37^{c}	14.400±1.04^{d}	61.56	17.73
Kecalok Bangka	42.067±2.11^{b}	8.232±0.31^{a}	9.002±0.43^{b}	43.80	11.59
Kecalok Palembang	41.833±1.78^{b}	7.733±1.19^{a}	7.868±3.97^{a}	43.26	10.42
Terasi (shrimp paste)	37.333±1.6^{a}	9.862±1.16^{b}	12.303±0.71^{c}	40.53	15.15

Desc. L*: *lightness*; a*: *redness-greenness*; b*: *yellowness-blueness;* ΔE*: total difference of color; ΔC*: the difference of Chroma. Means with different letters are significantly different ($p<0.05$) for each parameter (column).

contents were relatively lower as a result of higher moisture content. While *terasi* products have higher protein content due to the lower moisture content as a result of the drying process during shrimp paste fermentation. The higher ash content of the products was due to the addition of salt during the process of *kecalok* and *terasi* making.

The moisture content of fermented fish and shrimp products from Asian countries is in the range of 56.1-70.9%, including *patis* from Phillipines (56.1%), *budu* from Malaysia (70%), *ishiru* from Japan (70.9%), Chinese shrimp sauce (68.30%), and Vietnamese shrimp suace *Nuoc mam torn chat* (66.50%) (Yoshida, 1998). The high moisture content is mainly from the raw material. According to Montano, Gavino, and Gavino (2001), shrimp paste from the Philippines has a relatively low moisture content (33.2%) while *belacan* from Singapore was 31% (Binsan et al., 2008), but Thai *kapi* was 33.95-52.19% (Daroonpunt et al., 2016), and Brunei *belacan* was 47.92% (Kim et al., 2014).

The water activity (a_w) values of *kecalok* were 0.802-0.804, while *terasi* was 0.734 (Table 1). The a_w values has directly associated to moisture content of the product (Allen, Cornforth, Whittier, Vasavada, & Nummer, 2007). Thus, the a_w values of fermented shrimp depends on the drying period under the sun (Pongsetkul et al., 2014), since the shrimp sauce such product such as *kecalok* are made without any drying process, it has a high value of a_w (Figure 3). According to Montano et al. (2001), a_w value of the Philippines *mongoong* were in the range of 0.66-0.68 while Korean *saeu-jeot* were 0.682, Bruneian *belacan* was 0.728 (Kim et al., 2014), and Thai *kapi* were in the range of 0.669-0.774 (Pongsetkul et al., 2014), or 0.64-0.72 (Daronpunt et al., 2016). Lower a_w in *terasi* and another Southeast Asian shrimp paste compared to *kecalok* could be associated with the more consistency (dry and hard character) of shrimp paste than a liquid and soft in *kecalok* product. It brings the prolonged shelf-life of *terasi* than *kecalok* at ambient temperature.

Shrimp fermented products have a low-fat content. Table 1 presented that the fat content of *kecalok* and terasi are 4.52-4.73 and 5.28% resepectively. A Philippines *mongong* has a maximum fat content of 6.83% (Binsan et al., 2008), while Korean *saeu-jeot* and Thailand *kapi* have a lower fat contents, i.e. 4.89% (Kim et al., 2014), and 2.9% of Thailand *kapi* (Kleekayai et al., 2015). Carbohydrate contents were ranging from undetected to low due to the LABs activities as identified in sauce products being responsible for transforming glucose into lactic acid (Ijong & Ohta 1996). The hydrolysis of carbohydrate occurred due to the bacterial fermentation activity which produced organic compounds such as lactic acid, acetate, ethanol, acetoin, and diacetyl contributing to a distinctive aroma (Viallon et al., 1996).

The unique properties of fermented shrimp products are the presence of chitin compounds originating from the raw material. Chitin was obtained from the shell and carapace of krill reaching 13.7% (Nicol, Stolp, & Nordstrom, 1992). Based on the observation, the proportions of the shell and carapace were 36.06% of the total weight of the rebon shrimp. Uniquely, at the end of the fermentation process, the shells degraded into simpler compounds and the shell was not visible in the end product (*kecalok*). It is due to the presence of chitinolytic enzymes synthesized from fermentor microbes as successfully isolated by Puspita et al. (2017). Similar bacteria are also found in shrimp and shrimp paste which can hydrolyze chitin into chitin oligomer compounds (Ali & Koesoemawardhani, 2015; Zilda & Chasanah, 2005; Chasanah, Patantis, Zilda, Ali, & Risjani, 2011).

Microbes in *kecalok* was originated from raw materials, i.e. shrimp, salt, and palm sugar. Salt is an important factor in the production of *kecalok*, in which the salt affects the taste and shelf life. Meanwhile, the salt in *kecalok* selects only halophilic microbes that can be survived during fermentation process as well as in the other shrimp fermented products (Kurniawan & Muslih, 2014; Ruddle & Ishinge, 2010).The total microbial load and lactic acid bacteria (LAB) count of *kecalok* are relatively higher than *terasi* (Table 1). The presence of LAB in fermented products provides functional advantages of the product (Rhee, Lee, & Lee, 2011). Biological activities and beneficial LAB have been reported in traditional fermented seafood products being able to improve the nutritional and functional properties of the products. LAB is a group of bacteria that can attach to epithelial cells in the human intestine wall so that the bacteria have a potential to be used as probiotic bacteria (Gibson, 2007). Benefits of probiotics include inhibiting the growth of pathogenic bacteria, producing natural antimicrobial, lowering serum cholesterol level, increasing immune system and contributing to the health of its host (Vine et al., 2004).

According to Adnan and Owens (1984), the total number of microbes in Indonesian shrimp paste of *terasi* was 3.6 x 10^4 (cfu.g^{-1}) while lactic acid bacteria and molds was 2.5 x 10^3 and 6.0 x 10^1, respectively. They also reported that the longer fermentation process will lower the moisture content and high salt content in the product will decrease the number of microbes. Ali et al. (2019) reported that the viable microbes on *terasi* ranging from 2.2 x 10^3 to 1.9 x 10^4 (cfu.ml^{-1}) were not significantly different from the recent study 1.3 x 10^4 (cfu.ml^{-1}). Kobayashi, Kajiwara, and Wahyuni (2003) stated that LAB from *terasi* ranging from 1.2 x 10^4 to 7.0 x 10^6 (cfu.g^{-1}) was relatively higher compared to these observation which only amount to 9.0 x 10^2, 5.6 x 10^3, and 1.4 x 10^4 (cfu.ml^{-1}) for *terasi* and *kecalok* from Palembang and *kecalok* from Bangka respectively (Table 1).

Fermented products are a potential source of biological value compounds, sometimes even higher than unfermented materials (Yuan et al., 2014). During the fermentation process, the hydrolysis reaction converted the complex proteins into amino acids and peptides, and the other complex compounds affected the paste or liquid form of the end product which indicates the presence of hydrolase activity such as amylase, protease, and lipase. The derived compounds produced during the shrimp fermentation do not only affect distinctive flavor and aroma of fermented shrimp products, but also could increase the functional value of the product, (Gao et al., 2010; Kleekayai, Pinitklang, Laohakunjit, & Suntornsuk, 2016). Peptides sequences (3.5 kDa) from fermented shrimp products such as *terasi* from Indonesian and *kapi* from Thailand are known to have an antibiotic functional (Kobayashi et al., 2016), and a bacteriocin amysin (5,2 kDa) (Kaewklom, Lumlert, Kraikul, & Aunpad, 2013). Peptides of DP, GTG, ST extracted from fermented *Acetes chinensis* were identified as an antihypertensive compounds (Wang et al., 2008), the same as the amino acid sequences of KLKFV from fermented krill (Kawamura, Tabane, Satake, & Sugimoto, 1992). In addition, the peptide sequences of SV and IF isolated from Thailand *kapi* exhibited antihypertensive and antioxidant properties (Kleekayai, Pinitklang, Laohakunjit, & Suntornsuk, 2015). Furthermore, oligopeptides originating from *mungoong*; a Philippines fermented shrimp also provided antioxidative properties (Binsan et al., 2008; Peralta, 2008), the same as isolated from Indonesian *terasi* (Aung, Naylin, Zheng, Watanabe, & Hashinaga, 2004; Kobayashi et al., 2016).

Furthermore, Puspita et al. (2017), isolated 44 bacterial strains of the chitinolytic enzyme (chitin-hydrolyzing enzyme) originating from *kecalok*. A similar bacteria and enzyme also found in *terasi* (Ali & Koesoemawardhani, 2015; Zilda & Chasanah, 2005). The enzymes degrade chitin into simpler compounds n-acetylglucosamine or glucosamine which supposedly has high functional properties.

4. Conclusion

Kecalok is an Indonesia indigenous shrimp sauce originated from Bangka Island and Palembang, Indonesia which has a brown-reddish color, umami and salty taste, and slightly sour (pH 6.38-6.47). The product provides high nutrition including protein (32.48-33.44%), fat (4.52-4.73%), moisture (37.0-36.22%), and ash content (24.67-25.15%), a_w values of 0.802-0.804. The products contained beneficial LABs (5.6 x 103 - 1.4 x 10^4 cfu.ml-1), among the total microbial (6.9 x 106 - 9.4 x 10^6 cfu.ml-1). Therefore kecalok will be a prospective indigenous shrimp-based functional food.

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