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CHEMICAL COMPOSITIONS AND AMINO ACIDS OF DOLPHIN FISH (*Coryphaena hippurus*) ROES

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ABSTRACT

Fish processing industry produces more than 60% of byproducts include the head, bones, fins, skin, viscera and roes. Only 40% of the total body of fish that can be consumed by humans. Byproduct of the fishing industry is a source of nutrition and functional food ingredients, such as roes have a high protein content and amino acids. The aim of this study was determine the chemical composition and amino acid profile of dolphin fish roe. The proximate composition of dolphin fish roe is protein 19.16%, fat 2.05%, moisture 72.94%, ash 1.12% and 4.72 carbohydrates. There are 17 amino acids in dolphin fish roe including proline (3.32%), arginine (3.01%), serine (2.85%) and phenilalanine (2.65 %) while the smallest amino acid is cystine (0.43%), histidine (1.22%) valine (1.34%) and methionine (1.36%).

Keywords: *Amino acid; Chemical compositions; Dolphin fish; Roes*

1. INTRODUCTION

Fish processing industry produces more than 60% of byproducts include the head, bones, fins, skin, viscera and roes or eggs. Only 40% of the total body of fish that can be consumed by humans. Byproduct of the fishing industry is a source of nutrition and functional food ingredients (Dong and Betchel, 2010; Barrow and Shahidi, 2007). Byproducts such as roes have a high protein content and some of amino acids. Roes of several fish species are underutilized and considered as by-product waste in different parts of world, especially in developing countries. Roe is the term used to describe fish eggs (oocytes) gathered in skins (Mahmoud, Linder, Fanni, & Parmentier, 2008). Utilization

of byproducts generated for this purpose a lot of large pelagic fish such as tuna, skipjack and dolphin.

Based on Capture Fisheries Statistics Indonesia (2012), dolphin fish production in Indonesia reached 9,160 tons. Dolphin fish is one of the large pelagic fish species and has a high economic value. The high demand must yield a higher byproduct. Management byproduct of fish processing industry is a major problem and needs serious attention because it is associated with environmental pollution. Byproduct of the fishing industry is a source of nutrition and functional food ingredients (Dong and Betchel, 2010; Barrow and Shahidi, 2007).

Fish roe contains considerable amount of protein. Some research chemical composition of fish eggs including Alaska pollock (Theragra chalcogramma) and cod (Gadus morhua) contained moisture 67.4-80.0%, protein 16.0-25.8%, fat 0.3-5.2% and ash 1.7-2.3% (Bledsoe et al, 2003), skipjack, and bonito tongol contained moisture 72.17-73.03%, protein 18.16-20.15%, fat 3.39-5.68% and ash 1.79 to 2.10%. The major non-essential amino acids were glutamic acid/glutamine (12.18–12.65 g/100 g protein) and aspartic acid/asparagine (8.27–8.85 g/100 g protein). Leucine (8.28–8.64 g/100 g protein) and lysine (8.24–8.30 g/100 g protein) (Intarasirisawat *et al*., 2011). The aim of this study was determine the chemical composition and amino acid profile of dolphin fish roe.

2. MATERIAL AND METHOD

Samples

Dolphin fish roes obtained from fish traders in Pasar Besar Kota Malang-Indonesia, put in cool box containing with ice ratio of 2:1, then taken to the Laboratory of Engineering and Food Processing Brawijaya University to be analyzed proximate composition (moisture, protein, fat, and ash). Fish roes homogenized using a speed mixer and defatted using isopropyl alcohol (IPA) 1: 3 (w/v) for 3 hours to remove the fat and water. The precipitate was filtered dried using tray dryer cabinet at 45ºC for 4 hours. Results drying powdered and sifted through a sieve size of 60 mesh and then analyzed proximate (moisture, protein, fat, and ash) and amino acid profile.

Analysis Procedure

Samples, dolphin fish roes, were subjected to proximate analysis, including moisture, protein, fat and ash contents following the AOAC methods (AOAC, 2005).

Statistical analysis

All experiments were carried out in duplicate. The data are expressed as means and standard deviation.

3. RESULTS AND DISCUSSION

The proximate composition of dolphin fish roe can be seen in Table 1. All roes contained protein 19.16%, fat 2.05%, moisture 72.94%, ash 1.12% and carbohydrates 4.72%. Various studies show variation of chemical composition of fish eggs, including roes of sea water fish such as Alaska pollock (Theragra chalcogramma) and cod (Gadus morhua) contained moisture 67.4-80.0%, protein 16.0-25.8%, fat 0.3-5.2% and ash 1.7-2.3% (Bledsoe et al., (2003)), freshwater fish roes as catla (catla-catla), carp (Cyprinus carpio), Rohu (Labeo rohita) and Murrel (Channa striatus) contained moisture 50.7-67% , protein 16.6-28.2%, fat 3.2-9.5% and ash 1.1-1.4% (Balaswamy, Rao, and Jyothirmayi, 2011) , catfish roes (Ictalurus punctatus) contained moisture 55.7%, protein 28.1%, fat 16.5% and ash 1.8% (Sathivel, Yin, Bechtel, and King, 2009).

From the table it appears that the average protein levels increased after defatted be 55.34%, fat increased to 5.14%, Moisture of fish roes fresh dolphin fishquite high and decrease after defatted and drying process that is 19.46%, ash 2.73% and carbohydrates 17.31%. Defatted process affects the chemical composition of fish roes, where a decline moisture and can increase the protein content.

The results showed that the water content of dolphin dolphin fish roes comparable with fish roes of alaska pollock and cod, and higher than the roes of species of freshwater fish. Dolphin fish roes protein content comparable to allaska Polack and cod fish, higher than catla fish and goldfish, but lower than catfish. The fat content of dolphin dolphin fish roes comparable with fish roes of alaska pollack and cod, and higher than fat freshwater fish roes. The fat content in fish is high if it contains fat>15% (Hidayat 2005). The chemical composition of fish roes is caused by many factors, among which is mainly

caused by biological factors, including species, stage of maturity, food, seasons, fishing areas and processing conditions. In addition, the quantity and composition of fatty fish varies, depending on the species and habitats (Sahena et al., 2009; and Mahmoud et al., 2008).

Table 1. Proximate of Undefatted Roe and Defatted Roe from Dolphin Fish.

Proximate	**Dolphin fish Roe**	
	***Undefatted Roe* (% wb)**	***Defatted Roe* (% wd)**
Protein	19,16 ± 0,71	55,34 ± 0,27
Fat	2,05 ± 0,86	5,14 ± 2,47
Moisture	72,94 ± 0,60	19,46 ± 1,02
Ash	1,12 ± 0,19	2,73 ± 0,27
Carbohydrat	4,72 ± 1,99	17,31 ± 0,89

The chemical composition of fish roe and caviar is affected by both intrinsic species, maturity of the eggs, egg location within the skein) and extrinsic (diet, fish maturity, season, harvest area and processing conditions) factors (Bledsoe et al., 2003; Shirai, Higuchi, & Suzuki, 200). Bledsoe et al. (2003) compiled and presented comprehensive data on the chemical composition of fish roes that clearly demonstrate the inter- and intra-species variability. The data reported in the present study are within the range reported for chinook salmon by Bledsoe et al. (2003). Variation in the composition of eggs can be found in eggs produced by fish that grown under the same environmental conditions and fed identical diets (Iglesias *et al*, 1995) and even within eggs from the same roe or the same female (Bledsoe et al., 2003). This variation in chemical composition of eggs/roes has been attributed mainly to diet and biological conditions (reviewed by Zhu (1999)).

Amino acids of dolphin fish Roes *Defatted.*

Proteins in dolphin fish roe became concentrated after defatting, and then could be used as a proteinaceous source for further application. Amino acid composition of dolphin dolphin fish roes defatted can be seen in Table 2. Amino acid in dolphin fish roe consists of 17 amino acids including proline (3.32%), arginine (3.01%), serine (2.85%) and phenilalanin (2.65 %) while the smallest amino acid cystine (0.43%), histidine (1.22%) valin (1.34%) and methionine (1.36%).

The amino acid composition of tuna roes reported by Ziaeian, Moini, and Jamili 2008) that the dominant is histidine (10.80 g/100 g of protein), leucine (10.30 g/100g of protein) and lysine (11.70 g/100 g of protein), whereas the non-essential amino acid is the dominant glutamat acid/glutamine (5.89 g/100 g of protein), proline (3.79 g/100 g of protein) and serine (3.23 g/100 g of protein). Differences in amino acid composition might be due to different habitats, feeding and season (Ziaeian *et al*., 2008). The amino acid composition of dolphin dolphin fish roe defatted similar to tuna roe, mullet, cod, pollock and chinook salmon roe (Bledsoe et al, 2003). With the complete amino acid composition of dolphin fish roes defatted could be an alternative source of amino acids for various products.

Table 2. Amino Acids of Dolphin Fish *Defatted* Roe.

Amino Acids	Content (%/100 g/protein)
Aspartic	2,23
Glutamic	1,92
Serine	**2,85**
Glycine	1,83
Histidine	1,22
Arginine	**3,01**
Threonine	2,12
Alanine	1,95
Proline	**3,32**
Valine	1,34
Methionine	1,36
Isoleucine	0,93
Leucine	2,58
Phenylalanine	2,65
Lysine	2,38
Cysteine	0,43
Tyrosine	2,49
Total	**34,61**

4. CONCLUSION

The proximate composition of dolphin fish roe is protein 19.16%, fat 2.05%, moisture 72.94%, ash 1.12% and 4.72 is carbohydrates. There are 17 amino acids in dolphin fish roe including proline (3.32%), arginine (3.01%), serine (2.85%) and phenilalanine (2.65 %) while the smallest amino acid is cystine (0.43%), histidine (1.22%), valin (1.34%) and methionine (1.36%).

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