Identification of Amino Acid Profile, Fatty Acid Profile and Albumin from Cork Eggs (*Channa striata*)

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Abstract- Cork fish (*Channa striata*) is one of the fish that has high economic value. Cork fish (*Channa striata*) has many nutrients and high albumin content. Cork fish albumin is a good prospect to be developed because it is beneficial for postoperative healing. Cork fish albumin raw material is usually obtained from meat. However, many dont know that the cork fish part which is cork fish eggs, has a lot of nutritional content that has funcional benefits for the body. Cork fish eggs can be found in female cork fish that have matured gonads. Cork fish eggs have not been widely utilized bt the general public so cork fish eggs can be a good prospect for development. The study aims to identify the content of amino acids, fatty acids, and albumin content in cork fish eggs. The results showed that cork fish eggs had essential and non-essesntial amino acid compositions, with the highest L-Lysine value of 534,81 mg/kg and then glutamic acid 507,89 mg/kg while the lowest amino acid L-Phenylalanine 244,99 mg/kg and then L-Prolin 217,06 mg/kg. Cork fish eggs have the highest fatty acid compositition at 18,84055 unsaturated fatty acids and the lowest fatty acids at 0,2546% EPA. The average yield of cork fish eggs albumin is 1,91375 in Albumin A and 1,2525 in Albumin B. The results of Albumin A and Albumin B levels in cork fish eggs are influenced by the length and weight of cork fish.

Keywords: *amino acid, fatty acid, albumin, cork fish eggs*

I. Introduction

Indonesia as a country with a very large population is a potential market for fisheries products (Kusmini *et al.*, 2016). The availability of aquaculture for freshwater fish comsumption in Indonesia provides a great opportunity for the community and even entrepreneurs to develop cork fish farming. Demand and needs of local and foreign markets have increased along with the increasing prduction value of *Channa striata* cultivation each year (Listyanto and Andriyanto, 2009). Cork fish (*Channa striata / Ophiocephalus straitus*) is a major in Indonesia. This fish is founded in all lake, both consumed directly and preserved as salted fish or dried fish (Kordi, 2011).

Cork fish is rich in nutrients needed by the body, especially protein. Where this protein has a special function that can not be replaced by other nutrients, to build and maintaining tissue cells in the body (Asikin and Kusumaningrum, 2017). In addition to cork fish meat which has a high nutritional value, there are also parts of cork fish that are not inferior in nutrional content and are often not utilized properly by the community. This part is cork fish eggs. Fish eggs are a food that has a high protein content and omega fatty acids thet play a role in preventing cardiovascular disease (Intarasirisawat *et al.*, 2011).

Amino acid According to Suprayitno and Sulistyati (2017), are organic compounds containing amino groups (NH), a carboxylic acid group (COOH) and one of the basic formula $NH_2CHRCOOH$ amino acids are amphoteric compounds, which have acid groups and also groups of acids bases. Identification of egg and fiber amino acids indicates the presence of 17 amino acids (Azka *et al.*, 2015). Fatty acid according to Liputo *et al.* (2013), are part of a fat molecule, can function as a constituent of body fat or can also be used as an energy producer. Fatty acids commonly found in nature are generally in the form of monocarboxylic acids. Fish eggs have high nutritional substance and are rich in amino acids, fatty acids and minerals. Fish eggs contain 75% ovoglobulin, 13% collagen, and 11% albumin (Yoon *et al.*, 2018).

II. MATERIAL AND METHODS

2.1 Materials

The materials used to extract cork fish eggs are vacum ekstractor, steamer pan, stove, thermometer, beakerglass, and dark colored vial bottles. The material used in this study is eggs from cork fish that have been matured gonads that are found in Pasar Besar Malang and Pasar Baru Pare, East Java Province and aquades. This research uses a descriptive method. the parameters observed in this study were amino acids, fatty acids, and the effect of cork fish length and weight on cork fish egg albumin levels. In a preliminary study an extraction process was carried out using two different type of extraction. the two of extraction used are vacum extractor and steaming extractor.

2.1 Amino Acids Analyze

Weigh the sample with 0.1 gram then destroy the sample. After the sample is destroyed add 5 N HCL 10 mL which is then heated using an oven at 100 ° C for 24 hours. During the sample drying stage. Filtering is done so that the resulting solution is completely clean and no solids remain. The results of the filter were taken as many as 30 and added 30 drying solutions. The drying solution is made from a mixture of methanol, picothiocyanate and trietillamine using a 4: 4: 3 ratio. The derivatization step is then carried out, in which 30 derivatization solutions are added to the dryer, then the dilution step is added by adding 20 ml 60% acetonitrile or using 1 M sodium acetate buffer and leave it for 20 minutes. The filter results are then taken 40 to be injected into HPLC (AOAC, 2005)

2.2 Fatty Acids Analyze

The first step is to extract sokhlet for fatty acids, and weigh 0,02-0,03 g of fat in the form of oil. Fat or oil is weighed as much as 1 mL of NaOH 0.5 N in methanol and heated at 80°C for 20 minutes, as much as 2 mL BF3 20% for 20 minutes and reheated at 80°C for 20 minutes, then cooled at room temperature and added 2 mL saturated NaCl and 1 mL of Iso Octan is added to the sample, then shaken until homogeneous. The hexane layer was transferred with a dropper into a tube containing 0.1 g of anhydrous Na_2SO_4, left for 15 minutes. After that the solution is filtered using a micro filter to separate the liquid phase. A total 1µl sample was injected into *Gas Chromatography*. Fatty acid identification is done by injecting methyl esters in a gas chromatograph. The gas used as a mobile phase is nitrogen with a pressurized flow of 20 mL / min and as a burning gas is hydrogen with a flow of 30 mL / min. The column used was a Quadrex fused silica capillary column 007 cyanoprophyl methyl sil whose length was 60 m with an inner diameter of 0.25 mm. The temperature used is 125 ° C, then the temperature is raised to 5 ° C per minute until the final temperature of 225 ° C. Injector temperature is 220 ° C and detector temperature is 240 ° C (AOAC, 2005).

2.3 Albumin Level Analyze

Albumin content analysis using brom cresol green method with succinate buffer (7 mmol / l pH 4.2), brom cresol green 0.15 mmol / l, brij 25 and aquadest can succinate (0.01 M; pH 4.2). Albumin levels after purification of the test gel filtration column with UV, the ingredients include standard BSA 0.5 g / l, 0.1 M phosphate buffer pH 7.1 and aquadest(Nugroho, 2013). According to Suprayitno (2014), the formula for determining albumin levels is as follow:

$$\%\ Albumin\ levels = \frac{ppm\ \times 25}{Sampel\ weight\ \times 10^6} \times 100\%$$

III. RESULTS AND DISCUSSION

3.1 Albumin

Albumin testing is carried out to determine the albumin content found in cork fish eggs. From the results obtained the highest levels of fish egg albumin was obtained in cork fish 2.40 with a length of 27 cm and weight 444 g while the lowest cork fish egg albumin content was obtained at 1.03 with fish length of 18.5 and weight of 63 grams. Fish weight affects albumin level. The high albumin content is influenced by stress levels and the natural conditions of the environment in which cork fish live (Chasanah *et al*., 2015). According to Paul *et al*. (2013), the chemical composition of fish varies greatly from species or individual to each other, depending on age, available food, sex, and sexual conditions related to the spawning period, season and environment. According to Mahmoud *et al*., (2008) fish eggs contain 1% albumin, 75% ovo globulin and 13% collagen. Fish eggs have high fat nutrient content, especially in phospholipids and long chains of unsaturated fatty acids.

3.2 Amino Acids

Tabel 1. Results of Analysis of Amino Acid Profile of Cork Fish Egg

No	Amino Acid	(mg/kg)
1.	L- Arginin	385,29
2.	L- Threonin	277,85
3.	L – Fenilalanin	244,99
4.	L – Isoleusin	369,78

5.	L – Valin	303,33
6.	L- Lisin	534,81
7.	L – Leusin	366,93
8.	L- Alanin	394,03
9.	L-Asam Glutamat	507,89
10.	L – Asam Aspartat	<399,37
11.	L – Tirosin	271,64
12.	L- Prolin	217,06
13.	L – Serin	287,53
14.	Glisin	201,22

Source: Data Processed, 2019

From table 1 listed above shows cork fish eggs have several essential amino acids and non essential amino acids. Amino acids added: L-Isoleucine, L-Leucine, L-Lysine, L-phenylalanine, L-threonin, L-Valine, and L-Arginine. While amino acids are not essential: L-glutamic acid, L-Alanine, L-Aspartic acid, L-Proline, L-Serine, and L-Tyrosine. In essential amino acids the highest value in L-Lysine is 534.81 mg / kg and the lowest is obtained by L-phenylalanine of 244.99 mg / kg. According to Intarasirisawat *et al*. (2011), leucine with an amount of 8.3% -8.6% and lysine with an amount of 8.2% - 8.3% which is very dominant in essential amino acids when the fat in tuna eggs is removed. according to Warisan (2018), the amino acid content of lysine in cork fish was 0.197%. Lysine is one of the essential amino acids that is easily damaged during processing, because it is associated with changes in pH, oxygen, light, heat or combination and is a barrier for other food ingredients. The need for lysine in the body according to FAO / WHO (1985) is 0.0103%. Non-essential amino acids are calculated based on L-glutamic acid 507.89 mg / kg and exposure to glycine at 201.22 mg / kg. According to research conducted by Azka *et al*. (2015), glutamic acid is a non-essential amino acid which has the highest levels in flying fish eggs at 5.38%. According to Ziaeian *et al.*, (2008), differences in the composition of amino acids and fresh fish egg fat are caused by different habitats, food, and seasons. According to Susilowati (2010), glutamic acid is an amino acid that can form umami flavor, the interaction between amino acids and other volatile components such as aldehydes, hydrocarbons, pears, furans, alcohols, and others will make specific savory flavors.

3.3 Fatty Acid

Tabel 2. Results of Analysis of Fatty Acid Profile of Cork Fish Egg

No	Fatty Acid		% Result
1.	Asam laurat	C 12:0	0,0455
2.	Asam kaprat	C 10:0	0,0027
3.	Asam miristat	C14:0	0,0948
4.	Asam palmitat	C 16:0	0,9048
5.	Asam stearat	C 18:0	0,4146
6.	Asam pentadekanoat	C 15:0	0,0156
7.	Asam heptadekanoat	C 17:0	0,0499
8.	Asam arachidat	C 20:0	0,0128
9.	Asam behenat	C 22:0	0,0042
10.	Asam trikesanoat	C 23:0	0,0036
11.	Asam lignoserat	C 24:0	0,0195
12.	Asam palmitoleat	C 16:1	0,9158
13.	Asam heptadekenoat	C 17:1	0,1750
14.	Asam eikosenoat	C 20:1	0,1922
15.	Asam oleat		11,3197
16.	Asam miristoleat	C 14:1	0,0047
17.	C-asam oleat	C 18:1 ω9 c	11,3197
18.	Asam erukat	C 22:1	0,0045
19.	Asam eikosadienoat	C 20:2	0,1232
20.	Asam linolenat		0,6234
21.	Asam linoleat		3,0244
22.	Asam linolenat / ω3	C 18:3 ω3	0,5466
23.	Asam linoleat / ω6	C 18:2 ω6	3,0244
24.	c- Asam linoleat	C 18:2 ω6c	3,0244
25.	Asam eikosapentaenoat	C 20:5 ω3	0,2547
26.	Asam arakidonat	C 20:4 ω6	0,7316
27.	Asam linolenat / ω6	C 18:3 ω6	0,0768
28.	Asam eikosatrienoat / ω6	C 20:3 ω6	0,1276
29.	Asam dokosaheksaenoat	C 22:6 ω3	1,2746

30.	Asam eikosatrienoat / ω3	C 20:3 ω3	0,0888
31.	Lemak jenuh		1,5581%
32.	Lemak tak jenuh		18,8405%
	• Tunggal (MUFA)	• 12,5892%	
	• Ganda (PUFA)	• 6, 2514%	
33.	C 18:3 (asam linolenat / ω3)	0,5457%	
34.	Omega3	2,1635%	
35.	EPA	0,2546%	
36.	DHA	1,2744%	
37.	AA	0,7321%	
38.	Omega 6	3,9649%	
39.	Omega 9	11,3362%	
40.	Trans Fat	0,00%	
41.	Jumlah % lemak	20,3987%	

Source: Data Processed, 2019

In the table 2 above we can see that the highest value is found in unsaturated fat content of 18.8404% with MUFA of 12.5893% and PUFA of 6.2514%. While the lowest fatty acid content is found in EPA of 0.2546% and cork fish eggs do not have trans fat. According to Park *et al*. (2015), *Acipenser ruthenus* fish eggs had EPA content of 4.69% and DHA of 11.39%. The EPA content is lower than the DHA content because it is because EPA and DHA are located on the phospholipid membrane of different tissues. DHA is widely present in nerve and visual cell membranes, especially in the outer segments of the synaptosomal stem and membrane cell membranes (Cejas *et al*., 2003). According to Estiasih (2009), factors that influence the levels of essential fatty acids in fish in addition to fish species and food are development and growth, seasonality, salinity, and water temperature can also cause differences in the composition of essential fatty acids found in these fish (Monsen, 1985) .

IV. CONCLUSION

The highest albumin content in cork fish eggs (*Channa striata*) was found at 2,40 and the lowest at 1,03. The different albumin content in cork fish eggs can be caused by differences in temperature, pH, environment, food, age, season, spawning period, and sex in cork fish. The highest essential amino acid found in the L-lysine compound is 534,81 mg/kg. While the highest non-essential amino acid were found in compound L-glutamic acid 507,89 mg/kg and the lowest glycine was 201,22 mg/kg. And the highest content of fatty acids in cork fish eggs was found in unsaturated fatty acids of 18,8404%. Differences in levels of fatty acid and amino acid in cork fish eggs are caused by differences in fish growth, water salinity, water temperature, food, habitat, and chemical composition found in fish.

REFERENCES

[AOAC] Association of Official Analytical Chemist. 2005. Official method of analysis of the association of official analytical of chemist. *Arlington : The Association of Official Analytical Chemist, Inc.*

Asikin, A.N., dan I. Kusumaningrum. 2017. *Edible portion* dan kandungan kimia ikan gabus *(Channa striata)* hasil budidaya kolam di kabupaten kutai kartanegara, kalimantan timur. *Jurnal Ziraa'ah*. **42**(3): 158-163. E-ISSN 2355-2545.

Azka, A., Nurjanah., dan A. M. Jacoeb. 2015. Profil asam lemak, asam amino, total karetenoid, dan α-tokoferol telur ikan terbang. JPHPI. **18**(3): 250- 261.

Chasanah, E., M. Nurilmala., A.R. Purnamasari., dan D. Fithriani. 2015. Komposisi kimia, kadar albumin dan bioaktivitas ekstrak protein ikan gabus (*Channa striata)* alam dan hasil budidaya. *Jurnal Pascapanen dan Bioteknologi Kelautan dan Perikanan.* **10**(2): 123-132.

Cejas, J.R., E. Almansa., J.E. Villamandos., P. Badia., A. Balanos., and A. Lorenzo. 2003. Lipid and fatty acid composition of ovaries from wild fish and ovaries and eggs from captive fish oil of while sea bream (*Diplodus sargus*). *Aquaculture.* **216**(1-4) : 299 – 313.

Estiasih, T. 2009. Minyak ikan teknologi dan penerapannya untuk pangan dan kesehatan. Yogyakarta : Graha ilmu.

FAO/WHO. 1985. Energy and protein requirement. *GeneVa: Expert Consultation*

Intarasirisawat, R., Benjakul, S., and Visessanguan, W. 2011. Chemical compositition of the roes from skipjack, tongol and bonito. *Food chem*. **124**: 1328-1334

Kordi, M. G.H.K. 2011. Panduan lengkap bisnis dan budidaya ikan gabus. Penerbit Lily Publisher: Yogyakarta. ISSBN 978-979-29-3018-4

Kusmini, I. I., R. Gustiano., V. A. Prakoso., M. H. F. Ath-thar. 2016. Budidaya ikan Gabus. Penebar Swadaya: Jakarta.

Liputo, S. A., S. B. Berhimpon., dan F. Fatimah. 2013. Analisa nilai gizi serta komponen asam amino da asam lemak dari nugget ikan nike *(Awaous melnocephalus)* dengan penambahan tempe. *Chem.Prog*. **6**(1): 38-44.

Listyanto, N., dan S. Andriyanto. 2009. Ikan gabus (*Channa striata*) manfaat pengembangan dan alternatif teknik budidayanya. *Media Akuakultur*. **4**(1): 18-25.

Mahmoud, A.S.K., M. Linder., J. Fanni., and M. Parmentier. 2008. Characterisation of the lipid fractions obtained by proteolytic and chemical extraction from rainbow trout (*Oncorhynchus mykiss*) roe. *Process Biochemistry.* **43**(4) : 376-383.

Monsen, E.R.1985. In : NIH launching major researsh program on fish oil and health. Food Chemistry News 34-39, 6-8.

Nugroho, M. 2013. Uji biologis ekstrak kasar dan isolat albumin ikan gabus (*Ophiocephalus striatus*) terhadap berat badan dan kadar serum albumin tikus mencit. *Jurnal Teknologi Pangan.* **5**(1) : 16-26

Park, K. S., Kang, K.H., Bae, E. Y., Baek, K.A., Shin, M.H., Kim, S. U., Kang, H.K., Kim, K.J., Choi, Y.J and Im, J.S. 2015. General and biochemical composition of caviar from sturgeon (*Acipenser ruthenus*) farmed in Korea. *International Food Research Journal*. **22**(2): 777-781.

Paul, D.K., R. Islam., M.A Sattar. 2013. Physicochemical studies of lipids and nutrient content of *Channa striatus* and *Channa marulius. Turkish Journal of Fisheries and Aquatic Sciences.* 13: 487-493.

Suprayitno, E. 2014. Profile albumin fish cork (*Ophiocephalus striatus*) of different ecosystems. *International Journal of Current Research and Academic Review.* **2**(12) : 201-208. ISSN : 2347-3215.

Suprayitno, E., dan T. D. Sulistyati. 2017. Metabolisme protein. Penerbit UB Press: Malang. ISSBN 978-602-432-161-1.

Susilowati, A. 2010. Pengaruh aktivitas proteolitik *Aspergillus sp*-K3 dalam perolehan asam-asam amino sebagai fraksi gurih melalui fermentasi garam pada kacang hijau (*Phaseolus radiatus L.*). *jurnal Rubrik Teknologi.* **19**(1).

Yoon, I. S., Lee, G.W., Kang, S.I., Park, S.Y., Lee, J. S., Kim, J. S., and Heu, M. S. 2018. Chemical composition and functional properties of roe concertrates from skipjack tuna (*Katsuwonus pelamis*) by cook-dried process. *Food Science and Nutrition*. **6**(5): 1-11.

Warisan., A.D. Sasanti., dan Yulisman. 2018. Kandungan lisin dan pertumbuhan ikan gabus (*Channa striata)* yang diberi pakan berbeda. *Prosiding Seminar Nasional Lahan Suboptimal 384 – 393. ISBN : 978-979-587-801-8.*

Ziaeian, H., S. Moini., and S. Jamili. 2008. Consequences of frozen storage of amino acids and unsaturated fatty acid of tuba (*Tunnus tonggol*) roe. *Journal of Fisheries and Aquatic Science.* **3**(6) : 410-415.