Profile of Kerandang Fish (*Channa pleurophthalmus* Blkr) Proteins from Central Kalimantan

**Aryani**1,2, **Suprayitno E**2, **Sasmito B B**2, **Hardoko**2

1Faculty of Agriculture, University of Palangka Raya, Central Kalimantan
2Faculty of Fisheries and Marine Science, University of Brawijaya, Malang

**Abstract.** Kerandang fish (*Channa pleurophthalmus* Blkr) as one of freshwater fish from the Channidae family which is very potential and abundant in Central Kalimantan. The aim of this research was to determine and obtain a picture of the protein profile Kerandang fish. The benefit of this research is that Kerandang fish can be utilized maximally as one of the nutritious foods to demand the nutritional needs of the people in Central Kalimantan. This research was conducted exploratively qualitative with the parameters of the proximate test, amino acids using HPLC and determination of protein molecular weight using SDS-PAGE. The results obtained for the proximate test were 76.48% water content, 16.35% protein content, 0.35% fat content and 6.82% carbohydrate content. The results for amino acids assay obtained 15 types of amino acids, 8 types of essential amino acids with the highest type of amino acid, Leucine 4.69% and 7 types of non-essential amino acids with the highest type of amino acid, glutamic acid 9.11%, and total acid amino 53.32%. The result of analysis of protein profile of Kerandang fish meat based on its molecular weight using SDS-PAGE there are 27 protein bands in the range of molecular weights 10.202 - 134.432 kDa.

1. Introduction

Kerandang fish (*Channa pleurophthalmus* Blkr) is one of the fish species in the Channidae family, which is one of the predators of freshwater fish and as carnivorous fish, which no different its characteristic such as gabus fish, toman fish and other species. Snakehead species of fish are abundant in Central Kalimantan, often found in swamps, lakes and streams. In Sumatra, its known by the name Serandang fish [1]. The fish has several synonymous names namely *Ophicephalus urophthalmus* Bleeker and *Ophioccephalus spiritualis* Fowler but the common name that is often used is the ocellated snakehead; snakehead eyespots. Kerandang fish are known to have strong physical endurance, or rather are able to adapt to water conditions with minimum oxygen when compared to similar fish such as Toman fish. All types of Channidae members are able to slurp air from the atmosphere because they have additional breathing organs at the top of their gills, causing them to be able to move long distances during the dry season to find more settled water sources [2]. In Muara Enim and Musi Banyuasin South Sumatra stated that Kerandang fish are fish that can survive in water conditions with low oxygen levels (because they have additional respiratory organs in the gills that are able to take oxygen from the atmosphere), carbon dioxide levels free high and acidic pH waters. This fish habitat is in swamp forests which are overgrown by aquatic plants namely kumpeh (*Gramminae*), eceng gondok (*Eicchornia crassipes*) and higher plants. Black water color indicates that these waters contain a lot of organic material derived from peat [1].
Kerandang fish is one of the potential freshwater fishes in Central Kalimantan and has a low price, unlike other Channidae family fish which have a selling price twice as high, but Kerandang fish has not been widely used and consumed widely by the local community. Even though the Kerandang fish is estimated to have high nutritional content, especially high protein, as is the case with other types of fish from the Channidae family, so that it can be used as a quality consumption fish both fresh and processed. Lack of research on Kerandang fish which is the background for conducting comprehensive and in-depth exploratory research on the chemical composition, amino acid content and protein profile of Kerandang fish.

The aim of this study is to obtain a descriptive of the chemical composition, amino acid content and protein profile description of Kerandang fish meat, so that it can broaden knowledge about fish Kerandang and can be used as economic food that is used more widely for local communities to comply nutrition.

2. Material and method

2.1. Materials

This research was conducted for 4 (four) months from July 2017 to November 2017. Proximate testing was carried out at the Laboratory of the Faculty of Agricultural Technology, University of Brawijaya Malang, amino acid testing (HPLC) at the Integrated Chemistry Laboratory, Bogor Agricultural Institute, while testing the protein profile (SDS-PAGE) in the Laboratory of Molecular Biology FMIPA University of Brawijaya Malang.

The main ingredient used in this research is fresh Kerandang fish (*Channa pleurophthalmus* Blkr) meat, measuring 700 grams, approximately 5 kilograms obtained from Sebangau Kereng Bengkirai Lake in Central Kalimantan. In addition, this research also requires chemicals for proximate testing, amino acid testing (HPLC) and materials needed to view protein profiles (SDS-PAGE) with dry dorsal fins and dry caudal fins as comparison. The other materials: H2SO4, selenium, boric acid (H3BO3), pink methyl-red green bromcresol indicator, NaOH, n-hexane, HCl solution, N2 gas, potassium borate buffer, OPA reagent, amino acid standard solution, 15 types of standard amino acids namely aspartic acid solution, glutamate acid, serine, histidine, glycine, threonine, arginine, alanine, tyrosine, methionine, valine phenylalanine, isoleucine, leucine and lysine with their respective concentrations each is 0.5 μ Mol / mL, Tris-Cl pH 6.8, reducing Sample Buffer, Coomasie Brilliant Blue (CBBR250) gel, polyacrylamide gels, separating gel.

The tools used: glass / glass equipment, digital scales, filter paper, dark glass bottles, porcelain cups, ovens, desiccators, Kjeldahl flasks, destillators, erlenmeyer flasks, green methyl-red bromcresol indicators, fat-free cotton flasks fat, Soxhlet tube, shaker, 40 watt TL lamp, aerator, incubator, pH meter, freeze drying, cold centrifuge, rotary evaporator, microtome, spluit, light microscope, microscope camera, glass plate, chamber, filter cloth, HPLC, bottle- sample bottles, electrophoresis, nitrocellulose membrane, Bio-Rad, microplate gel.

The research used explorative with qualitative methods include proximate parameters, amino acids and protein profiles The data obtained are presented in table and figure form which are then analyzed descriptively so that they can be explained and drawn a conclusion.

2.2. Methods

Fresh Kerandang fish meat is filleted to separate from bones, scales, stomach contents and fins. The fish meat is then washed clean and weighed. Samples were divided into 2 (two) parts, wet samples for proximate testing, and dry samples obtained after the samples were dried/dried for 3-4 days in the sun and mashed with a mortal or blender for amino acid testing and testing using SDS-PAGE.

Proximate Analysis include water content, protein content, fat content [3]. Amino acid use amino acid test with HPLC [4] and SDS-PAGE test with electrophoresis method [5,6].
3. Results and discussion

3.1. Proximate test
The results of the proximate test results of Kerandang fish (Channa pleurophthalmus Blkr) meat showed in Table 1.

| Water (%) | Protein (%) | Fat (%) | Carbohydrate (%) |
|-----------|-------------|---------|------------------|
| 76.48     | 16.35       | 0.35    | 6.82             |

The content or composition of Kerandang fish meat based on proximate tests is describing the optimal nutritional composition. It can be seen that the water content is 76.48%, protein 16.35%, fat 0.35% and carbohydrate 6.82%, so that this fish can be used as a source of high nutritious food derived from fishery products. In addition to containing water, protein, fat and carbohydrate content, Kerandang fish meat also contained ash levels of 1.07%, albumin levels of 3.5% and Zn levels of 2.35%, so that the complete nutritional composition [7].

3.2. Amino acid test
The composition of amino acids in Kerandang fish (Channa pleurophthalmus Blkr) meat showed in Table 2.

| No | Asam Amino Type | Result (%) |
|----|-----------------|------------|
| 1  | Leusin          | 4.69       |
| 2  | Lisin           | 4.44       |
| 3  | Valin           | 2.78       |
| 4  | Treonin         | 2.71       |
| 5  | Isoleusin       | 2.74       |
| 6  | Penilalanin     | 2.60       |
| 7  | Histidin        | 1.16       |
| 8  | Metionin        | 1.76       |

The results of amino acid testing using HPLC on Kerandang fish meat obtained 15 types of amino acids, with details of 8 types of essential amino acids and 7 types of non-essential amino acids. The highest essential amino acid is 4.69% leucine amino acid and the lowest is 1.76% methionine amino acid. While the highest non-essential amino acid is glutamic acid 9.11% and the lowest is glycine amino acid 3.50%.

Leucine essential amino acids are needed for the growth of children as a trigger for brain function and for adults in nitrogen balance regulation, prevention of muscle and skin degradation and wound healing process [8]. While non-essential amino acids glutamic acid is an amino acid in which glutamic ion contains can stimulate several types of nerves that are on the human tongue. Glutamic acid and aspartic acid are important because they create the characteristic aroma and taste in food. Besides that
glutamic acid also plays a role in intermediate production, namely in the amino acid interconversion reaction, proline precursors, ornitine, arginine, polyamines, α-amino butyrate neurotransmitters (GABA), and NH3 sources [9].

3.3. Protein profiles

The results of protein profile testing using SDS-PAGE electrophoresis on markers, dorsal fins, caudal fins and fish meat as shown in Figure 1.

![Figure 1](image)

**Figure 1.** SDS-PAGE test results on markers, dorsal fins, caudal fins and Kerandang fish (*Channa pleurophthalmus Blkr*) meat

Description:
1. Markers
2. Kerandang fish dorsal fins
3. Kerandang fish caudal fins
4. Kerandang fish meat

Based on the results of tests using electrophoresis (SDS-PAGE), standard molecular weight measurements are carried out through RF value measurements by plotting in a standard curve as in Figure 2.

![Figure 2](image)

**Figure 2.** The standard curve is the relationship between molecular weight and RF protein marker
Protein mobility can be calculated using the line equation from the standard curve. The line equation obtained from these calculations is $y = -1.1818 + 2.1738$ with a value of $R^2 = 0.9671$ (in Figure 2), and the resulting molecular weight is shown in Table 3 (a,b,c,d).

**Table 3a.** Protein profiles on marker Kerandang fish (*Channa pleurophthalmus* Blkr)

| Well 1 | Marker |
|--------|--------|
| (kDa) | a | b | rf | Log BM |
|-------|---|---|----|-------|
| 200   | 0.46 | 6.37 | 0.072214 | 2.301030 |
| 130   | 0.77 | 6.37 | 0.120879 | 2.113943 |
| 95    | 1.17 | 6.37 | 0.183673 | 1.977724 |
| 72    | 1.56 | 6.37 | 0.244898 | 1.857332 |
| 55    | 2.03 | 6.37 | 0.318681 | 1.740363 |
| 36    | 3.02 | 6.37 | 0.474097 | 1.656303 |
| 28    | 3.78 | 6.37 | 0.593407 | 1.556332 |
| 17    | 5.42 | 6.37 | 0.850863 | 1.241518 |

**Table 3b.** Protein profiles on Kerandang fish (*Channa pleurophthalmus* Blkr) Dorsal Fins

| Well 2 | Dorsal fins |
|--------|-------------|
| A | b | rf | Log BM | BM (kDa) |
|-----|---|----|-------|----------|
| band 1 | 0.16 | 6.37 | 0.025118 | 0.025118 | 139,1028 |
| band 2 | 0.27 | 6.37 | 0.042386 | 0.042386 | 132,7217 |
| band 3 | 0.32 | 6.37 | 0.050235 | 0.050235 | 129,9188 |
| band 4 | 0.42 | 6.37 | 0.065934 | 0.065934 | 124,4893 |
| band 5 | 0.77 | 6.37 | 0.120879 | 0.120879 | 107,2116 |
| band 6 | 0.85 | 6.37 | 0.133438 | 0.133438 | 103,6119 |
| band 7 | 1.29 | 6.37 | 0.202512 | 0.202512 | 85,6844 |
| band 8 | 3.84 | 6.37 | 0.602826 | 0.602826 | 28,91098 |

**Table 3c.** Protein profiles on Kerandang fish (*Channa pleurophthalmus* Blkr) Caudal Fins

| Well 3 | Caudal fins |
|--------|-------------|
| A | b | rf | Log BM | BM (kDa) |
|-----|---|----|-------|----------|
| band 1 | 2.31 | 6.37 | 0.362637 | 1.744725 | 55,55527 |

**Table 3d.** Protein profiles on Kerandang fish (*Channa pleurophthalmus* Blkr) meat

| Well 4 | Kerandang fish meat |
|--------|---------------------|
| A | b | rf | Log BM | BM (kDa) |
|-----|---|----|-------|----------|
| band 1 | 0.24 | 6.37 | 0.037677 | 2.128504 | 134,432 |
| band 2 | 0.56 | 6.37 | 0.087912 | 2.069176 | 117,267 |
| band 3 | 0.7 | 6.37 | 0.10989 | 2.04322 | 110,464 |
| band 4 | 0.81 | 6.37 | 0.127159 | 2.022826 | 105,396 |
| band 5 | 1.03 | 6.37 | 0.161695 | 1.982038 | 95,948 |
| band 6 | 1.09 | 6.37 | 0.171115 | 1.970914 | 93,522 |
| band 7 | 1.59 | 6.37 | 0.249608 | 1.878214 | 75,546 |
| band 8 | 1.66 | 6.37 | 0.260597 | 1.865235 | 73,322 |
| band 9 | 1.74 | 6.37 | 0.273155 | 1.850403 | 70,860 |
| band 10 | 1.85 | 6.37 | 0.290424 | 1.830009 | 67,610 |
| band 11 | 2.19 | 6.37 | 0.343799 | 1.766973 | 58,475 |
| band 12 | 2.61 | 6.37 | 0.409733 | 1.689105 | 48,877 |
| band 13 | 2.83 | 6.37 | 0.44427 | 1.648317 | 44,496 |
| band 14 | 2.89 | 6.37 | 0.453689 | 1.637193 | 43,370 |
Molecular weight testing using SDS-PAGE showed that protein in Kerandang fish meat (27 bands) was detected more than protein in dorsal fins (8 bands) and caudal fins (1 band) on Kerandang fish, so that the protein in fish meat is what describes the profile of protein in Kerandang fish. 

Protein from Kerandang fish meat has 27 protein bands in the range of 10.202 - 134.432 kDa. Referring to the research who used the literature to identify protein profiles in natural and cultured fish cork [10], the protein profile in Kerandang fish meat from SDS-PAGE test results which were then analyzed based on studies in several literature are as in Table 4.

**Table 4.** Estimate of protein types based on molecular weight (BM) in Kerandang fish meat

| Band   | BBM (kDa)  | Protein Type       |
|--------|------------|-------------------|
| 1 - 4  | 134,432    | β-galaktosa       |
|        | 117,267    |                   |
|        | 110,464    |                   |
|        | 105,396    |                   |
| 5 - 17 | 95,948     | Albumin           |
|        | 93,522     |                   |
|        | 75,546     |                   |
|        | 73,322     |                   |
|        | 70,860     |                   |
|        | 67,610     |                   |
|        | 58,475     |                   |
|        | 48,877     |                   |
|        | 44,496     |                   |
|        | 43,370     |                   |
|        | 40,680     |                   |
|        | 38,814     |                   |
|        | 37,034     |                   |
| 18     | 33,002     | Carbonic anhydrase|
| 19 - 20| 30,301     | Tripsin inhibitor |
|        | 28,060     |                   |
| 21 - 22| 23,756     | β-lactalbumin     |
|        | 17,545     |                   |
| 23 - 27| 15,568     | Lysozyme          |
|        | 14,665     |                   |
|        | 14,052     |                   |
|        | 10,877     |                   |
|        | 10,202     |                   |
The result of electrophoresis showed that dominant proteins based on molecular weight in this research are the types of albumin (13 bands) and lysozyme (5 bands), more than β-galaktosa (4 bands), carbonic anhydrase (1 band), tripsin inhibitor (2 bands) and β-lactalbumin (2 bands).

Albumin is the highest plasma protein in the amount of about 60% and has a variety of functions that are very important for health, namely the formation of new cell tissue, accelerating the recovery of damaged body tissue and maintaining fluid balance in blood vessels with fluid in the interstitial cavity within the limits normal limit, blood albumin levels are 3.5-5 g dl⁻¹. Lack of albumin in serum can affect the binding and transport of endogenous and exodent compounds, including drugs because as expected the distribution of drugs throughout the body is binding through the albumin fraction [8,11].

Cakalang fish meat reported that based on literature study of structural proteins with molecular weight of 23 kDa is a type of myosin light chain (MLC), 27 kDa is a sarcoplasmic protein type of glyceraldehyde-3-phosphate dehydrogenase, 32 kDa is a type of myosin light chain (MLC), 27 kDa is a sarcoplasmic protein type of glyceraldehyde-3-phosphate dehydrogenase, 32 kDa is a group of sarcoplasmic proteins enzymes, 38 kDa is tropomyosin type structural proteins, 92 kDa is sarcoplasmic proteins, 110 kDa are antibody type antibody proteins in myotomal muscle, whereas 48 kDa and 71 kDa are unknown types [12].

Proteins with molecular weights of 27, 32 and 92 kDa are reported to be part of the group of enzymes in sarcoplasmic proteins. Glyceraldehyde-3-phosphate dehydrogenation (27 kDa) is an enzyme found in fish muscle [13]. Likewise, the 32 kDa protein is an enzyme found in fish muscle and serves to catalyze the proteolysis unit [14]. The 92 kDa protein is sarcoplasmic, a muscle tissue protein that generally consists of enzyme groups [15]. The 110 kDa protein is reported to be an antibody found in myotomal muscle produced as a response to changes in environmental temperature in rainbow trout Oncorhynchus mykiss and Allothunnus fallen [16,17,18].

4. Conclusion

Based on research data and analysis, it can be concluded that the description of the protein profile of Kerandang fish (Channa pleurophthalmus Blkr) based on chemical composition, amino acids and molecular weight is as follows: proximate test that is water content 76.48%, protein 16.35%, fat 0.35% and carbohydrate 6.82%. The results for testing amino acids obtained 8 types of essential amino acids (the highest amino acid leucine 4.69%) and 7 types of non-essential amino acids (the highest amino acid glutamic acid 9.11%) with a total of 53.32% amino acids. The results of the analysis of protein from Kerandang fish meat based on molecular weight using SDS-PAGE are albumin (13 bands), lysozyme (5 bands), β-galaktosa (4 bands), carbonic anhydrase (1 band), tripsin inhibitor (2 bands) and β-lactalbumin (2 bands), contained 27 protein bands in the range of molecular weight of 10.202 - 134.432 kDa, with the estimation of protein types as follows: molecular weight 105,396-134,432 type β-galactose, molecular weight 37,034-95,948 types albumin, molecular weight of 33,002 types of carbonyc anhydrase, molecular weight of 28,060-30,301 types of trypsin inhibitors, molecular weight of 17,545-23,756 types of β-lactalbumin, and molecular weight of 10,202-15,568 types of lysozyme.

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