Analysis of Albumin Levels in Farmed Sidat Fish (*Anguilla marmorata*) and Natural Breed Toman Fish (*Channa micropeltes*)

Hari Santoso
Jurusan Biologi FMIPA Unisma

Keywords: Albumin, *Anguilla marmorata*, *Channa micropeltes*.

Abstract: Sidat fish (*Anguilla marmorata*)) is one of consumed fish species with relatively high nutrition contents, vitamins, micronutrients and albumin. Similarly, albumin is found in toman fish (*Channa micropeltes*) which is of the same family as gabus fish (*Channa striata*). In this research, sidat fish (*Anguilla marmorata*) is obtained from fish farms in Lamongan while toman fish (*Channa micropeltes*) is naturally obtained from Banjarmasin, South Kalimantan where the two fishes have high albumin content. The investigation is aimed at analysing the albumin level in sidat fish (*Anguilla marmorata*) found from fish farms and toman fish (*Channa micropeltes*) found naturally in swamps. The samples used for sidat fish and toman fish had average weight of 250 and 230-250grams respectively. Using unpaired T-test from SPSS 23, the data analyses showed the average albumin level in sidat fish and toman fish is $\bar{X}$ = 13,2025 and $\bar{X}$ = 10,807 respectively. This means that there is a significantly high difference in the albumin level found between sidat fish (*Anguilla marmorata*) and toman fish (*Channa micropeltes*).

1 INTRODUCTION

Fish is one of the most abundant food sources beneficial for its protein content and medicinal purposes. Protein has specific function in terms of building and maintaining cellular tissues inside our body which cannot be replaced by other nutrients (Almatsier, 2004). As energy source, protein is needed at appropriate amount so that balanced nutrient intake can be achieved as well (Astawan, 2007).

In the first place, naturally-occurring protein, also known as native protein, can undergo changes due to heating process (denaturation). This happens as a result of the degradation of chemical bonds in its tertiary structure and secondary molecules, which in turn allows protein to be more easily digested by hydrolytic enzymes during metabolism process inside the digestive system (Lean & Michasel, 2013).

There are a number of globular proteins present inside our body, such as albumin, globulin, histone, and protamine (Anna, 2007). Albumin is a water-soluble protein and coagulates by heat. It is the most abundant protein inside blood plasma at about 60% of the total plasma volume at 4.5 g/dL. Albumin functions to maintain plasma osmotic pressure and to transport small molecules through plasma as well as other extracellular fluids (Montgomery, 1993).

Other than that, albumin regulates intravascular colloid osmotic movement, eases the movement of internal body fluid and facilitates transport of nutrients inside the body. In a typical human body, alongside other proteins, albumin is synthesised by liver tissue at ± 100-200 µg/g per day (Suprayitno, 2003). Inside human body, albumin has important role during post-op wound healing due to its antinociceptive and anti-inflammatory characteristics (Suprayitno, 2003; Mat Jais, 2008; Mat Jais, 1997).

One way to boost albumin intake is by consuming HSA (Human Serum Albumin). However, it is very expensive thus alternatively people look for white egg, sidat fish or toman fish which are cheaper yet contain albumin with similar clinical aspects. Also, albumin from fish extract is also proven to contain omega-3 and omega-6 fatty acids (Mustafa *et al*., 2012).

In previous studies, Indonesians have used fish for its albumin content. For instance, people in Banjarmasin, South Kalimantan, make use of steamed gabus/toman fish for wound healing from afterbirth processes (Mustafa *et al*., 2012). From this study, it was proven that albumin extracted from

Santoso, H.
Analysis of Albumin Levels in Farmed Sidat Fish (Anguilla Marmorata) and Natural Breed Toman Fish (Channa Micropeltes).
DOI: 10.5220/0008361502880291
In *Proceedings of BROMO Conference (BROMO 2018)*, pages 288-291
ISBN: 978-989-758-347-6

freshwater fishes can substitute albumin serum (Mustafa, 2012).

Nonetheless, previous studies did not clearly investigate the albumin level found in freshwater fishes nor investigate the difference between those which are farmed and breeding naturally. This study thus wants to analyse the albumin level in farmed sidat fish (*Anguilla marmorata*) and toman fish (*Channa micropeltes*). The two fishes are chosen because they are generally consumed and have been shown to contain albumin which is used by the people who consume them.

2 MATERIALS AND METHODS

2.1 Materials

Freshwater sidat fish from the species of *Anguilla marmorata* (Q.) with the average weight of 250g per fish were obtained from ASPIN (National Fish Farmers Association) of Pasar Sore Village, Lamongan. Meanwhile, toman fish from the species of *Channa micropeltes* were taken from Banjarmasin, South Kalimantan, had the average weight of 230-250 g per fish. Overall, 2 kg of each fish were used in this study.

Albumin level test make use of bromocresol green method with bromocresol green reagent, albumin standard reagent and control reagent.

2.2 Sample Preparation

The fishes had their stomach, scales, fins, tails and heads removed. Also it was ensured that blood and mucus were properly eliminated. The cleaned meat were sliced into boneless fillets and cut into smaller pieces. These pieces were blended and added with solvents at the ratio of 1:1 v/w (100 mL water solvent to 100 g fish meat).

2.3 Extraction Process

Albumin extraction was performed by using 0.1M HCl as solvent for the meat solution and that the solvent-solution mix was heated at 35-50 ^{O}C for 10 minutes. To separate the mixture with its supernatant, filtering process was done with addition of 200 mL hexane. This was followed by mixing the solution until two separate substances, oil and water can be seen. The water substance is the extract of albumin.

2.4 Qualitative Test

Take 500 µL of blended fish samples and add 4 mL of biuret reagent in. Positive result is shown by the display of reddish or bluish violet.

2.5 Quantitative Test for Albumin Extract

Photometer was used to investigate the highest albumin level between sidat fish (*Anguilla marmorata*) and toman fish (*Channa micropeltes*) which had been treated with bromocresol green reagent.

Formula:

% albumin = [(mL sediment x N x P)/50] x 6.25

Note:

mL sediment : sediments collected

N : nitrogen quality from the result of standard curve equation

P : albumin sedimentation dilution factor

Standard equation **Y = 0.646X – 0.003** and $\mathbf{R_2}$ = **0.982** for the left side of the equation

3 DISCUSSION OF RESULTS

3.1 Analytical Result from Qualitative Test

Biuret test showed that both fish extracts contained albumin.

Table 1: Qualitative Analysis of Albumin Level

Item	Test Substance	Test Method	
		Biuret	Visual
Albumin	+	+	+
Sidat Fish Extract 500 µL	+	+	+
Toman Fish Extract 500 µL	+	+	+

From Table 1, biuret test showed that all samples turned violet, which showed the presence of albumin protein. The test was able to detect the change in peptide bond which resulted in colour change. Ion Cu^{2+} from the reagent in basic solution reacted with polypeptides that form proteins to form violet-coloured complex compound.

Sidat fish from Lamongan Regency has higher albumin level than that of toman fish from Banjarmasin, South Kalimantan. This conclusion comes from the visible spectrophotometry absorbance results which showed that sidat fish samples from Lamongan have the highest absorbance values at 0.641 and the lowest at 0.626 as compared to toman fish samples at 0.602 and 0.519 respectively.

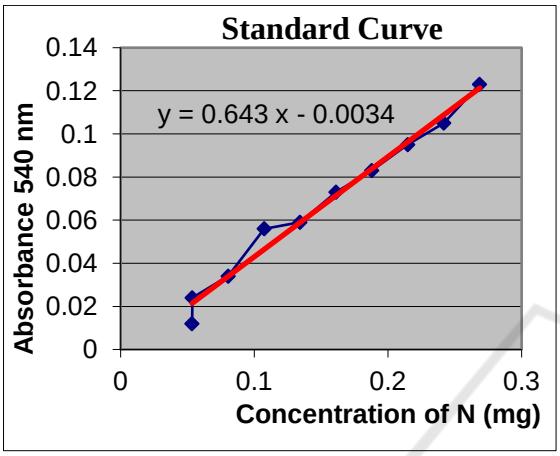

Figure 1: Standard Curve of Nitrogen Conc. Using Biuret Method

Fish meat samples used in the test were taken from lower head area and above tail area. For the head area, each sample used 2.5 g of meat from the right side of lower head area and 2.5 g from the left side of the same area. Similarly, for the tail area, each sample made use of 2.5 g of meat from the right side of tail and 2.5 g from the left side. The albumin level of toman fish seemingly differed between the head and tail area. The same observation was also made for sidat fish.

Each fish species recorded different albumin level and isoelectric point at around 4.6 – 4.9 (Ghufron, 2011). The difference in albumin level between the two areas is probably due to the different isoelectric point.

Myogin content, including albumin, in small fish is higher than that of large fish because large fish accumulates more fats (Ariza *et al*., 2016). Albumin level difference is probably due to the difference in terms of weight of fish samples, whereby out of the 2kg sample, each toman fish sample weighted around 230-250 g while it was about 250 g for sidat fish. Also, for sidat fish from Lamongan, they were farmed and given fish food rations which has a role in increasing their albumin level (Sulistiyati, 2011).

The best way to extract crude fish albumin is to use vacuum extractor with heating temperature at about 35 deg.C for 12.5 minutes because albumin as a protein is vulnerable to heat (de Man & John, 1989). In this experiment, the sample was incubated at the temperature of 37^{o}C inside water bath for about 10 minutes. It is probable that incubation influences the difference in albumin level.

3.2 Analytical Result from Quantitative Test

No.	Sample Type	Albumin Level (mg/100g)		Ave. ± SD
		Lower Head	Above Tail	
1	Sidat Fish	13.542	12.863	13.2025± 0.508*
2	Toman Fish	11.345	10.269	10,807± 0.234

Note: * shows significant difference

From the above results, it can be seen that the average albumin level in sidat fish from the species of *Anguilla marmorata* is 0.508 mg/100g while for that of toman fish from the species of *Channa micropeltes*, it is 0.234 mg/100g. Statistical test using unpaired T-test shows that there is a significant difference between the albumin level in sidat fish from the species of *Anguilla marmorata* and toman fish from the species of *Channa micropeltes.*

4 CONCLUSION

Albumin level found in farmed sidat fish from the species of *Anguilla marmorata* is higher than that of natural breed toman fish from the species of *Channa micropeltes* found in brackish water. With this result, farming of freshwater fish can be promoted for the purpose of utilising albumin for health purposes.

REFERENCES

Almatsier, Sunita. 2004. *Prinsip Dasar Ilmu Gizi*. PT. Gramedia Pustaka Utama Jakarta.

Anna T. 2007. *Thermostability of Proteins*. Journal Article Bios. Vol. 76, No. 1 (Mar., 2005), pp. 22-27.

Ariza dkk. 2016. *Analisis Kadar Alabumin Ikan Sidat (Anguilla marmorata dan Anguilla bicolor) dan Uji*

Aktivitas Penyembuhan Luka Terbuka pada Kelinci (Oryctolagus cuniculus). Galenika Journal of Pharmacy Vol. 2 (2) : 90 – 95.

Astawan, Made. 2007. *Ikan Air Tawar Kaya Protein dan Vitamin*. Penerbit Swadaya. Jakarta.

De Man & John. M. 1989. *Kimia Makanan*. Penerjemah Kosasih Padmawinata ITB. Bandung.

Ghufron. 2011. *Penetapan Kadar Albumin*. https://www.scribd.com/document/ diunduh 27 Nopember 2017.

Lean, J.E. & Michasel. 2013. *Ilmu pangan. Gizi dan Kesehatan*. Pustaka Pelajar. Yogyakarta.

Mat Jais, A.M., Zakaria, Z.A., Luo, A. and Song, Y.X. 2008. *Antifungal activity of Channa striatus* (haruan) crude extracts. International Journal of Tropical Medicine 3: 43-48.

Mat Jais, A.M., Dambisya, Y.M. and Lee, T.L. Antinociceptive Activity of *Channaa striatus* (haruan) Extracts in Mice. *J. Ethnopharmacol*., 1997; 57(2): 125-130.

Montgomery, R. 1993. *Biokimia Suatu Pendekatan Berorientasi Kasus*. UGM Press. Yogyakarta.

Mustafa, A., M Aris, W., & Yohanes, K. 2012. *Albumin and Zinc Content of Snakehead Fish (Channa striata) Extract and Its Role in Health*. International Journal of Science and Technology, 1(2), 1–8.

Mustafa, A., M Aris, W., & Yohanes, K. 2012. *Albumin and Zinc Content of Snakehead Fish (Channa striata) Extract and Its Role in Health*. International Journal of Science and Technology, 1(2), 1–8.

Sulistiyati, Titik, 2011. *Pengaruh Suhu dan Lama Pemanasan dengan Menggunakan Ekstraktor Vakum terhadap Crude Albumin Ikan Gabus (Ophiocephalus striatus)*. Universitas Brawijaya: Malang.

Suprayitno, E. 2003. *Penyembuhan Luka dengan Ikan Gabus*. Fakultas Perikanan. Universitas Brawijaya. Malang.

Suprayitno E, 2003. *Albumin Ikan Gabus (Ophiocepalus striatus) sebagai makanan fungsional mengatasi gizi masa depan*. http://www.antarajatim. Com. diunduh 30 Mei 2018.