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Comparison of Protein Levels in Freshwater Fish and Saltwater Fish

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Abstract

Fish are animals that live in fresh water and sea water. The purpose of this article is to find out the comparison of protein levels in fish from fresh water and sea water. The method for writing this article is a literature review method from several sources, including books, journals, the internet and other research reports. The resulting data is the protein content of several freshwater fish, tilapia 16.05%, catfish 14.53%, catfish 13.182%, milkfish 20.496%, goldfish 16.00%. Meanwhile, the protein content of some puffer sea fish is 21.40%, anchovies 18.83%, view 27.00%, tuna 26.30%, and salmon 19.90%. The method that can be used to analyze protein levels in fish is by using the Kjeldahl method.

Keywords: Protein, Fish, Fresh Water, Sea Water

1. Introduction

Fish are cold-blooded animals, their characteristic features are backbones, gills and fins (Burhanuddin, 2014). Consuming protein in fish is very beneficial for the body as a substance that builds cell tissue, regulates the metabolic system, and is fuel in the body (Munthe et al, 2016). Fish is a type of food that is widely consumed by Indonesian people to meet their animal protein needs compared to other products because of its protein, mineral and vitamin content (Subagiono, 2019).

Protein is an important constituent in all cells. This type of nutrient is a complex structure made of amino acids. All foods that come from animals and plants contain protein. Protein will be hydrolyzed by proteolytic enzymes to release amino acids which are then absorbed through the intestines. Input of all types of amino acids in adequate quantities is necessary for the growth and repair of body tissue (Syafruddin et al, 2016).

The nutritional content of each fish will vary depending on internal and external factors. Internal factors

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include the type or species of fish, gender, age and reproductive phase of the fish. External factors are factors that exist in the fish's living environment in the form of habitat, food availability and the quality of the waters where the fish live (Hafiludin, 2011).

Sea fish is food obtained from the sea. Indonesia is an archipelagic country where the majority of the population lives on the sea coast and consumes most of the food that comes from the sea, including fish. The government policy is to utilize local food, so the use of sea products also needs to be increased to provide sources. enough food. Apart from that, seafish also apparently have nutritional contents that can improve body health, so studies need to be carried out on this matter. Increasing fisheries production is closely related to the availability of fish which will ultimately support the food security system where this component consists of the availability, distribution and consumption subsystems (Inara, 2020).

Amino acids are often referred to and known as building blocks which are the end result of protein metabolism. One example is lysine (available lysine) as an amino acid component of protein which is easily damaged during the processing process because this compound is very sensitive to changes in pH, oxygen, light, temperature or heat (Alyani et al, 2016).

Protein

Protein is a group of macronutrients, unlike other macronutrients (carbohydrates, fat), this protein plays a more important role in the formation of biomolecules than a source of energy (building body shape).

Proteins are macromolecules that have a molecular weight between five thousand and several million. Proteins consist of chains of amino acids, which are linked to each other in peptide bonds. Amino acids consist of

However, if the organism is lacking energy, this protein can also be used as an energy source. Another feature of proteins is their structure which apart from containing N, C, H, and O, sometimes contains S, P, and Fe.

the elements carbon, hydrogen, oxygen and nitrogen. There are several amino acids containing the elements phosphorus, iron, iodine, and cobalt. The element nitrogen is the main element of protein because it is found in

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all proteins but not in carbohydrates and fats. Nitrogen elements constitute 16% of protein weight. Protein molecules are more complex than carbohydrates and fats in terms of molecular weight and diversity of the Protein Structure

Protein molecules are long chains composed of chains of amino acids. In protein molecules, amino acids are linked together through the reaction of the carboxyl group of one amino acid with the amino group of another amino acid, resulting in a bond called a peptide bond. This peptide bond is a primary-level bond. Two amino acid molecules linked together Properties of Proteins

Proteins are very large molecules, so they easily change physical form and biological activity. Many factors cause changes in the natural properties of proteins, for example, heat, acids, bases, organic solvents, pH, salts, heavy metals, and radioactive radiation. Changes in physical properties that are easily observed are the occurrence of densification (becoming insoluble) or solidification. Some proteins are soluble in water, some are insoluble in water, but all proteins are insoluble in fat solvents such as ethyl ether. The amino acid units that make them up. Protein molecules also contain phosphorus, and sulfur and there are types of protein that contain metal elements such as iron and copper.

in this way are called a dipeptide bond. If there are three amino acid molecules, it is called a tripeptide and if there are more it is called a polypeptide. Polypeptides that consist of only a few amino acid molecules are called oligopeptides. A protein molecule is a polypeptide, where a large number of amino acids meet each other with peptide bonds (Gaman, 1992).

solubility of protein will decrease if salt is added, as a result, the protein will separate as a precipitate. If protein is heated or alcohol is added, the protein will coagulate. This is because the alcohol attracts the water coat that surrounds the protein molecules. The presence of free amino and carboxyl groups at the ends of protein molecular chains causes proteins to have a lot of charge and to be amphoteric (can react with acids and bases). In acidic solutions (low pH), the amino groups react with H^+, so the protein has a positive charge. If electrolysis is carried

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out under these conditions, the protein molecules will move towards the cathode. And conversely, in an alkaline solution (high pH) protein molecules will react as acid or have a negative charge so that the protein molecules will move towards the anode (Winarno, 1992).

Types of Protein

Based on their shape, proteins can be divided into:

1. Fibrillary proteins (scleroproteins)

It is a protein in the form of fibres. This protein cannot dissolve in dilute solvents, whether salt solutions, acid bases or alcohol. For example, collagen is found in cartilage, keratin in hair, myosin in muscles, and fibrin in blood clots.

2. Globular proteins (steroproteins)

It is a protein that is shaped like a ball. This protein is soluble in dilute salt and acid solutions, this type of protein changes more easily under the influence of temperature, salt concentration, acid and base solvents compared to fibrillary proteins. This protein is very easily denatured, that is, the molecular composition can change followed by changes in physical and physiological properties such as those experienced by enzymes and hormones.

Proteins from the point of view of physiological function, namely those related to the supporting capacity for body growth and maintenance of body tissue, these proteins can be divided into:

1. Perfect protein, if protein can support body growth and tissue maintenance. Perfect protein is very necessary for children because it affects growth and development.
2. Half-perfect protein, if the protein is able to support tissue maintenance, but cannot support body growth. Proteins that repair damaged tissue.
3. Protein is not perfect, if it is completely unable to help the body's growth and tissue maintenance.

Function and Role of Proteins

Proteins play an important role in various biological processes. Roles these include:

1. Transportation and storage

Small molecules and ions are transported by specific proteins.

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For example, oxygen transport in erythrocytes by hemoglobin and oxygen transport in muscles by myoglobin.

2. Immune protection
   Antibodies are very specific and sensitive proteins that can recognize and then combine with foreign objects such as viruses, bacteria and cells from other organisms.
3. Movement coordination
   Muscle contractions can occur due to the shifting of two protein filaments. For example, the movement of chromosomes during the mitosis process and the movement of sperm by flagella.
4. Mechanical support
   The tension and hardness of skin and bones is caused by collagen which is a fibrous protein.
5. Enzymatic catalysis
   Most chemical reactions in biological systems are catalyzed by enzymes and almost all of the enzymes that play a role are proteins.
6. Generates and transmits nerve impulses
   Specific stimuli are responded to by nerve cell responses mediated by receptor proteins. For example, rhodopsin is a light-sensitive protein found in retinal rod cells. Another example is receptor proteins in synapses.
7. Growth and differentiation controllers
   Proteins regulate the growth and differentiation of higher organisms. For example, nerve growth factor controls the growth of nerve tissue. In addition, many hormones are proteins (Santoso, 2008).

Characteristics of Proteins

Proteins are introduced as information-giving macromolecules because the amino acid sequence of a particular protein reflects the genetic information contained in the base sequence of the corresponding region in DNA that directs protein biosynthesis. The characteristics of proteins are as follows:

1. Typical chemical composition
   Each protein is a pure compound
2. Typical molecular weights
   All the molecules in a particular example of pure protein have the same molecular weight. Because their molecules are large, proteins

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easily undergo physical changes or biological activity.

3. Typical amino acid sequence
   The amino acid sequence of a particular protein is genetically detailed. However, there are still small changes in the amino acid sequence of certain proteins (Page, 1997).

Source of Protein

Nearly 70% of protein comes from plant (vegetable) products, which come from grains, nuts, vegetables, fruit and cereals. Animal products used as protein are meat, eggs, milk and fish. Animal protein is referred to as complete and high-quality protein because it contains complete essential amino acids in a composition close to what the body needs.

2. Research Methodology

The method used in writing this scientific article is the literature review method, data is collected through text study and the results of relevant research. The literature review method is to look for sources that are relevant to the theory and related cases, whether from books, journals, other report articles, and from internet sites.

3. Results and Discussion

From literature review activities, several protein levels of freshwater fish and seawater fish were obtained, as shown in Table 1.1.

The types of fish in different water affect the level of fish protein levels. The table above shows that there are differences in the protein levels of freshwater fish and seawater fish. Differences in protein levels can be influenced by factors such as differences in habitat, size and type of fish (Hafiludin, 2015).

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Table 1.1. Protein Content of Freshwater and Marine Fish

No.	Freshwater fish		Saltwater Fish	
	Fish Names	Protein Content	Fish Names	Protein Content
1.	Parrot fish	16.05%	Bloated Fish	21.40%
2.	Catfish	14.53%	Mackarel tuna	26.30%
3.	Catfish	13.182%	Salmon	19.90%
4.	Milkfish	20.496 %	Pindang Fish	27.00%
5.	Goldfish	16.00%	Anchovy	18.83%

Freshwater fish protein levels based on the research results of Ningrum et al., (2019) obtained tilapia protein levels of 16.05%, Rahmawati (2013) obtained catfish protein levels of 14.53%, Syafruddin et al., (2016) obtained catfish protein levels of 13.182. %, Hafiludin (2011) obtained milkfish protein content of 20.496%, and Subagiono (2019) obtained goldfish protein content of 16.00%.

Based on the research results of Retti et al, (2013), the protein content of seawater fish showed that the protein content of puffer fish and anchovies was 21.40% and 18.83%, Himawati (2010) obtained the protein content of spotted fish of 27.00%, Salim and Triana (2017) obtained a protein content for tuna fish of 26.30%, and Razak (2011) obtained a protein content for salmon of 19.90%.

Protein content is determined using the Kjeldahl method, because this method is generally used for protein analysis in food. This method is a method for determining crude protein levels because it includes non-protein N compounds such as urea, nucleic acids, purines, pyrimidines and so on. The working principle of the Kjeldahl method is to convert organic compounds into inorganic ones (Rosaini, 2015). The principles of protein analysis using the Kjeldahl method include digestion, distillation and titration (Hafiludin, 2015).

The nature of fish protein is very easily damaged due to processing processes such as the influence of heat, acids, extreme bases and physical impacts, heavy metal cations and the addition of saturated salts so that the protein experiences denaturation.

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Protein denaturation occurs when the spatial arrangement or polypeptide chain of a protein molecule changes. Most globular proteins are easily denatured. If the bonds that form the molecular configuration are broken, the molecule will expand.

The bonds affected by this denaturation process are: (1) hydrogen bonds; (2) hydrophobic bonds, for example in leucine, valine, phenylalanine, tryptophan which are close to each other to form a micelle and are not soluble in water; (3) ionic bonds between charged groups (+), (-); (4) intramolucular bonds such as those found in the disulfide group in cystine.

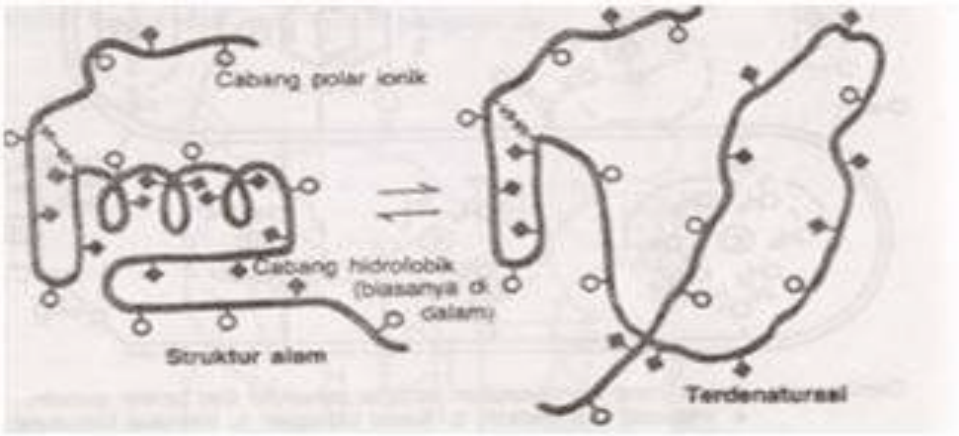

Figure 1.1 Protein Denaturation Process

Heating can cause the breaking of hydrogen bonds that support the secondary and tertiary structure of a protein, causing the hydrophobic side of the polypentide side group to open. This causes the solubility of the protein to decrease and eventually settle and clump, this event is called coagulation. The presence of heavy metal ions can break disulfide (SS) bonds which stabilize the indentations formed by polypeptides in building protein structures (Pandit, 2012).

4. Conclusion

Based on studies of the protein levels of freshwater fish and seawater fish carried out from several book sources, journals and internet sites, it was found that some seawater fish have protein levels that are higher than the protein levels of freshwater fish. The method that can be used to analyze

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protein levels in fish is by using the Kjeldahl method. Protein properties can be damaged if protein denaturation occurs which causes hydrogen bonds and disulfide bonds to be broken from several factors such as heating, pressure, pH and stirring.

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