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ARTICLE REVIEW: UTILIZATION OF FISH SKIN AS COLLAGEN

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ABSTRACT

The purpose of this review article is to review the process of extracting collagen from fish skin, the yield of collagen obtained from various types of fish and analysis of collagen marketing in Indonesia. The method used is literacy from various articles published in various journals. The results of literacy inform that fish skin from fish fillet industry waste can be processed or extracted into collagen. The collagen product obtained has a higher economic value and wider benefit value than the fish skin. The process of extracting collagen from fish skin can be done by various methods. The yield of collagen produced is influenced by the type of fish and how to extract it.

Keywords: *collagen, fish skin, deproteination, extraction*

BAB I
INTRODUCTION

One of the fishing industries in Indonesia is the fish fillet industry. This industry produces solid waste, including fish skin. According to Songchotikunpan et al (2008), the fish fillet industry produces fish skin waste in the range of 30-40% of the fish weight. One of the efforts to support a clean industry, then this fish skin waste needs to be utilized or processed into products that have economic value, including being processed into collagen.

Collagen is a protein found in vertebrates and invertebrates, approximately 30% of all proteins found in the body. Collagen fibers have a high resistance to pressure (Nurhayati 2009). Collagen is known to have many uses in the medical and pharmaceutical worlds, such as treating patients with hypertension, urinary problems, osteoarthritis, and angiogenic inhibition, such as complex diabetes, obesity, and arthritis (Rehn et al. 2001).

According to Friess (1998), fish skin is composed of extracellular proteins, 50% of which is collagen. The purpose of this paper is to review the process of extracting collagen from fish skin, the yield of collagen obtained from various types of fish, and the analysis of collagen marketing in Indonesia.

Collagen

Collagen is an organic structure that builds bones, teeth, joints, muscles, and skin. Collagen fibers have a strong resistance to pressure. The word collagen itself comes from the Greek which means to be sticky or to produce adhesive. Until now, there are about 28 types of collagen that have been identified, namely types I to XXVIII. (Anon 2009 in Nurhayati 2009). These types of collagen are found in various tissues, one of which is type I, which is found in most connective tissues, such as bone, skin, tendons, and blood vessels. Based on its shape, collagen is divided into 6 groups, namely fibrillar collagen, tissue, associated fibrils (FACIT), pearl chain, Verankerungsfibrillens, and transmembrane (Anon 2009 in Nurhayati 2009).

Collagen Extraction Process

The process of extracting collagen from fish skin generally consists of cleaning, deproteination, and hydrolysis stages. Various methods of extracting collagen from fish skin have been carried out by researchers in recent years as follows:

a. Nurhayati (2009)

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The stages carried out in this study consisted of immersion, deproteinization, reduction of fat content with butyl alcohol, demineralization, hydrolysis, and immersion in air. During the hydrolysis stage, pepsin enzyme is added to acetic acid to increase the solubility of collagen contained in the skin so that the collagen yield obtained is higher with the name Pepsin Soluble Collagen (PSC).

b. Sahubawa (2011)

The research conducted in 2011 consisted of several stages which were quite similar to other studies, including deproteinization for 24 hours, hydrolysis for 16-48 hours, then a salting-out process using a supernatant with NaCl added 0.9 mol dm^3. After salting-out, the precipitate was allowed to stand for 24 hours and then centrifuged for 20 minutes at a speed of 3500 rpm and a temperature of 4oC. then hydrolyzed again using acetic acid for 3 hours and produce liquid collagen which is then lyophilized (freeze-drying) for 12 hours and produces dry powdered collagen.

c. Nagai and Suzuki (2018)

The skin of the fish is cleaned from the remaining meat attached by soaking it in water with a temperature of $\pm$ 65-70 °C for 10 minutes in a water bath. After that clean with running water. The clean fish skins were placed in a separate glass beaker, then soaked in 0.8 M (1:6) NaCl to remove the remaining debris. Samples then with running water. Samples that have been cleaned of NaCl, immersed in 0.1 M NaOH solution with a ratio of 1:10 (w/v). Immersion in 0.1 M NaOH concentration was carried out for 5 hours at 4°C. Soaking in NaOH aims to remove non-collagenous substances and endogenous proteases. Then, fish collagen was extracted by immersing the sample in 0.5 M acetic acid solution with a ratio of 1:15 (w/v) for 24 hours, then filtered using filter paper.

Rendemen kolagen

The yield of collagen extracted from various types of fish skin has different amounts of content as shown in Table 1.

Table 1. Collagen yield extracted from fish skin

No	Fish Skin Type	Collagen Yield (%)
1	Japanese sea bass (*Lateolabrax japonicus*)	51.40
2	Chub mackerel (*Scomber japonicus*)	49.80
3	Bullhead shark (*Heterodontus japonicus*)	50.10
4	Big eye snapper (*Priacanthus tayenus*)	10.94
5	Ocellate puffer fish (*Tak ifugu rubripes*)	44.70
6	Nile perch (*Lates niloticus*)	63.10
7	Pangas catfish Skin (*Pangasius sp.*)	12,15
8	Cobia Fish Skin (*Rachycentron canadum*)	10,51
9	Black Tilapia Skin (*Oreochromis niloticus Bleeker*)	5,97

Source: data processed personally by the author

Based on the table, it can be concluded that the fish skin with the highest collagen was obtained from the skin of the Japanese sea bass (*Lateolabrax japonicus*) as much as 51.40% which was researched by Nurhayati in 2009. Then the quality of the collagen itself can be measured based on the solubility, viscosity, temperature, denaturation, and the amino acid content obtained.

Collagen Marketing Analysis in Indonesia

In finding and understanding collagen marketing in Indonesia, it can be seen in terms of market segments and also the selling price of the product.

a. Market segmentation

Market segmentation is the act of identifying and forming separate groups of buyers or consumers. The advantage of segmenting is that the company can design and produce products that are in accordance with the wishes and demands of the market and are more focused on serving the needs of certain market segments. The collagen market segmentation can be based on psychographics, and demographics. Market segmentation by demographics is aimed at children to adults as well as men and women. Products can be in the form of wound medicine, for example, purulent wounds, then facial cleansers, and bath soaps. Furthermore, market segmentation is based on psychographics, namely the upper-middle class who are interested in the habituation of healthy lifestyles.

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b. Price and Products

Here are some examples of products on the market that use ingredients from collagen and their prices;

No	Products Name	Products type	Price (Rp)
1	VIVA Cream Collagen Night cream - 22gr	Night cream for face	13.000
2	Propolis SM 10 ml	Wound Medicine	85.000
3	Collagen Bodywash 1L	Bath soap	101.000
4	Vital Proteins Collagen Peptides 400 gram	Collagen powder	575.000
5	Frozen Collagen 2in1 Powder Drink, 500 gram	Liquid Collagen	90.000
6	Nature's Way Collagen Tablets 60 Caps	Vitamin & Nutrition Supplements	265.000

Source: data processed personally by the author

CONCLUSION

Fish skin from fish fillet industry waste can be processed or extracted into collagen. The collagen product obtained has more economic value and wider benefit value than the fish skin. The process of extracting collagen from fish skin can be done by various methods. The yield of collagen produced is influenced by the type of fish and how to extract it.

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